NATIONAL GOVERNORS ASSOCIATION

Economic Development and Commerce Policy Studies Division

Center for Best Practices

A Governor's Guide to Intelligent Transportation Systems/ Commercial Vehicle Operations

by Jay Kayne and Thorn Rubel

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Executive Summary

The nation's economic future increasingly depends on the ability of American businesses to compete successfully in a global economy. States have used regulatory reform to support improvements to the productivity of U.S. firms. The commercial motor carrier industry is among the most regulated segments of the economy, Although the industry has raised questions about the degree of state regulation, the majority of complaints about state regulation and taxation of commercial motor carriers have focused on the excessive administrative burden and costs to comply with each state's requirements rather than the requirements of one national entity. To address these concerns, states, in consultation with the motor carrier industry, have developed base state and reciprocal systems such as the International Registration Plan and the International Fuel Tax Agreement to support the vision of a "seamless" national highway system.

Concurrent with the development of base state and other reciprocal agreements, new technologies have emerged that are designed to replace manual administrative processes with automation and electronic substitutes, The ability to send and receive information from a commercial motor vehicle traveling at highway speeds and to disseminate that information along the vehicle's entire route is an essential element of the vision of seamless highways. In addition, the ability of a carrier to electronically request and receive credentials or to file tax reports with its base state eliminates the need for state employees to enter information manually. Equally important, this electronic data can be shared more easily with other states in which the carrier operates.

This collection of advanced information and communications technologies is known as intelligent transportation systems/commercial vehicle operations (ITS/CVO) and covers three generals areas of state motor carrier regulation: safety assurance: administration of the credential process (e.g., vehicle registration): and commercial vehicle clearance at ports of entry and weigh stations. Many of the specific technologies (e.g., weigh-in-motion, automated vehicle identification, and automated vehicle classification) have or are being tested through a series of operational tests funded by the U.S. Department of Transportation.

States and the motor carrier industry are looking at institutional barriers that may prevent or deter deployment of ITS/CVO technologies nationwide. This guide examines the potential roadblocks to implementing these technologies and the role Governors can play in overcoming these barriers to implementation.

States and the motor carrier industry must address the following question: Is there suffi cient benefit from deployment of ITS/CVO to justify investment in new facilities and systems? The question is crucial because there is no federal mandate for either states or the industry to use ITS/CVO technologies. The willingness of both the public and private sectors to invest in the up-front costs and long-term operation and maintenance of the system will depend on the potential for real cost savings and increases in productivity. Research in this area is not complete. A cost/benefit analysis from the carriers' perspective conducted by the ATA Foundation suggests that certain ITS/CVO elements are more beneficial to the industry than others.' Moreover, the benefits of any component of the system vary according to each carrier's characteristics.

A state's willingness to invest both fiscal and political capital to convert to ITS/CVO varies according to the size of the state and the number of commercial motor carriers based and/or operating in the state. It also varies among state

commercial vehicle operations services. An additional issue for states is whether the introduction of advanced information technologies will result in major regulatory reform, not simply the automation of current procedures.

Any full-scale deployment of ITS/CVO technology will occur only after the question of who will pay for the system is answered. The answer to this question is closely related to the issue of demand. If the deployment of ITS/CVO results in real productivity gains for enough carriers, the industry will determine that it is in its interest to invest in the system. Similarly, if states can realize administrative efficienices and cost savings, they will shift revenues to this effort.

The financing of a national ITS/CVO network involves both front-end investment in facilities and funds to cover long-term operation and maintenance costs. To date, the federal government has covered the majority of front-end costs through the operational tests. In addition, these demonstrations have subsidized the cost of equipment (e.g., transponders) for participating carriers. Many states acknowledge that they need to invest in new facilities (e.g., weigh stations) because the existing ones are obsolete or need repair. As states make these investments, they can support ITS/CVO deployment or consider ITS/CVO technology alternatives. Only one multistate ITS/CVO project now includes a transaction fee for carriers that use the system. It is too early to determine whether there is sufficient demand to make the system self-supporting.

Although substantial questions remain regarding the costs and financing of these technologies, there are also concerns about coordination and standards. Primary among these concerns is one voiced by the motor carrier industry that it cannot support a framework in which vehicles must be equipped with redundant systems in order to comply with varying state technical specifications. This issue has significant economic ramifications for the vendors that have attempted to penetrate the ITS/CVO market. Resolution of this sensitive issue will require agreements among states and between states and vendors concerning the eventual standard for on-road transmission and receipt of electronic data.

Coordinating the automated collection and dissemination of data is also hampered by continuing differences among states in regulatory policies and interpretations of these policies. Eventual agreements on standards may depend much more on substantive policy agreements among states than on technical specifications.

Finally, there is the issue of coordinated data sharing among states and among agencies within a state. This issue is being addressed through the Commercial Vehicle Information Systems and Networks (CVISN) initiative. This system, based on a standard set of data transmission protocols, will ensure that carriers and state agencies can communicate electronically regardless of the hardware and software that is used by system clients. The most formidable barriers are institutional, not technical, including the desire of some state agencies to protect what they view as proprietary networks.

Two other important issues have emerged during the ITS/CVO operational tests. The first relates to the protection of a carrier's proprietary information, generally defined as data related to specific customers, specific commodities transported, and specific routes. The second issue is the potential use of ITS/CVO technology to change the way that states tax the commercial motor carrier industry. The availability of more accurate information about weights and routes raises concerns that states will use ITS/CVO to change from the current system of fuel-use taxes to one using weight-distance taxes.

Assuming that ITS/CVO provides an avenue for states to reform their motor carrier regulation and taxation systems in ways that benefit both the public and private sectors, Governors can play a critical role in promoting further acceptance and deployment of these technologies. Governors can take the following steps to facilitate implementation of ITS/CVO.

- Draw the links between ITS/CVO deployment and other state development objectives.
- Establish mechanisms and forums through which states and the motor carrier industry can jointly address barriers. Including the regulated industry in the decisionmaking process is especially important to address issues such as the protection of proprietary information and potential changes to the tax structure.
- Identify incentives to encourage public and private officials to shed their traditional views of the state/industry relationship, opening the door for more creative applications of advanced technologies to facilitate regulation of the motor carrier industry.
- Support and facilitate multistate arrangements that ensure the coordination and development of standards across state boundaries.
- Encourage the directors of state agencies with responsibility for motor carrier regulation and taxation, as they prepare their budgets, to investigate the potential of ITS/CVO technologies for producing cost savings and more effective administration.

Greater support for ITS/CVO can be achieved only if the demand for and benefits of these technologies can be determined. Two activities are central to this determination. First, NGA has received a grant from the Federal Highway Administration to conduct an objective cost/benefit analysis of ITS/CVO from the states perspective. This analysis will take into account differences among states and the value of applying ITS/CVO technologies to specific state motor carrier services. A report on the study will be released at NGA's Annual Meeting in July 1997.

Second, the benefit of ITS/CVO to the industry depends on the extent to which these technologies bring about a truly seamless national highway system. For this reason, the future of ITS/CVO depends heavily on states' ability to reconcile the differences among ITS/CVO approaches and develop standards for national deployment.

Introduction

The economic health of the United States depends largely on the ability of American businesses to compete successfully in a global economy. To increase the competitive advantage of firms doing business within their states, many Governors have implemented or are exploring ways to reform the regulatory climate. The debate over regulatory reform must reconcile the financial and administrative burdens on industry with the need to perform legitimate government functions, such as constructing and maintaining public infrastructure and protecting public health and safety.

The commercial motor carrier industry is among the most regulated segments of the U.S. economy. State regulation of motor carriers includes:

- assessing the safety of motor carrier operations, especially the condition of vehicles, the qualifications of drivers and the transportation of hazardous materials and hazardous wastes; and
- collecting registration fees and fuel taxes through which motor carriers reimburse states for their use of publicly maintained highways.

States, in cooperation with the motor carrier industry, have sought to ease the regulatory burden through uniform standards and procedures as well as through reciprocal and base state agreements. The desire of both states and the industry to make the regulation of motor carriers more efficient without compromising the performance of legitimate state government responsibilities has resulted in the following policies and programs.

