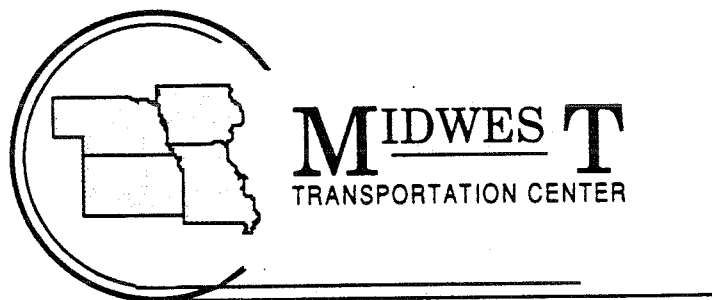


# **INTELLIGENT VEHICLE HIGHWAY SYSTEMS**

## **INSTITUTIONAL BARRIERS AND OPPORTUNITIES FOR I.V.H.S. IN COMMERCIAL VEHICLE OPERATIONS: AN IOWA CASE STUDY**



February, 1992  
Midwest Transportation Center

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**February, 1992**

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## EXECUTIVE SUMMARY

This report documents a brief study of the benefits from and the institutional barriers to Intelligent Vehicle - Highway Systems (IVHS) in Commercial Vehicle Operations (CVO). IVHS - CVO applications comprise a number of technologies in various stages of development. Some are currently being field-tested; many are still in their conceptual stage. Although several proposed IVHS - CVO applications are examined, primary concentration in the study is placed upon those applications that may reduce the cost of complying with motor carrier administrative and safety regulations. These compliance costs include the costs of complying with regulation of vehicle dimensions (i.e., size and weight), permitting, licensing, registration, fuel tax collection, and safety enforcement.

The study uses the State of Iowa, the Interstate 80 highway corridor through Iowa, and Iowa-based motor carriers as its case study. Through the Iowa case study, the research identifies the benefits of IVHS - CVO applications, institutional barriers to IVHS - CVO applications, examples of how barriers to multi-jurisdictional institutional issues have been solved, and identifies the "most promising" applications of IVHS - CVO technology.

The "most promising" applications were determined by identifying which applications: (1) do not conflict with the more intransigent institutional barriers, (2) will provide long-term benefits, (3) are technically feasible, and (4) are favored by carriers and public agencies. These are technologies that should be emphasized for early application because they are likely to be the most widely accepted. The five "most promising" include:

- Weigh-in-motion with automatic vehicle identification
- Pre-clearance for safety inspections
- "One-Stop-Shopping" for licenses, registrations, and permits
- Automated, apportioned fuel tax administration using instrumented state line crossings
- Automatic toll collection using electronic toll and traffic management systems

Electronic drivers' log books, electronic placarding of hazardous materials, and navigational aids were not included as "most promising" because they are either likely to provide lower levels of benefits, or impediments to their implementation are relatively great.

One of the highlights of the research is an estimate of the costs motor carriers incur while complying with administrative rules and regulations. The case study analyzed the cost structures of four motor carriers, and estimated their compliance costs in:

- Weight regulation and enforcement
- Safety regulation and enforcement
- Licenses, permits, and registrations
- Apportioned fuel tax collection and auditing
- Toll Payments

Cost estimates do not include the cost of taxes, tolls and fees associated with the five areas listed above, but include only the motor carrier costs of complying with these requirements. It was discovered that carriers' office costs associated with the administration of these requirements are much smaller than their over-the-road costs. Largely, compliance costs are dominated by delay experienced by vehicles and drivers while complying with administrative rules and regulations.

Of the carriers surveyed, typical compliance costs are found to be in the neighborhood of \$12,000 dollars per tractor-trailer per year. Assuming that the Iowa motor carriers surveyed are indicative of motor carriers throughout the country, a conservative estimate of the national cost of complying with administrative rules and regulation is approximately \$6 billion per year. Clearly, not all of these costs would be conserved through the application of IVHS - CVO technologies, but compliance costs would be significantly reduced.

If IVHS - CVO applications are to be introduced in commercial traffic corridors throughout the country, a new paradigm of partnership must be developed between public agencies within and between states, and between regulators and motor carriers. Collaboration will greatly facilitate the earliest deployment of a national IVHS - CVO network. In addition, only collaborative solutions to institutional issues will permit the system to have a robust variety of IVHS - CVO functions.

# CHAPTER I

## INTRODUCTION

Many motor carriers, a number of states, and the Federal Highway Administration are investigating and demonstrating a group of technology applications known collectively as Intelligent Vehicle-Highway Systems in Commercial Vehicle Operations (IVHS - CVO). Development of technical standards, as well as hardware and software, is well under way. A number of these technologies, including weigh-in-motion, automatic vehicle classification and identification, and automatic toll collection, are currently being road tested.

Figure 1-1, "Meeting Demands for IVHS - CVO," represents a simplified depiction of the institutional dynamics for IVHS - CVO demand. A number of demand forces are "pushing" for the implementation of CVO concepts. These forces include, for example, the desire to reduce motor carrier costs, the desire to reduce regulatory costs, and so on. It appears that meeting these demands requires an analysis of functional areas, both within the motor carrier industry, and within state-level regulatory agencies, to find those functions which are most likely to, when moving toward IVHS - CVO, satisfy those demands. Using this functional analysis, the study has identified several IVHS - CVO applications which seem to be "most promising," as noted in Chapter VI.

It appears, however, that the most significant obstacle to IVHS - CVO applications may be several institutional barriers which, if left unchecked, could inhibit the growth of a national network of IVHS - CVO capable highways. This study seeks to identify and analyze these institutional barriers to IVHS - CVO.

