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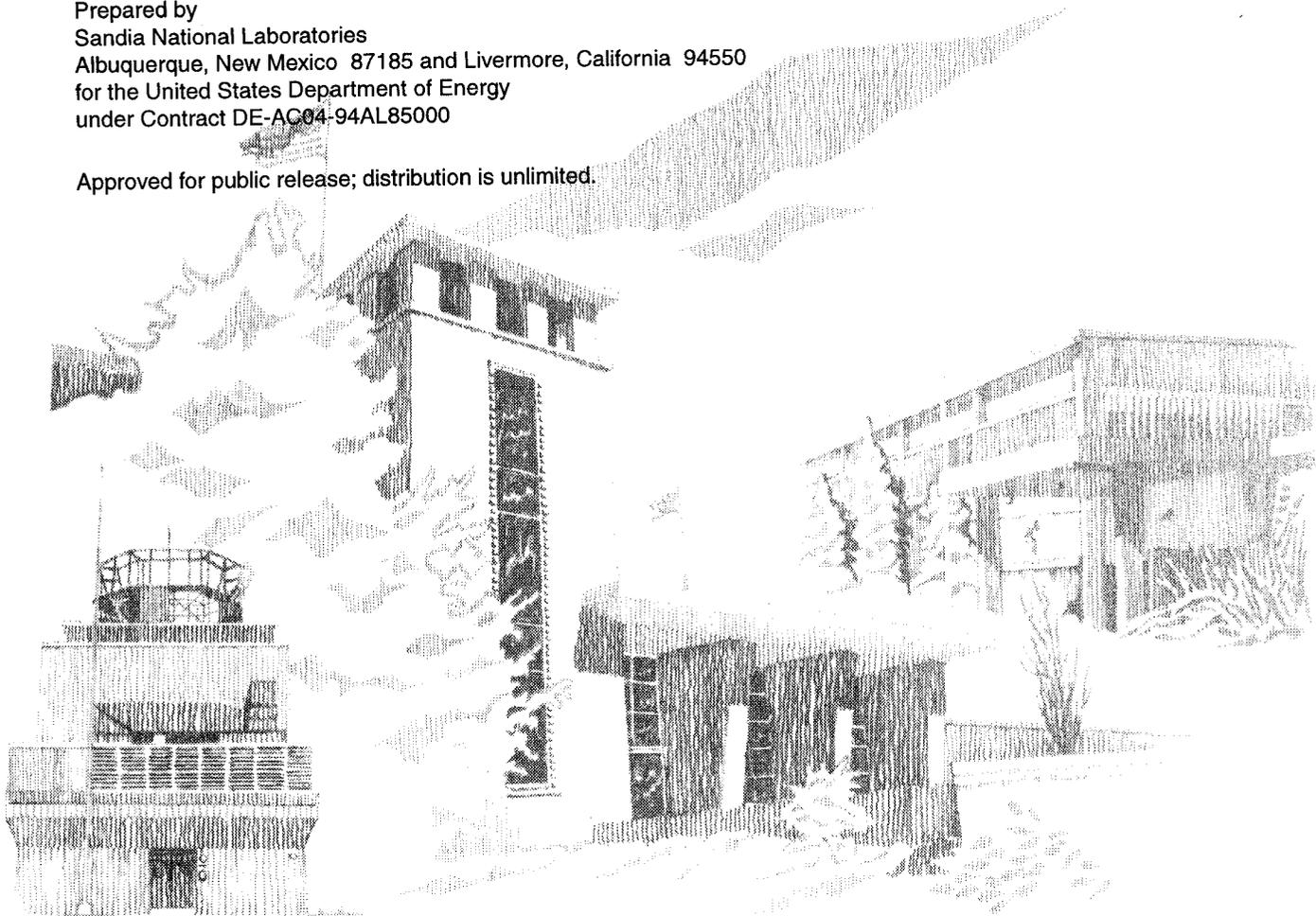
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Stakeholder Identification of Advanced Technology Opportunities at International Ports of Entry

Stephen K. Parker, Larry Icerman

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Stakeholder Identification of Advanced Technology Opportunities at International Ports of Entry

Report Prepared for the Advanced Technologies for International and Intermodal Ports of Entry Project

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ABSTRACT

As part of the Advanced Technologies for International and Intermodal Ports of Entry (ATIPE) Project, a diverse group of stakeholders was engaged to help identify problems experienced at inland international border crossings, particularly those at the U.S.-Mexican border. The fundamental issue at international ports of entry is reducing transit time through the required documentation and inspection processes. Examples of other issues or problems, typically manifested as time delays at border crossings, repeatedly mentioned by stakeholders include: (1) lack of document standardization; (2) failure to standardize inspection processes; (3) inadequate information and communications systems; (4) manual fee and tariff collection; (5) inconsistency of processes and procedures; and (6) suboptimal cooperation among governmental agencies. Most of these issues can be addressed to some extent by the development of advanced technologies with the objective of allowing ports of entry to become more efficient while being more effective. Three categories of technologies were unambiguously of high priority to port of entry stakeholders: (1) automated documentation; (2) systems integration; and (3) vehicle and cargo tracking. Together, these technologies represent many of the technical components necessary for pre-clearance of freight approaching international ports of entry. Integration of vehicle and cargo tracking systems with port of entry information and communications systems, as well as existing industry legacy systems, should further enable border crossings to be accomplished consistently with optimal processing times.

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Laura Kesselman-Jones and her staff at Kesselman-Jones, Inc. assisted in the preparation and distribution of the industry questionnaires forming the basis of the analysis contained in Section V. Kathleen Diegert of Sandia National Laboratories performed the statistical analysis of the data obtained by the industry surveys.

The New Mexico State Highway and Transportation Department generously made the written records of the interviews with representatives of U.S. and Mexican manufacturers and transportation services firms conducted by the Camino Real Intermodal Center project available to us. The information contained in Section VI is based entirely on those interviews.

We benefitted greatly from guidance provided by Brad Godfrey and Steve Roehrig of the Advanced Technologies for International and Intermodal Ports of Entry (ATIPE) Project. David Albright and John Wagner of the Alliance for Transportation Research were especially helpful on a number of occasions.

The ATIPE Project is sponsored by the Federal Highway Administration and the State of New Mexico. Senator Pete Domenici was instrumental in articulating the vision of and acquiring funds for the ATIPE Project. Without their support, this work would not have been possible.

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EXECUTIVE SUMMARY

As part of the Advanced Technologies for International and Intermodal Ports of Entry (ATIPE) Project to investigate and develop advanced technologies capable of expediting freight movement across U.S. borders and promoting cooperation among U.S. and Mexican agencies, Sandia National Laboratories undertook a multi-faceted process to gather input from primary and secondary sources to assist in the selection of technology choices. A diverse group of stakeholders was engaged to help identify problems experienced at inland international border crossings, particularly intermodal ports of entry at the U.S.-Mexican border.

Special emphasis was placed on collecting input from private-sector stakeholders, such as: shippers; cargo carriers, primarily trucks and railroads; customs brokers and freight forwarders; transportation consultants; and industry associations. The U.S. Customs Service, the Federal Highway Administration, the U.S. Departments of Transportation and Agriculture, and state agencies are examples of government stakeholders that provided guidance. Information from Mexican counterparts, industrial and governmental, was also compiled. An understanding of the identified problems was translated into qualitative requirements and performance parameters for inland international ports of entry. In Phase II of the ATIPE Project, these performance parameters will guide the development of functioning prototype technology that can be integrated into current and future border crossing infrastructures to improve the efficiency (i.e., expedite freight transport) and the effectiveness (i.e., satisfy governmental requirements) of ports of entry.

Five basic information collection methodologies were used, namely: stakeholder meetings; literature reviews; attendance at technical workshops and conferences; industry surveys; and contract research performed by industry experts. During the course of compiling the interests of stakeholders through these five methodologies, direct and indirect inputs from hundreds of people were obtained.

The fundamental issue at international ports of entry is reducing transit time through the required documentation and inspection processes. This issue was expressed by both individuals involved in port-of-entry operations and the user communities. However, stakeholders recognize time reductions must be accomplished while simultaneously maintaining regulatory and legal compliance. Examples of other issues or problems, typically manifested as time delays at border crossings, repeatedly mentioned by stakeholders include: (1) lack of document standardization; (2) failure to standardize inspection processes; (3) inadequate information and communications systems; (4) manual fee and tariff collection; (5) inconsistency of processes and procedures; and (6) suboptimal cooperation among governmental agencies.

Most of these issues can be addressed to some extent by the development of advanced technologies with the objective of allowing ports of entry to become more efficient while being more effective. The issues consistently selected by stakeholders as the highest priority for being addressed by advanced technology are: (1) standardization and simplification of border crossing processes, including documentation and inspection practices; and (2) elimination of inconsistent and duplicative government agency requirements.

Development of a comprehensive process map for border crossing interactions, including both formal and informal relationships, through which responsible parties and their respective physical inspection requirements are highlighted, is an important step in defining quantitative performance parameters for ports of entry and technologies designed to improve efficiency and effectiveness. A clear and systematic understanding of the border crossing process supports the preparation of qualitative descriptions of the causes of processing delays. Estimates of quantitative measures of the individual components of time delays can be derived from this information. Moreover, a thorough appreciation of the social interactions occurring in the extraordinarily complex environment of an international port of entry is an important aspect of a process map. Equally important, this understanding must influence design considerations to ensure the successful deployment and use of advanced technologies developed and made available to port-of-entry operators and the user communities.

Three categories of technologies are unambiguously of high priority to port-of-entry stakeholders, viz.: (1) automated documentation; (2) systems integration; and (3) vehicle and cargo tracking. Automated documentation and systems integration directly address the high-priority issues of standardization of border crossing processes and inspections and agency cooperation. Vehicle tracking and cargo tracking indirectly address these issues by enabling freight shippers and carriers to know current information for communication to port-of-entry operators in advance of vehicles reaching the border. Together, these technologies represent many of the technical components necessary for pre-clearance of freight approaching international ports of entry. Implementation of automated documentation generally requires more advanced information and communications systems than are presently utilized at international ports of entry. As automated documentation, systems integration, and vehicle and cargo tracking systems are developed and deployed, information security considerations become increasingly important.

Tracking, particularly cargo tracking, is of special interest to the intermodal transportation industry. Similarly, systems integration is closely related to the concept of interoperability of information and documentation systems across transport modes. Interoperability may be further extended to encompass civilian cargo and national defense materiel transportation.

Delays in border crossing processing is the issue at U.S.-Mexico ports of entry. Unstandardized, complex, and inconsistent documentation and inspection processes principally cause the transit time delays. Mitigation of these sources of delays should be achievable by automating documentation verification and integrating port-of-entry information and communications systems. Integration of vehicle and cargo tracking systems with port-of-entry information and communications systems, as well as existing industry legacy systems, should further enable border crossings to be accomplished consistently with optimal processing times.

1. INTRODUCTION

1.1 CURRENT SETTING FOR U.S. TRANSPORTATION SYSTEM IMPROVEMENTS

Rapid changes in the world economy are driving the need for a new vision of a state-of-the-art U.S. transportation system in the 21st century. Intermodalism and international transport will be important determinants in the design of competitive transportation infrastructures in the future. Issues faced by U.S. movers of commercial and military freight, such as widespread deregulation of the domestic transportation industry; globalization of markets, commerce, and manufacturing, including policy changes like the North American Free Trade Agreement (NAFTA) and the General Agreement on Tariffs and Trade (GATT); the end of the Cold War and the concomitant shifting of military strategy; rapidly expanding domestic and international transportation requirements in settings with increasing congestion; and the growth of the information and communications economy call for revolutionary improvements in the existing U.S. transportation system.

These issues, in part, serve to define transportation requirements based on competitive considerations; time-definite delivery and just-in-time manufacturing practices; efficient and effective international and intermodal transport; defense logistical needs for a rapidly responding, domestically based posture; sensitivity to safety, cost, time, and environmental impacts; cargo, vehicle, and information security; and the integration of electronic communications with the physical movement of freight. Responses, especially technologically based responses, to the needs of U.S. industry and national security must be coordinated if conflicts are to be resolved, barriers are to be removed, and advanced technologies are to be deployed optimally in the U.S. transportation system.

1.2 SANDIA NATIONAL LABORATORIES PROJECT BACKGROUND

The Advanced Technologies for International and Intermodal Ports of Entry (ATIPE) Project was initiated at Sandia National Laboratories in 1995 to investigate and develop suitable technologies that could be used to promote cooperation among U.S. agencies and their Mexican counterparts to expedite traffic across U.S. borders. New Mexico Senator Pete V. Domenici was instrumental in establishing the ATIPE Project. The Federal Highway Administration (FHWA) and the New Mexico Highway and Transportation Department are the principal sponsors of the ATIPE Project.

The ATIPE Project goal is :

- to develop functioning prototype technology that can be integrated into current and future border crossing infrastructures to improve the efficiency (i.e., expedite freight transport) and the effectiveness (i.e., satisfy governmental requirements) of ports of entry.

This goal will be accomplished in two distinct, but interrelated, phases:

- establishing priority requirements and performance parameters for freight traffic at inland international ports of entry (Phase I); and
- applying expertise developed through national security work performed at Sandia National Laboratories to develop and field test a state-of-the-art prototype system (Phase II).

Examples of Sandia expertise include: integrated systems engineering, electronic data interchange, global communications, information security, in-transit tracking systems, monitoring devices, network analysis, real-time data collection and processing, remote sensing, software and hardware integration, and wide-area information networks.

Completion of the current phase of the ATIPE Project is scheduled for 1997 upon having demonstrated functioning prototype technology at Santa Teresa, New Mexico. The prototype technology will be suitable for integration into current and future border crossing infrastructures to improve the efficiency and the effectiveness of international and intermodal ports of entry.

1.3 IDENTIFICATION OF PORT-OF-ENTRY ISSUES

As part of the ATIPE Project, Sandia National Laboratories undertook a multi-faceted process to gather input from primary and secondary sources to assist in the selection of technology choices. A diverse group of stakeholders was engaged to help identify problems experienced at border crossings, particularly intermodal ports of entry at the U.S.-Mexican border.

Private-sector stakeholders include, for example: shippers; transporters, primarily trucks and rail; customs brokers and freight forwarders; transportation consultants; and industry associations. The U.S. Customs Service, the U.S. Department of Transportation, the Federal Highway Administration, the U.S. Department of Agriculture, and state agencies are examples of government stakeholders that have participated. More limited information from Mexican counterparts, industrial and governmental, was also compiled. Ideally, an understanding of the identified problems can be translated into qualitative and quantitative requirements and performance parameters for inland ports of entry. These performance parameters will be used to guide the development of functioning prototype technology that can be integrated into current and future border crossing infrastructures to improve the efficiency (i.e., expedite freight transport) and the effectiveness (i.e., satisfy governmental requirements) of ports of entry.

The output from the stakeholder involvement and industrial collaborations during the Phase I of the ATIPE Project helped obtain:

- agreement from a commercial and industrial perspective on a short list of the most important issues or problems at ports of entry capable of being addressed by advanced technologies;

- succinct qualitative definitions of each of these issues or problems;
- specific quantitative performance parameters that reflect desirable resolution of, or solutions to, the issues or problems;
- priorities or relative rankings of the importance of these issues and/or problems from a commercial and industrial perspective; and
- feedback on the quality of the match between Sandia National Laboratories technology options and capabilities with respect to the agreed upon issues or problems.

1.4 PRIMARY AND SECONDARY INFORMATION SOURCES

A number of information sources for identifying priority problems and generating corresponding performance parameters were utilized, including:

- background literature surveys;
- attendance at technical conferences, workshops, and seminars as well as written proceedings;
- structured meetings with invited stakeholders;
- written questionnaires to representatives of industry and industry associations;
- structured interviews with U.S. and Mexican stakeholders; and
- technology and market assessments performed under contract by industry experts.

Information gathered from each of these somewhat disparate sources has been analyzed and synthesized into a set of visions regarding issues, problems, performance parameters, and potential technological solutions related to transporting freight through inland ports of entry. The output of this work provides clear, market-based guidance for the selection of priority technology development opportunities consistent with the capabilities at Sandia National Laboratories, while not duplicating efforts underway by private industry.

1.5 SELECTION OF PROTOTYPE TECHNOLOGIES

The ATIPE Project will utilize the results of Phase I to select one or more advanced technologies for prototype development and field testing at the Santa Teresa, New Mexico, port of entry. Contact with stakeholders through the primary and secondary source mechanisms established during the preparation of this Phase I report will continue throughout the prototype technology development process. As important new information is obtained, this information will be communicated in a timely manner to the ATIPE technical development team in order to ensure that the final technology prototypes are responsive to real-world market needs and not competitive with private-sector technology development programs.

1.6 ORGANIZATION OF THE REPORT

The information gleaned from each of the six identified sources has been summarized in separate sections of this report. Reports from three meetings of stakeholders are compiled in Section 2. Sections 3 and 4 summarize observations from a representative review of published literature and information obtained through attendance by ATIPE Project team members at various technical workshops and conferences during late 1995, respectively. An analysis of the data collected by a mailed questionnaire to industry associations and individual corporations in the transportation industry is given in Section 5. Information relevant to the ATIPE Project obtained through structured interviews with U.S. and Mexican stakeholders conducted by the Camino Real Intermodal Center (CRIC) Project is compiled in Section 6. A summary of an intermodal technology and market assessment performed for the ATIPE Project by M. John Vickerman, Principal of Vickerman-Zachary-Miller, is given in Section 7. Finally, Section 8 compiles and summarizes the results of the stakeholder involvement and industrial collaborations during Phase I of the ATIPE Project.

2. STAKEHOLDER MEETINGS

2.1 INTRODUCTION

The Advanced Technologies for International and Intermodal Ports of Entry (ATIPE) Project held two invited meetings to develop working relationships with the diverse group of stakeholders in ports of entry at the U.S.-Mexican border. These meetings were held in August and November 1995, respectively. A related meeting was held by Sandia National Laboratories in July 1994 prior to formally establishing the ATIPE Project. Each of the meetings was increasingly focused on obtaining specific input from stakeholders and, as such, each sequential meeting had a smaller number of participants. The first two of the meetings were held in Albuquerque, New Mexico, and the third meeting was convened in Washington, D.C.

2.2 FIRST STAKEHOLDER MEETING

The State-of-the-Art Port of Entry Workshop was held on July 14-15, 1994, to establish a dialogue among technologists and stakeholders, to explore the potential uses of technology at border crossings, and to set technology development priorities. This meeting was attended by nearly 100 stakeholders from federal inspection agencies, such as the U.S. Customs Service, the Immigration and Naturalization Service, and the U.S. Department of Agriculture; from U.S. transportation interests, for example, the New Mexico Taxation and Revenue Department, the New Mexico Motor Carriers Association, the Atchison, Topeka & Santa Fe Railway, the Southern Pacific Railroad, customs brokers, and shippers; and from Mexican agencies, including representatives from the Secretaria de Comunicaciones y Transportes and the Instituto Mexicano del Transporte. A wide variety of technologists and systems designers from government, national laboratories, and private industry also attended (see Appendix 2-A).

2.2.1 Workshop Outcomes

2.2.1.1 Level of Interest

A high level of interest in making international ports of entry both efficient (i.e., expediting freight movement) and effective (i.e., conducting thorough cargo and vehicle inspections) was evident throughout the workshop. Participants described the current environment as working under increasing constraints, such as decreasing manpower availability, expanding regulations, and increasing pressure to reduce processing times, while simultaneously experiencing increasing demand in the form of greater volumes of freight shipments. Users and port operators recognized the basic tension between inspection thoroughness and expediting freight movement. Cooperation between federal and state agencies was cited as a path to reduce these tensions. Implementation of the North American Free Trade Agreement (NAFTA) will have significant impacts on both federal and state operations related to processing freight through U.S.-Mexico ports of entry.

Keys to obtaining the simultaneous port-of-entry goals of efficiency and effectiveness are:

- standardization and simplification of processes and documentation; and
- capability to selectively target vehicles and cargo for inspection.

Automated documentation via technologies, such as electronic data interchange (EDI), can be a constructive way to address standardization and simplification of border crossing processes. Similarly, computed-based tools, such as classification methods and historical data bases, linked to automated vehicle identification (AVI) technology can improve inspection selectivity.

2.2.1.2 Operational Issues at Ports of Entry

Five operational issues at ports of entry were identified during the workshop, namely:

- fee and tariff collection;
- inspection;
- information and communications;
- access control and security; and
- systems integration.

Each of these issues can be addressed by advanced technologies.

2.2.1.3 Technology Priorities

The focus of the discussions was on inland international border crossings, although some of the issues and technologies explored are applicable to interstate and intermodal ports of entry as well. Technologies discussed at the meeting included:

- sensors and scanners;
- transponders, tags, and seals;
- communications;
- data processing;
- barriers; and
- systems integration, including tracking equipment.

Participants recognized that an important aspect of implementing useful technologies at border crossings is a thorough understanding of the entire function of any specific port of entry. Guides clearly articulating the needs of individual ports of entry must be prepared in advance of selecting specific opportunities for technological enhancements. Ports of entry are both information and labor intensive. Technologies capable of providing timely and accurate information and

designed to optimize the use of inspection resources, while being able to be installed at reasonable costs, are particularly attractive.

