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Intermodal Transportation Education and Training



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Washington, D.C.
November 2-5, 1997

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This report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

The views expressed in the presentations contained in this report are those of the authors and do not necessarily reflect the views of the steering committee, the Transportation Research Board, the National Research Council, or the sponsors of the conference.

The conference was sponsored by the Transportation Research Board and the Federal Highway Administration of the U.S. Department of Transportation.

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Preface and Acknowledgments

The topic for the conference was first suggested by the Task Force on Intermodal Transportation of the Transportation Research Board (TRB). A white paper on this topic entitled “Educational Issues in Fostering a New Perspective on Intermodal Transportation” was prepared and became the basis for the general topics discussed at the conference.

This conference was the fifth in a continuing series of conferences and workshops on intermodalism that have been organized by TRB since the passage of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). The first of these was a conference held in Irvine, California, in 1992: *ISTEA and Intermodal Planning: Concept, Practice, and Vision*. The second and third events were held concurrently in New Orleans, Louisiana, in December 1994: the *National Conference on Intermodalism: Making the Case, Making It Happen* and the *Intermodal Freight Terminal of the Future Conference*. The fourth event, the *National Conference on Setting an Intermodal Transportation Research Framework*, was held in Washington, D.C., in March 1996.

In June 1996, the Federal Highway Administration (FHWA) formally requested that TRB organize the National Conference on Intermodal Transportation Education and Training. In September 1996, the National Research Council appointed a steering committee, chaired by Michael D. Meyer of the Georgia Institute of Technology, to plan and conduct the conference. The steering committee recommended a conference format, outlined specific topics, and selected speakers. Several committee members took an active role in the conference program.

The objective of the conference was to examine educational and training needs related to all aspects of intermodal transportation: technology, advanced logistics, information systems, planning, and management. Over a 3-day period, participants reviewed existing and developing transportation education programs across all disciplines and examined the roles of educational institutions, private industry, and government in setting an agenda for meeting intermodal transportation education and training needs.

The goal of the conference was to formulate ideas to expand and improve transportation education and training and, in the words of Secretary of Transportation Rodney E. Slater, “To build partnerships to ensure that the nation has a skilled and educated transportation workforce prepared for the technologically challenging jobs of the 21st century.”

The formal program opened with welcoming remarks from Bruce Alberts, President of the National Academy of Sciences and Chairman of the National Research Council, and Gloria Jeff, Acting Administrator of FHWA, followed by the charge to the conference by Michael D. Meyer, Chairman of the conference steering committee. The keynote address was delivered by Robert D. Krebs, Chairman, President, and Chief Executive Officer of the Burlington Northern and Santa Fe Railway Company and former Chairman of the National Commission on Intermodal Transportation. Conference sessions included panel discussions, case study presentations, and status reports, as well as breakout discussion groups on specific topic areas.

An important component of the conference was the exhibits and demonstrations, which highlighted a broad

range of educational and training options: degree programs, continuing education and certification programs, on-the-job training, mentoring and internship programs, distance learning, and special skills training. A pre-conference dinner was held on Sunday evening, at which Mortimer L. Downey, Deputy Secretary, U.S. Department of Transportation, was the guest speaker. Mr. Downey also made presentations to the winners of a student essay contest conducted as part of the conference, Ana Martinez and Maalik Russell, both of whom presented their winning essays at the dinner.

The student essay contest was conducted as a means of showcasing one of the innovative transportation education programs, which has been implemented at the high school and junior college level in the Los Angeles area. The contest, sponsored by TRB with the support of FHWA and the Los Angeles County Metropolitan Transportation Authority (MTA), was open to high school seniors participating in the Transportation Careers Academy Program (TCAP) in the greater Los Angeles area. The essay topic, selected by the student, reflected what he or she had gained from participation in TCAP and how it would be applied to future career goals. Essays were initially reviewed by TCAP faculty, and the final selection was made after review by representatives of the conference steering committee, FHWA, and TRB.

Special thanks are extended to the following individuals and groups for their contributions to the conference:

- Michael D. Meyer, Georgia Institute of Technology, for serving as master of ceremonies throughout the conference and as moderator for case study and status report sessions, as well as the opening and closing sessions; Dr. Meyer also drafted the Chairman's Summary and was among those who reviewed the student essays;
- Robert D. Krebs, Burlington Northern and Santa Fe Railway Company, for delivering the keynote address, which set the stage for the remainder of the conference;
- Aaron Gellman, Northwestern University; Robert Martinez, Secretary of Transportation for the Commonwealth of Virginia; Jeff Crowe, Landstar System, Inc.; and Richard Simonetta, Metropolitan Atlanta Regional Transportation Authority, for providing responses to the keynote address;
- Charles Raymond, Sea-Land Services; Mark Bonatucci, Lockheed-Martin Corporation; Naomi Nightingale, Los Angeles County MTA; and Belle Cole, PMR Group, for presenting demand-side case studies;
- Glenda Tate, Office of Human Resource Management, U.S. Department of Transportation, for moderating the panel discussion Perspectives on Transportation Workforce 2000;
- Evelyn Thomchick, Pennsylvania State University; Louis Pignataro, New Jersey Institute of Technology, and Lester A. Hoel, University of Virginia; E. Cameron Williams, University/College of Charleston; Dennis Gay, Sea-Land Services; Jon Helmick and Gerhardt Muller, U.S. Merchant Marine Academy; Linda Dahlen and Emeric Pratt, Minnesota Department of Transportation; and Hattie Brown, FHWA, for preparing and presenting supply side status reports on current intermodal transportation education and training programs;
- Shirley McCall, coordinator of the TransTech Academy Program at Cardozo Senior High School for moderating the panel discussion Internship and Mentoring Programs;
- Tay Yoshitani, Maryland Port Administration; Joni Casey, Intermodal Association of North America; Lawrence Dahms, Metropolitan Transportation Commission; William R. Lucas, Military Traffic Management Command; Edward Wytkind, Transportation Trades Department of the AFL-CIO; and Lana Batts, Truckload Carriers Association, for providing the Firing Line Panel response to conference recommendations;
- Mortimer L. Downey, Deputy Secretary of the U.S. Department of Transportation, for serving as dinner speaker;
- Kelley S. Coyner, Acting Administrator of the Research and Special Programs Administration, U.S. Department of Transportation, and Terry L. Priest, Coors Brewing Company, for serving as luncheon speakers;
- Institutions, agencies, and individuals who put together and presented poster displays, exhibits, and demonstrations on existing programs and initiatives (see Appendix B in these proceedings);
- Individuals from the public and private sectors and academia for participating in the transportation workforce and internship-mentoring panels and for serving as facilitators and rapporteurs for the breakout discussion groups; and
- Faculty, administrators, and students from the Los Angeles County TCAP who participated in the student essay effort—in particular, essay winners Ana Martinez and Maalik Russell, whose presentations and presence at the conference demonstrated the character and quality of the future transportation workforce.

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Chairman's Summary

Michael D. Meyer, *Georgia Institute of Technology*

Transportation is far from the mainstream for most people, yet there is no element of our day-to-day lives that has a more pervasive effect on us. We need a transportation vision, especially an intermodal transportation vision, that gets the public thinking and talking about the importance of transportation and about participating in transportation policy and in the industry itself.

—Robert D. Krebs

The conference began with a keynote speech by Robert D. Krebs, Chairman, President, and Chief Executive Officer of the Burlington Northern and Santa Fe Railway Company. Krebs stated that we are still in the early stages of a transition to a truly intermodal transportation system. Progress has occurred in freight transportation, but it has been much slower in the public transportation sector. This difference is partially explained by a strong market-driven process in the freight sector that demands intermodal transportation services, whereas the impetus for such services has yet to be defined in the passenger sector. As Krebs noted, “If we’re going to adopt a true intermodal perspective, we need more time, more effort, and especially more education.” Other key points in Krebs’s presentation included the following:

- Many transportation officials do not come from transportation degree programs, which should be reflected in education and training programs for the profession.

- Core business curricula should include logistics and intermodal transportation courses as well as those in marketing, accounting, and finance.

- New applications for transportation and intermodalism do not come from a textbook; they come from real-life experiences. Therefore, we need to educate the educator.

- Private companies need to support transportation education by providing financial support, contributing teachers, and participating in courses.

- More research is needed on intermodalism, and these research results need to be incorporated into education and training.

Many of these ideas received further attention during the conference. There was general agreement that although some progress in intermodalism has occurred in the freight sector, this progress has not been at the levels expected when the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) was passed. There was also a sense that education and training were key elements in a strategy to enhance the nation’s intermodal transportation system.

KEY CONCEPTS

Several important concepts emerged from the conference discussion, especially during the early sessions, which focused on understanding the needs and desires of transportation providers. These concepts served as basic

points of departure for the discussions that occurred later in the conference.

Vision

There was a general sense that an intermodal transportation vision has not been effectively articulated and conveyed to the general public or to the transportation profession. Generally, this vision means understanding the important relationship between transportation and the functioning of society as we know it. More specifically, it means adopting a supply chain perspective on the movement of people and goods. There is clearly an important role for education and training in disseminating such a vision.

Private- and Public-Sector Involvement

Conference presenters and participants spent considerable time exploring the necessary involvement of government and industry in education and training. Words such as “dialogue,” “partnerships,” and “collaboration” were used to describe potential interaction. As noted by Krebs, with agreement by conference participants, agencies and companies have a huge stake in educating and training their workforce. An educated workforce is the future of these organizations.

Role of Curriculum in Management Training

Many of the conference participants did not have a formal education in transportation or logistics. Although a good exposure to transportation in a university program is worthwhile, it often takes more than this to be successful in the profession. Therefore, training and continuing education are important in producing and maintaining a skilled workforce. Lifelong learning suggests that knowledge and skill needs over the career of transportation employees should be important concerns for managers.

Systems Perspective

Although a systems perspective for transportation has been the thrust of many transportation policies and educational programs, conference participants believed that this perspective still has not taken hold. Organizations, as well as individuals within these organizations responsible for transportation, do not often see the big picture—transportation needs from origin to destination, the entire supply chain, and important linkages to

the way society functions. Along similar lines, a systems perspective suggests that transportation providers need to understand the cost drivers that relate to service provision (and how costs can thus be reduced), as well as the factors that influence the demand for passenger and freight travel.

Management of Technology and Innovation

One of the important characteristics of intermodal transportation, and of the market context within which it is offered, is the high rate of technological innovation. A serious challenge for the industry and for educators and trainers is how to prepare people to manage technology and to understand the impact of technology on organizations, especially mid- to low-level employees, who are often the first to use such technology. How can organizations develop a culture in which innovation is embraced and people are willing to take the risks associated with innovation?

DESIRED SKILLS AND KNOWLEDGE

In the first part of the conference, the focus was on the skills and knowledge desired by transportation organizations. Not surprisingly, conference participants noted that such skills and knowledge will vary significantly by job type. However, educators and trainers need to understand what skills are necessary before they develop an education and training program aimed at preparing a transportation workforce. Several illustrations of this linkage between desired skills and the programs designed to provide these skills were presented at the conference, for example, truck driver certification and signal technician certification. In addition, it was recognized that people learn in different ways and that the most effective way to educate or train individuals will likely vary from one context to the next. There is a need to evaluate different education and training models to determine which ones work best in which contexts.

Conference participants identified a set of competencies or skills that could apply to any level or position as well as to any field in transportation. These “core competencies” included the following:

- *Technical competence:* No matter what the task, individuals must be technically competent to perform it successfully.
- *Teamwork:* Being able to work effectively as a team is becoming one of the most critical characteristics of today’s workforce.
- *Role of measurement:* Implied by measurement is any level of mathematical reasoning, from basic math-

ematical skills to the development of mathematical models.

- *Communications*: One of the important needs, and a real challenge to educators, is developing student skills in technical communications.

- *Critical thinking*: Referred to by some as “problem-solving,” in essence this skill involves the ability to figure out the logical path from an existing status to a desired one.

As noted earlier, these core competencies are generic in the sense that they could be applied to any type of position. Conference participants also identified higher-level skills and knowledge that were appropriate for those involved with intermodal transportation:

- *Customer orientation*: Given the market context for intermodal transportation, the transportation workforce must understand customer desires and needs.

- *Systems perspective*: As noted earlier, intermodal transportation requires a systems perspective in the planning, operations, and management of services and facilities.

- *Economics and forecasting*: A basic understanding of how economies operate and how transportation fits into this economic context is needed.

- *Data, modeling, and information systems*: In a complex world, transportation officials need to understand how to use data in a decision support context, which could include developing models and information systems.

- *Basic research understanding*: This skill includes developing a research design, conducting experiments, and drawing conclusions.

As an example of how different levels of competency can relate to different levels of education, one conference group developed illustrative programs at different levels of entry for those interested in intelligent transportation systems (ITS). For example, two-year programs should include computer-assisted drafting and design (CADD), computer programming, electronics, quality control, and traffic control systems. Undergraduate programs should include a broad understanding of other engineering disciplines, crosscutting skills such as those in communications and business, and problem solution. Graduate programs should include broad knowledge of a major field and a subspecialty, computer tools, ITS and management information systems (MIS), and related multidisciplinary courses.

Conference participants also suggested that an increasingly important characteristic of intermodal transportation is understanding transportation service provision in an international context, which encompasses the following areas: economics, transportation characteris-

tics, geographic considerations, supply chain management, government role, delivery distribution, transportation and logistics strategy, and management of change and innovation. Many of the companies represented at the conference manage global operations, and they strongly believe that employees of the future will need to understand their company's place in the global market.

FINDINGS AND CONCLUSIONS

The conference findings and conclusions fall into three major areas: education and training pedagogy, industry-government and education-training partnerships, and policy and program initiatives.

Education and Training Pedagogy

M.B.A. Programs

Logistics and intermodal transportation courses should be incorporated into core M.B.A. programs. Many conference participants representing private transportation companies strongly believe that M.B.A. programs do not expose students sufficiently to transportation and logistics issues. Logistics curricula are often found, but the broader context of the transportation industry and service issues is often not present.

Core Competencies

Core competencies should be defined by academia and stakeholders for all levels of entry into the workforce. The concept of core competencies was viewed by many as a key point of departure for education and training programs. These core competencies should be developed jointly by all major stakeholders and constituencies and should provide input for program development.

Collaborative Work Projects in Education

Effective teamwork on projects is a key educational and training objective. Universities and training programs should actively seek opportunities to involve government and industrial partners in developing projects that not only benefit the organization but also provide important educational exposure for students.

Case Studies on Systems Perspective

Adopting a systems perspective in transportation courses is an important pedagogical strategy. Inherent in this approach, however, is the need to illustrate the

systems perspective through case studies. Conference participants believed that intermodal transportation case studies that show the systems nature of intermodal service provision should be developed and shared among education and training institutions.

Improved Communications

The ability to communicate on paper and in group presentations is a critical skill for all transportation professionals, as has been noted by many different groups and is well known in the transportation education community. Placing greater emphasis on effective communications skills should be an important goal of education and training programs.

Alternative Learning Methods

Many conference participants noted that the traditional teaching-training model that features an instructor in front of a class might no longer be appropriate for today's world. There was a strong belief that the U.S. Department of Transportation (DOT) and other organizations interested in transportation education and training should assess the effectiveness of alternative learning methods, which could include, but not be limited to, use of the Internet, internal organizational networks, distance learning, virtual university, and self-learning.

Industry-Government and Education-Training Partnerships

Conference participants identified many ideas for developing partnerships between industry and governmental agencies and education and training programs. No specific recommendations were made about which group should take the lead in establishing these types of interactions because their implementation would clearly depend on individual circumstances. In some cases, the education and training program might take the initiative, whereas in others, industry or government might take the first step. The sense of the conference was that each of the following approaches have merit and should be pursued when the opportunity arises.

Education of the Educator

Opportunities should be provided for those teaching to experience the practical world of transportation so that this experience can be incorporated into the classroom. These opportunities might range from hiring a teacher for a limited duration to establishing professional relationships between individual teachers and companies.

Student Interns

One of the most effective learning mechanisms is to have students experience firsthand the environment within which they will eventually work. Student internships provide a unique opportunity to do this. In setting up the internship, both the educational institution and the company or agency must agree to the terms of internship, for example, what activities count toward academic credit.

Professional Sabbaticals

It is also important to provide opportunities for transportation professionals to experience advanced educational experiences. Not only will this help the individual professional, but it will also provide useful input to the educational institution.

Job Rotation

One means of providing training opportunities within an organization is to rotate new employees among different functional units. This rotation provides new employees with opportunities to better understand the workings of the organization and to become more sensitive to the system within which the employee will operate during his or her career.

Team Teaching

The concept of team teaching includes courses with instructors from both transportation practice and the educational and training program. This concept is not new; many programs have been using this technique for some time.

Advisory Boards

Many programs have advisory boards to provide guidance on overall program direction and to help secure funding for strategic initiatives. Several company representatives at the conference suggested that use of advisory boards would be a good way for the private sector to influence future employees' formal education.

Guest Lecturers and Adjunct Professorships

A concept similar to team teaching, adjunct professorships were suggested by conference participants as a useful way of formally incorporating practice-oriented considerations into education programs. This concept has been used by many universities with great success.

Curriculum Development

The example used to illustrate this approach was Sea-Land Services' interaction with the U.S. Merchant Marine Academy in developing a curriculum that is directly related to the maritime industry. Not only does this interaction foster the exchange of ideas, but it could also generate financial support for innovative approaches to curriculum development.

Support of Research

Private and governmental support for transportation and logistics research can provide an important foundation for incorporating new ideas into transportation education and training curricula. At major universities, for example, research plays an important role in generating new ideas, which are then incorporated into the curriculum.

Endowed Chairs

Perhaps the most significant way in which private companies can influence the direction of transportation and logistics research and education is by endowing faculty chairs. Such endowments provide resources and guidance to educational institutions on the important topics that should be addressed by higher education.

Monitoring and Feedback

Education and training programs become most effective when there is monitoring and feedback on program effectiveness. Whether this occurs through advisory board membership or through formal evaluation procedures, this feedback loop is important.

Policy and Program Initiatives

Return on Investment in Training

Support for training programs by high-level management usually reflects an understanding of the company's return for investing in such programs. It is important to provide some level of understanding of how such a return could be measured and communicated to those in charge of investing in the organization's future. Conference participants suggested that this effort was something that DOT might undertake as part of its training programs.

Effectiveness of Alternative Learning Models

Conference participants believed strongly in the need for an assessment of alternative learning models. This assess-

ment could be supported by a consortium of public and private organizations concerned with providing the most effective approach toward training for their employees.

National Transportation Skills Standards

Several conference participants suggested that a set of national transportation skill standards be developed that could be applied throughout the United States and that could then become the core competencies at which education and training programs would be aimed. This idea was the most controversial of any suggested at the conference. Many participants were concerned about the loss of flexibility if a uniform set of standards were applied. Others thought that it would be difficult to find agreement on what these skills should be. There was no consensus on this initiative.

National Policy for Workforce Development

Several conference participants suggested that a national policy be developed linking transportation investment to the development of employee skills. Many other participants did not agree on the importance of this initiative. However, there did appear to be general agreement that including human resource development in the mission statement of transportation agencies was an important step in recognizing the linkage between organizational effectiveness and the availability of trained staff.

Clearinghouse for Curriculum

There was agreement that it would be very useful to develop a site on the World Wide Web to act as a clearinghouse for curriculum innovations. The Transportation Research Board could possibly take the lead in this development.

Federal Support of Education, Training, and Research

There is an important linkage among research, education, and training. Most conference participants, and all private-sector participants, strongly suggested that federal support of intermodal transportation research, education, and training should be a priority area for DOT. It needs to be recognized that through research, one can have a great deal of influence on the direction of the U.S. transportation system. Likewise, through education and training, future transportation professionals can become more sensitive to this direction.

Follow-Up Conferences

Most participants believed that this conference was a good initial step for the exchange of ideas on how to best

provide intermodal transportation education and training. Examples of innovative state-level training programs that could have excellent application elsewhere were presented. There was a clear sense that the next step was to have periodic meetings at which examples of good practice could be presented to the transportation community and examined for application elsewhere. There was strong support for TRB to consider cosponsoring a conference on international intermodal education.

Garrett A. Morgan Technology and Transportation Futures Program

The Garrett A. Morgan program was viewed by many conference participants as a major initiative in providing incentives and support for attracting the best students to a career in transportation. Because the program had just been organized when this conference was held, support was for the most part voluntary and unfunded. Conference participants believed strongly that the program should be supported with funding from DOT and with support from other agencies and corporations.

RESPONSE TO CONFERENCE FINDINGS AND CONCLUSIONS

The steering committee and participants were honored to have the Firing Line Panel, which consisted of distinguished transportation professionals representing a broad spectrum of the transportation industry, present on the final day of the conference to respond to the preliminary findings and conclusions. The panel included Tay Yoshitani, Maryland Port Administration; Joni Casey, Intermodal Association of North America; William R. Lucas, Military Traffic Management Command; Lawrence Dahms, Metropolitan Transportation Commission; Edward Wytkind, Transportation Trades Department of the AFL-CIO; and Lana Batts, Truckload Carriers Association. Although a number of the comments and responses from the panel were incorporated into and are reflected in this summary, many of the key points raised by panelists are highlighted in the section Firing Line Panel Response to Conference Findings later in these proceedings.

INTRODUCTION

Welcoming Remarks

Mortimer L. Downey, *U.S. Department of Transportation*

Bruce M. Alberts, *National Academy of Sciences and National Research Council*

Gloria J. Jeff, *Federal Highway Administration*

Mortimer L. Downey

I congratulate the student essay contest winners, Ana Martinez and Maalik Russell, from North Hollywood High School in Los Angeles County, California. If they represent the kind of professionals our industry can expect to see, we will be in good shape for at least another half-century.

For a long time, those of us in transportation have talked about the revolutionary changes our industry was undergoing—changes generated by new technologies; new partnerships; new concepts, such as intermodalism; and new priorities, such as environmental quality. These factors are combining with larger social and economic transformations to change how we make decisions, how we set priorities, and how we allocate resources. They are changing how we form partnerships within and outside our industry and the nature of those relationships. To make the most of these changes and to ensure that our transportation system continues to provide mobility and opportunity for Americans, we must have an educational community capable and willing to prepare the next generation of transportation professionals.

Last year, as part of preparations for reauthorization of surface transportation programs, many of us at the U.S. Department of Transportation (DOT) traveled the country meeting with transportation officials, business professionals, and others to talk about what was most needed for the transportation systems of the 21st century. The answer should not have surprised us—it was not new technologies, or more money, or any of the other important things you might expect. Instead, what

we heard was that the key need was people—or, to be more specific, well-educated, well-trained people who can help to design, build, operate, and maintain the advanced transportation systems this nation will need for economic success. Many of us have long recognized the need for enhanced education and training and for new and different programs to support these initiatives. That need has been especially true in intermodal areas. For example, 3 years ago the National Commission on Intermodal Transportation recommended that we “expand the intermodal focus of research, education, and technology development efforts.” Robert Krebs, who delivers the Keynote Address at this conference, chaired that commission and oversaw the preparation of these recommendations. His commission urged that we in DOT

draw on the resources of TRB and others to define and coordinate intermodal research and education needs, . . . conduct outreach to the mode-oriented programs of the nation’s universities to develop new ways of training the next generation of transportation professionals, . . . encourage the development of intermodal course modules and case studies, . . . and use the University Transportation Centers to take the lead on curriculum reform to provide stronger training in intermodal transportation.

As will be evident at this conference, DOT has acted on those recommendations and has made significant

progress in each of these areas. For example, the Federal Highway Administration of DOT provided the support for TRB to organize this conference, and DOT staff have worked with TRB standing committees and other transportation organizations to help define intermodal research needs.

This conference is but one aspect of DOT outreach efforts, not only to universities, but also to junior colleges, high schools, and grade schools. You will see evidence of this during the conference. Conference sessions will feature case studies focusing on various aspects of intermodal transportation operations and planning, including supply chain management, intermodal partnerships, data and information systems, logistics, transit operations, and intelligent transportation system (ITS) technologies. There also will be presentations on the status not only of university and other academic programs but also of private-sector and public agency education and training programs.

As evident in the displays featuring University Transportation Centers from around the country, curriculum reform and development also are under way. The plenary sessions and breakout discussion groups will provide an opportunity to become familiar with and to suggest further refinements and improvements to intermodal transportation programs and curricula.

Transportation is an industry that offers tremendous career opportunities for today's young people, *if* they are aware of them and *if* they can obtain the knowledge and skills demanded by potential employers. Accordingly, this conference will highlight partnerships and innovative programs being developed between educational institutions, business interests, and public agencies to help ensure that the transportation industry has the workforce it needs for the future. Here, too, DOT is involved.

One of the most visible crosscutting efforts is the Professional Capacity-Building Program for ITS Deployment. ITS is the application of advanced information and communications technologies to transportation. We need professionals to train technicians to design, work with, and deploy these new technologies that are making travel safer and more efficient. This program was established to develop educational and training initiatives for colleges and universities, to give them the resources they need to create curricula for this new world.

We recognize that the intensive training required for many transportation professions means that it is never too early to start, and that is why we are also closely in-

involved with the TransTech and Transportation Careers Academy programs. These programs introduce and begin training high school and junior college students for careers in transportation, and I am pleased to be able to share the head table this evening with students and educators from these programs. Their students are getting a jump start on our profession, and we look forward to seeing the results in coming years.

Finally, DOT is involved with the Garrett A. Morgan Technology and Transportation Futures Program, which seeks to build partnerships between and within the transportation and education communities. This program has been a top priority of Secretary Slater's, and President Clinton felt so strongly about it that he announced it himself last May. It is appropriate that this technology education program, which may make a greater difference in the lives of our children than any of our other initiatives, is named after the man who was truly the grandfather of transportation technology—the man who invented the automated traffic signal—Garrett Morgan.

This new initiative will challenge at least 1 million students to develop their math, science, and technology skills to prepare for careers in transportation, and it will foster lifetime learning. We have made a good start; as Secretary Slater announced recently, the Garrett Morgan program in its infancy has already touched the lives of 250,000 children across America. Although that is impressive, it is only a start. This fall, we sponsored a roundtable bringing together business, academic, and government leaders to take us to the next step.

That is also a purpose of this conference. It challenges us—as teachers, as researchers, as public officials, as businessmen and -women, as parents and concerned members of our communities—to determine what we need to do to help prepare our students for the future, and then to provide opportunities in schools and workplaces across America.

Over the next few days we want to identify existing and new opportunities to build partnerships between the transportation, education, business, and labor communities to ensure that we have a workforce that is ready for the 21st century and to create opportunity for the next generation of Americans.

We need your help and your ideas and your leadership to make these intermodal education programs a continuing reality throughout America and to work together for what really matters: our children, and their future.

Bruce M. Alberts

It is a privilege to be here to discuss my favorite subject—education. As President of the National Academy of Sciences, I also serve as Chairman of the National Research Council, of which the Transportation Research Board (TRB), the host of this conference, is the oldest and largest unit.

All of you know better than I that transportation is a major activity in this country; some estimate that it may directly or indirectly employ as many as one out of every seven people. Transportation offers tremendous opportunities for young people in terms of careers and a vision for their future. Part of our job is to make young people aware of the opportunities in the world of work and to help them gain the knowledge and higher level of skills demanded by today's employers.

This conference will highlight partnerships and other innovative programs that have been developed between educational institutions, private-sector transportation entities, and public agencies—programs designed to help ensure that the transportation industry has the workforce it needs for the future and to motivate and provide a vision for many of our young people today.

TRB developed this conference in response to a request from the Federal Highway Administration of the U.S. Department of Transportation. I would like to recognize Gloria Jeff, Acting Federal Highway Administrator, whose agency is the sponsor for the conference, and Kelley Coyner, Acting Administrator of the DOT Research and Special Programs Administration, who has worked hard to promote the Department's efforts in the area of transportation education. I also want to offer special thanks to Chair Michael Meyer and other members of the steering committee, as well as TRB staff, who planned this conference.

This morning I will briefly discuss how this conference fits into a broader context of what the Academy is doing in the area of education. I do not have to tell you that there is nothing more important for the future of this nation than the education we provide to our children. I also do not have to tell you that we have not been doing an adequate job. I do not think we can or will ever be completely satisfied with our schools, and I am not sure we should be. What I do think is that we are at a crucial time in terms of educational opportunities.

We live in an increasingly technical society. Employers tell us they cannot hire most of our high school grad-

uates because the students lack necessary skills and training. If that is true and it remains true, both the country and those high school graduates are going to be severely disadvantaged. Our society is becoming ever more technical at a faster and faster pace. People who do not understand this society, who do not have the skills or ability to be productive in this society, become alienated; that is a very destructive phenomenon, both for the people themselves and for the country.

I am especially aware of studies carried out over the last 10 years, one of which involved 20,000 students and their families in Wisconsin and California. The study looked at the attitudes that middle-class middle school children—sixth to tenth graders—have toward school. The study was summarized in a book by Lauren Steinberg called *Beyond the Classroom*. What this study shows is that nearly 40 percent of the kids who are in school today in that crucial age range are what Steinberg calls “disengaged.” They are in school because they have to be in school and do not take their education at all seriously but focus more attention on athletics and social activities. They are not motivated by what they are being taught and therefore are in a situation in which they are not going to learn much.

How can we get out of this dilemma? In 1989, the governors of the 50 states, led by now President Bill Clinton (then Governor of Arkansas), recognizing that we were not doing well enough in our kindergarten through twelfth grade system, called for national education standards in the major disciplines. The task of preparing the first-ever national science education standards fell to the National Academy of Sciences and National Research Council, largely because nobody else was willing to take on the task. It was very difficult forging a consensus, first, among scientists of all kinds—geologists, chemists, biologists, and others who think that their field needs more emphasis—and, second, among the scientists and the science teachers and educators. For example, teachers and educators understand that we do not take fourth graders and try to teach them about molecules and atoms because conceptually it does not mean anything to them yet. In other words, it must be recognized that there is an appropriate way and time to teach things.

The final results of the study were released in 1996 in a 250-page report.¹ This was the most difficult study the

¹*National Science Education Standards*. National Academy Press, Washington, D.C., 1996. Available via the Internet at <http://www.nap.edu/readingroom>, or call the National Academy Press (800-624-6242).

NRC has ever undertaken and was written by literally thousands of people. A year before the final report was released, a full draft went out to 40,000 people across the nation and an estimated 2,000 sets of comments were sent back, many of which were incorporated into the final document. This report is a national “grass roots” document—not a federal government document—and it represents the best vision of what we can do in our schools.

There are three bottom lines relevant to the task you have before you in this conference. First, science and scientific thinking are for all students, not just for those who might be scientists or engineers. They should be taught starting in kindergarten and continue to be taught in every year of school. Science must become a core subject as it is in many other countries.

Second, and I think this is extremely important, science today is not the science that most parents—many of you—remember learning in school, which was to learn all the parts of the cell, regurgitate them on a ditto sheet, and then go on to the next month and learn all the parts of a flower and all the parts of a plant and regurgitate that on another test, and so on. That is not what we regard as science anymore. *Science is learning how to solve problems. Science is inquiry—being faced with real-world kinds of problems and offering hands-on curricula that motivate kids, no matter what their background.* To motivate children to learn this kind of science, we need to connect it to their real world; that is, they have to see that it has some meaning, both in terms of their future and in terms of what they see around them on a daily basis. That is where this conference becomes particularly relevant: transportation is everywhere and offers an effective and practical means for helping children recognize the relevance of science.

Third, we need to connect science to math, to social sciences, to history, so that we have a rich texture in which science is embedded across all these boundaries. Again, transportation is a wonderful way to do that.

I still remember what we used to call “story problems” in mathematics class: two trains are coming toward each other; where will they meet? That is transportation, but it is not a very meaningful problem. It is not the kind of problem people deal with in the real world. We should give them a problem such as finding the shortest truck route to deliver these goods—a problem that requires examining alternatives and also illustrates jobs done by real people. Having someone from the transportation industry come in and talk about how they route trucks, how different transportation alternatives are considered, helps connect students to the concepts they are learning. For many of us, math and science education was completely different. It was rarely connected to the real world and involved more rote memorization and drills. Such methods may still work for some students, but I doubt that they work for the majority.

We have a great opportunity before us. The Academy has a special website called RISE, which just recently came online. Basically, it provides resources to people who are interested in helping their schools on matters relating to science and engineering education, and it connects to lots of other resources and lots of other people and other programs. The kinds of materials produced from a conference such as this are among the things that can be shared on the web and contribute to a community of people across America who are professionals, who are working to help our teachers do a better job and help our students be better prepared for the world of work tomorrow.

Gloria J. Jeff

Education is a subject about which I have a great deal of passion and a great deal of professional and personal interest. Many of you have had a chance to listen to my various conversations, dialogues, and “sermons on the mount” about what we must do to change the way we address transportation, and clearly intermodalism is at the top of the list. It is interesting to look at the audience and see people who represent all modes of transportation, as well as a variety of academic

institutions, approaches, and philosophies about how to move people and goods.

The objective of this conference is one that I feel is critical: to examine the education and training needs related to the concept of intermodal transportation, a term not lightly spoken these days nor one necessarily universally known, in spite of efforts to come up with definitions of “intermodalism” and “multimodalism.” We continue in the industry to struggle with those defini-

tions, in part depending on whether you are on the goods movement side of the table or on the passenger movement side. As we examine education and training needs, I am confident that we will manage to agree on some type of definition and then move forward.

We at the Federal Highway Administration initiated this conference because what *we* do not know about intermodalism could fill several libraries, and we recognized that we are not unique in the public sector or, for that matter, in the transportation sector. It became important, therefore, to begin examining ways to train and encourage a generation of transportation professionals and not a generation of highway engineers, transit planners, naval architects, marine engineers, and, to some extent, logistics specialists, who are only concerned with how to get a box from Point A to Point B, without recognizing that the overall transportation system also involves the movement of people. It is important to bring the very best minds together and begin to address the question of how to create a training and educational system that creates transportation professionals who understand the interconnectedness of transportation, not just individual modal approaches.

In his second term, President Clinton has challenged the nation by stating that he will make education his highest priority, with a call for literacy and math competency. Interestingly, we in transportation are in a position to respond to that in a variety of different ways. Within DOT and at the direction of Secretary Slater, we have stepped up to the challenge by creating the Garrett A. Morgan Technology and Transportation Futures Program. You will hear more about it during the conference.

Secretary Slater perhaps captured it best when he talked about what we need to have in the 21st century:

An integrated transportation system that is international in its reach; that is intermodal in its form; that is intelligent in its character; and that is inclusive in its fundamental nature.

With those sets of challenges before us, we clearly begin to see what characteristics an intermodal transportation education and training initiative must include.

It must be international. We must recognize that we can no longer talk about what we produce in this country as being self-contained. Products are moving in and out of this country from various parts of the world and become either interim products or final products that are produced and sent to markets worldwide. To meet the demands of our domestic markets, we get goods and parts from all over the world. For example, Hecht's had a sale this weekend. I seriously doubt that many of the customers recognize that in order for Hecht's to have those goods available for the sale, numerous intermodal transportation connections were required. Few cus-

tomers recognize that this is a fundamental part of everyday life here and throughout a changing world. The reason the grocery stores can offer a variety of products and produce regardless of the season or place of origin, that clothing and retail establishments can have the latest fashions and a host of manufactured products, and that information can be transmitted almost instantaneously is because of concepts such as just-in-time delivery, worldwide distribution and communications systems, and so forth. We no longer function as individual, uniquely defined nations but rather as an international marketplace. Not only must we better understand how we move goods in that context, but we also must learn lessons on how to move people.

It must be intermodal. Transportation education programs need to encompass intermodalism because it has become increasingly critical that we understand not only how we move from this mode to that mode, but also how we integrate those movements so that (a) we have a system that is both safe and efficient and productive and flexible in responding to the needs for goods movement and (b) we have a system in which we offer people choices and flexibility in their personal movements. We must recognize the interconnectedness so that there is no penalty and so that one day in the future when we design our models, there will be no built-in penalties every time there is a passenger transfer. We must find ways to give them more intelligent choices—training the professional to begin to look for those choices becomes an important part.

