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The State-of-the-Art Port of Entry Workshop

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The State-of-the-Art

Port of Entry Workshop

Albuquerque, New Mexico

July 14-15, 1994

Sandia National Laboratories

Federal Highway Administration

New Mexico State Highway & Transportation Department

Science Applications International Corporation

Alliance for Transportation Research

Abstract

The increased demand for freight movements through

international ports of entry and the signing of the North

American Free Trade Agreement [NAFTA] have increased freight

traffic at border ports of entry. The State-of-the-Art Port

of Entry Workshop initiated a dialogue among technologists and

stakeholders to explore the potential uses of technology at

border crossings and to set development priorities.

International ports of entry are both information and labor

intensive, and there are many promising technologies that

could be used to provide timely information and optimize

inspection resources. Participants universally held that

integration of technologies and operations is critical to

improving port services. A series of Next Steps was developed

to address stakeholder issues and national priorities, such as

the National Transportation Policy and National Drug Policy.

This report documents the views of the various stakeholders

and technologists present at the workshop and outlines future

directions of study.

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EXECUTIVE SUMMARY

Purpose of Workshop

The increased demand for freight movements through international ports of entry and the signing of the North American Free Trade Agreement (NAFTA) have increased freight traffic at border ports of entry. State-of-the-art technologies offer the possibility of reduced delay time while maintaining inspection requirements. The State-of-the-Art Port of Entry Workshop initiated a dialogue among international port-of-entry stakeholders and technologists to explore potential uses of technology at border crossings and to set development priorities. While some of these technologies can be useful at interstate ports of entry, this workshop focused on international border crossings.

Results

The most obvious outcome of the workshop is the high level of interest in making international ports of entry both efficient and effective. A wide variety of stakeholders were represented at the workshop, from federal and state agencies to private interests. Stakeholders noted that they are working under increasing constraints [increasing freight movements, decreasing manpower, more regulations, and increasing time criticality] in the face of increasing demand.

Users and operators recognize the basic tension between inspection thoroughness and expediting freight movement. There can be tension between federal and state agencies but great gains can be made through cooperative efforts. It was noted that NAFTA will have significant impact on both federal and state operations with commercial vehicles. The result is that stakeholders are willing to work as a team to improve performance.

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Ports of entry are both information and labor intensive, and there are many promising technologies that could be used to provide timely information and optimize the effectiveness of inspection resources. However, any technologies introduced must enhance operations at a reasonable cost.

Next Steps

Post-workshop surveys were sent to all participants to elicit their views on next steps. Their comments suggest the following guidelines for the next meeting:

.   Take a team approach.

.   Include data processing and information systems.

.   Analyze interagency and federal/state operations.

.   Focus on both enforcement end facilitation.

.   Focus on port operations first, then define opportunities
    for technology introduction.

.   Address state operations at border crossings in relation
    to federal efforts.

These criteria can be satisfied by collecting information from
participating agencies in both Mexico and the U.S. and
analyzing interrelationships to prepare for the workshop. A
focused analysis can be achieved by examining a specific port
that is as representative as possible. The following program
would accomplish these objectives:

.   Identify agencies and requirements, including mission

statements, information sources, databases used, agency

interactions, and performance measures.

. Map and model the current process of freight movement

through the ports for road, rail, and air modes.

. Analyze opportunities for performance improvement, using

the process model and small planning groups.

. Conduct a workshop to evaluate the feasibility of

implementing the improvements and to suggest others, and

reach a consensus on a plan for the selected port, if

possible.

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. Transfer the process used to other ports in both the U.S.

end Mexico, at their request.

Taking these steps offers opportunities to address several

national priorities. National Transportation Policy is

enhanced by the use of intermodal transportation systems that result in greater efficiency, mobility, and accessibility. Advanced inspection technologies support National Drug Policy with improved defenses against narcotics entering the U.S.

Other benefits of implementing advanced technologies at the border include innovation of port-of-entry design and operation, including interagency coperation [National Performance Review-Reinventing Government]. Public/private funding serves both government and commercial interests [Cost Reduction], and development of dual-use technologies required for national security can continue by using them to support border needs as well [Defense Conversion and Dual Use Technology]. Air quality problems are improved by faster movement of vehicles [Clean Air Act Amendments/Border Environmental Cooperation Commission]. New border facilities enhance US/Mexico trade opportunities [NAFTA/U.S. Trade Representative], and jobs are created by a facility that is attractive to shippers, consignees, brokers, suppliers, and industrial developers [Enterprise Zones].

Implementation of this program could address these national objectives and achieve tangible improvements in local

operations in a single project, a rare opportunity.

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NOMENCLATURE

ABI	Automated Broker Interface
ACS	Automated Commercial System
AEI	Automatic Equipment Identification
ARPA	Advanced Research Projects Agency
ATM	Asynchronous Transfer Mode[Communications]
AVC	Automatic Vehicle Classification
AVI	Automatic Vehicle Identification
BCR	Background Commodity Research
despacho previo	Prior clearance and payment on railways
DOT	Department of Transportation
EDI	Electronic Data Interchange
FNM	Ferrocarrilles de Nacionale Mexico [railway]
GIS	Geographic Information System
HAZMAT	Hazardous Materials
HDTV	High definition television
HELP	Heavy-Vehicle Electronic License Plate, Incorporated
HF	High Frequency
INS	Immigration and Naturalization Service
IMT	Institute of Mexican Transportation
IRD	International Road Dynamics, Incorporated

ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITS	Intelligent Transportation Systems
JIT	Just-In-Time [manufacturing process]
LAN	Local Area Network
NAFTA	North American Free Trade Agreement
PFNA	Pulsed Fast Neutron Activation
POE	Port of Entry
RF	Radio Frequency
SAIC	Science Applications International Corporation
SCT	Secretariat of Communications and Transportation [Secretaria de Comunicaciones y Transportes]
SMDS	Switched multi-megabit data service
SNL	Sandia National Laboratories
SONET	Synchronized Optical Network
STARBASE	System Tracking and Response Base
TPASS	Toll Plaza Application Simulation System
USDA	United States Department of Agriculture
VHF	Very High Frequency
WAN	Wide Area Network
WIM	Weigh-in-motion

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THE STATE OF-THE-ART

PORT OF ENTRY WORKSHOP

INTRODUCTION

The growth of the economy depends on the efficient movement

of people and goods across the international borders with

Canada and Mexico. Although the North American Free Trade

Agreement (NAFTA) may increase trade with both Mexico and

Canada, the promise of NAFTA can be realized only if the

international ports of entry through which that trade must

flow can handle the increase. Given the volume of this trade,

even small investments in port-of-entry efficiency can yield

enormous returns. As the pattern of government research and
development changes from military to civilian projects, the
investment of funds in technologies to increase port-of-entry
efficiency stands out as a way to reduce transportation costs,
enhance the security of border crossings, provide additional
protection from the risks of transporting hazardous materials,
and increase U.S. competitiveness in the international
marketplace.

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THE WORKSHOP

A port of entry involves complex interactions of state, local,
and federal governments, and private-sector interests on both
sides of the border. All of these must be considered in
planning and coordinating technological improvements to new or
retrofitted ports of entry to meet growing demand. The State
of-the-Art Port of Entry Workshop, held at the Albuquerque
Hilton on July 14 and 15, 1994, brought a broad selection of
these diverse international interests together with technology

providers for the first time to consider technological options

that address common problems facing ports of entry,

particularly those on the U.S./Mexico border.

Users	Technologists
U.S. Customs	Sandia National Laboratories
U.S. Dept of Agriculture	Science Applications Int'l Corp
U.S. Immigration and	BDM
Naturalization Service	
U.S. Dept. of Transportation	HELP Inc.
Federal Highway Administration	Lockheed
Secretaria de Comunicaciones y	Los Alamos National Laboratory
Transportes	Advanced Research Projects Agency
Border State Departments of	Alliance for
Transportation	
Transportation	Research
Southern Pacific Railroad	Wilson and Company
Atchison Topeka & Santa Fe	Bohannan-Huston
Railway	
Customs Brokers	International Road Dynamics
New Mexico Motor Carriers	Alex Mills Development
Association	

Instituto Mexicano del   Scientific Atlanta

    Transporte

Grupo Summa   Syntonic

Figure 1. Participating Organizations

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This workshop was basically a starting point; no technical

detail or specific new projects were recommended because of

the need for further analysis. The two-day schedule allowed

only glimpses into the issues and possible technical

solutions, and the participants, although representative of

border interests, did not include all stakeholder groups.

Therefore, this workshop should be viewed as a preliminary

scoping of the problems, a top-level review of how

technologies might improve port-of-entry processes.

STAKEHOLDER PARTICIPANTS

The international port-of-entry stakeholders at the workshop

came from a variety of public and private entities, with about 90 individuals attending. Federal transportation and inspection agencies contributed important insight to the panels. Public agencies and private interests from the U.S. border states were represented, and a number of technology providers were present.

Inspection Agencies

Workshop participants came from a variety of federal inspection agencies, including the U.S. Customs Service, the Immigration and Naturalization Service (INS), and the U.S. Department of Agriculture (USDA).

The focal point for US. inspections is the Customs Service at approximately 250 U.S. ports of entry. Customs is responsible for enforcing all 400 or so laws on goods entering and exiting the U.S. The inspection agencies identify people and freight at border crossings, and inspectors can use a broad variety of means to examine whatever conveyance is passing through their port. The difficult job of the inspection agencies is to balance law enforcement efforts against commodity movement Key

to this is the concept of focusing on probable offenders

through historical evidence and pre clearance of legal

traffic. Improved inspection technologies are clearly an

ongoing interest of these agencies.

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Besides their concerns for detecting illegal drugs and safety

infractions, inspection agencies are also concerned about

hazardous material (HAZMAT). Also, inspectors are required to

ensure that infectious livestock and plant life do not cross

international borders, endangering indigenous species.

Agricultural inspections by the USDA are very labor intensive

and can involve lengthy delays because little technology has

been developed to identify plant and animal diseases

automatically. The USDA also X-rays bus cargo to ensure that

it is disease free. The USDA performs background commodity

research, called a BCR, looking back five years for histories

of pest problems and similar concerns. Using these data

coupled with a risk analysis, USDA focuses its inspection

efforts on those shipments with the highest likelihood of

having problems.