Analysis of the findings reveals that several proposed IVHS - CVO applications are indeed promising. They present manageable levels of institutional barriers while providing exceptional opportunities to strengthen carrier productivity, improve highway safety, reduce regulatory costs, and raise compliance levels.

With 1.2 million truck-tractor power units, 3.7 million commercial trailers, and 36.5 million light-duty trucks on the nation's highways<sup>1</sup>, commercial vehicle operations are critically important to a smooth-functioning national transportation system. Traffic congestion and a lack of real-time traffic information are serious productivity issues for motor carriers. The American

# Meeting Demands for IVHS-CVO

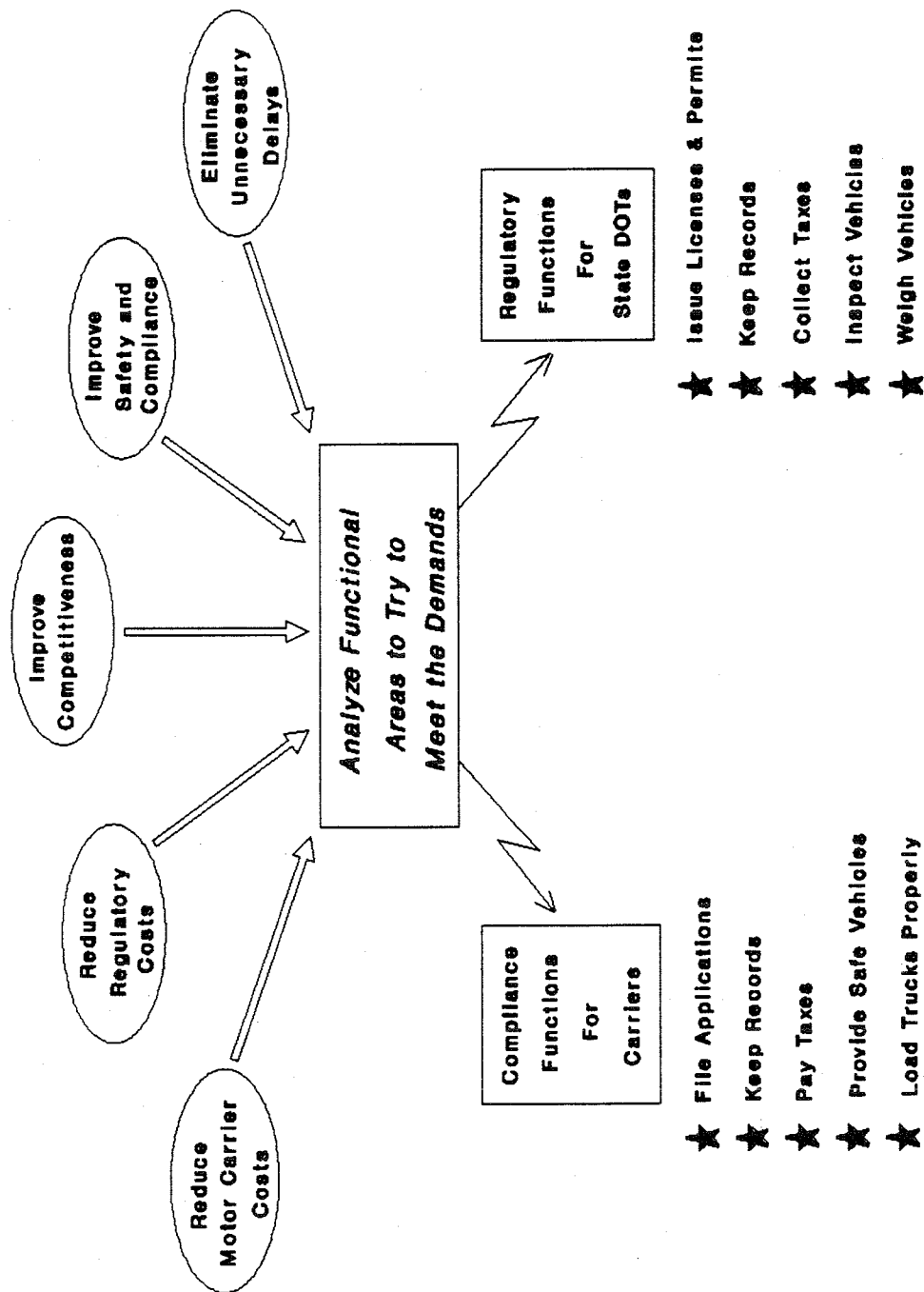


Figure 1-1 Meeting Demands for IVHS-CVO

Association of State Highway and Transportation Officials estimates that commercial "(t)ruck delays alone add \$7.6 billion per year to the cost of goods that Americans buy."<sup>2</sup> These facts point to the need to improve efficiency, capacity utilization, and safety in the nation's road freight system, and IVHS - CVO may be able to help.

This is an area that has not been studied in depth. IVHS America, a successor group to Mobility 2000, is composed of advocates for IVHS drawn from industry, government, and academia. IVHS America has developed a committee structure to look at institutional issues. The Institutional/Standards Subcommittee has as its mission:

" . . . to identify and resolve any organizational, administrative and statutory barriers to implementing advanced technology for the management of commercial vehicles and highway systems."<sup>3</sup>

This is the only organization responsible for synthesizing institutional issues and promoting solutions to institutional barriers. The very recent creation of this committee illustrates the lack of pertinent research and points to the need for extensive institutional work in the CVO area.