It must lead to the development of an intelligent system. The system must be intelligent because the reality is that we no longer can simply say, "Send the truck out" and have it get there, or "Send off the railcar" and know where it is, or "Track the goods that are in the container." Kenneth Wykle, the nominee for Federal Highway Administrator, is going to be very helpful in getting DOT to focus more attention on how to make the system intelligent. With his background in intermodal transport, he brings a perspective we have not had before—that of the *user*. The agency has had those who administered the program, those who were responsible as shippers or carriers, but I think this is the very first time that a user is sitting at the helm, and it will help us begin to recognize how the system can meet the needs of the user—it can become more intelligent through the application of advanced technologies.

It must be inclusive. The President likes to talk about the fact that we cannot afford to waste a single American. In transportation, we cannot afford to neglect any mode, to pass up any opportunity to deal with transportation and recognize its complexities and the contribution it makes to individual economies. We can no longer let the railroads or public transit operate in a vacuum. We can no longer let highways be the "big kid

on the block” who does whatever he wants, with little consideration to the impact on other modes. We can no longer overlook issues of port and airport access. We must be inclusive in the decision-making process, inclusive of the parties who are involved and inclusive of those who are affected, because we need to have the full spectrum of experiences, life-styles, and needs represented in the decision-making process. Without these experiences, we find ourselves making assumptions based on a limited point of view. We need that multiplicity because most of the best ideas for advancing technology, for advancing the future of transportation, do not come from a single point of view but from the give-and-take of many points of view and reasoned discussion.

For those of you who have spent time focusing on the whole issue of quality, you know that there is a lot of discussion about the achievement of quality when you have synergy within the team, and that synergy is not a

function of the majority’s beating down the minority but rather of where the ideas come together. In most instances, better ideas come out of individual viewpoints that have been hammered out together. It is that kind of inclusiveness that needs to be a part of looking at education and training in the future.

The charge to the attendees here is to take the preceding four characteristics to heart, to spend time not only listening to others and using this as a wonderful opportunity to network, but also recognizing that to make America what it needs to be, to make this world what it needs to be, a new type of transportation professional needs to be created. This conference is the beginning of an effort to create the future transportation professional; 20 to 30 years down the road, people will look back and recognize that this was the beginning. You can be proud to say that you were a part of it.

Charge to the Conference

Michael D. Meyer, *Georgia Institute of Technology*

When Secretary Slater announced the Garrett A. Morgan Technology and Transportation Futures Program, he said:

We are at a crossroads in the transportation field, with much of the seasoned workforce retiring and the demand for traditional and new skills expanding. . . . The federal government, transportation agencies, the education community and the private sector share an interest in developing the human resources needed to run the transportation enterprise of the next century.

The purpose of this conference is to examine the education and training needs related to all aspects of intermodal transportation—technology, advanced logistics, information systems, planning, and management. The conference steering committee has put together a comprehensive program, which includes representatives of the educational community, the transportation industry, and government, to discuss many of the issues that will be important as we look at the needs that will emerge over the next several years.

I am not going to spend time trying to gain a consensus on the definition of “intermodalism”; however, with regard to education and training, the basic point of departure is that we have to adopt a *total systems perspective* on transportation. We cannot look at one link versus another or one mode versus another. Certainly we have to focus on efficiencies associated with the connection points, but we also have to consider the bigger picture—customer orientation and an understanding of the movement of both people and goods from origin to

destination. This is a much broader perspective than that which we generally teach in universities and training programs, but one that is certainly needed if we are really serious about intermodal transportation. The transportation employees of tomorrow need to have this broader perspective if they are to be successful.

The conference is organized in a way that will bring out some of the needs for the future and, it is hoped, begin to define how to meet those needs. We will proceed with the Keynote Address, followed by a panel of four distinguished individuals representing different perspectives on transportation—education, operations and planning, passengers, and freight. This panel will be followed by case study presentations illustrating some of the key skills and issues associated with being successful in a transportation organization. The case studies will be followed by a panel discussion on characteristics of the transportation employee of the future and then participants will divide into smaller discussion groups. There will be an informal evening session in which those interested can learn about and discuss international transportation programs and initiatives developed and offered in institutions outside of the United States. Tomorrow, the focus will shift from what is desired in the transportation workforce in terms of skills training to what is being offered and produced in terms of educational and training programs. This part of the conference will include reports on the status of what is being offered at different institutions and through existing educational and training programs. There will be a panel discussion focusing on internship and mentoring programs, a key component of transportation education

and training. The panel discussion will be followed by a second set of breakout discussions.

On the final day, I will recap events, discussions, and recommendations and then ask a six-person Firing Line Panel representing all aspects of the transportation industry and government to react and respond to the recommendations. It is very important for all participants to understand that this is a working conference. Our goal by the final morning is to have developed an outline of specific observations, conclusions, and recommendations.

Another important component of this conference is the poster displays and exhibits through which organizations and institutions have the opportunity to illustrate, explain, and describe some of their programs and activities. The conference offers a total package and provides opportunities for each participant to provide input.

For those who were unable to attend the opening dinner and hear the remarks of Deputy Secretary Mortimer Downey yesterday evening, I also want to briefly mention yet another component of the conference—the essay contest, which was open to high school seniors participating in the Transportation Careers Academy Program (TCAP) in Los Angeles County, California. Students enrolled in TCAP were invited to write an essay about what they had gained from participating in a high school school-work program aimed at producing future transportation professionals. The two essay winners are with us for the entire conference and read their winning essays at last night's dinner. Those who were unable to attend are invited and encouraged to read these impres-

sive essays. Deputy Secretary Downey said last night that if this is an indication of the future human resource pool for the transportation profession, we are in good hands.

I am honored to introduce our Keynote Speaker. When the conference committee first met over a year ago, it was agreed that we would like to begin the conference with a speaker who understands and can articulate the concept of intermodal transportation, who recognizes that education and training are key to the future of the transportation industry and what that implies with regard to university, community college, and industry programs. Robert Krebs was the first on everyone's list of candidates.

Robert Krebs started his career in the railroad industry in June 1966 as a Special Duty Officer to the Executive Department of the Southern Pacific. Time will not permit a reading of all the evolutionary steps of his promotions and career movement—it will suffice to say that in April 1997, he was named Chairman, President, and Chief Executive Officer of the Burlington Northern and Santa Fe Railway Company. He is well known and respected for his views on the issue of the education and training needs and the professional needs of the transportation industry, both as an industry leader and as the Chairman of the National Commission on Intermodal Transportation. He will provide a good point of departure for this conference. Immediately following his address, a panel of distinguished transportation representatives from the public, private, and academic communities will offer a response.

Keynote Address

Robert D. Krebs, *Chairman, President, and Chief Executive Officer, Burlington Northern and Santa Fe Railway Company*

Six years ago, the Intermodal Surface Transportation Efficiency Act of 1991, commonly referred to as ISTEA, was supposed to establish a new era for transportation, integrating all the elements or modes of transportation into a seamless intermodal system, a system that would be safer, more efficient, and better for the environment. If we look back over the last 6 years, we see that the change, the transition, has been difficult. Perhaps it has been less so on the freight side. I am going to talk today from a business perspective, and obviously the examples I use will be from the freight side. I will also use myself as a case in point, because I have to think that the reason I am standing here is really a historical accident.

I went to work in the transportation industry 30 years ago because I wanted to live in Northern California. When I went to work for a railroad, I did not have a clue what I was getting into. I had gone through 18 years of formal education and never had a course in transportation. My education in transportation began the moment I was appointed assistant trainmaster on the midnight shift in Bakersfield, California. This fact tells you something about the lack of transportation education available within the academic community some 30 years ago. On the basis of what we heard earlier from Dr. Alberts, I am not so sure we have made much progress in the past 30 years.

When we talk about intermodal transportation, I think we can say that we have made progress over the last 6 years, at least on the freight side. Just this past week, Burlington Northern and Santa Fe Railway (BNSF) handled 67,000 trailers and containers across

the United States from the Midwest to the Pacific Coast, which is a record for us by a factor of 4 to 5 percent. These days, on a good Friday, United Parcel Service (UPS) gives BNSF 1,500 trailers to handle across the United States. When UPS was on strike, it cost our company \$1.0 million a day in lost revenue. UPS—its intermodal movements—is the number one customer for BNSF, and that holds even when you factor in coal, grain, and other merchandise. In a good week these days, J.B. Hunt also brings BNSF 8,000 trailers to haul across the United States. When I stood in front of our institutional and investor analysts on Wall Street a couple of weeks ago and reported on our second- and third-quarter earnings, I told them our business with Schneider was up 83 percent in the third quarter. All of these examples illustrate how intermodalism—trailers and containers on the railroad—is moving forward. It is totally market driven and there is no turning back.

The passenger sector is a more difficult challenge for a variety of reasons, but primarily because subsidies are complex and pervasive. Often, they hide what is really going on and prevent us from bringing out the best of the various modes. This points to the fact that we have not only an educational problem but also institutional and financial problems. I venture to say that on the passenger side, institutions have not embraced intermodalism to the extent that we have on the freight side, and in many cases, progress is difficult to detect.

If we are going to establish a true intermodal era, we need more time, more effort, and especially more education. In many respects, these efforts are just beginning. Every once in a while, there is evidence of an urge by

some to move backward—to substitute HOTEA (Highway Only Transportation Efficiency Act) for ISTEA. Fortunately, it does not look as though that is likely to happen because that is not the way to go for the good of the country. Since 1991, the importance of ISTEA and intermodalism to the future of transportation in the United States has been confirmed time and again.

Success depends upon education, and the ideas, strategies, and initiatives from those gathered here for this conference can help make a difference, build a bridge, move us in the right direction. I think everybody in this room can agree on one thing—we need fundamental changes in the education of lay people and of professionals if we are to maximize the benefits of intermodalism.

Secretary Slater's Garrett A. Morgan Technology and Transportation Futures Program has already been mentioned by previous speakers, and I want to say that I personally and BNSF as a company are committed to seeing this program work because it integrates transportation into all levels of education, particularly the lower grades, by bringing transportation into the curriculum at each grade level. By studying math and science and applying it to transportation, students have a chance to build transportation professional expertise that companies like BNSF can hire over the years to come. I think Secretary Slater's effort to expose this program to a million students by the year 2000 is the right start. It also means that the private sector has to get involved and help this program succeed. It is important for me and for BNSF to support the Secretary's education initiative for selfish reasons, so that we have qualified candidates in the years ahead to run and improve our company.

I want to return to the story of how I ended up in the railroad business. I never had a course in transportation. I was out on the West Coast looking for a job in California, where I was born and raised. I thought the sun rose and set in California and that is where I wanted to work. The fact that my job ended up being with a railroad was an inconsequential coincidence. Since leaving school and ending up in transportation, I have done a little historical research. At the time that I went to school, there were 20,000 graduates, with an estimated 400 of them in transportation-related careers and 40 (two-tenths of 1 percent) actually working in the transportation industry. Earlier today, Dr. Alberts said that an estimated one in seven jobs in our economy is related to transportation, a fact of which the general public is really not aware. It shows you how far we have to go to get the importance of transportation across to the public and to interest the public not only in job opportunities within the transportation industry but also in involvement in transportation issues so that we have the right public policy.

We cannot spend enough time relating the importance of transportation and intermodalism to national productivity. An article in *The Wall Street Journal* in June 1997 stated that one of the key reasons for the nation's sustained growth is transportation efficiency. In 1996, logistics costs hit a low of 10 percent of the gross domestic product (half what it was in 1980), saving the nation \$7.0 billion a year. Also contributing to this productivity has been deregulation of the transportation industry.

Just before I took that first job with Southern Pacific Railroad in 1966, my roommates from school asked me, "Bob, what are you doing? Don't you understand you're ruining your life? You're going to work for a railroad? Don't you know the railroad industry is a dying industry? If you want to go to work for a good transportation company, go to work for a company like Pan Am or TWA." In the first decade of my career, those companies were showing profits, whereas 10 years later, one-third of the railroad industry was in bankruptcy. Today, however, I stand before you with my biggest problem being how I handle all the business that is offered to BNSF—quite a change. In large part because of deregulation, the 130-year-old, nearly dead railroad is now a growth industry that has the opportunity to show results perhaps as spectacular as those of companies like Microsoft.

We can look at education and training from two sides—the supply side and the demand side. What do we need to do on the supply side? First, at the university level, logistics and intermodal transportation need to be included in the core business curriculum along with marketing, accounting, finance, and other basic courses. Second, we need to educate the educator. New applications for transportation and intermodalism do not come from the textbook; they come from real-life experiences in the field, and educators need to get involved in that real-life experience. This means that industry needs to create internships so that educators can benefit from active, practical experience. Faculty members need to be involved not only in the trenches but also through experiencing and being part of the decision-making process that leads to major changes in transportation all the way up to the boardroom level. Third, private-sector companies need to support transportation education. This can happen at the senior management level; for example, I sit on the governing board of the Business Advisory Council at Northwestern University's Transportation Center. More important, however, is the connection at the middle management level. Middle managers from industry need to spend more time on both sides of the desk—as teachers and lecturers and as active participants and students in the programs like those available and offered through Northwestern and other institutions.

Finally, the federal government needs to ensure that it is getting its money's worth with research and develop-

ment (R&D) dollars, especially in intermodalism. I do not think this has happened so far. One of the recommendations of the National Commission on Intermodal Transportation was to expand the R&D focus on intermodalism; unfortunately, we have not really succeeded in that area. Administrators or directors of the Office of Intermodal Transportation have been handcuffed because they have not had the resources. The money that the government puts into transportation R&D continues to be for modal rather than intermodal R&D. That situation needs to change.

On the demand side, I believe that business, BNSF included, has an obligation to actively recruit and then take care of the transportation professionals who come out of our educational system. At BNSF, after years of downsizing, we see a real need for transportation expertise, and this year we are changing our corporate management training program. We are doing three or four things to make it different; the most important is that we are hiring more people. We are actively recruiting. We are going to more schools, a greater breadth of schools, not only schools that have experts in transportation or graduate experts in transportation who will now major or specialize in transportation. This year for the first

time we are also going to liberal arts schools to look for general managers. We wish these graduates would have at least some exposure to transportation or understand the importance of transportation to our economy and the value of a career in the transportation industry. We are also paying our corporate management trainees more and getting them out into the field faster so that they can have a rewarding relationship with the company and produce more quickly for us.

Corporations also need to provide more financial support and incentives to the transportation and logistics educational system. We need to endow chairs. We need to provide consulting opportunities for faculty and for students, graduate students especially, and we need to fund research. There is a lot to be done on both the supply side and the demand side.

In closing, I would say that transportation is far from the mainstream for most people, yet there is no element of our day-to-day lives that has a more pervasive effect on us. We need a transportation vision, especially an intermodal transportation vision, that gets the public thinking and talking about the importance of transportation and about participating in transportation policy and in the industry itself.

Response to Keynote Address

Richard Simonetta, *Metropolitan Atlanta Regional Transportation Authority*

Jeff Crowe, *Landstar System, Inc.*

Robert Martinez, *Secretary of Transportation, Commonwealth of Virginia*

Aaron Gellman, *Northwestern University*

Richard Simonetta

Even though I have spent my career in public transportation, which is the movement of people over relatively short distances within urban areas, I agree with a lot of what our keynote speaker said today. I was very hopeful back in 1991 when ISTEA came along to begin to prescribe in more definitive terms what intermodalism was to mean for all of us working in transportation. For a change, public transportation was going to have a seat at the table with the big guys in highways and begin to share in some of the resources available to transportation in general, but not necessarily or specifically to public transport. I agree that there has been a lack of real success in the passenger sector of ISTEA. I am pleased to hear that the private-sector freight side of the transportation industry is doing so well, since that is extremely important for our economy and, of course, a strong economy supports continued investment in all transportation.

On the public side, we have not achieved what many thought were going to be breakthroughs, partly because of a fear of changing old institutions. We have worked hard to begin addressing the importance of changing those institutions, but even as the reauthorization debate has gone on this past year, it is quite clear to me that a real vision for the future has not been prevalent. The truth is that our industry does need vision if we are to resolve some of these issues.

Admittedly, we work in a much more global community today than we did in 1991 or, for that matter, than

we did back in the late sixties and early seventies, when many of us began our careers in transportation. We need to be more aware of what is happening in the world so that we can take advantage of the opportunities that exist for us locally.

I want to comment on what was said earlier about BNSF going to the liberal arts schools to find general managers. Working in public transportation now for 27 years, I have come to realize that there was no college curriculum that prepared one in any particular way for public transportation management. My background is in urban and regional planning, and I have worked alongside general managers who have had law degrees, M.B.A.'s, or who have worked in a number of other disciplines; for example, there are former school teachers who have somehow found their way into public transportation careers. This perhaps suggests that there is something about a liberal arts background that prepares individuals to assume the role of providing broad leadership to the public transportation industry. Both of my daughters are M.B.A. students, and I would not hesitate to tell them that they are, in my opinion, probably the least prepared to serve in the role of a general manager, to provide that broad vision to an organization, to understand the customer side, to understand the value of employees, and to understand that you need to create an environment within an organization that is going to allow the creativity of both technicians and generalists to achieve as much as possible. This is not to say that

there are no examples of very successful, “visionary” transit managers who have come from technical backgrounds. More times than not, however, the engineers and the M.B.A.’s who come up through the budget office are not going to be the ones who provide the broader vision. In fact, some of the best transit managers come from public administration backgrounds, making a transition from being a city manager to being a transit manager or from being an urban planner to being a general manager.

Within public transportation, there is a great deal that goes with the concept of intermodalism. If you can envision the Atlanta region—in which the Metropolitan Atlanta Regional Transportation Authority (MARTA) rapid transit system provides rail service, an extensive bus system provides bus service, there are interconnected bus services in suburban areas, and automobiles are still the most prevalent form of transportation—you will find that connectivity exists to a great extent between automobiles and public transit. Hartsfield International Airport is the second busiest airport in the world and is served by taxi cabs, buses, as well as MARTA rail; this exemplifies a great deal of intermodalism.

Thirty percent of MARTA riders transfer either from rail to bus or from bus to rail, which demonstrates that

there is a built-in intermodal system at the very fabric of our operation. We own and control over 27,000 parking spaces adjacent to either bus routes or rail stations. Our plan for the next 5 years is to provide an additional 10,000 parking spaces. On an average day, there are over 7,000 boardings at Hartsfield Airport, people who are either going from rail to plane or from plane to train.

An important component of intermodalism that is frequently overlooked in public transportation is the pedestrian mode. Within metropolitan Atlanta, every transit rider is at some point in the trip a pedestrian. Too often we focus on the needs of other transportation modes and forget that the pedestrian mode is also very important and must be worked on just as effectively as others. Everything we do in the way of designing parking lots, stations, bus stops, and transit centers very much involves the pedestrian, as well as persons with disabilities, who may require extra attention.

I am hopeful that we will end up with reauthorization legislation that will eventually become a multiyear bill, keeping us moving in the current direction. The U.S. transportation industry has begun to embrace more and more what is happening throughout the world. Each of the points Gloria Jeff made earlier is important to the broad spectrum of transportation, and each has a global implication from which we can learn.

Jeff Crowe

First of all, I would like the audience to know that I am an educator. When I graduated from college many, many years ago, I did not set out to be in the transportation industry. For 7 years I was an educator, teaching emotionally disturbed and mentally handicapped children. With a liberal arts background and majors in history and political science, I somehow ended up in the trucking business.

I agree with much of what the keynote speaker had to say this morning. In addition, Landstar participates in many of the programs and initiatives in which BNSF participates. Krebs’s comments regarding the supply side of transportation education and training were right on target. I would like to drive home that point by asking the audience this question: How many of you when talking to your children have ever said, “I want you to grow up to be a trucker”? Not very many. How many of you, when you were growing up or when talking with your

children have said, “When you grow up, I want you to be in the transportation business”? Perhaps a few more. I ask these questions to introduce an issue with which the transportation industry—in particular the trucking industry—must deal. The trucking industry is deeply misunderstood, deeply underappreciated, and unless we collectively fix the supply side issues, we will not change the public’s perception of the trucking industry.

Secretary Slater’s ideas are right on target; now we have to take responsibility for acting on them. This should perhaps begin with a changed perception of what this industry is about from its very core, and that core is trucking. If we are talking intermodal, there is not a piece of intermodal freight that does not, at some point in its move, go on a truck. We have to change the public’s perception of the trucking industry; however, there is not enough time on the program today to talk about how to do that.

I differ with previous speakers as to how successful we have been in recent years in furthering intermodalism. I do not believe we have moved very far, even on the freight side, toward achieving a true intermodal transportation system. We continue to operate as modal systems, which have a great deal of difficulty in joint planning (of which there is basically none) and in making successful handoffs (to which precious little attention is paid); this is where the system fails both in the movement of commerce and in the movement of information. I believe we have a long, long way to go.

What are the drivers of our multimodal system? I want to talk first about what drives *truck-rail-truck*, because they are common to a large degree. Appropriately, each of those management teams focuses on its individual mode, measuring itself on its individual mode. When you study service schedules, you talk about yard-to-yard for railroads rather than focusing on origin-to-destination delivery. When you see price alternatives and costs, they are driven by individual modes. A recent example of this is in the rail industry, where right now one sees a focus on which trains move faster, faster trains serving one single source. This country currently faces a significant transportation issue caused by the meltdown of a combined railroad—an issue that has an impact on all of us. There is a tremendous opportunity for each system and this is evidenced by the surge of business in an already superb economy.

What do we need to improve? Landstar generates significant amounts of revenue on an intermodal system, and we frequently use BNSF. However, what we have to realize is a better exchange of both commerce and information. We must work jointly to resolve where handoffs occur, to improve where the lowest-cost provider, the smallest-margin business in our industry, is the same as it is for the rail business. This is how we price our business, by considering those truckers who participate in the drayage business, where there is practically no margin. You do not see any company standing up and saying, “When I grow up, I want to be a drayage holder.” What does that mean? Our intermodal system is largely viewed, on the surface freight side, as a low-cost alternative, hauling less-than-time-sensitive business. It has not been able to track into new business sectors and probably will not be able to until we jointly solve the information systems issues as well as the true handoff issues.

What about *truck-vessel-linehaul*, which can be rail or truck on either side? There are similar issues. The exchange of information is equally as complicated as the exchange of commerce. We need to improve on the exchange of commerce, which includes improving the infrastructure that serves the ports and making a better handoff available for either mode when the vessels arrive. Control and exchange of information relates not only to electronic data interchange but also to things such as electronic funds transfer and truly creating one billed origin-to-delivery, without modal paperwork being handed off between the individual modes. At present, I think the commerce side works better than the information side, and if we are going to gain true efficiencies and find new markets that we can move into together, we have to work the information side. *Truck-air-truck* is perhaps the most reliable of the combination modes, chosen because it is a velocity-price issue. You have a very fast linehaul segment in the middle, a very reliable system at both ends, extremely fragmented, with the same issues as those for truck-vessel-truck.

I think there are significant opportunities to change the system if we can begin to educate people at a young age, “grow” more people who are looking at this system as it should be—a service provider moving goods from origin to destination. I believe all freight ends up on whatever mode gives the greatest value, and that is the combination of price and velocity. We have much to gain. As Krebs pointed out earlier, the significance of how much we have gained is saving this company \$7.0 billion, which is the driver of what makes this economy continue to move forward and truly make us competitive in the international and intermarket arena.

There is a lot of work to be done and significant opportunity before us. I hope this conference will move forward on some of these issues. As you think about curriculum development, let it not be limited to the question I posed earlier. Let me pose yet another: “Do you want to grow up and own your own business?” I believe more young people in today’s world really want to own their own business. They are not driven by the same issues that drove many of us. They do not want to work for the same company all their life, as many of us have. I believe that the entrepreneurial business owner owns trucks, whether as a segment of the supply chain or as a manager of other companies. You can be an entrepreneur and be part of this wonderful transportation system.

Robert Martinez

My educational history is much like that offered by other speakers today in that I also had no formal training in transportation. Years ago, I expressed an interest in being involved in the federal government, was recommended to then U.S. Department of Transportation Secretary Sam Skinner, and ended up as Deputy Administrator at the Maritime Administration. A couple of years after that, I was selected as the first Director of the Office of Intermodalism. I found it interesting that after a couple of years at Marad, having had no transportation background before that, then moving to the Office of Intermodalism, suddenly my background was in maritime. The moral of the story is that the fundamental or most important foundation for a successful career in transportation is to have a good general education. The further you go with education, the better off you are going to be regardless of where you end up in transportation.

I do not accept the philosophy that anyone can be the most qualified individual for any particular job. Although I feel fully qualified to be Secretary of Transportation for Virginia, I would find it difficult to argue that I am the most qualified individual for this job. Despite this, every 4 years the issue comes up as people are selected for high-ranking government, as well as private-sector, positions. There are a number of people who are equally qualified; however, they would bring different talents to bear and would perhaps bring a different emphasis. The point of this digression is that, to the extent that an individual, a young person, is fully educated and has gone as far in the educational system as possible, he or she cannot be denied a good position and eventually a high-ranking position, either in the private sector or the public sector, on the basis of educational background. Education is indispensable for young people who have the ambition to move ahead in the transportation arena. It is incumbent upon those of us in transportation to look broadly for new talent. This includes looking at people who are generalists, for example, those with liberal arts degrees.

The transportation industry has to compete against other industries for the best people, regardless of whether they have a master's in business administration or a bachelor of arts or a bachelor of science or an engineering degree. As a general rule, the best people coming out of engineering school, or the best people coming out of liberal arts schools, are not necessarily going to have any type of specialization in transportation. If you are looking to fill an open, highly specialized junior slot, you would go out and look for a specialist; however, as a

general rule, that is not the case. We need to do a better job of recruiting the best people, who are generalist engineers, generalist liberal arts, or M.B.A.'s, and then retaining them through opportunities and compensation that are adequate to keep us competitive.

Beyond the issue of the types of degrees that young people earn at institutions of higher education is the fundamental issue that both Alberts and Jeff pointed out—we have to improve our elementary and high school education systems.

Previous speakers have expressed some disappointment with how far ISTEA has gotten us in 6 years and noted that there is still a lot to be done. Although there are still a lot of unfulfilled promises, the dialogue, the debate, the discussion has fundamentally changed with the passing of ISTEA. Four years ago, it would have been unheard of to have this kind of forum to talk about, in Meyer's words, "a systems approach." The fact that we share the same goals, that we agree on the same terms of dialogue and discussion that have been framed by ISTEA is a fundamental difference between the environment we have today and the environment that existed before ISTEA. In this respect, ISTEA has had a major impact.

I agree with earlier comments regarding the role of the private sector, as well as deregulation, of which we need more if transportation is to become more efficient across the board. I also concur with comments regarding passenger transportation. The subsidy programs that exist today, which are primarily a function of the role of the public sector in the movement of passengers, unfortunately serve to cloud what is happening in the marketplace. Until we are able to devise a mechanism for better responding to and better understanding what the market demands, we will be unable to achieve the types of efficiencies in passenger intermodalism that are starting to be seen on the freight side. We have to learn how to be more market-driven on the passenger side of the equation. I do not have the answer to how you do that, but the subsidy schemes are clearly part of the problem. That is not to say that I support eliminating subsidies for passenger movement, because I do not; however, we do need to do a better job of figuring out what the marketplace wants.

There are a couple of areas on which I would like to see more emphasis. The first of these is technology. Technology is going to continue to change transportation and that influences how we educate future transportation professionals. Current and future workers in the industry have to be more "technologically literate" and

be comfortable with amassing, using, and analyzing vast amounts of information.

Second, we have a public, both passengers and shippers, that demands greater mobility and greater capacity. But we also have a public demanding that this be achieved without degradation of the environment. In my mind, there is only one way that this can be achieved, and that is through investment in technology and becoming smarter about how we provide transportation. Perhaps this relates to the earlier call for intermodal R&D and a greater focus on a systems approach as opposed to modal R&D programs, on which governmental R&D seems to continue to focus.

I also want to underscore the role of the private sector, but I would take that further and argue that we must be opening up new arenas, nontraditional arenas, for the private sector, be they in highway and transit elements of overall systems or perhaps more fundamentally in providing opportunities for the private sector in financing transportation projects, an area that has previously been largely the purview of the government sector. In an age when we have increasingly limited public resources for transportation, it is incumbent upon us to find ways of introducing more private-sector elements into how we think about and finance transportation.

Let me close by summarizing some of the qualities I think we need to look for in our future transportation pro-

fessionals. They have to be customer-focused, which can mean at least two things today. We need systems that are basically seamless, because the reality is that although in an ideal world we would like to have everyone talking about how wonderful intermodal transportation is, that is just not going to happen. Most people do not know what “intermodal” means, and I am not sure that they need to. On the other hand, users of the intermodal system who do understand it, like shippers, increasingly demand transparency and seamlessness. What it comes down to is that transportation has become more complex and customer-focused, and that is something young people considering careers in transportation need to understand.

The transportation professional needs to be flexible and willing to respond, needs to be market oriented, and needs to be aggressive. The transportation professional must avoid, at all costs, becoming bureaucratic, while at the same time be able to deal with those who are accustomed to doing things one way—who are bureaucratic. This is true for both the public and the private sectors. This is a challenge, because there continues to be a lot of bureaucracy in many sectors of the transportation industry. The transportation professional must also be optimistic, must have good quantitative skills, and have a good technological base and a good information skills base.

Aaron Gellman

It has been clearly demonstrated that the path to a career in transportation logistics today goes through intermodalism. Consequently, education for such careers should certainly encompass intermodalism, but not to the exclusion of many other issues and aspects of transport and logistics. For example, many universities, including community colleges, have become so excited by the educational opportunities offered by logistics and logistics management that they have soft-pedaled, even eliminated, education related to actual transportation, the component of logistics without which we have nothing. Few schools have maintained a presence, have given suitable priority to transport education. Admittedly, more education is specifically focused on transport careers today than before deregulation, and a great deal more education today is focused on logistics, but without transport, logistics is the sound of one hand clapping.

Industry has both an interest and a role to play regarding education for transport and logistics careers. Krebs expressed such an interest, and of course BNSF wants the best students. They want the intellectual capital they need to maximize profits—that is the goal of the private sector in transport. It is important to recognize that the public sector also needs the best people, those with the ability to do what is needed to manage public enterprises, such as MARTA, such as the various transportation elements within the Commonwealth of Virginia.

Historically, we have not always gotten the best out of the transport and logistics programs that universities offer. The role of industry in all of this is to keep education “green.” There needs to be a continuing dialogue between industry (the demand side of the equation) and universities that supply the students they need (the supply side of the equation). We need this dialogue, and it is

something we at Northwestern prize very highly, as do other educational institutions. For example, universities collectively need to be told that third-party logistics firms are critical to the future, even to the present, in transport performance and logistics performance.

Air freight, for example, is an area that has not been sufficiently understood from an educational standpoint, a situation that needs to be corrected. We need to do more with respect to the management of technology and the management of integration processes. In most universities, little is taught about how transport innovation takes place or, even more important perhaps, how to avoid thwarting worthy transport innovation. As educators and transportation professionals, we need to understand this and we need to be able to impart this to students because they most certainly are going to be managing technology. There is no way that the technology, the intensity of the transport and logistics business is going to do anything but increase. By the way, this is one of the reasons that I am an economist.

When I heard previous speakers qualifying themselves by saying that they had no transportation education, I thought that I was going into the witness box, where you have to state your qualifications. I actually have an education for a transportation career—my B.A. at Virginia was, by self-selection, very much related to transport, as was my M.B.A. at Chicago and my Ph.D. at MIT. I did all my papers on transport and logistics subjects, with the exception that while I was at MIT, I discovered my other field, the management of industrial innovation processes. The two come together very nicely in transport and logistics these days.

In any event, industry has both an interest and a role in university education for intermodalism, and this is the way we ought to think about it—education for intermodalism. The obligation and interest of industry can be fulfilled through communication and cooperation between academia and relevant industry players. Communication has to involve both freight and passengers. For example, it is amazing to me that no one in the airline industry seems to understand that they have an obligation, which is profit maximizing, to take some interest in what happens to the passengers en route in their aluminum tubes and en route to and from them. However, airlines take very little interest in this, and I think that is unfortunate. I suspect the reason is that the airlines, for the most part, view the airport as a public enterprise over which they have little influence. I view this as head-in-the-sand thinking, and when the airlines continue to experience the up-and-down motion of other industries, as they have begun to, I think they will take more interest in extending their reach into the full supply chain where passenger travel is concerned.

We also need more dialogue with transport and logistics enterprises regarding international movement of

goods and people. There is still a tendency to put more emphasis on domestic at the expense of international, even in an ever-increasingly global economy.

We need to teach students a lot more about “managing in all seasons,” and by that I mean all *economic* seasons. For example, as painful as it is to say, the railroads of the United States have for most of the 20th century (certainly since World War II) managed in a situation of shrinkage. Now the railroads are managing in an era of growth, which is a very different challenge. We ought to be turning out people from our universities who can manage in all of those seasons, and we need to be told this by industry, because it is critical to development in certain industries, including, at the present time, the railroads. Managing in growth and managing in a decline or a steady state are very different things.

Where is the cooperation? The cooperation needs to come through advice about what instruction we ought to be giving. Northwestern gets that through its Business Advisory Committee, and it is invaluable to us. It keeps the courses green. It keeps the courses looking forward.

We also need to rely on industry for research projects and research data and information. This is even slightly more important than research financing. We also need cooperation with respect to recruitment, with respect to placement. If industry will tell us what kind of people they want by attributes, we can much more accurately, efficiently, and humanely advise our students as to which of the placement opportunities offered should be seriously considered and how they can prioritize them.

I would also suggest that cooperation for the universities extends to being honest brokers of ideas and of solutions. Let me give you one example. We recently were involved in a situation in which two modes of transportation that interchanged a significant amount of traffic in a given commodity were not really connecting intellectually with respect to data and other issues. We called a one-day meeting of the principal carriers and the shipper. Fortunately, it was a concentrated industry and a very limited number of producers. We found during the first hour we met that not one of the railroad executives had ever met one of the truck company executives. They exchanged traffic on an hourly basis all over the country, yet they had never met one another. In just one meeting, they exchanged a lot, and it has been tremendously beneficial for the shipper, for the carriers, both rail and highway, and we were honest brokers. I do not think such a meeting could necessarily have been called in the private sector; in fact, perhaps it would have been more dangerous. But a university can be an honest broker, and we were willing to do it. I am sure others across the spectrum of American academia would be willing to do the same.

The university community ought to recognize that education for intermodalism is a godsend because inter-

modalism is a great platform for addressing a wide spectrum of issues that matter, not only in a transport and logistics context, but also in a broader context. For example, at the first level, intermodalism deals with transport. Intermodalism also deals with public participation in decision making—call it political science, if you will. Intermodalism also has a component that must address data systems, data requirements, and data interchange. Intermodalism requires that you take a look at the global nature of our world economy. Intermodalism requires us to introduce the concept of customer requirements and customer satisfaction. Intermodalism also requires us to look at financial considerations such as inventory issues. For these reasons, those of us in the university community ought to see intermodalism as something we want to embrace for pedagogical reasons, although there are many other reasons as well.

Should it be part of the core curriculum? I certainly would like to see that, but it is a hard sell to deans, for several reasons. One of the problems that many universities, including Northwestern, have with regard to establishing a core curriculum is that logistics competency is typically found in at least two schools—if you're lucky, it is in three—which makes it even more difficult. These schools have their jealousies, their boundaries, and it is difficult getting the university to understand

that for logistics education, not only do we need to address what is done in the graduate school of management, but we also need to integrate and offer the courses to any students who are interested in logistics, regardless of the school or department they are in—industrial engineering, civil engineering, and so forth. Our Ph.D. programs in economics have a number of professors and students interested in logistics matters, but it is difficult to bring them together. We need to meet that very substantial challenge. It is political and it is also financial because of the differences in salaries that people make at the different schools. In the case of Northwestern, it is difficult because we also have different calendars for different schools.