U.S. Transportation Interests

Departments of transportation from the U.S. border states and the New Mexico Taxation and Revenue Department were present at the workshop. The border states are likely to share increased revenues generated by increased border traffic, but they will also bear some of the burden of providing infrastructure improvements. Private stakeholders were represented by the railways, the New Mexico Motor Carriers Association, customs brokers, and shippers. Two railroads with international connections were present: the Atchison Topeka & Santa Fe and the Southern Pacific. These private-sector businesses are interested in the potential use of technology to make border crossings more efficient and less costly.

Mexican Interests

Because 70% of Mexican commerce involves the U.S./Mexico border, Mexico is very interested in improving already congested conditions at the border. The Mexican government was represented by the Secretaria de Comunicaciones y

Transportes (SCT) and the Instituto Mexicano del Transporte

[IMT]. The IMT is researching many areas, including how to

promote industrial development through transportation

improvements. The IMT works with universities and research

laboratories on

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infrastructure optimization and on specifications for the

transport sector. The SCT is conducting feasibility studies to

support projects for improving port-of-entry efficiencies.

Technologists and Designers

Technology providers from both government and private industry

attended. Government technologists were the Department of

Defense's Advanced Research Projects Agency [ARPA], Sandia

National Laboratories (SNL), Los Alamos National Laboratory,

and the Alliance for Transportation Research, a consortium of

New Mexico universities, national laboratories, and the state

transportation department. Large private firms in attendance

were BDM Federal, Lockheed, Science Applications International

Corporation [SAIC], and its subsidiary, Syntonic. Smaller
firms at the workshop were HELP [Heavy-Vehicle Electronic
License Plate], Incorporated International Road Dynamics
(IRD); and Alex Mills Development. Architecture and
engineering firms in attendance were Bohannan-Huston and
Wilson & Company.

WORKSHOP APPROACH

This workshop was developed to bring a disparate set of
parties [bordercrossing stakeholders and technologists]
together. They began thinking about how to solve a common
issue: the application of technology to improve port-of-entry
inspection activities and freight movement. Overviews from
the perspective of Mexico and U.S. transportation agencies
were given at the beginning of the workshop. There were also
presentations on port-of-entry design and typical operations
at border crossings. [See Appendix El, Agenda.]

To help the technologists understand the needs at border
crossings, there were plenary briefings from the user
community [U.S. and Mexican transportation agencies,
inspection agencies, and shippers, including customs brokers].

There were also briefings on technologies and applications to help the port-of-entry users understand the available and developing technologies.

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A user/technology team sorted through the issues that arose in the user briefings and assigned them to the port-of-entry functions [as defined in Chapter 3]. The team reformulated and added to these issues for use in the facilitated workshop sessions. Each workshop had a mix of border crossing stakeholders and technologists that went through the specific list of issues. They then decided which technologies applied to a particular port of-entry function [such as tariff and fee collection] and which areas needed help beyond what technologies could of offer.

A final session briefed participants on the results of each of the facilitated workshops and showed some potential impacts of workshopre commendations on port-of-entry design and

operations. After the

workshop, evaluation forms were sent to each attendee to

obtain consensus on the topics for future workshops.

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BACKGROUND

RELATED PROJECTS

Because border transportation issues are becoming more

pressing national concerns, a number of state and federal

agencies have formed interagency organizations to take a broad

look at the impact of increased trade on port of-entry

infrastructure.

Task Force on Border Infrastructure and Facilitation

The federal interagency Task Force on Border Infrastructure

and Facilitation was formed in January 1994 to examine the

nature of traffic congestion at major international U.S. land
border crossings. The principal objective of the
recommendations of this group is to achieve coordinated short-
and long-term changes in border planning, management, and
financing [affecting both operations and infrastructure].
This activity will facilitate efficient, cost-effective
movement of people and goods while maintaining safety and
security.

Task Force recommendations address many of the issues raised
at the workshop. They include the following:

  . Set a standard that defines "border efficiency."

  . Improve coordination of Customs Service and INS operations.

  . User tolls, user fees, and private sector funding.

  . Expand and standardize the use of electronic data
     interchange.

  . Use pilot programs to test innovative concepts and new
     technologies for border-wide benefits.

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. Develop a regional planning approach for new and expanded
border crossings and related infrastructure.

. Utilize and coordinate FHWA early deployment on priority
corridors.

Although the Task Force has a short life, appropriate member
agencies will be charged with implementing the recommendations
that are approved by the Administration. A summary of
workshop results was sent to the Task Force.

Intermodal Surface Transportation Efficiency Act of 1991

The Federal Highway Administration of the U.S. Department of
Transportation has completed the Report to Congress required
by Sections 1089 and 6015 of the Act. The report, Assessment
of Border Crossings and Transportation Corridors for North

American Trade, addresses the problem of border station
congestion and recommends "the use of new technologies for
facilitating the movement of people, cargo, and vehicles
through major border crossings." Also, the report recommends
utilizing and coordinating Intelligent Transportation System
(ITS) field operational test project results.

Southwest Border Transportation Alliance

The Southwest Border Transportation Alliance is an
organization of state transportation planning agencies from
the four states bordering Mexico. Members of the Alliance are
currently taking steps toward a major binational study that
would include participation by the six Mexican border states.
This organization offers the opportunity, and perhaps some
resources, for addressing problems of federal state
cooperation at ports of entry in both countries.

Other Projects

Several other related projects are under way. They include a
research and development program for drug detection being
conducted by ARPA, a project to share information among drug

enforcement agencies being conducted by the Defense

Information Systems Agency; the development

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of detailed process maps by Customs and INS to improve

coordination; mobility improvement for Niagara International

Transport through the use of advanced technology; and

participation in binational and trinational forums such as the

newly established joint Working Committee on Border

Transportation Planning.

CURRENT OPERATIONS

Many of the present international ports of entry separate

commercial from noncommercial traffic. Noncommercial border

crossings have a primary [quick] inspection area. Individuals

who do not pass this inspection proceed to a more intensive

secondary inspection area. Those that fail the secondary

inspection are sent to the impoundment lot. Those that pass

inspections go to the toll booths before exiting the facility.

The commercial ports of entry also have quick release booths,

followed by a secondary inspection dock where the commercial vehicle unloads, and finally an impoundment lot for those failing inspections or a toll booth for those that pass.

In 1992, 20,000 rail cars per month crossed the border at Laredo, and 5,000 rail cars crossed per month at El Paso (Table 1). One rail car can have up to ten double-stacked containers. From the time when a train arrives to when it departs is approximately one to two days at the larger crossings, and it can take three or more days in Laredo. It takes about two hours [three to eight hours at Laredo] for U.S. Customs to check a train without inspecting its load. U.S. inspections can take up to 24 hours at the discretion of the inspector. Mexican inspectors have a random red light/green light system for selecting rail cars for inspection. If one of the containers is unloaded for inspection, the other containers on the same car are held up also. A method called despacho previo allows bonding before the train arrives at the border. All railroad cars in interchange service were required to be equipped with Automatic Equipment Identification (AEI) tags by January 1, 1995, to automate processing.

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CHANGING NEEDS OF SHIPPERS AND CARRIERS

A major change in recent freight transport comes from
companies receiving Justin-Time (JIT) deliveries from
producers, in effect using the conveyance as a rolling
warehouse of stock. This is especially evident in the
maquiladora twin-plant international manufacturing process.
The traffic requirements for the JIT process not only require
rapid freight movement but also predictability and reliability
of freight arrival.

Containers and trailers moving in and out of Mexico by rail
come from the U.S. domestic pool; even the racks that freight
is moved in must be returned to the U.S. pool. The U.S.
railways co-schedule rail traffic with Ferrocarriles de
Nacionale Mexico [FNM-the Mexican national railroad]. There
is a domestic bill of lading from the origin to the border,
where freight must be rebilled to go from the border to its

destination. One improvement being developed is a through

bill of lading from origin to destination across the border.

A growing amount of freight is shipped via intermodal carriers

where better service is expected to offset the additional

cost. The carriers essentially sell service, and it is

important to avoid congestion at borders and other delays that

may hamper their service

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As an example of current international rail freight movements,

commodities moving from Long Beach to Mexico City via rail

will spend about 32 hours from Long Beach to El Paso and

another 60 hours from Juarez to Mexico City. However, freight

can spend two to four days at the border; a guaranteed 24-hour

delay would fit the transportation providers' needs much

better. Most of the delays are from lack of documentation by

the initial seller [who may reside outside the North American

continent], and as noted earlier, inspection problems can hold

up a partial load.

The railways have begun implementing despacho previo with

Mexican customs to allow prior clearance and duty payments before the train reaches the border. However, the train is still subject to the red light/green light process. The development of electronic data interchange (EDI) will allow shippers to log onto a computer database to locate and determine the status of their shipments.

However, these solutions do not deal with a basic problem: there are a large number of players that interact with the railways at the border, including U.S. and Mexican customs, customs brokers, immigration services, agriculture inspection agencies, and freight forwarders. All these agencies and firms have their own procedures and documentation. The one-stop shopping concept, that is, having a single multinational agency as a point of contact for all border crossing issues, may be useful here.

As JIT manufacturing becomes more popular, the number of trucks servicing small businesses and remote areas will increase, as will traffic through border crossings. To expedite freight traffic, inspection agencies can focus on stopping carriers that are not in compliance and let the carriers in compliance bypass lengthy examinations. Truckers

that are in compliance need not bear the brunt of inspection
fees either. The goal of truckers in compliance is to cross
borders as easily and with as little delay as passenger
vehicles.

The customs brokers are the interface between the inspection
agencies and the transportation providers. They are the legal
representation for importers and exporters, and they
facilitate movement of shipments. They provide information to
all the agencies, typically through the

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automated broker interface (ABI] of the automated commercial
system (ACS). A key need in the broker's job is the ability
to access information on-line about any shipment, from origin
to destination. Brokers also need to be able to locate
shipments and identify reasons for delay. In this way,
brokers can quickly locate problems at the border and apply
release procedures appropriate for the commodity, importer, or
shipper. Other major needs of customs brokers are the ability
to track commodity movements after their leaving customs and

to link the conveyance with the shipment. Methods and

technologies that can reduce human data entry error and

validate stored information are also important.