## **RESEARCH METHODOLOGY**

The methodology for this study includes a literature review and analysis of IVHS -CVO materials, and a review of current demonstration projects and proposed IVHS - CVO applications. The institutional barriers are analyzed through a series of interviews with motor carriers, interest groups, regulatory agencies, and private sector companies. Institutional barriers and opportunities are examined. Iowa law and administrative rules are reviewed to ascertain areas which may prohibit automated and/or electronic processing and administration of motor carrier matters. Some examples of multi-jurisdictional cooperation on motor carrier regulation are presented, clearly demonstrating that technical and regulatory cooperation among several states is possible, and is indeed somewhat common.

The broad areas of IVHS technology represent dozens of specific technological capabilities, as noted in Table 1-1. Some of these are proposed, and some are already in production. This research will examine potential applications of all these technologies to

commercial vehicle operations (CVO). It is not proposed here to analyze the IVHS - CVO hardware and software technologies, but rather the institutional issues which will affect any potential implementation. The research team has assumed that technical developments are proceeding well, and has not developed an analysis of IVHS hardware or software.

**Table 1-1 Primary Technologies Associated with IVHS-CVO**

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Automatic Vehicle Identification	(AVI)
Heavy Vehicle Electronic License Plate	(HELP)
Weigh-in-Motion	(WIM)
Automatic Vehicle Classification	(AVC)
Electronic Placarding/Bill of Lading	(EBL)
Automatic Vehicle Location	(AVL)
On-board Computers	(OBC)
Two-way Real-time Communication	(TWC)
Automatic Clearance Sensing	(ACS)
Advance Traveler Information Systems	(ATIS)
Electronic Data Interchange	(EDI)
Electronic Toll and Traffic Management	(ETTM)
Automatic payments and collections (Electronic Funds Transfers)	(EFT)

---

Analysis of the institutional issues will be accomplished using an institutional matrix, with all the various IVHS - CVO technologies (See Table 1-1) analyzed against the several institutional issues areas listed at the beginning of Chapter IV. Each of the several IVHS - CVO technologies will be examined by the research team to illuminate its potential or possible effects on a number of institutional aspects of the Iowa motor carrier environment. The institutional challenges to each new technology may be tested and analyzed in this research matrix framework.

For case study purposes, it is assumed that a national east-west IVHS freight corridor along Interstate Highway 80 (I-80) will be implemented. This interstate highway has, in certain segments, the highest heavy truck counts in the country.<sup>4</sup> It serves as an east-west arterial for intermodal and truck freight, passing through a number of significant freight origins and destinations. I-80 passes through California, Nevada, Utah, Wyoming, Nebraska, Iowa, Illinois,

Indiana, Ohio, Pennsylvania, and New Jersey. New York is also included in the assumptions due to its role in the important bridge, highway, and freight terminal activities of the Port Authority of New York and New Jersey at the eastern-most terminus of I-80.

It is anticipated that an analysis of the institutional issues facing Iowa will become a "first step" in developing and implementing an instrumented IVHS - CVO corridor on I-80. The research team, however, also recognizes the regional, rather than corridor, nature of many freight patterns and would like to note that I-80 could also become a kind of "spine" in a regional network of IVHS - CVO instrumented roads. Whether an east-west corridor or a regional network, I-80 provides the level and diversity of freight volumes necessary for a successful demonstration.

## **REPORT ORGANIZATION**

Chapter I describes the rationale for IVHS - CVO and some of the forces pushing and pulling these technological applications into the current policy forum. Also described is the methodology to be employed in this study, which includes a literature review, carrier and DOT interviews, a compliance cost survey, a detailed analysis of state rules and laws, and a review of other institutional barriers to CVO applications.

To provide the reader with a sense of the technology and IVHS - CVO applications and functions, Chapter II defines the broad areas of IVHS - CVO and discusses their applications. An understanding IVHS - CVO concepts is important to understand how the technology and functions may conflict with institutions, its potential roles in the administration of regulations, and the benefits of CVO.

Chapter III investigates the potential benefits from IVHS - CVO applications. The benefits are first approached from a theoretical basis. Because many of the IVHS - CVO applications are still conceptual and little empirical work exists on benefits, the discussion is largely theoretical. One benefit area, however, that has received both a large measure of attention and some empirical investigation is the reduction of motor carrier administrative and safety regulation compliance costs. Also included in the Chapter III are the results of the compliance cost study conducted as part of this research. The research is largely a case study

of these costs for four motor carriers. It is clear that the costs on a national scale are large and, by a significant measure, IVHS - CVO applications can help to reduce the cost of compliance.

Since there are significant benefits of IVHS - CVO applications, Chapter IV presents some of the obstacles and barriers to implementing CVO applications. A list of twenty-four specific institutional issues is developed. The discussion in the chapter continues with a review of Iowa laws and administrative rules that may be incompatible with IVHS - CVO applications. In addition, the variation in regulation and rules between states along the I-80 corridor is defined to illustrate the tremendous confusion of incompatible state motor carrier administrative rules and regulations.

Given the clutter of motor carrier administrative regulation, Chapter V reviews cooperative examples in which states have managed to cooperate through multi-jurisdictional organizations to streamline these processes. These examples of legislated or evolved multi-jurisdictional organization identify some paths to uniformity and to mutual reliance for the administration of commercial vehicle regulation.

After a discussion of the barriers to IVHS - CVO application and knowledge of the benefits, Chapter VI identifies the "most promising" applications. These applications should be focused upon for early application because they do not conflict with one or more of the most formidable institutional issues. Further, the "most promising" applications are likely to be positively embraced by the motor carrier industry because they will result in a decline in the cost of complying with state administrative regulation.

The last chapter identifies ingredients that are necessary to facilitate the implementation of the "most promising" applications. Underscored is the need to bring together government regulatory, enforcement, and highway operating agencies, with motor carriers and service providers to build partnerships to accomplish IVHS - CVO objectives. The need to build a new paradigm of partnership is clear.