- Uniform standards for on-site and roadside inspections developed through the Commercial Vehicle Safety Alliance (CVSA) have helped motor carriers by clarifying what is expected of them regardless of the state(s) in which they operate.
- Base state agreements for the proportional registration of commercial vehicles through the International Registration Plan (IRI') and the reporting of fuel taxes through the International Fuel Tax Agreement (IFTA) have eliminated the need for motor carriers to file multiple applications and reports.
- The recent implementation of the commercial driver license (CDL) ensures that a driver licensed in one state is deemed capable of driving in other states based on national standards.
- The Uniform Program for the base state registration and reciprocal permitting of hazardous materials transporters, recently piloted in four states, has the potential to reduce the paperwork and costs associated with individual state programs.

Although the implementation of base state and reciprocal agreements improves the administrative processes associated with state motor carrier registration and permitting programs, it raises many questions about on-road enforcement. In addition, the decentralization of information on the motor carrier industry complicates state infrastructure and emergency response planning.

Base state and reciprocal agreements have not resulted in motor vehicles being able to move seamlessly from one state to another, an objective that is a high priority for the motor carrier industry. In most cases, a vehicle must stop at each state border or port of entry for authorities to ascertain its weight and check its credentials. These multiple stops result in both lost time and productivity.

Concurrent with the development of base state and reciprocal agreements, new technologies have emerged that are designed to replace manual administrative processes with automated and electronic substitutes. Much of the fanfare surrounding these technologies has centered on their use for congestion management. Yet the ability to send and receive data from commercial vehicles traveling at highway speeds and to disseminate that information electronically can help make motor carrier regulation and enforcement more efficient and realize the industry's dream of a seamless national highway system.

The potential for improving commercial motor vehicle regulation depends on technologies that store, transmit, and distribute data. The feasibility of various ITS technologies is being evaluated through a series of operational tests funded by the U.S. Department of Transportation (USDOT). Addressing the technical feasibility of the technologies is only one of the challenges in implementing an ITS/CVO system. Instituting public policies and actions that resolve the human and institutional barriers to technology deployment may be the more difficult task.

Defining ITS/CVO

ITS/CVO is a collection of advanced information and communications technologies that support state administration and enforcement of motor carrier laws and regulations. ITS/CVO helps states in the effective administration of the following three regulatory functions:

- safety assurance-performance of drivers and inspection of vehicles;
- credential administration-processing of applications for registrations, permits, and fuel tax accounts; issuing of credentials: carrier reporting: and auditing; and
- commercial vehicle clearance-verification of credentials and weighing at weigh stations, ports of entry, mobile sites, and international border crossings.

In addition, the ITS/CVO infrastructure can be used by the motor carrier industry for fleet management, including dispatching and routing vehicles, as well as for monitoring performance.

The technologies that support ITS/CVO can be grouped into the following five categories:

- weigh-in-motion (WIM)-electronic scales embedded in highway surfaces that transmit the weight of vehicles to enforcement officials while the vehicle travels at mainline speeds;
- automatic vehicle identification (AVI)-transponders that serve as electronic license plates to identify vehicles at weigh stations or ports of entry;
- automatic vehicle classification (AVC)-system that identifies the number of axles and axle spacing;
- automatic vehicle location (AVL)-system that provides real-time information about a vehicle's position, which is obtained through a global positioning satellite (GPS) network: and
- two-way communication (TWC)-interactive onboard systems that transmit information about the performance of the vehicle and driver and receive instructions.

Each of these technologies is at different stages of testing and deployment. For example, several states are using WIM facilities to check for oversized/overweight vehicles while the vehicles travel at mainline speeds. TWC, which requires much more extensive onboard equipment and more sophisticated receivers, lags behind WIM and AVI in terms of operational testing and deployment.

The final piece of the ITS/CVO puzzle is the communications network that will receive, store, and distribute the information that is needed to make the determinations associated with vehicle clearance and safety. This information architecture, referred to as Commercial Vehicle Information Systems and Networks (CVISN), will give state regulators and enforcement officials access to the state and federal data repositories where critical information about each commercial motor carrier

and its vehicles and drivers is maintained. For example, by entering an identifier common to all of the linked information systems, a roadside inspector will be able to determine whether the vehicle is properly registered under IRP, whether the carrier has complied with IFTA reporting requirements, and whether the carrier has the necessary oversized/overweight and hazardous materials permits. The inspector also will be able to learn where and when the vehicle was last inspected by a CVSA-authorized inspector and whether that inspection resulted in an out-of-service violation.

Setting the Framework for State Policymaking

The eventual success of ITS/CVO as a major component of the nation's public infrastructure will be determined in two arenas. The technological issues will be resolved by the private sector with input from public officials. The lead on institutional issues lies with the public sector, with participation by the regulated industry and the vendor community. This report establishes the parameters for a national discussion on the institutional, human resource, and political issues associated with deployment of a national IVS/CVO program. Drawing on the experience of the eight ITS/CVO demonstration projects, this report:

- informs Governors and their transportation advisors about the potential of ITS/CVO to improve state regulation of the motor carrier industry while easing the financial and administrative burdens on the regulated carriers;
- articulates the major issues that will determine the future deployment and utilization of ITS/CVO technologies; and
- identifies specific actions that need to be taken before the potential benefits from ITS/CVO can be realized.

Information for this report was gleaned from a literature review, including a series of reports on state ITS/CVO experiences to date, state and regional institutional barriers reports funded by the Federal Highway Administration (FHWA), and a study of the costs and benefits of ITS/CVO to the industry prepared by the ATA Foundation, FHWA has contracted with the National Governors' Association (NGA) to conduct a similar cost/benefit analysis from the state perspective. The report will be released at the 1997 NGA Annual Meeting. In addition to the literature review, NGA held a roundtable involving state officials who have participated in the operational tests. (A list of the roundtable participants is found in the appendix.)

State Experience with ITS/CVO

Through a series of state operational tests and other federal initiatives, transportation officials and industry representatives have been able to refine their vision of what ITS/CVO can and should be. In addition, experience from the operational tests has identified specific institutional issues and barriers that must be addressed before a national ITS/CVO program can be deployed successfully. This chapter provides a brief description of state operational tests and initiatives that have been funded by the Federal Highway Administration. Of the eight operational tests, only one has moved to a deployment phase.

HELP/Crescent

In 1982 Arizona and Oregon transportation officials were looking for a better way to process trucks through ports of entry. This effort, initially funded with small grants from FHWA, evolved into a full operational test of ITS/CVO technology from 1990 to 1993 with participation by six states-Arizona, California, New Mexico, Oregon, Texas, and Washington (see Table 1). The project focused on monitoring oversized/overweight vehicles through the use of three ITS technologies:

- weigh-in-motion;
- automatic vehicle identification; and
- automatic vehicle classification.

Vehicle information is captured at one of thirty-three equipped sites along Interstate-5 on the west coast, or Interstate-10 or Interstate-20 in the southwest. The data are then uploaded to a central computer that regularly distributes vehicle information to the remaining sites. Each vehicle is equipped with transponders that identify the vehicle at mainline speeds. If properly permitted, the vehicle receives a green light signal to continue. Approximately 5,000 motor carriers participated in the operational test.

HELP/Crescent represented a true partnership between state regulators and the regulated industry. To oversee development of the project and future expansion, the participating states established a nonprofit entity, HELP Inc. The board of directors is composed of two representatives from each state-one from state government and one from industry. The responsibility for day-to-day management of the project lies with HELP Inc., staff located in Phoenix, Arizona. Central computer services are provided by Lockheed Martin IMS from its corporate facilities in Santa Clara, California.

Since completion of the operational test in 1993, HELP, Inc., has expanded both functionally and geographically. The latest effort, called Pre-Pass, includes electronic clearance for vehicle registration and fuel tax reporting. Ten states now participate in all or some of HELP, Inc.'s activities. In addition, HELP Inc., is the first ITS/CVO effort to move from federal grants to debt and venture capital as its

Table 1. Completed Multistate Operational Tests

Project	*Participating States*	*Application*
HELP/Crescent	Arizona, California, New Mexico, Oregon, Texas, Washington	Electronic clearance, bypass
Automated Mileage and State Border Crossing	Iowa, Minnesota Wisconsin	Electronic mileage tracking, state border crossing monitoring

source of funding. Revenues are generated from transaction fees assessed on carriers that benefit from the system. Each time a vehicle is successfully precleared at a weigh station or port of entry, the carrier is charged a transaction fee of ninety-nine cents. These revenues now cover only a fraction of HELP, Inc.'s operating expenses. Long-term projections suggest that as the functional value of the system expands with the participation of additional states, the effort will become self-sustaining.