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FUNCTIONAL ISSUES

An international port of entry is very complex, and a wide

variety of stakeholders discussed an even broader range of

issues. A port of entry can be viewed several ways. One way

is by the transportation aspect of interest, whether it is the

vehicle, its driver, or its cargo: There are regulations for

each aspect that focus on different port-of-entry operations.

The other way is by enforcement agency. There are federal,

state, and possibly municipal and third-party interests for

both Mexico and the U.S. These interests can easily compete or

conflict because so many agencies are involved. Thus, many

issues raised in the facilitated workshops could not be solved

only by incorporating state-of-the-art technologies. Often

organizational concerns are a greater problem. For this

reason, the workshops were not restricted to associating

technologies with issues, but were allowed to address issues

that also need administrative attention. These are covered in

Chapter 4, Management Issues. The functional issues examined

in this chapter are listed in Figure 2.

While this workshop is only a first step in improving

international ports of entry, some key themes came out of the

discussions. First, a high level of interest exists in

improving both the efficiency [expediting freight] and

                          ISSUES

        . Fee and Tariff Collection

        . Inspection

        . Information and Communications

.   Access Control and Security

.   Systems Integration

Figure 2. Port-of-Entry Functions

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effectiveness [having thorough inspections] of border

crossings. Keys to obtaining both goals are (1)

standardization and simplification of processes and

documentation and (2) capability to target vehicles and

pedestrians for inspection selectively.

Standardization and simplification easily come from

computer-based tools because information is the focus of many

port-of-entry processes. Technologies and procedures that have

common user interfaces and automate many of the redundant

information checks will facilitate traffic flow through border

crossings. An example of these technologies is the electronic

data interchange (EDI), which standardizes interaction with

computer databases.

Inspection selectivity also comes from computer tools such as classification methods and historical databases. Tools that will be the most effective allow operators to focus on what humans do best, such as making visual assessments, and let the computer do the intensive data searches and comparisons. An example of these technologies is automatic vehicle identification (AVI), which takes sensor or transponder information and compares it to records kept in a computer database.

Pre-clearance of freight [in terms of electronic credentials, on-board monitoring, automatic roadside inspection, and HAZMAT identification and tracking] can expedite legal traffic and focus inspection efforts.

FEE AND TARIFF COLLECTION

A port of entry has a revenue-producing function that needs to be considered. First, not only are fees being assessed, but tariffs and sometimes penalties or fines are also collected at border crossings. These may be prepaid, collected as cash or

noncash, or waived. Also, there are annual and one-time fees,
and per-use fees. Revenue is collected for passage of the
cargo, the driver, and/or the vehicle through the port.
Because of the cash involved, toll systems have a dollar loss
of 20 to 30%.

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Federal agencies are concerned with customs duties [usually
paid in a noncash manner] on the cargo. The duty is assessed
according to cargo classification and intrinsic value. The
INS performs credential checks on the vehicle drivers. State
agencies require that moneys for state corporation commission
stamps are collected according to cargo classification. State
agencies also perform a driver credential check collect fees
for highway use, and assess fines for overweight loads.

Federal agencies collect user fees on vehicles that may be
per-trip fees [paid in cash] or an annual prepaid fee. State
agencies issue trip permits to vehicles by the vehicle's
weight and the expected distance to be traversed by collecting
cash payment. If the vehicle is too large, the state collects

a penalty paid by cash or credit. For vehicles carrying

HAZMAT, the state collects both per-trip [paid with cash] and

annual prepaid fees. In the future, states may wish to

collect fines for vehicles that fail air quality assessments.

Municipalities or another third party may collect fees for

trucks crossing international bridges, assessing fees by the

number of axles and accepting payment by cash or credit.

Also, private concerns may sell insurance for the vehicle.

Technologies could facilitate truck freight movement through

ports of entry and still effectively assess and collect

revenue. These technologies would need to collect information

on the tractors, trailers, and cargo separately. Information

about tractor physical characteristics and operating data

[such as odometer readings], trailer physical characteristics,

cargo characteristics, and shipper history could be put into

transponders, that is, radio devices that would automatically

convey pertinent information to border facilities. The

transponder attached to the tractor would communicate all the

information from the tractor, trailer, and cargo, and the data

could be compared to data from a bill of lading or other

shipping documents. This setup would require transponders,

portable readers, stationary or fixed readers, and a central

database to manage data access and management functions.

Present transponders may be inadequate to handle the load of information transferred at international borders. The driver's personal credentials and trip information [including company history] may need to be put on transponders to be quickly read into port-of-entry computers and compared with regional database information.

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These transponders would also need to handle information relating to on-board cargo monitoring and support roadside safety and emission inspection services.

Many benefits would result from this sort of automation. International customs agencies would have increased compliance from the automated validation and would improve their record of correctly assessed commodity tariffs. Their operation would be more efficient, permitting faster traffic flow, and would promote more secure transfer of revenues collected. In turn, the government would have more effective utilization of

port operators and facilities, which should translate into lower costs over the long run and more secure transfers of revenues collected.

Private vehicles mixed with freight traffic could have expedited clearance under this system. Shippers can also be given expedited clearance and a better ability to track the movement of goods, facilitating their scheduling ability with an automated, accessible system. Shippers would have the financial benefits of less wear and tear on vehicles because delays would be minimized at the port of entry and more conveyances would be rolling at any given moment. Automated movement of funds would be more efficient and more secure, given modern auditing software packages. Finally, automated information collection and analysis could give the shippers more information for correcting any problems occurring en route.

INSPECTION

There are various reasons for inspections at border crossings: to detect contraband and illegal aliens, for safety, and to weigh the vehicle.

In particular, contraband inspection is expensive because it is labor intensive, and the agencies are increasingly short on manpower. However, the costs of failing to find contraband during inspections can be even greater. Deaths and employee absence and ineffectiveness from illegally imported drugs are two examples of these costs, and black market imports cost jobs. Risk analyses are performed to determine

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where diminishing returns exist in the inspection process so that agencies do not overallocate resources.

A main issue for the inspection community is how to focus limited resources onto specific criminal activity. Inspectors realize that only a small percentage of port users are real problems, and holding up traffic to inspect every vehicle is counterproductive. Inspectors would be more effective rigorously inspecting the subset of the traffic that contains the criminal element.

More effective inspection depends on the effective selection
of those inspected. Some agencies [such as the INS] may have a
100% inspection rate. Other agencies [such as Customs and the
USDA] may have inspections at the point of origin for the
commodity combined with random inspection at the border
crossing. Effective use of selection technologies would
greatly improve inspection thoroughness.

More point-of-origin inspections will directly reduce the
congestion at border crossings and increase the thoroughness
of inspections. However, once the inspection has taken place
outside the port of entry, container seals must remain intact
with high integrity throughout the trip if these items are to
pass through the border crossing without a second inspection.

Today's electronic tagging and seal technologies are a good
match to the problem of assuring freight integrity after
inspection at the point of origin. Because proprietary
information needs to be stored on the   electronic tags and
seals, they need to be secure. The data should be
accessible only by parties with the proper need to know.
Additionally, itmay make sense to use seals that emit an

alarm when the tag or its protected cargo has been tampered with or damaged, and that can aid in locating lost containers. On-board cargo monitoring, security, stability, emissions, and other environmental factors could be logged on the tag and reported later.

Information access and processing are integral to the inspection operation. Inspection is information intensive because not only the present status of each shipment is important, but also the history of the driver, shipper, and receiver. These are keys to selecting the appropriate

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vehicles on which to concentrate inspection resources. This historical information needs to be available and easily accessible at more than one port of entry, even though some of the information may be private or proprietary. One focal point is at intermodal connections where tags for container identification could eliminate confusion during mode changes.

INFORMATION AND COMMUNICATIONS

Information processing and dissemination are central to most port-of-entry functions, and workshop participants approached this function as a series of process improvements, such as dissemination of information to appropriate parties. This process can otherwise be described as allowing the information to be retrieved by a wide variety of users, but limiting full access to those with the proper need to know.

Allowing shippers, as well as port-of-entry, personnel, access to status and location data for cargo at border crossings would aid in scheduling freight passing through the ports. Cargo could be tracked as it moves through border inspections, and regulatory agents could track shipments and keep an electronic audit trail after inspections to ensure that the shipment is moved legally. There are other stakeholders, such as customs brokers and government record keeping and statistics agencies, that would benefit from easier access to border crossing data appropriate to their functions. Many of these information customers and many of the data to be collected are remote to the ports of entry, requiring reliable, high-information-rate communications with the facilities.

Besides facilitating shipping operations, improved information and communication services would also aid border inspection and enforcement agencies. Retaining and passing historical information about the drivers, transportation companies, and cargo origins would allow Customs and other agencies to be more selective in their inspections. For example, Customs could required more comprehensive inspections on goods associated with companies having a history of inspection and documentation problems. At the same time, Customs could do less thorough inspections or even bypass freight coming from

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companies with good histories. This would focus inspection efforts on the "bad guys." Also, this would give port-of-entry customers a strong incentive to keep a clean record and good documentation because their service would be expedited as a result.

Another improvement needed at ports of entry is the ability to

quickly stop "runners," criminals that try to run through the port without submitting to inspections and fee collections. Once a runner is detected, a delay apparatus needs to be activated. Because runner actions span a very short time, an automated system would aid greatly in solving this problem.

Communication technologies for improving these processes include wireless two way communications between port-of-entry operators and vehicle drivers. This would be a cheap and useful way for sending bypass information directly to the driver. This would allow the port-of-entry operator to assess driver competency based on slurred speech and incoherence, indicating intoxication. More sophisticated communication between port computers and the tags on the cargo and vehicle could provide automated validation of pre-cleared shipments and permit rerouting of cleared vehicles to bypass lanes.

Some multimedia technologies are commercially available to support international border crossing services. Other communication systems under development could also aid in disseminating port-of-entry information. A multimedia communication system as part of the border crossing computer network would have the ability to send photographs scanned

into the system across the whole network. The asynchronous

transfer mode (ATM) technology allows for rapid dissemination

of large amounts of cats, such as photos. Development of

wireless ATM will allow a mobile system to have the same

transmission and network capabilities as the port of entry.