## ENDNOTES

1. U.S. Congress, Office of Technology Assessment, Moving Ahead: 1991 Surface Transportation Legislation, OTA-SET-496, Washington: USGPO, June 1991, p. 35.
2. "A New Era in Road Policy," Nation's Business, September, 1991, pp. 20-26.



3. IVHS America, CVO Committee, Institutional/Standards Subcommittee, "Draft Mission Statement," July 31, 1991.
4. The average daily heavy truck counts on I-80 in Iowa (1987) was 5,775 trucks, according to Iowa Department of Transportation data reported by the Iowa Transportation Center.



## **CHAPTER II**

### **IVHS - CVO APPLICATIONS**

This chapter describes the various applications of intelligent vehicle-highway systems in commercial vehicle operations, (IVHS - CVO). Dozens of applications have been proposed. This chapter describes and categorizes those systems relating to both automobiles and to commercial vehicles first, and will then outline the applications in commercial vehicle operations.

#### **APPLICATION DESCRIPTIONS**

IVHS - CVO comprises a number of evolving, semi-interdependent technologies in the areas of electronics, communications, engine design, highway design, traffic control, and information processing. Elements of future IVHS systems may include Advanced Traffic Management Systems, Advanced Traveler Information Systems, Commercial Vehicle Operations, and Automated Vehicle Control Systems.

Five general areas of IVHS, and their potential application to commercial vehicle operations, are discussed below.

- **Advanced Traffic Management Systems (ATMS)** include elements of freeway management systems and traffic signal control. ATMS may locate disturbances in freeway traffic flow, as well as provide interactive and adaptive traffic signal control at adjacent street and freeway ramp intersections. ATMS may improve traffic flows such that rush hour truck bans in all congested areas are no longer considered to be the most appropriate means of traffic control. For motor carriers, ATMS may also play a role in route selection, and even site selection for carriers and shippers.
- **Advanced Traveler Information Systems (ATIS)** include pre-trip and in-vehicle information for drivers on accident zone delays, congested traffic, weather conditions, alternative routes, recommended speeds, and trip planning. Among the techniques used to provide this information are on-board computers (OBC), electronic navigational aids, traffic information broadcasting, and automatic vehicle monitoring systems. Vehicle monitoring systems include automatic vehicle location (AVL) technology, for monitoring from a home base.
- **Commercial Vehicle Operations** allow a central controller or dispatcher to know the location and progress of a fleet of vehicles, which may also use AVL. Specific regulatory and fleet safety and credentials inspection requirements may be easily met by electronic

log books and manifests, as well as electronic operating authority, licensing, registration, and permitting. Electronic log books and freight manifests may be kept and accessed by roadside regulatory authorities without stopping the truck. Trucks may be weighed and axle loads and configurations determined using weigh-in-motion (WIM) technology. The Federal Highway Administration has prepared a thorough analysis of the need for, and uses of truck weight data.<sup>1</sup>

- **Advanced Vehicle Control Systems (AVCS)** may collect data from on-board sensors in the engine, fuel system, electrical system, brakes, and so forth to provide drivers (or potentially carrier dispatchers) with routine or emergency equipment operating indicators. A more advanced application finds electronic adaptive control of various vehicle components, adjusting engine components or recommendations to drivers for current conditions and according to pre-selected parameters.
- **Advanced Public Transportation Systems (APTS)** used in passenger mass transit applications.

Commercial vehicle operations may be broadened to include a number of private sector operations as well as public-sector administration and regulation:

- **Fleet Management**
  - Automatic toll collection
  - Vehicle and cargo tracking
  - Hazardous material electronic placarding
  - Cargo and passenger scheduling and routing
  - Automated registration, permits, and fuel tax payments
  - Route guidance, navigational aids
  - Equipment and driver scheduling
- **Driver and Vehicle Safety**
  - Dynamic vehicle safety warning systems
  - Communication of accident or weather information
  - Driver fatigue and impairment countermeasures
  - Remote vehicle and driver safety inspections
  - Computerized maintenance records
- **Automation of State Regulatory Functions**
  - Issuing license plates

- Annual vehicle registration
- I.C.C. operating authority (and insurance)
- Temporary registration (trip permits)
- Fuel tax registration, payment, and auditing
- Temporary fuel tax permits
- Weight-distance taxes (not all states)
- Oversize and overweight permits
- Hazardous materials permits
- Issuance of truck credentials in one location
- Collection of tolls, where applicable

The Crescent Project and H.E.L.P. (Heavy vehicle Electronic License Plate) plan to demonstrate and test a number of data collection and transmission technologies, the technical aspects of which are beyond the scope of this paper. Furthermore, Advantage I-75, a demonstration corridor from Florida through Michigan to Canada, plans to demonstrate a pre-clearance system for weight and safety enforcement. Early positive results from the demonstration projects will be important to other future IVHS - CVO projects. Crescent and Advantage I-75 will demonstrate:

- State-by-state data collection (weight, axle spacing)
- Carrier data collection (fleet reports received by carriers)
- Weight enforcement programs (summarized low-speed weight data)
- Fixed site weight screening (weigh-in-motion)
- Automatic through clearance - weights and lengths
- Automatic through clearance - registration and operating authority
- Automatic through clearance - safety inspection
- Automatic through clearance - permits

Throughout the remainder of this report, the existing and proposed IVHS - CVO functions will be discussed and their potential for application analyzed. There is, however, clearly a rich and diverse set of IVHS applications being proposed, several are still conceptual, and some are being tested and are in operation.