2.2.2 Next Steps

Questionnaires were sent to all participants following the workshop to elicit suggestions for appropriate next steps. The questionnaires addressed priority topics for future workshops, issues to be addressed, and priorities for technological improvements. Future workshops were given a high priority with the following guidelines:

- institute a team approach;
- include data processing and information systems;
- analyze interagency and federal and state operations;
- focus on enforcement and facilitation;
- understand port operations prior to defining opportunities for introducing advanced technologies; and
- address state operations at border crossings in relation to federal efforts.

Conceptually, these guidelines could be met by selecting a few representative ports of entry and:

- identifying agencies and requirements, including mission statements, information sources, data bases used, agency interactions, and performance measures;
- mapping and modeling current processes of freight movement via road, rail, and air transport modes;
- analyzing opportunities for performance improvement, employing a process model and small planning groups;
- conducting a workshop to enhance the feasibility of implementing the improvements and to suggest others, ultimately reaching a consensus on a plan for the selected port of entry; and
- transferring the process used to other ports of entry in both the U.S. and Mexico upon expressions of interest.

2.2.2.1 Future Workshop Topics

Future workshop topics listed on the questionnaires included:

- fee and tariff collections;
- port-of-entry inspections;
- port-of-entry information services;

- port-of-entry communications;
- access control and security;
- port-of-entry systems integration;
- measuring port-of-entry performance;
- port-of-entry standardization; and
- port-of-entry pilot projects.

Stated qualitative priorities were assigned numerical values (i.e., low = 1; medium = 2; and high = 3) in order to compute average scores and standard deviations, and to establish relative rankings. The three highest ranked topics for future workshops were: port-of-entry systems integration, port-of-entry inspections, and port-of-entry information systems (see Fig. 2-1). Access control and security was the lowest ranked topic.

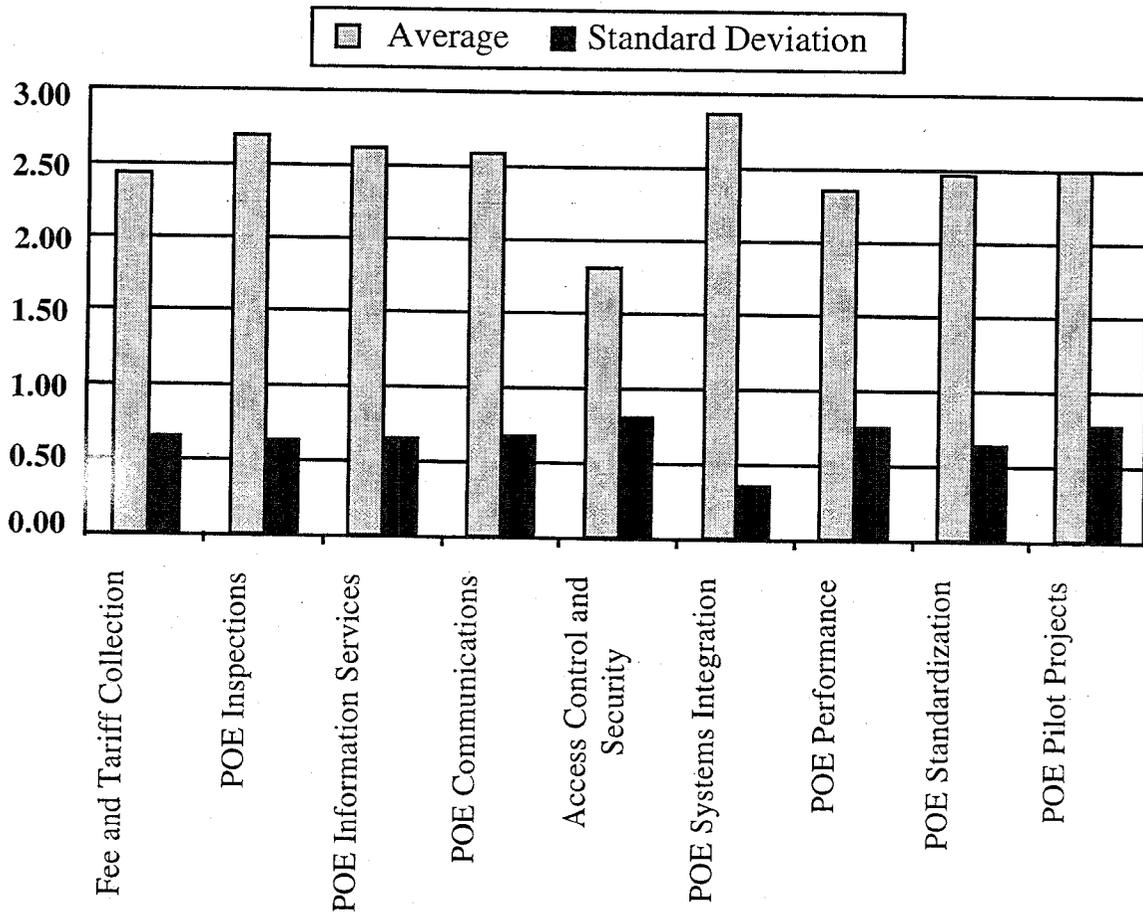


Figure 2-1. Relative Rankings of Future Port-of-Entry Workshop Topics.

Source: B. Godfrey, "The State-of-the-Art Port of Entry Workshop," SAND95-0867, Sandia National Laboratories, Albuquerque, New Mexico, May 1995.

2.2.2.2 Port-of-Entry Issues

Twelve issues were specifically identified on the questionnaires as follows:

- increasing cooperation between state and federal agencies;
- increasing cooperation among federal agencies;
- consolidating federal inspections;
- automating inspection services;
- automating fee and tariff collection;
- standardizing and/or simplifying inspection processes;
- standardizing and/or simplifying documentation;
- standardizing and/or simplifying port-of-entry hardware and software;
- lowering costs associated with ports of entry;
- reducing time spent by freight at ports of entry;
- allowing universal selective access to port-of-entry information; and
- increasing the portion of off-site inspections.

Again, stated qualitative priorities were assigned numerical values (i.e., low = 1; medium = 2; and high = 3) in order to compute average scores and standard deviations and to establish relative rankings.

The three highest ranked issues were: reducing time spent by freight at ports-of-entry, standardizing and/or simplifying documentation, and standardizing and/or simplifying inspection processes (see Fig. 2-2). Low-priority issues included: allowing universal selective access to port-of-entry information, consolidating federal inspections, and increasing the portion of off-site inspections.

2.2.2.3 Technology Priorities

Nine technologies were identified on the questionnaires for establishing both near-term (i.e., less than two years) and far-term (i.e., greater than three years) priorities for improving the stated technologies. The technology list included:

- seals and tags;
- data processing, including electronic data interchange (EDI);
- monitoring and tracking;
- communications;

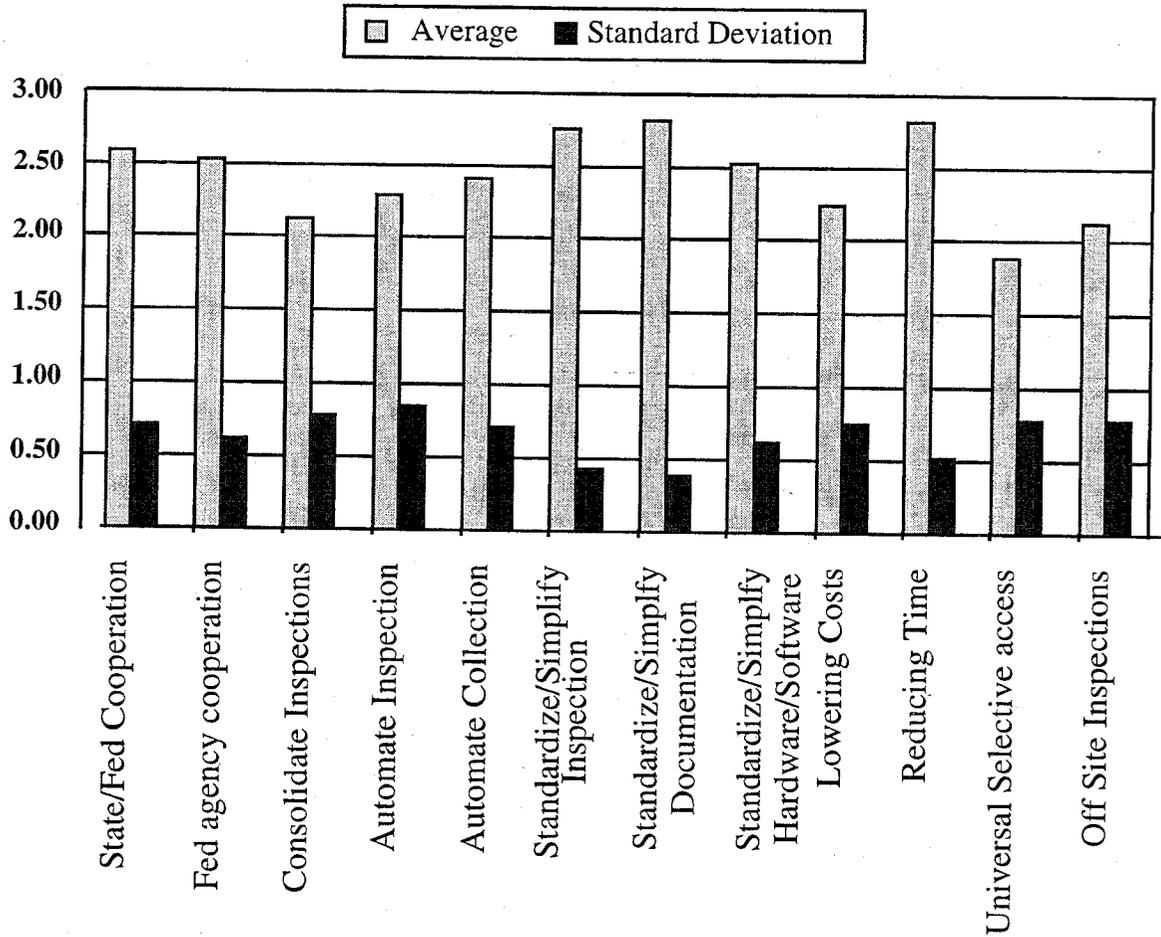


Figure 2-2. Relative Rankings of Port-of-Entry Issues.

Source: B. Godfrey, "The State-of-the-Art Port of Entry Workshop," SAND95-0867, Sandia National Laboratories, Albuquerque, New Mexico, May 1995.

- barriers;
- sensors and scanners;
- simulation;
- classification; and
- system integration.

Assigned numerical values (i.e., low = 1; medium = 2; and high = 3) to stated qualitative priorities were used to compute average scores and standard deviations and to establish relative rankings. The three highest ranked technologies for near-term improvements were: system integration, data processing, and sensors and scanners (see Fig. 2-3). Rankings for far-term improvements were essentially the same as those for near-term improvements. Again, security related technologies received low rankings.

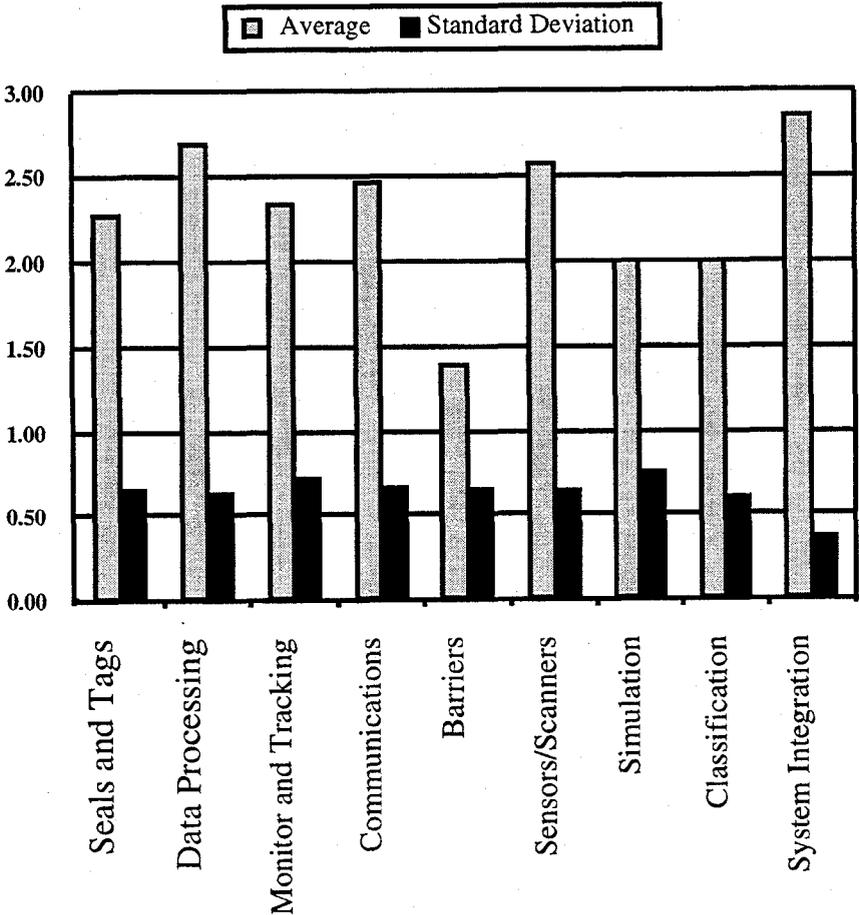


Figure 2-3. Relative Rankings of Near-Term Improvements in Port-of-Entry Technologies.

Source: B. Godfrey, "The State-of-the-Art Port of Entry Workshop," SAND95-0867, Sandia National Laboratories, Albuquerque, New Mexico, May 1995.

2.2.3 Conclusions and Results

Workshop participants clearly recognized the need for a thorough understanding of the process of freight transit through international ports of entry as a first step in defining technology priorities. This understanding could take the form of a process map delineating the key responsible parties and their respective information needs and physical inspection requirements. Such a process map could also serve to highlight the complex social structures present at ports of entry.

Relative rankings of future port-of-entry topics, port-of-entry issues, and technology priorities were developed as part of the workshop discussions (see Table 2-1). Topics of greatest identified interest were port-of-entry systems integration, port-of-entry inspections, and port-of-entry information systems. Reducing time spent by freight at ports of entry, standardizing and/or simplifying documentation, and standardizing and/or simplifying inspection processes are high-priority issues to be addressed at ports of entry. The latter two issues are commonly manifested as delays in border crossings, a corollary to the first ranked issue. Each of these issues can be addressed by deployment of advanced technologies.

System integration, data processing, and sensors and scanner technologies were ranked as the highest priorities for near-term improvements. These three technologies are closely correlated to the three highest ranked issues.

Table 2-1. Summary of Stakeholder Workshop Priorities

Category and Item	Relative Rank
Future Port-of-Entry Topics	
systems integration	2.9
inspections	2.7
information systems	2.6
Port-of-Entry Issues	
reducing time spent by freight at ports of entry	2.8
standardizing and/or simplifying documentation	2.8
standardizing and/or simplifying inspection procedures	2.7
Technology Priorities	
system integration	2.9
data processing	2.7
sensors and scanners	2.6
Note: A score of 3 corresponds to a high-priority ranking, 2 indicates a medium-priority ranking, and 1 represents a low-priority ranking.	

2.3 SECOND STAKEHOLDER MEETING

The Advanced Technologies for International and Intermodal Ports of Entry (ATIPE) Project convened a meeting on August 4, 1995, in Albuquerque, New Mexico, to provide stakeholders an opportunity to better understand the scope and intent of the ATIPE Project, to allow the ATIPE Project team to hear stakeholder perspectives directly, and to define optimal approaches to acquire stakeholder input throughout the course of the ATIPE Project, especially in the early stages involving definition of performance parameters at international ports of entry. Approximately 50 individuals attended the meeting (see Appendix 2-B).

2.3.1 Presentations

2.3.1.1 *Invited Presentations*

A presentation by the U.S. Department of Transportation delivered by Noah Rifkin, Director of Technology Deployment, firmly endorsed the goal of the ATIPE Project to facilitate the achievement of seamless movement of freight throughout North America as called for by the North American Free Trade Agreement (NAFTA). Stakeholder interests must be well represented in the planning of the ATIPE Project. Furthermore, the intent of the ATIPE Project is not to push new technology into port-of-entry operations, but rather to allow market forces and the needs and requirements of stakeholders to guide the development of appropriate technology.

2.3.1.2 *Project Team Presentations*

The vision of a future transportation network, a so-called inland nodal model (see Fig. 2-4), in which agile manufacturing, just-in-time distribution, and state-of-the-art information management would be integrated into nodes capable of shifting in geographic location in response to market dynamics was described by James Kelsey, Senior Technologist on the ATIPE Project. Conceptual borders could exist at these inland nodes in place of geographical borders provided that the necessary advanced technologies were implemented through a cooperative team effort. Brad Godfrey, ATIPE Project Manager, emphasized the need for teamwork on the ATIPE Project with respect to stakeholders willingness to assist in systematically identifying priority needs not currently satisfied with existing technology. Given the technology base now in use and the current development programs underway in private industry, the objective of the ATIPE Project is to build on and supplement these technological capabilities. In order to accomplish this objective, David Albright, President of the Alliance for Transportation Research, the ATIPE Project sponsor, urged stakeholders to be assertive in communicating technology performance requirements to the ATIPE Project team. The ATIPE Project is a prototype hardware development activity, in contrast to a feasibility study, and as such cannot be successful without substantive inputs from the transportation industry as well as governmental agencies.

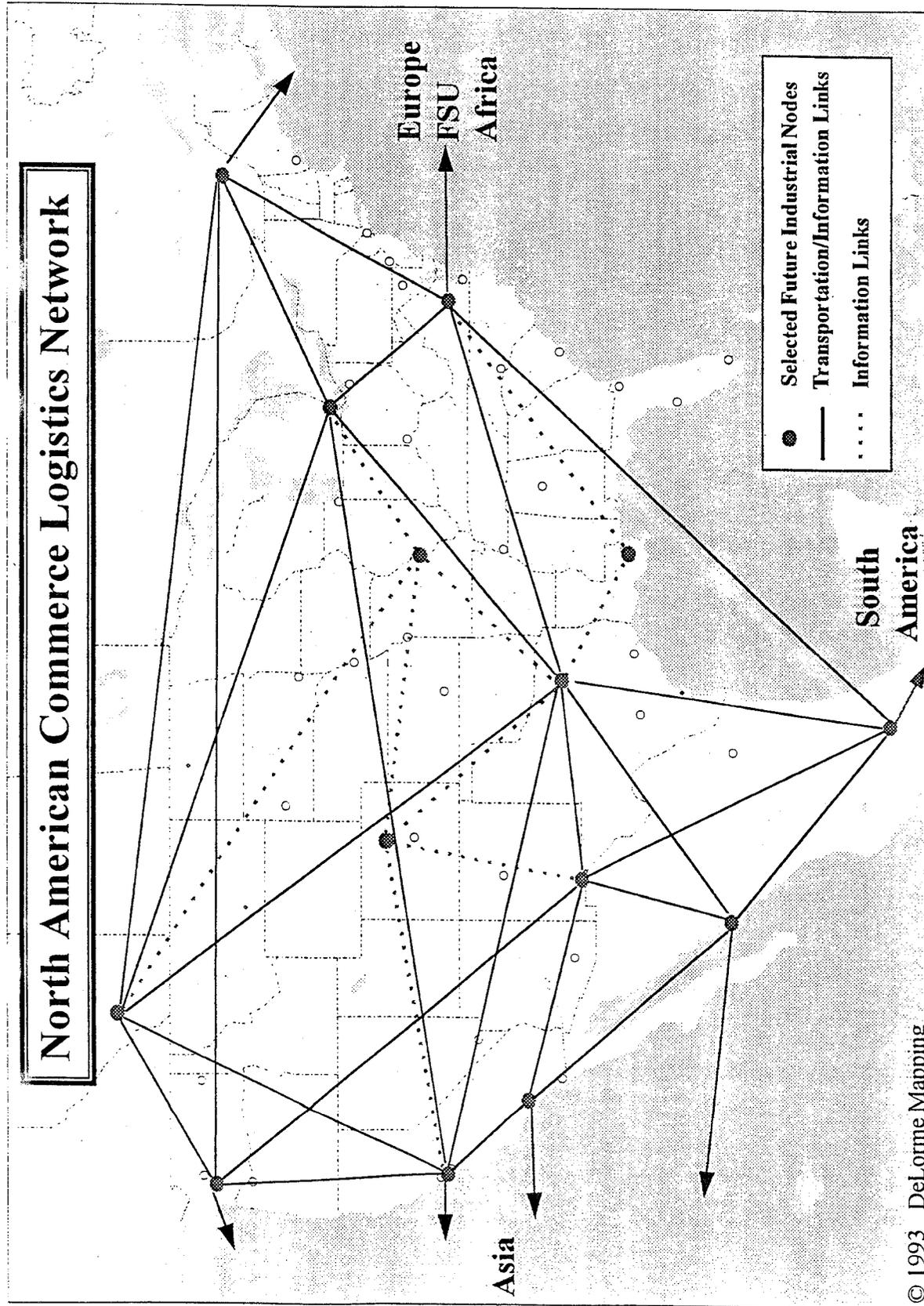


Figure 2-4. North American Commerce Logistics Network.