Broadband encrypted communication systems would allow

operators to disseminate data over wide areas while

maintaining information security. Many of these technologies

are part of the HELP project and are being considered as part

of a development effort for a private, commercial

transportation information network.

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The communications systems may be tied in directly to other

equipment at the port of entry. Wire and wireless

communication systems allow a stand-alone computer at a border

crossing to be part of a regional or even global information

network, given satellite communication technology. Sensors

and scanners at the border crossing, as well as remote sensors

and transponders, can send information directly to the facility's main computer system for automatic processing.

Systems can be designed so that instead of overloading port operators with data from various sensors, computers could filter data, noting which vehicles need special attention. If the port's security systems were tied into a communication system, port operators could actuate barriers remotely. Having sensors, transponders, and security systems communicate with a central computer system at the border crossing allows automatic actuation of security measures when problems are sensed, such as obvious gate runners.

Many technologies are being developed that would be useful in the portof-entry computer operations room. Given the amount of information coming in through communication lines, high definition television (HDTV) technology may be worth pursuing. HDTV would allow operators to display whole sets of data rather than paging or panning through several screens of data. Since information is a key commodity at a port of entry, databases that store this information are the focal point of many operations. Two database technologies that may at first seem competitive are actually similar in function: integrated

and distributed databases.

Integrated databases link information obtained and stored by disparate agencies into a master catalog of data. This technology would be useful at border crossings because there are so many stakeholders [such as various inspection agencies, brokers, and revenue collection agencies] that need reliable information about the vehicles and cargo passing through the facility. Traditionally, this information is stored in individual repositories that are maintained separately, increasing not only the workload of information processing, but also increasing the probability of inconsistencies across databases. Integrating the data into a secure, linked database would allow individual agencies to maintain control over

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their data responsibilities while reducing duplication of efforts and associated data inconsistencies.   Distributed databases take the linking process a step further by allowing

each information manager to maintain control over his database

while allowing simple data retrievals over a large network.

This technology would be useful in distributing the data

responsibilities across all the ports of entry, instead of

centralizing all the data into one mainframe. Centralization

may have some of the advantages of integrated databases.

However, one disadvantage is that there is a single point of

failure [i.e., "the main computer is down"]. Another problem

is that those who have the most knowledge about the data are

remote and, therefore, tend to lose control of data

maintenance. Research in distributed database technology is

heading toward maintaining databases locally while allowing

simple nationwide access. This would allow each port to have

its own data in integrated databases but to be linked to

distributed databases at other border crossings.

Many of the data access problems can be solved by having a

standardized EDI through which data are retrieved. Much of

the technology is available now standardization, however,

requires administrative resolution and control over the

various data formats. If the interfaces can be standardized,

the following step allows for electronic documentation. It

may appear that electronic documents are more ephemeral than

paper documents. However, they provide rapid consistency and fraud checks because much of the information can be automatically accessed by a computer network

Vehicle, driver, and cargo data consistency checks can be more sophisticated, catching a higher percentage of fraud and error, using computer-based techniques under development. Mathematical algorithms and software, such as neural nets, can quickly and accurately classify vehicles, given minimal sensor data [time periods between truck wheels crossing highway traffic tubes]. With access to other sensor data and historical information in an integrated-distributed database, these technologies will be able to identify vehicles quickly and check consistency with their electronic documentation. Classification/identification data can be fed into modern risk analysis routines automatically so that operators an have real-time information on each carrier. Thus, inspection

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agencies can spend more resources on carriers who have been problems.

Many aspects of these information and communication systems

are   commercially available. Other technologies are ready for

field testing. Some technologists feel that additional

studies and analyses will only delay deployment of these

services.

Port-of-entry automation will be challenged by commercial

vehicles that can carry, maintain, and transmit on-board

electronic credentials while monitoring results and changes in

travel plans. Current vehicle tags will need to be replaced

by those with in-vehicle processing units to support all of

the services for commercial vehicles. A commercial vehicle

information exchange network will be needed to support a

state-of-the-art

port of entry.

ACCESS CONTROL AND SECURITY

Several issues were raised in the

workshop that related to security at ports of entry and

controlling access to data, equipment, and facility personnel.

The basic access control issue is facilitating movement of legal traffic through border crossings while simultaneously limiting unauthorized access to any part of the same facility. Legal traffic movement can be expedited by keeping unnecessary contact with port-of entry personnel to a minimum. This is basically the selection/bypass process mentioned in earlier sections. Limiting unauthorized access means ensuring that port-of-entry personnel and equipment are physically protected from intruders. Access control also includes disallowing unnecessary access to private and proprietary data stored at the facility.

An even more intriguing problem is control at a multi-use facility where state and federal entities co-exist. Port-of-entry security involves validating that vehicles, personnel, and cargo have proper accreditation for being on the premises. Many problems with quickly identifying illegal people and items on port-of-entry property may be solved with rapid background checks. Consequently, maintaining and accessing historical

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records are important. Once intruders are detected, there
needs to be a method for stopping them without interfering
with operations. This is the "runner" problem mentioned
earlier in which an individual or vehicle needs to be stopped
with minimal interruption to the main traffic flow.

Again, technologies that apply directly to access control and
security include both communication and information tools.
Physical barriers for vehicles and pedestrians [such as
hydraulically actuated barriers for stopping vehicles and
dispensed foams for disabling people] limit access internally
or externally to a border crossing.

Two-way communications between port operators and vehicle
drivers can facilitate traffic movement by limiting direct
contact to only what the port operator deems essential (e.g.,
visual sobriety checks). AVI and automatic vehicle
classification (AVC) technologies can give port operators
information prior to vehicle arrival. This can help expedite
passage or focus inspection efforts, either way segregating
legal traffic from those who need more attention. Sensor

systems placed at border crossing entrances and remote to the facility would be part of the AVI/AVC system along with an automatic assessment system in the facility computers (or possibly embedded in the sensors). This system could be integrated with facility security systems to activate bypass switches or barriers automatically, whichever may be needed.

Automated traffic control sensors inside the border station could determine where long queues exist downline and reroute traffic inside the facility accordingly. Pre-inspected loads might be deemed a low enough security risk at these times to allow complete bypass of inspections or only a small percentage of the pre-cleared traffic could be routed into the main inspection lines.

The data in the AVI/AVC system could be considered proprietary by its owners. Even though several operators at the port might need access to the whole classification database, portions may need to be inaccessible to the outside world. Database technology has allowed multilevel access for several years and research is continuing in this area. Modern database technology allows sophisticated control of who has access to certain parts or all of a given database and methods

are being developed to prevent access by hackers. This

technology would allow ports to

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accumulate commodity and transportation data into a central

[or distributed] database, but access would be limited to only

the parts essential to a particular job.

Port operators should have a reliable and simple communication

system with response teams in case of HAZMAT spills, law

enforcement problems, and other emergency needs. Touch-screen

computers with autodial capabilities can help an operator in

an emergency situation contact the appropriate emergency

response team.

SYSTEM INTEGRATION

These proceedings have already mentioned that many of the

technologies useful to border crossings can work

synergistically. An example of this is a computer system that

can communicate with sensors and traffic control equipment to route specific vehicles according to their classification and carrier history automatically. The capabilities of the individual components of a system like this are, for the most part, already available. However, these capabilities alone do not ensure a sound, workable design for port-of-entry operations. The key to getting the expected synergy is systems integration, making the components fit together.

For successful system design, care needs to be taken to include concerns of government enforcement functions as well as facilitating private sector operations. Both public and private concerns can be important to all stakeholders. Thorough government inspections resulting in apprehension of those transporting illegal goods reduce international crime. This improves the overall economy [fewer dollars spent on health care related to illegal drugs, fewer jobs lost to black market operations]. Expedited freight and vehicle movement reduces wear and tear on international bridges and other border infrastructure and reduces pollution from idling vehicles. This reduces costs and problems borne by government agencies.

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One-stop shopping for border inspections may expedite traffic through ports of entry and is another reason for joint federal/state inspections. Also, conducting commodity inspections at the point of origin [or other remote stations] and pre-clearing goods may relieve congestion at the border facilities. However, it is crucial not to compromise inspection standards just to expedite freight transportation.

Facilities should be designed so that the appropriate information is readily available to the port operators. Extraneous information merely confuses and slows down operations, while incomplete or tardy information causes the operator to spend more time obtaining the information needed to make appropriate decisions. An important system-wide effort should be made to standardize processes and documentation reasonably, thus minimizing confusion among drivers moving freight through the port. This requires extensive dialogue between ail border-crossing stakeholders.

Workshop discussions illustrated that it is important that one

agency take the lead in systems integration. However,
different groups suggested that the U.S. Department of
Transportation (DOT), U.S. Customs, and even SNL should take
the lead role. Whatever agency takes the lead must organize
forums for all stakeholders to discuss their needs so that
perceived improvements at border crossings do not make
conditions worse. It would also be useful to have a process
to improve border crossings from a regional perspective, not
just a local view.

An across-the-board look at border-crossing processes should
occur before attempting to implement the new technologies.
This functional analysis should examine each agency's goals to
determine areas of overlap and to ensure that all functions
are encompassed in the integrated design. It is also
important to document lessons learned, yielding a database of
past experiences so that bad experiences are not repeated.

Lessons learned from interstate ports of entry should be
integrated into international border crossing designs. In the
same way, state ports of entry ought to implement the best
ideas that apply from international border crossings. As an
example, all ports of entry with inspections may

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benefit from technologies such as AVI and weigh-in-motion

(WIM). These technologies could automatically divert some

traffic to bypass lanes.

AVI could also serve as a key into the EDI, linking the

conveyance to the transportation network. EDI should be made

available to all stakeholders. This means that the interface

should have bilingual [and eventually multilingual]

information, be standardized, use international protocols, and

have security mechanisms limiting access to only the data

needed by the user. Inspection outcomes should be logged into

the database.

The systems integration work group should use these

technologies to deliver information that is appropriately

formatted for the analysts. As stated previously, information

is the focal point of ports of entry. All information

collected and presented, therefore, should be in a usable form

even though it may be coded for internal storage.