## ENDNOTES

1. Federal Highway Administration, Automated Traffic/Truck Weight Monitoring Equipment (Weigh-in-Motion), Washington: USGPO, March 1990. (Report No. FHWA-DP-90-076-002).

## **CHAPTER III**

### **BENEFITS OF IVHS - CVO**

To clearly understand the institutional framework which surrounds many of the implementation questions for various IVHS - CVO applications, it may be helpful to examine some of the forces working for and against adoption of the CVO concepts. Some of these forces, be they "market" forces or effects of government policy, are well-known. Others are more obscure. As the benefits of IVHS - CVO are recognized, they comprise forces pushing to adopt CVO applications. As the costs of IVHS - CVO are recognized, they may become forces pushing against adoption of CVO applications.

This chapter identifies the benefits of IVHS - CVO technologies. Several of the benefits theorized are likely be significant, but little empirical work has been conducted to estimate their magnitude. As such, any discussion of possible benefits is largely conceptual. Much of the benefit debate, however, has focused on reducing potential administrative and safety regulation compliance costs associated with the use of IVHS - CVO applications. Therefore, the research does investigate compliance costs and presents original findings regarding their magnitude.

The first section of this chapter defines potential benefits (cost reductions) of IVHS - CVO applications. The second section identifies estimates of regulatory compliance costs, through a review of past studies, as well as reporting results of a modest survey of the trucking industry.

### **BENEFITS OF IVHS - CVO APPLICATIONS**

The research team has identified nine areas of theoretical benefits which may occur from adopting various IVHS - CVO applications. Also, there are a few areas where benefits have been demonstrated. Cost areas are covered in the following sub-sections. Clearly, the country has much to gain from applying these technologies to the nation's surface transportation network.

**Reduced Congestion and Shipment Delays.** Truck congestion on the interstate highways may be reduced through the two-way real time communication component of IVHS - CVO. Motor carriers will be able to reduce average shipment time-in-transit, while increasing vehicle and equipment utilization rates. The need for reliable, on-time service in the competitive

marketplace makes this technology attractive. The following delay circumstances may be successfully avoided by motor carriers using this IVHS - CVO technology.

- Traditionally congested areas
- Accident sites
- Construction zones
- Hazardous weather conditions

WIM (weigh-in-motion) technology is an application that will reduce delay through high processing rate without disrupting mainline traffic operations. Other benefits of WIM applications include improved highway safety over the presence of static scale crews, reduced weigh scale crew sizes, increased commercial vehicle coverage and the ability to minimize scale avoidance, and reduced per-unit data collection costs.<sup>1</sup>

**Accident Reduction, Highway Safety.** By suggesting alternate routes, trucks may avoid accident areas, thereby reducing traffic volumes around the accident sites and reducing the possibility of multiple-vehicle collisions. With electronic placarding, responses to hazardous materials spills should be safer, while clearing the roadway sooner. By disseminating timely weather information and road conditions, trucks may avoid dangerous areas, thereby reducing weather-related traffic accidents. Implementation of IVHS - CVO in some urban areas may be a viable alternative to banning truck traffic during rush hours.

**Improved Truck Driver Performance.** Using driver training aids and navigational features possible with IVHS, it is expected that driver skills, driver satisfaction, and driver retention will be increased. This, in turn, should alleviate some of the difficulties experienced in recruiting drivers. Furthermore, with advances in electronic manifests and log books, using on-board computers (OBC) and possibly interfaces with shippers' Electronic Data Interchange (EDI) systems, drivers may accomplish complex tasks easier, with greater accuracy.

**Improved Carrier Management Information.** Carriers will be able to obtain accurate and timely information on the status of shipments, location of trucks, trailers, and containers, estimated time of arrival, driver and equipment availability, safety inspection record, fuel taxes paid, state-by-state fleet miles, and the status of vehicle licensing, registration, and permits. Carriers may more closely track shipments of hazardous materials, reducing liability and exposure. Carriers may want to integrate some data elements collected through IVHS into their EDI systems, communicating with shippers and distribution centers.



**Greater Energy Savings.** Through techniques of delay reduction, efficient navigation, routing and scheduling, and elimination of some inspection and weigh station and port-of-entry stops, some diesel fuel savings may be realized. Drivers may be less inclined to use excess fuel to "catch up" at higher speeds after experiencing long stops or congestion, as their exposure to congested areas decreases.

**Improved Intermodal and International Traffic.** Carriers are acutely aware of their role in intermodal traffic, as well as the international dimensions of much of the freight which they carry. IVHS technologies, including AVI and HELP and electronic placarding, electronic manifests, and interfaces with EDI links, and automatic customs clearance, may provide expedited intermodal and international service for trailers and containers. Since railroads and steamship lines are beginning to adapt these technologies for identifying and manifesting their freight, benefits to those motor carriers using the same technologies will likely occur.

**Improved Ambient Air Quality.** With more efficient truck routing and scheduling possible through IVHS, and less time with engines idling, or delayed in traffic jams, emissions of hydrocarbons, carbon oxides, nitrogen oxides, and particulate matter should be reduced. This will occur especially in congested urban areas, where relief is most needed.

**Increased Infrastructure Capacity.** Without major additional lane mileage, the vehicle capacity of the interstate highways, as well as terminals and dock areas, may be increased through IVHS - CVO technologies. This is a function of the ability to avoid accident and congested areas, as well as the ability to choose the most efficient routes.