2.3.2 Technology Roles

Stakeholders were engaged in a discussion with the ATIPE Project team regarding their perspectives on the ATIPE Project to:

- clarify their needs and concerns;
- provide input describing the role technology can play in addressing those needs and concerns; and
- offer insights and recommendations on pitfalls to avoid and barriers to consider.

Three themes emerged from this discussion, namely:

- engage the private sector;
- progress towards an inland nodal model for freight transportation suffers from the absence of an integrated strategy adopted by government and industry and among the U.S., Mexico, and Canada; and
- input from Mexican authorities needs to be solicited.

A call for increasing the private-sector involvement in the ATIPE Project was made by some participants because participation by industry will be a key success factor in the ATIPE Project, as well as in achieving the inland nodal model of freight transportation in the future. A specific key suggestion for ways to access industry included establishing contacts with stakeholder alliances such as the American Trucking Association, the National Freight Partnership, and the Intermodal Freight Council.

Several participants noted the many independent and often duplicative initiatives pertaining to commercial freight movement resulting in inefficient use of resources (e.g., time and financial) and expertise resident in both government and industry. Greater cooperation between government and industry activities was championed by a number of participants.

Institutional barriers were cited as major challenges to overcome to obtain seamless international borders. Freight shippers complained about a fundamental lack of integration among U.S., Mexican, and Canadian port-of-entry operations. Since some of these barriers arise from the absence of standardized technologies, opportunities exist to reduce institutional and policy-driven barriers by the deployment of broadly accepted advanced technologies. The International Border Clearance Planning and Deployment Committee, under its charter to work on transportation, immigration, and customs issues trilaterally, may be a valuable resource.

Active involvement of Mexican officials in the ATIPE Project was cited as a key to overcoming U.S.-Mexico institutional barriers. Several participants recommended holding a meeting with Mexican stakeholders at a Mexico location to facilitate attendance at the meeting by Mexican officials who face strong restrictions on international travel. Logistical, time, and cost constraints prohibited such a meeting being held during Phase I of the ATIPE Project. Internet connections are being established between U.S. and Mexican border states and the national capitals

of Washington, D.C., and Mexico City as part of a project undertaken by the U.S.-Mexico Joint Working Committee.

2.3.3 Related Projects

A number of projects related to the ATIPE Project objectives was described briefly by the participants. Examples of these projects are:

- Otay Mesa Field Operations Test conducted by the Federal Highway Administration, U.S. Customs Service, and Mexican Customs to expedite freight movements by heavy commercial vehicles using transponders interfaced with a decentralized data system;
- pre-clearing of trucks using transponders and a centralized data base at the Nogales, Arizona, port of entry;
- State of Arizona Binational Planning and Program Study with oversight by the Border State Technology Advisory Committee;
- port-of-entry simulations to evaluate inspection technologies along the U.S. southwest border conducted by Science Applications International Corporation with sponsorship from the Advanced Research Projects Agency (ARPA) and the U.S. Customs Service;
- automated reading and verifying license plates in the corridor between San Antonio and Laredo, Texas; and
- use of automatic vehicle identification (AVI), weigh-in-motion (WIM), smart cards, and other technologies in the Commercial Vehicle Information Systems Network (CVISN) developed by the Applied Physics Laboratory at Johns Hopkins University.

These projects are focused on improving existing border infrastructure or automating border processes rather than on implementing comprehensive changes to port-of-entry processes. Greater understanding of basic functional requirements, such as improved protocols for targeting selected vehicle and cargo inspections or even to determine the actual need for stopping vehicles at border crossings, is needed. This latter observation is consistent with the inland nodal model of future transportation systems and would require suitable technology to be fixed to vehicles engaged in international commerce rather than being installed at ports of entry.

2.3.4 Role of Stakeholders

The ATIPE Project challenged the participants to provide specific input on:

- identifying the correct stakeholders;
- defining how stakeholder input could best be solicited;
- designing the preferred stakeholder meeting format; and
- selecting optimal meeting sites.

Participants warned of the proliferation of activities focused on bi- and trilateral border issues with little apparent integration and substantial duplication. Yet another separate effort by the ATIPE Project would further confuse matters and dilute already overextended resources. No new commissions or committees should be established. Instead, the ATIPE Project should collaborate with existing organizations, such as the Binational Commission on Bridges and Crossings, but not rely exclusively on these groups to provide the necessary stakeholder input because private-sector perspectives are, at best, generally underrepresented.

Because broad stakeholder input is required for the ATIPE Project, information gathering processes must be accommodating to a diverse community of interests, including commodity owners; transportation providers; federal, state, and provincial agencies in the U.S., Mexico, and Canada; and customs brokers and freight forwarders. Three formats were considered, namely, directed workshops, facilitated panel discussions, and personal interviews. Directed workshops have the disadvantage of being inappropriate for generating official input to the ATIPE Project team and being an awkward setting to discuss potentially sensitive business issues. While being more conducive to generating useful inputs from the private sector, facilitated panel discussions have the disadvantage of being small in size and therefore potentially less than representative of the diverse stakeholder population. Several participants suggested that interviews would be the most effective approach to obtaining genuine cooperation from the transportation industry. The ATIPE Project team indicated a preference for using a mix of strategies to obtain stakeholder input. Representatives from the Federal Highway Administration urged the ATIPE Project team to capitalize on existing documentation of stakeholder interests and to use primary data collection techniques only for validation purposes.

2.3.5 Conclusions and Results

A wide variety of stakeholder perspectives were presented and discussed. The ATIPE Project team benefitted from a number of the suggestions received. For example, mechanisms have been adopted to prevent stakeholder input from being a series of discrete formal interactions with interested parties, but rather a more continuous feedback process carried on throughout the term of the ATIPE Project. Initially, guidance on establishing operational requirements for advanced technology capable of effectively addressing well-defined problems experienced by industry and government at international ports of entry is the most valuable input to the ATIPE Project. During the course of Phase II of the ATIPE Project, advice on technology selection, design specifications, and cost goals will continue to be solicited from the diverse stakeholder community.

2.4 THIRD STAKEHOLDER MEETING

An expert panel of industry and government officials was convened for Sandia National Laboratories by Don Breazeale & Associates, under contract to the Alliance for Transportation Research, on November 9, 1995, in Washington, D.C., to discuss the ATIPE Project. Twenty-one individuals attended the meeting (see Appendix 2-C).

2.4.1 Objectives

The principal objectives of the meeting were to:

- define the most important issues or problems in international/intermodal freight movement, with an emphasis on inland ports of entry, and
- obtain recommendations for next steps in developing a collaborative working relationship between Sandia National Laboratories and industry.

In particular, the meeting was designed to serve to better define how industry and Sandia National Laboratories can best collaborate on the ATIPE Project, as well as to identify key private-sector operational people skilled in translating functional concepts into performance requirements.

2.4.2 Principal Theme

Moving freight faster through ports of entry while maintaining regulatory compliance emerged as the overarching theme of the discussions. Although processing speed is of paramount importance, consistency and predictability of processing speed are significant variables to be addressed while achieving acceptable transit times. Simply put, industry commonly experiences unacceptable delays at border crossings. This situation has become increasingly troublesome as timeliness is often a measure of competitiveness in international trade, particularly in instances involving deliveries to just-in-time manufacturing facilities.

Four items were identified as being the major drivers behind processing delays experienced at border crossings, namely: (1) constrained physical facilities and layouts of ports of entry; (2) rising traffic volumes generated, for instance, by the North American Free Trade Agreement (NAFTA); (3) complexity of processing procedures; and (4) lack of coordination among governmental agencies. In the latter case, participants pointed out the practice of series rather than parallel processing steps as well as the failure to optimize processing sequences. These situations commonly result in duplicative and repetitive processing activities, especially in the event of a specific requirement not being met by an individual transporter or freight shipment. A related concern of industry, especially prevalent among motor carriers, is the extraordinary inconsistency across governmental jurisdictions often requiring the maintenance of multiple sets of records and documentation.

Participants recommended that Sandia National Laboratories staff could access valuable information sources to further articulate the issues or problems contributing to delays in freight movement through ports of entry through industry associations, such as the Association of American Railroads, the American Trucking Association, and the Intermodal Association of North America; direct contacts with industry representatives, especially individuals with shipping logistics responsibilities; and federal agencies, such as the U.S. Customs Service, the U.S. General Services Administration, and the U.S. Department of Transportation, particularly the Intelligent Transportation Society of America. Each of these sources could articulate important, but different, perspectives on the issues or problems associated with processing delays at border crossings.

2.4.3 Major Issues or Problems

A wide range of issues or problems related to processing freight movement through ports of entry was discussed by the participants. Out of these discussions, two general categories of issues emerged, namely: (1) information handling and (2) physical processes. Process integration and standardization are topics commonly associated with information handling. Physical processes include items such as inspections, tracking, and security. The participants agreed that the greatest opportunities for immediate contributions to resolving delays experienced at border crossings were likely to fall within the information handling category. However, considerable interest was expressed regarding improvements in vehicle and cargo tracking capabilities that are increasingly being demanded by customers of freight shipments, especially firms employing just-in-time manufacturing practices. Several participants noted that tracking capability is intimately linked to the ability of shippers to control costs and, thus, be more competitive, as well as ensuring cargo security.

In order to further focus the discussions, the participants were charged with identifying major issues or problems associated with freight movement through ports of entry. The emphasis was on industry perspectives. Ten issues or problems were discussed in varying levels of detail, as follows:

- cargo security;
- cargo and conveyance examination and inspection, especially nondestructive and/or noninvasive methods;
- cargo safety;
- information security;
- need for systems and process integration improvements;
- extensive paper requirements, including permitting, taxation, and insurance documentation;
- lack of uniform or universal identification cards;
- failure to obtain universal acceptance of a single set of definitions and operational terms;

- processing of through country (in-bond or in-transit) intermodal shipments; and
- achievement of a balance between solutions acceptable to small versus large businesses.

Moreover, during the course of the discussions, information security and vehicle and cargo tracking emerged repeatedly as areas in which advanced technology may offer valuable solutions to border crossing delays.

Several potential barriers to successful deployment of new technology at ports of entry were identified as part of the deliberations. As information collection and processing becomes more automated and centralized, security concerns involving confidential aspects of business transactions may discourage widespread participation in the system unless strict need-to-know capabilities can be designed to limit inappropriate information access. Industry representatives voiced considerable concern regarding the past tendency of governmental agencies to collect information for one purpose and then utilize that same information to eventually regulate industry practices. Decentralized and disaggregated information processing, while often inefficient, provides a sense of security that may be compromised by extremely centralized information processing and storage procedures.

2.4.4 Appropriate Federal Roles

Several of the industry participants expressed difficulty in defining an appropriate role of government in finding solutions to problems that are viewed by many to fall within the domain of private industry. However, there was a general recognition that many of the issues or problems needing attention transcend single industries, perhaps making government a useful partner in developing solutions. Support for an integrated analysis of private-sector and government needs was nearly universal. A majority of the participants felt important contributions could be made through government and industry collaborations in quantifying the basic causes of processing delays at border crossings. Testing of new technology at maritime ports as well as at inland border crossings was also suggested as an appropriate and valuable role for government. In addition, systems integration and information security expertise developed by the federal government since World War II was recognized by the participants as being well matched to addressing through advanced technology many of the issues or problems associated with efficiently moving freight through ports of entry while maintaining regulatory compliance.

2.4.5 Conclusions and Results

Prior to the development and installation of new technology, however, three more immediate activities were suggested by the participants. First, development of a process map for border crossing interactions identifying key responsible parties and their respective information needs and physical inspection requirements. Secondly, preparation of qualitative descriptions of the causes of processing delays. Lastly, estimation of quantitative measures of the individual components of processing delays. These three activities, which have been incorporated into the work plan of Phase II of the ATIPE project, are expected to serve to better define issues or problems for which technological solutions should be sought.

Appendix 2-A

Participants Attending the State-of-the-Art Port of Entry Workshop

Steve Abeyta
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Alliance for Transportation Research

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Bill Barringer
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George Bays
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Brian Beranek
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Susan Binder
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Brian Burnett
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Dale Buskirk
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Stakeholder Meetings

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Appendix 2-B

Invited Participants Attending the August 4, 1995, ATIPE Project Stakeholders Meeting

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Joe Alcantar, Jr.
Brown, Alcantar & Brown

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Federal Highway Administration

Bill Beschle
The Eureka Company

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Don Breazeale
Breazeale and Associates

Bill Burns
BPLW and Associates

Dale Buskirk
Arizona Department of Transportation

James Chavez

Lee Chimini
Federal Highway Administration

B.G. Clark
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Myles Culbertson
New Mexico Border Authority

John Dugan
Atchison, Topeka & Santa Fe Railway

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James Gentner
Help, Inc.

Brad Godfrey
Sandia National Laboratories

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Tracy Graham
General Services Administration

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U.S. Immigration and Naturalization Service

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Max Johnson
New Mexico Public Safety Department

Greg Jones
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Albert Thomas
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Jack Thompson
New Mexico Transportation Authority

Tom Tumillo
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Clay Whetstine
ABF Freight System

Duncan Wright
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Appendix 2-C

Invited Participants Attending the November 9, 1995, ATIPE Project Stakeholders Meeting

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Ron Ashby
Federal Highway Administration

Harry Caldwell
Federal Highway Administration

Christina Casgar
Transportation Research Board

Lee Chimini
Federal Highway Administration

Leo Constantine
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Larry Henry
Alliance Shippers

Tom Kelly
Burlington Northern-Santa Fe Railroad

Bill Lamott
Chrysler Corporation

John McQuaid
Intermodal Association of North America

Ray Mintz
U.S. Customs Service

Mike Onder
Federal Highway Administration

Jim Russell
Science Applications International Corporation

Cheryl Washington
United Parcel Service

Hosts

Jeff Amos
Don Breazeale & Associates

Don Breazeale
Don Breazeale & Associates

Other

Brad Godfrey
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Steve Roehrig
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Larry Icerman
Icerman & Associates

John Wagner
Alliance for Transportation Research

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3. SELECTED LITERATURE REVIEW

3.1 INTRODUCTION

A representative, but not comprehensive, literature review was performed by the Advanced Technologies for International and Intermodal Ports of Entry (ATIPE) Project to characterize major issues present at ports of entry resolvable by deployment of advanced technologies. In addition, broad classes of technologies capable of addressing these issues in a constructive manner were identified. Desired performance parameters for border crossings and for specific technologies were also investigated through secondary literature sources.

3.2 ISSUES AT PORTS OF ENTRY

An international port of entry is a complex, highly interdependent, information intensive operation with many organizations and individuals involved in the process of clearing cargo shipments for transit across national borders. Efficient operation of a U.S.-Mexico port of entry requires coordination and cooperation of all stakeholders, ranging from the U.S. Customs Service and Mexican customs; other federal inspection and regulatory agencies, such as the Immigration and Naturalization Service, the U.S. Department of Agriculture, the U.S. Department of Transportation, the Food and Drug Administration, the Drug Enforcement Administration, and the Environmental Protection Agency; freight forwarders, customs brokers, and drayage companies; bridge operators and toll collectors; and cargo shippers and carriers. In addition, the General Services Administration is responsible for the design, construction, and maintenance of U.S. port-of-entry facilities. State and local governmental agencies are also involved in facilitating and monitoring border crossings. These diverse groups generally have their own separate, and often duplicative, procedures and documentation requirements.

Although many issues arise at international border crossings, the principal effect of these issues on freight transport is time delays in processing passage through the ports of entry. For example, performance objectives at ports of entry involve:

- reducing time spent during primary inspection;
- reducing time spent in the primary inspection queue;
- reducing time spent in secondary inspection; and
- increasing the use of expedited processes.

These objectives must be met while ensuring safe and legal transit of freight.

3.2.1 Information and Communications

A high-priority border crossing issue is the need for an efficient and reliable communications system allowing port-of-entry personnel access to key information before a specific cargo shipment arrives at the port of entry. Most border crossing delays are caused by incomplete documentation that should be able to be mitigated by improved information and communications systems. Automated activation of vehicle, driver, and cargo data review processes, involving remote two-way communications between port-of-entry operators and incoming vehicles in advance of the border crossing, is an important step in restructuring border inspection and enforcement processes. This capability holds substantial promise in expediting the movement of freight through ports of entry.

3.2.2 Inspection Selectivity

Federal and state inspection agencies are faced with the challenge of focusing limited resources toward identifying illegal traffic and/or cargo passing through ports of entry. A small fraction of port-of-entry users are out of compliance or involved in transporting contraband or other illegal goods. Inspection agencies need improved ways to accurately identify vehicles or freight requiring rigorous inspection. Large numbers of false-positive inspections (i.e., inspections resulting in no compliance violations) cause substantial unnecessary delays and consume resources better allocated to inspections resulting in the detection of violations. Conversely false-negative selections (i.e., passage of vehicles or cargo out of compliance without being subject to thorough inspection) undermine the basic purpose of operating ports of entry.

3.2.3 Standardization and Consistency

Port-of-entry documentation required for vehicles, cargo, operators, shippers, and receivers by federal, state, and local agencies, as well as various other public and private interests, is neither standardized nor consistent and is often duplicative in both content and sequence. Documentation and information sharing among the agencies and users are not well developed at ports of entry. A high priority of border crossing users is the standardization and integration of port-of-entry documentation and information systems.

Consistency in processing time is also a major issue affecting cargo shippers, especially those engaged in time-definite delivery transport or serving just-in-time manufacturing facilities. For an increasing number of shippers and carriers, second in importance to reducing border crossing delays is the ability to plan delivery schedules taking into account predictable and consistent processing times at international ports of entry.

3.3 ISSUE-SPECIFIC APPLICATIONS OF ADVANCED TECHNOLOGIES

Successful deployment of advanced technologies to reduce delays and improve the efficiency of ports of entry will require very close coordination and cooperation. Government agencies and freight transporters must be involved in the development of new technologies in order to optimize the safe and legal passage of cargo through ports of entry. For example, Article 512 of the North American Free Trade Agreement (NAFTA) is entitled "Cooperation." This section clearly states that to the extent possible the Parties will agree, for the purposes of facilitating trade, to harmonize documentation, standardize data elements, and accept international data syntax for exchange of information. Equally important, considerably greater cooperation and integration is needed among U.S. agencies. More effective coordination is also needed between federal and state agencies. Advanced technologies can assist in meeting these objectives.

3.3.1 Information and Communication Technologies

3.3.1.1 Remote Activation of Sensors and Controllers

Automated pre-clearance of freight can expedite legal traffic and focus inspection efforts at ports of entry. Technologies in this class include: automatic vehicle identification (AVI), electronic credentials and documentation, hazardous materials designations, and on-board monitoring of port-of-entry status.

3.3.1.2 Tracking Systems

Vehicle and cargo tracking systems have the promise of decoupling port-of-entry processes from the actual physical border crossing infrastructure. Reliable, continuous tracking of vehicles and freight can reduce delays at ports of entry, as well as allowing the shippers, carriers, and receivers of cargo to know the status of the freight upon demand. Much attention has been focused on the need to develop more accurate, efficient, and cost-effective methods to track both vehicles and freight. Because this capability can improve port-of-entry processes and customer service simultaneously, substantial motivation exists for all parties to pursue collaborative efforts to achieve state-of-the-art vehicle and cargo tracking. Technologies in this class include: tags, transponders, global positioning systems, electronic documentation, electronic data interchange (EDI), and on-board communications. Technology has been developed to track defense-related shipments throughout the U.S., but to date this capability has not been effectively transferred to the commercial freight industry.

3.3.1.3 Information Access and Security

Multiple parties representing government agencies and the user community are interested in improving the quality of and access to information sharing for port-of-entry processing. However, some information important to border operations may be private, proprietary, sensitive, and not appropriate for unlimited access. Information systems need to be designed to allow information to be retrieved by a wide variety of users, while limiting full access to those with the proper need to know. Technologies in this class include: data base design, information systems integration, data

encryption devices, certification processes, software interfaces for authentication of users, and digital signature verification. Considerable attention is being given to the development of information standards and system architectures to facilitate information sharing, but relatively little effort appears to be devoted to the security aspects of these systems. Security concerns can be a major barrier to the adoption or use of integrated information systems by private industry. Effective resolution of security concerns should speed implementation of shared information systems such as EDI.

3.3.2 Inspection Selectivity Technologies

3.3.2.1 Data Base Development and Information Analysis

A priority for the inspections community is the development of and improved access to data bases providing current and historical information on drivers, transportation companies, and cargo origins to allow inspectors to be more selective in their inspections. Considerable attention is devoted to hardware and software development to facilitate the transfer of and access to information, but little effort has apparently been dedicated to developing analytical applications of the information data bases. Technologies in this class include: risk assessment and management, probabilistic and simulation methodologies, expert systems, decision support techniques, artificial intelligence, and neural networks. Opportunities exist to develop models based on trend and risk analyses of historical border information to help identify the types of shipments associated in the past with out-of-compliance practices and to predict future occurrences. Models capable of elucidating the consequences of alternative inspection practices, such as 100% inspection rates, random inspections of a fixed percentage of shipments, or inspections conducted at the point of origin, could be developed with current technology.