HELP Inc., is the most mature example of state utilization of ITS/CVO in terms of both technology and organization. The lessons learned from this project are highlighted throughout this report.

Automated Mileage and State Border Crossing

The Automated Mileage and Stateline Crossing Operational Test (AMASCOT) evaluated a system that tracks truck mileage and state border crossings to facilitate faster and easier reporting to state regulatory agencies using global positioning satellite technology, The system automatically tracks and updates a truck's position, records interstate border crossings, and apportions actual mileage to each state driven. It then distributes the data to the carrier operations office for immediate processing into IFTA and IRP formats. Six carriers from three states-Iowa, Minnesota, and Wisconsin- participated in the project and traveled on taxable roads in the forty-eight contiguous states.

The completed operational test evaluation sought to answer the following questions.

- Can automation of fuel tax reporting satisfy IFTA and IRP reporting requirements?
- Can automation enhance the ability of state regulatory agencies to audit motor carrier records?
- Will automated fuel tax reporting provide time and cost savings to motor carrier operators?

Final evaluation results indicate that the project meets IFTA and IRP reporting requirements. Potential auditing benefits were identified, including higher reporting accuracy and cost savings from having to enter less data manually, Actual benefits would depend on other variables, however, such as staffing resources. Carriers identified significant potential cost savings from automated mileage and route data collection; they estimated that the savings could range from 33 percent to 50 percent of current IFTA and IRP administration costs. The system is now being introduced as a commercial product for motor carrier operators.

Advantage I-75

Advantage I-75 is designed to facilitate motor carrier operations by allowing transponder-equipped and properly documented trucks to travel any segment along the entire length of Interstate 75 (I-75) at mainline speeds with minimal stopping at weigh/inspection stations. Partners include Florida, Georgia, Kentucky, Michigan, Ohio, Tennessee, Ontario (Canada), the motor carrier industry, American Trucking Associations, National Private Truck Council, United Parcel Service, SAIC, Hughes, and the University of Kentucky (see Table 2). Currently operational, the Mainline Automated Clearance System (MACS) includes the use of three ITS technologies:

- weigh-in-motion;
- automatic vehicle identification; and
- automatic vehicle classification.

Vehicle information is captured at one of twenty-nine equipped sites along the I-75 corridor to identify participating trucks and check their weight and credentials. Electronic clearance decisions at downstream stations are based on truck size and weight measurements taken upstream and on computerized checking of operating credentials in each state. During the operational test, transponders are being provided to participating carriers at no charge. Approximately 4,000 transponder-equipped trucks are participating in the operational test. When MACS determines the

Table 2. Ongoing Multistate Operational Tests

Project	*Participating States*	*Application*
Advantage I-75	Florida, Georgia, Kentucky, Michigan, Ohio, Tennessee	Electronic clearance, bypass
Electronic One-Stop shopping	Arizona, Arkansas, California, Colorado Illinois, Iowa, Kansas, Minnesota, Missouri Nebraska, New Mexico, South Oakota, Texas, Wisconsin	One-stop multistate electronic purchase of credentials
International Border Electronic Clearance	Arizona, California, Michigan, New Mexico, New York	Electronic clearance
Out-of-Service Verification	Idaho, Minnesota, Wisconsin	Electronic out-of service monitoring and verification

validity of weight and credentials, the driver receives a green light and audible signal to bypass the station.

Scheduled for completion in 1997, the operational test will be evaluated in an effort to assess the following questions.

- Does mainline clearance produce significant time savings for motor carriers?
- Does mainline clearance produce significant fuel savings for motor carriers?
- What level of electronic clearance participation is required to reduce unauthorized scale bypasses on I-75?
- What level of electronic clearance participation is required to significantly reduce queue lengths at weigh stations along the I-75 corridor?
- What are the barriers that impede continued state deployment of electronic clearance after completion of the MACS test?
- What are the barriers that impede continued motor carrier participation in electronic clearance after completion of the MACS test?

The multijurisdictional policy committee governing the project is discussing alternatives for funding the project upon completion of the operational test phase. Three additional states-Indiana, Maryland, and Virginia—have expressed an interest in participating in the project after the test is completed.

Electronic One-Stop Shopping

Three electronic "one-stop shopping" operational tests are testing different approaches to one-stop, multistate electronic purchase and receipt of credentials from motor carrier facilities, permitting services, truck stops, and state agencies. Thirteen states are participating in three projects:

- HELP, Inc. (Arizona, California, and New Mexico);
- Midwest (Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, South Dakota, and Wisconsin); and
- Southwest (Arkansas, Colorado, and Texas).

The primary objective of these tests is to evaluate improvements to state and motor carrier productivity from an electronic system that will make it possible for a motor carrier to apply, pay for, and receive all necessary credentials or permits electronically from either the base state or individual states through a single site. The credentials and permits available through one-stop shopping include:

- International Fuel Tax Agreement;
- International Registration Plan;
- oversize/overweight permits; and
- single state registration system.

These operational tests are scheduled to conclude and undergo evaluation in 1997. The evaluations will address the following questions.

- Can the implementation of a one-stop shopping system for the management of the commercial vehicle credential process result in improvements to the convenience, timeliness, and consistency of applying for and receiving credentials?
- Will motor carriers and state agencies accept electronic one-stop shopping services?
- Can the institutional issues involved in the implementation and use of a paperless credentialing method be overcome?

International Border Clearance

The international border clearance projects are designed to expedite commodity movements through the extensive use of electronic data interchange (EDI) and the automation of manual processes currently used to monitor commercial vehicle movements at the border. The projects are located at the following border crossings:

- Ontario/Michigan and New York Crossings;
- Otay Mesa/California Crossing;
- Nogales/Arizona Crossing; and
- Santa Teresa/New Mexico Crossing.

The projects include:

- integrated preprocessing of data for cargo, vehicle, and driver;
- electronic data interchange transfer of regulatory data;
- use of transponders and vehicle-roadside communications as a part of the line-release system;
- use of electronic seals to ensure cargo integrity: and
- use of traffic management systems to reduce overall delays.

These projects are scheduled for completion in 1997-98 and will be evaluated based on questions such as the following.

- Can advanced ITS technologies be applied in such a way to make it possible for commercial vehicles to cross international borders without stopping?
- Can common data elements and processes for the U.S. Customs Service, Immigration and Naturalization Service, and Department of Transportation be developed and implemented at international border crossings involving the United States, Canada, and Mexico?
- Will border inspectors accept electronic systems' verifications of cargo, driver, and vehicle inspections?

Out-of-Service Verification

The out-of-service tests combine the use of video technology and automated vehicle identification technologies to monitor vehicles placed out of service for safety violations and reduce the number of out-of-service vehicles on the road before safety violations have been corrected. Three states are participating in the tests-Idaho, Minnesota, and Wisconsin. In Idaho video technology is used at the port of entry to monitor vehicles placed out of service, because the ports are not manned on a twenty-four-hour basis. The video technology maintains surveillance on out-of-service drivers and vehicles and notifies the state police if a vehicle moves from the site. In Minnesota and Wisconsin, AVI technologies identify vehicles at four inspection stations and use real-time access between weigh stations and a central database to identify out-of-service vehicles. When a match is found, the system sounds an alarm to notify inspectors.

Evaluations for these two projects are designed to answer the following questions.

- Can automated electronic enforcement practices for commercial vehicles improve overall compliance?
- Can electronic enforcement improve the efficiency and effectiveness of inspection staff?
- Is out-of-service electronic enforcement a viable function that will promote the advancement of automated weigh stations?

Commercial Vehicle Information Systems and Networks

Commercial Vehicle Information Systems and Networks is an FHWA initiative that refers to the ITS systems elements that support CVO. It is not a new information system but a concept of using existing information systems owned and operated by state and local governments, carriers, and other CVO stakeholders to foster a crash-free environment and enhance performance-based safety management for the public and private sectors. The CVISN core infrastructure is a selected group of key CVO information systems that provide a mechanism for the exchange of safety, registration, fuel tax, hazardous materials, and commercial driver license information among states (see Table 3).