**Reduced Compliance Costs for Motor Carriers.** One of the most significant benefits of IVHS - CVO, especially from the "One-stop Shopping" concept, is reduced compliance costs, both in the motor carrier industry, and in terms of public-sector administrative costs. Motor carriers are faced with a heavy administrative burden as they comply with necessary laws and regulations relating to vehicle licensing, registration, permits, size and weight, operating hours, fuel and other taxes, vehicle safety, and driver licensing. Compliance procedures vary from state to state. IVHS- CVO may provide a means to reduce compliance costs, through paperwork reduction, accurate mileage-by-state reporting, electronic manifest and weight checking, and elimination of redundant or needless requirements and forms.

There seem to be significant compliance costs which constitute an important group of benefits from IVHS - CVO implementation. With "intelligent" custom-designed systems, compliance with very different state rules can be accomplished through a given system, without each state being required to enact uniform rules and laws. The remainder of this chapter seeks to identify costs associated with compliance. Clearly, not all compliance costs will be avoided through the adoption of IVHS - CVO applications, but a significant proportion of these costs may be avoided.

## **EFFORTS TO ADDRESS COMPLIANCE COST AND UNIFORMITY**

There are few examples of empirical research to measure potential benefits from different IVHS - CVO applications. In some areas of IVHS - CVO, such as two-way communications and real-time traffic and congestion information, studies are underway to estimate potential benefits. Preliminary results in one study of less-than-truckload carriers in a busy metropolitan area, an average savings of 40 minutes per driver, per day, is achieved through more accurate scheduling of pick-ups and deliveries.<sup>2</sup> These kinds of applications, however, are faced with very few institutional barriers when compared with those applications related to safety, regulation, and taxation. It is expected that these kinds of commercial vehicle applications will indeed be implemented, based on the carrier's projection of the gains which they may provide.

Current work in progress at the University of South Florida is focused on developing the benefit/cost ratio for the truck pre-clearance and automatic vehicle identification (AVI) systems proposed for Advantage I-75 on the Interstate Highway 75 corridor. According to researchers, costs are a function of system design, instrumentation, and trucker time. Benefits are seen to include paperwork reduction, improved highway safety, and travel time savings.

The I-75 concept provides for manual weighing and either random or initial inspection of trucks. The pre-clearance data for the participating trucks is sent in an electronic "envelope" which precedes the truck along its trip, allowing that truck to pass subsequent ports-of-entry uninterrupted. If Advantage I-75 is unable to reduce the actual time spent in weight, credentials, and safety checks, carriers may find their costs have not decreased. One researcher

expects that there may be no net benefit for this part of the I-75 concept.<sup>3</sup> Others cite the preliminary demonstration of time savings by an automated weigh station in Kentucky.<sup>4</sup>

## **BENEFITS FROM UNIFORMITY IN COMPLIANCE REQUIREMENTS**

Uniformity among states in administering motor carrier law has long been recognized as an important goal. Recent efforts to determine the costs and effects of the patchwork of state regulation may be traced to a pre-deregulation (1975) study completed by the Midwest Research Institute in Kansas City for the Federal Highway Administration.<sup>5</sup>

The study used a survey of eleven motor carriers differing in size and type to quantify compliance costs. Extrapolating those costs over the entire (interstate carrier) industry at that time, compliance costs of about one billion dollars including vehicle registration, motor fuel taxes, third structure taxes, and public utilities commission permits (including direct cost of the permits) were estimated.

The study also identified the significant problems and administrative variations facing motor carriers with interstate operations. The study was requested by the federal Office of Management and Budget in order to determine the level of cost savings which may be available from reform in this area.<sup>6</sup>

The Motor Carrier Act of 1980<sup>7</sup>, which relaxed federal economic regulation for motor carriers, also identified the lack of uniformity among the states and directed the Secretary of Transportation and the Interstate Commerce Commission to study the matter and make appropriate remedial recommendations to Congress. The Act states that:

"Congress hereby declares and finds that the individual State regulations and requirements imposed upon interstate motor carriers regarding licensing, registration, and filings are in many instances confusing, lacking in uniformity, unnecessarily duplicative, and burdensome and that it is in the national interest to minimize the burdens of such regulations while at the same time preserving the legitimate interests of the State in such regulation. Therefore, Congress directs the Secretary of Transportation and the Interstate Commerce Commission . . . to develop legislative or other recommendations to provide a more efficient and equitable system of State regulations for interstate motor carriers .

. . .<sup>8</sup>

The act also recognized that reform of the permit procedure for contract carriers is necessary, and required that "The Commission shall streamline and simplify, to the maximum extent practicable, the process for issuance of permits..."<sup>9</sup>

The National Cooperative Highway Research Program conducted an analysis of the cost effectiveness of collecting, transmitting, and processing heavy vehicle port-of-entry and weigh station data using automatic vehicle identification (AVI) and state-based, pre-clear and bypass reader technology. The study estimated that for an "average" weigh station state, with ten percent of the trucks AVI-equipped, there would be a break-even of net present benefit/cost in that state.

Excerpts from this study's findings are shown in Table 3-1. Using various AVI participation rates, benefits start to accrue. For example, if fifteen percent participate, the study estimated a net present benefit of 9.25 million dollars, and with thirty percent participation, the benefit is estimated at 28.75 million dollars in that average state. It should be noted that this study estimated significant additional costs for those non-AVI equipped motor carriers.<sup>10</sup>

**Table 3-1 Net Present Costs and Benefits (In Thousands of Dollars)**

	A.V.I. PARTICIPATION RATE			
	10%	15%	20%	30%
FOR TYPICAL STATE				
Benefits	\$3,617	\$4,113	\$4,608	\$5,564
Costs	\$3,377	\$3,377	\$3,377	\$3,377
Net	\$ 240	\$ 736	\$1,231	\$2,187
FOR AVI MOTOR CARRIERS				
Benefits	\$17,680	\$26,520	\$35,360	\$53,041
Costs	\$ 1,227	\$ 1,840	\$ 2,454	\$ 3,681
Net	\$16,453	\$24,680	\$32,906	\$49,360
FOR NON - AVI MOTOR CARRIERS				
Benefits	\$ 847	\$ 4,284	\$ 5,990	\$ 7,024
Costs	\$17,534	\$20,447	\$23,580	\$29,820
Net	(\$16,687)	(\$16,163)	(\$17,590)	(\$22,796)
NET PRESENT VALUE	\$ 6	\$ 9,253	\$16,547	\$28,751

Source: N.C.H.R.P. Report No. 303.