Finally, there is the matter of handoffs—between secondary school education and undergraduate college education, from college to first career step and then to graduate school, from graduate school to next career step, from career to continuing education, back and forth. These handoffs are critically important, and the responsibility is not entirely in the education sector, but also in the industry sector with those who employ the individuals going through this process. Both academia and industry must meet those responsibilities forthrightly if each is to perform at the highest level possible in their respective spheres.

DEMAND SIDE OF INTERMODAL TRANSPORTATION EDUCATION AND TRAINING

Case Studies

Van Heusen Shirts to Market: Vertical Integration and Supply Chain Management: New Ways of Doing Business

Charles Raymond, *Sea-Land Services, Inc.*

What I am about to present may surprise some of you. I will be talking about a company that owns and operates the largest commercial building in the world—twice the size of the Pentagon; a company that each week moves over 3,000 tons of automobile parts from 28 different plants and locations in Europe to five different plants in Latin America for one of the big three automobile makers in the United States as a total logistics package; a company that for the last 7 years has had the marketing contract to manage the Trans-Siberian Railway for the government of the former Soviet Union. That company is called Sea-Land Services.

The theme that I heard being put forth by previous speakers was that we need to be much more customer-oriented, much more customer-focused, if you will, in order to improve the supply chain and reduce cost. You cannot do that by simply having functional expertise. For the total logistics business to be successful, you need to have a perspective, which is the customer's perspective.

I am quite sure you did not think I would use a Van Heusen shirt to present a case study on intermodalism, but there are some key drivers in the garment company called Van Heusen. Van Heusen is tasked with moving their operations from one part of the globe to another, finding new sources, reducing their costs, and further improving their supply chain. Some of their drivers are the rising costs in Korea, which is becoming more industrialized, has a maturing middle class, and whose economic expansion over the years has been phenomenal. With that have come labor problems and, as a

result, rising costs. At the same time, the quota system is having an its impact on Van Heusen. In addition, they are having to respond to style changes more quickly than they perhaps did in the past.

Two flows are involved in this process. The first is the primary flow of raw material, in this case cotton, which comes from the United States, mainly from Texas, and moves by truck and rail and ultimately by sea and then truck again to the fabric maker in Korea. Once there and made into cloth, it moves by truck and sea again, this time to Guatemala, where the cutting, styling, button placement, packaging, and labeling all take place. The product then moves to the port in Santo Tomás and by sea to either New Orleans or Port Everglades and then into Van Heusen's North American distribution centers. From there it goes by truck and air parcel to the commercial retail customer and ultimately to the consumer.

Several subtransportation systems are involved as well. One deals with samples, which have to move from the fabric maker in Korea to Guatemala to be cut and styled in order for the buyers to accept the product that Van Heusen is ultimately going to put on the retail shelf.

Some of the required skills and knowledge in today's environment that deal with supply chain management are discussed in the following paragraphs.

Fundamental economics includes knowledge of supply and demand, international currency and banking, financial ratios, and letters of credit.

Purchasing services and moving products through the supply chain require a very delicate understanding of supply and demand economics as it relates to the purchase of raw materials, contracting for labor, and

movement of goods, whether by truck or rail or by sea or other modes. Supply and demand is a key tool for business managers of the future and facilitators to understand in every transaction.

With regard to international currency and banking, if you don't think recent events in Southeast Asia had an impact on Van Heusen, had an impact on Sea-Land, and had an impact on you, then you were asleep. People who are going to function well in this changing global environment really have to be able to understand how sways in international currency and how international payment facilities can affect their cost of doing business and the quality of their product.

In choosing a mode and a carrier within that mode, as well as in choosing a company that will sew on buttons or a company that will cut fabric for you or a farmer who is going to grow and ship cotton for your base product, it is critical to know what the return on invested capital is, what your suppliers' financial operating ratios are, and how to predict their effectiveness in the future and in applying technology and change in their part of the supply chain.

An understanding of how letters of credit are constructed and transacted and the costs of various facilitations and the overall banking and funds flow transfers as we move cargo, information, and money through the supply chain is essential.

Modes of transportation constitute the second area of knowledge. There are obviously tradeoffs in using different modes. A previous speaker talked about the velocity/price issue—service versus cost. You can get tremendous service, but can your product pay for that service? How reliable is that mode and how does reliability help you to reduce the safety stock in your overall logistics chain? It may be more critical to pay a higher price for reliability to take the supply of stock out of your chain than traditional thinking may have led us to believe.

Product sensitivity and time versus cost—how perishable is your product? For example, you can move a trailer load of Van Heusen shirts for \$2,700 from Korea to Cleveland, Ohio, but if it takes you 5 weeks to do that, the shirts are going to be out of style by the time they get to the market. This is less critical for some of the more traditional commodities such as resins, cotton, waste paper, craft liner board, and so forth; however, it is a lot more critical for products like VCRs, Nike shoes, and Van Heusen shirts.

Geography and cultural learning are important. For example, Sea-Land just moved its headquarters from around the world down to Charlotte, North Carolina, and hired 350 people locally. Very few of them understood the metric system. Very few of them understood geography; for example, they knew nothing about the smaller countries in Europe.

Understand the effect of time zones; don't pick up the phone in North Carolina at 4:00 p.m. Eastern Standard Time and call somebody in Hong Kong, because you're going to wake them up, which won't make for a great business relationship.

Professionals in transportation and in the supply chain business really need to have a keen understanding of currency, which is an area you do not know about until you experience it. You do not know the effect of currency on your product until you are changing your dollars in a foreign market where the currency is being devalued and experience the impact of this on your own life.

Transportation and logistics professionals need to understand that mode capabilities differ by geographic area. Barging in China or on the Rhine River is a lot more reliable than you may think it is. It is more reliable than trucking or rail in certain sectors of the United States today. Know your geography—we once had a shipper move a product from Santo Tomás, Guatemala. They manifested it on the bill of lading, and we carried it to St. Thomas, Virgin Islands. St. Thomas and Santo Tomás sound alike, but they are 1932 km (1,200 miles) apart—and believe it or not, the only way you can get from one to the other is through Miami.

Knowledge of *data transfer and electronic commerce* is also important. Electronic commerce encompasses supply chain management and the compatibility of system architecture. For example, what is the base technology platform upon which your system is running? What is the platform upon which your suppliers' information is being moved? Are they compatible? One also has to be knowledgeable about web-based technologies and about the economies of information technology, not only electronic data interchange (EDI), as somebody pointed out this morning, but also electronic funds transfer.

In the area of *government regulations and customs*, for a product to move, people need to understand how duty drawback actually works. What is required in order to participate in those programs? What is the impact of issues like child labor? If you are selling these Van Heusen shirts to U.S. soccer Moms, what are their concerns about the assembly of these products in areas where child labor may have been or is an issue?

The quota system—how does that affect your ability to move the product? If you have a hot item constructed in one country that suddenly takes off and you run up against a quota system in another country, how do you move your raw materials and your manufacturing process to another location and not affect your business?

Finally, labor, which is a key issue for Van Heusen, has been dealt with in Korea and in Guatemala in a very effective way. However, Van Heusen has also done so in consultation with their ocean carrier, Sea-Land.

Transportation professionals in the future must have education and training in *distribution and delivery*

skills. The Sea-Land building in Hong Kong that I mentioned earlier is 557 418 m² (6 million ft²). We do warehousing, bar coding, and just-in-time inventory there as well as multicountry consolidation. We do all the distribution in Asia for McDonald's, Nike, and Reebok, and we run the quality program for Hallmark cards in this facility. It is a lot more than just single-mode transportation.

Knowledge of *costing and pricing* includes activity-based costing (ABC), a technique that transportation professionals need to understand. They should also have knowledge about cost-based pricing. In our industry pricing has traditionally been market based; you charge what the market will bear. As you start to customize products and services, you need to charge for them on the basis of cost, not the market, because unless you differentiate, you will price yourself into the ground.

On the subject of conferences and tariffs, as mentioned by previous speakers, I would also make a big push for deregulation. You cannot operate in the kind of environment where the traditional conference system dictates how much you are going to charge a customer for the ocean portion of your transportation link.

Understanding of *transportation and logistics strategy* is critical—understanding capacity and how capacity-supply relationships drive costs. For example, look at the industry consolidation that is occurring in ocean transportation now, with two or three major consortiums coming together with nine carriers. What impact does this have on terminals, on information and information systems, on planning? How will deregulation of the ocean industry, following that which has occurred in

the truck and rail sectors, affect the ability to move products through multiple geographies to the ultimate consumer?

With regard to revenue management, are you going to be exposed to suppliers' charging a higher price during the typical rush out of Asia during May to October, or are you going to be able to sit down and contract with the carrier for a rate that is going to allow you to price that product and sell it in the marketplace throughout the year?

Finally, there is market segmentation: in your suppliers' minds, how are your various products segmented?

The whole concept of supply chain management is changing, moving from a situation in which there are stacks of products for which invoices are cut, accounts receivable are made, payments are cashed through banks, and so forth. Supply chain management is going to become much more fluid, and the flow of goods, information, and funds through the system is going to be critical.

From our perspective at Sea-Land, the learning strategies that need to be in place include corporate internships, that is, the ability to educate the educators, if you will, and that is not meant to be derogatory, but rather a challenge to keep those who are in the educational environment up to date with trends. Transportation professionals need to understand the capabilities and limitations of the transportation network in managing products through international trade; this will involve partnerships with universities, job rotation and experience, and personal learning, even if it is on the web, and understanding the transportation network itself.

Global Transportation Network: An Intermodal Information System

Mark Bonatucci, *Lockheed-Martin Corporation*

The global transportation network (GTN) is the information system for the U.S. Transportation Command (USTRANSCOM), and Lockheed-Martin is the prime contractor. As deployed today, GTN is the largest successful implementation of an intermodal transportation supply chain management information system (MIS).

GTN is the primary command and control system, including operations information, and is the primary business management system for USTRANSCOM. As such, its span is very wide, and it interfaces with numerous other systems. It encompasses the information needs of a wide range of intermodal interests—those of carriers, managers, and customers. To provide the required functionality, GTN acquires data from about 23 external systems today. Lockheed-Martin adds about three systems a month and plans to interface with 100 intermodal carriers over the next 24 months through electronic data interchange.

The objectives of GTN have been intermodal from its inception. As an information management system, it has common bonds with numerous systems that are being implemented today. The strategic initiatives are support, both centralized policy planning and guidance, and decentralized execution, so that response to that centralized information can be rapid.

The tactical objective for GTN—to provide a centralized repository and source of intermodal information, planning analysis, execution, and forecasting across the entire intermodal system and worldwide universal communications with all trading partners—has driven its intermodal nature. It has been on a rapid path ever since

Desert Storm and Desert Shield in 1990, when a loss of in-transit visibility resulted in the need for the Joint Forces to open 25,000 of the 40,000 containers shipped to Saudi Arabia to figure out what was in them and where they had to go on the next leg of their journey.

This aggressive development and deployment schedule also infuses the system with functionality in an incremental fashion. Ensuring that users' needs are met in an adaptive and evolutionary fashion is a good way to ensure that what is built is what real users need and want, a system whose users' base is broad, ranging from senior executive generals to personnel supply clerks. Thus, GTN presents special challenges and skill requirements.

The goal for GTN is to provide all the transportation information to support total asset visibility, which is the Department of Defense version of supply chain management. The principal events that are recorded in GTN, relative to movements of people and cargo, relate to lift and shipment of an item and receipt at every node in the transportation pipeline. The system attempts to chronicle every move of an item as it flows through the defense transportation system.

The final segment of total asset visibility is in-transit visibility. Here movement transactions or information about shipments of unit sustainment cargo is captured. If your unit cargo is built to order and sustainment cargo is built to replenish, you can see a correlation with things that the Council for Logistics Management (CLM) talks about in the context of supply chain management. Passengers help to execute and control the transportation process, which requires that extensive amounts of infor-

mation be sent to GTN, which then functions as a transportation central repository and primarily is the command and control information system.

In order to provide the necessary in-transit visibility across all modes of the global transportation system, GTN receives information from air movements, seafair, truck and rail, requisitions or orders, and then unit moves, which are large orders, and basic operations in order to better manage the assets themselves.

To achieve this in a relatively short period of time and meet customers' needs, the major challenge for every information systems provider is figuring out what to build. The development methodology called joint application development (JAD) is utilized, which requires and facilitates close-coupled user involvement. JAD helps ensure that the functionality produced is the functionality desired by the user community. It gets the users involved early in the development process, but even more important, it keeps them involved throughout. The evolutionary, incremental aspect provides users and domain experts with multiple opportunities to view and use the actual product as it is demonstrated, developed, and delivered.

In order to ensure that all issues are considered during this short product life cycle, we have combined JAD with a focus called integrated product teams (IPTs), in which a cross-functional team approach is employed. This is both in response to, and for the satisfaction of, the broad skill and knowledge requirements of an information system with GTN's breadth. The team consists of at least one member with the skills and knowledge required to address a particular product or function area through to completion. The velocity of change in the commercial marketplace, along with the demand to satisfy this need rapidly, has required adoption of the "adapt and reuse" principle as a mantra throughout the life of GTN, that is, from the perspective of both USTRANSCOM—the customer—and Lockheed-Martin. Use of this principle has done a number of things; primarily, it has spread out the development and deployment cycles, and it has reduced the acquisition costs. However, for the technical staff, it has also driven a need for broad knowledge of the workings and technologies available in the commercial marketplace.

Each team member is expected to bring a basic skill set to the team, depending on his or her role. *Domain experts* are knowledge engineers with intermodal operations knowledge in at least one, preferably two, modes, because of the nature of GTN. They are required to have in-depth knowledge of at least one or more of the feeder systems and the data that are available from them. They are required to have basic information systems and information engineering capabilities. Ideally, they have an understanding of relational database techniques and process engineering skills that all the big five consultants have

been talking about for years. Teamwork skills are also essential. I emphasize teamwork again and again because to operate and quickly deploy such a large system, you cannot have your own ideas. You have to work on a team and you have to work in a collaborative environment.

Systems engineers then take that knowledge and try to apply functional knowledge and functional requirements and develop a top-level architecture for a solution. They are required to have broad knowledge of commercial information technology, the MIS environment, and a deep-rooted understanding of JAD and rapid application development (RAD) techniques and their limitations. On the technology side, we have talked about JAD/RAD techniques for years as a panacea. The reality is that these techniques solve many, many problems and help deliver the solutions people want, but they have certain limitations and require a certain amount of patience on the part of engineers to listen to users.

Data modeling is the key to this whole centralized repository and requires basic World Wide Web communications architecture skills, operations research, and an understanding that intermodal transportation and supply chain management are control-of-flow operations research problems. A combination of information security skills and business savvy is also important. It is funny to hear people talk about the need to share information when the reality is that most corporations are investing heavily in their technology infrastructure and are looking for ways to reap service discriminators. As for trying to get them to work together and adopt open systems, the transportation side of these companies is behind the technology side. We have been dealing with open standards and trying to figure out what to share and what to hold close to the vest for years on the technology side. Now the business side is getting involved.

Database engineers and architects must have superior skills in data modeling. When you look at the functional titles and the relationships between global supply chains, modeling is the key to developing a system quickly without wasting time. If it is done wrong, you end up throwing away half of what you developed in the first 6 months of a project. Deeply rooted software query language skills are necessary, as well as a basic understanding of the transportation domain. If educators could figure out how to infuse some transportation into the engineering side and the operations research side, so that students learn how to apply technology, and then some technology into the business side, so that students are not afraid to wrestle with the technology, that would help greatly. *Software application developers* need technical skills in basically the same areas as the database engineers, along with their own technical knowledge. The *project manager/team leader* is the person we expect to bring the knowledge to bear of what data and information can be shared without losing the service

discriminator advantage and what data and information must be safeguarded.

In this industry, roughly 1,000 technology companies are now involved, so staffing and training of that staff are constant challenges. We have increased our staff in this area by 100 percent in the last 15 months and continue to grow. Training and education then become ongoing requirements and will be through the foreseeable future. One must fuse business and technical skills to create robust and durable representations of real-world objects and how they relate to each other while still maintaining these database and performance ways. None of you like to press a button on a computer and wait 3 min for an answer. This means that in addition to modeling all these complex interactions, the data modeler has to work fast. The global nature of intermodalism complicates that situation. In enterprise modeling, the functional side needs to understand and model processes in a technical way or in a way that can be translated for technical people without loss of the meaning across the enterprise. In addition, they have to foresee the nature of the process changes that the technology will enable when it is brought to bear on the problem.

Teamwork is essential, since no one person can do it all. As much as technicians like to consider themselves experts who should be left to do what they want and functional experts like to just indicate what the system will do, you have to work in the realm of the possible and you have to respect each other and work as a team. When we look at entry-level or even senior candidates (and we are looking for both right now), we put a premium on those who have worked at least at the undergraduate level on collaborative projects for which the actual grades and success of the entire team are influenced by the grades and success of the individual members. This experience brings a lot to bear when they come into a business that functions in that way.

In external alliances with trading partners, teamwork comes into play regarding what data are shared and what data are safeguarded. On the technical side, we have had to wrestle with this with open systems for years. For example, I can get lots of information on DOS and what this operating system does, but I could not pay

\$100 million today and get the proprietary format of a PowerPoint file from Microsoft. Therefore, you have to understand which things are your market discriminators and only safeguard those as opposed to everything else. When we try to share data with some transportation companies for whom USTRANSCOM is a large customer, it is taking us months just to work out confidential disclosure agreements.

What we have come to realize is that we going to have to pay more for higher-level personnel with more experience because it is unlikely that anyone, even a transportation professional, understands multiple modes without at least 5 years of experience. As I mentioned earlier, we are placing a premium on collaborative work projects in undergraduate programs for entry-level and new recent graduates. We have increased our use of technical consultants and subcontractors, not across our whole enterprise, but on focused initiatives. We are going out and buying, at a premium, those skills we need. We are establishing and continue to maintain ongoing in-house training programs, brown-bag sessions where our functional experts talk and educate our technicians on what the domain experts need to know and our technicians educate the functional people as to what technology is and does.

With respect to increased documentation and focus on processes, even as our talent base grows very quickly, there is still a need to cater to the average worker as opposed to the exception. This includes, for example, ISO 9000 and the Software Engineering Institute's capability maturity model (SEI CMM) or initiatives where we are forcing cross-training of best practices. We have explored, and continue to explore, the establishment of an alliance with an institution for transportation domain knowledge. Technicians just do not have that type of exposure. They spend their life in the information technology world and they need to know how to apply that technology to the domain, be it banking, transportation, or elsewhere in the industry.

Increased participation in industry groups and conferences to maintain currency in both transportation and technical domains is important. The velocity of change in knowledge here is also rapid.

Transit System Planning and Operations

Naomi Nightingale, *Los Angeles County Metropolitan Transportation Authority*

At Los Angeles County Metropolitan Transportation Authority (MTA) we have been involved in the business of workforce development at the high school level since 1985. It was no easy task to convince our executive staff that, for our own sake, transportation needed to be involved in the business of education, that we indeed needed to develop partnerships with our high schools, our middle schools, our universities and colleges, in terms of meeting the needs of MTA's 20-year plan.

As we looked at our 20-year plan and the 725 km (450 miles) of rail that we anticipated developing—the transportation systems, highways, and freeways within the Los Angeles County and Southern California region—what was absent from that 20-year strategic plan and even from our 5-year business plan was the workforce education and training required and the qualified people required to build and operate those systems. In Los Angeles, when we broke ground for our first line in 1985, the Long Beach to Los Angeles Blue Line, we imported every person who worked on that project, from planning to construction. As you can imagine, in an area where we have double-digit unemployment, that simply was not an acceptable practice. The Transportation Careers Academy Program (TCAP), with high school students from grades 9 through 12 and students from community college up to grade 14, is our effort to prepare the workforce that the Los Angeles County region needs in order to have a supply of qualified potential employees.

TCAP is managed through our Career Development and Training Center. We have developed a system of delivering education and training that involves not only our TCAP for grades 9 through 14 but also the Transporta-

tion Teaching Institute, which is our mechanism for providing support services to both teachers and students. We have a cadre of 300 volunteers, professionals from the MTA and our business partners, who support teachers and students in a variety of ways, including curriculum development, so that teachers have assistance in writing curriculum appropriate and relevant to the transportation industry. Each teacher and each 12th-grade student has an industry mentor. We are expanding that program to provide MTA mentors for 11th graders as well.

We have an information and resource team that goes out to schools and involves teachers in building relevant practical, real-life projects for the classroom. We have a group that makes lectures and tours and has developed a directory so teachers can pick and choose what is most important and appropriate for their particular subjects. We also have a train-the-teacher group. Each summer, teachers come to the MTA and are assigned mentors whom they shadow on the job. They also do actual work for the agency and attend a series of workshops to orient them to the transportation industry and familiarize them with the various transportation-related occupations.

The area I will focus on is our customized training department, established for the development of new and emerging technologies. The capstone for our system of delivering education and training is the Advanced Transportation Industry Consortium (ATIC), which the MTA cochairs with our regional planning agency, the Southern California Association of Governments (SCAG). The consortium is designed to be the initiative that brings public, private, and government entities to the table in the interest of workforce development for the Southern

California region. There is also a job development and training component of our system, which requires all contractors who do business with the MTA to allocate 3 percent of their labor dollars to employing unemployed persons in the area, including displaced workers, engineers from our aerospace industry, and others who are unemployed but qualified to work in the industry. These components make up our system of delivering education and training, encompassing high school students, college students, and unemployed adults.

Our customized training department recently focused on the development of a training program for signal system technicians in response to MTA's investment in and installation of new traffic signal controls. There are about 10,000 of these new controls throughout the 88 cities in Los Angeles County to measure congestion mitigation, air quality, and mobility in the Los Angeles County area. After the investment and installation of those signal control systems, it was discovered that no individuals had been trained to maintain and repair them. The career development and training center, working with the signal support group, an organization put together to address how repair and maintenance were going to be carried out in this particular initiative, looked at what needed to be done with existing employees. We set up a series of workshops on signal controls and communications for the existing public works employees from the 88 cities in Los Angeles County. These workshops were funded through MTA's internal funding mechanism, Call For Projects, by means of an application from the career development and training center, which received \$159,000 for a two-year period. The major objective of these programs was to provide comprehensive training to local traffic signal operation and maintenance personnel in the areas of signal synchronization, communication, operation, and maintenance.

The second objective was to provide a means for disseminating information and knowledge about current technologies in the areas of signal systems operation and maintenance. Many of the small cities did not have knowledge about the capabilities of such technology or how to fund its installation. This initiative served as a forum for the delivery and dissemination of that information and provided an opportunity for operation and maintenance staff to share their experiences and knowledge. We have held four or five workshops this year, sending out flyers to recruit for participation in the program. There are always more applicants than we have space for in the class, which is limited to 25. We do have a plan for continuing the workshops next year.

The proposed training is envisioned to draw resources from or expand existing programs at the federal, state, and local levels to suit the local agency projects funded by the MTA; to provide a forum to involve all concerned agencies, both public and private; and to

develop a curriculum at the community college level to provide training and encourage development in the areas of signal synchronization. In addition to the workshops that we have developed for existing employees, we have worked with the community college to develop a certificate-level program for those interested in entering the field and learning the trade of signal systems operations and maintenance. The final objective was to develop a curriculum that could lead to certification in the future and to provide the necessary future workforce in this particular field.

The signal systems program was developed with funds from the MTA. We have a technical advisory committee that helps with the technical information and provides oversight for curriculum development. The signal support group helps with the planning and coordination of signal system synchronization throughout Los Angeles County. It involves the highway program at the MTA and the career development and training center, funded by our internal Call For Projects funding mechanism. Throughout Los Angeles County we have several regional traffic forums that deal with signal synchronization in their particular region.

The MTA, through this investment, looked at what the next phase would be. We submitted a second application through our Call For Projects mechanism for funding beginning in the year 1999 to move into signal controls, traffic signal preemption for bus operations, and other areas in intelligent transportation systems that deal with signal synchronization as it relates to broader areas within the county on freeways and highways.

Some of the cities within the county had traffic control systems for which special training was necessary, so we set up a program that is actually being conducted by the manufacturer.

One of the areas in which we strongly believe is partnership with other entities in the delivery of education and training. In addition to our partnerships with the Los Angeles Unified School District, the Norwalk LaMarada School District, and the community college district, the California Advanced Transportation Training Alliance (CalSkills) is one of our partners in the delivery of this particular program and a broader range of programs.

ATIC is our effort to employ this kind of system of delivering education and training for a broader range in the Southern California region and imminently at a national level as we look at what the needs are in the transportation industry professionally, technically, and at the laborer levels.

The MTA internally has an administrative internship program in which we are dedicating some of our slots to graduates from our TCAP at the high school level. The executive level is very open to that program as we look at succession planning through TCAP into the regular workforce at the MTA.

Technology and Intermodal Transportation: Priority Corridor Planning and Operations

Belle Cole, *PMR Group, Inc.*

This case study is about a model for addressing workforce needs in the advanced transportation industry, especially in what is now being called advanced transportation systems (ATS), although I will continue to refer to it by the more commonly recognized acronym, ITS. The model is the California Advanced Transportation Training Alliance (CalSkills). It is an efficient and cost-effective way for the state of California to respond quickly to major obstacles, key shortages confronting an emerging industry.

What are the main features of this model going to be? What are the desired outcomes? What are its unique contributions and challenges? How will it be used to address the training needs of ITS deployment initiatives such as the Southern California priority corridor? Let me begin to answer these questions by telling you about the CalSkills organization, which will put things in context.

As you know, ITS is the basis of an emerging industry that will support a domestic market the value of which was recently estimated at \$400 billion over the next 20 years, \$300 billion of which is in the consumer industry, and will generate new jobs commensurate with that stream of revenue. ITS is basically the application of technologies such as those for advanced communications and control, information processing, and electronics to transportation systems to make these systems more efficient.

ITS makes it possible to receive accurate real-time information on optimal routing and traffic directions, to provide for collision avoidance and warnings, to generate automatic incident detection and emergency notifi-

cation, to automate guidance of vehicles, to permit remote monitoring of traffic conditions and control of signals, and to provide for centralized management of fleet and public transit vehicles.

CalSkills has learned that the technology areas for these systems include computers, sensors, videoprocessing equipment, communications equipment, vehicle components, and systems that cut across a core of occupations that have been talked about by two previous speakers from industry—communications, data processing, electronics, and traffic management. There appears to be a continuing shortage of people with necessary skills to design, manage, and maintain these systems. These skill shortages are showing up in other growth industries as well, including the multimedia and entertainment industries, which are other key industries in California. I learned yesterday from a report in the *Los Angeles Times* by an economist who writes frequently about high-tech industries that there are right now something like 190,000 information-based jobs that need to be filled, many of which are in these industries. The objective of CalSkills is to respond to industry needs because the planning, design, implementation, operation, and maintenance of ITS require that well-trained professionals have skills in these areas.

For the first time that I know of in California, an economic development project called Project California, a public-private partnership looking at ways to advance the ITS industry in California, devoted attention to human resource needs. If this industry was going to create 400,000 new jobs over the next 10 years, about half estimated to be in the field of ITS and the remainder

in the areas of alternative fuel vehicles and rapid rail, what would this workforce look like? What kinds of skills are these people going to need? What are the demand occupations? Who is doing the necessary training to provide the kinds of skills that are needed, and how do you bring about the match between the trainer and the industry?

CalSkills was created as part of Project California to consider these questions. It has now evolved into a public-private partnership with a board of trustees from the ITS industry and also from government agencies interested in training to deal with the urgent workforce needs of this growing industry. It is intended to enable this industry to respond to what we call "unmet training needs." It is not interested in looking at what most professional schools and universities are doing in terms of providing people in the engineering field, but rather at what these companies need at this point in time.

Some companies, if they are large enough, will have their own internal training programs that will enable them to get their people to the point where they can carry out some of these new complex functions. However, many firms, especially medium-sized and small firms, are unable to do that. The service we are providing really is geared toward the needs of industry, particularly small to medium-sized industry.

This initial effort, especially with emerging industries like the ones we were looking at, required understanding what the industry is, where it is located, what the technologies are, and what the firms are. As a way of understanding the unmet training needs, some industries are very well documented, but when we looked at the industries in California in which we were interested, we discovered that very little information was available. Therefore, we produced a report, which could be made available to anybody interested in the ITS and electric vehicle industries, to look at these technology areas. It was done not just out of interest, but because in order to look at workforce needs, you have to understand where the firms are—who you need to talk to—especially since we were trying to define those needs in a way that covered more than one firm, that covered a segment of the industry.

The first task was to examine the unmet training needs. Once that was done, we came up with a list of about 22 demand occupations that seemed to cut across the industry for professional, technical, and workforce skills and needs. With that came the process of determining what occupations we would be able to look at, recognizing that this was a small effort looking at a big question. A filtering process had to take place. If you want to develop a training program, you need to have to set priorities: which needs are the most important and are not being met in the usual ways. This required soliciting the informed judgment of people in the industry and outside experts. Using this methodology, we were

able to come up with four or five occupations that we put on a fast track. We did a skills analysis of a couple of those occupations and came up with the signal system technician. It is interesting that our effort indicated the strong need for these technicians, and, independently, the Los Angeles County Metropolitan Transportation Authority (MTA) came up with this need as well. We were able to join forces so that we could take advantage of their workshops and their need for a community college program.

Once you know what the need is, who is doing this kind of training? We had wonderful participation from the major extension programs from principal universities around the state, as well as community colleges, the state system, and proprietary trainers. We learned who could do what. The problem did not really seem to be a question of people being able to do the training, but rather of matching the company or companies and the people to be trained. A training program was identified consisting of an identified occupation or set of skills, specifications for curriculum development, an eager qualified provider, employers with real jobs, trainees (either existing employees or potential new hires), and funding arrangements. Therein enters the brokerage role of CalSkills. In the process, we identified over 200 firms and potential entrants into this industry; these were firms many of which have real obstacles to progress because of personnel and skill shortages.

It is almost like job development. Once you decide on the occupation, you need to look very carefully at what is required in developing it. I looked at the list provided and realized that to do the kind of work we would do, you needed to talk to the people in the company and maybe other companies to get a good feel for what the training program would have to include and then identify providers. CalSkills does not do training, but rather pulls together the right people. The essence of the brokerage component is to get the firm and the trainers ready to work together and to find a funding source. Various demand occupations and skills came out of the program—different types of engineers, project managers, systems engineers, manufacturing-related skills, and business skills for small and medium-sized firms.

Signal system technician was the highest priority of the demand occupations. It required consultation with employers, unions, and educators. The most interesting feature of this was the difficulty and yet the excitement of actually finding a community college that really wanted to author a certification program. Long Beach City College already had a strong program in electronics, and this specialty was one they were willing to develop. As a result, the program will be used in the other 107 community colleges throughout the state.

In addition to development of the required curriculum, another component is drawing together experts

from the public and the private sectors to define the type of program to be taught. What was going on at MTA was a "specializations" program. We defined the areas to be taught as "advanced fundamentals," which included digital control and technology, fiber optics technology, microprocessors, fundamentals of computer programming, modem and network communications, and testing equipment, both documentation and test results.

Another category we have been looking at is ITS project manager and the skills needed for that job, specifically, budget planning, contract negotiations, marketing and sales, team leadership and consensus management, knowledge of several fields of engineering (civil, mechanical, materials, electrical), and software engineering and development. For people who do systems integration, we discovered that the need for ITS project managers was absolutely foremost on their minds. Other required skills areas included continuous process improvement (CPI), including workflow analysis, process definition, and statistical process control, as well as technical and proposal writing and public speaking and presentation skills.

For case study purposes, you need to ask the question, What will it take to continue and expand this effort? There are real lessons for other communities and states that want to organize and carry out a project like this. What we regard as the unique contributions of CalSkills include anticipation of workforce needs, detailed matching of needs with training, speed and flexibility of delivery, lower costs achieved through economies of scale and leveraging of public funds, improved quality by matching provider with need, assistance to small and medium-sized firms with collab-

orative training efforts, and response to professional capacity building for California.

The Southern California Priority Corridor is the site of numerous leading-edge research planning and deployment activities using ITS. It is one of five or six major ITS deployment projects of both the federal government and the California Department of Transportation (CalTrans). The corridor is one of four identified under ISTEA. The major characteristics demonstrate that it is clearly as intermodal as a project can be. It integrates and deploys ITS infrastructure in urban areas of six counties from Ventura County down to the U.S. border with Mexico at San Diego. It links several CalTrans regional operations (Advanced Traffic Management Systems) and creates a framework for information distribution to travelers (Advanced Travel Information Systems). It creates systems to communicate between information systems operated by regional transit agencies and commuter passenger rail systems (Advanced Passenger Train Systems). It also integrates ITS projects into Showcase, which is a "system of systems." Finally, it creates a commercial vehicle operation (CVO) information corridor from the U.S.-Mexican border to the Inland Empire.

In closing, I want to point out that CalSkills is an information clearinghouse for different services and information involving all the different forms of transportation. With respect to training and education, we see it as meeting immediate, short-term, and longer-term workforce needs as they now occur. It does not matter whether it is intermodal or one mode, because the strategy is to look at the need. If the need is intermodal, that is what we address and that is where we try to get the training.

PANEL DISCUSSION

Transportation Workforce 2000

Glenda Tate, Moderator, *Office of Human Resource Management, U.S. Department of Transportation*

Robert Coon, *Con-Way Transportation Services, Inc.*

Mona Christie, *Kimley-Horn & Associates, Inc.*

Virginia DeRoze, *Truckload Carriers Association and Professional Truck Driver Institute of America*

Alberto Santiago, *National Highway Institute*

Glenda Tate

During the past several years, there have been a number of reports that focus on the workforce of the year 2000 and beyond. What is interesting to note is that these reports are obsolete almost as soon as they come out because the world of transportation is changing so rapidly. This is a challenging topic, one that we need to prepare for, and one worthy of serious discussion.

Data from the Bureau of Labor Statistics (BLS) indicate that about 10 million people, or about 7 percent of the U.S. workforce, are employed in transportation careers. This workforce ranges from those who operate vehicles to air traffic controllers, engineers, safety inspectors, environmentalists, and those who make travel arrangements. Historically, when we look at transportation as a field, we know that of the many job opportunities available, traditionally many have not required an advanced degree. However, again according to BLS data, it is estimated that by the year 2000, 65 percent of all jobs will require more than a high school education, 20 percent will require a bachelor's degree, and only 15 percent will be for the unskilled worker. There is no reason to believe that the transportation field will not follow this pattern. We have already heard about the truck

driver whose primary skill used to be the ability to drive a truck. Today, that individual must also know how to use a computer to perform the job satisfactorily. The same is true for the locomotive engineer and many other transportation positions.

When we consider intelligent transportation systems (ITS), we see a field with the potential to provide 21st century answers to 21st century problems, such as ever-increasing traffic congestion and fewer funds for new infrastructure. This is but one example of the impact of technology on our work environment and on the skills that need to be in place to make the promise of technology a reality at work. After all, the technology is only as good as the people who can operate it.

I believe that one of the challenges for us in federal, state, and local governments is to join our partners in the educational arena and the private sector to begin to think about how we prepare our workforce for the year 2000. To paraphrase Rosa Beth Canter at Harvard University, our partnerships must be living systems, evolving progressively in their possibilities. One of the challenges for those of us in the regulatory arena at the U.S. Department of Transportation (DOT) is the whole notion

of intermodalism. For those of you who have any dealings with DOT, you understand how difficult that notion is. In DOT's Strategic Plan, Secretary of Transportation Rodney Slater set the goal of "one DOT." Although this does not mean that modal operating administrations will be eliminated, it does mean that the Secretary wants a culture of intermodal thinking. He wants decisions to be made within an intermodal framework. The leadership at DOT recognizes that if we are going to be in step with the kind of transportation policy we need for the year 2000 and beyond, it is imperative that it be within an intermodal framework.