CVISN deployment is comprised of five major steps. The first step was to develop management plans and technical frameworks necessary to coordinate the program. The second step was to develop prototypes to demonstrate the operational concepts. The prototype states are Maryland and Virginia and both have held "showcases" to demonstrate the various ITS/CVO technologies in a live environment. The third step is a pilot phase in which eight additional states-California, Colorado, Connecticut, Kentucky, Michigan, Minnesota, Oregon, and Washington-in seven regions throughout the nation will participate in systems development. Each state was awarded $1 million in matching grants for a two-year period. The fourth step will partner each pilot state with another state in its region, and the final step is to expand the project to all interested states.

Mainstreaming

Another federal initiative to incorporate ITS/CVO into state transportation planning is know as "mainstreaming." The objectives of the initiative are to:

- incorporate ITS/CVO more fully into state and metropolitan transportation planning activities;
- coordinate ITS/CVO activities among agencies and states; and
- explain the ITS/CVO program to key decisionmakers in the public and private sectors.

The mainstreaming initiative began in September 1996, with thirty-three states comprising seven regional consortia receiving grants. Each state received $30,000 in federal matching funds to support the development of ITS/CVO business plans with specific projects, milestones, and responsibilities. Each of the seven regional consortia was awarded up to $180,000 to fund the appointment of a

Table 3. Ongoing Federal Initiatives

Project	*Participating States*	*Application*
Commercial Vehicle Information Systems and Networks (CVISN)	California, Colorado, Connecticut, Kentucky, Maryland, Michigan, Minnesota, Oregon, Virginia, Washington	Safety information exchange, commercial vehicle administrative processes, electronic clearance, international clearance, automated roadside inspection, onboard safety monitoring, hazardous material incident response, fleet and freight administration
Mainstreaming	California, Colorado, Connecticut, Delaware, Georgia, Idaho, Indiana, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, Rhode Island, South Dakota, Tennessee, Utah, Virginia, Washington, West Virginia, Wisconsin, Wyoming	All ITS/CVO user services

full-time program director, the development of a regional ITS/CVO business plan, and the establishment of a regional CVO forum.

Under this initiative, the following types of activities will also be conducted:

- support for state and regional working groups composed of representatives of key public and private sector CVO stakeholders;
- benefit/cost analyses and other technical studies that provide supporting information for deployment planning activities; and
- outreach to, and education of, state and industry stakeholders to increase awareness of, and support for, ITS/CVO activities.

The mainstreaming initiative will share progress and lessons learned during the CVISN model deployment among the states and incorporate CVISN planning requirements into agency business plans.

Summary

The operational tests and demonstration programs have served two valuable purposes. First, they have tested the technical feasibility of various ITS/CVO technologies. More important, however, they have identified institutional barriers and issues that must be addressed before large-scale deployment of ITS/CVO is possible. Experience from these tests provides the basis for developing the institutional and political framework that will be required before the full potential of ITS/CVO can be realized. The following chapters detail the organizational, financial, and human resource issues associated with ITS/CVO deployment and the Governor's role within an ITS/CVO implementation framework.

State Realization of the ITS/CVO Vision

The compelling issues associated with full deployment of ITS/CVO are economic and institutional issues, not technological issues. Support for a national ITS/CVO system will depend on public policies and actions that address each of these market, fiscal, and organizational considerations. The issues fall into the following general categories:

- the demand for ITS/CVO;
- investment and revenue requirements;
- coordination and standards; and
- miscellaneous issues (e.g., privacy concerns).

This chapter examines specific issues and barriers within each of these categories and, to the extent possible, provides policy options that have emerged from the operational tests.

The Demand for ITS/CVO

The Intermodal Surface Transportation Efficiency Act of 199 1 (ISTEA), the enabling legislation supporting ITS/CVO does not contain mandates for either public or private utilization of intelligent transportation technologies. Widespread deployment of ITS/CVO on a voluntary basis, including public and private investment in the required infrastructure, will depend on whether ITS/CVO provides benefits for regulators and the regulated industry that justify their investment in the technologies.

State Perspective

State support for ITS/CVO depends on whether the system helps state government address three policy objectives. First, does ITS/CVO improve the state's business climate by reducing the administrative and financial burdens on motor carriers and facilitating the movement of raw materials, supplies, and manufacturing products through the state? Second, does ITS/CVO result in more effective regulation of the motor carrier industry, including compliance with state registration, taxation, and safety requirements? Third, can ITS/CVO result in cost savings without compromising the other two policy objectives?

It is the melding of these three policy objectives that will determine whether states invest in ITS/CVO technologies. According to Minnesota transportation officials, "The trade-off from the perspective of states may be difficult to define. Cutting state administrative costs may not be sufficient if change does not advance or compromises other objectives, such as preserving a competitive environment or public safety. Further, it is not sufficient for state agencies to profess a 'customer service' objective if they have not also answered the question 'at what cost?'"

There is significant variance among states concerning the importance of the range of ITS/CVO services. For example, Texas does not haveports of entry and does not permanently staff its weigh stations. The Texas enforcement framework relies heavily on roadside inspections and random spot checks. Major investments in port-of-entry or weigh-station facilities for preclearance would be inconsistent with the state's current enforcement philosophy.

Industry Perspective

From a motor carrier's viewpoint, the theoretical benefits of ITS/CVO deployment include reduced administrative costs, higher productivity, and better fleet management. According to the America Trucking Associations (ATA), "Using advanced technologies to ensure compliance with state regulations could substantially benefit commercial vehicle operators. Requiring fewer stops could reduce travel time, increase productivity, save fuel, and reduce emissions."' The extent to which

theoretical benefits result in real savings and higher productivity varies, however, among different carriers based on factors such as fleet size, the type of commodities transported, and the carrier's current use of automation and onboard electronics. It also depends on whether ITS/CVO can be integrated with the carrier's existing systems.

Experience from the operational tests, the ATA Foundation survey of motor carriers, and the state institutional barriers studies all suggest that the answer to the benefits question is more complex than expected. For example, the conventional wisdom among ITS/CVO advocates was that the technologies would benefit larger carriers more than smaller carriers. This assumption was based on two factors. First, the more complex management requirements associated with larger fleets beg for automated solutions. Many companies have already installed onboard computers, cellular phones, and transponders. For example, DuPont is increasing its use of automation to facilitate interstate movement of products and supplies, weighing, certification, calculation of tax liabilities, and response to hazardous materials incidents.

Second, it was assumed that the productivity of each truck would increase as a result of less downtime while a vehicle was weighed or inspected. The economic benefits to a carrier therefore would be directly proportional to the number of vehicles in the carrier's fleet. This assumption overlooks the infrastructure that large carriers have built to support their operations. In particular, most large carriers have established a network of terminals that facilitate the long-distance transport of goods and the delivery of these goods to the local market area. The location of these terminals is often based on the distance that a driver is expected to cover in an average workday, including the necessary stops to meet regulatory requirements and rest. Even if ITS/CVO technologies save the driver thirty to sixty minutes, the vehicle must still terminate each leg of its route at a terminal.

In contrast, a smaller carrier that may be handling a point-to-point delivery may be able to cover an additional thirty to sixty miles as a result of the time savings at the weigh station or port of entry. Unhampered by the need to end its day at a designated point, the small carrier can increase the revenue generated per vehicle per day.

These differences among carriers have implications for the ways that states generate demand for ITS/CVO utilization, According to Minnesota transportation officials, "[commercial motor carriers] are a diverse group, and providing adequate motivation for them to participate in such efforts will require focused communications programs outlining the costs and benefits of proposed changes."*

State officials also have to take into account the differences between freight and passenger carriers. Although freight carriers place a high priority on ITS/CVO services that alleviate the need for frequent visits to state offices, the passenger carrier industry does not place the same importance on this service. Survey responses from passenger carriers suggest that they are able to organize their business transactions to minimize the need for such visits. Similarly, the importance of preclearance services increases for motor carriers for which time sensitivity is a major competitiveness or productivity issue.