TECHNOLOGY OPPORTUNITIES

As mentioned earlier, it is important to first understand the
entire border crossing process before implementing any
particular technologies. Workshop participants were quick to
point out that technologies should not be showcased without
all parties clearly understanding why they were needed.
However, several broad technological opportunities clearly
emerged out of the workshop discussions and it is important
that users and stakeholders be aware of potential technology
improvements to port operations.

Since one of the main issues concerning border crossings is
maintaining and disseminating valid information, data
processing technologies developed for these purposes will be
high-leverage items. EDI and standardized data formats will
make port-of-entry information much more accessible to more
users. Technology is maturing in these areas, and further
discussion from all stakeholders is needed to define the
details of standardization.

Computer communications systems need to be designed for wide but secure dissemination of the data collected at the border crossing. Other

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communications will be necessary for remote activation of sensors and controllers.

Classification technologies, such as WIM and AVI, used in concert with bypass lanes, can help border crossings pursue the dual goals of efficient and effective operation. Future classification technologies [such as neural networks] integrated with historical databases may greatly improve the selection mechanism trained to recognize carriers that are habitual or potential border crossing problems.

Tags, seals, and transponders can be used to allow containers inspected at their point of origin to bypass further inspections. Future versions of these technologies will actively denote the status of the vehicle, driver, and cargo to alert port operators of potentially illegal or dangerous

situations. Automated security systems can be designed to contain these vehicles or pedestrians with minimal interruption of regular traffic flow.

As smugglers become more sophisticated and traffic increases at the border, the need for sensors to supplement human and dog inspections also increases. While there are many more sensors and scanners that can inspect luggage nonintrusively, a need remains for large-scale scanning of containers and conveyances. One labor-intensive area where scanners traditionally have not been used is agricultural inspection. A device that could automatically scan freight for disease and infection would aid the USDA immensely.

The key to implementing useful technologies at ports of entry is thinking through the entire function of the port carefully. Opportunities for technological enhancement will be wasted if products are developed in isolation, without an overarching guide stating what needs to be accomplished. Systems integration of these technologies is the key to having an effective and efficient border crossing system that does not become obsolete with equipment change.

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4

MANAGEMENT ISSUES

CROSSCUTTING AND GENERAL ISSUES

The concluding sessions of the workshop addressed several
topics that included 1) cooperation among the several agencies
involved, 2) information sharing, 3) enforcement vs.
facilitation, 4) establishment of performance baselines, 5)
funding, and 6) leadership. The contents of the sessions are
summarized below.

Agency cooperation has been discussed elsewhere, and the
concept of rationalizing the process was raised again. Such a
rational process would prioritize entrance [and exit]
requirements based on the consequences of noncompliance.
Interagency agreements could then be formulated for sharing
responsibilities for initial identification of problems. The

agency identifying the potentially offending vehicle or container could then refer the problem to agency specialists for further examination. The development of a process to define agency interactions and exploit opportunities for cooperation was strongly recommended.

Information sharing was a recurrent theme in efforts to improve this information intensive process. Independent documentation is needed for cargo, vehicle, driver, shipper, and receiver for federal, state, and local agencies in both the U.S. and Mexico. The type and valuation of cargo are of interest to Customs, Agriculture, and insurance companies. Compliance records of shippers and transportation companies are very important in the development of inspection strategies. International origin and destination data are needed by federal statistical agencies and transportation facilities planners.

The balance between the conflicting port-of-entry goals of enforcement of numerous regulations versus facilitation of freight movement was raised

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as a fundamental problem early in the conference and continued
to be pervasive. The technologies discussed offer the promise
of improved performance in both areas. However participants
urged that implementation be designed to supplement more
streamlined and shared processes.

The first step in evaluating potential technologies is
establishing a baseline measuring the current performance of
ports. Increased performance offered by proposals for
improvement would then be compared with current operations to
estimate benefits that would then be compared with costs. A
broad definition of benefits and cost was encouraged because
the benefits of more confidence in the integrity of shipments
would accrue not only to inspection and revenue collection
agencies, but also to victims of drug use and theft of
intellectual property. The benefits of faster processing
would accrue not only to shippers, receivers, customs brokers,
transportation companies, and consumers, but also to the
economies of both countries in the form of increased
international competitiveness.

Thoughts on funding attempted to match payments to beneficiaries. Because the broad base of beneficiaries of improved inspection reflects national populations as a whole, the public sector, through its relevant agencies, was the most logical candidate. Since the immediate benefits of faster processing are largely felt in the private sector, costs could logically be recovered through user fees. However, fees paid should be commensurate with savings. Because many technology options can provide both improved inspection and time savings, public-private partnerships also emerged as logical entities to pay the bills.

Thoughts on leadership ranged widely. The U.S. Customs Service has traditionally taken the lead at most ports and has been the principal customer of the General Services Administration, which designs, constructs, and maintains them. However, interagency and international cooperation is imperative if significant performance improvements are to be achieved. The DOT was suggested as an agency with a mission to facilitate freight movements. This department is currently supporting the interagency Task Force on Border Infrastructure and Facilitation, which has many of the same objectives and

recommendations as the workshop. This Task Force includes a representative from the National

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Economic Council in the Executive Office of the President with interdepartmental responsibilities that might be useful in achieving coordination. Leadership should also come from the local level, perhaps from one of the four regional offices of the federal inspection agencies along the border. The Department of State was suggested since it is responsible for international port-of-entry operations. SNL was also suggested as an organization with both the technical competence and objectivity needed to lead an interagency program.

The Port of the Future:

Design and Operational Impact

The meeting began with a physical description of a typical
port of entry designed for truck and automobile traffic and a
presentation on current operations and technologies in use.
The meeting concluded with several implications for facility
design and operations to accommodate new technologies.

Special bypass lanes could be constructed for trucks equipped
with transponders containing information about pre-clearance
of the cargo by Customs officials at remote locations, the
integrity of the seal, the condition of the cargo, the
credentials of the driver, any deviations from the planned
route, an indicator of the level of risk based on historical
violation data, the status of user fee and tariff accounts,
and the vehicle's compliance with safety and environmental
regulations. The transponder could be interrogated
electronically as it approached the port. The information
could be simultaneously transmitted to inspection officials on
the other side of the border. Trucks meeting all requirements
would not be required to stop. Trucks not meeting all
requirements or those subject to random inspections would be
diverted to inspection areas. These areas would be designed
to accommodate facilities housing X-ray and pulsed fast
neutron activation equipment for contraband detection.

Biological and chemical sensors would be used to detect noncompliance with agricultural requirements.

If intermodal facilities were available at the port, pre-cleared containers with transponders would be tracked as they moved between truck and rail modes as well as to and from temporary storage and inspection

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areas. Rail cars could have the same kind of transponder data as trucks. Facilities would be provided for interrogating railcar transponders at greater distances from the port than trucks. This system would permit trains to enter switching yards to detach cars and off-load containers that did not meet all requirements. The remaining cars could continue without further delay.

Facilities would need to be designed to house inspectors from various agencies, perhaps in a single room that contained display consoles presenting appropriate transponder data for

evaluation. Automated data evaluation could include decision
rules for acceptability and deviations from those rules. When
field inspections were needed, date from inspection equipment
could also be evaluated from a central location. Agents in
inspection areas could have mobile video equipment, making it
possible for field inspections to be monitored from a central
location. The case proximity of inspection officials from
severer agencies, and perhaps the U.S. and Mexico, would
permit immediate communications among inspectors as decisions
about the disposition of noncompliant cargo were reached. The
possibility of achieving multiple, simultaneous evaluations
would also permit a more efficient organization of port
operations.

Physical design features could place the control room with
inspection agency computer consoles in a tower, permitting
visual confirmation of the flow of trucks, trains, and
containers. The tower would also be useful for confirming
information from access-control sensors and systems for
controlling the operation of physical barriers that could be
used to stop runners. Other physical features would include
wiring, fiber-optic lines, antenna locations, and power
supplies to support information and communications systems.

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Conclusions

It was apparent from the user speeches and further discussions in the workshop sessions that port-of-entry stakeholders are under pressure from several directions. Because of the signing of NAFTA, freight movement across the Mexico/U.S. border is expected to increase. At the same time, many manufacturers have moved to JIT operation, which minimizes warehouse usage by requiring timely transportation of assembled parts from remote locations, including across the border. However, resources at the border are already strained, and all indications are that manpower will be reduced and regulations will increase. The net effect of these events is that there will be increased congestion at the border facilities unless operations are improved.

Standardization and simplification were deemed as keys to success of improving border crossings. A lead agency needs to be assigned so that a careful, integrated effort takes place

instead of having a disjointed collection of technologies

installed at the various border ports. The DOT may be in the

best position to lead multi-agency discussions and work

through international and industry protocols. Historical data

should be used to derive lessons learned from past efforts.

The product of this work would be a roadmap to technology

implementation that takes into account the entire

border-crossing process, including recommendations on

administrative procedures.

Information is central to many port-of-entry inspections and

can be the key to selecting which conveyances passing through

the facility need the most thorough inspections. Timely data

on vehicle, driver, and cargo allow manufacturers and

transportation providers to schedule their resources

appropriately, reducing transportation overhead costs. These

data are essential to customs brokers who are charged with

expediting and resolving problems with freight passage. Also,

information needs to be available to stakeholders on both

sides of the border in a format that can easily be understood

by all parties.

In terms of the port-of-entry functions identified for this

workshop, information is vital to each operation. Fee and tariff collection requires the port operator to have validated information on the driver,

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conveyance, and cargo. Inspectors can be more selective on what is searched if there is information on the credibility of the carrier and on the nature of the goods before the conveyance reaches the port. Status of inspections needs to be available to many parties, such as other inspection agencies at that border crossing, agencies at other border crossings [for future reference], and customs brokers. Facility security personnel need to know which drivers or pedestrians are probable runners while they can still stop them, not after the fact.

Besides current data on the driver, conveyance, and cargo, it is also important that historical records be kept on port-of-entry transactions. As stated above, a record of past changes and resulting net effects would be useful in designing

future border facilities. The cost of installing data
collecting tools is offset by the knowledge that this
information can be used in keeping designers from
re-implementing known mistakes.