You have heard comments from Deputy Secretary Mortimer Downey about the Garrett A. Morgan initiative. DOT has put together a publication entitled *Careers in Transportation*. It was developed when we were unable to find anything that provided students with good

information about the careers available in transportation, particularly students in high schools and community colleges. One notion that we hear over and over again as we talk about preparing the workforce for the year 2000 is making students aware of transportation careers at an early age. We have heard at this conference that individuals often end up in transportation careers almost by happenstance. We want to change that.

Our panelists will be able to talk about some of these fundamental issues, about the current challenges in attracting and retaining a qualified workforce. We will talk about how to upgrade the skills of the individuals already in the transportation workforce and how to create an environment for continuous learning. We will talk about issues concerning what some refer to as the contingent workforce: how do we bring them into the workforce in order to be able to work effectively?

Robert Coon

We have to look very carefully at what we, the ultimate consumers, want in terms of the product—potential future employees. This panel has been asked to talk about the demand side of the business. I am here today as a user, as one of the largest employers of transportation personnel in the United States, to present my demands.

First, I would like to know what intermodalism is. The conference started by indicating that we were not going to define it, but I think it is very important that we agree on what intermodalism is and how it differs from transportation, distribution, supply chain management. Is it more than multimodalism, which a lot of those in my industry have talked about? Or is it just another buzzword that is formulated by academics and loved by a lot of corporate trainers? We really need a clear definition.

Intermodalism changes all the time. Companies that were not even in the intermodal business are suddenly forced into it just as a matter of survival. A transportation colleague of mine at this conference is with a company called Caliber Systems, which has just been acquired by Federal Express. We were talking about the fact that most people do not realize that about half (52 percent) of Federal Express packages never get inside an airplane. Federal Express is one of the largest trucking companies in America today, a prime example of intermodalism.

Second, I would like to know who owns intermodalism. When I spoke at the Intermodal Association of North America conference, we had one definition. When I spoke at the Council for Logistics Management, there was another definition. There may be a third one at this conference. I recently saw an impressive chart showing how many people are involved in intermodalism; however, the reality is that one request for those involved in transportation education is to help define the vocabulary better. The question then becomes where intermodalism resides. Does it properly belong with the Department of Commerce, the Special Trade Commission? How about DOT? Where within a college or university is it appropriate to place intermodalism as a discipline? If intermodalism is going to succeed as a concept easily transferable from academia to the real world, we need a clear definition of where it resides as well as what it is. Earlier today it was said that logistics properly should be in the core of the business administration curriculum within any college or university. But where does intermodalism fit? We do not find out where that is until we solve the problem of who owns it.

Third, we need to make a clear distinction between what education is and what training is. Who is responsible for student education versus employee training? We are masters at training within our industries. It has been pointed out to me that we at Con-Way spend an entire

week on orientation, during which time new employees see 24 different video presentations. However, although we may be masters at skills training, we are very ignorant when it comes to education.

One of the issues that has not been clearly addressed is not who trains and educates the future transportation job applicant but what is being done about the current employees. A real contribution of colleges and universities to the future of transportation is meeting the need for continuing education in transportation, and not just for the professional level. Twenty-two percent of the drivers we employ today have had some college courses or have a college degree. It is not unusual to find somebody with a master's degree driving a truck.

Fourth, in terms of demand, I would like to offer a challenge: what is the most important thing to teach students who are interested in pursuing careers in transportation or logistics or intermodalism? Although we all have different ideas of what should go into the curriculum, all three user groups represented in a recent conversation on this topic came up with the same answer: we ought to teach them communication, starting with how to listen to the customer, how to listen to other employees and other groups within which they operate, and then how to communicate what is important back to those people. It is not enough just to teach technologies anymore; we also have to teach a bit of sociology. We have to teach people how to operate in groups, how to interact with one another, how to form and be part of a team.

In addition to supply management, I suggest we also include change management in every college curriculum that deals with this subject. Team management and project control are concepts that are as important to learn as the concepts of technology or information systems.

Fifth, communication does not just apply at the student level. We need and have yet to see sufficient communication between universities and the private sector. It is not just important for us to ask how we get students into our companies and internships. We must also ask how we get professors into our companies, not just as consultants, but as actual practitioners. How many professors sitting in this room would be willing to call up a company and ask for an internship for themselves? If you do, you will probably get a very positive response. It is not enough for us to tell you what we want and then demand it; we would like to show you. It is important for you to be able to walk into your classroom and say, "I just spent this last summer working on a shipping dock, or in a marine company, doing something in the real world."

Last, as we consider what we want from this conference, we want information, not intervention. We want definition, not regulation. We do not look to groups like this or to government agencies to tell us how to do something because we are very good at doing our jobs. What we would like is better communication, to make sure that everybody is moving in the right direction. We want dialogue, not just recommendations. Most important, although we want national direction, we want these to be local programs.

Mona Christie

I will be speaking from the consulting side of transportation on how we view intermodal transportation education and training and the impact it has on us. It is exciting to see all the different groups represented here with the common goal of a partnership. The reality for us within industry is that education is our future, so we have a very strong vested interest.

We find today, through hands-on experience with projects, that transportation solutions by necessity are becoming more complex. Today's solutions involve more modes than has been the case in the past. The process no longer involves just highway traffic or highway infrastructure. It has become an evolutionary process that requires integration of all the various modes to work together to deliver a solution. Transportation professionals of today and tomorrow need a comfort level to think beyond the past re-

straints of single modes to be able to meet the transportation challenges of the 21st century.

Intermodal transportation training and education is very important to the future of the transportation industry and practice and to the future of the transportation delivery system to serve the public. The public deserves seamless transportation options that make life and travel easy and safe. Intermodal transportation has definitely become part of the landscape of the future, and our firm wants to be part of that landscape.

A more broad-based approach is needed in terms of personnel skills, training, and experience as they relate to intermodal transportation planning and operations. The highly specialized disciplines of the past are no longer adequate to meet the ever-changing demands of transportation. The current environment demands a broader under-

standing of the various modes of transportation, how they interact, how they function, and who they serve. Today transportation professionals are needed whose expertise crosses all the disciplines and who have a vision of the big picture. Only by understanding the various modes can the transportation professionals of today set a vision, conceptualize, and make plans for the transportation needs of the present and the future.

The greatest personnel and education and training challenges that Kimley-Horn, as a consultant, faces in its intermodal transportation planning practice can be viewed from two perspectives: that of our existing staff and that of the skill set we look for when recruiting new staff. Addressing the education and training needs of existing staff has required that we challenge our current transportation professionals to incorporate their various specialized transportation disciplines and jointly pursue and produce projects. By collectively using their existing skills, the project teams interact and recognize opportunity from the various modes and disciplines, thereby identifying solutions that go beyond current answers and address future needs. In preparing for this panel, I spoke to several of our transportation practice builders who are currently working with intermodal projects. One of them seemed to put it all together when he stated that what attracted him to come to our firm was the fact that we had all the individual skill sets present, and this afforded him the opportunity to integrate them and offer clients seamless service.

With regard to the skill sets we look for when recruiting new professionals, our base criteria at all levels have included a solid technical background, good people and communication skills, as well as self-confidence and leadership attributes. These have served us well in the past as foundations for future success. Now, however, when we look at technical skills, our focus has shifted from specialized expertise to a more broad-brushed approach. We look for mid- and senior-level professionals with a solid technical background, but we also look for professionals with a big picture orientation, who not only possess an understanding of how the various disciplines and modes interact, but who also have had the opportunity to work on projects where they were interrelated.

At a junior or entry level, we look for college graduates whose curricula provide a solid technical foundation but also blend their exposure to the various transportation modes and disciplines. We prefer graduates who have had some hands-on experience through cooperative programs, internships, or summer work. As with our professional staff, we look for graduates who are well-rounded, demonstrate good people and communication skills, and have been involved in leadership roles, both on and off campus. We view the hiring of our young professionals as an investment in our future and commit to continue their training after they are hired.

We have found some specific activities that are practical and also necessary for both the public and the private sides. Among the most important activities is partnering with education and training institutions, which goes beyond a college recruiting program in which we benefit from the hires to development of a college relations program in which staff get to know the professors and the curriculum, to support the program through scholarships, and to invest time by making people available to go into the classroom and speak from a practitioner standpoint as well as giving professors the opportunity to be on project teams that use their expertise and enable them to interact with practitioners in the field. We have also found that working with colleges to develop cooperative internship opportunities not only benefits the students, but also benefits us, giving us a head start on the recruiting process as we seek new hires.

We have also developed internal programs to meet the unique challenges of training and development. We have an analyst development program that promotes cross-training between the disciplines. We have found that departments of transportation offer wonderful training programs that involve rotating staff among the various departments, and we have enhanced the skills of our young professionals by giving them similar opportunities. Early on, we take our young professionals to client meetings, public hearings, and presentations and make them an integral part of the process. This year we initiated a new program called the self-directed career development program through which our young professionals are encouraged to take senior-level professionals to lunch to discuss career paths. "Senior professional" is rather loosely defined as someone who has either more experience or more responsibility and someone who the young professional feels could offer career guidance and encouragement.

We also offer formal training to help bridge the gap between academia and application. We have young professional training and consultant training to support the transition into the actual consulting side of the business. At the mid- to senior level, we have a project manager certification program that requires participation in numerous company-sponsored training courses. On a more informal level, to ensure that we are on the cutting edge within the different disciplines, we offer brown-bag technical training lunches at which our internal talent is used to present topics. At all levels, we encourage involvement in professional associations, going beyond membership to take leadership roles, making a contribution to the industry itself.

We truly believe that the two most important keys to the firm's future success are to recruit and retain the brightest, most talented individuals. To retain them and continue to have multidisciplinary professionals, we must offer personal and professional challenges.

Virginia DeRoze

I would like to talk about a model for building partnerships. I have been in education for 30 years. For the last year and a half, I have been with the Truckload Carriers Association (TCA), which is the association of long-haul trucking companies. I joined TCA at the same time that the association assumed management of the Professional Truck Driver Institute of America (PTDIA), which was formed 12 years ago to advance truck driver training. The people in the industry were unhappy with what was happening in driver training, both within private schools and public schools, and wanted to do something about it. They assembled a group for the purpose of reviewing the DOT standards for entry-level truck driver training, as well as the skill standards. They came out of this meeting and tried to tell the schools what to do. Speaking from the point of view of educators, we do not take well to instructions from a government agency or a certification body saying, "Do this." Educators want to be involved in determining what they will be expected to do.

When I was hired to revitalize PTDIA, I proposed that we not just look at partnerships, but that we develop a stakeholder model including everyone involved in truck driver training: the carriers, the students, the drivers, and the schools. We found at least three other partners as well: the insurance companies, who want quality training to cut down on payment of claims; the regulators, who accredit the private courses and who want to know that what they are licensing is more than a truck driving school advertised on the back of a matchbook cover; and, very important, job-funding organizations. Approximately \$2.0 billion goes for training from the Department of Labor alone. Not all of that goes to truck driver training, but the department wanted to know what schools they should actually fund.

We began to work on skill standards as well as communication between education and business. By working on standards, we focused on what it was to be a truck driver. What do you have to know, how well do you have to know it, and what do you have to do to gain those skills? This is what brings stakeholders together.

In February 1997, we had a meeting of high-performing, accident-free drivers. We also got the safety managers involved. We asked them what they were doing now on the basis of what they had learned in previous reviews. They cited several issues, such as fatigue, communication, and customer service, issues not considered in the old standards. We took this information

to the schools—85 of them in one room. Private, public, and carrier schools collectively worked on specific operational issues such as what it takes to back a truck, what it takes to couple and uncouple a tractor trailer, and so on. We had a very good facilitator who had worked with the teamsters and labor unions all over the country and who was able to get them to work together on the standards.

We then assembled a smaller group to come up with the actual skill standards, which were announced in October 1997. The next step was to develop a curriculum based on these skill standards. To develop the training process, we matched each skill standard with a portion of a performance-based curriculum. The standards deal with administration, truck safety, record keeping, graduation rates, and employer satisfaction. The employer has to say what he gets out of a particular school.

We also talked to students because this is a facilitative partnership. This evaluation process is a lot like the university accreditation process in which there is a self-study; everybody in the school gets involved and they rate themselves against the standards. We use an educational team that includes not people who do not know about truck driver training, but owners, educators from truck driving training programs, and safety managers. This is the team that evaluates the school.

As a result, each of our stakeholders got something out of this process. The carriers can now go to DOT and demonstrate that (a) the industry has taken the initiative and developed the standards and (b) the industry cares about the training and certification of these people. The representatives of insurance companies indicated that the standards are exactly what they wanted because they ensure that the drivers are doing what they need to do. We are holding state and regional stakeholder meetings, mirroring what we did nationally in states such as Pennsylvania, Texas, Illinois, and California. Illinois has endorsed the skill standards, and Texas is going to use the standards to certify their schools. The Department of Labor plans to send the skill standards to all the job-funding organizations. In all the different products we have developed, we are able to raise all our skill standards.

In closing, I offer this advice: if you want to get communication going among groups of people, look at what you want the person or group to be able to do, what you want them to be able to know, and get everybody involved. Then you will have communication.

Alberto Santiago

The National Highway Institute (NHI) is a technical training arm of the Federal Highway Administration (FHWA). We have a curriculum of about 120 courses, which is rapidly growing and is going to be in the range of 150 to 160 within the year. We teach courses on topics ranging from civil rights to how to fix a pothole, how to develop and implement ITS, how to build bridges, and so forth. It is very much across-the-board as it relates to highway engineering.

We became an institution through legislation enacted in 1970. Over the past 27 years, we have instructed an estimated 330,000 students. Before ISTEA, the focus was primarily on state departments of transportation. Since ISTEA, we have expanded our customer base to include local governments, private industry, academia, and the international community.

In trying to define what the workforce for the year 2000 is going to be, I came to the conclusion that it is difficult, if not impossible, to come up with a specific set of skills, knowledge, and abilities for the future. Nevertheless, I will try to define four major areas I consider to be the key elements.

One is the effect of technology, about which we have already heard some comments and remarks. Within the context of how technology affects our workforce, the bottom line is that we now have, by far, more knowledge than we can use. For example, we have developed real-time traffic control systems, and we know how to develop superpavements. However, none of that knowledge is reaching the street. We need to be cognizant of and understand how computer technology accelerates the completion of research and that therefore the body of knowledge is going to increase much faster than we are able to adapt it to current practice.

The second area relates to our ignorance, if you will, of what technology transfer is all about and what the components of technology transfer are. We are trying to establish the most efficient, the most productive transportation system, and we need to find the people to be able to make that happen. We need to understand that technology transfer conveys many different scenarios: marketing technology, packaging it the right way for the right customer, technical assistance, training and education, and other components. For the most part, we use training and education programs as a mechanism to convey all of these scenarios—as a marketing tool, as a technical assistance tool, and so forth. The one key ingredient we often forget is what the audience is trying to get and what they need in terms of packaging to make that information something they can use once they get out of these training courses. NHI's training and education

programs are highly focused on conveying knowledge, not necessarily on teaching. By the time the students finish the training, they have only been conveyed knowledge; they do not have the experience or expertise to be able to test that knowledge on the job.

The third area is our inability to manage change and technology. What is the human effect of creating change in an organization? Those of you who have gone through reorganizations know about the divergent views when change is brought from the top down versus from the bottom up. This mindset toward change got us into trouble because we brought about change thinking that we were trying to make things better, but the result has been that we are still using the same assumptions we used 20 years ago. As a civil engineer and traffic engineer by profession, it appalls me that we go to the corner on any given street and see a signal control box that by today's standards is almost a supercomputer timing the signal with strategies that we developed in the 1930s.

For the most part, computers are used as a mechanism to convey information, but we need to expand our ability to gain and acquire knowledge by using technology in an intelligent way. When you get new software, how many of you just pull it out of the shrinkwrap, install it, and start playing with it, versus reading the manual and going through the tutorial?

One thing that amazes me tremendously, because of my technical background, is that when new technology is produced and we try to sell it to the practitioner, we do not know as researchers what kind of evidence these people need in order to bring that technology to their practice. The practitioners probably don't know either. Someone has to bridge that gap. We need to understand what makes technology accessible to them and find ways by which they can use it, keeping in mind that in the case of computer technology, it changes every 6 months.

The last area I would like to consider deals with our own approach to training and education. The typical model is to hire an expert, for example, on ITS or pavements, and ask this individual to develop a 3-day course. We have to get out of that paradigm. We need to bring together instructional design people. We need to bring those in adult education together with these experts and package information so that it is amenable to the audience we are targeting. We cannot develop an ITS course and assume that it will be adequate for the diverse community that relates to ITS. We need a short version of that seminar for management so they can get an understanding of what it is and how it may affect their policy and their budgeting process. We need training courses or training initiatives for the engineers involved in design and operation and in the

installation of these systems. We need courses and training initiatives for the technicians who are going to support and maintain this equipment over the long haul, and so on.

We need to revise our definition of training and reinvent the way we go about designing training initiatives. People learn in an estimated 25 different ways, and we need to find a way by which we can reach the critical groups using the right approach.

The approach we use to define competencies is also no longer valid. The definition of “competence” from the instructional side of the house is very different from that of an engineer who is in practice. You must ask that engineer what kind of skills and competencies he or she has versus the type of person they seek to hire. For the most part, the fact that we teach transportation planning, that we teach ITS, that we teach safety, and so on, does not mean that we teach “intermodalism.” Our professional culture is one that strives to fight fires but does not strive to invest and make long-term plans to make intermodalism something that can be institutionalized. We need to take more responsibility for what we teach and how we apply what we learn. People will tell you, especially at the local government

level, “Don’t bore me with the technical details, just tell me how to do it.” If you do that, however, the chance of them applying the technology or the expertise is questionable. Nevertheless, that is what the customers want, but then you have to deal with the issue of how to package it so they don’t make mistakes when they use the technology.

Besides technical training, we need to provide our workforce with skills to communicate, negotiate, facilitate, perform as a team, and develop comprehensive solutions. By comprehensive, I mean that they meet the requirements not only of what our problems are today, but also of what our problems are going to be tomorrow. Today, we live in an environment of limited resources. If every 5 or 10 years you have to scrap your traffic signals and put up new ones or you need to develop a new system to convey train information to mass transit users, and so on, it is not going to work.

Earlier today we were struggling with the definition of intermodalism and put forth an overall theme of being able to move people and goods. I would like to encourage you to consider that we include moving information as part of that definition.

SUMMARY OF PANEL THEMES

The following themes emerged from the panel discussion:

- Industry change, including technology, downsizing, and process, is having and will continue to have a significant impact on the future workforce, particularly in the mix of skills required to perform jobs.
- Partnering is critical as we look at training opportunities and new skill sets. This means sitting down with our partners as well as other stakeholders.
- In addition to technical skills, it is also imperative that individuals have good communication skills, know how to use technology, and be able to work in a team environment.
- Consideration must be given to nontraditional approaches to training aimed at ensuring that after training and educational programs are over, trainees leave with something they can actually use on the job.

SUMMARY OF DIALOGUE WITH AUDIENCE

Question

Where do panelists see the responsibility for funding the type of training they all feel is essential, or short-term

training, which is required if a company is to have a workforce with the skills needed to make these companies as competitive as they can be? We know there are tremendous shortages of people in technologies and communication and in data processing. Some firms fund their own training programs and others obtain it through the NHI, which is funded by FHWA. We have been told there is minimum new funding available for training. Could any of the panelists give us an idea of where and how this is going to be dealt with?

Panel Responses

1. This question goes back to earlier comments about trying to differentiate between education and training. It may not be so much a question of where new money comes from as a question of where current money is being spent. We in industry have been complaining for years, and now some people are listening, about the fact that it is very difficult to train somebody who is not already educated. If they cannot speak and write and read, it is very difficult to provide them with skills training. Industry looks to the formal education system to produce individuals with basic educational skills. We are very willing to take it from there and put up the money for training in the heavy technical areas. We have, in reverse, a similar problem voiced by colleges and universi-

ties, who ask how they can most effectively allocate money within the current curricula. There have been comments this morning about “interdisciplinary warfare” between different departments within a university. We face similar issues in terms of competence. It is easy for us to give money for skills training. It is easy to give money to teach people new technology. On the other hand, it is very difficult to stand in front of my CEO and say we need to put money toward a remedial course to teach people how to read, write, and communicate. Perhaps one of the things we ought to ask ourselves is, “Where is the money going?” We do not expect the colleges and universities to do it all nor do we expect to do it all ourselves. We need to better define our respective roles, then consider where the money comes from and where it is going to flow.

2. If you look at the job training money coming out of the Department of Labor, that money flows to the states and then to the local job training funding sites. Various companies need to go to that job funding site, to the Private Industry Council, to the workforce development group, and say, “This is the type of training we need.” Many of these people know little or nothing about transportation training needs.

3. There are also displaced workers, people who had been working and are displaced for a variety of reasons, often a combination of technology and lack of skills. There are also welfare-to-work initiatives. Regarding money to support programs that provided remedial education for people who cannot read and write, I would encourage industry to work with local community colleges. The local community college can package together a program that offers training in technical skills coupled with remedial reading and writing programs.

4. I offer a completely different spin in response to this question. If you follow what is going on with the reauthorization for transportation, there are indications that specific programs are going to be earmarked. It is still too early to say which ones they are going to be, but there is the environment that is willing to accept that as a reality. We, as educators and trainers, have been flawed in our approach to selling our services. There are relatively few organizations in the country that actually bring their human resources directors to the table when they are thinking about long-term strategy, when they are thinking about reorganization, when they are thinking about institutionalizing a change with their organization. Why that is the case, I don’t know. The bottom line is that we, as trainers and educators, are not being recognized for what we can offer and, to some extent, what we do best, to influence and help share the ultimate culture of the organization in which we participate. We need to understand and be a part of developing the strategic pathway. We can be engaged when we get ourselves on board, when we can start influencing the di-

rection and the methodology by which changes take place in the institutional life of any kind of business, be it the public sector, the private sector, industry, even academia. We need to play a role in initiating institutional change so that later on, we can say, “Training is one way of conveying this change, but you need to do X, Y, Z as well and understand what the consequences are.” Another point I want to make is who attends training today? Often it is the people who are available, not the people who need it. For example, we go out to City X and promote training on how to patch a pothole. People sign up for that course, but when the course comes to an organization, those who are available that day get to attend. They may not be the individuals who actually need the course. We need to work on that to ensure that when we provide the service, it is actually being offered to those who need it rather than just to those available to attend the course.

5. There clearly is a role all of us can play in the business of education and training. Unless you work for a company that understands that an investment must be made in people in order to meet company goals, most of us know that budgets for training are generally the first to be cut. As another panelist mentioned, one of the problems is being invited to the table to talk about the importance of funding for continued learning and development programs; it is a business imperative to make that investment so that in fact the organization meets its goal. There is real work to be done, not only in the human resources community, but also with those line program managers who have responsibility for accomplishing specific business objectives. A report last year by Arthur Andersen & Company discussed the need for an organizational threshold of between 2 and 3 percent of payroll to be invested in education and training for companies. A lot of work needs to be done to meet this funding need.

Question

I have a two-part question. I have been in university education a little over 20 years and do not know any professors of technical communication. Yet I have heard potential employers say, “Your students can’t communicate.” Certainly I, and others, have tried for over 20 years to figure out what technical communication really means. The first part of my question is, Can you be more specific about what you mean by that? Is it talking in complete sentences, or is it conveying information in front of a group? What is it about communication that you are looking for in terms of skills? The second part of my question is, Have you run across any program at the junior college or university level that seems to be better in teaching skills in technical communication and that could serve as a

model, if you will, for others? I can offer from my own experience what we are now doing. Traditionally, we would send our students out to take a technical communication course in an English Department. They would come back and they could not communicate any better than before. What we have now done is hire a communication specialist specifically for the Engineering School to work with students and faculty and help them learn how to communicate more effectively, to work with the students in putting together presentations. We are trying to do something different, but I am not sure it is going to work any better. Are there other examples you are aware of that seem to be doing a better job?

Panel Responses

1. I commend you on your model. Any time you can get the trainer into the mud, which you are doing, it is going to work. I really feel you will have good results. Faculty and students need to be around technical trainers to hear and get the nuances of all those things.

2. The most important communication skill I find lacking is group presentation. It is becoming more and more a part of the interview process. A colleague of mine who heads a companion group of human resource professionals in the biotech industry reports that they have everyone who comes into their company or who is being considered for employment, regardless of their educational background or level of expertise, give a one-hour presentation to all of the other people within the company. They can use anything they want, but the point they want to convey is that it is not enough to simply do good research. It is not enough to simply be a technical expert. You have to be able to communicate that, starting with your colleagues and ultimately to your customers. This is the place where people who are absolutely brilliant when it comes to technical skills fall right off the track. It does not mean they are any less valuable to the company, except that as smart as you can be, unless you can communicate with your colleagues, you are going to miss out. Most companies today are becoming more and more fussy about who they hire. We do not have a lot of money to spread around to just hire people and hope that sheer mass will do anything from move the freight to get us into the technology future. The key element we are looking for is the ability to stand up there and not only have good ideas but be able to present them to a group. A professor I spoke with recently made that very point. As part of his senior seminar group, he asks his students to select a company to investigate; however, it is no longer enough to write a fancy paper; they also have to present it to the rest of the class. My reaction to that was, "Good for you," because that ultimately is the skill that

can make the difference on whether you survive in corporate America today.

Question

You talked about the skills necessary at the corporate level. We are also talking about occupations that are not necessarily at the corporate level. Do any of you want to comment on those communication skills, because I anticipate that you are not talking about requiring the same kind of communication skills of, for example, a truck driver.

Panel Responses

1. We also need to be concerned and/or aware that the environment in which these presentations are being made brings a predetermined set of assumptions; that is, this individual is going to get up in front of the class and talk about the topic of that class, which is going to be driven by jargon. It is going to be driven by a professor who has this engineering background expectancy. You must have data, graphs, and so forth. A lot of money and effort in this regard is directed at engineers, and I put myself into that group. We cannot talk outside our own environment and we cannot write outside our own environment. When I try to speak to an audience that is not in engineering, I cannot use graphs or the same technical jargon I would use with my colleagues and that is a detriment. A second point is that communication skills also include listening skills. How do you deal with jargon? How do you deal with what I consider to be a limiting language? Your definition system may be very different from mine, but we still use them in any kind of conversation. There is no agreement on a universal glossary of what many of these terms mean. Each of us brings to a discussion our own spin and our own vices, which sometimes are explained, but most of the time are not. Another thing I would encourage you to do to make your students more eloquent and more proactive about developing their communication skills is to get them out of the engineering school. Have them make a presentation at their local high school, perhaps in conjunction with a high school career day. Take them out and show them what the other side of engineering looks like—the client-based side of engineering. To the extent that they can begin to understand and develop these other skills, you can begin to institutionalize the skills into courses offered at the second or third year of school. For every course students should be required to make a presentation outside of the immediate class group.

2. It was mentioned earlier that collaborative learning, communication, and ability to be a team player are key el-

ements that, in the last 12 months, have become discriminators, certainly for entry-level people. We do not have infinite resources, and the cost of buying that skill base at the entry level is now approaching about \$40,000 a year on the technical side. We are looking for people who know how to communicate and how to be part of a team.

3. With regard to communication, that kind of course needs to be introduced at the high school and middle school levels. With the Transportation Careers Academy Program, our students are involved in public speaking and presentation skills as a part of the courses they are taking. Before coming to the MTA for their internships, they are taken to mock interviews. We have professionals who come out and interview them for real jobs. They are selected from that interview process to come and do internships within the MTA. They are practicing and learning throughout their high school careers to be good public speakers, to make presentations as part of the technology we have put into the classroom to assist them in making and developing multimedia presentations. I think the two students we brought with us, if you were here last night for dinner and for the reading of their essays, are an example of the "product" and skills these students have developed as a result of participating in classes that demand communication and presentation skills. It has to start before you get to the college level, because part of it is the student's own comfort level with being in front of the public and making speeches.

4. I would like to elaborate on what was just said. Thirty years ago I received a Ph.D. and went to teach. Nobody taught me how to teach, but I had the ability to convey the technical knowledge. I do a pretty good job of teaching today, I think, because I have learned how to

teach. If you looked at my library 30 years ago and what I have added to it, there is a tremendous amount of material on how to teach, how to communicate. I had an experience when I ran a technology transfer program and asked people to sign their name. We have workers going to workshops who do not know how to write their name. They should have the right to learn the technical information that will help them do a better job. When we think about packaging and learning experiences and skills, we need to carefully assess the receiver and the level. In my job, I need an executive package, a mid-level package, and an entry-level worker package. I had a workshop conference 2 weeks ago. One attendee said, "My boss made me go to this, even though I have been doing this job for 20 years. But, you know, I learned something and I'm really glad he made me come." We need to take more time to consider the attitudes of the receiver and how we package training programs.

5. In addition to universities or high schools preparing students, industry has a responsibility as well. When we go out and recruit on a college campus, the students with the strongest verbal communication skills are going to get our attention first. When we bring them into the company, we used to put them in an office and have them churn out numbers all day. We don't do that as much anymore. We feel responsible for getting them out to start meeting with clients, going to and making presentations. It is amazing to see the early presentations when they are gulping air, so nervous that they can hardly stand it. They are given the opportunity and, as with anything else, with practice you get better. We in industry have a responsibility to create the opportunities so they can hone their communication skills as well as their analytic skills.

Breakout Discussions 1

The first set of breakout sessions addressed two major questions: (a) What entry-level educational background training and skills are most desired and in demand? (b) What opportunities are needed and available to retrain and upgrade the skills of those already employed as job requirements, procedures, and processes change? Each of the breakout groups had a specific area of focus.

GROUP A: INTERMODAL FREIGHT TRANSPORTATION MANAGEMENT AND OPERATIONS

Entry-Level Skills and Knowledge

There was general agreement that a systems perspective was among one of the most important things, specifically an understanding of the supply chain and its various components. Also important is having a global perspective, a recognition that the industry today is rarely operating only in a domestic market. Having teamwork skills is also a key factor. If you talk to business executives and recruiters, the need for entry-level people who can work with others effectively often emerges as a top priority. A technological orientation, along with math and science competency, was identified as critical even at the entry level. Math and science competency would include (a) an understanding of the role of measurement and metrics in intermodal transportation and logistics and (b) the ability to apply mod-

eling and other management software tools—not necessarily to create new ones, but to apply those that are available off the shelf. An environmental focus, or “green perspective,” is important, specifically an understanding of its importance in operations and in the regulatory environment. Real-world experience is also considered desirable, specifically, internships and various work-study arrangements. Finally, language skills were considered important, both English and foreign language skills, again recognizing the fact that transportation today is a global industry. The emphasis is on entry-level recruits who are able to articulate their ideas and communicate effectively regardless of the language involved.

Continuing Education and Training

When considering the needs of those who are already employed in the workforce, the group found it useful to break them down into different domains or levels: the front-line service provider, the middle manager, the executive, the regulator, and the policy maker. This list is not meant to imply any hierarchy of importance, but rather a recognition of the fact that people in those different domains have different needs with respect to training and continuing education. From this, the group came up with several “essential” themes and some recommendations that relate to them. These are themes that, in most cases, apply to both entry-level and continuing education domains.

- *Academic and Industry Partnerships:* Strong alliances between industry and academia were considered critical and essential to the continued forward movement and “smart” evolution of the transportation industry. One example is in curriculum development, specifically, a desire for industry to provide input to academic institutions as they develop new curricula in this field. This input will help ensure that academia is on target and meeting the needs of its industry customers. A second example is faculty internships, wherein faculty members at various schools go into industry to brush up on their skills and catch up on what is happening in the real world. The reverse is also important—that industry people come into the schools as visiting professors or resident executives. Such programs already exist in some places and should be more widely instituted. A third example is promoting industry investment in education and research as well as federal investment in intermodal training and research. This initiative includes bringing educators and trainers and industry together as we are doing at this conference to discuss various ideas and ensure that the effort is ongoing. The group also came up with a list of skills and requirements, recognizing that there is a need to prioritize the list to ensure that training is effective, coherent, and cohesive. In this exercise industry can help define what is most important and what is less important in a general sense.

- *Long-Term Strategies and Commitment:* The proposal is to address all stages of the intermodal career and not isolate them from one another, in other words, to make sure that they hang together and that education and training are viewed as ongoing and not just discrete events. This theme also includes identification of best practices in the field, thereby reducing the amount of time spent “reinventing the wheel.”

- *Greater Coordination and Cohesion in Intermodal Education and Training:* The group acknowledged that education and training can be very fragmented and that consideration should be given to creating a clearinghouse of education and training opportunities. A second proposal was to look for parallels between for-credit learning (academic programs) and continuing education. A third focused on how to work around competitive issues in the field of continuing education, particularly financial issues.

- *Use of Available Technology:* This theme centered on the ability to respond to the increasing importance of technology in the transportation field. For example, the group discussed the advantages and limitations of distance learning and the idea of putting self-learning systems in place, as some firms already have done. One example is Sea-Land, which offers employees an extensive CD-based self-training library dealing with various facets of the company’s operations, intermodal transportation, and logistics.

GROUP B: DATA AND INFORMATION SYSTEMS AND INTERMODAL PARTNERSHIPS

Entry-Level Skills and Training

Group B considered high school, junior college, and university and college experience in the area of data and information systems. It was noted that earlier presentations demonstrated the importance and frequent use of data and information. At the entry level, a minimum body of threshold knowledge, a toolbox of basic skills, is needed that includes basic reading, writing, and math skills acquired at the middle and high school levels and benchmarked at the university and college levels. Communication skills are also critical, with an emphasis on listening. Also important are skills in critical thinking and problem solving across disciplines and areas of expertise and understanding so that a true holistic approach can be achieved. Teamwork and social interaction skills are important from a threshold standpoint. Global awareness, with a geographic as well as a business appreciation for political and social boundaries, is important. An understanding of and ability to use technical vocabulary, not only in transportation and intermodalism, but also in computation, computers, and electronic communication, is very important, along with fundamental personal computer-based skills.

The group then considered higher-level skill capabilities and traits, beginning with basic research understanding and abilities. At higher levels it is also important to be customer- or market-driven, if not both. In addition, familiarization with using data and modeling skills is important. At the college level, this includes familiarization with models, tools, and how to use them; at the graduate level it includes the ability to design, build, and use models and system simulations capable of providing desired results. A systems analysis approach and appreciation from a systemwide, holistic view are also considered important. An understanding of economics is important, including demand forecasting, needs assessment, pricing, budgeting, and finance, as well as an appreciation of both macro- and microeconomics—understanding the business and political geography of the world and the trading partners involved. All these factors need to be scaled from the perspective of the provider, the user, or the planner of the systems.

Continuing Education and Training

Group B believed that resources are available through various professional associations and programs, and although these programs may not fulfill all the needs, there are significant resources that can be cataloged and utilized for this purpose. A process or structure for contin-

uous upgrading of skills and knowledge is required. Perhaps there is also a need for centers of excellence for the definition and training of the “intermodal professional.” These centers would be part of a clearinghouse for the availability of programs and resources, for the skills in demand, and for definition of vocabulary and processes. At a higher level, the centers of excellence could also provide an understanding of the intermodal business environment, along with an awareness and visibility of current industry opportunities. The group drew an analogy to a tree, in which the entry level needed to be the firm foundation upon which the basics were built, and industry integration and multiplicity of higher-level skills completed the picture.