3.3.2.2 Contraband Scanning

In addition to the transport of illegal drugs, port-of-entry inspectors attempt to detect undocumented hazardous materials and leakage, illegal armament, prohibited products, and misrepresentations of cargo passing through border crossings. Technologies capable of facilitating these inspection requirements are a very high priority for the border inspections community. Current procedures rely heavily on visual inspections and portable intrusive probes, both of which are labor intensive. Technologies in this class include: density meters, range finders, electronic noses, X-ray systems, neutron activation techniques, ultrasound scanners, electromagnetic detection techniques, and computer-based tomography. Because many organized smuggling operations are extraordinarily sophisticated, the inspections community has a constant need for state-of-the-art sensing and scanning technologies.

3.3.3 Standardization Technologies

3.3.3.1 Border Processes

A key to making advanced technology useful in improving the efficiency and effectiveness of ports of entry is a thorough understanding of border crossing functions. A number of efforts have been undertaken to document and map border crossing requirements, systems, and processes; but, in general, these efforts have focused on a specific port of entry or a specific user. No definitive document delineating border crossing processes has been prepared to guide the development of a comprehensive technology plan for ports of entry. Development of such a process map, indicating both formal and informal relationships and interactions, for international ports of entry is widely recognized as an important initial step toward achieving consistency and implementing advanced technologies in an exceptionally complex social environment. Technologies in this class include: complex systems analysis, information management and prioritization techniques, and logical design methodologies.

3.3.3.2 Systems Integration

An extraordinary number of disparate activities have been planned and/or undertaken to improve the efficiency of international ports of entry. In spite of these efforts by federal agencies, state governments, and the user community, many of the problems continue to persist and, in some cases, the delays experienced at border crossings continue to worsen. Without a comprehensive guide of individual and organizational needs to be satisfied, these efforts may well yield an unintegrated and uncoordinated collection of institutional and technological solutions, systems, and process changes further impeding the flow of traffic through ports of entry. A high-priority objective is to integrate the diverse requirements present at an international port of entry in a manner meeting the needs of the wide variety of stakeholders. Advanced systems integration technologies may yield impressive results if properly designed and implemented.

3.4 CONCLUDING REMARKS

The principal issue at international ports of entry is expediting freight movement in compliance with existing regulations and procedures. Inadequate information and communications systems, cargo inspection practices and techniques, and failure to standardize documentation requirements and eliminate duplication are the major causes for processing delays at border crossings. Advanced technologies, such as remote activation of sensors and controllers, universal information access with appropriate security and confidentiality measures, and vehicle and cargo tracking systems, are strong candidates for providing the necessary improvements in information and communications systems. Sophisticated data analysis and decision-support algorithms, as well as advanced vehicle and cargo inspection systems, should improve the ability of inspection agencies to target and intercept out-of-compliance and illegal freight shipments. A thorough understanding of border crossing processes by application of systems analysis techniques, in addition to optimizing the integration of the multitude of systems functioning at a modern, high-cargo-volume facility, are necessary steps in any effort to obtain more efficient and effective operations at international ports of entry.

3.5 SELECTED BIBLIOGRAPHY

1. J.A. Adams, Jr., "Window on the Future: Mexico in 1996," *Twin Plant News* 11(5), 9-13 (1996).
2. C. Brown, B. Gau, R. Horn, N. Kennedy, B. Norris, and P. O'Leary, "ITS/CVO Cross-Border Strategic Plan: Border Crossing Requirements and Procedures," John A. Volpe National Transportation Systems Center, Staff Study 401-HW50C-95-06, June 30, 1995.
3. DRI/McGraw-Hill, "U.S. Freight Transportation Forecast to 2003," American Trucking Associations Foundation, Alexandria, Virginia, April 1995.
4. K. Kelley and E. Van Steenburg, "Equipment Location Systems - Providing Intermodal Terminal Operators with Information Accuracy," paper presented at the Transportation Research Board National Conference on the Intermodal Terminal of the Future, New Orleans, Louisiana, December 7-9, 1994.
5. Marshall Macklin Monaghan Limited, JHK & Associates, and Constance Consultants, "Preliminary Engineering and Design of IVHS/AVI New Technology Applications," Michigan-Ontario-New York Highway Border Crossings, Progress Report No. 2, May 1995.
6. Marshall Macklin Monaghan Limited, KPMG Management Consulting, JHK & Associates, and Constance Consultants, "Study of Institutional Impacts of New Technology Applications," Report prepared for the New Technology Committee for the St. Clair and Detroit Rivers Highway Border Crossings, May 1994.
7. J.G. Palmer, Jr., M. McLeod, and M.C. Leue, "Simulation Modeling of Traffic Access for Port Planning," paper presented at the Transportation Research Board National Conference on the Intermodal Terminal of the Future, New Orleans, Louisiana, December 7-9, 1994.
8. J.C. Rijsenbrij, "Automation: A Process Redesign," Europe Combined Terminals B.V., October 1994.
9. J. Holguin-Veras and C.M. Walton, "The State of the Practice of Information Technology on Marine Container Ports," paper presented at the Transportation Research Board National Conference on the Intermodal Terminal of the Future, New Orleans, Louisiana, December 7-9, 1994.
10. The Information Exchange and Automation Working Group, "The North American Trade Automation Prototype," Report to the Heads of Customs, June 1995.
11. D. Vandevveer, "Intermodal Rail Facility Design for the Next Century," paper presented at the Transportation Research Board National Conference on the Intermodal Terminal of the Future, New Orleans, Louisiana, December 7-9, 1994.

4. TECHNICAL WORKSHOPS AND CONFERENCES

4.1 INTRODUCTION

Members of the Advanced Technologies for International and Intermodal Ports of Entry (ATIPE) Project team attended two by-invitation-only workshops as part of the efforts to collect relevant information on international port-of-entry issues with potential technical solutions. These workshops were convened by the Intelligent Transportation Society of America in November 1995 and the Transportation Research Board of the National Research Council in December 1995, respectively.

4.2 INTELLIGENT TRANSPORTATION SOCIETY OF AMERICA WORKSHOP

The Intelligent Transportation Society of America held a planning workshop on November 16, 1995, in Hanover, Maryland, entitled Working Toward a National Intermodal Intelligent Transportation System Freight Strategy, to explore the question of whether the U.S. Department of Transportation (DOT) initiative on electronic technology architecture should be tailored to meet the needs of the intermodal freight industry. This workshop was restricted to invited participants only (see Appendix 4-A). Part of the workshop agenda provided an overview of the National Intelligent Transportation Systems (ITS) Architecture.

4.2.1 Purpose

The goal of the workshop was to identify potential technology contributions with respect to:

- top-level requirements of the freight industry for successful and efficient operations;
- current status of these requirements being addressed and satisfied;
- requirements not being addressed and shortfalls in current practices;
- future plans for addressing those requirements; and
- proper role, if any, for the federal government in enhancing intermodal freight mobility.

Special emphasis was given to the intermodal requirements, if any, calling for action on part of the federal government.

4.2.2 Observations

4.2.2.1 National Intelligent Transportation Systems Architecture

Substantial concern was expressed by industry participants regarding the National ITS Architecture and the roles played to date by the federal government. In general, industry appears to be confused and displeased with the participation of government agencies in intermodal freight matters. This situation suggests that the ATIPE Project may experience considerable skepticism from the intermodal industry in attempts to gain guidance on appropriate performance parameters for new technologies.

Modernizing the information and communication systems used by the trucking industry is the present emphasis of the ITS architecture. Much of the work has apparently been accomplished without close communication or interaction with this segment of the transportation industry. Many industry representatives are uneasy about the intent of this work.

According to the present plans of DOT and the Federal Highway Administration (FHWA), upon completion of the work to the trucking industry, the ITS architecture will be interfaced with existing architectures developed largely by industry for rail, air, and marine transportation to achieve a true intermodal capability. This integration will be complex because the rail, air, and marine industries claim to be well advanced in developing and deploying electronic data interchange (EDI) and communication technologies. To complicate matters, these dedicated systems, commonly called legacy systems, have been implemented as stand-alone systems. Therefore, these systems are generally interoperable with other transportation modes, except for those companies providing integrated transportation services, such as Federal Express and United Parcel Service. Some segments of the air freight industry are disturbed by apparent government interference in intermodal transportation systems that serve the industry well.

4.2.2.2 Emerging Themes

Overall, the need for achieving interoperability across transport modes was a major theme championed by the participants. Industry agreed on the best single source for delineating intermodal operability standards and technology development priorities being the Intermodal Association of North America.

Another theme emerging from the discussions was that successful, widely implemented systems must be simple or at least appear to be simple to the users. Simplicity is necessary in order to have the systems reach the large fraction of intermodal freight moved at some point in its transit by small businesses without the resources to support complicated systems.

4.2.2.3 System Priorities

The DOT and FHWA activities in ITS have focused so far on vehicle tracking. However, a prerequisite to efficient intermodal freight transport is cargo tracking. Strong support was voiced for the concept of in-transit freight visibility with confidentiality. While strongly endorsing this concept, many industry representatives were very concerned that a national freight tracking system developed and coordinated through a government initiative would ultimately emerge into future inappropriate regulation of industry and/or would compromise proprietary interests.

Two additional priorities for furthering intermodal transportation were identified as follows:

- communications systems to alert the trucking industry to cargo surges originating from marine and rail transfer stations; and
- universal tag, transponder, and reader systems to allow pre-clearance of intermodal cargo across transport modes.

The second priority is extraordinarily challenging in the near-term because of the existence of multiple tags and transponders presently in use. However, the development of universal reader technology could be interfaced with existing practices and would accomplish many of the objectives of a fully compatible integrated system.

Three important considerations for future information technologies for the transportation industry emerged from private discussions during the workshop as follows:

- elimination of manual data input via keyboards;
- utilization of the Internet as a value-added network and universal information infrastructure; and
- assurances of information security in shared communications infrastructures, such as the Internet.

The first consideration could help mitigate the present requirements for redundancy in data input for business and government needs. Cargo tracking systems could capitalize on the widespread accessibility of the Internet. Defining interindustry and intersector information security needs will be a significant challenge in the third instance because the transportation industry has little prior experience in this arena.

4.2.3 Concluding Remarks

The intermodal transportation industry clearly has not embraced the ITS work. Substantial concern exists related to governmental motivations of becoming involved in information and communications systems for use by the intermodal industry. In fact, the situation may be best characterized as a lack of acceptance of some aspects of the work on the National ITS Architecture, perhaps in part as a result of industry not being well informed of the purpose, approach, and development practices of the effort in advance of important design criteria being selected. This apparent insensitivity to industrial perspectives is likely to make acceptance of this architecture much more challenging than necessary.

The ATIPE Project would be well advised to take notice of this tension between the transportation industry and government agencies and avoid similar pitfalls in the selection and design of advanced technologies to serve as prototypes for international ports of entry. A key ally to have in projects attempting to deploy new technologies successfully in the intermodal transportation industry is the Intermodal Association of North America.

The importance of cargo tracking, simplicity of information and communications systems, and information security was evident throughout the discussions. According to industry, these considerations deserve considerably more emphasis the development work on the National ITS Architecture.

4.3 TRANSPORTATION RESEARCH BOARD CONFERENCE

The National Research Council (NRC) through the Transportation Research Board (TRB) plans to conduct a national conference to assist in establishing a framework for an integrated national intermodal research agenda. Support for the March 1996 conference is being provided by the Advanced Research Projects Agency (ARPA) and DOT. The objective of the conference is to develop a strategic framework for intermodal research and to widely disseminate the findings in the transportation community. This conference will build on the results of three workshops convened by TRB. The first workshop, held in December 1992, identified the issues associated with meeting the planning requirements set forth in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). Two concurrent workshops were held in December 1994, *Intermodalism: Making the Case, Making It Happen* and *The Intermodal Terminal of the Future*, to share best practices of state and local governments in conducting intermodal planning called for under ISTEA.

4.3.1 Steering Committee Meeting

On December 11-13, 1995, the NRC-appointed Steering Committee for the March 1996 *Setting an Intermodal Transportation Research Framework Conference* held a planning meeting in Irvine, California. The Steering Committee is composed of experts in transportation planning and operations in air, highway, marine, and rail modes and includes individuals representing the civilian and military transportation sectors. About 65 people attended the planning meeting by invitation (see Appendix 4-B).

4.3.2 Working Papers

As part of the planning meeting, preliminary versions of technical papers commissioned by TRB were presented and discussed. A number of observations regarding research needs were made in these papers. Perspectives from social scientists and national security interests were included in the discussions, as well as the more traditional science and engineering perspectives on establishing research agendas.

4.3.2.1 Social Considerations

Research agendas can benefit by including social, as well as technology development and deployment, considerations. Important research areas identified in the socialization of intermodal transportation include:

- documentation and evaluation of ongoing experiments with advanced technology in the transportation industry to understand the social learning aspects of deploying new technologies, including advanced examples from the integrated air freight companies and the time-definite delivery trucking firms, as well as less visible examples;
- investigation of the interdependent relationships between information infrastructures and transportation infrastructures in intermodal and modal transport;
- development of the underlying technical components of an intermodal information infrastructure, such as client-server systems, distributed data bases, expert systems, neural networks, and machine learning, and emerging communications technologies, such as value-added networks, the Internet and World Wide Web, and applet based models of networked computing;
- experimental deployment of advanced information systems and communications technologies in industrial environments through a real-world testbed approach; and
- investigation of high-level requirements analysis to assess deployment of technologically advanced information systems in a complex organizational and cultural setting influenced by a strong institutional order, such as the U.S. transportation system.

4.3.2.2 Optimization of Transportation Systems

The growth of intermodal transport and the needs for appropriate research will be driven by factors such as:

- increasing reluctance to invest public funds in expansion of modal transport systems;
- proof of successful intermodal transport by the integrated air freight industry;
- demands from commerce for new solutions to logistics management; and
- national defense requirements for ready intermodal transport capacity in the U.S.

Technological solutions should be sought for overcoming the inherent barriers and constraints to implementing intermodal transportation systems. Examples of these challenges include achievement of coordination without integration and accommodating differences in languages, measurement systems, and rules and regulations in international and intermodal transportation. Because large-scale intermodal transportation cannot be accomplished through vertical integration, value-added technological improvements capable of facilitating cooperation and harmonization across transport nodes must be developed and deployed cost effectively.

Optimizing the overall U.S. freight transportation system must incorporate a number of objectives such as:

- reliable service, on time without cargo damage;
- full visibility of cargo and vehicles at all times accomplished through advanced tracking technologies;
- accurate cargo documentation that is paperless, worldwide, and immediate;
- safety procedures to minimize transportation accidents and environmental contamination;
- maximum flexibility and recovery to accommodate delays, errors, and load variations;
- minimum overall costs to users and carriers;
- continuous, seamless intermodal transportation; and
- security systems preventing electronic or physical disruption.

Additional important research topics were identified in five specific areas:

- applied information technology involving issues such as architectures, interoperability, data bases, access, and security;
- systems engineering and assessments including modeling, simulation, data base validation, effectiveness evaluation, costs, and benefits;
- policy analysis investigating legislative, regulatory, and institutional barriers, as well as applications of decision-making and partnership-building tools;
- infrastructure and vehicle enhancements, particularly in the intermodal arena; and
- technology transfer methods to encourage rapid and widespread dissemination of advanced transportation technologies.

4.3.2.3 National Defense Considerations

Special requirements for intermodal transport to support national security include:

- commonality or interoperability with commercial systems including coding, containers, information systems, and bulk transportation;
- criticality of rapid, end-to-end seamless and continuous flow requiring multimodal capability;
- extraordinary flexibility to unanticipated changes achieved through system robustness;
- extreme vulnerability of transportation systems to electronic and physical disruption; and

- simulation and modeling of interoperability, continuous flow, system robustness, and system vulnerability.

Research in these areas should appropriately be conducted with focus and guidance from the U.S. Department of Defense.

4.3.3 Organizational Issues

To achieve the vision of a functionally efficient intermodal transportation system in the U.S., four actions were outlined for DOT as follows:

- increase funding for intermodal transportation R&D;
- establish a stronger centralized oversight and control of R&D conducted by DOT;
- develop enhanced capability for R&D contracting and systems engineering; and
- form a senior R&D advisory board for the Secretary of Transportation.

The discussions pointed out that the DOT surface transportation R&D budget for Fiscal Year 95 was about \$515 million, with less than 1% being allocated to intermodal R&D. An estimated \$2 to \$5 million is committed to intermodal transportation R&D by DOT. This value is comparable to the budget of the ATIPE Project.

4.3.4 Concluding Remarks

Participants at this planning meeting recognized the importance of incorporating the social dimensions of new technology into the R&D agenda for intermodal, especially international, transportation. Process mapping was suggested as an important activity to be performed well. Many components of the intermodal transportation system have been mapped by owners of the process, such as individual companies, the U.S. Customs Service, and operators of single ports of entry. However, establishing ownership and determining process boundaries that incorporate the entire U.S. intermodal transportation system has not fit within the structure of DOT. Accordingly, productive work should be possible by building on existing models and process maps.

The importance of interoperability of information systems across transport modes, as well as between the civilian and military sectors, was emphasized in the working papers presented at the planning meeting. Vehicle and cargo tracking systems integrated with electronic documentation represent technological enablers to achieving widespread success in future intermodal transportation. Special security capabilities will need to be incorporated if civilian and military transportation needs are going to rely on a single information systems infrastructure supporting intermodal transport.

Appendix 4-A

Invited Participants Attending the Intelligent Transportation Society of America Workshop

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Appendix 4-B

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5. TRANSPORTATION INDUSTRY ASSOCIATION AND CORPORATION SURVEYS

5.1 INTRODUCTION

The Advanced Technologies for International and Intermodal Ports of Entry (ATIPE) Project compiled extensive lists of industry associations and companies in the inland transportation industry with experience in international and intermodal transportation issues. The purpose of these compilations was to solicit opinions regarding problems experienced in moving freight through international ports of entry through a written questionnaire.

5.2 MAILING LISTS AND SURVEY SAMPLE

The industry associations, compiled principally from the *1996 Encyclopedia of Associations*, spanned the stakeholder spectrum from truck transport, rail transport, intermodal transport, import/export organizations, commodity shippers, customs brokers and freight forwarders, and special situations, such as hazardous and perishable materials transport, transportation consultants, trade and business groups, and electronic data interchange. A final representative mailing list of 57 entries was assembled (see Appendix 5-A).

Commodity shippers and transportation companies were the dominant categories of firms included in the sample of individual private corporations involved in shipping freight through inland international ports of entry. This sample was compiled from stakeholder lists generated by the ATIPE Project through participation in technical conferences and symposia, corporate directories, and data bases maintained by organizations such as the National Freight Partnership. A final representative mailing list of 228 entries was assembled (see Appendix 5-B).

5.3 SURVEY INSTRUMENT DESIGN AND RESPONSE RATES

Four-page questionnaires were prepared for each of the industry association and corporation samples. The two questionnaires (see Appendices 5-C and 5-D, respectively) were very similar except for slight wording changes to better personalize some of the individual questions. The industry association questionnaire contained an additional question requesting identification of potential technical solutions to high-priority port-of-entry issues that should be investigated by the ATIPE Project. To facilitate rapid response times, the questionnaires were prepared in multiple choice formats with the opportunity for respondents to write in additional comments or responses and to elaborate on specific items.

One purpose of the survey was to identify categories and level of severity (i.e., not a problem, minor inconvenience, or significant complication) of problems experienced at inland ports of entry and to identify the trends in the severity of these problems. Four problem areas were specified on the questionnaires as follows:

- delays or operational inefficiencies;
- confusion regarding port-of-entry requirements, systems, and processes;
- theft or vandalism; and
- injuries or threats to the safety of personnel.

Trends in these problem categories were restricted to qualitative measures such as improving, staying about the same, and worsening over time.

A second principal part of the questionnaire explored the impacts of these problems and the severity of these impacts. Six impact categories were identified as follows:

- negative financial impacts;
- lost customers;
- increased employee turnover or morale problems;
- lost assets;
- forced changes in operations; and
- loss of competitive standing.

Four qualitative measures of severity of the impacts could be selected, namely, not a problem, a minor concern, becoming more serious, and a significant concern.

Identification of the causes of problems was the third aspect of the questionnaire. Specific causes were assembled under five broad categories. These categories and individual items are:

cumbersome border requirements

- unnecessarily complex border requirements and processes;
- conflicting requirements from the many parties involved in international ports of entry;
- duplicative, overlapping, or nonstandard border requirements and processes;
- poor or inconsistent service from port-of-entry operators;

inefficient or obsolete practices

- concentration of all border operations at the port of entry rather than use of point-of-origin or point-of-destination operations;
- ineffective or inefficient methods of selecting port users to be inspected;
- inadequate automation of border operations;

inadequate infrastructure

- too few ports or lanes for traffic volume;
- port facilities designs making operations inefficient, unsafe, or both;
- inadequate security measures at port facilities;

inadequate resources dedicated to port operations

- insufficient hours of operation;
- inadequate number of inspectors and other key port officials and personnel;

inadequate methods and technology

- inadequate data processing methods and technology to help port users meet border requirements;
- inadequate or difficult access to border crossing data by port users;
- lack of standard information formats and requirements so key information can be understood by all port users;
- inadequate communication between users and port operators.