One method for reducing congestion at the ports is to have
inspections remote from the border crossing. An obvious
inspection point for freight is at the commodity point of
origin, the manufacturing facility. After the freight leaves
the facility, inspectors need a way to assure that the freight
container has not been breached and, if it has been breached,
to determine what the container status is at the border.

Promising technological solutions to these problems are
available today; however, this does not mean that all problems
will be solved tomorrow. There are still issues that need to
be resolved, such as who will pay for technology
implementation and where can it be most effective.

If one wants to implement technologies, the best place is at
operational facilities or at those in the design phase.
Implementing prototype technologies at an operational site
runs the risk of increasing congestion while "the bugs are

being worked out." It appears obvious that the best place to

try out a new technology would be at a new facility that has a

small, growing amount of traffic. However, new facilities are

a very small percentage of ports of entry and are, therefore,

unrepresentative of the overall border operation. Prototype

technologies are probably best tested at the new facilities,

but designers need to remember that integration into existing

facilities should receive first priority after they are

tested.

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5

RECOMMENDATIONS

NEXT STEPS

As stated earlier, this workshop was essentially a prelude to

a more ambitious set of work that needs to be done to address

port of-entry improvements with advanced technologies.

Post-workshop surveys were sent to all participants to elicit

their interpretation of future workshop focus. Although

response was low, about 25% of the participants, all the major

stakeholder groups [inspection agencies, state and federal

transportation agencies, Mexican interests, private sector,

transportation providers, and technologists] were represented.

About half the respondents were technologists; most of the

other stakeholder groups had two participants responding.

To evaluate the results of the rating system quantitatively,

we translated low, medium, and high scores into values of 1,

2, and 3, respectively. Forms that had both medium and low

marked were averaged, giving a net score of 1.5. Averages

were taken of the marked forms by individual workshop, issue,

and technology. This method assures that even though some

forms were not completely filled out, no values were

automatically assumed: the scores represent the true average

of the responses. Standard deviation shows the level of

agreement about the average score. Higher values for standard

deviation mean less consensus. For example, if all the

respondents that rated an issue gave it a medium priority, the

average would be 2, and the standard deviation would be 0.

From the responses on the survey forms, apparently the respondents were eager to participate in future workshops. The ratings of future portof-entry workshop priorities are shown in Figure 3. Generally, there is a high level of interest in the suggested workshops. The port-of-entry systems integration workshop had the highest priority and the highest

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level of consensus. Access Control and Security has a notably lower priority and a relatively high standard deviation. This means that even though most of the participants that did respond felt that this was the lowest priority, there is a constituency that is very interested in security improvements. One additional workshop suggested dealing with state issues so that the state taxation and revenue department, motor carriers, transportation department, and others could work through issues such as operations, electronic and interactive communications, and so on.

Another workshop on joint federal/state ports was suggested that would address issues such as port integration and harmonization, joint operations, problem resolution, and future trends.

Click HERE for graphic.

There was also a positive outlook on the nature of the workshops in bringing about changes. Nearly all the respondents believed this particular workshop would be useful in their job and that the suggested workshops would impact future port-of-entry operations. Most believed that the focus of the workshops should remain on the port-of-entry functions because a team approach is needed, but some believed that

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the focus should be on individual agencies and then focus on the functions later. Also, most believed that holding some of these workshops near an international port of entry depending on the workshop focus, would help the participants see the

problems firsthand. Others were not sure that this would be
much help and suggested that holding future workshops near the
agencies might be more useful. There were suggestions to
include state agency operations more adequately in future
meetings.

Although some respondents thought the format used in this
workshop would be good for future workshops, several
improvements were suggested. There were suggestions to reduce
the focus on hardware and spend more time on port-of-entry
operation specifics from the inspection agencies and users.
As to the size of workshops, there were suggestions to have an
open forum, to limit the number of organizations and people,
and to expand the scope of the workshop to include state
agencies [to improve traffic flow in and out of the facility].
However, it was suggested that the first step to future
workshops needs to be defining the lead agency. Also, it was
suggested that technology application should come after
defining each agency's requirements.

The results from the survey on what issues need to be
addressed on both sides of the border can be seen in Figure 4.
Again, the respondents saw most of these issues as high

priority. On the average, the highest rated issues dealt with cooperation among agencies, standardization simplification, and reducing the time freight spends at the ports of entry. This was not surprising because these were key themes mentioned throughout the workshop, with speakers alluding to the necessity of teamwork and compatibility. The lowest scores went to consolidation of federal inspections and universal selective access to border-crossing information. This may be more because of skepticism about administrative concerns than barriers. There was a suggestion that automating inspection services should focus on operator interactivity.

Participants also suggested some additional issues that need to be addressed. Defining port-of-entry requirements is essential to discerning the base needs of border ports. The private sector needs to be involved in the planning to ensure federal agency cooperation with private sector users. A more direct issue is separation of freight from other traffic.

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Figure 5 shows the survey results on prioritization of technology improvements. There were not any major distinctions in the survey results between priorities for the near term [two or less years] and the long term [three or more years], so only the near-term chart is presented here. On the average, the respondents saw the technologies as lower priorities than the issues. The highest priority items were data processing [information is central to port-of-entry operations] and systems integration [how to improve operations, not just implementing technology]. Improving barrier technology was seen as the lowest priority for enhancing border crossings and that correlates with the low priority given for the Access Control and Security Workshop. Apparently, most of the respondents were more interested in high-level issues than the more specific security issues.

Click HERE for graphic.

38   THE STATE-OF-THE-ART PORT OF ENTRY WORKSHOP

Click [HERE](#) for graphic.

39   THE STATE-OF-THE-ART PORT OF ENTRY
WORKSHOP

OBJECTIVES

Based on the survey results, the criteria for next workshop

should include the following:

.   Take a team approach.

.   Include data processing and information systems.

.   Analyze interagency and federal/state operations.

.   Focus on both enforcement and facilitation.

.   Focus on port operations first. Then define opportunities

    for technology introduction.

.   Address state operations at border crossings in relation to
    federal efforts.

Meeting these criteria can be accomplished by collecting

information from participating agencies and analyzing

interrelationships to prepare for the workshop. More focus

can be achieved by examining a specific port that is as

representative as possible.

Work Plan

1. Identify agencies and requirements.

Conduct a telephone survey and field interviews with the

federal and state inspection officials, both US. and Mexico,

at the selected port. Information collected would include

mission statements, information sources, databases used,

technologies used, information needs, interactions with other

agencies, and performance measures.

2. Map and model the current process.

Define the sequence of events as freight moves through the
ports for road, rail, and air modes. Take advantage of
ongoing projects conducted by U.S. Customs and the INS.
Develop a model of the process.

40   THE STATE-OF-THE-ART PORT OF ENTRY WORKSHOP

3. Analyze opportunities for performance improvement.

Use the model and small planning groups to propose alternative
procedures and technologies that offer the potential for
performance improvements in both enforcement of regulations
and facilitation of movement.

4. Conduct workshop.

Design and conduct a structured workshop involving
representatives from all stakeholder groups in both countries
to evaluate the feasibility of implementing the improvements
and to suggest others. Participants would be supplied with
the information developed during the mapping and modeling

process. They would be expected to prepare for the workshop
by reviewing the material and discussing it with operators and
policy makers in their organizations. Reach a consensus on a
plan for the selected port, if possible.

5. Transfer the process used to other ports.

Since all ports are different, the process used, complete with
its inventory of alternative operational innovations and
technologies, would be conducted for other ports, in both the
US. and Mexico, at their request.

BENEFITS

These workshops offer opportunities to address several
national priorities:

  . We can "reinvent" port-of-entry design and operations
    through effective use of redesigned processes that use
    technology appropriately and incorporate interagency
    cooperation [National Performance Review - Reinventing
    Government].

.   We can address air quality problems at some of the current

    border crossings by moving vehicles through ports more

    quickly [Clean Air Act Amendments/Border Environmental

    Cooperation Commission].

41   THE STATE-OF-THE-ART PORT OF ENTRY
WORKSHOP

.   We can provide facilities that will encourage and enhance

    trade opportunities for both the U.S. and Mexico and make

    both countries more competitive in international trade by

    reducing transportation costs [NAFTA/U.S. Trade

    Representative].

.   We can capitalize on dual-use technologies that need

    continued development to support national security
interests

    but can be leveraged to support port-of-entry needs e.g.,

    sensors; nonintrusive inspection; wireless communication,

    identification, and classification; intelligent agents;

    information systems, etc. [Defense Conversion and Dual Use

    Technology].

.   We can stimulate job creation by creating a service-oriented

    climate at the port that is attractive to shippers,

    consignees, brokers, suppliers, and industrial developers

    [Enterprise Zones].

.   We can provide an improved defense against narcotics and

    other illegal substances through advanced technology

    inspection systems that reduce the possibility of

    penetrating the U.S. borders [National Drug Policy].

.   We can promote use of intermodal transportation systems that

    result in greater efficiency, mobility, and accessibility

    [National Transportation Policy].

.   We can leverage government investments by taking advantage

    of innovative financing mechanisms that bring the synergy of

    public/private partnerships to funding infrastructure

    investments that serve both government and commercial

    interests [Cost Reduction].

Implementation of this program could address the national

objectives listed above and achieve tangible improvements in

local operations in a single project, a rare opportunity.

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APPENDIX A. WORKSHOP PARTICIPANTS

Click HERE for graphic.

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APPENDIX B. AGENDA

Thursday July 14, 1994   Thursday July 14, 1994

Albuquerque Hilton-New Mexico   Applications Panel-John

   South   Room   Wagner, SAIC

7:15 Registration and Continental 3:30 Jim Gentner, HELP Inc

         Breakfast   Pat Shea, Science

                                          Application

      Introduction Panel Moderator -   International

Corp.

James Kelsey, Sandia Nalional Lab   Jim Elliott, Los Alamos

8.00   Gerry Yonas, Sandia National Labs   National Labs

Noah Rifkin, Department of   Larry Luzyaski, Scienc

Transportation   Application Int'l Corp.