GROUP C: PUBLIC TRANSPORTATION AND TRANSIT OPERATIONS

Group C expressed the view that among the roles of educators is the investment in human capital—a very important responsibility. Accordingly, the group defined the overall goal of education and training as developing and institutionalizing an integrated and seamless system for educating, training, and continuously improving our transportation workforce. Rather than rely on the traditional model for education—the K through 12, secondary, and postsecondary model, which, as is known from international education models, is not the only way to educate our workforce—the group focused on identifying a cluster of core competencies. Drawing from the management field, the group identified interpersonal, technical, and conceptual competencies, with subcompetencies to form a matrix including the fields of communication, team building, negotiation, customer focus, and computer literacy. The group also identified practical strategies, including student internships and faculty fellowships, which would be mutually beneficial to both academia and industry. The group also believed that consideration should be given to development of national transportation skills standards, similar to the PTDIA model presented earlier. It was the understanding of the group that the Department of Labor and the Department of Education have been trying to identify some core skill competencies. Another suggestion offered was for a national policy that requires linkages between investment in the workforce and the award of contract dollars for transportation projects. In other words, some form of funding should be institutionalized because, although it is very nice to come up with policy statements, it is difficult, if not impossible, to implement them if there are no resources to back them up. There is also a need to develop a public information system whereby the public can be made aware and have a better understanding of the contributions of transportation

infrastructure, which in many cases is so seamless that it is almost invisible to the users and beneficiaries. A clearinghouse of curriculum materials is also needed, and the Garrett A. Morgan website may be an excellent place for that. It would also be beneficial to build workforce development into performance appraisal systems. Although speakers have talked about the need for mentoring, the group thought that there was a need to be more specific and to hold the generation that is moving on accountable for bringing up the next generation, in other words, some form of succession planning. It is also desirable to link development of integrated academic approaches, such as the MTA program in California. This particular program has already built upon and been accepted by the academic community and meets academic credential and accreditation requirements. It would be useful to disseminate this program as a model by forming linkages with the major educational publishers, particularly since California is a major driver for textbook purchases and textbook development. This dissemination could be in the form of modules, enhancements to the existing curriculum, or through formation of partnerships with the textbook industry. On the technology side, partnerships could also be pursued with some of the major educational software designers such as Microsoft. The group also believed that it would be helpful to formalize linkages with groups that are already “educational allies,” such as the insurance industry, the National Transportation Safety Board, state motor vehicle administrations, the Transportation Research Board, and unions, to mention a few. In summary, the group believed that what does not get measured does not get done effectively and offered five principal suggestions:

1. Include an explicit requirement for workforce development in the reauthorization of ISTEA. In addition, it is important for DOT and the modal administrations to include in their strategic plans explicit statements about the need for workforce development. Currently, most of the workforce development strategic plan statements focus on existing employee development but fail to address or focus on the long-term perspective.

2. Reemphasize the need for funding of transportation workforce development with the awarding of transportation contracts. For example, some believe that the use of this approach in Los Angeles, California, has helped ensure the future supply of transportation workers without unduly compromising the competitive strategies of private-sector firms.

3. Implement modal job rotation, both within departments of transportation, as a way of building and operating one integrated intermodal transportation system, and within the private sector, where partnerships across modes are becoming essential.

4. Institute team teaching. Dallas–Fort Worth, where a system is in place that allows for cross-fertilization among modes and disciplines, was offered as an excellent model in the area of intermodal transportation education.

5. Increase emphasis on return on investment of educational dollars as a means of minimizing remedial education and of increasing the effectiveness of industry's training dollars.

GROUP D: INTELLIGENT TRANSPORTATION SYSTEMS TECHNOLOGIES

Entry-Level Skills and Training

Group D categorized entry-level skills for intelligent transportation systems (ITS) into three groups: 2-year programs, which would include the technical schools or community colleges; 4-year undergraduate programs; and graduate-level programs, each of which would build on the others. With the 2-year programs, basic skills needed include computer programming, electronics, information about quality control, and perhaps some basic construction and safety knowledge. In general, the individual would need skills to use computers and software applications. Building on this at the 4-year undergraduate level would be a broad understanding of the engineering disciplines, especially those tied into ITS and transportation. Crosscutting skills in various disciplines are needed at all levels. These include communication skills; the fundamentals within a particular major; key business skills such as project management, budgeting, scheduling, and so forth; and individual skills—training an individual to be a self-starter, a problem-solver, and an analyst—so he or she can work effectively. At the graduate level, individuals need a substantial knowledge of computer tools and programming at specific levels and explicit knowledge of ITS and what it does and how it affects transportation, as well as the fundamentals of management information systems. They also need a subspecialty within a specific discipline, broad knowledge of all components within a major, and perhaps most important, a multidisciplinary or interdisciplinary background, so they are aware of all the factors that affect and are associated with ITS and intermodalism.

Continuing Education and Training

Strategies to address needs within the existing workforce are required. There is need for more partnering and leveraging among the different sectors to minimize duplication. Funding is limited for any type of continuing and

distance education, as well as for ongoing training in the workplace. There is a need to meet the existing demand, which is very broad and also very specific, depending on what area of the field one is looking at. There is a need to sustain the availability of the workforce over the long term. There is a need for cross-training of existing professionals to ensure, for example, that the civil engineer knows what is required of the electrical engineer in the design of facilities and systems. With respect to ITS, it is very difficult to achieve this type of cross-training, and that is a major challenge. Finally, the group believed that there really is no “best” delivery process; the process will depend on what area of the workforce you are dealing with and the specific needs associated with it.

GROUP E: PUBLIC AGENCIES

Entry-Level Skills and Training

Group E focused on entry-level requirements for the transportation planning agency and whether the same level of experience is needed across the federal, state, and local levels and whether urban versus rural planning makes a difference in terms of requirements and needs. The consensus was that the requirements are basically the same, with some caveats. For example, in very small cities, such as entities in California comprising 3.9 m² (1.5 mi²) with one traffic signal, there may be no individual in the local government with a planning background or degree. Depending on the scope and complexity of the position required, a person with some transportation and economics background is desirable—a B.S. in planning, an M.S. in engineering with a transportation focus, a degree in liberal arts or some liberal arts emphasis, or broad transportation experience (not necessarily in a single mode). In looking at the qualifications in tiers, regardless of the level at which the person fits, across the board the Tier 1 skills that they would need include good communication skills, interpersonal skills, ability to work in teams, analytical and critical thinking skills, customer relations skills, logistics experience in some freight-related jobs, an overall positive attitude, flexibility, adaptability, and the ability to be a good listener. Tier 2 skills would bring the person up to the level of advanced analytical skills, the ability to manage, and the ability to work independently. Tier 3 skills would include specialization for the particular job they perform.

Continuing Education and Training

With respect to opportunities to retrain and upgrade skills, continuing education, lifelong learning, and

work-study are all available; however, budgetary constraints within a given company, organization, or agency can have an impact on such programs. One type of opportunity thought to be lacking is the interpersonal exchange or “externship”—exchanges between companies or departments that engender a greater understanding about other job functions or modes of transportation. In addition, employers need to see the value in providing incentives for their employees to continue their education and training, to involve themselves in academic improvement, and to involve themselves in work-study outside the company or agency. Such incentives include tuition reimbursement, tuition credits, opportunities for promotion for those who take the initiative to take classes or get involved in work-study projects. It is also valuable for teachers to participate in internships during the summer, for private-sector people to intern in public

agencies, and for public servants to intern with private-sector organizations. The academia-industry work-study combination as a means for additional training is a good one. For example, Los Angeles has a program called TLAMP, short for the leadership and management training program for middle management employees, the level that often merits the most attention, particularly in reference to “changing the paradigm.” Other activities thought to be feasible in terms of additional training include certification programs at lower levels; for example, in Los Angeles there is an upgrade program for signal systems technicians. Overall, there was consensus within the group that there should be a concerted effort to ensure that the freight sector is included in the discussions about intermodal planning and mobility changes along with the traditional focus on passenger movement.

SUPPLY SIDE OF INTERMODAL TRANSPORTATION EDUCATION AND TRAINING PROGRAMS

Status Report on Current Programs

Programs Offered Through Industry and Professional Groups

Evelyn Thomchick, *Pennsylvania State University*

I begin with two caveats: (a) what I say is based in large part on my personal views and experience, and (b) I come here from the Business Logistics Department of a College of Business, which suggests that my view may be somewhat different from that of the mix of engineering and business representatives here. The College of Business faculty, through the Pennsylvania Transportation Institute, works with civil and mechanical engineers on transportation research and education projects, which has enabled me to become familiar with the engineering perspective.

My presentation is based on a review of business logistics-related organizations; however, much of what I say will apply to other transportation organizations as well. If it does not, members of the audience are encouraged to step up and offer an engineering perspective.

In preparing the presentation, I began with the Directory of the Council for Logistics Management (CLM), the largest professional organization in the logistics field, composed of over 12,000 members representing all the functional areas of logistics, including transportation. The CLM Directory, in addition to membership information, includes a listing of related logistics organizations both in the United States and outside the United States. A quick count of the logistics-related organizations in the United States revealed that there are 56, which does not include those centered around transportation engineering or transportation economics. At Penn State, there are faculty in agriculture, geography, and even some in psychology who perform transportation-related research. This suggests that there are more transportation-related professional groups than are rep-

resented in the CLM Directory. I attempted to identify a major focus of the different professional organizations and how their focus relates to the education and training services they offer. All provide education and training directly to industry personnel as well as to and through educational institutions.

Academic research organizations provide a forum for presenting theoretical and applied research carried out by academic faculty in business, engineering, and other transportation-related disciplines, as well as industry researchers who frequently work with universities, particularly in support of graduate student theses and dissertations and in development and introduction of university curriculum materials. The Transportation Research Board, although a somewhat special case because it is a unit of the National Research Council, is a good example of this type of professional organization, which encompasses issues relating to transportation technology, design, policy, operations, and education as well as the environment. The Transportation Research Forum (TRF), transportation engineering societies (such as the American Society of Civil Engineers), and transportation academic societies would also fall into this category. The forums provided by these groups range from annual meetings and conferences to workshops, seminars, symposia, and conferences on specific topics. All provide for the exchange of ideas, presentation of research, standing committees to develop research topics and monitor research in particular areas, and dissemination of information and research through journals, proceedings, and reports, often technical reports.

Practitioner education focuses on applied research and education, specifically application of research that was performed by another sector to improve the way things are done in industry, whether it be in the area of business or engineering. For example, the academic research sector may develop the mathematics for an optimal vehicle routing algorithm. At this level, the applied research would focus on using the algorithm in industry, in a company, and the type of presentation or publication at this particular level would involve applying the algorithm in a company, demonstrating how it was used and the improvements that were made, and might be coauthored by the research personnel in the company. There is still significant academic involvement, but now the emphasis is on the application of research. Many of these organizations also provide parallel academic conferences and publications. For example, the CLM has an educators conference in which more theoretical research can be presented, whereas in the main conference presentations, the emphasis is more at the applied level. The CLM also publishes the *Journal of Business Logistics*, which is one of the top academic journals. The American Society of Transportation and Logistics (AST&L) publishes the *Transportation Journal*, which is considered an academic journal but is also read by practitioners.

In the intermodal area, there are many forums and ways information is disseminated, ranging from major national conferences, annual conferences, annual meetings, specialty conferences, local chapter activities, and applied research studies. CLM, for example, provides funding for research studies, such as a current one of interest to this group because it involves logistics skills assessment. The study will try to identify some of the core transportation skills, but with a broader perspective at many different levels, looking at other areas of logistics as well. Journals, proceedings, and reports are ways of disseminating information from conferences and meetings. Facility tours and equipment exhibits are useful aspects of many conferences; from an academic perspective, such conferences provide one way for educators to find out what is going on and how things are being done in industry. The International Intermodal Expo, cosponsored by the Intermodal Association of North America (IANA), is an excellent example of a forum where various types of educational experiences take place.

The next level of organization, a little farther away from what some might consider research, focuses on industry practices. These are organizations that improve, set standards for, and monitor industry practices, for example, the American Warehousing Association, a trade association of public warehouses. Although not all relevant organizations have "transportation" in their title, most of their members are providers, users, or recipients

of transportation services or may serve as transportation brokers. Most of these organizations have a transportation interface if they are not direct providers of transportation. At this level of improving practices and processes, the focus may be on providing personnel training required as a result of some new industry operations or safety standard, in other words, getting down to really an operational level. Some of these organizations also develop and promote industry positions. The National Industrial Transportation League (NITL), for example, develops positions not only on U.S. legislation, but often on transportation-related policies developed by international multilateral organizations such as the United Nations. They may also be involved in lobbying. Most, however, also have an educational or research function and may make materials available to those outside the organization. For example, in one of the courses I teach, I order information packets from the American Trucking Associations (ATA) because they provide the latest financial statistics on truckload and less-than-truckload carriers. It is information I could compile myself, but it would take a long time and ATA has already organized it into a nice package. In this way, ATA provides educational materials both for their membership and for academic institutions.

There is also a group of organizations that offer certification. They go a step farther in establishing educational standards for the profession to the extent that they have developed assessment methods, usually in the form of examinations or some type of formal assessment, rather than just attendance at conferences. They provide educational support for the certification process in the form of study materials, instructors, and mentors and focus on a particular area, all of which relates in some way to transportation, logistics, or both. For example, the following organizations relate to these specific areas: American Production and Inventory Control Society (APICS), production and inventory management, a logistics component; National Association of Purchasing Management (NAPM), purchasing; Society of Logistics Engineers (SOLE), logistics engineering; Transportation Intermediaries Association (TIA), third-party providers; and National Customs Brokers and Forwarders Association of America (NCBFAA), which is in the process of developing a new certification program for customs brokers and foreign freight forwarders.

I will talk briefly about a certification program with which I am familiar, namely, that of the AST&L. The certification program is run by a board of examiners selected from universities represented on the current AST&L board. The program is based on current transportation and logistics curricula of universities that have strengths in those particular areas. The board operates on a rotation system to ensure opportunity to bring in

new people, new universities, and fresh ideas in an effort to keep the certification content current. There are various areas of AST&L certification, with three required general management components in finance, marketing, and information systems. Other components are oriented toward transportation logistics, specifically transportation economics, logistics systems management, public policy and legal issues, and international transportation and logistics. The creative component of the certification process can take one of several forms: a research paper, a project done through work or internship, a major presentation, or a case study provided by AST&L in an exam format.

We have been talking about what skills are required, what the basic education requirement is. I would argue that you may not need a degree in transportation logistics, but it is strongly advisable to have a common body of knowledge. I think this is a way to complement employees who may not have degrees in transportation and logistics but can acquire the equivalent through a variety of delivery mechanisms—self-study, industry groups, or in-house training programs such as those offered by AST&L.

Finally, the theme of this conference is intermodal transportation, and in many of the industry group programs I have mentioned, intermodalism is not always readily identifiable or even separate. Nevertheless, it is part of the overall program and is included in the components of all the transportation-related exams or is part of the study track. Perhaps a next step to come out of a conference such as this is to rethink the programs of these professional organizations in light of intermodalism.

I want to mention that these organizations also offer other types of educational support to students in high schools, colleges, and universities, often in the form of scholarships and awards. Many of the organizations sponsor student competitions not unlike that which was sponsored as part of this conference for students enrolled in the TCAP program. Often, they offer research opportunities for graduate students, which can lead to either undergraduate or graduate master's degree papers, as well as doctoral dissertations. These organizations also encourage student participation in conferences, and several offer reduced student memberships.

College and University Transportation and Logistics Programs

Louis J. Pignataro, *New Jersey Institute of Technology*
Lester A. Hoel, *University of Virginia*

In the transportation field today, it is evident that a new profession is emerging that is multimodal in perspective, multidisciplinary in approach, and multisectoral in application. The new transportation professional uses concepts and techniques from engineering, urban and regional planning, management, law, political science, and a variety of other disciplines to solve transportation problems. These problems affect shippers, carriers, travelers, international organizations, and national, state, and local governments and involve all modes of travel.

University transportation programs are facing the challenge of this new profession. Their goals are to provide instruction in the analysis, planning, and operations of the transportation systems that are the working domain of today's transportation professionals. In order to meet these goals, multimodal concepts should be incorporated into the program, a multidisciplinary approach should be used, and an attempt should be made to fuse the public and private sectors of the industry.

This presentation is a synthesis of university transportation and logistics programs. In December 1996, a questionnaire was sent to several universities eliciting responses about their transportation programs with regard to intermodalism, interdisciplinary aspects, course content, faculty involvement, and programmatic inadequacies; 37 responses were received. In addition, 30 websites were searched for information. The synthesis results are based on the combined survey responses and website searches of 67 programs. There are some aspects of the questionnaire that were only available

from the survey responses and not from the website searches.

Intermodalism is an important concept in transportation education. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) emphasized the efficient design and operation of transportation systems; linkages among travel behavior, urban form, and environmental quality; and the promotion of intermodalism. The Research and Special Programs Administration (RSPA) of the U.S. Department of Transportation (DOT) recently completed a study to provide information to DOT on the intermodal freight industry. The study suggested interactive methods to enhance the interface between the ITS program and freight industry initiatives. RSPA summarized that the intermodal system is not a system, but a collection of modal systems that are linked. The study concluded that there are several areas that the federal government could foster to affect the future of freight transportation in this country. Colleges and universities with transportation programs could consider suggestions from these recommendations to further develop their academic programs. The RSPA recommendations support (a) efficiency and global competitiveness, (b) encouragement of regional and corridor development efforts, (c) understanding of the freight sector, (d) a shared vision of technology benefits, and (e) a commitment to open ITS architecture. These recommendations were made to support ITS investments and improvements.

Last year, a strategic planning subcommittee of the ITS America Intermodal Task Force drafted a strategic plan for ITS America's prospective role in intermodal

transportation. The agenda and actions suggested by the task force included a broad range of activities, such as identifying resources needed to implement an action plan, ensuring responsive ITS architecture for intermodal needs, improving outreach efforts with modal associations, stressing transportation efficiencies through the use of ITS technologies, and developing research, program, and policy recommendations.

In December 1994, TRB assisted in organizing a major national conference on intermodalism sponsored by five key DOT administrations and the Office of Intermodalism. The conference stressed innovative approaches to making intermodalism happen, including innovative financing, development of partnerships, better understanding of the benefits to society associated with intermodalism, and better appreciation of the role of technological advances in fostering greater productivity and improving system performance.

Because of the commitment and importance of DOT and ITS, the needs and roles of the federal government and ITS America should be considered in the development of education, curriculum, and research agendas for the advancement of intermodalism. This intermodal developmental work can consider the following elements for further definition: connections to provide the transfer of people, choices to provide modal options, and collaboration to provide organizational partnerships.

The introduction of intermodalism into transportation, as reflected in the ISTEA legislation, resulted in a broad range of reactions from the surveyed institutions. On a percentage basis, reactions of the institutions included the following:

<i>Reaction</i>	<i>Percentage</i>
No change in program	13
Minor changes in program	16
Course additions to program	43
Always incorporated intermodalism	28

Although most schools do not include the terms "multimodal" or "intermodal" in their course titles, there are strong indications that the concepts are included in a vast array of courses. For instance, the terms "systems," "policy," "management," and "logistics" in course titles suggest the intermodal nature of the transportation program at universities. The majority of universities with transportation programs offer modal (airport, freight, public transportation) and transportation systems courses. About one-fourth of the programs include public policy, management, and logistics courses. Most of the survey responses specified that intermodalism is stressed in their programs, either as a result of the ISTEA legislation or as a long-term policy of the school.

Some of the new courses that were added to the transportation programs include public transportation systems, multimodal freight system analysis, intelligent transportation systems, demand management, and intermodal systems and safety. Existing courses have also been modified to incorporate concepts, principles, and analytical techniques to ensure that intermodal policy issues are addressed.

Several universities suggest majors (or career goals) in transportation studies such as the following:

- Transportation Planning, Transportation Analysis, Transportation Design, Transportation Policy, Transportation Facilities, Transportation Economics, Transportation Logistics, Transportation Management, Transportation Engineering, Transportation Administration, Transportation Systems and Technologies, and Transportation Intermodal Systems
 - Traffic Engineering
 - Modal Transportation
 - Mass Transportation
 - Urban Transportation
 - Highway Engineering/Operations
 - Intelligent Vehicle and Highway Systems (IVHS)

In addition, there are core courses that students must take to complete their degree requirements. These courses cover the range of planning, policy, network analysis, statistics, traffic studies, transportation, demand management, public transportation, economics, and logistics. Many universities list core courses for the major areas of study. As an example, New Jersey Institute of Technology (NJIT) has aligned the following core courses with each of the major areas of study:

<i>Major</i>	<i>Core Courses</i>
Transportation Engineering	Introduction to Urban Transportation Planning Transportation Economics Urban Systems Engineering Traffic Studies and Capacity Public Transportation Operations/Technologies Traffic Control
Transportation Planning	Introduction to Urban Transportation Planning Transportation Economics Urban Systems Engineering Transportation Demand Management Mass Transportation Systems Multimodal Freight Transportation Systems Analysis

<i>Major</i> Transportation Systems and Technologies	<i>Core Courses</i> Introduction to Urban Transportation Planning Transportation Economics Urban Systems Engineering Traffic Studies and Capacity Multimodal Freight Transportation Systems Analysis Intelligent Transportation Systems
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An expansion of both the major areas of study and associated core courses may be helpful for the students in planning their programs. The enhancement of existing courses with intermodal concepts will further strengthen the education of tomorrow's transportation professional.

The incorporation of intermodalism into university transportation programs is also reflected in research activities. Courses are linked with research activities. Real-world problems have been used as case studies in relevant courses to provide students with experience in working on practical transportation problems that expose them to the importance of intermodalism. More intermodal problems are being advanced as research projects than before. Methods and theories from other fields such as economics, engineering, marketing, finance, logistics, information systems, management, social science, and law have been extensively applied to transportation research. Coordination with other programs on research projects is becoming more widespread. The extent that intermodalism has been incorporated into programs varies with organizational features of the program. In most cases, programs are on a graduate level.

Although intermodalism is being added to and emphasized within the existing transportation and logistics programs, new programs have been started in this field. For example, an optional program, Global Trade, Transportation, and Logistics (GTTL), was established at the University of Washington. It is tied to the needs of government and industry for people trained in the methods of today's global commerce. It is overseen by a special interdisciplinary committee whose members are drawn from the university and the private and public sectors. In the program, particular attention is directed to activities involved in the flow of goods from point of origin to point of consumption across international boundaries. These activities involve maritime, aviation, and overland modes of transport and the intermodal connections between them, as well as logistics and management. Included in the studies are communications, technical, environmental, energy, regulatory, and other systems that facilitate international trade.

Several new organizations were established to facilitate education and research in the transportation field.

The National Center for Transportation and Industrial Productivity (NCTIP) at NJIT was established by ISTEA. The Center focuses on increasing productivity through transportation improvements ranging from improving private and public carrier fleet productivity through better scheduling of activities and equipment management to improving personal productivity by reducing congestion and improving safety on our nation's highway and transit systems.

Even though the institutional features of university transportation programs vary, there are some organizational similarities among them. Most transportation programs are interdisciplinary, with either participating faculty from other departments or course requirements from other departments. Most programs coordinate with other departments on courses. The disciplines and academic departments involved with the transportation programs include engineering (all schools), planning, economics, architecture, geography, operations research, business, social science, and physical science. Faculty from different interdisciplinary groups work together on teaching and research. The equivalent full-time dedicated faculty varies with the magnitude of the program, from no dedicated faculty to nine, and averages about three.

In most cases the transportation program is on a graduate level, either the master's or doctoral degree. Traditionally, transportation is a specialization of the civil engineering discipline. Even if it has become an interdisciplinary program, in many cases it offers degrees in other disciplines with an emphasis on transportation. Joint degrees are offered, such as an M.S. in industrial engineering with a major in transportation, an M.B.A. in transportation management, or a master of urban planning in transportation. NJIT and Rensselaer designate M.S. and Ph.D. degrees in transportation engineering.

Although there may be a "transportation center" at the university, 90 percent of the surveyed centers had their primary focus on the research program, not the administration of the education program. With the centers focused on research, administration of the degree programs was usually performed by a department. In most cases the Civil Engineering Department performed this function. Other departments included those in business, geography, planning, and graduate logistics management. The transportation program at NJIT is unique among those in the country. It is one of the 10 percent of the surveyed schools that has a transportation center acting as the administrative unit for research and conferring degrees for the university. From its inception, NJIT's transportation program was developed as an interdisciplinary program. Administratively, it was never housed in any academic department, but it was structured and administered by the Executive Committee for the Interdisciplinary Program in Transportation. Currently, the academic program is administered by the Institute for Transportation (IT), and it offers

designated M.S. and Ph.D. degrees in transportation. The admission of graduate students into the transportation program and certification of their meeting degree requirements are IT's responsibility. Although the Executive Director reports directly to a dean for the degree program, all of the faculty associated with the program have academic homes in various departments. To create a core transportation faculty, the provost created transportation slots in various departments. These faculty devote all of their time to the development of the transportation program.

Cooperation in the universities between the transportation program and other departments is generally the rule. However, there were several negative responses describing the limited cooperation that exists in some universities. These comments included "protectionism" within departments, often caused by budget cuts; university priorities; core requirement problems; lack of a reward system; questionable cooperation; limited departmental cooperation; and lack of state financial support, which discourages cooperation.

The involvement of several academic departments in the interdisciplinary program could foster bureaucratization. For example, in a particular university, any change in the transportation program has to be reviewed by each department's curriculum committee, each college's curriculum committee, the university's curriculum committee, the faculty senate, the graduate school, the university council, and then approved by the Board of Regents. It took 2 years to change the name from "Transportation Planning" to "Transportation." Efforts to resolve these issues include improved procedures and policies in the university to resolve department protectionism, core requirement problems, and the lack of a reward system. The administration's reevaluation of financial needs and budgetary allocations can resolve the lack of financial support and university priority issues.

Although interdisciplinary research and education is encouraged, in some universities the reward structure that acknowledges the contributions does not exist. Departmental incentives motivate faculty to focus on departmental activities. Usually, faculty associated with the interdisciplinary program have their home departments. Their service to the interdisciplinary transportation program is taken into account for promotion, tenure, and merit salary increases by their home departments.

Although the administrations of some universities strongly support interdisciplinary programs (with seed funds or building programs), about half of the interdisciplinary programs have very limited or no support. Many of the respondents stated that moral support and encouragement were all that the administration offered. To enhance the interdisciplinary program, financial and cooperative support from the administration must be

forthcoming. Most of the programs do not receive funding, which has caused problems for some programs in attracting faculty.

In general, university transportation programs are adjusting to meet the new requirements of the profession. Although progress has been made, problems still exist. The research suggests the following:

- Transportation programs are available as graduate programs in many schools. They are generally located within the Civil Engineering Department.
- Although "intermodal" is not a term used in course titles, many schools include the concept in their transportation program.
- DOT and ITS America are anxious to develop support for and incorporate the concepts of intermodal systems.
- Several universities have added or modified a variety of courses in response to the stressing of intermodalism in ISTE.
- Although interdepartmental cooperation in fostering the transportation program is widespread in universities, there are several programs in which the interaction between the departments is weak.
- Administrative support for interdisciplinary programs is sporadic.

The findings resulted in the following suggestions:

- Collaboration with the DOT and ITS America should be pursued to enhance the educational program.
- The curriculum section of the survey revealed several transportation majors. In addition, core subject matter associated with these majors was also incorporated. Guidance can be obtained in structuring a program by reviewing these items. Means to overcome the institutional barriers to interdepartmental cooperation and achieve administrative support for the programs should be pursued. Some of the suggestions offered include additional funding, cooperation and improved university procedures to achieve parochial departments, improved university policies and procedures to address core requirement issues, and institution of reward systems.

The following studies (cited in this presentation) are suggested reading for those interested:

1. *Intelligent Transportation Systems and Intermodal Freight Transportation*. Report FHWA-JPO-97-008. U.S. Department of Transportation, Dec. 1996.
2. *Strategic Plan*. ITS America, Intermodal Task Force, March 15, 1996.
3. *Conference Proceedings 11: National Conference on Intermodalism: Making the Case, Making It Happen*. TRB, National Research Council, Washington, D.C., 1996.

Transportation Education and Training Partnerships

E. Cameron Williams, *University/College of Charleston*

The steering committee discussed intermodal partnerships in broad terms. What I offer is an exploratory look at the nature of existing intermodal partnerships, specifically collaborations between industry and academia to provide intermodal transportation education and training programs in an undergraduate, graduate, or continuing education context.

I surveyed a dozen programs that were a judgment sample of a larger group. This sample included one doctoral program whose spokesperson asserted that intermodalism is incorporated across the curriculum in all areas. One-fourth of the sample involved executive-level continuing education programs, including two certificate programs that involve a series of coherent, curriculum-driven continuing education courses. A good example is the global logistics and intermodal transportation certificate offered through California State University at Long Beach, which has a formal partnership with the Port of Long Beach as part of their certifi-

cate program. Another example is the arrangement between Georgia Southern University and the Georgia Freight Bureau. About half of the institutions sampled have industry advisory boards and committees.

Some of the institutions offer industry internships, which can be a very innovative and useful collaborative mechanism. Internships can take many forms, from highly organized, formal, structured programs to relatively informal kinds of arrangements. They provide an opportunity for faculty to remain current in industry practices in intermodal transportation. About two-thirds of those queried use guest lecturers, adjunct professors, and executives-in-residence. From an academic point of view, industry financial support for curriculum and program development is desired. All of the institutions contacted reported some informal academe-industry contact, which is reassuring and helps counter the ivory tower stereotype of professors of transportation and logistics as being wrapped up in theory and out of touch with the real world.

SUMMARY OF DIALOGUE WITH AUDIENCE

Presenters were asked to offer comments on whether distance learning, coupled with technology, was likely to be an increasing trend in intermodal transportation education and training. Although often touted as a cost-effective way to offer programs, distance learning and associated technology requirements can be very expen-

sive. In addition, the time component for development and for interaction with the students can be significant. In some cases, it can require almost one-on-one learning, leaving less time for development in the areas of continuing education or executive development. Responses suggested that some form of distance learning is being considered or implemented in many academic institutions; the following examples were given:

- Penn State offers correspondence courses that support distance learning, and a four-course credit certificate is being developed that will be offered through distance learning delivery. In addition, college credits from logistics schools can be applied to AST&L certification. There are plans to link the Penn State distance learning certificate with AST&L certification.

- At the College of Charleston, consideration is being given to using the college's projected investment in the distance learning technology to offer continuing education programs and intermodal transportation in the Greenville-Spartanburg industrial heart of the state.

- The Georgia Institute of Technology offers distance learning opportunities such as a master's degree in environmental engineering and several other degree programs; however, faculty must be offered incentives to get into distance learning because it does require significant time and resources.

- At Prince George's Community College in Maryland, distance learning courses have been offered for the past 5 years through an integrated continuing education program that enables development and offering of non-credit courses that easily transition and articulate into a credit program. The cost is substantial; however, as part of the statewide Bell Atlantic Lab Consortium (a statewide consortium), this particular type of "telecredit" course is something in which faculty have been trained and on which they are working with industry partners.

- In Virginia since about 1980, there has been an arrangement among four universities in Virginia—University of Virginia, Virginia Tech, Old Dominion, and Virginia Commonwealth—to offer interactive graduate courses. For example, a Virginia Tech graduate course can be taken by University of Virginia graduate students while it is being taught at Virginia Tech, and vice versa.

The term "distance learning" can encompass a multitude of approaches, making it difficult to really define what is meant by the term and what technologies are included. For example, there is an organization called the National Technological University (NTU), a consortium of 50 schools, including Georgia Tech. The consortium offers master's degrees in areas such as electrical engineering, materials science, computer science, and others, all of which are sponsored primarily by industry. The consortium also includes some of the largest technology companies, such as IBM and Lucent Technologies. NTU, which has a program focused on transportation, has been in existence for about 15 years and has granted an estimated 1,000 master's degrees in various professional areas. There are plans to extend the NTU programs into public agencies such as departments of transportation to expand the group of individuals who can benefit from distance learning education.

Private-Sector Continuing Education and Training Initiatives: The Sea-Land Experience

Dennis Gay, *Sea-Land Services, Inc.*

I will offer you a private-sector snapshot of some of the pressures and factors affecting education and training as they relate to intermodalism and transportation within Sea-Land and, to some extent, CSX Corporation.

It is important to note the evolution of intermodalism when one looks at private-sector education and training issues. Perhaps the most appropriate descriptor for this evolution would be “rapid change.” Within Sea-Land, intermodalism evolves on almost a weekly basis as new kinds of services are offered in different markets, as new trucking firms become intermodal partners, as new types of warehousing opportunities emerge—our organization is undergoing continual and rapid change.

Another issue to be dealt with is what I will term the “tough love” environment in which we operate. At the present time, ocean container shipping is under a lot of stress, with considerable international competition and some overall tough times. What does that mean for training and education? Simply put, there is less money to develop it and there is less time to devote to it. In other words, we operate as a very lean, aggressive training and education group facing a lot of challenges in a very fast-paced environment.

All of us are affected by the new information world. There are a number of recent books that address this issue. One, entitled *The Digital Economy*, points out that changes in information have changed the way business is done worldwide. This role of information poses an enormous challenge to educators and their ability to stay current and to offer the kind of learning necessary for people to adapt to continual change.

Why is intermodalism important to CSX? First, CSX is truly a multimodal organization. If there is any organization that should have its arms around training and education in the intermodal world, it should be CSX. We should be doing this the best, setting the industry standard. We continually learn and try to get better at it because we are a global intermodal organization—we have barge operations, ocean container shipping, rail, air freight, and a vast amount of logistics services. As whole, the company is right in the middle of this whole topic.

What is CSX/Sea-Land doing? I will start at the executive level and look at a top-down approach to how we are handling intermodal training and education. University partnerships with a number of schools have worked quite well for us. We have worked with the University of Tennessee, including sending people to their executive M.B.A program, in which a fair amount of transportation-related issues are embedded. We also work with them in a research format. For example, as a vendor they have built multimedia modules for us and as a partner have created educational materials for us to use in our railroad operations.

CSX also recently participated in a special kind of partnership with the Darden School at the University of Virginia, which involved representatives from a consortium of companies that were brought together for an executive program focused on intermodal issues. The program included an on-site 2-week curriculum component and an off-site project-based component, for which CSX developed a supply chain project. The final phase of the program again brought the participants together to work through their projects as a group.

At present, CSX/Sea-Land is setting up a local relationship with the McCall School of Business at Queens College in Charlotte, North Carolina, for a unique executive education program that will be offered only to top-tier individuals within the Sea-Land organization. The program will be tailored to a weekend format (Friday and Saturday), and the cases and methodologies for learning will focus specifically on Sea-Land operations. The approach is to reduce the theoretical approach and increase the focus on real-world case studies of intermodal and transportation issues that people face in their work environment. The Queens College program offers a convenient time and a convenient location that works logistically for the leadership of our organization. The curriculum is tailored toward Sea-Land. We work with faculty to develop the case studies used in the program. It is also establishing a partnership between academia and the private sector within the local Charlotte community, affording other opportunities for learning.

We also encourage executives to participate in university-sponsored short courses offered through organizations such as Northwestern University in specific areas relating to intermodalism. We are working very closely with the U.S. Merchant Marine Academy (USMMA) at Kings Point, encouraging internship programs and actively participating in the development of the USMMA intermodal and logistics program. Sea-Land Senior Vice President Charles Raymond, who earlier presented an intermodal case study, serves on the Vision 2000 Committee, which is helping the USMMA work through the future of its programs and offerings to ensure that private-sector issues and concerns are blended into the curriculum. Sea-Land personnel also get involved by coming back and helping the USMMA cadets face future challenges, including participation in an interviewing skills course. Currently, I am working with USMMA faculty to develop case studies based on actual Sea-Land activities, which can be used in the curriculum to help shape the learning experience of the cadets as they go through the program.

We are working on a management trainee program in which bright young university students are invited to come into the Sea-Land organization. We then rotate them quickly through various departments so that they can learn the business and identify potential key positions in the organization.

Another challenge we face is normal recruiting with the universities. However, the preponderance of our efforts focuses on developing the current workforce; in other words, we are not doing a lot of hiring. In fact, we are contracting in size and learning how to operate as a leaner organization. Therefore, the majority of my time is spent developing programs for those already in the workforce.