The Office of the Secretary of Transportation has recently developed a rough estimate of compliance cost based on the 1975 FHWA study noted above.<sup>11</sup> The study estimates a cost per vehicle per state, in terms of private carriers, exempt carriers, and regulated Class 3 and

Classes 1 and 2 together. Adjusted for inflation, the 1990 interstate "burden" (cost) is estimated to be between 1.10 billion and 3.32 billion dollars annually.<sup>12</sup>

The study does not assume automated or electronic (IVHS - CVO) applications in deriving costs. Using industry segment-specific per-truck compliance costs, it hypothesizes that either 10, 20, or 30 states opt-in to the concept of total reciprocity, and this is how the range of values is derived (1.10 to 3.32 billion dollars). The study has not been published.<sup>13</sup>

There have been estimates of the benefits (cost savings) which may result from provisions of various versions of the Intermodal Surface Transportation Efficiency Act of 1991<sup>14</sup> which requires all states to participate in the International Fuel Tax Agreement and to participate in a base-state registration plan for truckers. Although the legislation does not require any automated or intelligent vehicle-highway components, "(t)hose provisions . . . could save truckers more than one billion dollars per year in complying with state highway tax laws."<sup>15</sup>

The previous estimates of compliance costs, though helpful, are found to be very general in nature. They may lack a research-based specificity. In an effort to move toward a cursory estimate of the actual extent of compliance cost which motor carriers face, this study examined financial and operating information from four carriers, and based on these case studies, has arrived at some tentative conclusions about compliance costs, as presented in the following section.

## **MOTOR CARRIER COMPLIANCE COST SURVEY**

Due to the importance of the compliance cost issue as an implementation opportunity for IVHS - CVO, and the lack of data on actual compliance costs, the research team worked closely with four motor carriers to develop general estimates of five areas of compliance cost for each of the four sample carriers. The five areas of compliance cost include:

- Weight regulation and enforcement
- Safety regulation and enforcement
- Licenses, permits, and registrations
- Apportioned fuel tax collection and auditing
- Toll payments

The participating motor carrier firms were selected to represent the widest variety possible of for-hire motor carriers. The carriers include truckload and less-than truckload firms, as well as interstate and intrastate operations. The respondent carriers have 1,752 tractors

and 3,110 trailers in service. They employ 1,880 company drivers and 247 owner-operators. Three carriers reported results for the calendar year ended December 31, 1990, and one for the calendar year ended December 31, 1989.

The compliance cost survey instrument may be found in Appendix C. The survey instrument was pre-tested with one motor carrier, and revised accordingly. The chief executive officer of each carrier approved their firm's participation in the survey. The questionnaire is constructed so that the carrier could disassemble the questionnaire into five parts and have it filled out by the appropriate department head(s). The survey data are not reported in any particular order, and all company data are kept strictly confidential.

**Weight Regulation and Enforcement.** All carriers report compliance costs related to weight regulation and enforcement, although the carriers differed markedly in their experiences of time spent at weight stations, and the resulting costs. The first carrier estimated the value of time spent at \$17,559\* per truck per year (\$476 for driver time per year; plus \$17,083 per tractor-trailer per year). The second carrier estimated the value of time lost at \$10,983 per truck per year (\$3,400/driver per year; plus \$7,583 per tractor-trailer per year). The third carrier estimated the value of time lost at \$688 per truck per year (\$104/driver per year; plus \$584/tractor-trailer per year). The fourth carrier estimated the value of time lost at \$1,958 per truck per year (\$1,659/driver per year; plus \$299 per tractor-trailer per year, not including mechanical wear and tear on equipment).

Carriers in this study were also concerned about the value of lost business which may occur from weigh scale delays and delays in obtaining appropriate state permits and overweight permits. However, a general estimate of the value of the business lost is not developed in this study.

Only one of the four carriers in this study reported any maintenance shop personnel costs related to weight regulation. This would include weighing vehicles and keeping necessary records.

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\* The carrier estimated an average of six weight or inspection stops per cross-country round-trip. Vehicle wear and tear was estimated at \$20 per stop. The researchers assume both numbers to be high, and therefore these two data elements will not be used in estimating industry-wide costs.

Additionally, driver training time related to vehicle weight regulation was estimated by the carriers as ranging between one-half and ten hours per year per driver. All carriers also reported incidental costs related to weight regulation and enforcement for telephone charges, postage, copying, and forms.

**Safety Regulation and Enforcement.** All carriers reported compliance costs related to safety regulation and enforcement, although the carriers differed markedly in their experiences of time spent at safety stations and the resulting estimated costs. All carriers required pre-trip vehicle inspections by either the driver or a shop person. All four carriers reported that the number of inspections they face has declined over the last 12 to 24 months. Slowing down and stopping at inspection stations, even when an inspection is not performed, is found to be a significant carrier cost area in terms of time spent.