Respondents were provided an opportunity to specify actions to address the problems experienced at ports of entry. The listed options included: none, political or administrative, operational changes or adjustments, and developing or buying new or upgraded technological solutions. Five specific items were provided under the technological solutions action category as follows:

- information or data processing systems;
- security or safety systems;
- communication systems;
- vehicle or freight monitoring or tracking systems; and
- identification systems.

Additionally, respondents were asked to identify any other commercial technology being developed to address border crossing problems.

Issues capable of being addressed by technological solutions were the fifth part of the questionnaire. Eleven issues were identified with respondents selecting a priority level among low, medium, and high. The issues included:

- reducing commercial users' time spent at ports of entry;
- lowering commercial users' costs associated with ports of entry;
- consolidating federal inspections;
- standardizing or simplifying inspection processes;
- standardizing or simplifying documentation;
- standardizing or simplifying port-of-entry hardware or software;
- increasing cooperation among government agencies;
- automating inspection services;
- automating fee and tariff collection;
- increasing off-site inspections;
- allowing universal selective access to port-of-entry information.

In addition, industry associations were asked to identify potential technical solutions worthy of further investigation by the ATIPE Project for those issues categorized as high priority.

Questionnaires were mailed to 57 industry associations and 228 corporations. The response rates were 12.3% and 14.9%, respectively. Provided the respondents represent an unbiased sample, the margin of error for responses expressed as percentages is about $\pm 38\%$ for industry associations and $\pm 18\%$ for corporations.

5.4 DATA ANALYSIS

5.4.1 Problem Categories

Delays or operational inefficiencies (delays) and confusion regarding port-of-entry requirements, systems, and processes (confusion) were commonly judged to be significant complications, while theft or vandalism (theft) and injuries or threats to the safety of personnel (safety) were not (see Table 5-1). Within the significant complication category, confusion regarding port-of-entry requirements, systems, and processes was ranked highest by both corporations and industry associations. The differences in the responses of corporations and industry associations are not statistically significant at the 95% confidence level.

Table 5-1. Percentage Response to Identified Problems Being a Significant Complication

	Problem (Percentage of Respondents)			
	Delays	Confusion	Theft	Safety
Corporations	46	57	17	10
Associations	57	71	14	14

The trends for delays or operational inefficiencies and confusion regarding port-of-entry requirements, systems, and processes among the respondents assigning a significant complication level of severity is indicated in Table 5-2. Seventy-one percent of the responding corporations and 80% of the industry associations felt confusion regarding the port-of-entry requirements, systems, and processes was improving or staying the same. However, 24% and 20%, respectively, indicated the confusion is getting worse. Similarly, 64% of the responding corporations and 75% of the industry associations judged the delays or operational efficiencies to be improving or staying the same. To the contrary, 29% and 25%, respectively, believe these problems are getting worse.

Table 5-2. Trends in Problems Representing Significant Complications

	Level of Severity (Percentage of Respondents)		
	Improving	Staying the Same	Getting Worse
Corporations			
Confusion (n = 17)	6	65	24
Delays (n = 14)	14	50	29
Associations			
Confusion (n = 5)	20	60	20
Delays (n = 4)	0	75	25

5.4.2 Impacts of Border Crossing Problems

A high-impact category was created by combining the responses of becoming more serious and a significant concern to the six specified impacts. Responding corporations and industry associations both judged financial losses to be the most common with frequencies of 49% and 57%, respectively (see Table 5-3). Forced operational changes, with response rates 40% and 57%, respectively, for corporations and associations, were the second most frequently cited impact. There is no significant difference at the 95% confidence level between the responses by corporations and industry associations summarized in Table 5-3.

Table 5-3. High Impacts of Problems Experienced at Ports of Entry

Impacts of Problems	Percentage of Respondents	
	Corporations (n = 30)	Associations (n = 7)
Financial losses	49	57
Lost customers	37	43
Increased employee turnover or morale problems	7	29
Lost assets	17	29
Forced changes in operations	40	57
Loss of competitive standing	23	14
Note: Percentages do not total 100% because individual respondents were encouraged to indicate all applicable impacts.		

5.4.3 Causes of Problems Experienced at Ports of Entry

Duplicative, overlapping, and nonstandard requirements and processes was the most commonly cited cause of problems experienced at ports of entry by both corporations (76%) and industry associations (100%). Inadequate data processing technology, too few inspectors and other personnel, and unnecessarily complex border requirements and processes were also frequently identified by both corporations and industry associations as being causes of border crossing problems (see Table 5-4). The largest differences of opinion among corporations and industry associations were on the impact of the design of inefficient port facilities, the presence of too few inspectors, and the inadequacy of automated border operations. Both corporations and industry associations least frequently identified inadequate security measures as a cause of problems experienced at ports of entry. This outcome is consistent with the low ranking of theft or vandalism and injuries or threats to personnel safety as problems experienced at ports of entry by both corporations and industry associations (compare Tables 5-1 and 5-4). Other infrequently identified causes of problems include inadequate access to data by port users and ineffective selection of users to be inspected.

Table 5-4. Causes of Problems Experienced at Ports of Entry

Causes of Problems	Percentage of Respondents	
	Corporations (n = 30)	Associations (n = 7)
Cumbersome border requirements		
unnecessarily complex requirements	60	71
conflicting requirements	63	57
duplicative, overlapping, or nonstandard requirements	76	100
poor or inconsistent service	33	43
Inefficient or obsolete practices		
concentration of operations at the border	50	43
ineffective selection of users to be inspected	43	29
inadequate automation of operations	57	86
Inadequate security		
too few ports or lanes for traffic	57	43
inefficient port facilities designs	47	86
inadequate security measures	13	29
Inadequate resources dedicated to port operations		
insufficient hours of operation	50	71
inadequate inspectors and other personnel	63	100
Inadequate methods or technology		
inadequate data processing	67	71
inadequate access to data by port users	23	43
lack of standard information formats and requirements	63	57
inadequate communication between users and operators	43	57
Note: Percentages do not total 100% because individual respondents were encouraged to indicate all applicable causes.		

5.4.4 Actions Taken to Address Problems Experienced at Ports of Entry

The most commonly taken actions in response to problems experienced at ports of entry are administrative or political with a 40% and 57% response rate indicated by corporations and industry associations, respectively (see Table 5-5). Operational changes or adjustments were the second most frequently cited action by both corporations and industry associations. Among technological solutions, information systems (27%) and communications systems (27%) were cited most frequently by corporations, while information systems (43%) and vehicle monitoring or tracking systems (43%) were most frequently cited by industry associations. Again, security and safety were infrequently cited actions by both corporations and industry associations. Nearly one-quarter of the corporations indicated that no actions were being taken to address the problems experienced at ports of entry.

Approximately 25% of the respondents indicated no awareness of other commercial technology being developed to address border crossing problems. Identified technologies included: interfacing between customs brokers, freight forwarders, and steamship lines; electronic scanning of commercial cargo for detection of contraband; customs automated manifest system for ocean freight imports; software designed to aid in classifying goods, documentation requirements, and load tracking; cargo tags and transponders; and pre-pass systems. An additional suggestion was to investigate the technology being adopted in many northern European countries pursuant to the establishment of the European Community.

Table 5-5. Actions Taken to Address Problems Experienced at Ports of Entry

Actions Taken	Percentage of Respondents	
	Corporations (n = 30)	Associations (n = 7)
None	23	14
Political or administrative	40	57
Operational changes or adjustments	33	43
Technological solutions		
information systems	27	43
security or safety systems	10	0
communication systems	27	29
vehicle or freight monitoring or tracking systems	23	43
identification systems	23	29
Note: Percentages do not total 100% because individual respondents were encouraged to indicate all applicable actions taken.		

5.4.5 Priorities for Technological Solutions

The qualitative measures of low, medium, and high priority were assigned quantitative values of 1, 2, and 3, respectively, in order to develop rankings of the 11 specified issues that could be addressed by advanced technologies by the ATIPE Project. The highest ranked issue by both corporations (2.7) and industry associations (2.9) was increasing cooperation among government agencies (see Table 5-6). The overall average score assigned to the identified issues was 2.3.

Table 5-6. Priority Issues with Technological Solutions

Issue	Numerical Rankings	
	Corporations (n = 30)	Associations (n = 7)
Reducing commercial users' time spent at ports of entry	2.4	2.7
Lowering commercial users' port-of-entry costs	2.2	2.3
Consolidating federal inspections	2.1	2.1
Standardizing or simplifying inspection processes	2.7	2.4
Standardizing or simplifying documentation	2.7	2.6
Standardizing or simplifying hardware or software	2.4	2.4
Increasing cooperation among government agencies	2.7	2.9
Automating inspection services	2.5	2.4
Automating fee and tariff collection	2.3	2.0
Increasing off-site inspections	1.7	1.4
Allowing universal selective access to information	1.8	2.0
Note: A score of 3 corresponds to a high-priority ranking, 2 indicates a medium-priority ranking, and 1 represents a low-priority ranking.		

Corporations ranked standardizing or simplifying inspection processes and standardizing or simplifying documentation among the top three priorities. Reducing commercial users' time spent at ports of entry and standardizing or simplifying documentation were ranked second and third, respectively, by industry associations. Increasing off-site inspections was ranked lowest among the 11 issues by both corporations and industry associations. Allowing universal selective access to port-of-entry information was ranked next to last by corporations and tied with next to last with automating fee and tariff collection by industry associations.

5.5 CONCLUSIONS

In general, the responses by corporations and industry associations were not significantly different regarding experiences encountered at ports of entry, business impacts of problems experienced, causes of the problems, actions taken to mitigate the problems, and priorities for technological solutions. The two most frequently cited problems representing significant complications experienced at ports of entry by both corporations and industry associations are: (1) confusion regarding port-of-entry requirements, systems, and processes and (2) delays or operational efficiencies. A majority of corporations and industry associations reported the severity of these problems remaining about the same over time. However, 20% to 29% of the corporate and industry associations judged these problems to be getting worse. Higher percentages of both corporations and industry associations felt delays or operational efficiencies were getting worse than was confusion regarding port-of-entry requirements, systems, and processes. Financial losses, forced operational changes, and lost customers were the three most frequently cited impacts of problems experienced at ports of entry by both corporations and industry associations.

Corporations and industry associations agreed that duplicative, overlapping, and nonstandard requirements and processes was the most common cause of problems experienced at ports of entry. Inadequate data processing methods and technology, inadequate number of inspectors and other key port officials and personnel, and unnecessarily complex border requirements and processes were also frequently identified by both corporations and industry associations as being causes of border crossing problems.

Administrative or political actions were the most commonly cited responses to problems experienced at ports of entry by corporations and industry associations alike. Operational changes or adjustments were the second most frequently cited actions taken. With regard to technological actions, information systems and communications systems were identified most frequently by corporations, while information systems and vehicle monitoring or tracking systems were most frequently mentioned by industry associations.

Increasing cooperation among government agencies was the highest priority with potential technological solutions deserving attention by the ATIPE Project. Corporations ranked standardizing or simplifying inspection processes and standardizing or simplifying documentation equal in importance to increased agency cooperation. Industry associations ranked reducing commercial users' time spent at ports of entry and standardizing or simplifying documentation second and third priority, respectively. Advanced technologies should be able to address the most significant port-of-entry problems and high-priority issues with potential technological solutions identified by corporations and industry associations. Many of these problems and issues are manifested, in large part, as processing-driven time delays at border crossings. Because time delays in transiting ports of entry are directly translatable into financial losses and/or opportunity costs, adoption of new technologies with competitive costs should be encouraged by companies involved in international commerce and their industry associations.

Appendix 5-A

Mailing List of Industry Associations

American Commerce and Shipping
Association
Anthony Keenan, Chief Executive Officer
1385 Iris Drive
Conyers, GA 30208

American Commodity Distribution
Association
John Harter, Executive Secretary
P.O. Box 2158
New Smyrna Beach, FL 32170-2158

American Import Shippers Association
Hubert Wiesenmaier, Executive Director
662 Main Street
New Rochelle, NY 10801

American Institute for Shippers'
Associations
Glenn Cella, Executive Director
P.O. Box 33457
Washington, DC 20033

American International Freight Association
David Hobson
1200 19th Street, N.W., Suite 300
Washington, DC 20036

American Movers Conference
Joseph Harrison, President
1611 Duke Street
Alexandria, VA 22314

American Railway Engineering Association
L.T. Cerny, Executive Director
50 F Street, N.W., Suite 7702
Washington, DC 20001

American Truck Dealers
James Westlake, Director
8400 Westpark Drive
McLean, VA 22102

American Trucking Association
Michael Jackson, Counselor to the President
2200 Mill Road
Alexandria, VA 22314

American Trucking Associations
Foundation
Gregori Lebedev, Senior Vice President and
Managing Director
2200 Mill Road
Alexandria, VA 21314-4677

Association of American Railroads
Joyce Koeneman
50 F. Street NW
Washington, DC 20001

Chemical Waste Transportation Institute
Richard Robinson, Executive Vice President
4300 Connecticut Avenue, N.W., Suite 300
Washington, DC 20036

Conference on Safe Transportation of
Hazardous Articles
Lawrence Bierlein, General Counsel
3000 K Street, Suite 300
Washington, DC 20007

Cooperative Business International
Robert Scherer, President
1401 New York Avenue NW, Suite 1100
Washington, DC 20005

Council on Competitiveness
Daniel Burton, President
1401 H Street, N.W., Suite 650
Washington, DC 20005

Electronic Data Interchange Association
Gregory Harter, Chief Executive Officer and
President
1800 Diagonal Road, Number 280
Alexandria, VA 22314-2340

Transportation Industry Association and Corporation Surveys

Express Carriers Association
James McDiarmid, Executive Director
2200 Mill Road
Alexandria, VA 22314

Hazardous Material Advisory Council
Jonathan Collom, President
1101 Vermont Avenue NW, Suite 301
Washington, DC 20005

Independent Truck Owner/Operator
Association
Marshall Siegel, President
P.O. Box 621
Stoughton, MA 02072

Intermodal Association of North America
John McQuaid, President
7501 Greenway Center Drive, Suite 720
Greenbelt, MD 20770-3514

International Safe Transit Association
Ellis Murphy, Executive Director
43 E. Ohio Street, Suite 1022
Chicago, IL 60611

Interstate Truckload Carriers Conference
Lana Batts, Executive Director
2200 Mill Road, 3rd Floor
Alexandria, VA 22314

Mid-West Truckers Association
Robert Jasmon, Executive Vice President
2727 N. Dirksen Parkway
Springfield, IL 62702

Munitions Carriers Conference
Jerry Turner, Managing Director
P.O. Box 1446
Fairfax, VA 22030-1446

NASSTRAC
Joseph Cutrona, Executive Director
1750 Pennsylvania Avenue, N.W.,
Suite 1111
Washington, DC 20006

National Accounting and Finance Council
Jane Sanders, Executive Director
2200 Mill Road
Alexandria, VA 22314

National Association of Foreign-Trade
Zones
Brandi Handack, Executive Director
17351 Eye Street, N.W., Suite 506
Washington, D.C. 20006

National Association of Freight
Transportation Consultants
D.F. Behme, Executive Director
P.O. Box 21418
Albuquerque, NM 87154

National Association of Rail Shippers
Anne Bennof, Director
50 F Street, Room 4202
Washington, DC 20001

National Automobile Transporters
Association
Robert Farrell, President
902 Buhl Building
Detroit, MI 48226

National Customs Brokers and Forwarders
Association of America
John Hammon, Executive Vice President
1 World Trade Center, Suite 1153
New York, NY 10048

National Foreign Trade Council
Barbara Simmons, Secretary
100 E. 42nd Street
New York, NY 10001

National Freight Transportation Association
J.W. Lind, Executive Director
P.O. Box 450
Big Flats, NY 14814-0450

National Furniture Traffic Conference
Raynard Bohman, Managing Director
P.O. Box 889
Gardner, MA 01440

National Magazine and Film Carriers
Ken Hofer, Executive Director
2200 Mill Road
Alexandria, VA 22314

National Motor Freight Traffic Association
Martin Foley, Executive Director
2200 Mill Road
Alexandria, VA 33214

National Moving and Storage Association
Gary Frank Petty, President
1150 Main Street
Fairfax, VA 22030-5066

National Perishable Logistics Association
William Towle
1010 Lake Street, Suite 210
Oak Park, IL 60301

National Private Truck Council
Gene Bergoffen, President and Chief
Executive Officer
66 Canal Center Plaza
Alexandria, VA 22314

National Railroad Freight Committee
S.D. Kennedy, Chairman
222 S. Riverside Plaza, Suite 1120
Chicago, IL 60606

National Tank Truck Carriers
Clifford Harvison, President
2200 Mill Road
Alexandria, VA 22314

New York Foreign Freight Forwarders and
Brokers
Stewart Hauser, President
28 Vesey Street, Suite 2120
New York, NY 10007

NM Motor Carriers Association
Vic Sheppart, Managing Director
4809 Jefferson NE
Albuquerque, NM 87109

Nu-Trans Cooperative
Darrell Sutton, Managing Director
3333 S. Iron Street
Chicago, IL 60608

Professional Trucking Services Association
Anthony Keenan, President
1385 Iris Drive
Conyers, GA 30208

Railway Progress Institute
Robert Matthews, President
700 N. Fairfax Street
Alexandria, VA 22314

Regular Common Carriers Conference
James Harkins, Executive Director
5205 Leesburg Pike, Suite 1110
Falls Church, VA 22041

Small Business Exporters Association
E. Martin Duggan, Executive Director
4603 John Tyler Court, Suite 203
Annandale, VA 22003

Southwest Public Affairs
Fred O'Cheskey, President
6121 Indian School Road NE, Suite 141F
Albuquerque, NM 87190

The International Trade Facilitation Council
Robert Windsor, President
1800 Diagonal Road, Suite 220
Alexandria, VA 22314

The National Industrial Transportation
League
Edward Emmett, President
1700 N. Moore Street, Suite 1900
Arlington, VA 22209-1904

Transportation Brokers Conference of
America
Annette Petrick, Executive Director
5845 Richmond Highway, Suite 750
Alexandria, VA 22303-1865

Transportation Claims and Prevention
Council
William Augello, Executive Director and
Counsel
120 Main Street
Huntington, NY 11743

Western Highway Institute
Sharon Nichols, Director
1200 Bayhill Drive, Suite 112
San Bruno, CA 94066

Western Railroad Association
James Baker, President
222 S. Riverside Plaza, Suite 1100
Chicago, IL 60606-5945

Western Railroad Traffic Association
R.C. Becker, Chairman
222 S. Riverside Plaza, Suite 1100
Chicago, IL 60606-5945

Appendix 5-B

Mailing List of Private Corporations

A & H Distributors
Arturo Ruiz, Manager
617 E. Highway 83 at McColl Road
McAllen, TX 78501

ABACO Custom House Broker
Pete Araujo, President
610 Customer Drive, P.O. Box 9750
El Paso, TX 79905

ABF Freight Systems
John Dale, Vice President-Transportation
3801 Old Greenwood Road
Ft. Smith, AR 72904

ABF Freight Systems
Clay Whetstine, Manager-Road Operations
4800 Lincoln NE
Albuquerque, NM 87110

Action West
Manuel Banuelos, Exports Manager
1931 Myrtle Avenue
El Paso, TX 79901

Acustar/Chrysler
Fritz Massou, President and Chief Executive
Officer
265 Peter Cooper Drive
El Pas, TX 79936

Alex Mills Development Company
Alex Mills, President and General Manager
11 Spa Circle, Buena Vista Ranch
Nogales, AZ 85621

Allen-Bradly Company
Kint Loose, Mexican Operations
1000 East Ball Road
Anaheim, CA 92805

Allied Signal Automotive
Carlos Masters, Plant Manager
100 Cienegas Road
Del Rio, TX 78840

Allied Van Lines
Michael Fergus, President
215 W. Diehl Road
Naperville, IL 60563

Altec Electronica Chihuahua
Mario Okubo, Manager
Av. de la Juventud S/N P.I. El Saucito
Chihuahua, Chihuahua MEXICO 31110

Am-Mex Brake International, Inc.
William F. Buckley, Vice President
800 East 32nd Street #20
Yuma, AZ 85366

American Freightways, Inc.
Tony Balisle, Executive Vice President-
Operations
2200 Forward Drive, P.O. Box 840
Harrison, AR 72602-0840

American Industries (GD)
Shannon McDonald, Director of Business
Development
12035 Rojas Drive, Building A
El Paso, TX 79936

Ametek Technical, Inc.
Ken Kroll, Manager
450 West Los Angeles Avenue
Simi Valley, CA 93065