In addition, industry demand neither is constant across all ITS/CVO services, nor is there a consensus among motor carriers that their deployment of ITS/CVO technologies will reduce costs. Research conducted by the Washington State Transportation Center at the University of Washington found that although most motor carriers agree that ITS/CVO is a good thing, "these firms are reluctant to press for the 'whole' system, as many of the benefits from ITS/CVO technology will not directly improve their bottom line."[5] Similarly, in response to a survey of motor carriers conducted by Ohio State University for the Ohio Department of Transportation, many interviewees voiced their belief that ITS/CVO innovations could

actually increase their cost of operations.' As part of their motor carrier survey, Minnesota officials looked at the perceived value of electronic data exchange as an alternative to physical visits to state administrative offices. Respondents indicated that they visit the Minnesota Administrative Truck Center an average of seven times a year and a state or deputy registrar an average of five times a year. With better communications, the respondents suggest that as many as 25 percent of these visits could be eliminated.[7]

Differences among motor carriers make it extremely difficult to calculate a single cost/benefit ratio that covers the entire industry. The benefits also vary across ITS/CVO user services. A carrier that can utilize the time savings from preclearance to complete an extra delivery every day may see a significant return from the investment of transponders on its fleet. In contrast, a carrier that is able to complete a point-to-point delivery fifteen minutes faster may not generate additional revenues from the time savings to justify the investment in ITS equipment. This situation led Idaho transportation officials to conclude that "the industry is unlikely to push, as an industry," for ITS/CVO deployment.[8]

To date, there is little evidence of broad-based industry support for ITS/CVO. According to the western states' institutional barriers study, "In most of the participating states, the active constituency advocating implementation of transparent borders is small or nonexistent."' This support will emerge only if the industry views ITS/CVO deployment as helping motor carriers operate more efficiently within an increasingly competitive marketplace. Equally important, support will not result from promises of ITS benefits.

Whether industry sees ITS/CVO as meeting their needs may depend on two factors. First, does the financial return from investment in ITS/CVO services translate into real savings? For example, if onboard equipment reduces the probability of accidents, will the industry realize savings in liability and disability insurance costs? Second, industry support increases if ITS/CVO investments serve multiple purposes, including freight mobility and compliance with state regulatory requirements. States' ability to increase demand for ITS/CVO will depend on whether states focus on the benefits that are most important to the industry.

Since the use of ITS/CVO technologies by states or the motor carrier industry is voluntary, it is critical that states determine the demand for ITS/CVO within the regulated community before making investments in ITS/CVO services. Within a voluntary framework, it is possible that the administrative savings associated with ITS/CVO may not be fully realized if a state is forced to maintain a parallel, manual regulatory system to accommodate carriers that elect not to employ the technology.

Mutual Interests

Support for ITS/CVO services is more likely to be generated when state regulators and the industry can agree on program objectives. One area in which this is clearly the case is vehicle and driver safety. According to Idaho transportation officials, "Both the trucking industry and state agencies have a strong interest in the safety of their trucks and the effectiveness of safety programs. . . . While truck accidents are a small portion of all accidents each year, truck accidents tend to be more costly, more visible, and more likely to cause serious injury or death."" Similarly, California Highway Patrol officials characterized the mutual benefits of Pre-Pass "as streamlining the movement of commercial vehicles without compromising public safety."' 1Even in these cases, however, industry support for ITS/CVO is tentative if motor carriers believe that implementation of ITS technologies will hurt their competitive position in the marketplace through excessive costs or additional regulatory requirements.[12]

Costs and Financing

In states that have conducted attitudinal surveys about the value of ITS/CVO user services, the overwhelming concern is whether

the benefits from deployment of the associated technologies clearly outweigh the investment in the systems. These findings mirror the findings from surveys of the motor carrier industry. For this reason, FHWA has contracted with NGA to conduct a cost/benefit analysis of ITS/CVO deployment from the states' perspective (see Figure 1).

The importance of reliable information about the costs and benefits of ITS/CVO technologies was noted in several of the state institutional barriers reports. For example, the Ohio report states, "The major impression we had after these interviews [with state officials] was that the agencies would not be against any CVO innovation that made economic sense and was supported by the motor carrier industry."[13] Although other institutional barriers might delay implementation of an ITS/CVO environment, little if any support would be forthcoming without evidence that the investment in technology and required regulatory adjustments made economic sense. Equally important, it seemed unlikely that any senior state official, including the Governor, could champion ITS deployment in the face of negative returns.

Unfortunately, the nature of most ITS/CVO operational tests and demonstrations, which focus on specific activities within an ITS/CVO framework, means that there is little evidence on the cost of total implementation of the system. Certain cost elements for both state administrators and the motor carrier industry, however, have been identified. These include:

- investing in information and data processing systems and the communications network to transmit the data among states, among state agencies within each state, and to roadside enforcement officers;
- programming to upgrade existing systems and make them consistent with adopted national standards;

Figure 1. National Governors' Association ITS/CVO Cost/Benefit Analysis

In April 1996 the Federal Highway Administration contracted with NGA to study the costs and benefits associated with state deployment of ITS/CVO technologies for the purpose of regulating the motor carrier industry. To ensure that the project accurately reflects state needs, NGA has assembled a technical advisory group (TAG) to assist in the design and oversight of the study. Members of the TAG include state officials who have been active participants in the ITS/CVO operational tests or have responsibility for various aspects of state motor carrier regulation, such as taxation or hazardous materials. The formal membership is supplemented by resource people from the motor carrier industry and the vendor community.

At its initial meeting on August 8, 1996, the TAG established the following framework for the cost/benefit analysis.

- The differences among states in terms of regulatory frameworks and cost structures make it impossible to conduct a national cost/benefit analysis that accurately reflects the conditions in a specific state.
- States would be better served if NGA developed a cost/benefit methodology and made that available to states to generate their own numbers.
- To test the methodology and provide some analysis of the costs and benefits to states of ITS/CVO technology, NGA would generate cost/benefit information for a representative sample of states,
- The methodology should, to the extent possible, avoid speculation about potential ITS/CVO costs and benefits. It should take into account only those assumptions that are supported by the operational tests and other demonstration projects.
- The final report should include a spreadsheet model and documentation of the methodology that can be used by any state to obtain a better understanding of the benefits and costs within that state.

The cost/benefit report will be released at the 1997 NGA Annual Meeting in July.

- installing transponders and receivers for commercial motor vehicles:
- providing additional equipment (e.g., laptop computers) to law enforcement officers and field inspectors; and
- providing marketing and education programs to make the regulated industry aware of and comfortable with ITS/CVO procedures.

Perhaps more important than the cost of deploying ITS/CVO is the allocation of costs among states and the federal government and between the public and private sectors. The relationship between the costs to various participants and the direct benefits they receive from their investments will determine their willingness to contribute to any financing scheme. For example, representatives of the Missouri motor carrier industry indicated that they believed the state would realize more benefits from ITS/CVO services than the industry. They therefore are reluctant to bear the financial burden of paying for ITS/CVO implementation.[14] In addition, there are differences of opinion between sectors of the motor carrier industry. In terms of state regulatory reform, most shipper/carriers (i.e., companies that transport products that they manufacture) view ITS/CVO as a low priority. These carriers place more importance on state and federal regulatory reform related to employment and environmental factors.[15]

To develop a financing allocation plan that has broad-based support throughout government and the industry, advocates of deployment of a national ITS/CVO system must address the following issues.

- What elements of the system represent the national interest and should be funded through federal mechanisms?
- Is the system a public good? If so, does investment in the system by some states and some carriers create a public infrastructure that others can use without contributing?
- Do the productivity increases for the motor carrier industry justify a fee structure and rates that cover the system's long-term operating and maintenance costs?
- Can states develop fee structures that clearly tie costs to the benefits received only by those carriers that pay the fees?

Participants in the western states' institutional barriers study suggest that it is not a question of whether the resources exist for states to finance ITS/CVO systems. It is a question of making such investments a priority. "None of the states participating in this study lacks the resources to build the transparent borders system. The necessary resources are available as part of the USDOT funding allocated through ISTEA, in combination with the resources currently available to the individual states. However, each of the participating states has considerably more funding needs than available resources, and the transparent border systems must compete with these other funding requirements."[16]

It is unlikely that states would increase revenues through fees or taxes to finance ITS/CVO systems, particularly in the current environment of downsizing state government and reducing tax rates. Legislatures might only be receptive to increasing revenues if the industry sponsored the financing package based on its belief that ITS/CVO deployment would result in reduced operating expenses that more than offset any increase in public taxes or fees. A more likely scenario is the shifting of appropriations from one budget category to another (e.g., from salaries to information systems).