Benjamin Montiel Espinosa, SCT   Jayne Williams,
Sandia

Dave Thompson, Wilson & Company   National
Labs

Steve Dick, Wilson & Company

Mike Smith, Science Applications

International Corp.   4:45   Workshop
Announcement-

Bob Rea, SAIC

6:00   User/Technology
Team

Meeting and Dinner

Friday July 15, 1994

Port of Entry Uscr Pancl Moderator Dan

Payton, SAIC

9:30   Arthur Pitts, US Customs   Albuquerque Hilton-
New

John Vigil, US Department of   Mexico South Room

Agriculture

7:15 Continental Breakfast

10:00 Break

Albuquerque Hllton-

Designated Rooms

10:30 John Puffer, Southern

Pacific Lines

Steve Griego, Santa   8:00 Facilitated Workshops

in

Fe Railway   Designated Rooms

Vic Sheppard, NM Motor

Carrier Association

Fernando Velasquez, Institute   Albuquerque Hilton-New

of Mexican Transportation   Mexico South Room

Raul Gomez, Rudolph Miles & Sons

12:00 Lunch Buffet

11:45 Lunch Buffet

Facilitated Outbriefs

of

Morning Sessions

Technology Panel Moderator-

David Albright, ATR   1:00 Jessica Glicken, Sandia

12:45 John Pennella Advenced   National labs

Research Projects Agency

Ernie Mercier, US Customs

Gary Ruegg, Science Applications

International Corp

Roger Johnson, Science

Applications Int'l

Technologies

Dave Swahlan, Sandia
University

National Labs

John Naegle, Sandia
for

National Labs

Ed Davidson, Syntonic

Laverne Romesberg, Sandia

National Labs

Ernie Edwards, BDM Federal

Pat Shea, Science

Application

International Corp.

Don Garcia, Department

of Energy

Mike Moulton, Sandia/ATR

Tim Karpoff,

of New Mexico

Gregory Lay Alliance

Transportation

Research

2:30 Break

3:00   Break

3:00 Impact on Facility

Operations-Mike Smith,

SAIC

Impact on Facility

Design-Steve Dick,

Wilson & Co.

Workshop Wrap up-Bob

Rea,SAIC/Mike Moulton,

ATR

B-1

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B-2

APPENDIX C. TECHNOLOGIES

APPENDIX C

TECHNOLOGIES

SENSORS AND SCANNERS

In addition to illegal drugs, inspectors are trying to detect
hazardous materials and leakage, illegal armament, and any
other misrepresentation of cargo crossing international
borders. These misrepresentations can be quite subtle, such
as trying to avoid higher tariffs by falsifying the country of
origin of the goods or improperly classifying the type of
commodity. At present much of the inspection is carried out
visually and with intrusive probes, which is very labor
intensive.

Scanners and sensors can revolutionize inspections at ports of
entry. These devices can search cargo non-intrusively as
opposed to having a human visually inspect container contents.
These devices detect items that would elude a human inspector,
such as illegal drugs hidden in a grain boxcar or liquid
propane tanker.

A well known scanning technology is X-ray radiation, such as
used to scan the human body. X-ray technology being developed
can scan a rail container in two minutes compared to the human

analysis time of 15 minutes. The radiation is such that if a

person were hidden in the container, they would receive the

equivalent dose of only two chest X-rays.

Other scanning technologies include pulsed fast neutron

activation [PFNA], ultrasound, tomography, and electromagnetic

detection. These scanners operate at different frequencies to

give the inspector non-intrusive pictures of the interior of

the container. These pictures visually note changes in

interior composition that can cue the inspector to items

C-1

that may be hidden in the container. Most of these

technologies are currently able to examine only luggage-size

containers.

Dogs are the main sensors used at border facilities. Their

acute sense of smell works quite well in detecting chemical

vapors emanating from illegal substances. However, conditions

at the U.S./Mexico border ports on very hot summer days with

even hotter pavement impede the operating capability of the

dog. In its place, sensors sometimes known as "sniffers" can detect and identify chemical vapors. The micro gas chromatograph is a hand-held device that separates and classifies gases that are in the vapor; detection time for a selected substance is from five to ten seconds. Gamma backscatter, as well as hydrogen detection and laser range-finders, can be used to examine voids and detect hidden compartments.

There are testbeds and models of many of these technologies to determine what impact they should have on border inspections. While these technologies are costly, their use may be the only way to compensate for inspection manpower shortages without compromising thoroughness of inspections. Another benefit of these devices performing their particular inspection regime on cargo quickly is that vehicle and freight throughput should increase accordingly.

Transponders, Tags, and Seals

Transponders, tags, and seals are technologies used to store information and relay the stored information across a communications link. In the past, these technologies were

distinct. Tags and seals were clipped to and stuck on

containers as labels and to ensure that the contents had not

been disturbed. Transponders were essentially little one-way

radios attached to containers used for remote identification.

As these technologies have matured, their distinctions have

blurred and now many tags and seals contain transponders.

There are three main types of transponder tags: read-only,

read/write, and computer off-load. The read-only transponders

traditionally have been used to identify mobile equipment for

inventory control electronically. These transponders are

permanently programmed, and they save labor and reduce the

possibility of error by allowing information

C-2

to be read electronically. Read/write transponders

additionally allow data to be written to the transponder so

that information can be added or changed as the status of the

vehicle or freight changes. Computer off-loaded transponders

have computers on board the transponder that can make status

assessments from sensor data and log data history or report

conditions to operators.

Current read-only tags include information on cargo
identification and container physical dimensions in a
standardized format for rail cargo. These tags are mounted on
the front bumper of trucks or on the sides of rail cars.
These tags are read from fixed antenna systems by the rail or
roadbed and by hand-held readers that can upload information
from the tag and download it to a printer or another computer.
As these data are disseminated to a wide set of customers,
transponder tag data could be used to gather arrival and
departure times, report on intermediate shipment locations,
control access, provide yard inventory information,
automatically collect tariffs, and automatically identify
equipment.

Communications

The previous technologies were developed to acquire and store
information; communications technologies were developed to
pass information between points. The type of communications
needed is determined by the type of information that needs to

be passed and the required transfer time. The higher the

frequency bandwidth [or transmission speed for wire systems],

the more information can be transferred in the same amount of

time. As the data requirements have increased from

transmitting voice, to sending computer data, to sending high

fidelity computer graphics and photographs in real time,

communications bandwidths have increased.

Communications can be classified into two types: wireless

systems [like radios] and wire systems [like telephones]. The

wireless systems comprise four main types: local area networks

[or LANs], optical systems, radio frequency (RF) systems, and

satellite communications.

Wireless LANs are currently broadcast over short distances and

can handle moderate transmission speeds [up to 10 megabits, or

about 250 pages of text per second]. Future LANs will use

high frequency bandwidth

C-3

ATM to pass voice, data, and video. Optical communications

are also used in LANs, headsets, and storage tags using source

modulation and in bar code readers using reflection

modulation.

RF systems include high frequency/very high frequency [HF/VHF]

radio, cellular telephone and radios, personal communication

systems, and microwave communications. The first two systems

are low speed, limited range systems best used for local voice

transmission; personal communications systems have similar

qualities but also may be used for constant two-way tracking.

Microwave transmissions have a medium to high speed

transmission and a range up to 50 miles between repeaters or

end nodes.

Satellite communications systems can be used for data and

telephony transmission. There are many satellite systems

being designed to supplement the services provided by MRSat,

ORBCOM, and QUALCOM, and the proposed Motorola Iridium system.

GPS/GVLS can provide one-way communication or tracking, if

needed.

Wire systems, also known as physical communications, include

LANs, telephone, and other telecommunications. Current LAN

technologies can handle high transmission speeds, up to 100 megabits per second, using fiber optics or certain wire systems. Follow-on LAN technologies will eventually be superseded by ATM when it is deployed, increasing speeds beyond 600 megabits per second. Telephone technology is low speed, inexpensive, and easy to use. Leased T1 lines and fractional T1 provide low to medium speed [to 1.5 megabits per second] across dedicated lines for a moderate price, while leased T3 lines provide more bandwidth at a higher cost.

Current telecommunication services include frame relay, providing medium speeds to 1.5 megabits per second, and switched multi-megabit data service (SMDS) with data rates to 32 megabits per second. Transparent LAN service is low cost and has simple connections, but is limited to a metropolitan area. Future telecommunications technology improvements include the synchronous optical network (SONET) with high data rates that will replace T1 and T2 lines. Also, ATM will become a communication standard for LANs and wide area networks (WANs). There are international standards coming out in the next few years that should enhance data transmittal just as future networks turn global.

C-4

As more private or proprietary information is transmitted

between points, communication security becomes an issue.

There are several methods to protect data being transmitted,

including data encryption, modulation, and media control.

Encryption technologies send messages in a format that is

unreadable without decryption equipment or software so that

intercepted messages appear to be random garbage. Modulation

techniques such as frequency hopping and spread spectrum

transmission deny an interceptor's obtaining information by

merely tapping into a single channel. Media control does not

allow an interceptor physical access to the transmission media

[secure, dedicated communication lines]. Media control may

use protocols, such as passwords or secure ID cards, to deny

unauthorized access to computer network resources.

Data Processing

The technologies associated with data processing include both

computer hardware and software. Some aspects of these

technologies will be covered in the following sections.

Computer Hardware

It is assumed that major ports of entry or some centralized

office will have a stationary computer operation where

transactions are processed. Remote facilities and remote

parts of large border crossings may have small, mobile

workstations that can be tied into these mainframes as a WAN.

Information will be passed into the WAN via radio, landline,

or satellite link

Hand-held and pen-based computers can use a spread spectrum

radio link to connect to one of these portable workstations.

These workstations can in turn act as a worksite server for a

remote LAN. This client/server system could relay data taken

from the field [including audio, video, photographs from

electronic cameras, graphics, text, and telemetry data] back

to the main office for further processing and dissemination.

In concert with these developments are technologies such as

high definition flat panels. High density flat panel displays

can show high

C-5

resolution images from the field either on the remote

workstations or at central processing sites. Continuing

development of portable workstations and high density flat

panel displays will focus on making low-cost, rugged equipment

for use at remote locations. These capabilities, currently

under development, will enhance human operation at remote

sites.