Amway Corporation
Jim Wilterink
7575 E. Fulton Road
Ada, MI 49355

ANR Freight Systems
Bill Klotz, Vice President-Transportation
Maintenance
P.O. Box 5070
Denver, CO 80217

A.O. Smith Corporation
Nancy Garwood, Purchasing
531 North Fourth Street
Tipp City, OH 45371

A.O. Smith Water Products Division
Ron Massa, Executive Vice President
5605 N. McArthur Blvd., Suite 360
Irving, TX 75038

Apple Computer, Inc.
Santiago Rodriguez, International Exports
20523 Mariani Avenue
Cupertino, CA 95014

Ari-Son Internacional, S.A. De C.V.
Eduardo Toledo, General Manager
Camino Libramiento Km. 4.5
Nogales, Sonora MEXICO 84000

AT&T de Mexico
Mauricio Lopez-Portillo, Purchasing-
Transportation Specialist
Edificio Omega,
Campos Eliseos Numero 345-PH2
MEXICO 11560

AT&T Power Systems
Don Faletto, Purchasing Manager
3000 Skyline Drive
Mesquite, TX 75149

AT&T Productos de Consumo de
Mexico, S.A.
William Wagoner, Manager
Anillo Periferico Sur #7999
Tlaquepaque, Jalisco MEXICO 45601

Atchison, Topeka & Santa Fe Railway
Steve Griego, Manager of International
Department
805 S. Santa Fe
El Paso, TX 79901

Atchison, Topeka & Santa Fe Railway
Skip Kalb, Vice President-Industrial
Development
1441 W. Airport Freeway
Euless, TX 76040

Augat Wiring Systems, Inc.
A. Gallo, Vice President-Mexican
Operations
2745 Gunter Park Drive West
Montgomery, AL 36109

Avery Dennison
Al Tsuma, Export Manager
150 N. Orange Grove Boulevard
Pasadena, CA 91103

Bacchus Industries
Rick Bacchus, President
300 Antone
Sunland Park, NM 88063

Bailey-Mora Company/Export Diaz
Gaby Perez
4940 Gateway East Boulevard
El Paso, TX 79905

Baxter Health Care Corporation
Keith Lombardi, Director of Manufacturing
1 Baxter Parkway
Deerfield, IL 60015

Beckman Industrial
Alan Stone, Plant Manager
4200 Bonita Place
Fullerton, CA 92635

Bell Wood Lighting Company
Carlos Beltran, Manager
6955 Camino Maquiladora, Suite F
San Diego, CA 92173

Black & Decker Corporation
Fred Vandermas
701 E. Joppa Road
Towson, MD 21286

Bob's Custom Saddles, Inc.
Robert G. Haley, President
4202 Lakeside Lane
Scottsdale, AZ 85253

Border Apparel
Hector Cervantes, Plant Manager
1817 Myrtle
El Paso, TX 79901

Transportation Industry Association and Corporation Surveys

Bourna Incorporated
Don Young
2533 North 1500 West
Ogden, UT 84404

Bourns, Inc.
Dan Henson, International Sales Manager
1200 Columbia Avenue
Riverside, CA 92507

BRK Electronics
Murray Craig, Director of International
Sales
780 McClure Road
Aurora, IL 60504

Brown, Alcanter & Brown
Joe Alcanter, Vice President
P.O. Box 1161
El Paso, TX 79947-1161

Brownstone Trading Company
Pat O'Rourke, Manager
714 University
El Paso, TX 79902

Brunswick Corporation
Jack Reichert, President
1 N. Field Court
Lake Forest, IL 60045-4811

Burlington Industries, Inc.
David Stump, President
506A Radar Road
Greensboro, NC 27410

Burlington Industries, Inc.
Linda Van Fleet
3330 W. Friendly Avenue
Greensboro, NC 27420

Campbell Soup Company
Carl Lucas
Campbell Place
Camden, NJ 08103-1799

Canadian Freightways Limited
Don Chapman, Director of Operations-
Western Region
4041 A Sixth Street S.E.
Calgary, Alberta CANADA T2G 4E7

Cargo de California
John Garcia, Manager
6621 Wilson Avenue
Los Angeles, CA 90001

Carolina Freight Carriers Corporation
Rick Menigoz, Vice President-
Transportation
P.O. Box 697
Cherryville, NC 28021

Celite Corporation
Tim Bloomer
P.O. Box 519
Lompoc, CA 93438

Central Transport, Inc.
Robert Davis, International Director of Sales
P.O. Box 80
Warren, MI 48090

Central Transport, Inc.
John Mulvey, Vice President-Sales
P.O. Box 80
Warren, MI 48090

CF Motor Freight
W. Roger Curry, President
175 Linfield Drive
Menlo Park, CA 94025

Chemport Chemicals, Inc.
Vincente Medina, Manager
7500 Viscount Boulevard, Suite 122
El Paso, TX 79925

Chrysler Corporation
Rita McKay
12000 Chrysler Drive
Highland Park, MI 48288-1919

C.J.C. Holding Company
Gary Garrison, Vice President
7211 Circle S. Road
Austin, TX 78714-2099

Clayton Industries Company
Allan Draper, Production Manager
4213 North Temple City Boulevard
El Monte, CA 91731

CMB Maquila Services, Inc.
Trinidad Lopez, General Manager
2475 Paseo de las Americas
San Diego, CA 92173

CMB Maquila Services, Inc.
Michael Walsh, Manager
2475 Paseo de las Americas, Suite C
San Ysidro, CA 92163

Coca Cola Company
Paul Brennan, Manager, International
Trans-Shipping
P.O. Drawer 1734
Atlanta, GA 30301

Colgate-Palmolive Company
Tony Cavaliere
300 Park Avenue
New York, NY 10022

Consolidated Freightways, Inc.
John Paiva, Manager of Transportation
175 Linfield Drive
Menlo Park, CA 94025

Container Corporation of America
Mentz Billngesle, General Manager
185 N. Smith Avenue
Corona, CA 91720

Crown Controls Corporation
Mark Gagle, Mexican Operations
40-44 S. Washington Street
New Bremen, OH 45869

Cummins Electronic, Inc.
Bernie Koczaja, Executive Director-
Manufacturing
2851 State Street
Columbus, IN 47202-0628

Cummins Engine Company, Inc.
Jerry Streitmeier
Box 3005
Columbus, IN 47202

Daher Golden Eagle
Allen Clair, Sales Manager
200 Center Street
El Segundo, CA 90245

Dallas & Mavis Specialized Motor Carrier
Service
Wade Houston, President
620 E. Shipp Avenue, Suite B
Louisville, KY 40201-3546

Dayton-Walther Corporation
Carl Sprock, Distribution Manager
P.O. Box 1022
Dayton, OH 45401

Disposable Medical Products, Inc.
Troy Bennet, Vice President of
Manufacturing
1180 West Industrial Park Drive
Nogales, AZ 85628

Doublestack Services
Daniel Robles, Office Manager
12135 Esterloma, Suite E4
El Paso, TX 79936

Duracell International, Inc.
Paul Steffen, Marketing Manager
Berkshire Industrial Park
Bethel, CT 06801

Eastman Kodak Company
Robert Polis, Exports Sales Manager
343 State Street
Rochester, NY 14650

Eaton Corporation
Jeff Solich, Manager-Transportation
111 Superior Avenue
Cleveland, OH 44114

EDM of Texas
Albert Wiser, President
14042 Distribution Way
Dallas, TX 75234

E.D.S. Manufacturing, Inc.
Luis Moreno, Operations Manager
101 Freeport Drive, Warehouse 8
Nogales, AZ 85621

Eli Lilly & Company
Bruce Ruoff
Lilly Corporate Center
Indianapolis, IN 46285

Transportation Industry Association and Corporation Surveys

Eriez Magnetics
Kathy Height, Export Traffic Coordinator
P.O. Box 10652
Erie, PA 16514

Evenflo Products Company
Rick Cheek, Traffic Manager
1000 Evenflo Drive, P.O. Box 709
Canton, GA 30114

EWD/Division of Chrysler Corporation
Irene Arellano, Purchasing
1265 Peter Cooper Drive
El Paso, TX 79936

Farah Manufacturing Company, Inc.
Jackie Boatman, Vice President-
Manufacturing
8889 Gateway West Boulevard
El Paso, TX 79936

Fisher Controls International, Inc.
Roger Bryant, Manager of Distribution
Services, North America
205 South Center Street
Marshalltown, IA 50518-2823

Ford Motor Company
Jim O'Connor, Executive Director of
American and Worldwide Export
The American Road
Dearborn, MI 48121

Fritz Companies
Jay Robie, Inbound Transportation Manager
550-1 Eccles Avenue
South San Francisco, CA 94080

Fruehauf Trailer Corporation
Rob Eldridge, Sales Director
P.O. Box 44913
Indianapolis, IN 46244-0913

Gateway Service, Inc.
Barry Batsell, President
3554 Boca Chica Boulevard
Brownsville, TX 78520

GATX Logistics, Inc.
Bob Simcoe, Manager of Mexican
Operations
1301 Riverplace Boulevard, Suite 1200
Jacksonville, FL 32207

General Electric Corporation
Matt Schaffer, Purchasing
2000 Taylor Street
Fort Wayne, IN 46802

General Foods Corporation
Stanley Hirshman, Transportation Manager
3 Lakes Drive
Northfield, IL 60093-2753

General Motors Corporation
Lois Clinovin, International Sales
3044 W. Grand Boulevard
Detroit, MI 48202

Georgia Pacific
Warren Myer, Director-International
Operations
133 Peachtree Street, N.E.
Atlanta, GA 30303

Gerber Products Company
Karen Lause, Export Order Coordinator
445 State Street
Fremont, MI 49412

Gilbert International, Ltd.
Joe Gilbert, Vice President
P.O. Box 1403
Laredo, TX 78042-1403

G.M. Trading Company
Bob Melton, President
4818 Highway 90 East
San Antonio, TX 78220

GO Dan Industries
Emilio Gonzales, Import/Export
1901 Blair
Laredo, TX 78040

Goodyear Tire & Rubber Company
John Polhemus, Vice President of Latin
American Operations
1144 E. Market Street
Akron, OH 44316

Great American Farms, Inc.
Maida Sotomayor, Import Director
1287 West Atlantic
Pompano Beach, FL 33069

Greenforest Oak Furniture, Inc.
Imelda Real, Vice President
9950 Marconi Drive, Suite 106
Otay Mesa, CA 92173

Grupo Summa
J. Manuel Flores, Investment Analyst
Leon Tolstoy #166-2 Comejo Industrial
Chihuahua, Chihuahua MEXICO

GTE Corporation
Danny Monder, Director of International
Projects
700 Hidden Ridge
Irving, TX 75038

Haggar Apparel Company
Jack Smith, Vice President
6113 Lemmon Avenue
Dallas, TX 75209

Hershey Chocolate-North America
Milt Matthews, Vice President of Sales
14 E. Chocolate Avenue
Hershey, PA 17033

Hewlett-Packard Company
Arlene Pinelle, International Division
3000 Hanover Street
Palo Alto, CA 94304-0890

Honeywell, Inc.
James Grierson, Vice President-Business
Development
Honeywell Plaza, P.O. Box 524
Minneapolis, MN 55440

IBM Corporation
Roy Borden, Manager of International Sales
Route 9, Town of Mount Pleasant
North Tarrytown, NY 10591

ICM Pharmaceuticals, Inc.
Ester Ring, Export Manager
ICN Plaza, 3300 Hyland Avenue
Costa Mesa, CA 92626

Instituto Mexicano del Transporte
Fernando Velasquez, Transportation Planner
AV Popocatepetl N. 506 B
Col Xoxo, CP 03330 MEXICO

Interlink Freight Systems
Keith Robson, Chief Executive Officer
243 Consumers Road, 9th Floor
Willowdale, Ontario CANADA M2J 4W8

International Freight Services
Joe Dimaio, President
1610 Rollins Road
Burlingame, CA 94010

International Rectifier Corporation
Shawn Fogarty, Sr., Vice President of Sales-
Latin America
233 Kansas Street
El Segundo, CA 90245

IQF
Paul Farnsworth, Mexican Operations
306 West Rhapsody
San Antonio, TX 78216

Ireco Inc.
Terry Tanton, Area Manager
Crossroads Tower, 11th Floor
Salt Lake City, UT 84144

ITT Automotive Corporation
Steve Haywood
3000 University Drive
Auburn Hills, MI 48326-2356

JB Hunt
George Peel, Terminal Manager
11090 Gateway East, Building A
El Paso, TX 79927

J. Marcel Enterprises of Yuma, Inc.
Abelardo Sanchez, Manager
598 East 20th Street
Yuma, AZ 85366

J. Mex Import
John Burke, General Manager
117 E. Nakoma Street
San Antonio, TX 78216

Johnson & Johnson Medical
Glenda Benedict, Vice President-Human
Resources
2500 Arbrook Boulevard
Arlington, TX 76104

Transportation Industry Association and Corporation Surveys

Johnson Controls
Jim Tarkowski, Plant Manager
507 E. Michigan
Milwaukee, WI 53202

Kastan Engineering Corporation
Linn Kastan, President
1424 Continental Street, Suite 20
Otay Mesa, CA 92173

Kellogg Company
Estela Coll, International Exports
P.O. Box 3599
Battle Creek, MI 49016-3599

Keystone International Company
Russell Peasley, Export and Project Services
Manager
P.O. Box 40010
Houston, TX 77040

KLLM, Inc.
Kenneth Anders, Executive Vice President
P.O. Box 6098
Jackson, MS 39288

L & A Juice Company, Inc.
David Langer, President
161 95 Stethens Street
City of Industry, CA 91745

L.E. Coppersmith, Inc.
Jeff Coppersmith, Vice President
3460 Wilshire Boulevard, Suite 700
Los Angeles, CA 90010

Levi Strauss Company
Max Cowan, Manager
1459 Bessemer
El Paso, TX 79936

Levin Manufacturing
Jean Cervantes, Distribution Manager
7800 Trade Center Avenue
El Paso, TX 79912

Liquid Carbonic Corporation
Alex Villamil, International Manager
135 S. LaSalle Street
Chicago, IL 60603

Loral Electro-Optical Systems, Inc.
Dewis Freeman, President
600 East Bonita Avenue
Pomona, CA 91767

Louisiana Pacific-Texas Corporation
Hubert Momers, Export Manager
P.O. Box 3107
Conroe, TX 77305

Made In Mexico, Inc.
Jack Sauerman, Manager
310 Third Avenue, Suite B-8
Chula Vista, CA 91910

Maidenform, Inc.
Julie Annunziata, Traffic Manager
254 Avenue East
Bayonne, NJ 07002

Mallinckrodt Medical, Inc.
Dave Lockwood, Purchasing Manager
675 McDonald Boulevard
St. Louis, MO 63134

Maquiladora Operations Company
Anton Gattiker
2531 W. 327th Street, Suite 119
Torrance, CA 90505

Maquinados Y Productos Electromecanicos
Luis Mendivil, Manager
239 Imperial Avenue
Calexico, CA 92231-2800

Marathon Le Tourneau Company
Gary Pressler, Traffic Manager
P.O. Box 2307
Longview, TX 75606

Martin Guitars
Lon Werner, Manager-Mexican Operations
510 Sycamore Street
Nazareth, PA 18064

Mattel Toys
John Amerman, Chairman of the Board
333 Continental Boulevard
El Segundo, CA 90245-5012

Mayflower Transit, Inc.
Pete Million, Vice President-Traffic
P.O. Box 107
Indianapolis, IN 46206

Merck Sharp & Dohme International
Elizabeth Smith, Import Department
P.O. Box 2000
Rahway, NJ 07065

Mexico Sales Associate, Inc.
Mario Valenzuela, Plant Manager
2318 Martin Luther King
Calexico, CA 92231

Miles & Sons
Raul Gomez, General Manager
P.O. Box 11057
El Paso, TX 79983-1057

Miles, Rudolph & Sons
Toni Mena
4950 Gateway E., P.O. Box 11057
El Paso, TX 79983-1057

Mitsu-Soko, Inc.
Virginia Blasnek, Vice President
20974 South Santa Fe
Carson, CA 90810

Mobil Oil
Kitty Trahan, Transportation Analyst
3225 Gallows Road
Fairfax, VA 22037-0001

Molecular Bioproducts, Inc.
Larry Scaramella, President
9888 Waples Street
San Diego, CA 92121

Monsanto Company
David Williams, Director of Transportation
800 N. Lindbergh Boulevard
St. Louis, MO 63137

National Chemsearch Corporation
Maria Louisa Murillo, Import-Export
Manager
2727 Chemsearch Boulevard
Irving, TX 75061

Navajo Express, Inc.
Mike Desmond, Vice President Sales and
Marketing
5300 East 56th Avenue
Commerce City, CO 80000

Navtrans International Freight Forwarding
Fred Parshley, Manager
8901 S. La Cienega Boulevard
Inglewood, CA 90301

Neutrogena Corporation
Brigitte McIntosh, Director of International
Administration
5760 W. 96th Street
Los Angeles, CA 90045

Nova/Link
Brad Wolfe, Plant Manager
739 East Fronton
Brownsville, TX 78520

Oneita Industries
Karen Parrott, Manager
P.O. Box 24
Andrews, CA 92510

Otis Elevator Company
Wayne Burns, Mexican Operations
2301 N. Forbes Boulevard
Tucson, AZ 85745

Overnite Transportation Company
Frank Sutherland, Vice President-Network
Management
P.O. Box 1216
Richmond, VA 23209-1216

Oxford Industries, Inc. Lanier Clothes
James Tuman, Manufacturing Manager
222 Piedmont Avenue
Atlanta, GA 30308-3306

Pacer/Pacific Motor Transport Company
Dave Davidson, Pricing Manager
1229 E. Pleasant Run Road, Suite 300
DeSoto, TX 75115

Panasonic Matsushita Electronic
Tim Hioki, Manager
9375 Customhouse Plaza, Suite E
San Diego, CA 92173

Parsons Brinkerhoff
Phillip Reeder, Supervision Transportation
Planner
901 Mopac S., Building II, Suite 595
Austin, TX 78746

Transportation Industry Association and Corporation Surveys

Peavey Company/Conagra Trading
Companies
Pete Gagliano, Vice President of Corn &
Soybeans
730 Second Avenue
Minneapolis, MN 55402

Pepsico, Inc.
Wendy Willauer, Secretary to the Vice
President of Public Relations
700 Anderson Hill Road
Purchase, NY 10577

Phelps Dodge Corporation
Charlie Brown, Senior Vice President-
Phelps Dodge Sales Company
2600 N. Central Avenue
Phoenix, AZ 85004-3014

Phillips Petroleum Company
Carol Hamilton, International Exports
Phillips Building
Bartlesville, OK 74004

Pillsbury Company
Terry Thompson
200 S. 6th Street
Minneapolis, MN 55402

Pioneer Hi-Bred
Fred Funk, Distribution System Coordinator
7000 Northwest 62nd Avenue, P.O. Box 56
Johnston, IA 50131

Pioneer Speakers, Inc.
Harujiho Hirotsue, Manager
2112 W. 24th Street, Suite D
National City, CA 91950

Pony Express Courier Corporation
Drew Naber, President
P.O. Box 35206
Charlotte, NC 28235

Purolator Courier Ltd.
Fred Manskey, President
5995 Avery Road, Suite 500
Mississauga, Ontario CANADA L5R 3T8

R A Rodriguez, Inc.
R.A. Rodriguez III, President
320 Endo Boulevard
Garden City, NY 11530

RainBird, Inc.
Mike Donoghue, Manager
7590 Britannia Court
San Diego, CA 92173

Ralston Purina Company
Kathy Sweeney, Transportation Manager
Checkerboard Square
St. Louis, MO 63164

Rheem Corporation
Jaime Loera, Plant Manager
130601 Mines Road
Laredo, TX 78041

Richnan, Inc.
Fernando Gutierrez, Manager
943 N. Expressway, #15-58
Brownsville, TX 78520

RJR Nabisco
Juan Davila, Marketing & Transportation
Services
345 Park Avenue, 20th Floor
New York, NY 10154

Roadway Express, Inc.
Bob Carr, Director of International Business
Development
1077 Gorge Boulevard
Akron, OH 44309

Roadway Express, Inc.
Jim Staley, Vice President-Operations
1077 Gorge Boulevard
Akron, OH 44309

Rochester Gauges, Inc.
Kevin LaDue, Vice President-Operations
P.O. Box 29242
Dallas, TX 75229-0242

Samsonite Corporation
Tom Leonard, President
11200 E. 45th Avenue
Denver, CO 80239

San Antonio Shoe, Inc.
Terry Armstrong, President
101 New Laredo Highway
San Antonio, TX 78211

Santa Fe Company
John Dugan, Manager-Industrial
Development
3030 N. 3rd Street, Suite 200
Phoenix, AZ 85012

Sara Lee Knit Products
Jim Iager, Vice President of Mexican
Operations
1000 East Haines Mill Road
Winston Salem, NC 27103

Sea-Land Service, Inc.
Paul Connely, Transportation Manager
150 Allen Road
Liberty Corner, NJ 07920