Not withstanding better fuel tax enforcement as a result of electronic clearance of vehicles, none of the states currently participating in the operational tests view enhanced revenue generation as an objective of ITS/CVO deployment. It is likely that state implementation of the technologies will be limited to the current revenue base. Decisions to shift funds that may currently pay for personnel and other non-ITS expenses will depend on the extent to which investment in ITS/CVO technologies permits more effective enforcement with the same amount of funds.

Advocates of ITS/CVO within state government face two problems. Historically, state regulatory and enforcement agencies have little, if any, discretionary funds within their budgets. Tests and demonstrations of ITS/CVO divert resources from core agency functions. If the regulatory function is housed within the larger state transportation department, which may have discretionary funding, it may not be able to compete against the use of such funds for more visible infrastructure improvements that also garner broader political capital.

There are ways that states can direct additional resources to ITS/CVO services without increasing fees or taxes on the motor carrier industry. For example, some states view regulatory violations such as unpermitted overweight vehicles as criminal violations. Fines and forfeitures resulting from these violations currently are deposited in accounts under the jurisdiction of the court system. By designating such violations as civil rather than criminal violations, the resulting revenues could be dedicated to ITS/CVO improvements and operations.

Industry Financing

The willingness of industry to contribute to the initial and ongoing costs associated with ITS/CVO is directly related to the perceived benefit. Feedback from the state institutional barriers studies and the ATA-sponsored cost/benefit analysis suggests that there are still unanswered questions on the benefits of these new technologies. For example, in the 1994 institutional barriers study, Missouri transportation officials found that there was a "lack of support from the motor carrier industry for the implementation of ITS/CVO technologies because of uncertainty regarding the potential benefits."[17] This does not mean that Missouri motor carriers are averse to further examination of the benefits of ITS/CVO as evidenced by the industry's support for the state's participation in the CVISN pilot program.

One example of industry support for a user fee is being tested through the Pre-Pass program administered through HELP, Inc. Each time a commercial vehicle takes advantage of the electronic credential check, rather than having to stop for a manual inspection at a weigh station or port of entry, the motor carrier is charged a fee of ninety- nine cents. The fee schedule was adopted by the HELP, Inc., board of directors, which includes an industry representative from each of the participating states. It is too early to determine whether the fee structure will encourage enough carrier participation to cover the system's costs. This effort is consistent with the recommendations of the western states' study, which noted that one approach to financing ITS/CVO activities is "to work with industry to determine whether increased automation would increase industry productivity to warrant new, dedicated temporary fees for implementation.""

Summary

It is difficult to draw conclusions from the evidence to date concerning the inclination of states or the motor carrier industry to invest in ITS/CVO technologies. Most of the operational tests and demonstrations have been heavily subsidized with federal funds or financed through injections of venture capital by private investors. The magnitude of investment required for deployment of a national ITS/CVO system and the political pressures to reduce federal spending will require that ITS/CVO advocates identify other consistent sources for system financing. The extent to which Congress supports intelligent transportation efforts and CVO projects in the forthcoming reauthorization of the surface transportation act may affect the environment in which state ITS/CVO investment decisions are made.

In addition, it is difficult to price ITS/CVO services because the operational tests included research and development costs. These costs should decrease as standards are adopted and competition among manufacturers of onboard equipment increases. Despite these caveats, the ultimate decision by states and the industry to invest in ITS/CVO will depend on the cost/benefit ratio. From the industry perspective, benefits can be objectively calculated in

terms of reduced operating expenses and new revenues that affect a company's bottom line.

From the state viewpoint, investment in ITS/CVO will depend on a combination of fiscal and programmatic objectives. At one level, state officials will look for administrative savings and operational efficiencies resulting from ITS/CVO services. They will also assess the impact of ITS/CVO deployment on other state policy goals, such as increasing highway safety and promoting economic development within the state.

Standards and Interoperability

Although state officials and industry representatives have identified ITS/CVO issues on which they disagree, consensus has emerged in the area of standards and interoperability. The vision of transparent borders will never be realized if states and agencies within states cannot share data electronically. Equally important, the industry will not support ITS/CVO deployment if it is required to invest in redundant onboard systems to satisfy states' differing technical requirements.

Much has been done to resolve these issues. As part of the CVISN design process, states are working with the U.S. Department of Transportation to develop ED1 transaction sets to share information about registration, taxation, and permits. In addition, after several years of controversy concerning transponder specifications, states participating in the operational tests and demonstrations have now decided on a standard transponder design that meets the technical requirements of most ITS/CVO applications.

Several issues have not yet been resolved. For example, provisions of the North American Free Trade Agreement (NAFTA) related to surface transportation may require additional discussions with Canadian and Mexican counterparts related to standards and interoperability. Moreover, carriers involved in multimodal transport have urged that compatibility standards extend beyond motor carrier requirements to cover rail and air transport.

Although state CVO administrators acknowledge the need for a single set of standards and for equipment capability, they point out that their ability to meet this standard is sometimes beyond their control. For example, Minnesota officials note that coordination among state agencies is hampered by the legislative mandates under which the agencies operate. These mandates seldom include coordination among agencies or states as a priority or even a consideration. Similarly, some states' ability to participate in national programs is restricted by state procurement regulations.

Resolving the standards and interoperability issues has two implications for the acceptance and use of ITS/CVO services by states and the industry. Many states admit deferring action until they are confident that any investments in ITS technologies are consistent with national standards. In discussions with neighboring states, Texas officials found that "many states have expressed a reluctance to implement ITS technology until standards are established for equipment such as AVI."[19]

Standards and interoperability issues also represent a major political and credibility issue for many states. As an Idaho official said, "Imagine the furor if I got all of the truckers in my state to put on transponders, which I could probably do, and six months later FHWA, or some other organization, decides that transponder B will be the national standard. It would never be remembered that I pushed the industry forward, or that I built a functioning system. It would only be remembered that I made the trucking industry bend over backwards and then had to go back to [it] again."[20]

The industry is expressing similar concerns. In several of the state motor carrier surveys, companies said that their interest in ITS/CVO will increase once they are assured that any investment in onboard equipment would follow technical qualifications that are used by all states. Motor carriers that had already invested in onboard equipment for their own purposes (e.g., fleet management) have urged state officials to adopt open standards that are not

equipment-specific. Findings from the Illinois motor carrier survey suggest the "need for an expandable open system architecture that can utilize what companies already are using . . . . Systems should be easily upgradable."[21]

An underlying question is whether the introduction of ITS technologies and electronic data interchange will provide the impetus for achieving these standards. The desire for national standards did not arise with the introduction of ITS/CVO The western states' institutional barriers report points out that "the inefficiencies arising from the lack of standardized procedures and uniformity in regulatory requirements has been a focus of the federal government, state governments, and the motor carrier industry since the early 1960s. However, the fact that limited progress has been made over the last thirty years indicates the persistence and resilience of the institutional barriers confronting transparent borders."[22]

Regulatory Reform

Some members of the motor carrier industry are concerned that ITS/CVO could distract states from undertaking more important regulatory reforms. Results from New Mexico's motor carrier survey suggest that "carriers want [governments] to improve the efficiency of their current regulatory process before taking on new initiatives. Automation of otherwise inefficient processes is not the answer."[23] There is a real danger that states may view ITS/CVO as an end rather than as a tool through which they can achieve true regulatory reform. Reform is needed regardless of the infusion of ITS technology.

A more appropriate approach is to focus on specific elements of state motor carrier regulation and evaluate the options that are available as a result of emerging technologies. For example, large motor carriers often complain about the additional expense of registering new vehicles as a result of fleet turnover. Minnesota addressed this concern by developing procedures under which the carrier could retain the license plate, transfer it to a new vehicle, and provide the department of transportation with information on the new vehicle. None of this required ITS technologies. However, the benefits of this regulatory change would be greater if the carrier could provide the information electronically and if the new information could be readily available to enforcement officers who otherwise might issue a citation based on out-of-date information.