I believe that it is important to focus on nontraditional ways of teaching and training—to touch people

and help them learn about intermodal and transportation issues. For example, there is a whole host of Internet-based learning that can be accessed in a self-directed style. Individuals can go to the World Wide Web to get information, search topics, find contacts, and form networks to learn from others. Use of the Web is proliferating in many aspects of our lives, through business and at home, and this source will become one of the primary drivers of development for people in terms of gaining more information about intermodalism and the business surrounding it.

From an intranet perspective, Sea-Land has on its internal system various learning tools for those front-line service providers. A vast number of people in different geographic areas need to have exposure to training, education, and knowledge; I have to touch people in 110 countries. The challenge is really the delivery system. How do you get the information and the tools to them? The intranet strategy is becoming one of our primary strategic delivery platforms for trying to proliferate information to front-line service providers throughout the Sea-Land network.

One example of the partnerships we are entering into on the intranet includes the Harvard Business School, which has an intranet-based management coaching tool that we are piloting for them on our intranet. We also have a number of Gartner Group courses on basic applications training, computer literacy issues, and so forth that can be taken through our intranet. We have also developed chat centers and threaded newsgroups where people can get online and talk about issues; for example, those in Hong Kong can network with those in Long Beach on issues in the business. This is where the power of technology helps people grow and develop and learn.

What will be needed in the future? Three or four things are needed to proliferate intermodal education throughout my world in the private sector. The first is to craft and integrate career paths and developmental plans that provide intermodal learning opportunities. As I think about development in my world, I need to make sure that there are points in the development cycle that are going to address the intermodal issues that we face. I also need to proliferate the Web-based learning. This will become one of my major strategies in terms of increasing awareness of intermodal issues within the workforce in general. We also need to push our partnerships with academia, from the standpoint both of getting better at them and doing more with them, and of pushing our people out into academia to participate and become part of the content that experts are talking about at institutions throughout the country.

Finally, one of the greatest paybacks for an organization is the development of skills in critical thinking and collaboration, both of which are essential to general manage-

ment. Organizations need people with the skills and ability to think well together, to solve problems more effectively. These types of skills and the ability to integrate these skills into private- or public-sector organizations will be fundamental to enabling those groups to move forward.

SUMMARY OF DIALOGUE WITH AUDIENCE

Question

How do you determine an appropriate subject to be taught in distance learning, and what is the reaction from the student population as to their capability to absorb the material and be able to use it materially in the workplace?

Response

Most of it is driven by the business; for example, Sea-Land is currently integrating a new supply chain management software tool called Sea Blocks that tracks cargo from origin to destination through the entire supply chain. One of the challenges we face is how to make people aware of the new software, of how it will be used in the organization, and of how it will affect their particular job. Sea-Land is not trying to teach intermodalism, but rather introducing intermodal issues that relate to the specific job that Sea-Land does.

Question

At some point, doesn't someone have to figure out what an appropriate topic is to be taught by other media, determine the ability of students to absorb the material, and measure how effective that training environment is in lieu of other options? If one is trying to influence performance and behavior with relation to how people do their job, one needs to be careful with respect to the media used to convey that message, as well as the content of the message being sent. Individuals learn in different ways and different styles, and one cannot bank everything on distance learning.

Response

What I have presented is just one platform or delivery alternative that is fundamental to a global company that has to touch people in a number of locations on a tight budget. I am not suggesting that it is the answer to all educational issues, but rather that it is one of the approaches to providing awareness and knowledge that we can use to get something in front of our workforce to help them learn and understand their environment.

Question

In looking at your workforce issues, have you identified what you think are some of the critical shortages or critical areas for retraining within your own internal training program?

Response

I have previously mentioned one of the most important—critical thinking and collaboration skills at all levels of the organization. The number one challenge from a learning perspective, however, is computer literacy and the use of technology in the business. This is critical at every level, from the CEO down to the administrative staff who work in all the offices.

Question

If you have your training in 110 countries, how do you address the cultural and language issues?

Response

That is a complex and intriguing issue. Because all of our business associates speak English, we do not have to deal with language differences. However, there remains the issue of how people of different cultures respond to the way information is presented. Message design is critical.

Military Education and Training Programs: The U.S. Merchant Marine Academy Experience

Jon Helmick and Gerhardt Muller, *U.S. Merchant Marine Academy*

This presentation will focus on a domain that is generally not very well understood, specifically, defense transportation and the education and training related to it. It will provide a quick overview of historical characteristics and organizational and operational challenges related to defense transportation and its operations, take a look at in-state objectives or plans for the future of the Defense Transportation System (DTS), and provide a summary of military transportation, education, and training programs, with a few representative examples.

Business logistics today is still a relatively young discipline, really having only evolved since the early 1960s and originating in large part from military logistics. There is a long tradition of efficient logistics in the defense environment. It should also be pointed out that it is fashionable in some circles to criticize the military in the context of transportation and its management of transportation. I am not here to defend the military in that context but to point out that there is an important aspect here and that is the cost of failure in defense logistics and transportation, which is very different than it typically is in the business environment. In the business environment, if the parcel does not get there on time or the container goes missing, a job may be lost or a customer's goodwill lost. In the military environment, you are talking about possible loss of life or serious injury or the failure of a campaign.

Among the historical characteristics of the DTS, one of the challenges includes fragmentation, that is, an orientation among different services, a functional syllogism and division by mode, a modal orientation that until re-

cently has precluded effective integration. From the 1940s until 1986, the DTS was managed by the Secretary of the Army, the Secretary of the Navy, and the Secretary of the Air Force. It was not until 1987 that the U.S. Transportation Command (USTRANSCOM) was activated with a view toward integration. However, it was not until the Gulf War, in which it was recognized that there were some serious problems with failure of information to flow and integration of the managers (the components being the Military Traffic Management Command, the Air Mobility Command, and the Military Sealift Command), that full authority was given to USTRANSCOM to coordinate defense transportation among these agencies. USTRANSCOM became the single manager of the DTS.

Other problems include bureaucracy, customers having to deal with multiple organizations within the DTS, and redundancy in terms of automated systems. Currently, about 150 different automated transportation management systems exist in the DTS and about 380 different financial management systems; clearly there is redundancy that could be consolidated.

Because of the need to provide readiness and support for combat operations, there has been some tendency to provide what is termed "just-in-case" inventory, meaning an excess of inventory so that stockpiles are available to fight the war in a particular theater. Such an approach, however, incurs high costs, and the military today has been looking at alternatives. It is generally not recognized that if there are stockpiles of inventory in the theater, combat forces often have to be diverted to defend those stockpiles, which can slow the

build-up in a conflict and cause major problems. Therefore, defending inventory becomes an issue. The high inventory levels also result in high overhead and system duplication. Lack of flexibility has also been an issue, the failure of integration among command and control systems.

Many of you are familiar with in-transit visibility (ITV)—knowing where cargo is, in particular as it moves through the supply chain. But in the military context, that includes not just goods in transit but equipment and material in general. Total asset visibility (TAV) is knowing where everything is on the battlefield—knowing where all your personnel are, your tanks, and so forth, which obviously requires real-time information and integrated information systems.

USTRANSCOM is trying to alleviate these problems and has developed a very cohesive and coherent plan called DTS-2010, which has a number of important themes and objectives. One of these is a customer focus—a streamlined and flexible defense transportation system that responds to the needs of vendors and customers in the field, time-definite transportation services. USTRANSCOM has established the USTRANSCOM Business Center to facilitate this customer service with a focus on intermodal transportation.

The Joint Mobility Control Group (JMCG) is intended to integrate traffic management functions within the military. In C4 Integration, the four C's are command, control, communications, and computer systems. The idea is to integrate all of these so that they interface effectively to provide the necessary real-time information on traffic movement, in-transit cargoes, and so on.

Intermodalism is receiving an increasingly important emphasis within DOD and the DTS. A number of exercises have been held involving intermodal commercial carriers—the TurboCAD exercise, for example, which dealt with containerized ammunition distribution. The plan focuses on partnerships, alliances between military traffic managers and their civilian counterparts, recognizing the heavy use of commercial carriers in the DTS.

Empowerment refers to decentralization of authority to some degree, to giving the local DTS agents—the people who are actually in the field serving the customer—greater authority, better training, and the autonomy to do what needs to be done.

Acquisition reform is a key part of empowerment. The Single Integrated Procurement System (SIPS) involves electronic data interchange connectivity and access to commercial capability and has a great deal to do with streamlining procurement and contracting for transportation services.

Finally, seamless handoffs here involve a “fort-to-fox-hole” concept, which means that the delivery system should be transparent to those in the theater and should not pose a problem for a war-fighting effort. In this con-

text, USTRANSCOM is the single port manager in a distant theater.

Having said where defense transportation is and where it is trying to go, let me tell you what a representative sample of military schools, organizations, and institutions is doing with respect to education in the context of intermodal transportation. The guiding principle is the Operational Plans and Interoperability Directorate of the Joint Chiefs of Staff. They do not train, per se, but they are responsible for policy programs and analysis of military education issues. They make a statement about what kind of training and education military officers will need to be successful in the future. They talk about the need to be able to think creatively, reason critically, and act decisively in the face of ambiguity and uncertainty. They also emphasize the importance of jointness, that is, bringing the services together to accomplish the mission effectively.

The Air Force Institute of Technology (AFIT) has a graduate program in the School of Logistics and Acquisition Management. The AFIT transportation management program focuses on developing an understanding of defense in private-sector transportation systems among its students; enhancing their managerial skills, both qualitative and quantitative; enabling students to analyze the impact of defense transportation on defense logistics; and so on.

The Naval Postgraduate School in Monterey, California, offers, in the Department of Systems Management, an M.S. in management, and they have curricula in transportation and logistics management.

The U.S. Army Transportation Center at Fort Eustis, Virginia, trains the Transportation Corps to meet the worldwide mission of the Army active, reserve, DOD, and civilian transportation managers, and even allies from abroad. They have courses in watercraft operations, marine terminal operations, rail operations, strategic deployment, and others. They also develop advanced concepts and doctrine related to transportation management.

The U.S. Naval War College has four resident colleges and one continuing education college; the basic focus here is to enhance student decision-making ability in naval and joint operations. There is a center for research and gaming that deals with advanced strategic and war-fighting concepts; one of the more interesting courses deals with joint maritime operations, which has a very intermodal focus.

The National Defense University, through the Industrial College of the Armed Forces in Washington, D.C., offers a 9-month course that has to do with military transportation.

The U.S. Merchant Marine Academy (USMMA) is rather different from the others in that it is under the U.S. Department of Transportation rather than the

DOD. However, we wear two hats in the sense that we graduate midshipmen who, if they do not go into the active duty military, are in the Naval Reserve, and many of them end up in senior positions in commercial industries and in transportation management, intermodalism, and logistics. We are developing a new major in logistics and intermodal transportation. However, logistics and transportation have been a part of our business core for some years.

The research emphasis on intermodalism and logistics has also been revitalized with the creation of a new institute. The USMMA is an active participant in the Garrett A. Morgan program and part of a number of collaborative agreements and cooperative arrangements with the Research and Special Programs Administration, the National Highway Institute, and others.

An informal survey was conducted at Kings Point on continuing education in maritime schools. Some interesting results came out of this survey. Of the seven schools contacted, only one, the Great Lakes Maritime Academy, does not have a continuing education program.

When we talk about continuing education itself in terms of professional mariner courses, breaking it down by courses related to the deck or the engine, the deck had six programs, whereas the engine had four. With respect to transportation courses, of the seven schools, only two had some kind of a technical or transportation course associated with intermodalism.

Looking at the frequency with which these courses are offered, there is a mixture of regular and irregular

courses. The average number of students per course is about eight. The clients that these courses serve are basically in the commercial sector, although the continuing education program at Kings Point does also serve the federal government (U.S. Department of Transportation and DOD), as well as state governments.

There is an interesting quote from Paul Kaminsky, who at the time, in 1995, was Undersecretary for Acquisition and Technology at DOD:

Every logistics dollar spent on outdated systems, inefficient or excess capability, and unneeded inventory is a dollar not available to build, modernize, or maintain war-fighting capability. The remarkable thing that relates to this is that approximately 50% of DOD's budget goes to logistics.

On the basis of that quotation, one could argue that education is a principal means, although not the only means, by which to reduce that expenditure. Certainly, information technology and the application of automated equipment identification (AEI) technology and bar coding are very important. But to have the people in place who can design those systems and can operate them effectively and manage them intelligently is clearly what is needed.

The DOD effort at the moment to integrate the DTS could be summarized as a very forward-looking one, one that is heavily emphasizing intermodal transportation. It is a massive and well-thought-out effort to integrate existing redundant and duplicative systems.

Public Agency Education and Training Initiatives at the State Level: Minnesota Department of Transportation Experience

Linda Dahlen, *Minnesota Department of Transportation*

I am here to talk to you about Minnesota Department of Transportation's (MnDOT's) SEEDS program, which is a statewide diversity initiative conceived around 1993. "SEEDS" is not an acronym. Its genesis was encouragement from our Commissioner on the issue of recruiting highly qualified, diverse candidates for openings in our agency. He said, "Why don't we grow our own?" The program concept was developed and has been in place since that time.

The program is structured within my office, a separate office from the human resources area in MnDOT. If the program were to be replicated, it could just as well be located in a human resources office or somewhere else within any other organization. For MnDOT, however, it has worked well locating it in the office of which I am the Director, the Office of Workforce Equity and Diversity (OWED). In addition to the SEEDS program, we also handle complaint investigation and response to lawsuits, as well as training and consulting with management on issues relating to employment law and affirmative action. More recently, we hired an American Sign Language interpreter, who works with our deaf employees and their supervisors.

What is SEEDS and what are some of the parameters? It is an outreach program targeted at racial or ethnic minorities, the economically disadvantaged, or both. It offers highly motivated students the chance to learn through on-the-job experience. The students are paid while they work for us, and we prepare them for possible full-time employment after graduation, depending on job availability. They are not guaranteed a job, but many of our graduates have been hired at MnDOT.

The benefits to MnDOT have included access to highly motivated student employees. This has an impact on and reduces our long-term recruitment and advertising costs. We share in the educational process with our partner institutions, and we have a chance to observe and develop potential full-time employees.

We conduct the outreach for this program using some of the standard methods such as mailings and brochures sent to educational institutions and to students themselves. We also partner with other programs, such as the national Transportation and Civil Engineering Careers (TRAC) program developed with support from the American Association of State Highway and Transportation Officials (AASHTO) and two internal MnDOT programs, our graduate engineer training program and our civil engineer technology training programs. We have also sent printed materials to high schools throughout the state of Minnesota, as well as to placement offices at the postsecondary level. In addition, as part of the outreach program, the SEEDS program manager, Emeric Pratt, has done a tremendous job working with some of our technical schools in the local Minneapolis-St. Paul area, as well as in other areas within the state. We are also involved in collaborative efforts with the Center for Transportation Studies and other organizations at the University of Minnesota.

A wide variety of courses is available to the students, including administrative support, office and clerical activities, landscape architecture, law, surveying, civil engineering, business, communications, and management information systems. This variety provides the department with student workers in many areas.

To be a SEEDS student, you must be a member of a racial or ethnic minority or be economically disadvantaged, or both. The status of being economically disadvantaged is determined on the basis of 125 percent of the poverty income level from data provided by the Minnesota Department of Labor and Industry. Students must have at least 12 months left in their educational program to be eligible; however, this requirement is somewhat reduced if they are in a program that is less than 2 or 3 years long. The maximum amount of time that a student could remain in our program is 4 years.

With high school seniors, we are looking for students who have career goals that match MnDOT's needs. As for business, technical, or trade school entry, students need an overall grade point average (GPA) of 2.5 or the equivalent. They have to be studying subjects that would be useful to us at MnDOT in terms of our hiring, and they must maintain their GPA at 2.5 or above.

The requirements are the same for college and university students, except that SEEDS engineering students must have a 3.0 average, which is the minimum used for hiring civil engineering students at MnDOT.

We have also had a number of welfare-to-work participants, who have come to us through trade technical schools in the Hennepin and Ramsey Counties Twin Cities Opportunities Industrialization Centers (OICs). These students' achievements have been a source of great pride and satisfaction for them because the wages and the benefits that they receive from MnDOT allow them to care for their families.

The funding for this program comes from the normal budgetary funds set aside for MnDOT operations in terms of total salaries. The additional overhead comes from the administrative costs for the program manager and some rather minimal program costs. The funding has been devised so that 75 percent of each student's cost is paid through my office to each office, district, or division that wants a SEEDS student, and 25 percent has to come from their own office budget. This way there is an incentive not to abuse the program because some of their own dollars are involved. MnDOT would be hiring student workers anyway to do these jobs, so there is no additional program cost for salaries. The SEEDS student workers are paid as student worker clericals, student work paraprofessionals, or paraprofessional seniors; those classifications come from state schedules. These workers can only be part of the SEEDS program as long as they are enrolled as students.

Supervisors have the responsibility for making the SEEDS program work. First, they have to provide the students with a mechanism to be successful, orienting them to the organization and its policies and procedures. The students' job responsibilities must match their academic curriculum; that is, it would not be appropriate to have engineering students perform administrative or

clerical tasks. In addition, the supervisor must make sure that the employee receives appropriate supervision. The supervisor must also work with the SEEDS program manager to assist in permanent job placement as the students approach the end of their academic term.

Each SEEDS student has a mentor, who is different from his or her supervisor. The mentors are called SEEDS planters and have received training as mentors. They are part of a larger mentoring program that MnDOT instituted about 18 months ago throughout the organization.

Currently, we are in a demand industry, and our office fields all requests for SEEDS students. Supervisors prepare position descriptions, interview the students who are referred to them, make the job offers, and ensure that the students get off on the right foot in their career at MnDOT. Supervisors are also required to conduct a formal mini-evaluation with the student at the end of the first 3 months and subsequently every 6 months. If there is a problem, such as poor work habits, that is affecting the student's success, the supervisor must work with the program manager to try to resolve it early so that the student, while working at MnDOT toward his or her career goals, will have a fulfilling experience.

The success of the SEEDS program has been due in part to the inner workings of three groups: (a) the students putting forth their best efforts, (b) the educators and placement counselors working with our office, and (c) MnDOT management, both the immediate supervisor and upper-level management who provide guidance to our office on how to develop this program.

Data on the program from July 1997 showed a variety of racial and ethnic groups and included both men and women. Most of our SEEDS students are young, just coming out of high school or college; however, we also have other, nontraditional students. Our oldest SEEDS student was 45; both he and his son were enrolled in the program at the same time. SEEDS students are working in virtually every division and office in our agency. From June 1994, when we really got the program off the ground, to date, there have been 41 hires, including both men and women with various racial and ethnic backgrounds. The hires were distributed among the clerical, professional, and technical areas. SEEDS graduates have been hired as everything from clerk typists II to civil engineers. They are working in our engineering services area, our right-of-way and surveys technical support, and in bridges and structures. They are working in some of our districts up north in Detroit Lakes and in Bemidji, Minnesota. They are working in information resource management, administration and human resources, and in the audit area.

Some graduates have been hired outside of MnDOT. Employers have included consulting firms, other private

industry, and publications, most within Minnesota. Some graduates have been hired outside the state of Minnesota. We certainly do not consider it a failure if the students do not ultimately come to work at MnDOT; however, the majority of the SEEDS students do. We believe that we are providing a benefit in terms of giving people who are in their student years a successful and positive initial work experience so that they will take what they have learned and the skills they have acquired into whatever endeavor they undertake in the future.

SUMMARY OF DIALOGUE WITH AUDIENCE

Question

With respect to the welfare-to-work initiative, one of the challenges we find is that once the job is obtained, infrastructure is missing, such as transportation, child care, health care. I presume that health care is not an issue because these individuals are state employees; however, what do you provide with respect to transportation and child care?

Response

Some of these issues are addressed when the person is working for us as a student; there may be child care and transportation issues even then. It is something they work through with support from the people who are working with them to enter the program as well as from the academic counselors in their school and the SEEDS program manager. We have not found these to be major issues when they are hired as full-time workers by MnDOT because they have been addressed earlier. It is a collaborative effort. The welfare-to-work entrants have the program manager to go to, their supervisor, and their MnDOT mentor as well as the other support people they might have through other mechanisms to help in that transition. Although these are real problems, so far they have not been viewed as impenetrable barriers.

Question

Do other state departments of transportation (DOTs) have similar programs?

Response

Part of the reason we are here is to spread the information about our program because we think it is replicable.

We are not aware of any other DOTs that do things in this way; however, we want other DOTs to know about the program. If there is any aspect of our program that other states think they could replicate, that would be very gratifying.

Question

You mentioned the number of students hired and success stories. On the flip side, has there been any experience with students who have started this program but have not been successful for whatever reason? If so, what was learned from those learning experiences? What was it that really just did not click?

Response

There have been relatively few students who have left the program because of work-related problems. A few could not adjust to the world of work, could not grasp the notion of positive work habits, such as being on time, having respect for coworkers, and that sort of thing; no more than three or four fall into this category. We have had students who, for one reason or another, had to interrupt their education. That reason might have been a family crisis—anything from a death in the family to major surgery. In these cases, if it seems appropriate, we will put them on a deferred track, so that when they can get their life back together, overcome whatever the impediment, we will bring them back. If they have shown themselves to be dedicated student workers, we do try to maintain that status and work through whatever problems might arise.

Question

What was the genesis of this program?

Response

It was started as a diversity initiative. Our Commissioner wondered why MnDOT was going outside of the state to recruit black civil engineers. At that time, in 1992, there were no native-born minority students at the University of Minnesota in the civil engineering program. The Commissioner believed that to be an unsatisfactory situation. Hence, the program began as a means of addressing a civil engineering issue and has grown beyond that. Diversity issues are supported within my agency very strongly, both in policy and in funding, and this seemed to be a marriage of both re-

sulting in a program that would meet these needs simultaneously. However, the commitment of the top-level management to making it happen and then assembling a committed team to work on the project is essential for success.

Question

I have a suggestion for you. It seems as though this program, and some information about this program, should perhaps be disseminated to the greater body of DOTs.

Response

That is a good suggestion, and in fact there will be a session at the TRB Annual Meeting to discuss the results of this conference, and a Conference Proceedings will be published in which this could be a representative case study of what a state DOT is doing. This would be a good presentation to disseminate more widely to other

states. MnDOT really wants to share our successes and learn from others.

Question

How do you measure the effectiveness of the program?

Response

We do track all the numbers. Probably the most important criterion is whether this program is serving MnDOT's needs to have a diverse, highly qualified pool of persons for job placement in MnDOT. That is probably our most important measurement, but we are also looking at the number of students who graduate and work elsewhere and have success there. Last year, our SEEDS graduates were approximately 10 percent of the permanent full-time hires in MnDOT. We hired about 150 people permanently full time, and about 15 of those were SEED students; thus, the program has had a significant impact.

Public Agency Education and Training Initiatives at the Federal Level: FHWA's Programs with Minority Institutions

Hattie Brown, *Federal Highway Administration*

I appreciate this opportunity to share with you information on FHWA's programs with historically black colleges and universities (HBCUs) and other minority institutions of higher education, including Hispanic-serving institutions (HSIs) and Native American-serving institutions. Later in my presentation I will focus on a particularly effective and well-received program—the national Summer Transportation Institute. This program is high on the list of programs that FHWA supports because it is geared toward the enhancement and enrichment of our youth to support development of the next generation of transportation professionals.

First, I will provide an overview of the FHWA program for HBCUs and other minority institutions of higher education. Since the program began in 1982, we have developed a number of initiatives that range from partnering with minority institutions to providing fellowships, grants, and contract opportunities for them, their faculty, and their students. In return, the minority institutions have been an excellent resource for FHWA in the areas of research, training, and technical assistance. The minority institutions, for example, have been involved in research in areas such as highway safety and the environment, in training a number of transportation professionals, and in providing support and advice to disadvantaged business enterprises (DBEs).

FHWA is continually striving to ensure that these institutions participate in all aspects of our agency programs and projects, which has helped FHWA to achieve its goal of enhancing minority involvement. In fact, the national Summer Transportation Institute was developed as a result of the partnership consisting of FHWA,

the South Carolina Department of Transportation, and South Carolina State University. The institute program is an investment in our future. The objectives of the program are to motivate students to consider careers in the transportation industry and to provide them with math, science, and technological enrichment to enable them to pursue such a career.

The concept of the institute was first developed by the partnership in 1992, and in 1993 the first institute was established at South Carolina State University, with an enrollment of 20 students. The success of the program enabled it to gain the support of the Greenville Urban League, and by 1994 it had expanded to include 40 students. In 1995, as a result of continued success and the demand to expose and introduce more students to careers in transportation, the program was expanded to six HBCUs and 140 students were enrolled. In 1996, the program expanded to 13 institutes in 12 states, with 375 students enrolled. In 1997, I am proud to announce that the program included 16 institutes in 14 states, with 490 students participating.

The Summer Transportation Institute program has enjoyed, and continues to enjoy, top-level commitment from fellow government officials. As you heard from Acting FHWA Administrator Gloria Jeff earlier in the conference, she has a personal commitment to ensure that youth are exposed to careers in transportation. From the perspective of the U.S. Department of Transportation, this program certainly supports and is linked with the Garrett A. Morgan Technology and Transportation Futures program. If you take it to another level of national commitment, the program definitely supports President Clinton's initiative

to ensure that our youth are prepared for careers of the future. The program also has top-level commitments from officials of state departments of transportation. This is shown by the fact that all of the institutes have a department of transportation as a strongly committed partner. There is also a strong commitment on the part of college and university presidents and faculty, private industry, and Urban League affiliates.

Recruitment for the students is done statewide; applications are distributed to high school guidance counselors. The students are selected on the basis of their expressed interest in the areas of engineering, science, transportation, or technology. Their course work should include a heavy concentration of math and science courses, and they should have at least a 3.0 grade point average, as well as three letters of recommendation in support of their application.

Students participate in a 4-week program that includes classroom and laboratory instruction, as well as activities that expose them to all modes of transportation—land, water, and air. They also receive course work in self-worth and interpersonal relationships among students and other faculty members, as well as in communication skills.

What do the students accomplish during these 4 weeks of training and introduction to transportation careers? They design and build solar cars, bridges, gliders, and rockets. They participate in field trips to state and private transportation sites. They complete coursework in areas such as transportation systems, problem-solving, the design process, intermodalism, the environment, time management, and construction.

The six HBCUs that participated in the program in 1995 were South Carolina State University, Albany State University, Kentucky State College, North Carolina A&T University, Virginia State University, and Jackson State University. In 1996, when the program was expanded to include 13 HBCUs and 1 HSI, the following schools were added to the list: Alabama A&M University, the University of Arkansas at Pine Bluff, Benedict College, City College of New York (an HSI), Florida A&M University, Southern University, and Tennessee State University. In 1997, the program expanded to 16 with the addition of three more HBCUs: Morgan State University, Delaware State, and Clark Atlanta University. Since 1993, the program has been attended by just over 1,000 students.

As the Summer Transportation Institute program has grown, so too has the need to ensure that there is continuity in the program and that the quality of the program is maintained. To address this need, South Carolina State University was designated in 1995 as the National Resource Center, responsible for providing support services in curriculum development and in training and workshops to the other participating universities. The

program has been successful in strengthening the relationship among FHWA, state DOTs, and HBCUs and other minority institutions of higher education.

What are we looking at for the future of the program? There are plans to expand the Summer Transportation Institute to include a mentoring component. This addition will require aggressive marketing to prospective partners, more private industry involvement, and broader participation by all modes from within the transportation agencies involved with the program. Efforts are also under way to secure multiyear funding for the program. The program already has achieved the goal (set by then FHWA Administrator Rodney Slater) of reaching 500 students nationally. Secretary of Transportation Rodney Slater has now set a goal of expanding the program to 2,000 students by the year 2000. On the basis of the program's growth since it began in 1993, there is confidence that his goal can be achieved.

I want to close by noting that one of the main reasons the program has achieved such a high level of success is because it attracts some of the most intelligent, motivated, and energetic students. I have had the pleasure of attending a number of the Summer Transportation Institute graduation ceremonies and have participated in the programs. It is gratifying to see so many energetic, eager, and bright high school students ready to take on 4 weeks of training, be introduced to transportation, and then, it is hoped, set out to make their mark in the transportation world. As transportation professionals and as educators, our challenge is to harness that energy, maintain that level of interest and enthusiasm, and ensure that they do pursue a career in transportation.

SUMMARY OF DIALOGUE WITH AUDIENCE

Question

At what grade do you take them into the program?

Response

Students are 9th and 10th graders.

Question

Are the students provided with any stipend?

Response

No, students do not receive personal stipends. They are hosted on the university campus, and the funding

FHWA provides goes to the university to provide housing and cover the cost of faculty and staff to teach the curriculum.

Question

Have you done any follow-up to see how many of the students who go through the program actually go into the transportation industry?

Response

That is one of the pieces being added to the program. We are finding that the first groups of students are just entering college or are in the first 2 years of college. Preliminary indications are that not only are they going to college, but that they also are majoring in fields related to transportation. The tracking component is just getting under way and will be an important factor in determining whether this investment is yielding transportation professionals.

Question

Do you have any idea of what the cost per student is?

Response

On average, the cost is about \$1,500 per student.

Question

Doesn't the program appear to be geared primarily toward civil engineering? Those of us in the logistics and business sector would also like to have a chance to begin identifying and developing talent at this level, so if there is any expansion of the program I would suggest that these areas also be incorporated.

Response

The program is really not directed just toward civil engineering. It is directed at all majors and fields required by a DOT, including economics, civil engineering, bureau of weights, and so on. I would also like to point out that although it is an HBCU program, it is a truly diverse program. The racial and ethnic mix of students participating in the most recent institute was 46 percent African American, 16 percent Hispanic, 13 percent white, and 25 percent in the Other category.

PANEL DISCUSSION

Internship and Mentoring Programs

Shirley McCall, Moderator, *TransTech Academy, Cardozo Senior High School*

Evelyn Thomchick, *Pennsylvania State University*

Stephen Blake, *Center for Transportation Training, Education, and Research, Inc.*

Beatrice Lee, *Los Angeles County Metropolitan Transportation Authority*

Donna Sharp, *Norman Thomas High School/Council of Logistics Management*

Shirley McCall

Established in 1991, the TransTech Academy at Cardozo Senior High School was the first transportation studies academy in the Washington, D.C., area. The academy is designed to provide high school students with a well-rounded academic and technological program that exposes them to future career opportunities in the field of transportation. The program helps students bridge the gap between school and the workplace through internships, mentoring, summer work programs, field trips, and college visits. The Transportation Research Board (TRB) is among the organizations that provide TransTech students

with internship opportunities. Participants are encouraged to visit the TransTech Academy exhibit at this conference, where you will have an opportunity to meet some of the students whose projects are on display.

Our panel today will discuss a broad range of internship and mentoring programs offered to students from high school through graduate school. These are but a sample of many exciting programs available to students from middle school through graduate school. Additional programs are highlighted in the displays and exhibits (see Appendix B in these proceedings).

Evelyn Thomchick

The Penn State Business Logistics Internship Program is part of the Penn State Smeal College of Business Internship Program. Undergraduate and graduate students apply for internships through the Internship Office. Undergraduates are generally placed in 5- to 8-month assignments, and M.S. and M.B.A. students are available during the summer between their first and second years of study.

There has been a great increase in demand for business logistics majors in recent years. In the 1996–1997 academic year, 168 business logistics students were placed in internships. These students represented the largest proportion (28 percent) of the internships awarded in the Smeal College of Business Administration for 1996–1997. Marketing and finance follow, each with 18 percent, and accounting with 17 percent. Average salaries for business logistics undergraduates were in the range of \$450 and for M.B.A. students just under \$800. The demand for undergraduate business logistics interns has more than doubled within the last 5 years, with just under 80 being placed in the past academic year. Many students have had two 6-month internships before they graduate.

Some students find internships or business logistics-related jobs in other ways. The Council for Logistics Management (CLM) supplies universities and other institutions with a large list of employers who offer summer internships in logistics. For these internships, students apply directly to the employers. Last year, CLM interns worked as analysts in the areas of materials management, marketing, and operations and provided support to consultants and managers in areas such as finance, pricing, and transportation. Companies participating in programs such as those offered by CLM and other organizations not only find productive summer employees, but also are given an opportunity to work with and screen potential future employees. The same is true for the intern, who has the opportunity to learn more about a company and particular type of job before he or she makes a long-term commitment.

The American Society of Transportation & Logistics (AST&L) also provides mentoring services through its Board of Examiners and chapter offices. The AST&L main office will also recommend mentors if requested. Many companies with employees in the certification program set up mentoring programs within their companies.

Stephen Blake

FHWA, U.S. Department of Transportation (DOT), with support and funding from the Federal Transit Administration, Federal Railroad Administration, and the Research and Special Programs Administration, contracted with the Center for Transportation Training, Education, and Research (CTTER) to coordinate, administer, and conduct the Summer Transportation Intern Program for Diverse Groups (STIPDG) for the summer of 1997. This program provides an opportunity for students from diverse educational and social environments to spend 10 weeks at DOT working as interns with one of the modal administrations and performing research on selected transportation topics.

STIPDG is an excellent vehicle for exposing students to the inner workings of DOT and provides them with mentors who assist them in developing career objectives

and goals. Students are exposed to current topics of interest in the transportation field, have an opportunity to sharpen their research skills using those topics, and are introduced to individuals in the field who may be able to assist them as they pursue careers in transportation.

Fifteen bright and capable students representing various cultural and ethnic groups from both minority universities and other universities and colleges participated in the 10-week program in 1997. The students were chosen through a national competition to which 65 students throughout the country submitted applications. Students were selected on the basis of their grade point average, their interest and work experience in transportation, their expressed areas of interest, autobiographical sketches, and letters of recommendation from professors and employers. They represented 13

colleges and universities in 11 states, Puerto Rico, and the District of Columbia. Six were from historically black colleges and universities (HBCUs), one was from a Hispanic-serving institution (HSI), one was from a Native American college, and the remainder were from other institutions of higher learning. Nine of the students were engineering majors. Just over half (54 percent) were men, and 46 percent were women. About two-thirds (66 percent) were African American, 12 percent were Caucasian, 12 percent Asian American, 6 percent Native American, and 6 percent Hispanic American.

The 10-week program, which ran from June 2 through August 8, began with an orientation session and introduction of students to their mentors. The interns met with modal administrators and with Secretary of Transportation Rodney Slater. During the program, interns visited several transportation organizations to meet staff, collect information for research projects, and make contacts for future job opportunities. The visits included Tidewater Transit and the Virginia Ports Authority in Norfolk, Virginia; the Maryland State Highway Administration and Mass Transit Administration in Baltimore, Maryland; and the Regional Plan Association and Port Authority of New York and New Jersey in New York City. They also visited a number of organizations in the Washington, D.C., area, including TRB, the American Association of State Highway and Transportation Officials (AASHTO), and the American Public Transit Association (APTA).

The program also provided training in job interviewing and networking techniques. The culmination was an awards luncheon at which certificates were presented by mentors and STIPDG committee members. For those interested, additional details on the program are available, as well as copies of the research papers prepared by the interns.

Also present at this conference are two of the students who participated in the 1997 program, Leo Dumond, a senior civil engineering major at Howard University, and Melody Burch, a junior mechanical engineering major at George Washington University. Dumond's interest is in the design of transportation facilities, and he was assigned to FHWA for his internship. His assignment was to prepare a summary paper on the different types of pavement condition survey equipment and to work with the group leader in making final arrangements for the National Workshop on Pavement Management. Burch is interested in the area of automobile safety systems, particularly crash analysis, and was assigned to the Research and Special Programs Administration. Her assignment was to assist a senior engineer in reviewing new editions of American National Standards Institute (ANSI) technical standards that are incorporated by reference into the pipeline safety regulations, in indexing these standards for ease of reference by engineers to match technical requirements of each standard with construction and maintenance requirements for pipeline facilities; in preparing a report on guidelines for small gas pipeline operators, and in setting up and running various technical committee meetings.