Computer Software

Once the data are communicated to a central processing office

in the port, much data processing can be done. Classification

software, such as neural nets, can quickly and accurately

classify vehicles, given very simple sensor data [time

measurements between truck wheels crossing highway traffic

tubes]. Current research shows that of twelve classes of

vehicles [from motorcycle to multi trailer trucks], neural

nets can accurately classify 96 to 97% of the Class II and III

vehicles [cars and pickups, with and without trailers] and 60%

of the Class V vehicles [two axle trucks]. The results of

this probabilistic technology compare to the 90% accurate
classification requirement in the Intermodal Surface
Transportation Efficiency Act of 1991 (ISTEA) for Class II and
III vehicles and the 30% accurate classification of Class V
vehicles using fielded technology. Given access to more
sensor data, classification software should be able to
identify vehicles and perform consistency checks quickly.

Simulation technology can be used to enhance border crossing
operations. The Toll Plaza Application Simulation System
(TPASS) developed at Syntonic gives a visual display of
anticipated traffic queuing in a border crossing. This type
of model can be used to compare different technologies that
might be introduced at a port of entry to expedite traffic.
As an example, vehicles equipped with an RF transponder can be
validated with an AVC system. This system can have the
carrier's credit card automatically debited so that the
vehicle could be directed to a bypass lane instead of going
through a manual toll booth. The TPASS simulation shows that
manual-only toll collection can handle 350 to 500 cars per
hour while an AVI/transponder system has a throughput of 1400
to 1700 vehicles per hour. TPASS can also estimate the total
number of queued vehicles by time of day before and after

implementing electronic toll collection. Data of this type

can be used in a cost-benefit analysis to determine the

utility of installing an AVI

C-6

system at a given port Also, computer models of sensor and

scanner technologies can be used to optimize design of the

technology prior to introduction at a border crossing. These

simulations are typically calibrated against real data to

refine the internal model for future applications.

Barriers

Barriers give a distinct legal boundary, such as with a

perimeter barrier, and delay or deny access to certain areas

until intruders can be contained. Barrier access delay time

must be greater than the time it takes to detect and assess

that there are intruders plus the time it takes to dispatch a

response team to the scene.

Some drivers try to run their vehicles through the port without stopping to avoid inspection and paying tolls. While simple fences, posts, and gates cannot guarantee stopping a truck, vehicle barriers are available that can stop a truck in motion. Vehicle barriers are available with a two-second cycle time and can be operated remotely. These barriers remain in the "up" position and are lowered when vehicle drivers pay their tolls or pass inspection and can be set to stop tailgaters trying to sneak through the port. Security turnstiles are available with electronic controls to regulate pedestrian traffic, allowing passage of authorized personnel only.

Less-than-lethal technology can be used to stop criminals without having to shoot at them. Sticky foam can be dispensed at criminals trying to run through security blocks. This foam essentially bonds people instantly to their surroundings. Special measures are required to release them. Aqueous foam is about 99% air but totally obscures visual cues, thereby disorienting people surrounded by it. This foam is so inexpensive it could fill a corridor or bypass ditch every night as an intrusion precaution. Both foams can be ejected from fixed dispensers or portable dispensers that have a range

from twenty to fifty feet

C-7

Systems Integration

Each of the technologies previously mentioned can improve

border crossing operations. However, if the technology is

incompatible, inflexible, or intolerant to user needs, more

harm than good can come from its introduction into an existing

facility. Conversely, technologies may be integrated such

that the outcome is much more useful to the operators than the

stand-alone version. An example of this would be complex

technologies that may make burdensome requirements on the

operator, but when integrated with a computer-based controller

that has a friendly interface, the system may actually reduce

the operator's workload. Unfortunately, integrating diverse

technologies into a logical system is not a trivial effort,

but the discipline of systems integration has precisely this

goal.

In the case of the diverse technologies that might be put into

a port-ofentry system, there are processes that have already

been designed by manufacturers and shippers such as automated

inventory and tracking systems. These systems could be

integrated into a state-of-the-art border crossing. However,

the first issue that needs to be determined is what a port of

entry should do. What are the port's objectives, and where

does a port's responsibility end and another entity's begin?

Do we want to make the border crossing the focus of activity,

or do we want to decentralize functions such as inspections to

relieve border congestion? Is the port's basic goal to have a

border that is transparent to legal freight movement and

impermeable to illegal goods? These questions need to be

answered before trying to integrate more technologies into

border crossings.

A basic principle of design is that the system should serve

everyone's needs in the production-to-consumption chain of

manufacturing transportation. An example of this principle is

that allowances are needed for manual processing by operators

and carriers that do not wish to automate immediately, so a

design is required that has separate processing facilities for

those not willing to automate. A good systems design will

produce greater effciencies across all port operations oy

reducing the amount of repetitive activity such as multiple

entries of the same carrier data. An upgradable design can be

based on an open

C-8

systems architecture and would require an understanding of all

technologies and their associated availability timelines.

The basic methodology used by the systems integrator is to

determine the objectives first, then design a prototype

system, and evaluate and refine until all requirements are

met. In determining the objectives, the integrator will

characterize the facility, such as identifying what should be

kept from crossing the border. In designing the prototype,

the integrator will develop an initial system that uses

complementary components to meet the design goals. The

integrator will develop a system model that will be used to

aid in designing the prototype and later to pre-test

refinements to the system. In the evaluation, the integrator

will identify shortcomings, such as system vulnerabilities,

and refine the design using a balanced approach to

accomplishing the objectives.

An example of an integrated system is the HELP program under development. This is a proposed fee-for-service system that can be used to expedite freight traffic through interstate ports of entry. HELP combines several technologies: AVC, WIM, transponders, communication beacons, centralized databases, and automated toll collection readers.

The HELP system will have transponders mounted on trucks that will respond to communication beacons set up some distance from the ports of entry. The transponder will have information, such as the current odometer reading and interstate registrations, which can be used for automatic credential verification of the truck, the driver and the cargo. These credentials can be used to process the truck for taxes [weight-distance tax, fuel tax, etc.] and pre-clear the truck for HAZMAT, emissions, and safety inspections through a centralized database. The state can still stop processed trucks for random inspections, but generally the truck would not be required to stop.

Another example is the system tracking and response base,

STARBASE, a system SNL developed for the Department of Energy.
STARBASE integrates transponders, communications equipment,
and data processing software and hardware into a system used
to continuously track vehicles. Vehicle tracks are displayed
real time on a Geographic

C-9

Information System (GIS) using off-the-shelf technology in
this operational system.

Redundant high frequency (HF) and satellite communications
ensure that STARBASE operators can remain in contact with
vehicles anywhere in the U.S. 24 hours a day. Measures have
been taken to ensure that communications and data remain
secure during operation. Besides the GIS display screen the
operators have several other screens on the STARBASE console,
any of which can be used to display information pertaining to
the vehicles, the shipments, and the health of STARBASE.

As an example of human factors engineering, if an emergency
occurs, STARBASE software allows the user to step rapidly

through standard procedures using touch screens. In this way,
an operator in a crisis situation has all the information at
hand. The computer will even dial the emergency response
team's phone number. STARBASE developers maintain a testbed
system that mirrors the operational system so that new
hardware and software can be tested off-line before
introduction into an operational environment. Computers used
in STARBASE are designed using an open architecture so that
upgrades will not be precluded.

These systems, along with others mentioned previously, give an
idea how advanced technologies can be integrated. Again, much
care must be exercised to ensure that systems operate as
intended and are designed to have easy upgrade paths so that
they do not become obsolete. The systems integrator needs to
be the link between what is available now and how new
technologies are introduced.

C-10

APPENDIX D. SURVEY MATERIALS

1. Future Workshops

Please evaluate the priority of these workshops and suggest an

appropriate attendee/org.:

A. Fee and Tariff Collection   Low Med High _____

B. POE Inspections   Low Med High _____

C. POE Information Services   Low Med High _____

D. POE Communications   Low Med High _____

E. Access Control & Security   Low Med High _____

F. POE Systems Integration   Low Med High _____

G. Measuring POE Performance   Low Med High _____

H. POE Standardization   Low Med High _____

1. POE Pilot Projects   Low Med High _____

J. _____   Low Med High

II. Quality Issues

A. Will your workshop experience help you in your job?   No   Yes

B. Will these workshops have impact on future POE

   operations?   No   Yes

C. Should workshops focus on inspection agencies

   instead of POE functions?   No   Yes

D. Should future workshops be held at or near Ports

   of Entry?   No   Yes

E. How would you improve workshop format and content?

        D-1

III. Issue Prioritization:

What is the priority of addressing the following issues, for both US and Mexico:

A. Increasing cooperation between

    state and federal agencies   Low   Med   High

B. Increasing cooperation among

    federal agencies   Low   Med   High

C. Consolidating federal inspections Low   Med   High

D. Automating inspection services   Low   Med   High

E. Automating fee and tariff   Low   Med   High

    collection

F. Standardizing/Simplifying   Low   Med   High

    inspection processes

G. Standardizing/Simplifying   Low   Med   High

    documentation

H. Standardizing/Simplifying POE   Low   Med   High

    hardware/software

I. Lowering costs associated with   Low   Med   High

    POEs

J. Reducing time spent by freight   Low   Med   High

    at POEs

K. Allowing universal selective   Low   Med   High

    access to POE information

L. Increasing portion of off-site   Low   Med   High

    inspections

M. Other: Low   Med   High

IV. Technology Prioritization

What do you see as the priority for improving the following

technologies:

Near Term (< 2 Years)   Far Term (3+ Years)

A. Seals and Tags   Low   Med   High   Low   Med   High

B. Data Processing   Low   Med   High   Low   Med   High

   (e.g., EDI)

D-2

C. Monitoring and   Low   Med   High   Low   Med   High

   Tracking

D. Communications   Low   Med   High   Low   Med   High

E. Barriers

F. Sensors/Scanners   Low   Med   High   Low   Med   High

   (e.g.,X-ray)

G. Simulation   Low   Med   High   Low   Med   High

```
H. Classification   Low    Med    High      Low    Med    High


I. System           Low    Med    High      Low    Med    High

   Itegration



D-3



Click HERE for graphic.



D-4
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