Another example of reform is the opportunity to eliminate much of the paperwork that currently must be kept in the cab of each commercial vehicle. With the adoption of a single identifier for each vehicle-for example. the manufacturer's vehicle identification number-retrievable online information can provide enforcement officers with more comprehensive and up-to-date information on each vehicle. Updating information online also represents a significant cost savings to the industry. A national motor carrier spends thousands of dollars distributing credentials to its fleet. With online documentation, these periodic mailings could be completely eliminated.

Regulatory reform to accommodate ITS/CVO may have substantial implications for states. Some states indicate that regulatory reform will require a thorough review of state statutes that mandate specific administrative procedures and standards. In its institutional barriers report, Nebraska officials identified an initial list of statutory mandates that would require modification. For example, Section 325 of the Nebraska ***Revised Statutes*** states that "no person shall operate a vehicle unless such vehicle shall at all times carry in or upon it the registration certificate furnished for it."[24] Although the term "certificate" could be defined to include a transponder that accesses the registration certification, state officials suggest that amending state statue is necessary to avoid future legal challenges.

A similar review of Iowa's state laws, rules, and procedures found "thirty-nine instances in the law, seventy-five in the rules, and twelve in procedures where electronic or automated processing methods may violate current law or

rules."[25] For example, Section 321.20 of the Iowa Code requires that a motor vehicle registration application include the "owner's signature written with pen and ink."

New Regulatory Paradigm

Implementation of ITS/CVO provides states the opportunity to completely revamp their regulatory philosophies. In many states, the regulatory framework calls for the state to conduct a cursory review of all motor carriers through compliance reviews and inspections on the roadside or at weigh stations and ports of entry. Many state officials suggest that it would be better to direct regulatory enforcement efforts to carriers that have unsafe operations or that attempt to circumvent regulatory requirements. ITS services such as preclearance enable states to adopt a different regulatory approach.

ITS/CVO builds a relationship between the industry and its regulators in which both acknowledge and contribute to each other's needs and objectives. For example, the industry lists seamless passage across state lines among its highest priorities. Allowing a vehicle to enter the state without being subjected to regulatory scrutiny requires confidence among state offtcials that the carrier is in compliance with regulatory and fiscal requirements. As stated in the New Mexico institutional barriers study, "Clearing compliant commercial vehicles through state ports of entry and weigh stations is the cornerstone of the transparent borders concept."[26]

The reward of seamless passage across state lines gives the carrier an incentive to do what it can in support of state objectives such as highway safety. In this sense, ITS/CVO provides an opportunity to empower motor carriers through incentives rather than sanctions. The way the state communicates its objectives when using any ITS technologies is important in garnering industry support for ITS initiatives. Texas officials found that industry support "will not be gained if the program is viewed primarily as an enforcement or revenue enhancement tool."[27]

Other Institutional Barriers

States identify several other barriers that may affect their ability to deploy ITS/CVO technologies.

Confidentiality of Information

ITS/CVO systems are information-intensive. Some data are provided by the carrier, including vehicle number, driver, and shipment information. Other information is generated by the systems. For example, onboard transmissions to receivers at weigh stations and ports of entry create electronic logs of times and locations. Some motor carriers have raised issues concerning the use of ITS/CVO information for purposes other than motor carrier regulation.

In addition, some carriers fear that ITS/CVO systems may increase regulation of the motor carrier industry because certain information may be more readily available. In its survey of motor carriers, Illinois officials found that motor carriers are concerned that they will be asked to "reveal information that other industries or transportation modes do not have to reveal."[28]

Concerns about confidentiality of information, especially when data are shared among states to support seamless highways, are tied to differences in state laws pertaining to freedom of information. For example, Minnesota has one of the most stringent freedom-of-information acts. In contrast, Ohio holds public employees personally liable for divulging business information that is gathered by the state for regulatory purposes. Which statutes govern information gathered in Ohio that may have been shared with Minnesota officials? In the New Mexico survey of motor carriers, the industry expressed a concern "regarding the distribution of data and protection of carrier privacy if ITS/CVO initiatives lead to widespread data sharing."[29]

During the development of its Pre-Pass program, HELP, Inc., examined several options for controlling the storage and distribution of information. Based on strong preferences expressed by industry, the board ultimately

elected to contract with a third-party vendor to collect tax and registration information from the participating states and distribute it to the checkpoints within the HELP, Inc., system. The use of a contractor also allayed industry concerns about freedom-of-information act requests.

Accuracy of Information

Electronic monitoring of motor carriers raises a number of issues related to the use of the data to enforce statutes and regulations. For example, is information about a commercial vehicle's weight generated by weigh-in-motion technology accurate enough to issue citations? When using electronically generated data, there is a need to establish thresholds above which violations will be deemed to occur.

The California Highway Patrol elected to use WIM technology as the mechanism to screen for violations, rather than as the basis for citations. When the reading from a WIM facility identifies a potential violation, the commercial vehicle is then stopped and weighed on a stationary scale to obtain the official weight for purposes of issuing the citation.

The use of pen-based computers for inspections has increased the accuracy of the data maintained within state and national databases in a number of ways. For example, the direct entry of pen-based computer information alleviates errors caused during transcription of illegible notes. In addition, the data are immediately entered into the database, making responses to queries more up-to-date.

Industry Concern Over Additional Taxation

Industry support for regulatory reform using ITS/CVO technologies is tempered by lingering concerns that states will use data generated by the system to change the way commercial motor carriers are assessed for their use of the nation's highways. The same information that can be used to preclear commercial vehicles can also be used to calculate weight-distance taxes. Even if the state argues that any shift in tax structure would not result in a net increase in revenues, there would certainly be a gross shift among different categories of motor carriers.

Human Factors

In the institutional barriers studies, several states note that there is a lack of skills associated with designing and maintaining ITS/CVO systems. State investment not only must focus on hardware and programming, but also on personnel and training. Such human resources investment may be difficult to achieve within current budgets, especially if the regulatory agency is expected to maintain existing service levels during the transition period.

Automation also raises concerns about downsizing and staff restructuring. These concerns can be addressed by involving union representatives in the development of in-service training programs.

Aversion to Change

Despite complaints about overregulation of the motor carrier industry, the industry acknowledges that many of the most burdensome regulatory requirements have been addressed through programs such as CDL and agreements such as IRP and IFTA. Many of the state motor carrier surveys suggest that the industry may not want to tinker further with a system that is perceived as working fairly well.

The Governor's Role within an ITS/CVO Implementation Framework

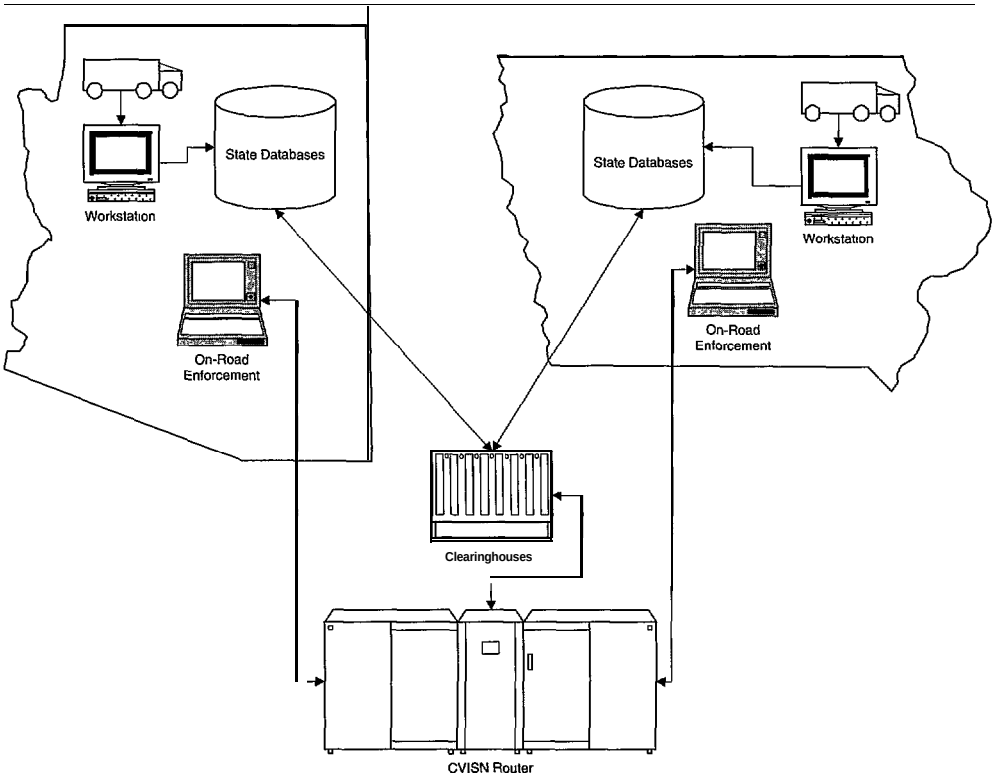
The evolution from discrete operational tests to national deployment of ITS/CVO will depend on overcoming the issues and barriers discussed in the previous chapters. The organizational framework through which these public policies are addressed and corresponding programs are developed is both vertical (i.e., intergovernmental) and horizontal (i.e., interagency and interstate). In addition, the necessary partnership between the public and private sectors makes the organizational framework for implementation complex (see Figure 2).