Sears Roebuck & Company
Michael Geiter, Marketing Manager
3333 Beverly Road, Location AC281A
Hoffman Estates, IL 60179

Shannon Brokerage Company
Terry K. Shannon, Vice President
80 N. Nelson Avenue
Nogales, AZ 85628

Smith and Nephew, Inc.
Michael Chanca, Imports
2777 Loker Avenue W.
Carlsbad, CA 92008-1300

Sony Corporation of America
Elizabeth Salen, Purchasing Manager
Sony Drive
Park Ridge, NJ 07656

Soto Forwarding Agency
Alfonso Soto, Jr., President
3600 E. 14th Street
Brownsville, TX 78520

Southern Pacific Lines
Steve Abeyta, Senior Manager-Border
Relations
913 Franklin Avenue, Suite 400
Houston, TX 77002

Southern Pacific Lines
John Puffer, Director-Border Relations
Mexico Group
913 Franklin Avenue, Suite 400
Houston, TX 77002

Southern Tech Plastics
Travis Johnson, Operations Manager
9575 Pan American Drive
El Paso, TX 79927

Southwest Public Affairs
Fred O'Cheskey, Chief Operating Officer
P.O. Box 1945
Albuquerque, NM 87103

Spalding & Evenflo Companies, Inc.
Janice Archambeault, International Division
Accounts Manager
425 Meadow Street
Chickapee, MA 01013

Stevens Transport
Smokey Adams, Operations Manager
9757 Military Parkway
Dallas, TX 75227

Sunbeam Oster
Dan Lewis, Vice President
P.O. Box 247
Laurel, MS 39441

Superior Industries International, Inc.
Cindy Zawaski, Export Administration
7800 Woodley Avenue
Van Nuys, CA 91406

Taco Bell Corporation
Larry Taylor, Purchasing Manager
17901 Von Karman Avenue
Irvin, CA 92714

Tecate Industries
Gloria Olsen, Sales
1841 Friendship Drive
El Cajon, CA 92020

Tecma Maquila Services
Alan Russell, President
2000 Wyoming
El Paso, TX 79903

Tektronix, Inc.
Lynn Murdock, Manager-International
Division
26660 S.W. Parkway, Mail Stop 50-228
Wilsonville, OR 97070

Transportation Industry Association and Corporation Surveys

Tenn-Mex, Inc.
Robert Boling, General Manager
2262 San Juan Drive
Eagle Pass, TX 78852

Texas Instruments, Inc.
Chuck Nielson, Personnel Manager
13510 N. Central Expressway
Dallas, TX 75265

Texas Mexican Railway Company
Bateman Lacey, Manager of Sales
1200 Washington Street
Laredo, TX 78042

The Clorox Company
Marsha Weintraub, Senior Export
Coordinator-Mexico and Canada
1221 Broadway
Oakland, CA 94612

The Dow Chemical International
Jerry Craig, Logistics Department
122 West Way
Lake Jackson, TX 77566

The Eureka Company
Bill Beschle, Manager-Warehousing &
Materials
9600 Pan American Drive
El Paso, TX 79927

The Gates Rubber Company
Al Stecklein, President, North American
Rubber Operations
P.O. Box 5887, 990 South Broadway
Denver, CO 80217-5887

The Gillette Company
Laurie Lynch, Export Department
Prudential Tower
Boston, MA 02199

The Harper Group
John Monroe, Vice President of
Import Sales
260 Townsend Street
San Francisco, CA 94107

The Hoover Company
Espie Villescás, Product Control
Coordinator
7850 Hoover Avenue
El Paso, TX 79912

The Quaker Oats Company
Jose Miguel Zelaya, Commercial Director
7000 W. Camino Real, Suite 200
Boca Raton, FL 33433

3-M
John Taraldsen
905 Highway #22 South
Hutchinson, MN 55350-2927

TNT Bestway Transportation
Chuck Day, Vice President-Operations
2633 E. Indian School Road, Suite 200
Phoenix, AZ 85016

TNT Overland Express
Rob O'Reilly, Vice President-Operations
5280 Maingate Drive
Mississauga, Ontario CANADA L4W 1G5

Tony Lama, Inc.
Joe Lama, Purchasing Manager
1137 Tony Lama Street
El Paso, TX 79915

Transcontinental Refrigerated Lines, Inc.
Ralph McGee, Executive Vice President
130 Armstrong Road
Pittston, PA 18640

TRW Electronic Assemblies Division
Tony Everhardt, Plant Manager
4200 W. Military Highway
McAllen, TX 78503

Tyson Foods Company, Inc.
William Abbott, Director of International
Operations
2210 Oaklawn Drive
Springdale, AR 72762

Union Carbide Corporation
Maryann Wise, International Transportation
Department
39 Old Ridgebury Road
Danbury, CT 06817

Union Pacific Motor Freight Company
George W. Fijo, Director-Quality Safety
210 N. 13th Street
St. Louis, MO 63103

Union Pacific Railroad
Raleigh Sheffield, General Manager-Mexico
Projects
1416 Dodge Street
Omaha, NE 68179

United Technologies/Auto Division
Jim Rowe, Vice President of Operations
5200 Auto Club Drive
Dearborn, MI 48126

United Van Lines
Robert Baer, President
#1 United Drive
Fenton, MO 63026

U.S. Gypsum
Keith Kahl, Manager-Investor Relations
125 S. Franklin Street
Chicago, IL 60606

U.S.-Mex Manufacturing Company
Gerry Dimateo, Manager
2500 Hoover Avenue, Suite G
National City, CA 91950

Van Heusen
Ken Wyse, Vice President of Licensing
1290 Avenue of the Americas
New York, NY 10019

Wrangler, Inc.
John Schamberger, President
335 Church Court
Greensboro, NC 27401

Xerox Corporation
Bob Rice, Plant Manager
5724 W. Las Pocitas Boulevard
Pleasanton, CA 94588

Yellow Freight
David Calderon, Sales Manager
1130 Vista De Oro
El Paso, TX 79936

Yellow Freight Systems, Inc.
Doug Fisher, Vice President-International
Operations
10990 Roe Avenue
Overland Park, KS 66207

Zenith Electronics Corporation
Jim Johnson, Mexico Sales Manager
1000 Milwaukee Avenue
Glenview, IL 60025-2493

Appendix 5-C

Questionnaire for Industry Associations

The Advanced Technologies for International Intermodal Ports-of-Entry Project
Questionnaire - Response requested by October 27, 1995

Sandia National Laboratories is highly experienced in handling sensitive, private and proprietary information as a result of more than 40 years in the national security arena. All information will be maintained in strict confidence. Under no circumstances will individual answers be divulged. All input will be aggregated into general categories of border-crossing problems, requirements, and issues to help guide the Sandia project team. Thank you for participating in this survey.

1. What is the magnitude and current status of the following problems as experienced by your membership in transporting freight through international ports-of-entry?

	I would identify this problem as:			The problem is:		
	Not a Problem	A minor inconvenience	A significant complication	Improving	Staying about the same	Getting worse
Delays/operational inefficiencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Confusion about port-of-entry requirements, systems & processes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Theft/vandalism	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Injuries or threats to the safety of personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Comments/other problems: _____

2. What are the impacts of these border problems on your membership's operations?

	Not a problem	A minor concern	Becoming more serious	A significant concern
Negative financial impacts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lost customers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increased employee turnover or morale problems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lost assets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Forced change in operations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Loss of competitive standing in your industry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Comments: _____

(Please feel free to use back for additional comments)

3. To what do you attribute these problems? (check all that apply)

- Cumbersome border requirements**
 - Unnecessarily complex border requirements and processes
 - Conflicting requirements from the many parties involved in international ports-of-entry
 - Duplicative, overlapping or nonstandard border requirements and processes (i.e. documentation, inspections, fee and tariff collection, security measures)
 - Poor/inconsistent service from port-of-entry operators
- Inefficient or obsolete practices**
 - Concentration of all border operations (i.e. inspections, fee collection) at the port-of-entry rather than use of point-of-origin/port-of-destination operations
 - Ineffective/inefficient methods of selecting port users to be inspected
 - Inadequate automation of border operations
- Inadequate infrastructure**
 - Too few ports/lanes for traffic volume
 - Poorly designed port facilities making them inefficient, unsafe or both
 - Inadequate security measures at port facilities
- Inadequate resources dedicated to port operations**
 - Insufficient hours of operation
 - Inadequate number of inspectors and other key port officials and personnel
- Inadequate methods/technology**
 - Inadequate data processing methods and technology (such as EDI) to help port users meet border requirements
 - Inadequate or difficult access to border crossing data by port users
 - Lack of standard information formats and requirements so key information can be understood by all port users
 - Inadequate communication between users and port operators

Comments/other sources: _____

4. What action(s) is/are your association taking to address these problems?

- None
- Political or administrative action. Elaborate: _____

- Operational changes or adjustments. Elaborate: _____

- Developing or buying new or upgraded technological solutions (identify below)
 - Information (data processing) systems
 - Security or safety systems
 - Communications systems
 - Vehicle or freight monitoring/tracking systems
 - Identification systems (such as tags)
 - Other: _____

Comments: _____

(Please feel free to use back for additional comments)

5. Are you aware of other commercial technology being developed to address border crossing problems? Please describe: _____

6. Please evaluate the following issues as priorities for the project team to address with advanced technology solutions. Think in terms of what would be the most beneficial to facilitating your membership's operation or business at a border port-of-entry. (Circle one response per issue.)

	PRIORITY LEVEL		
	Low	Medium	High
a) Reducing commercial users' time spent at POEs	Low	Medium	High
b) Lowering commercial users' costs associated with POEs	Low	Medium	High
c) Consolidating federal inspections	Low	Medium	High
d) Standardizing/simplifying inspection process	Low	Medium	High
e) Standardizing/simplifying documentation	Low	Medium	High
f) Standardizing/simplifying POE hardware/software	Low	Medium	High
g) Increasing cooperation among government agencies	Low	Medium	High
h) Automating inspection services	Low	Medium	High
i) Automating fee and tariff collection	Low	Medium	High
j) Increasing off-site inspections	Low	Medium	High
k) Allowing universal selective access to POE information	Low	Medium	High
l) Other: _____	Low	Medium	High

7. Regarding those issues you identified as high priority, are there potential technical solutions you would recommend that the project team further investigate? _____

8. The next phase of this project is to convene panels of stakeholders to discuss these issues and problems in more detail and to prioritize technology opportunities for improving port-of-entry operations. To obtain the best results, the panels only consist of 15 - 20 people. Therefore, we need individuals who can represent the interests of others with similar requirements or perspectives (i.e. one person to represent trucking industry interests, one for maquilas, etc.) Please recommend an individual(s) who could represent your interests in future discussion of border-crossing issues?

Name _____

Affiliation _____ Title _____

Address _____

City _____ State _____ Zip _____

Phone _____ Fax _____ E-mail _____

(Please feel free to use back for additional comments)

9. Recommendations of persons in the commercial/private sector who represent the needs of private sector port-of-entry users:

1. Name: _____
Affiliation _____ Title: _____
Address: _____
City: _____ State _____ Zip _____
Phone: _____ Fax _____ E-mail _____

2. Name _____
Affiliation _____ Title _____
Address _____
City _____ State _____ Zip _____
Phone _____ Fax _____ E-mail _____

10. Please provide information about yourself. (optional)

Name _____
Affiliation _____ Title _____
Address _____
City _____ State _____ Zip _____
Phone _____ Fax _____ E-mail _____

Check here if you are interested in being a participant in a stakeholder discussion panel.

We would appreciate any additional information (i.e. association reports, manuals, industry publications) that would provide more detail about the actions you, or other commercial interests outside your association, are taking to address border-crossing problems. Please enclose with survey response. Again, information will be strictly confidential.

Return survey in self-addressed stamped envelope provided by October 27, 1995 to:

Steve Parker, Energy Policy & Planning Department OR
Sandia National Laboratories
PO Box 5800, MS 0722
Albuquerque, NM 87185-0222

FAX: (505) 844-3296

QUESTIONS? (505) 844-5635

(Please feel free to use back for additional comments)

Appendix 5-D

Questionnaire for Private Corporations

The Advanced Technologies for International Intermodal Ports-of-Entry Project
Questionnaire - Response requested by October 20, 1995

Sandia National Laboratories is highly experienced in handling sensitive, private and proprietary information as a result of more than 40 years in the national security arena. All information will be maintained in strict confidence. Under no circumstances will individual answers be divulged. All input will be aggregated into general categories of border-crossing problems, requirements, and issues to help guide the Sandia project team. Thank you for participating in this survey.

1. What is the magnitude and current status of the following problems as experienced by your company in transporting freight through international ports-of-entry?

	I would identify this problem as:			The problem is:		
	Not a Problem	A minor inconvenience	A significant complication	Improving	Staying about the same	Getting worse
Delays/operational inefficiencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Confusion about port-of-entry requirements, systems & processes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Theft/vandalism	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Injuries or threats to the safety of personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Comments/other problems: _____

2. What are the impacts of these border problems on your company's operations?

	Not a problem	A minor concern	Becoming more serious	A significant concern
Negative financial impacts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lost customers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increased employee turnover or morale problems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lost assets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Forced change in operations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Loss of competitive standing in your industry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Comments: _____

3. To what do you attribute these problems? (check all that apply)

Cumbersome border requirements

- Unnecessarily complex border requirements and processes
- Conflicting requirements from the many parties involved in international ports-of-entry
- Duplicative, overlapping or nonstandard border requirements and processes (i.e. documentation, inspections, fee and tariff collection, security measures)
- Poor/inconsistent service from port-of-entry operators

Inefficient or obsolete practices

- Concentration of all border operations (i.e. inspections, fee collection) at the port-of-entry rather than use of point-of-origin/port-of-destination operations
- Ineffective/inefficient methods of selecting port users to be inspected
- Inadequate automation of border operations

Inadequate infrastructure

- Too few ports/lanes for traffic volume
- Poorly designed port facilities making them inefficient, unsafe or both
- Inadequate security measures at port facilities

Inadequate resources dedicated to port operations

- Insufficient hours of operation
- Inadequate number of inspectors and other key port officials and personnel

Inadequate methods/technology

- Inadequate data processing methods and technology (such as EDI) to help port users meet border requirements
- Inadequate or difficult access to border crossing data by port users
- Lack of standard information formats and requirements so key information can be understood by all port users
- Inadequate communication between users and port operators

Comments/other sources: _____

4. What action(s) is/are your company taking to address these problems?

- None
- Political or administrative action. Elaborate: _____

- Operational changes or adjustments. Elaborate: _____

- Developing or buying new or upgraded technological solutions (identify below)
 - Information (data processing) systems
 - Security or safety systems
 - Communications systems
 - Vehicle or freight monitoring/tracking systems
 - Identification systems (such as tags)
 - Other: _____

Comments: _____

5. Are you aware of other commercial technology being developed to address border crossing problems? Please describe: _____

6. Please evaluate the following issues as priorities for the project team to address with advanced technology solutions. Think in terms of what would be the most beneficial to facilitating your operation or business at a border port-of-entry. (Circle one response per issue.)

	PRIORITY LEVEL		
	Low	Medium	High
a) Reducing commercial users' time spent at POEs	Low	Medium	High
b) Lowering commercial users' costs associated with POEs	Low	Medium	High
c) Consolidating federal inspections	Low	Medium	High
d) Standardizing/simplifying inspection process	Low	Medium	High
e) Standardizing/simplifying documentation	Low	Medium	High
f) Standardizing/simplifying POE hardware/software	Low	Medium	High
g) Increasing cooperation among government agencies	Low	Medium	High
h) Automating inspection services	Low	Medium	High
i) Automating fee and tariff collection	Low	Medium	High
j) Increasing off-site inspections	Low	Medium	High
k) Allowing universal selective access to POE information	Low	Medium	High
l) Other: _____	Low	Medium	High

7. The next phase of this project is to convene panels of stakeholders to discuss these issues and problems in more detail and to prioritize technology opportunities for improving port-of-entry operations. To obtain the best results, the panels only consist of 15 - 20 people. Therefore, we need individuals who can represent the interests of others with similar requirements or perspectives (i.e. one person to represent trucking industry interests, one for maquilas, etc.) Please recommend an individual(s) who could represent your interests in future discussion of border-crossing issues?

Name _____

Affiliation _____ Title _____

Address _____

City _____ State _____ Zip _____

Phone _____ Fax _____ E-mail _____

8. Recommendations of other persons in the commercial/private sector who represent the needs of private sector port-of-entry users:

1. Name: _____
Affiliation _____ Title: _____
Address: _____
City: _____ State _____ Zip _____
Phone: _____ Fax _____ E-mail _____

2. Name _____
Affiliation _____ Title _____
Address _____
City _____ State _____ Zip _____
Phone _____ Fax _____ E-mail _____

9. Please provide information about yourself. (optional)

Name _____
Affiliation _____ Title _____
Address _____
City _____ State _____ Zip _____
Phone _____ Fax _____ E-mail _____

Check here if you are interested in being a participant in a stakeholder discussion panel.

We would appreciate any additional information (i.e. company reports, manuals, industry publications) that would provide more detail about the actions you, or other commercial interests outside your company, are taking to address border-crossing problems. Please enclose with survey response. Again, information will be strictly confidential.

Return survey in self-addressed stamped envelope provided by October 20, 1995 to:

Steve Parker, Energy Policy & Planning Department
Sandia National Laboratories
PO Box 5800, MS 0722
Albuquerque, NM 87185-0222

OR

FAX: (505) 844-3296

QUESTIONS? (505) 844- 5635

6. CAMINO REAL INTERMODAL CENTER PROJECT

6.1 INTRODUCTION

The Advanced Technologies for International and Intermodal Ports of Entry (ATIPE) Project received cooperation in the form of information sharing from the Camino Real Intermodal Center (CRIC) Project funded by the New Mexico State Highway and Transportation Department. The CRIC Project interviewed approximately 275 individuals in Mexico and the U.S. regarding shipping practices and experiences in moving freight across U.S.-Mexico borders. This information was collected to support the development of an international intermodal center near Santa Teresa, New Mexico. These interviews were recorded on written questionnaires.

6.2 SURVEY INSTRUMENT DESIGN AND SAMPLE SIZE

A three-page guide was prepared by the CRIC Project for use with interviewees representing Mexican and U.S. firms using U.S.-Mexico ports of entry. Company information and shipping practices were the two principal components of the interview. Each of these components collected information of potential value to the ATIPE Project. In the company information section, respondents were asked to indicate the type of firm as follows:

- manufacturer;
- trucking firm;
- railroad;
- steamship line;
- warehouse firm;
- air freight firm;
- logistics services firm; and
- freight forwarder, consolidator, or customs broker.

Under the shipping practices component of the interview, respondents were given the opportunity to identify one or more of eight technical features that would be useful to include in the design of the Camino Real Intermodal Center, specifically:

- automated security systems;
- automated documentation;
- automated fee and tariff collection;
- container, chassis, trailer, and railcar tracking systems;

- X-ray automated contraband inspection systems;
- weigh-in-motion systems;
- customs automated systems; and
- data base for international commerce.

The ATIPE Project obtained a copy of the completed interview guides for each participant. A total of 114 and 158 interview guides were obtained from respondents from Mexican and U.S. companies, respectively.

6.3 DATA ANALYSIS

6.3.1 Type of Firm

A total of 103 Mexican firms (90% of the sample population) and 105 U.S. firms (66% of the sample population) responded to the technological needs part of the interview (see Table 6-1). In both instances, manufacturers dominated the responses.

Table 6-1. Type of Firms Indicating Technological Priorities

Type of Firm	Number of Respondents	
	Mexico (n = 103)	United States (n = 105)
Manufacturer	64	55
Trucking	12	10
Railroad	1	6
Steamship line	0	10
Warehouse	4	5
Air freight	0	4
Logistics services	2	12
Freight forwarder, consolidator, or customs broker	11	26
Unspecified	14	1

Note: The totals do not equal the number of respondents because some respondents identified themselves as more than one type of firm.

6.3.2 Technological Priorities

Automated documentation; automated fee and tariff collection; and container, chassis, trailer, or railcar tracking systems were the three most frequently cited technological needs by both the Mexican and U.S. respondents (see Table 6-2). Both groups cited automated documentation most frequently. Sixty-eight percent of the Mexican firms selected automated documentation, compared to 81% of U.S. firms.

Table 6-2. Technological Priorities of Mexican and U.S. Firms

Technology	Number of Respondents	
	Mexico (n = 103)	United States (n = 105)
Automated security systems	32	60
Automated documentation	70	85
Automated fee and tariff collection	45	73
Container, chassis, trailer, or railcar tracking systems	44	80
X-ray automated contraband inspection systems	40	60
Weigh-in-motion systems	39	65
Customs automated systems*	44	0
Data base for international commerce**	27	1
Other	17	41

Note: The totals do not equal the number of respondents because many respondents identified more than one technology priority.

* The reported values for customs automated systems cannot be compared directly to the values of the other eight technologies because customs automated systems did not appear on 39 Mexican and 104 U.S. questionnaires.

** The reported values for data base for international commerce cannot be compared directly to the values of the other eight technologies because data base for international commerce did not appear on 47 Mexican and 104 U.S. questionnaires.