Beatrice Lee

The Los Angeles County Metropolitan Transportation Authority (MTA) mentor and internship program has many facets and affords many opportunities to students, public agencies, and businesses. This presentation provides an overview of different aspects of the program; conference participants are encouraged to stop by the exhibit to obtain more information.

The best example of what can be accomplished through the program is offered by the two students from North Hollywood High School who are part of the Transportation Careers Academy Program (TCAP) and are the winners of the student essay contest. In their essays, Ana Martinez and Maalik Russell discuss their

school-to-career experience. Maalik had a summer internship with the MTA in which he worked with staff and inspectors involved in subway construction. Ana worked for the summer with Engineering Management Consultants, an MTA contractor.

The Transportation Teaching Institute (TTI) is a volunteer program managed by the Career Development and Training Center of the MTA. It is composed of industry professionals from the MTA and other businesses who volunteer service to students and teachers. Resources and technical assistance are provided to TCAP, the Transportation Occupations Program (TOP), and local institutions and via the Internet. There are six volunteer groups within TTI: Train the Teachers, Curricu-

lum Writing, Mentors for Students, Mentors for Teachers, Information and Resources, and Lectures and Tours.

Components of the internship program are as follows:

- An implementation plan and guidelines;
- Pre-work-site visits and meetings with prospective employers;
- Monitoring of student progress in the classroom;
- Workshops on writing a resume and other aspects of job preparedness;
- Student job interviews by volunteer professionals;
- Discussions on job application selection and placement criteria;
- Teacher evaluation and assessment;
- Workshops on issues relating to human resources, student processing, work permits, medical coverage, payroll and accounting procedures, and worker's compensation;

- Intern and employer job orientations;
- On-the-job work-site review; and
- Program exit evaluations by the intern and the employer.

The challenges faced in this program include identifying employers who are able to fund student interns, securing work-site supervisors who will offer quality work assignments, and matching students' skills to job requests. The successes of the program are reflected in the permanent placements with businesses following summer internships, the number of students going on to college after their internships, the enhancement of student resumes as a result of the work experience, and the evidence that employer projects have moved forward in part as a result of the intern assignments.

Donna Sharp

In 1991, the Council of Logistics Management (CLM) New York City Roundtable and the Office of Occupational Education of the New York City Board of Education began discussions about developing a high school level business program that would focus on the study of logistics and international trade. In September 1993, a 3-year high school program, now known as the Logistics Program, was approved and initiated with 34 students enrolled. The program is housed at the Norman Thomas High School for Commercial Education, located on 33rd Street just off Park Avenue in Manhattan.

The program was designed so that graduates would be well qualified for an entry level in logistics, transportation, or international trade or could pursue a college education, or both. It was decided by the steering committee for the Logistics Program to develop an interdisciplinary curriculum that integrates academic and occupational subjects toward goals that are worthwhile and essential to today's logistics professional. The 3-year program begins as students enter their sophomore

year and consists of the following cycles: Year 1, Introduction to Logistics and Global Trade; Year 2, Types and Methods of Transportation; and Year 3, Logistics Management.

An exciting part of the program is the senior-year internships, which grant academic credit for on-the-job training in logistics management to seniors who have completed 2 years of the high school logistics program. Students spend approximately 12 weeks, usually 4 hours a day in the afternoons, with their sponsor company. Participating sponsor companies have included Agip USA, Asarco, Colgate-Palmolive, Level Company, Pfizer, UPM-Kymmene, and United Parcel Service, to name a few.

Throughout the year, transportation and logistics professionals visit the school to participate as speakers and discuss topics such as careers, technology, supply chain management, warehousing, purchasing, and transportation. In addition, throughout the school year, tours are scheduled for all students enrolled in the program.

Breakout Discussions 2

The second set of breakout discussions addressed three principal questions:

1. How effectively are existing education and training programs meeting the needs of the transportation sector?
2. What changes or enhancements could be made to improve programs?
3. What, if any, are the barriers to change?

GROUP A: UNDERGRADUATE PROGRAMS

Group A, which consisted of 10 people, primarily academics from business programs, focused on the topic of undergraduate intermodal transportation and logistics programs. The first topic covered was key skills needed, and the discussion resonated with many themes that had emerged earlier in this conference.

First, students have to graduate with a systems perspective, which means that they understand or appreciate the entire supply chain, even though the bulk of their course work is in one area. In other words, a student pursuing an intermodal transportation major must understand that there is a role for purchasing and inventory control and other key logistical activities and what his or her particular role provides in the supply chain and what value it creates.

Second, there is a need to incorporate teamwork activities into the curriculum, to get students working together as a team by teaching them team-building skills, which are skills they often do not have when they come

into the program. On the basis of their experience, some in the group cautioned about going overboard with teamwork activities, believing that the result would be that some individual participants would not accomplish as much as they should.

Basic problem-solving skills was the third key component that programs must offer students. Programs should ensure that students can tackle what used to be called “math story problems,” which can reflect actual situations with which they will be faced. It is the program’s responsibility to teach them, when presented with a problem scenario, to analyze it effectively, make necessary computations, and then interpret the results. In the end, when you ask how much it costs to move a truckload from Denver to Los Angeles, they know that the answer is not \$10 million and why.

The fourth component needed is technology skills. Although students may not be able to get hands-on experience with every tool, they at least need to be aware that those tools exist. Thus program managers cannot make excuses such as, “We don’t have a good computer system, so we can’t teach them tools for routing and scheduling.” Even if a program cannot offer its students hands-on experience, it still needs to inform students that the tools are available.

Finally, there needs to be a focus on quantitative skills, some of which may be tailored to a particular area. However, both those in engineering and those in business and logistics need a minimum level of competency in calculus and statistics as well as advanced training and skills at the level required for their particular area of concentration.

What are some of the barriers to ensuring that students have the opportunity to develop these skills? Money is always an issue, and it is going to be more so at the university level. State funding at most institutions is dropping. It will be necessary to work hard to secure external funding from industry and from government grants and other sources. University bureaucracy is another barrier. It takes at least a year to get a new course approved. To get a new program approved can be a 2- to 3-year process. It can be even more difficult to get rid of a program; it could take 6 to 8 years to drop a major or drop a program.

Hand-in-hand with the bureaucratic problems is the difficulty in being able to offer state-of-the-art technology. By the time the contracting and installation process of outfitting a classroom or laboratory with Pentium 100 computers is finished, the technology is already out of date—the standard is now Pentium 200s with MMX and all sorts of other features.

Time is another critical barrier at the undergraduate level. Many people may not realize that in many business programs, there may be only six or seven classes in the major field, which translates to six or seven 3-hour classes in a semester system. In programs in which there is a concentration rather than a major, there may be only two classes. This time factor makes it difficult, if not impossible, to respond every time a new request or requirement comes along. The continual challenge of modifying programs means that conscious and often difficult decisions have to be made regarding what gets added, what gets dropped, and what gets only basic coverage.

The suggestions offered by this group include the following:

1. Industry, academia, and public agencies need to work together to develop a reasonable list of core competencies and skills that all transportation and logistics undergraduates should possess. This list should include a basic understanding of the processes and the issues but is not likely to include high-level quantitative analysis and financial analysis skills.

2. It should also be recognized that there is room for differentiation in a program. With six or seven courses, a program cannot present the whole package of logistics, transportation, intermodalism, engineering, and so on. There needs to be a focus. It becomes a question of breadth versus depth, and the latter is probably more important. The student should become proficient in a particular area, and room to explore different areas should be allowed.

3. Professional organizations should play a role in developing the standards and the common body of knowledge expected of students. There could be an independent body that assesses whether a particular pro-

gram meets the criteria and is capable of providing students with a common body of knowledge.

4. Industry can and should take an active role in undergraduate education through student and faculty internships, advisory boards, and getting into the classroom, either to teach a course or through an executive-in-residence type of program. At the undergraduate level, it may not always be best to bring in a senior executive, but rather the students should be exposed to middle managers, line managers, and people who can inform students what it is like to be on the firing line. This approach may help students to realize that it is highly unlikely for them to walk out the door of an undergraduate program and into the corner office next to the corporate vice president, with whom they will talk and help make strategic decisions. If students are only exposed to high-level executives, they may leave a program with unrealistic expectations, and this can become a major impediment to their future success.

5. Undergraduate programs need financial support for technology and tools. One approach is to have a company “adopt” a university or university logistics and transportation program and work directly with those directing the program to develop classrooms with the technology and software needed to produce the future workers that industry needs. Industry can also help in development of case studies and problems representative of the real issues and problems students will face when they move from the classroom to the real-world job.

Undergraduate programs need to maintain perspective: they cannot be all things to all people. Given limited time and resources, programs must have a focus that enables them to produce the best students possible. Although individual programs may not cover every area, each program should ensure that it does a quality job of training qualified candidates who can move into industry as productive and effective workers.

GROUP B: GRADUATE PROGRAMS

Group B focused on the graduate program level. The discussion revolved around six key issues:

1. On traditional roles and needs, the group reaffirmed what is happening today at the graduate level (master’s degree and Ph.D. candidates) among those who are being brought into the transportation sector. In addition to the traditional areas such as consulting, teaching, and research, these candidates are getting increased attention from the government sector and its changing role in the transportation field, from equipment suppliers, and from the overall transportation industry as its need and interest in those with graduate

degrees increase. This, in turn, has given rise to issues such as wage scales at the university level. Throughout the conference, attention was focused on issues relating to globalization, the growth and increased emphasis on electronic commerce and communications as well as modeling and systems issues, all of which need to be emphasized and expanded at the graduate level.

2. On the question of how to measure the effectiveness of graduate programs, it is first necessary to know where you are going. If you do not have a goal, any road will get you there. Currently, effective programs are all but nonexistent. Accreditation criteria were discussed; these ought to be brought more to the surface and looked at as measures of the success of these programs and thereby serve more of a purpose than just accreditation. Although there is an effort to determine through placement offices where people go, at what levels they enter, and to what types of companies they go, there remains a void in measuring the true effectiveness and output of a program. For example, if individuals are placed at a certain level after leaving a graduate program, one also needs to know where they are 5 to 10 years later. Although university development offices may know where a particular student is located for purposes of fund raising, the program from which the student matriculated may not know where they are and how they have progressed. These types of measures include the following: How happy are employers with the placement of an individual after some period of time? How fast is that graduate-level individual contributing to the organization? How long did it take him or her to come up to speed? What kind of intellectual resources did the university provide for their more focused graduate-level programs? Was the program multidisciplinary? To provide an indication of whether a program is effective and whether it needs to change its direction in any way, you need to ask the following questions: Is it a multicountry program with faculty and students from multiple countries? Is there a cooperative transnational program, in which programs are conducted in more than one country?

3. How well are graduate programs meeting industry needs? The group believed that they are meeting this goal only marginally today but that they will do better in the future if (a) there is continued responsiveness to current issues in transportation and (b) there are continuing opportunities such as this conference to bring these issues to the surface and determine how they can be effectively addressed. There was cautious optimism that existing programs are meeting industry needs, but it was believed that more can be done through an ongoing effort and commitment to making programs more responsive.

4. What are the barriers to making programs more responsive? They are similar to those at the undergradu-

ate level: financial issues facing both program administrators and students; cultural and global issues that must be recognized and addressed; the challenge of putting together and administering interdisciplinary programs; and the issue of whether bringing practitioners into the program somehow colors the purity of research (an issue that the transportation sector historically has done a good job of recognizing and addressing).

5. What are the rewards for being involved in graduate transportation programs? Promotion and tenure often depend in part on the issue of how frequently and in which journals to publish. If you want material published in the transportation sector, it has to be worthwhile to the industry and at the same time consistent with the more traditional use of journals.

6. Whether an intermodal transportation education program initiative goes forward depends in part on what can be viewed as a three-legged stool, the legs consisting of government, the private sector, and educational institutions. What is also needed is some type of catalyst for getting the job done, particularly when there is some real or perceived competition between academic institutions and the private sector. This leaves the possibility of government's being the catalyst in pulling all of this together to provide a comprehensive framework. There is also a need for financial support, some kind of retainer or partnership to bring funds in and through the university for both faculty and students.

GROUP C: ELEMENTARY THROUGH HIGH SCHOOL PROGRAMS (K-12)

Group C focused on programs at the K through 12 level and made the following observations:

1. On the effectiveness of existing programs, it was believed that the data really are not sufficient right now to draw meaningful conclusions. There are excellent models across the country, but these need to be more widely replicated before trends and themes can be identified or measured. Although the private sector believes that the community colleges and universities are being very responsive, they would like to see more programs at the K through 12 level. Any effectiveness criteria that are developed should be linked with state and national standards.

2. With respect to monitoring effectiveness, again it was thought that communication between secondary and postsecondary schools and between the public and private sectors is not sufficient. As a result, either the monitoring is inconsistent or the information needed is not being distributed to all channels.

3. What are the barriers to change? There need to be dedicated personnel and a budget at the industry level to

work with the school programs. Problems also arise from lack of agreement between and within the public and private sectors as to the definition of "intermodalism." By and large, students are not aware of the many wonderful careers in transportation, and a public relations campaign is needed to let them know of these opportunities. Educators need a strategy for recruiting industry partners. This strategy would require them to outline goals and objectives, which will help potential industry partners understand how and where they fit within that strategic plan and what short- and long-term returns they can expect from the investment of their time and resources.

4. How can the public and private sectors work together more effectively for programs in elementary through high schools? One way is through partnerships and involvement with programs such as TransFuture, TransTech, and Garrett A. Morgan. There is also a need for more teacher certification and training programs to build upon existing successful models of business and education partnerships. Community colleges can and will design more customized training programs for this purpose in response to industry requests. Businesses interested in working with schools should contact local school-to-work offices to identify potential partners. The transportation industry, through educational and professional organizations, could sponsor some type of contest for K through 12 students. Educator should also be encouraged to join and participate in trade and professional organizations, such as the Council on Logistics Management.

GROUP D: CERTIFICATION AND CONTINUING EDUCATION PROGRAMS

The members of Group D were a diverse representation from the military, the private sector, and the public sector; the group focused on what is meant by and what is available in the area of certification and continuing education programs. As far as the certification process is concerned, it was believed that this area is best left to the various professional associations, be they in logistics, engineering, planning, and so forth. The role of continuing education and training was defined as activities after the degree-granting process or licensing phase and was focused primarily on the upgrading of skills or on retraining to satisfy changing job requirements.

A major problem facing this sector of transportation education and training is convincing employers, whether in the public or private sector, that continuing education is worth the time and effort, both for the employees and the employers. One way to approach the solution of this problem is through better communication among the sometimes-fragmented group of those involved in inter-

modal transportation—a group that contains wide and varied levels of expertise in many different areas.

Perhaps the best way is to work with the various professional associations within the transportation industry, for example, the Council on Logistics Management, the American Society of Civil Engineering, and the American Planning Association. These types of associations hold the key to improvement and expansion of continuing education programs and opportunities. It would also be very beneficial to establish and sponsor regional intermodal roundtables, which would provide opportunities for private industry, the military, and government to get together and discuss what is needed and desired in terms of intermodal transportation education and training.

Fellowship programs are another means of communication, for example, programs in which private industry would loan executives and managers to the government and the military. It would also be beneficial to offer fellowships that would enable university professors to spend time in industry to gain first-hand, real-world experience, which can then be transferred to the classroom. Yet another suggestion was to establish some type of brokering service that would incorporate various existing systems. For example, if a small firm in private industry wanted to know about the educational opportunities for continuing education, there would be a one-stop shopping place where they could get information on what continuing education programs are available and how they can match their needs with available programs.

Development of case studies for use in continuing education programs may help make systems and employees more efficient, reduce costs, and increase productivity. Information gained from case studies could be the catalyst for getting the private industry involved in partnerships with other industries, the government, the military, and academia.

There are numerous delivery mechanisms for continuing education—CD-ROMs, videos, the Internet, and so on; however, person-to-person contact, whether through a roundtable system, fellowships, or other means, is perhaps the most effective way to deliver and offer courses on a one-to-one basis. Whatever systems are developed or whatever proposals are adopted, cost-effectiveness and conciseness will make them viable to private industry. Short courses (one to two sessions) are probably the best way of ensuring participation by private industry. Few, if any, companies can afford to have key employees out for 2 or 3 weeks at a time.

GROUP E: WEBSITE DEVELOPMENT

Group E discussed the potential for developing and launching a website on intermodal transportation education and training needs and opportunities. The challenge

to the group was to help the DOT interagency working group think through the design and possible topics to be included on a website offered through the DOT Office of Intermodalism. The first task was to provide ideas and input on content areas such as the following:

1. What kind of jobs, grants, and learning opportunities are available;
2. A calendar of current events, including emerging news flashes and issue awareness;
3. A definition of intermodalism and the historical context of how intermodalism has progressed over time, which might include a diagram or organization chart of the Office of Intermodalism and its connection with other DOT agencies and with nongovernmental organizations;
4. A Yellow Pages type of directory to the necessary people and information, for example, the location of rail ramps and who to contact;

5. Information on the services offered by the Office of Intermodalism, a collaboration center with threaded newsgroups or chat rooms offering an opportunity for discussion of topical areas and ongoing conversations about intermodal issues, to include a registry, list of servers, or a network of intermodal professionals from business, industry, and the public sector; and

6. Lists of other resources and links to other sites dealing with policy issues, research, and so on.

On the issue of design, it is important that it be simple and easy to use; there are good models in government from which to draw. The website would also offer opportunities to work with companies like Intel, Microsoft, and other leading technology firms, who may wish to partner with government and offer their expertise to the Office of Intermodalism to get the site up and running.

Firing Line Panel Response to Conference Findings

Tay Yoshitani, *Maryland Port Administration*
Joni Casey, *Intermodal Association of North America*
Lawrence Dahms, *Metropolitan Transportation Commission*
William R. Lucas, *Military Traffic Management Command*
Edward Wytkind, *Transportation Trades Department of AFL-CIO*
Lana Batts, *Truckload Carriers Association*

On the final day of the conference, Steering Committee Chairman Michael D. Meyer summarized the preliminary findings and conclusions of the conferees (see Chairman's Summary in these proceedings). Following this summary, a Firing Line Panel of distinguished transportation professionals represent-

ing a broad spectrum of the transportation industry was given the opportunity to respond. Although a number of those comments are reflected in the Chairman's Summary, the following are highlights of some of the key points made by each panelist and a summary of the panel's dialogue with the audience.

Tay Yoshitani

Market demand very much influences the type and cost of transportation service. Transportation itself has become a commodity whose cost becomes a determining factor in consumer use of the service. In response, the transportation industry has undergone large-scale changes, the most noticeable being mergers. In the last 10 years, the number of major railroads has declined from 42 to 8, major ocean carriers from 25 to about 7.

With regard to education and training, this means that industry will need people who can help companies differentiate their services through marketing, technology innovation, and awareness of the political environment. Transportation is an intrusive industry, so transportation offi-

cial must understand how to be effective in an often volatile environment.

Environmental sensitivity is a key characteristic of the times in which we all work. Transportation officials not only have to manage their way through the environmental process, but also have to understand the politics of getting things done in a world in which political controversy can be linked to the degree of environmental disruption.

The port industry has developed a Port Professional Management Program whose objective is to develop port managers who have a systems perspective on the successful management and operation of their facilities. We must have well-trained and qualified people to take the industry into the next century.

Joni Casey

Trade associations need to ensure the availability of quality education and training programs on behalf of their members as well as a supply of qualified employee recruits for member companies. In some instances, trade associations also provide education and training opportunities for their members.

Transportation education has often taken second place to logistics. We should not lose sight of the respective roles and relationships of transportation and logistics.

As an association that represents the intermodal freight transportation industry, most of our interest will be on training. Curriculum issues in graduate programs and K through 12 initiatives are not within our scope at this time.

Having industry-agency-academic fellowships or sabbaticals is a great idea. One of the early efforts at educating state and local planning officials about the freight community ran into the problem of lack of knowledge or insufficient understanding of the freight industry. This is a great area for partnerships.

We need to be cautious when we combine intermodal passenger and freight education and training initiatives.

The core competencies are perhaps the same for both, but continuing education and training initiatives should be focusing on different things.

An emphasis on technology, and how to best apply innovative technologies, is certainly appropriate. Technology is a driving force in the intermodal industry. However, we also clearly need to focus attention on human resource needs. People are absolutely the most important and valuable asset of any company. Educating and training this asset will basically determine the success or failure of the company.

Although suggested as a means of enhancing training activities, tying mandatory quotas of training activities to funding authorization is not worthwhile. This bond would likely reduce the flexibility that is necessary for training to respond to industry needs.

It is important to have some sense of the return on investment of training activities and of conferences such as this one. Organizational inertia is characteristic of most agencies, and the best ideas for education and training can languish for years without implementation. We need to show the benefits of implementing effective programs.

Lawrence Dahms

The title of this conference was probably wrong because there is no job called an "intermodalist."

The challenge of intermodalism at the highest management level is to leverage all of the modal interests to act intermodally. Therefore, the focus of intermodal education and training should be at that level, not at the K through 12 level or at the level of low- to mid-level employees. And at the highest management level, the need is for basic technical competency in conjunction with interpersonal and managerial skills that are learned on the job.

There has not been much progress in intermodalism in the passenger sector since ISTEA, but this is not because of deficiencies in education and training. There is still a lack of understanding and a lack of commitment at the highest levels of business and government on what the intermodal concept is all about and whether it is worth all of the attention. Unless there is this commitment for and an understanding of the concept of the "intermodal manager," there will be little support for education and training.

William R. Lucas

For the military transportation support function, technical competence is essential. In a combat support situation, the commanding officer will want to have a transportation expert, a supply expert, a petroleum expert, and so on.

Ever since Desert Shield, intermodal transportation has been a key concern to the U.S. military. Forward operations cannot rely on having fixed bases of support, so the military relies on door-to-door service, including the use of commercial services. To be successful, however, there needed to be a logical organizational structure to support this strategy. A joint traffic management office has been created to educate military customers on the benefits of intermodalism and on the capabilities of intermodal transportation to meet their needs, to match requirements with capability, and to provide a full range of solutions.

One of the basic strategies for developing an intermodal focus in transportation is an intern program. Approximately 20 interns per year are placed into a transportation officer basic course that introduces them to the customers they will have to support. The program also exposes the officers to leadership

training and to the practical demands of intermodal transportation.

Continuing education is another vital element of our technical support program, especially oriented toward those who are not part of the transportation intern program but who nonetheless have a role to play in intermodal transportation service provision. A Joint Deployment Transportation Center has been created to offer blocks of instruction to combat officers at different stages of their career so that they understand the transportation requirements of combat modes of operation. This instruction is often done with mock exercises that require rapid deployment of troops and material.

One of the key issues with intermodal education and training is the exchange of information on what everyone is doing. A website for intermodal transportation would allow one to advertise intermodal positions and thus serve as a central focal area for job announcements and for those seeking jobs.

The U.S. Department of Transportation (DOT) should be a major actor in transportation education and training. DOT should be an enabler and maybe a partial funder, but not a regulator.

Edward Wytkind

Labor is a key foundation for the success of intermodal transportation. The impact of intermodal transportation on labor is the blurring of modal lines in companies and the challenge of transferring skills to accomplish the seamlessness the industry demands.

Deregulation has had a big impact on industry and on skills in training and education. There are varying perspectives on the benefits of deregulation. To labor, deregulation has cost jobs. Some will argue that jobs have been created, but these jobs are not as good as they were 20 years ago. Studies show that in an industry that is booming, real wages continue to decline. We must be

concerned about the quality of jobs. Therefore, in consideration of training, one cannot ignore the quality-of-job issue and whether you are training people to go to jobs that don't exist.

Labor needs to be part of the education and training strategy. In unionized industries, regional and local union offices offer the best delivery mechanisms for instruction. Partnerships must have labor representation.

A national policy linking workforce development and funding is a great idea, but most likely unrealistic and unenforceable. The Davis-Bacon standard provides a very thorough apprentice program and ensures that a worker can do the job.

Labor has provided some innovative approaches to the training needs of the industry. For example, the AFL-CIO has developed a highly acclaimed training program for hazardous materials transportation. However, employers do not recognize the need of giving employees

time to participate in these programs.

Don't forget that you can't let training and education become disconnected from what is on the receiving end. It is real difficult to attract good people to tough but important jobs when the wages are eroding.

Lana Batts

The longhaul truckload carrier is the fastest-growing segment of the transportation industry. The biggest concern is a tremendous shortage of high-quality entry-level drivers.

A key challenge to the profession is attracting quality people to transportation; intermodalism will then take care of itself. And the critical problem in this challenge is our image. Very few people grow up wanting to be a truck driver. And yet intermodal transportation does not work without truck drivers. Many of the most important CEOs in the industry began as truck drivers.

The image of the trucking industry must change. Few people know that 80 percent of the truckload industry has satellite communications in the trucks. A recent survey showed that 38 percent of the truck drivers with satellite communications are on the Internet. The job is one that is challenging and creative.

Return on investment for training is a critical selling point to industry leaders. One must first ask the question, who has a stake in training? Then one must ask how the industry defines the value added by this training. For trucking companies, the return on investment is improved safety and reduced driver turnover. For insurance companies, it is reduced accidents and a reduction in the severity of accidents. For truck driver training schools, which are also stakeholders, it is the ability to differentiate themselves. Then, you have to quantify the benefit of this investment.

If you are serious about the possibility of national transportation skills standards, they must be developed at the stakeholder level. You also have to ask questions on skill standards: What it is that you want that individual to

know? What do you want that individual to be able to do? How well do you want them to be able to do it? Then you have to start talking about aptitude and ability. But if you don't start at the stakeholder level, it will never work.

Incorporating workforce development into the mission of the DOT agencies is absolutely crucial. We have to get DOT to understand that experienced truck drivers are not developed overnight. We can't hire truck drivers until they are 21 years old, so we lose all of the good people who often make career decisions at 18 years of age. The key is training.

The federal role in education, training, and research is absolutely crucial, especially for DOT. In 1991, when the U.S. Department of Education decided that it was not going to invest in any training courses that were less than 600 hours, DOT was not in on the debate. If transportation officials believe in training and in entry-level jobs, then DOT has to be involved.

As we look at the image issue, we have to take it upon ourselves to make transportation exciting to the K through 12 grades. Image building starts at this level. The trucking industry has a program called Trucker Buddy. It was designed and is maintained by truck drivers. A truck driver adopts a classroom, and when he is driving around the country, he sends postcards back. So, for example, if he is in South Dakota, he sends a postcard of Mt. Rushmore. The teacher then can turn that postcard into a history or geography lesson. The truck driver often brings the truck to the school, and the kids climb all over it. Those are the kinds of things that we have to do to get people excited about trucking, to get them excited about transportation.

DIALOGUE BETWEEN FIRING LINE PANEL AND CONFERENCE PARTICIPANTS

Conference participants were given an opportunity to direct questions to the Firing Line Panel. The following were among the issues raised by participants.

Question/Comment

The number one priority in DOT's Strategic Plan is transportation safety. How do we relate this to education? The only time safety seems to become an issue is when we have a disaster or when the system fails. We need to be more proactive in our education and training programs on the safety issue.

Response (Lana Batts)

I don't think it is enough to say "safety." I know we became very involved in the Professional Truck Driver Institute of America because of safety. Do we know that trained truck drivers are safer? You can't prove it. You have to start looking at the individual actions and operating procedures of companies. We must ask what the value added is. One DOT study on entry-level driver training found that one could not draw a connection to safety, although everybody knows it is there. You have to ask the questions, Do trained drivers have fewer accidents? Is the severity of those accidents less? In fact, we find that entry-level drivers do have more accidents, but the severity is less. They tend to be backing accidents. So I think you deal with safety one accident at a time.

Response (Edward Wytkind)

Much of what I said had to do with the quality of the job. Well, the word "virtual" is being used a lot in the 1990s, and there are also virtual transportation companies. To us, the definition of a transportation company is one that is heavily invested in all aspects of the industry, including safety. Unfortunately, when the business of making money requires you to squeeze and cut every place you can, safety can be sacrificed. Investment in new equipment is critical for safe operations. You don't find many examples of established large companies that have been in this business for decades and have been involved in major accidents.

When you talk about safety, you can't ignore two things—the people who operate the equipment for employers and the level of investment in safety, training, human resources, and wages so that you attract the right people who will operate at the best and safest levels.

Question/Comment

The word "security" has also not been mentioned at this conference. Safety and security obviously are linked, but security is a separate issue. The whole issue of how we ensure that our transportation system is secure from terrorist attacks and other threats seems to me to be a rather important one that deserves a little more attention than it has received at this meeting. How do you educate transportation professionals to be sensitive to security issues? Some of you may be familiar with the President's Commission on Critical Infrastructure. Transportation is one of the critical infrastructures that the Commission has been studying.

But the main point that I wanted to make is the following. What I heard this morning really helped me to crystallize some thoughts that I had. It seems to me that the title of the conference was really not wrong but that, in essence, we focused on one dimension of the educational issue: preparing people for particular jobs and particular occupations. Yet education has many roles to play and this is only one role. Another role that we have to play has to do with educational awareness and public education at all levels. We should perhaps pay a little bit more attention to what George Bush called the "vision thing." We talk about intermodalism because we have a transportation system, not only in this country but internationally, that is failing. Certainly we have many strengths. Historically the transportation system has permitted us to achieve economic development. In many ways, our freight system is the envy of the rest of the world. Nevertheless, we are suffering from pollution. We are suffering from congestion. It is impossible to pick up a newspaper these days without finding stories about transportation problems of one kind or another. The question is, What kind of vision do we have for what kind of transportation system?

I would suggest that there is another word that has been missing in the discussions that we've had until now. That word is "ethics." It seems to me that if we're going to talk about transportation, if we're going to talk even at the level of preparing people for transportation positions, we have to be concerned by the ethical dimension. I would suggest that ethics comes at several levels. On one level, you have the individual. Individuals have to be responsible. I would also suggest that at the policy level, questions of ethics are important. You have to worry about equity, social justice, the disadvantaged, the disabled, and so on. Finally, I would suggest that the kind of transportation system we need ought to be an ethical transportation system. By that I mean one that does not pollute, one that is environmentally benign, one that does not waste energy the way that we are wasting energy today, one that is efficient, and one that is accessible and open to all. When Secretary Slater talks about his vision

of the transportation system for the future, he talks about an intermodal one, an efficient one, an intelligent one.

Question/Comment

I want to add one thing on the security issue. Force protection is a significant concern within the U.S. Department of Defense. The Commander of the U.S. Transportation Command does a force protection assessment before every mission. That information is shared with commercial airline partners to let them know if there are risks inherent in any of the areas in which they will be operating. The Military Sealift Command has a similar partnership with ship operators in which force protection training is offered as well as good intelligence on some of the areas into which they will be sailing.

Question/Comment

I want to thank Tay Yoshitani for mentioning and highlighting the role of the environment and the importance of the environmental movement to what we do in transportation. That has been touched on a little bit all throughout the conference, and I hope the point doesn't get lost. If you look around at the people in the room, they are basically transportation people—some from the private sector and a good many educators. It would have been great if we could have had a few more people from the environmental perspective adding their thoughts. It is interesting that when you go to environmental conferences, the room is filled with environmental advocates. If there was one theme from this conference, it is the importance of cross-fertilization and partnerships.

Question/Comment

In our society, image is everything. We get it on television. We get it through movies. We get it in newspapers. Image is what makes or breaks companies. And transportation has not been one to project an image that has attracted students to the field. One of the things that I did as part of the Summer Transportation Intern program was to make sure that the students who come through that program understand the importance of transportation and the image of transportation—getting them excited about being part of the profession, excited about what they do, and excited about coming into the profession and being part of solving the problems of transportation throughout the country. How do we change? How do we project our image? How do we create an image for the transportation industry that will attract students to the

profession—the best and the brightest—so that they can solve the problems that we've been working on most of our careers and haven't finished yet?

Response (Joni Casey)

My predecessor coined the phrase "Intermodalism is the Rodney Dangerfield of transportation—it gets no respect." This statement can probably be expanded to transportation in general. Transportation is taken for granted and is not noticed until there is a failure. I don't know what the magic answer is to getting transportation elevated to a higher level. Once you go through an educational activity and show people the impact of transportation or what would happen if it wasn't occurring, a light bulb goes on and you see a sudden recognition.

Response (Lawrence Dahms)

I have three points to make. One is that I don't agree that transportation has this horrible image that is being presented here. I think that transportation has its problems, as does almost every other function in society, but I'm not sure that transportation is on the low edge despite some of our problems.

Second, to the extent to which we want to project a positive image, intermodalism is not an identifiable, real product. So if we are concerned about perception and projecting to the public, we have to project reality.

The third point is that despite the fact that intermodalism will never be rolling off the tongues of everybody on the street, it still is a legitimate concern of transportation managers. The fact is that there are some very able advocates and spokespersons for the various modes of transportation. What is missing, I believe, is still the leadership of how you tie it all together. You can call it intermodalism. You can call it anything you want to call it. But in any case, the void, it seems to me, is there. So, again, I would repeat what I said at the podium. If you're going to have a good image, you're going to sell a real product. A truck bringing produce is a real product. I'm sure that registered with all of you. But similarly, if you are trying to achieve an objective, you've got to define that objective. There is an objective for intermodalism that has not been well defined at the highest levels, and so there is a lot of confusion. This conference was a good conference in terms of saying that we ought to educate people to be good citizens, to be good truck drivers, maybe to be good truck managers. I still think the point was missed that if there is intermodalism, what is it and what do you have to do about training someone to deal with it?

Question/Comment

I think it is more of a marketing issue than an image problem. If you go to a cocktail party and tell somebody you're a traffic manager, the normal reaction is that they want to tell you about the light that is out of sequence at the local intersection. They simply don't understand. But I don't think that image is the real issue. It is just a lack of education and marketing.

Question/Comment

I have a slightly different perspective on image. I think we try to define a level of image for transportation that is a bit too broad. I think you have to look at it by mode, and within the mode you have to look at each company. I can tell you that within every mode, there are companies that have excellent images, excellent reputations for what they do. There are those that are not in that class. So I think it is just too broad to think in terms of the image of an industry.

Question/Comment

I'd like to ask a question of the panel as a whole regarding their suggestions on measuring the effectiveness of the education process and its outputs. We had some very good remarks on how to measure the effectiveness of training programs, where the skills are taught, and that perhaps is a more accessible form of measuring the return on investment. But with respect to the education process, the outputs and the process itself, from your various perspectives, how would you provide a better focus to the educational programs to permit goal setting as we try to structure those programs so that their content and their outputs are more in sync with the needs of the broader transportation enterprise?

Response (Lawrence Dahms)

I'm not an educator and I haven't the slightest idea how to answer the question. But I do think that the question of education needs to be divided. One part is, What do we need in continuing education or even training to fill gaps? In cases like that, what sorts of things need to be done that are specifically transportation education issues? This is a challenge for this kind of conference and this kind of community. But in the meantime, I don't think we ought to ask transportation or some other function like transportation to make up for the ills of the Department of Education or the education community as a whole. Therefore, transporta-

tion people aren't the right people to answer that question. It would do us well to do our job well and let the education department do its job well and support that department.

When I graduated from school too long ago, it was easy for someone like me to work my way through school because it didn't cost me much. The state paid for my education in California. California was leading the nation, I believe, at that time in terms of supporting education. We're probably, despite our wealth, close to last in the nation now. That is a sad commentary, and it is not one that is going to be made up for by transportation people pretending they are educators.

Response (Joni Casey)

One aspect of the question that was asked is the value that the employer places on the education and how that is reflected in terms of job advancement, continuing education opportunities through tuition reimbursement, and mechanisms that an employer can put in place to encourage education so that it is showing the value to the employer of the education. That might be one approach in terms of measuring the effectiveness.