This multidimensional approach to ITS/CVO deployment cannot occur by accident. It will take public leadership at both the state and federal levels, as well as the concerted efforts of industry champions, to bring together the various elements on which ITS/CVO deployment will depend. Within each state, only the Governor has the breadth of authority to ensure successful collaboration. This does not mean that deployment can be mandated by gubernatorial decree. It means that the Governor is in a unique position to create the climate for collaboration that is essential to national deployment. That collaboration must occur among states, among state agencies, between levels of government, and with the motor carrier industry and ITS technology vendors.

Gubernatorial intervention is needed to address the major policy issues raised in this report, including:

- generating the demand for ITS/CVO deployment by the regulated industry and state administrators that will justify investment in the technologies;

Figure 2. ITS/CVO Organizational Framework



- exploring innovative methods of financing the initial investment in ITS/CVO infrastructure and methods for recapturing the ongoing expenses of operating the system;
- promoting collaboration among all the public and private stakeholders to resolve issues of interoperability; and
- overcoming the human and institutional barriers that can impede the changes in policies, programs, and organization that may be required.

The Governor need not become proficient in the technical aspects of ITS/CVO. The Governor's primary role is one of change agent, clearly articulating the state's policy goals and expectations and creating an effective system of rewards for those who contribute to the effort.

Generating Demand

Although there are legitimate questions about the benefits and costs of ITS/CVO services, it would be unfortunate if the answers to these questions were prejudiced as a result of unfounded concerns or preconceptions within state agencies and the motor carrier community. The Governor has the opportunity to ensure that ITS/CVO gets a fair hearing within the state by creating a process that engenders confidence in the outcomes of the process. For example, the Governor can clearly articulate the state's goals and objectives (e.g., for regulatory reform or highway safety). In addition, the Governor can establish principles to guide the process that allay industry fears about state motives for implementing ITS/CVO. These guiding principles could include the following.

- State decisions on ITS/CVO utilization and deployment will be based on objective cost/benefit analysis.
- Selected ITS/CVO services, at a minimum, must have no negative fiscal impact on the regulated industry. Decisions will be based on real cost savings and real increases in productivity.
- The state will not initiate any ITS/CVO effort that is inconsistent with nationally adopted standards.

By acknowledging these industry concerns up front, the process can then focus on critical issues such as financing, privacy, system reliability, and the impact of ITS/CVO on legitimate state regulatory objectives.

Addressing Institutional Barriers

A Governor who decides to champion ITS/CVO needs to be realistic about the challenges of implementation and the requirements for success. It is important to acknowledge the real and perceived impediments. By identifying these barriers at the outset and demanding methods to ameliorate or eliminate them, the Governor can ensure that these issues do not become roadblocks later in the process. It is also important that the state get agreement on the central issues before spending time and resources on operational barriers and regulatory procedures. Idaho officials stated that, from their perspective, organizational and procedural barriers are relatively unimportant "when compared with the barriers that arise from disagreements over the system's intended functions, the cost of providing systems, and the parties responsible for paying those costs."[30]

The Governor can also encourage state officials to look for opportunities to deploy ITS technologies concurrent with scheduled or needed upgrades of facilities and systems. For example, many of Oklahoma's ports of entries and weigh stations are twenty to twenty-five years old and need upgrading. State officials could use the funds appropriated for upgrades and expansions to begin the deployment of ITS technologies at those facilities. Besides making the most effective use of scarce resources, coordination with scheduled maintenance alleviates disruptions and inconveniences related to construction or reconstruction activities.

Many of the procurement issues associated with other state technology purchases arise during the discussion of ITS/CVO deployment.

States are concerned that the traditional one-time, low-bid model may not work. At the outset, states need to recognize that technology is constantly subject to expansion and upgrade. For this reason, the customary buyer/vendor relationship may not work. The Governor has the opportunity to use ITS/CVO implementation as a model to address procurement reform.

A major issue related to procurement is the inability of program officials who lack expertise in technology to clearly articulate the state's needs or to evaluate vendor proposals. In a self-evaluation, New Mexico officials found that "the state's experience with ITS has been marred by continual maintenance problems. . . . In terms of working with contractors, New Mexico got what the state asked for, but the state didn't know what to ask for or what was needed."[31]

In addressing concerns about interoperability and standards, the Governor may be most effective by stating what should not be done rather than what can be done. For example, the Governor may order that no purchases for data processing equipment or programming will be made without assurances that the purchases are compatible with the emerging CVISN architecture.

Maintaining Interest and Momentum

Full implementation of ITS/CVO services is a long-term endeavor and requires high-level visible leadership. State progress in implementation, however, is jeopardized each time there is a turnover in leadership in the Governor's office or among key cabinet officials. To help ensure continuity, an interagency or public/private board or commission can be created to oversee the development and deployment of ITS/CVO. By vesting leadership authority in several individuals, advocacy and program progress are less likely to be affected by the departure of one person.

This panel can serve several functions. It can advise the Governor and legislature concerning the state's interest in deployment of each ITS/CVO service. It can address institutional issues such as the adoption of technical standards or privacy protections. It can reconcile differences in the missions of agencies (e.g., enforcement versus promotion). Over time, it can assess the impact of ITS/CVO systems on state policy and program objectives and recommend changes, as appropriate.

Promoting Interstate Efforts

Economic markets do not recognize state borders. Clearly, the motor carrier industry benefits from the realization of a seamless national highway system brought about through the use of ITS/CVO technologies. To achieve this reality, interstate cooperation is needed in a number of areas, from the exchange of data to the adoption of technical standards. In addition, interstate collaboration can generate economies of scale, lessening the fiscal impact of ITS/CVO deployment.

Where ITS/CVO services are viewed as advancing state regulatory objectives, the Governor can promote cooperative efforts across state lines that would reduce the total cost of ITS/CVO deployment. For example, regional weigh stations or ports of entry could serve several states if information gathered at these regional facilities are readily available to enforcement officials in all the participating states.

Summary

The challenges to ITS/CVO implementation will vary among states. As is the case whenever new technology is introduced into the workplace, questions regarding the technical feasibility of the initiative are among the least daunting. It is the institutional, fiscal, and political roadblocks that require the majority of public policymaker's attention. This discussion of the barriers and opportunities related to ITS/CVO deployment was never intended to determine whether states should pursue this activity. Its purpose is to identify the questions and issues that need to be addressed as state officials ponder this decision.

This report raises more questions than it answers, but it also recommends a two-stage process for obtaining some of the answers. In

stage one, a state should conduct a rigorous cost/benefit analysis to determine the range of ITS/CVO services it might pursue. If the analysis demonstrates that it is in the state's interest to proceed, stage two requires that the Governor establish a process through which legitimate concerns about the impact of ITS/CVO services on the industry, the state, and the general population can be addressed. Additional guidance to states that elect to participate further in deploying ITS/CVO technology will be available upon completion of the NGA cost/benefit analysis report and a study of the lessons learned from the CVISN prototype and pilot states.

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