Approximately 16% and 39% of Mexican and U.S. firms identified technologies other than the eight listed on the interview guide. Nearly one-half of the Mexican firms identifying other technologies (i.e., eight firms) indicated a preference for customs automated systems. This response is informative because many of the Mexican interview guides inadvertently omitted customs automated systems and data base for international commerce from the eight listed

technologies. Similarly, more than one-third of the Mexican firms identifying other technologies listed data base for international commerce. Additional suggestions, not necessarily technologies, included: a local Food and Drug Administration Office; a financial institution, such as an international bank; locating both Mexican and U.S. customs officers in the intermodal centers; systems to avoid contraband traffic; and X-ray systems to eliminate the need for unloading cargo for inspection.

In contrast, 34 U.S. respondents, or nearly one-third of the total number of U.S. interviewees and more than 80% of those making suggestions for other technologies, indicated a preference for any technology capable of expediting freight movement through a port of entry and reducing delays. Additional suggestions, not necessarily technologies, included: in-transit clearing, data sharing among governmental agencies, adequate inspection stations and customs brokers facilities, elimination of human intervention, enhanced turn around space, and crane availability. Not a single U.S. respondent mentioned customs automated systems or data base for international commerce, in spite of nearly all of the U.S. interview guides omitting these technologies from those listed.

Manufacturers and transportation services companies were separated as part of the analysis to compare technological preferences among these two groups (compare Tables 6-3 and 6-4).

Table 6-3. Technological Priorities of Manufacturers

Technology	Percentage of Respondents	
	Mexico (n = 64)	United States (n = 55)
Automated security systems	34	55
Automated documentation	63	73
Automated fee and tariff collection	44	64
Container, chassis, trailer, or railcar tracking systems	50	67
X-ray automated contraband inspection systems	41	55
Weigh-in-motion systems	39	64
Customs automated systems*	55	0
Data base for international commerce**	33	0
Other	13	45

Note: The totals do not equal the number of respondents because many respondents identified more than one technology priority.

* The reported values for customs automated systems cannot be compared directly to the values of the other eight technologies because customs automated systems did not appear on 16 Mexican and 55 U.S. questionnaires.

** The reported values for data base for international commerce cannot be compared directly to the values of the other eight technologies because data base for international commerce did not appear on 21 Mexican and 55 U.S. questionnaires.

Table 6-4. Technological Priorities of Transportation Services Companies

Technology	Percentage of Respondents	
	Mexico (n = 39)	United States (n = 50)
Automated security systems	26	60
Automated documentation	77	90
Automated fee and tariff collection	44	76
Container, chassis, trailer, or railcar tracking systems	31	86
X-ray automated contraband inspection systems	36	60
Weigh-in-motion systems	36	60
Customs automated systems*	23	0
Data base for international commerce**	15	0
Other	23	32

Note: The totals do not equal the number of respondents because many respondents identified more than one technology priority.

* The reported values for customs automated systems cannot be compared directly to the values of the other eight technologies because customs automated systems did not appear on 23 Mexican and 49 U.S. questionnaires.

** The reported values for data base for international commerce cannot be compared directly to the values of the other eight technologies because data base for international commerce did not appear on 26 Mexican and 49 U.S. questionnaires.

Transportation services firms included all respondents not indicated as being a manufacturer, namely, trucking firms; railroads; steamship lines; warehouse firms; air freight firms; logistics services firms; and freight forwarders, consolidators, or customs brokers.

Automated documentation; customs automated systems (i.e., when corrected for write-in suggestions); and container, chassis, trailer, or railcar tracking systems were the three most frequently cited technologies by Mexican manufacturers. Mexican transportation services companies most commonly selected automated documentation, automated fee and tariff collection, weigh-in-motion systems, and X-ray automated contraband inspection systems. Except for both Mexican manufacturers and transportation services companies most frequently citing automated documentation, considerable difference of opinion was apparent between these two groups (see Table 6-5). However, a need for automated security systems was uniformly cited relatively infrequently.

Table 6-5. Technological Priorities of Mexican Firms

Technology	Percentage of Respondents		
	All (n = 103)	Manufacturers (n = 64)	Transportation Services Firms (n = 39)
Automated security	31	34	26
Automated documentation	68	63	77
Automated fee and tariff collection	44	44	44
Container, chassis, trailer, or railcar tracking	43	50	31
X-ray automated contraband inspection	39	39	36
Weigh-in-motion	39	41	36

U.S. manufacturers cited automated documentation; container, chassis, trailer, or railcar tracking systems; automated fee and tariff collection; and weigh-in-motion systems most frequently. U.S. transportation services companies most commonly selected automated documentation; container, chassis, trailer, or railcar tracking systems; and automated fee and tariff collection. The top three technologies selected by U.S. manufacturers and transportation services companies were virtually identical (see Table 6-6).

Table 6-6. Technological Priorities of U.S. Firms

Technology	Percentage of Respondents		
	All (n = 105)	Manufacturers (n = 55)	Transportation Services Firms (n = 50)
Automated security	57	55	60
Automated documentation	81	73	90
Automated fee and tariff collection	70	64	76
Container, chassis, trailer, or railcar tracking	76	67	86
X-ray automated contraband inspection	65	64	60
Weigh-in-motion	65	55	60

6.4 CONCLUSIONS

Automated documentation is unambiguously the most highly desired technology to be installed at international ports of entry by both Mexican and U.S. manufacturers and transportation services firms. Although Mexican companies indicated a strong preference for customs automated systems, U.S. firms do not appear to give a high priority to this specific technology. Container, chassis, trailer, or railcar tracking systems and automated fee and tariff collection systems were also frequently cited as important technological advances for modern ports of entry.

6.5 OBSERVATIONS

In general, U.S. companies responding to the technological needs section of the interview appear to have higher interest in advanced technology at ports of entry than their Mexican counterparts. However, overall a substantially smaller fraction of U.S. interviewees (66%) than Mexican interviewees (90%) specified technological needs at the Camino Real Intermodal Center. Clearly, greater calls for expediting freight movement through ports of entry were voiced by U.S. than by Mexican companies participating in the CRIC Project interviews. High levels of frustration were particularly evident in the responses by representatives of U.S. firms. Similar attitudes were not detected in the responses by Mexican companies. Proper interpretations of this observation may have little to do with technology. Additional factors, such as respective border policies and procedures, standard business practices, language, culture, or personal expectations, may well have had significant influences on the respective responses.

7. INTERMODAL FREIGHT TRANSPORTATION TECHNOLOGIES

Abstracted from:

M. John Vickerman, "Advanced Technologies for Intermodal International Ports of Entry," Contractor Report, Sandia National Laboratories, Albuquerque, New Mexico, January 1996.

7.1 INTRODUCTION

The Advanced Technologies for International and Intermodal Ports of Entry (ATIFE) Project contracted with M. John Vickerman, Principal of Vickerman-Zachary-Miller of Reston, Virginia, to prepare an assessment of current and emerging port-of-entry technologies from a private-sector perspective. Descriptions of operational problems being or capable of being addressed by advanced technologies, identification of specific firms marketing or developing such technologies, and recommendations for the most attractive technological areas for contributions to be made by the ATIFE Project represent additional aspects of the requested technology assessment.

7.2 BACKGROUND

Continued growth in freight transport in standard containers has facilitated a corresponding expansion in the movement of intermodal freight via ship, rail, and truck. A variety of technological advances during the past 40 years has altered the economics of single-mode freight transport and has allowed intermodal shipments to become cost competitive in many markets. The principal advantages of containerization are:

- loading and transportation equipment can be standardized, thus, supporting capital investment in specialized facilities and reducing the time and labor necessary to transfer between modes; and
- cargo does not need to be unpacked, sorted, and repacked at transfer points, also reducing the time and labor associated with mode transfers.

These two advantages have allowed intermodal carriers to reduce cost and improve customer service simultaneously.

Intermodal freight shipments in the U.S. have grown rapidly in the past five years and are projected to experience high growth rates to the year 2000 and beyond. Widespread globalization of the economies of industrialized countries and the growth of extensive manufacturing capabilities in the developing world, along with the advancement of international trade alliances, are major drivers of the growth in international intermodal freight transportation.

7.3 TECHNOLOGIES IN INTERMODAL FREIGHT TRANSPORTATION

7.3.1 Technology Applications and Needs

Volume growth in containerized cargo shipments, consolidation of intermodal rail facilities, and increased competitiveness in freight transport have encouraged the freight transportation industry to seek new technologies to lower costs, improve service, and maintain safety. Fourteen areas of the intermodal freight transportation industry have been identified as having potential for performance improvements through application of advanced technology. These areas include:

- documentation;
- information transfer;
- information security;
- site security;
- site access;
- on-site traffic pattern control;
- inspections;
- toll and fee collection;
- safety;
- incident and accident response;
- intermodal transfer planning;
- logistics and on-site inventory;
- systems integration and cargo tracking; and
- agency coordination.

7.3.2 Candidate Technologies

Seventeen classes of technologies have been identified for possible applications within these 14 areas of the intermodal transportation industry. Many of the technologies have applications in multiple areas as solutions to specific problems experienced by intermodal shippers and/or broad industry needs. Although these technologies have been identified principally from an intermodal perspective, many of the technologies have similar potential applications at international ports of entry handling single-mode, as well as intermodal, freight shipments. These technology classifications include:

- automatic equipment identification (AEI) and automatic vehicle identification (AVI);
- global positioning systems (GPS);

- terminal operating systems (TOS);
- intelligent transportation systems (ITS) and intelligent vehicle systems (IVS);
- load-planning systems;
- dispatch systems;
- signage;
- fences and K-barriers;
- physical security;
- camera and cards;
- seals;
- weighing, particularly weigh-in-motion (WIM), systems;
- safety and accident prevention and response;
- electronic data interchange (EDI);
- information security;
- electronic payments; and
- systems integration.

7.3.3 Technological Priorities

Each of these technologies were evaluated with respect to the opportunity for advanced technology prototypes to be developed by the ATIPE Project without competing with current and near-term product development activities by private industry. Five evaluation criteria were utilized as follows:

- technical level - sophistication of equipment needed for manufacture, manufacturing process, and of monitoring or maintenance requirements during use;
- technical risk - probability of replacement by a competing technology or failure in the development process;
- room for technical growth - potential reward and possibilities for expanded applications and improvements;
- industry saturation - level of existing competition; and
- technology investment cost - level of development and manufacturing costs.

Each technology was assigned a score ranging from 1 to 5 for each criterion, with increasing technical level and room for technical growth being assigned higher scores and increasing technical risk, industry saturation, and technology investment cost being assigned lower

scores. For a given technology, the numerical scores for each criterion were summed to provide a composite score suitable for translation into relative rankings. High composite scores indicate technologies with the most promising opportunities for market entry and priority technology development targets for the ATIPE Project.

7.3.4 Matching of Technologies and Applications

A technology-application area matrix was developed to match the 17 technologies with the 14 application areas (see Table 7-1). Included in this matrix are the composite scores for each of the technology classifications. The four highest ranked technologies are:

- systems integration;
- electronic payment;
- safety and accident prevention and response; and
- information security.

Interestingly, these technologies have among the lowest number of applications (see Table 7-1).

7.4 TECHNOLOGY DEVELOPMENT RECOMMENDATIONS

Based on the identification of application areas and the technology assessments, both qualitative and quantitative, for improving intermodal freight transport, three specific technologies were recommended for development by the ATIPE Project. These technologies are contained within the broad technology classifications of systems integration, safety and accident prevention and response, and information security, respectively:

- data management integration systems;
- hazardous materials documentation; and
- information security.

Extensive private-sector competition within electronic payment technology resulted in no ATIPE Project development activities being recommended in this technology classification.

Within the general category of systems integration, a data management integration system would allow subscribers access to information contained in a data base shared by, for example, railroads, trucking companies, intermodal facilities, and international ports of entry. Ready access to continuously updated data would facilitate acquisition of cargo tracking and status information by freight carriers that is increasingly becoming expected by freight shippers and receivers as standard customer service. Although the ATIPE Project is focused on inland international ports of entry, such a system could also be used by shipping lines engaged in maritime freight transport. This system should interface with existing computer information systems or legacy systems and could utilize interfaces provided by value-added networks and/or the Internet.

Table 7-1. Technology-Application Area Matrix for Advanced Technologies for Intermodal Freight Transport

APPLICATION	Technology Classification																	
	AEI/AVI	GPS	TOS	ITS/IVS	Load Planning	Dispatch	Signage	Barriers	Physical Security	Cameras and Cards	Seals	Weighing	Safety and Accident	EDI	Information Security	Electronic Payment	Systems Integration	
Composite score	12	13	12	14	12	14	13	13	14	13	12	12	16	14	16	17	18	
Documentation	X		X		X	X				X	X			X		X		
Information transfer	X	X	X	X	X	X	X			X	X			X		X		
Information security														X	X			
Site security	X	X	X				X	X	X	X	X							
Site access	X	X		X		X	X		X									
On-site traffic pattern control			X	X	X		X											
Inspections	X		X	X					X	X		X	X					
Toll and fee collection	X	X		X						X		X		X		X		
Intermodal transfer planning	X	X	X	X	X	X								X				
Incident/accident response		X		X			X						X					
Safety	X	X	X	X	X		X			X		X	X					
Logistics/on-site inventory	X	X	X		X					X				X				
Systems integration/cargo tracking	X	X	X	X	X									X				
Agency coordination	X	X		X										X				
Number of applications	11	10	9	10	7	6	4	4	1	8	4	3	3	8	1	3	0	

Note: Systems integration was not assigned to specific application areas.

Source: Abstracted with modification, from M. John Vickerman, "Advanced Technologies for Intermodal International Ports of Entry," Contractor Report, Sandia National Laboratories, Albuquerque, New Mexico, January 1996.

Hazardous materials documentation falls within the general technology classification of safety and accident prevention and response. Transport of hazardous materials requires considerable special documentation compared to standard shipments. A hazardous materials data base accessible by members to an information service could substantially reduce delays experienced at international ports of entry. Special handling, storage, transport, and emergency response instructions could be assembled in the data base along with restrictions on transport promulgated by specific governmental agencies. Since many hazardous materials regulations and restrictions on transport are geographically specific, this data base could be integrated with vehicle and cargo tracking systems, such as those based on GPS technology, to provide location-specific information.

Availability of information security technology is a barrier to the widespread adoption of electronic data interchange. Two technology development areas appear to be particularly promising for the ATIFE Project, viz.:

- encryption devices and certification processes for the Internet; and
- software interfaces for authentication of digital signatures.

8. COMPILATION OF RESULTS

8.1 INTRODUCTION

The Advanced Technologies for International and Intermodal Ports of Entry (ATIPE) Project utilized a wide variety of mechanisms to ascertain the interests of diverse stakeholders concerned with international port-of-entry processes. Determination of the most important issues related to ports of entry capable of being addressed by advanced technologies was the primary focus of the interactions with stakeholders. Identification of technologies suitable for resolving these issues was a secondary topic of interest. Five basic information collection methodologies were used as follows:

- stakeholder meetings;
- literature reviews;
- attendance at technical workshops and conferences;
- industry surveys; and
- contract research performed by industry experts.

During the course of compiling the interests of stakeholders through these five methodologies, direct and indirect inputs from hundreds, probably more than 500 people, were obtained. These individuals spanned the full spectrum of stakeholders in the public and private sectors, including:

- federal government officials;
- state government agencies;
- freight shippers;
- freight carriers;
- customs brokers and freight forwarders;
- transportation consultants; and
- industry association executives.

Information was obtained from both U.S.-based individuals and companies and representatives of Mexican manufacturers and transportation services firms.

8.2 INTERNATIONAL PORT-OF-ENTRY ISSUES

Overwhelmingly, the fundamental issue related to international ports of entry is reducing transit time through the required documentation and inspection processes. This issue was expressed by both individuals involved in port-of-entry operations and the user communities. Time reductions must, however, be accomplished while maintaining regulatory and legal compliance. Most of the other issues identified by stakeholders are manifested as time delays at border crossings. Examples of these issues, often expressed as problems, repeatedly mentioned by stakeholders include (see Table 8-1):

- lack of document standardization;
- failure to standardize inspection processes;
- inadequate information and communications systems;
- manual fee and tariff collection;
- inconsistency of processes and procedures; and
- suboptimal cooperation among governmental agencies.

Table 8-1. Priority International Port-of-Entry Issues Identified by Stakeholders

Issue	Information Source				
	Stakeholder Meetings	Literature Reviews	Technical Meetings	Industry Surveys	Expert Assessments
Agency cooperation	x			x	x
Cargo security	x				
Communications systems	x	x	x		
Data processing				x	
Document standardization	x	x		x	x
Fee and tariff collection	x				x
Information security	x		x		x
Information systems	x	x			x
Inspection selectivity		x			
Inspection staff levels				x	
Inspection standardization	x			x	x
Interoperability	x		x		
Process standardization		x		x	
Systems integration	x	x			x
Systems simplicity	x		x		

Most of these issues can be addressed to some extent by the development of advanced technologies with the objective of allowing ports of entry to become more efficient (i.e., expediting freight movement) while being more effective (i.e., satisfying governmental requirements). The issues consistently selected by stakeholders as the highest priority for being addressed by advanced technology are:

- standardization and simplification of border crossing processes, including documentation and inspection practices; and
- elimination of inconsistent and duplicative agency requirements.

8.3 BORDER CROSSING PROCESSES AND PROCEDURES

Stakeholders can describe readily the issues and problems experienced at ports of entry. These descriptions are most commonly expressed qualitatively and somewhat in isolation. More quantitative, systems-oriented descriptions of the issues are very challenging to obtain. Development of a comprehensive process map for border crossing interactions, including both formal and informal relationships, identifying key responsible parties and their respective physical inspection requirements is an important step in defining quantitative performance parameters for ports of entry, as well as technologies designed to improve port-of-entry efficiency and effectiveness. A clear understanding from a systems perspective of the border crossing process should support the preparation of qualitative descriptions of the causes of processing delays. This information should facilitate the estimation of quantitative measures of the individual components of time delays.

In addition, a thorough understanding of the social interactions occurring in the extraordinarily complex environment of an international port of entry should be factored into the process map. Equally important, this understanding must be translated into design considerations in order to ensure the successful deployment and use of advanced technologies developed and made available to port-of-entry operators and the user communities.

8.4 PRIORITIES FOR ADVANCED TECHNOLOGIES AT PORTS OF ENTRY

Clear distinctions between port-of-entry issues or problems and advanced technology opportunities are difficult to obtain from stakeholders. Often the definitions of issues and the discussions of technologies tend to merge into similar descriptions. Likewise, qualitative performance parameters for technologies are much more readily available than quantitative measures easily translated into design objectives. Nonetheless, priorities for technologies to address the issues or problems associated with international and intermodal ports of entry are relatively uniformly recognized by stakeholders.

Compilation of Results

A summary of technological priorities identified through various modes of interaction with stakeholders is given in Table 8-2. Three technology classes are unambiguously of high priority:

- automated documentation;
- systems integration; and
- vehicle and cargo tracking.

Table 8-2. Priority International Port-of-Entry Technologies Identified by Stakeholders

Issue	Information Source				
	Stakeholder Meetings	Literature Reviews	Technical Meetings	Industry Surveys	Expert Assessments
Automated documentation	x	x	x	x	x
Automatic vehicle identification	x	x			x
Cargo pre-clearance		x	x		
Data processing	x	x			
Electronic data interchange	x	x	x		x
Electronic payment				x	x
Information security		x	x		x
Process mapping	x		x		
Sensing and scanning	x	x			
Systems integration	x	x	x	x	x
Vehicle and cargo tracking	x	x	x	x	x

Tracking technology, particularly cargo tracking, is of special interest to the intermodal transportation industry. Similarly, systems integration is closely related to the concept of interoperability of information and documentation systems across transport modes. This concept may be further extended to encompass civilian and national defense cargo transportation. Implementation of automated documentation will generally require more advanced information and communications systems than are presently utilized at international ports of entry. As automated documentation, systems integration, and vehicle and cargo tracking systems are developed and deployed, security considerations will become increasingly important. Interestingly, advanced security technologies were judged by some stakeholders as very important, while other stakeholders viewed security considerations to be of relatively low priority. Some of this divergence of opinion may be related to the differences between physical and information security.

Automated documentation and systems integration directly address the high-priority issues of border crossing process and inspection standardization and agency cooperation. Vehicle and cargo tracking indirectly address these issues by enabling freight shippers and carriers to know current information that can be communicated to port-of-entry operators in advance of vehicles reaching the border. Together these technologies represent many of the technical components necessary for pre-clearance of freight approaching international ports of entry.

8.5 CONCLUDING REMARKS

Simply put, delays in border crossing processing is the nemesis of U.S.-Mexico ports of entry. Unstandardized, complex, and inconsistent documentation and inspection processes are principal causes of the transit time delays. These causes can be effectively mitigated by automating documentation verification and integrating port-of-entry information and communications systems. Integration of vehicle and cargo tracking systems with port-of-entry information and communications systems, as well as existing industry legacy systems, should further enable border crossings to be accomplished consistently with optimal processing times.

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