Response (Michael Meyer)

In engineering education, you get accredited basically every 6 years. The process includes interviews with faculty, employers, students, the School Chair, and a variety of constituencies. The accreditation process at the undergraduate level now has switched from "Do you teach X, Y, and Z?" to "Do you have in place an assessment process that brings in outside ideas and thoughts so that over time there is some sense that you are responding to the market, you are responding to the needs of the community?" It is a very difficult thing to show evidence on paper, but I happen to agree that this shift in focus is appropriate to bring into the university, at least, in a formalized way. We have done surveys of employers, recruiters, alumni, and other educational institutions. We do benchmarking with other universities. This is another model one can use instead of saying, "Do you teach a course on intermodal transportation?" or "Do you teach a course on logistics?" Rather, "Do you have in place a process by which you are listening to people and you are making changes in response?"

Question/Comment

I would like to get back to basics. Intermodalism developed from multimodalism in response to the needs of the

customer in a changing marketplace, both domestically and, more important, globally. You have to understand what the customer needs. I'm talking on the freight side. But we're really talking about the customer who is interested in cost, transit time, on-time delivery, don't lose it, don't break it, and if you're going to stay in business, you have to make a profit. When we're talking about education and training, we have to really focus on the basis of what we're really trying to do, and that is move the freight for the benefit of the customer.

Response (Lana Batts)

The customer wants four things: on-time pickup, on-time delivery, reliable service, and low cost. How do we pick it up on time? How do we deliver it on time? How do we not damage it? And how do we minimize the cost? This is probably why intermodal freight has progressed faster than intermodal passen-

gers because intermodal freight's customers demanded that we figure out how to do that, and intermodal passengers have not. They still want to stay in their car because it gets them there on time and when they want to go.

Question/Comment

We do need to pay attention to fundamentals and to the basics. As an educator, I was absolutely thrilled to go to the Garrett A. Morgan Roundtable because it brought industry, the education community, the government, and professional associations together. What I am hoping to see come out of this conference is some sort of a sense of a synergistic partnership or the possibility of a synergistic partnership. For that reason, I think it is wonderful that transportation does what it does best and that educators do what they do best. We have to find common ground, and this conference is a good way to start.

APPENDIX A

Student Essays

As a means of showcasing one of the innovative transportation education programs that has been implemented at the high school and junior college levels in the Los Angeles area, the Transportation Research Board, with the support of the Federal Highway Administration and the Los Angeles County Metropolitan Transportation Authority (MTA), sponsored a student essay contest open to high school seniors participating in the Transportation Careers Academy Program (TCAP) in the greater Los Angeles area.

The essay topic, selected by the student, reflected what he or she had gained from participation in TCAP and how he or she will apply this experience to future career goals. More than 60 essays were submitted and reviewed by TCAP faculty, who selected 14 finalist es-

says from students representing 4 TCAP high schools. These 14 essays were then reviewed by representatives of the conference steering committee, TRB, and FHWA.

Two winners, Ana Martinez and Maalik Russell, both students at North Hollywood High School, were flown to Washington, D.C., to participate in the conference, accompanied by staff from the Los Angeles County MTA. Ana and Maalik read their essays at a dinner on the evening of Sunday, November 2, and were awarded certificates by Mortimer L. Downey, Deputy Secretary of the U.S. Department of Transportation. On Monday, November 3, the students had the opportunity to meet with Secretary of Transportation Rodney E. Slater.

The full text of their winning essays is presented here, with brief biographical sketches of the students.

School-to-Career Experience

Ana Martinez, *North Hollywood High School Transportation Careers Academy*

The Transportation Careers Academy Program (TCAP) is a special, academically challenging program offered to students at North Hollywood High School. Rules and regulations are established requiring each student to meet these standards in order to qualify for the program. TCAP offers its students a great variety of challenging classes that not only prepare you for college, but also help you establish your future career goals. Computer literacy, school-to-career opportunities, and an emphasis on teamwork are three main focuses of TCAP that help you explore and discover not only what you are capable of accomplishing, but also how you can put your skills to use in the real world.

The image of how computers are used in this program is the main reason why I was attracted to TCAP. Unexpectedly, I discovered through my time in the program that behind that computer screen that first attracted me exists a whole new world filled with knowledge and wonderful experiences that can be attained through hard work, dedication, and the skilled help of your teachers. The programs these computers have to offer, such as WordPerfect, PowerPoint, Grolier's Encyclopedia, and many more, are of great help to us in our school work. Teachers expect reports to be creative, typed and formatted correctly, spell-checked, and so on. PowerPoint presentations are also a major part of our school work. This gives us a chance to research the program and apply it to our school work efficiently. Computer work is mandated by teachers in all our class work. Computer programs are well taught to students, and students can then operate effectively with them in the real world.

School-to-career opportunity is something not often offered to many high school students. TCAP, on the other hand, focuses on preparing its students with the right kind of knowledge and the right kind of attitude that is expected of us in the real world. I, for one, had the opportunity to practice these skills when I worked for Engineering Management Consultants (EMC) this past summer. From the beginning, the employers expected their employees to be responsible, self-controlled, and reliable, and to act like adults, not like ordinary high school students. Strong job performance was expected of me, and through the skills I acquired at TCAP, I was successful. I found my time at EMC to be very rewarding and fulfilling. I was able to perform as well as any regular employee at this company. My qualifications were up to their expectations and standards. Through TCAP and EMC, I have been able to build character and set personal goals.

One of the experiences that TCAP offers is guidance on how teamwork should be established. Everything you do requires good communication skills and the ability to work well as a member of a team. Teamwork is emphasized through the teachers in all of their classwork as well as homework. We are taught to form groups, generate new ideas, demonstrate understanding, adaptability, empathy, and politeness in group settings. Contributing to work efforts has taught me to work toward agreements involving exchange of resources and to resolve problems together in unity. This, too, was of great help for me at EMC because most of the work required in the real world demands a second opinion and feedback from others.

Above all, TCAP has helped me become a whole new person. My self-esteem has risen and I feel very well-qualified to achieve all of my personal goals. I have grown inside, and, thanks to the many techniques taught to me by TCAP, I am capable of achieving all my dreams. It has helped me prepare for future career choices and

has given me a positive outlook for my future. Any student privileged enough to be a part of a special academic program is a person with great worth and will make a lasting contribution to the world.

The world is waiting for us to start a whole new generation—why not do it with a good education?

Ana Martinez is a senior at North Hollywood High School Transportation Careers Academy. She has been involved with the Academy since 1996. Last summer, as part of the Academy's summer internship program, she worked with Engineering Management Consultants, a major contractor with the Los Angeles County Metropolitan Transportation Authority.

Ana was born in El Salvador, and today is active in her high school, church, and community. At school she is enrolled in honors classes and advanced placement classes. She is a member of her church youth group and volunteers at a local elementary school.

When Ana graduates in June 1998, she plans to attend a 4-year university and study to become an elementary school teacher.

School-to-Career Experience

Maalik Na'eem Russell, *North Hollywood High School Transportation Careers Academy*

The advantages of a direct connection between school and the work environment, which the Transportation Careers Academy provides for its students, I believe, is one of the most exciting and valuable experiences a student could receive in high school. Not only is it good to put on a resume that you had a job that a teenager would not usually get over the summer, but it builds character. I think this is the most valuable thing I got out of my summer internship. Some of the characteristic traits that I gained from the summer work program include a higher sense of responsibility for my actions, what integrity really means and how I can learn to use it to my advantage, and a heightened sense of self-esteem.

Waking up early in the morning for work is not something that I enjoy doing, especially during summer break. However, when that first day of work came, I was up and out the door long before it was time to go. I arrived at work on time and very nervous. I was scared that I would mess up on the first day or get into some kind of trouble. Many of the other student interns I talked to felt the same way. That made me feel a lot better.

When I arrived at my work location, the secretary took me around and introduced me to everyone. I went through orientation and was given a task to perform. The task was pasting pictures and copying down information about them onto a sheet of paper. This was a very simple task, so I was really happy about that. To complete it, however, would be a different story. This was the job that nobody in the office had time to do, so the backlog was enormous. The inspectors used about two rolls of film a week taking pictures of the subway

system they were building. We were about two years behind in organizing them.

After two straight weeks of doing this same repetitive job, it started to get boring and slightly annoying. I started to look for ways of getting out of doing it. In my mind, I wondered why I had to keep doing the same thing over and over again when there were so many other things that I could have done that were much more enjoyable. Finally, I talked to one of the inspectors about how boring my job really was. As a result I found out how important that job was to the MTA.

The inspectors take pictures so when the contractor makes false claims about delays or a damaged part of the subway, they have visual proof to deny almost all of the false claims. Usually these claims go to court and can possibly cost millions of dollars. Immediately, I reevaluated my thoughts and took on a different attitude toward the job they had given me. Knowing that I was responsible for organizing something that could save that much money reminded me of two things. They asked me to do it because it was important, and I was responsible for completing it. Knowing that I was responsible for completing this task raised my self-esteem to a new peak. I made it my personal goal to complete the job successfully. I started to feel good about getting up early in the morning and going to work.

After completing the pictures, I was asked to do something a lot better. They had me updating drawings that the inspectors would use in the field after changes were made. It was extremely hard to understand at first, but I had the positive attitude that I had learned from the previous task and did my best. Just by using my sense of

right and wrong and taking the initiative instead of waiting for people to tell me what to do, I think I earned more respect in the office than I had previously had. People in the office had more confidence in me and trusted me with more important jobs to do.

From my experience at TCAP and my summer experience, I can say that I not only learned a lot, but also had fun. The things I learned from my summer job I can definitely use at school and at my future workplace.

Maalik Russell is a senior at North Hollywood High School Transportation Careers Academy and has been enrolled in the Academy since 1996. This past summer, Maalik spent his summer internship with Parsons-Dillingham, a subway construction contractor.

Maalik is involved in a number of extracurricular activities, both in and out of school. At school he is in band, Civil Air Patrol (USAF Auxiliary), and airframe and power plant mechanics classes. His hobbies include radio-controlled airplanes, computers, and ham radio. When not in school, Maalik is the disc jockey for the youth group in his church. In the Civil Air Patrol, he is the Cadet Deputy Commander, and is in charge of the training of new cadets.

After high school, Maalik plans to enlist in the Air Force or become a warrant officer in the Army, piloting helicopters. His long-range career goal is to become a commercial airline pilot.

APPENDIX B

Poster Displays and Exhibits

An important component of the conference was the poster displays and demonstrations, which highlighted a broad range of programs designed to meet a variety of transportation education and training needs and situations. There were 24 displays wherein schools, colleges, universities, public agencies, private-sector companies, and professional groups provided information and material on the content, scope, and objectives of their particular intermodal transportation education and training program or initiative. Each display was staffed by an individual (in some cases, a student) who responded to questions and interacted with attendees. The following are brief descriptions of the programs and initiatives included.

1. Joint Programs Office, U.S. Department of Transportation, and ITS America Professional Capacity Building Program for ITS Deployment

This program was developed in response to concerns about all the transportation technology currently being developed and deployed. Although the technology will have a positive impact on transportation operations, it is also going to require entirely new sets of skills and a new kind of transportation professional. This program was established to develop and deliver educational and training initiatives for all levels of higher education to train technicians to work with the new technologies, to design them, and to get them into production.

Contacts: Thomas F. Humphrey, Donna C. Nelson

2. Minnesota Department of Transportation Office of Workforce Equity and Diversity SEEDS Program

SEEDS is a student worker program in the Minnesota DOT that offers highly motivated racial or ethnic minority and economically disadvantaged students the opportunity to grow through on-the-job training. The students must meet certain academic achievement requirements and be preparing for a career that matches MnDOT's workforce needs. Participants in the SEEDS Program include college, technical, and vocational students, some of whom have left welfare and become permanent employees of MnDOT. Jobs range from clerk typist to information systems coordinator to graduate engineer. The program is coordinated with other special programs, specifically the Graduate Engineer Rotation Program and the TRAC program.

Contacts: Linda Dahlen, Emeric Pratt

3. Jefferson County School to Career Partnership Tech Prep Logistics and Transportation Consortium

With grant funding, the partnership identified the competencies and skills needed to enter the logistics field and developed a three-tier curriculum and program for students to master these skills. Students who complete the 18-week sequence are eligible to take a high school level industry professional examination and be certified by

the industry. The program has also developed an associate degree program at the community college level and a B.S. degree in business with emphasis in transportation and logistics at the university level. An internship program has been developed to help teachers and students learn about transportation and logistics careers at first hand and to apply their classroom knowledge. The goal is to develop an active partnership among educators, students, and industry to implement an integrated and articulated education program that leads to opportunities in the transportation and logistics industry.

Contacts: Rand Coolman, Linda Harrison

4. Northwestern University Transportation Center

The Transportation Center is a leading interdisciplinary education and research institution dedicated to the long-term improvement of domestic and international transportation and distribution systems. Founded in 1954, the Center's goals are to improve the understanding of transportation issues; engage in basic and applied research, often in direct collaboration with industry; train graduate students for careers in business, government, and academia; provide a series of continuing education programs for transportation and logistics professionals; and disseminate transportation knowledge through conferences and publications.

Contacts: Edward Czepiel, Aaron Gellman

5. Francis L. Cardozo Senior High School TransTech Academy Program

TransTech Academy was established in 1991 as the first transportation studies academy in the Washington, D.C., metropolitan area and is designed to provide high school students with a well-rounded academic and technological program that will expose them to opportunities in the field of transportation. The goal of the program is to bridge the gap between the classroom and the workplace by enabling students to learn about and work in various areas of the transportation industry through field trips, internships, mentoring, a summer work program, and college visitations.

Contact: Shirley McCall

6. Reach for Tomorrow

RFT is a program that both educates and motivates students early enough in their academic careers to

enable and empower them to set and achieve attainable goals. The RFT Summer Program targets rising high school freshmen who have the skills to be successful but are not applying them in their daily lives. Students are taken to one of three military academies to live and work with cadets and midshipmen for one week to expose them to future educational and career opportunities attainable through education and skills training in areas such as transportation and telecommunications.

Contact: Peter Underwood

7. FHWA, U.S. Department of Transportation, Garrett A. Morgan Technology and Transportation Futures Program

This program is a new national education initiative built on partnerships between and within the transportation and education communities. The goals of the program are to help educators integrate transportation components into the curriculum, particularly for math and science; to identify and support collaborative efforts with community and junior colleges, technical schools, and the private sector to provide a technologically skilled transportation workforce; to increase the availability of and enrollment in multidisciplinary transportation degree programs; and to build bridges from school to work in transportation-related fields.

Contact: Kelley S. Coyner

7A. Office of Intermodalism, U.S. Department of Transportation, Garrett A. Morgan Website

The Garrett A. Morgan program will soon launch a website as an informative and effective education aid, with links to other material on a variety of transportation industry and education community sites. The website is designed to provide information to increase awareness of transportation careers; educational support and enrichment in the areas of math, science, and technology; and a medium to facilitate partnership efforts and accomplishments.

Contact: Alexander Landsburg

8. U.S. Merchant Marine Academy Logistics and Intermodal Transportation Program and Continuing Education

The USMMA provides comprehensive education and training in intermodal transportation at both undergraduate and continuing education levels. The undergraduate program is currently expanding to include a new academic major and numerous ancillary programs, and aims to graduate future leaders of the nation's intermodal transportation system. The continuing education program offers an array of professional courses, seminars, and conferences in logistics and intermodalism for transportation professionals.

Contacts: Ryan Galloway, Brian T. Holden, Jon S. Helmick, Christopher J. McMahon, Gerhardt Muller, Ronald Riley

9. University of Maryland College of Business and Management

The college offers an undergraduate logistics and transportation major, an M.B.A. concentration in the area of logistics and transportation, and both a major and a minor in logistics and transportation at the doctoral level. The goal of the program is to provide a high-quality education as well as research and service to the transportation industry.

Contacts: Tom Corsi, Curt Grimm, Hugh Turner

10. University of Arkansas Mack Blackwell National Rural Transportation Center

The goals of the program are to improve life in rural America through improvements in transportation and to encourage students to enter the transportation field as a career. The program offers an M.S. in transportation engineering combined with real-time research studies for trucking companies, waterways, railroads, and other transportation-related interests.

Contact: Jack Buffington

11. Pennsylvania State University Department of Business Logistics

The department offers undergraduate and graduate programs in logistics and interdisciplinary graduate degree programs in transportation industry education and training. The goal is to provide the highest-quality logistics education using a variety of delivery methods to a

broad customer base including university students and industry personnel. The department is affiliated with the Penn State Center for Logistics Research, which has 25 corporate sponsors.

Contacts: David Petrillo, Evelyn Thomchick

12. American Society of Transportation & Logistics

AST&L offers certification in transportation and logistics, correspondence courses, scholarships, and hazardous materials training programs. Its goals are to establish, promote, and maintain high standards of knowledge and professional training; to formulate a code of ethics for the profession; to advance the professional interests of members of the organization; to serve as a source of information and guidance for the fields of traffic and transportation, logistics, and physical distribution management; and to serve the industry as a whole by fostering professional accomplishments.

Contacts: Timothy J. Janowiak, Evelyn Thomchick

13. Los Angeles County Metropolitan Transportation Authority Career Development and Training Center

The Transportation Careers Academy Program (TCAP) is a "school within a school" sponsored by the Los Angeles County MTA in cooperation with the Los Angeles and Norwalk/LaMirada Unified School Districts. Five TCAP academies located on five high school campuses accommodate over 750 students. Four colleges in the Los Angeles Community College District offer certificate and associate degree programs that allow students to continue their studies in transportation-related fields. The ongoing industry-education partnership creates opportunities and learning environments for students to understand the relevance of career goals and job preparation.

Contacts: Arthur Gomez, Benita L. Horn, Holly Johnston, Maria Morales, Beatrice Lee, Naomi Nightingale

14. University of Virginia School of Engineering and Applied Science

Since the 1940s, the transportation program at the University of Virginia has served as a major resource for transportation training and research. It is an interdisciplinary effort, with programs in education, research, and technology transfer. The objective is to organize and

promote the program to advance the intermodal transportation system through innovation in design, management, and technology. The program offers undergraduate and graduate degrees and includes the Virginia Transportation Research Council among its industry partners.

Contacts: Nicholas Garber, Lester Hoel

15. Georgia Transportation Institute

The Georgia Transportation Institute represents 30 universities and colleges in the state of Georgia with research and teaching interests in transportation. The program includes extensive continuing education opportunities, distance learning, internships, certificates, and academic degrees. Government and corporate sponsors participate in a wide variety of activities that provide internship exposure to intermodal transportation issues.

Contact: Michael D. Meyer

16. University of Denver Intermodal Transportation Institute

ITI is concerned with the development of a sustainable intermodal transportation system in which rail, water, highway, air, and transit networks are integrated. Faculty expertise and research units include the Denver Research Institute, which houses a remote-sensing laboratory. ITI is developing innovative, interdisciplinary degree, certificate, and professional development programs in intermodal transportation studies that include opportunities for specialization in the university's professional schools.

Contact: Joseph Szyliowicz

17. University of Tennessee Southeastern Transportation Center Program

The University Center has developed programs with a multidisciplinary (business and engineering) intermodal transportation emphasis for undergraduate and graduate students. The program, which aims to graduate students qualified to pursue both employment and research opportunities in intermodal transportation, includes internships, tours of intermodal facilities, lectures by intermodal industry leaders, and participation in major intermodal events such as the International Intermodal Expo.

Contact: Zach G. Zacharia

18. Information from Various Agencies and Institutions

19. Mountain-Plains Consortium (Colorado State University, North Dakota State University, Utah State University, University of Washington)

The four MPC universities sponsor a cooperative graduate education program that features an exchange of graduate courses among universities and a nonresident program for state transportation department personnel. The program is multimodal and multidisciplinary in nature and features courses in rural public transportation, freight transportation, logistics, and administration, plus a wide range of courses in transportation engineering. The goals are to attract qualified individuals to the transportation field and equip them with multidisciplinary problem-solving skills; to enhance the skills and knowledge base of current transportation practitioners regarding changing industry issues, practices, and technology; to supply transportation companies and businesses with skilled logisticians and freight transportation specialists; and to foster the exchange of ideas among students from different disciplines and with different transportation career objectives.

Contacts: Shawn Birst, Lance Schulz, Denver Tolliver

20. University of Washington Global Trade, Transportation, and Logistics Studies Program

The university offers a wide-ranging and interdisciplinary Graduate Option Program that is overseen by an interdisciplinary committee whose members are drawn from the university and private and public sectors. GTTL works with leaders in business and government organizations to determine their needs for trained people coming out of the university and, in turn, works to develop internships and jobs for graduate students in the option program. The aim of the program is to enable graduate students to augment their degree studies in preparation for careers in trade, transportation, and logistics. There are 14 colleges, departments, and schools within the university whose students are eligible to participate in the program.

Contact: Jess J. Browning

21. Georgia Southern University Southern Center for Logistics and Intermodal Transportation

This program, established in 1992, prepares students for careers with shipper and carrier organizations. It offers an undergraduate bachelor's degree in business administration with a major in logistics and intermodal transportation. Public- and private-sector partners in this program include the Georgia Freight Bureau and the Georgia Ports Authority.

Contact: Brian J. Gibson

22. Rutgers University National Transit Institute

NTI was created by ISTEA to provide education and training for professionals in the U.S. transit industry. It provides continuing education in the areas of multimodal transportation planning, advanced technologies and innovative practices, management development, and professional development for trainers.

Contact: Stephan Parker

23. Dowling College School of Aviation and Transportation National Aviation and Transportation Center

Dowling College and the NAT Center are dedicated to providing leadership in educating intermodal transportation specialists to fill the human resource needs of air, ground, rail, space, and maritime industries. A key element of the program is partnership agreements between business, industry, and educational institutions. Students can pursue B.S. and M.B.A. degrees, as well as participate in applied and technical associate degree programs, including retraining of students interested in making career changes into aviation and transportation.

Contacts: Jeannine Abbinanti, Carl Berkowitz, Anthony Libertella, Brigitte Miranda

24. New Jersey Institute of Technology Institute for Transportation

NJIT's multidisciplinary program offers designated M.S. and Ph.D. degrees in transportation as well as specialized training. Programmatic research and technology transfer activities are administered by the Institute for Transportation. The goal is to provide opportunities for graduate studies and research in transportation.

Contacts: Sarah O'Malley, Louis Pignataro

Steering Committee

Biographical Information

Michael D. Meyer, *Chairman*, is Professor of Civil and Environmental Engineering, Director of the Transportation Research and Education Center, and Chair of the School of Civil and Environmental Engineering at the Georgia Institute of Technology. From 1983 to 1988, Dr. Meyer was Director of Transportation Planning and Development for Massachusetts, where he was responsible for statewide planning, project development, traffic engineering, and transportation research. Before that, he was a professor in the Department of Civil Engineering at Massachusetts Institute of Technology (MIT). The author of more than 120 technical articles, Dr. Meyer has also authored or coauthored numerous texts on transportation planning and policy, including a college textbook on urban transportation planning. He is an active member of numerous professional organizations and has chaired committees relating to public transportation, transportation planning, environmental impact analysis, transportation policy, transportation education, and intermodal transportation. Dr. Meyer has consulted with many transportation organizations and has been involved with numerous expert review panels that have advised state and local officials on the most cost-effective investment in transportation. He has participated in many international transportation research and education programs. Dr. Meyer has a B.S. in civil engineering from the University of Wisconsin, an M.S. in civil engineering from Northwestern University, and a Ph.D. in civil engineering from MIT. He is a registered professional engineer in the state of Georgia.

Sarah C. Campbell is a partner at TransManagement, Inc. She has more than 20 years of professional experience in the transportation field and has worked at all levels of government. Ms. Campbell's career has included directing capital budget development, establishing broad participation in urban planning programs, as well as analyzing national and local policies for transportation planning and capital programs. Before joining TransManagement, she served as a founding director of the Surface Transportation Policy Project, a public-interest coalition that united a broad range of transportation, environmental, design, business, and planning interests on national transportation policy issues for the first time. In this capacity, she developed several policy proposals that were incorporated into the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). She has also held a number of positions in transportation in the public sector throughout her career. Ms. Campbell has a B.A. from the University of Texas and an M.P.A. from the Lyndon B. Johnson School of Public Affairs at the University of Texas.

Dennis Gay has worked in the training and education area for more than 20 years in public, private, and government sectors. Currently, he is the director of human resources development at Sea-Land Services, an ocean container shipping firm that is part of the CSX transportation family. As director, he leads the design and implementation of global training and employee development initiatives. Mr. Gay has presented at various national technology and education conferences including the Computer Dealer Exposition (COMDEX), the Inter-

national Society for Performance and Instruction, the Computer-Based Training Conference, and those of various other transportation groups. He founded the Railroad Multimedia Training Consortium and serves as a board member for StarLight Systems in the Silicon Valley. Graduating from Indiana University with bachelor's and master's degrees in education, Mr. Gay has worked both domestically and internationally as a specialist in technology-based applications.

Aaron J. Gellman is Director of the Transportation Center at Northwestern University, a position he assumed in January 1992. He is also Professor of Management and Strategy at the J.L. Kellogg Graduate School of Management and Professor of Industrial Engineering at the Robert R. McCormick School of Engineering and Applied Science, both at Northwestern. Dr. Gellman is the founder and former President of Gellman Research Associates, Inc. (GRA), with more than 20 years of experience in consulting. He has published many articles on transportation economics and policy, research and development, the regulation of transportation, and the management and utilization of research and technology. He served for 24 years as an Adjunct Professor at the University of Pennsylvania, offering graduate courses in transportation and in the management and utilization of technology. Dr. Gellman received a B.A. in economics from the University of Virginia, an M.B.A. in transportation from the University of Chicago, and a Ph.D. in economics from MIT.

Arthur B. Goodwin has had a 28-year career with the City and the Port of Los Angeles, dealing in all facets of transportation planning and project development with a particular emphasis on intermodal freight movement. He worked on the initial outer harbor dredging project, which created an additional 190 acres of new land known as Pier 300 and deepened the main channel to (45 mean lower low water (MLLW)), thereby enabling fully loaded post-Panamax container vessels to dock at any location in the Port of Los Angeles. He also was assigned the task of developing a rail intermodal container transfer facility (ICTF), which opened in 1986, wherein marine containers could be transferred from truck to railcar closer to the port. He assumed the position of Project Manager for the Alameda Corridor Project, which has heightened awareness of port landside access issues, particularly as they relate to international trade movements and the interconnectivity of all transportation modes. Mr. Goodwin holds a degree in civil engineering and a master's of public administration from California State University at Long Beach. In 1998 he will assume chairmanship of the TRB Committee on Intermodal Freight Terminal Design and Operations.

Lester A. Hoel is Hamilton Professor of Civil Engineering at the University of Virginia. His research interests include both highway and urban transportation systems, and he has coauthored widely used textbooks on public transportation and traffic engineering. He has served on task forces on intermodal transfer facilities and multimodal transportation planning. Dr. Hoel chaired the TRB Executive Committee, the TRB Committee on Transportation Education and Training, and the TRB/NRC Study Committee for the Transportation Professional Needs Study. Dr. Hoel is a member of the National Academy of Engineering.

Mary Collins Holcomb is Assistant Professor of Logistics and Transportation at the University of Tennessee. Her research interests focus on design of networks and systems for efficient and effective flow of materials and products and service measurement methodologies. Her career includes work at the Oak Ridge National Laboratory, the U.S. Department of Transportation, the U.S. Department of Defense, and the Burlington Northern Railroad. Dr. Holcomb's experience combines expertise in logistics, transportation, and education.

Robert Kochanowski is Executive Director of the Southwestern Pennsylvania Regional Planning Commission (SPRPC), the metropolitan planning organization for Pittsburgh. He received a graduate certificate in traffic engineering from the Yale Bureau of Highway Traffic. He has been a member of the TRB Executive Committee and is a member of the Port of Pittsburgh Commission, the Pennsylvania Rail Freight Advisory Committee, and the Transportation Committee of the Greater Pittsburgh Development Commission. Under his leadership, the SPRPC has become a national leader in passenger and freight intermodal planning.

Louis J. Pignataro is Executive Director of the Institute for Transportation at the New Jersey Institute of Technology (NJIT). He is recognized as one of the nation's leading educators and researchers in transportation. Before joining the faculty at NJIT as a Distinguished Professor, he was Chaired Professor of Transportation Engineering and Associate Director of the Institute for Transportation Systems at the City College of New York and headed the Department of Transportation Planning and Engineering and was Director of the Transportation Training and Research Center, which he founded at the Polytechnic Institute of New York. Dr. Pignataro has contributed numerous papers to the field of transportation planning and engineering, which have been published in various periodicals and journals. He is past Chairman of TRB's Committee on Transportation Education and Training.

Roger L. Schrantz is the former administrator of the Division of Planning and Budget for the Wisconsin Department of Transportation and former chair of the AASHTO Standing Committee on Planning. He has served as Reauthorization Manager for the Wisconsin Department of Transportation (DOT) and served on the TRB Committee on Statewide Multimodal Transportation Planning. While an administrator at the Wisconsin DOT, he was responsible for planning and implementation of TransLinks, a major statewide intermodal program.

Carl J. Seiberlich is an independent consultant, who formerly was director of military programs for American President Lines. He was an Admiral in the U.S. Navy and Deputy Chief of Personnel for the Naval Military Personnel Command. He cochaired TRB's Intermodal Transportation Task Force and has been a member of TRB's Committee on Ports and Channels and the TRB/NRC Steering Committee for a Conference on Setting an Intermodal Transportation Research Framework. Mr. Seiberlich combines current knowledge of intermodal shipping issues with expertise in integrated information systems.

M. John Vickerman is a Principal of VZM/TranSystems Corporation, an engineering architectural firm specializing in the planning and design of marine and intermodal transportation facilities. Under his leadership, TranSystems has become a nationally and internationally recognized firm known for providing innovative solutions to the many operational, planning, and design issues that currently confront the transportation industry.

Mr. Vickerman has been involved in projects for a broad range of both public- and private-sector clients worldwide. He served as Chairman of TRB's Committee on Intermodal Freight Terminal Design and Operations and is also a member of the Committee on Ports and Channels. He holds a B.S. in architectural engineering from California Polytechnic State University and an M.S. in structural engineering from the University of California at Berkeley. He holds engineering or architectural registrations in 12 states.

E. Cameron Williams holds the Tecklenburg Endowed Professorship in Intermodal Transportation and is Director of the Paul T. Nelson Intermodal Transportation Program at the University/College of Charleston, South Carolina. His research interests lie in the area of international ocean shipping and maritime trade, with a current focus on maritime safety issues, and he is the author of numerous articles, papers, and monographs. He is a former professional marine and is a licensed Master of ocean-going vessels of up to 1,600 gross tons, as well as Second Mate of ocean-going vessels of any tonnage. He retired from the Naval Reserve with the rank of Captain after a 28-year reserve career that included two command tours; his decorations include the Merchant Marine Vietnam Service Medal and a Navy Commendation Medal. He has taught at Georgia Southern University and the U.S. Merchant Marine Academy. A native of Alabama, he graduated from the U.S. Merchant Marine Academy with a B.S. in marine transportation and earned his doctorate at the University of North Carolina at Chapel Hill.

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Abbreviations and Acronyms

Advanced Transportation Industry Consortium (ATIC)	intermodal container transfer facility (ICTF)
advanced transportation systems (ATS)	joint application development (JAD)
Air Force Institute of Technology (AFIT)	Joint Mobility Control Group (JMCG)
American Production and Inventory Control Society (APICS)	management information system (MIS)
American Public Transit Association (APTA)	Maritime Administration (MARAD)
American Society of Transportation & Logistics (AST&L)	Metropolitan Atlanta Regional Transportation Authority (MARTA)
American Trucking Associations (ATA)	Metropolitan Transportation Authority (MTA)
automated equipment identification (AEI)	Minnesota Department of Transportation (MnDOT)
Burlington Northern and Santa Fe Railway (BNSF)	National Association of Purchasing Management (NAPM)
California Advanced Transportation Training Alliance (CalSkills)	National Center for Transportation and Industrial Productivity (NCTIP)
California Department of Transportation (CalTrans)	National Customs Brokers and Forwarders Association of America (NCBFAA)
Center for Transportation Training, Education, and Research (CTTER)	National Highway Institute (NHI)
commercial vehicle operation (CVO)	National Industrial Transportation League (NITL)
Computer Dealer Exposition (COMDEX)	National Technological University (NTU)
computer-assisted drafting and design (CADD)	New Jersey Institute of Technology (NJIT)
continuous process improvement (CPI)	Opportunities Industrialization Center (OIC)
Council for Logistics Management (CLM)	Professional Truck Driver Institute of America (PTDIA)
Defense Transportation System (DTS)	Reach for Tomorrow (RFT)
disadvantaged business enterprise (DBE)	Society of Logistics Engineers (SOLE)
electronic data interchange (EDI)	Software Engineering Institute's capability maturity model (SEI CMM)
Global Trade, Transportation, and Logistics (GTTL)	Southern California Association of Governments (SCAG)
global transportation network (GTN)	Southwestern Pennsylvania Regional Planning Commission (SPRPC)
Hispanic-serving institution (HSI)	Summer Transportation Intern Program for Diverse Groups (STIPDG)
historically black colleges and universities (HBCUs)	total asset visibility (TAV)
in-transit visibility (ITV)	
Institute for Transportation (IT)	
integrated product teams (IPTs)	
intelligent transportation systems (ITS)	
Intermodal Association of North America (IANA)	

Transportation and Civil Engineering Careers (TRAC)
program

Transportation Careers Academy Program (TCAP)

Transportation Intermediaries Association (TIA)

Transportation Occupations Program (TOP)

Transportation Research Forum (TRF)

Transportation Teaching Institute (TTI)

Truckload Carriers Association (TCA)

U.S. Department of Transportation (DOT)

U.S. Merchant Marine Academy (USMMA)

U.S. Transportation Command (USTRANSCOM)

United Parcel Service (UPS)

The **Transportation Research Board** is a unit of the National Research Council, which serves the National Academy of Sciences and the National Academy of Engineering. The Board's mission is to promote innovation and progress in transportation by stimulating and conducting research, facilitating the dissemination of information, and encouraging the implementation of research results. The Board's varied activities annually draw on approximately 4,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest. The program is supported by state transportation departments, federal agencies including the component administrations of the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation.

The National Academy of Sciences is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. Upon the authority of the charter granted to it by the Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters. Dr. Bruce M. Alberts is president of the National Academy of Sciences.

The National Academy of Engineering was established in 1964, under the charter of the National Academy of Sciences, as a parallel organization of outstanding engineers. It is autonomous in its administration and in the selection of its members, sharing with the National Academy of Sciences the responsibility for advising the federal government. The National Academy of Engineering also sponsors engineering programs aimed at meeting national needs, encourages education and research, and recognizes the superior achievements of engineers. Dr. William A. Wulf is president of the National Academy of Engineering.

The Institute of Medicine was established in 1970 by the National Academy of Sciences to secure the services of eminent members of appropriate professions in the examination of policy matters pertaining to the health of the public. The Institute acts under the responsibility given to the National Academy of Sciences by its congressional charter to be an adviser to the federal government and, upon its own initiative, to identify issues of medical care, research, and education. Dr. Kenneth I. Shine is president of the Institute of Medicine.

The National Research Council was organized by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purpose of furthering knowledge and advising the federal government. Functioning in accordance with general policies determined by the Academy, the Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in providing services to the government, the public, and the scientific and engineering communities. The Council is administered jointly by both the Academies and the Institute of Medicine. Dr. Bruce M. Alberts and Dr. William A. Wulf are chairman and vice chairman, respectively, of the National Research Council.

Abbreviations used without definitions in TRB publications:

AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
IEEE	Institute of Electrical and Electronics Engineers
ITE	Institute of Transportation Engineers
NCHRP	National Cooperative Highway Research Program
NCTRP	National Cooperative Transit Research and Development Program
NHTSA	National Highway Traffic Safety Administration
SAE	Society of Automotive Engineers
TCRP	Transit Cooperative Research Program
TRB	Transportation Research Board
U.S.DOT	United States Department of Transportation

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