The first carrier estimated the value of time lost at \$17,559 per truck per year (\$476 for driver time per year; plus \$17,083 per tractor-trailer per year). Another carrier estimated the value of driver time lost at safety inspections at \$769/driver per year, but did not estimate the value of the equipment time lost. The third carrier, an intrastate carriers, estimated the value of time lost at \$24/driver per year; plus an additional \$20 per inspection in lost time value of the equipment if the rig is actually pulled around for an inspection. The fourth carrier estimated the value of time lost at \$2,264 per truck per year (\$808 for driver time per year; plus \$1,456 per tractor-trailer per year). If the rig is actually pulled around for an inspection, there would be an additional driver and equipment cost of \$20.21 per truck per inspection for that carrier.

Carriers noted that there may be some lost business as a result of safety inspection delays, but it is believed to be very small or negligible for these four carriers. All four reported their belief that due to their safety record and equipment condition, their trucks are rarely required to go through a full inspection. Inspection delays may, however, constitute significant cost elements for other carriers.

Three of the four carriers in this study reported maintenance shop personnel costs related to safety regulation. This would include time to make annual inspections, handling stickers, and keeping necessary records in the shop. Cost estimates for shop time and the cost of training

shop personnel about safety regulation and stickers range from a few hundred dollars per year per company to about five thousand dollars per year per company.

Carriers all reported using clerical and administrative staff to track and maintain safety records. The responding carriers reported five full-time equivalent (FTE) clerical staff members for their companies, which comprise 1,752 tractors. Using the clerical wages reported, the survey finds an average compliance cost for clerical staff of \$56 per tractor per year for vehicle safety-related compliance in the shop areas.

Additionally, clerical staff training time related to vehicle safety regulation was reported by some carriers, as well as incidental costs related to safety regulation and enforcement for telephone charges, filing and storage costs for inspection reports, postage, copying, and forms. All of these training and incidental costs related to safety regulation were in a range from a few hundred dollars to over \$15,000 per carrier per year.

**Licenses, Permits and Registrations.** Among the five areas of compliance cost in this study (weight regulation, safety regulation, licenses, permits, and registrations, apportioned fuel tax, and toll payment) the clerical costs related to licenses, permits and registration appear to be more significant than in the other four areas. All carriers report compliance costs related to these credentials, although the carriers differed markedly in their estimate of, and experience with, the process of obtaining and managing truck credentials.

Carriers all reported using clerical and administrative staff to track and maintain credential records. The four carriers together reported 5.83 full-time equivalent (FTE) clerical staff members working on credentials for their companies, which comprise 1,752 tractors. Using the respective clerical wages and benefits costs reported by each of the four carriers, the survey finds an average compliance cost just for clerical staff of \$59.73 per tractor per year for licenses, permits, and registrations and related record keeping. It may be important to note that average clerical wages in Iowa may not represent wage levels in the U.S. as a whole.

Additionally, clerical staff training costs are also reported by three of the four carriers. Trainers, which are assumed to be in-house management personnel, are not included in the following estimate of training costs. Included in these costs are hourly wages and benefits of the clerical staff while in training. This clerical training cost for the 5.5 FTE staff members can be averaged over the tractor fleet, and is estimated at \$7.81 per tractor per year.



Long-distance telephone charges related to licenses, permits, and registrations were reported to be \$8,180 for the four carriers in the study. This comes to \$4.67 per tractor per year for long distance charges related to credentials compliance. Note that there were other long distance telephone charges reported for safety compliance and fuel tax issues.

The respondents also reported miscellaneous costs related to credentials compliance. These costs include postage, copying, wire charges, and fuel tax bonds. Costs of \$21,886 for the four carriers yield an average of \$12.49 per tractor per year for these miscellaneous costs related to credentials compliance. Total clerical cost for compliance costs related to licenses, permits and registration is \$84.79 per truck per year.

The first carrier estimated the value of driver time spent per year on licenses, permits, and registrations at about fifteen minutes per trip. This totals to about \$548,883 for the first carrier, or a weighted average of \$667 per tractor per year.<sup>b</sup> Added to this is \$72.50 per tractor-trailer per year for shop personnel training and sticker, card, and license plate inventory and placement.

The second carrier estimated the value of driver time spent per year on licenses, permits, and registrations at about thirty minutes per trip. This totals to about \$1,230,750 for the second carrier, or an average of \$2,250 per tractor per year. Added to this is \$443.51 per tractor-trailer per year for shop personnel training and sticker, card and license plate inventory and placement.

The third carrier (an intrastate carrier) reported no driver time spent on licenses, permits, and registrations. They did, however, report shop personnel time for training and placement and inventory of stickers, cards and license plates at \$18.03 per tractor-trailer per year.

The fourth carrier estimated the value of driver time spent per year on licenses, permits, and registrations at about thirty minutes per trip. This totals to \$499,500 for the fourth carrier, or an average of \$1,500 per tractor per year. Added to this is \$25.19 per tractor-trailer per year for shop personnel training and sticker, card, and license plate inventory and placement.

It is interesting to note that carriers must receive, inventory, distribute, affix, and record a significant number of credentials in or on each tractor. These include license plates,

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<sup>b</sup> It is assumed that all tractors are in service year round. We know that down-time for tractors is generally less than 5%.

registration stickers, fuel tax apportionment stickers, and cab cards. The four carriers in this study reported that their typical tractor had either 8, 30, 50, or 75 license plates, registration stickers, cab cards, and fuel tax stickers per year.

**Apportioned Fuel Tax Collection and Auditing.** Some compliance costs faced by carriers in the fuel tax area were reported in the previous section on licenses, permits, and registration. These costs included time to handle fuel tax stickers or long-distance telephone charges to resolve a dispute over a temporary permit. Additional compliance costs, however, for apportioned fuel tax collection and auditing are noted.

Carriers all reported using clerical and administrative staff to track fuel purchases as well as state-by-state fuel consumption and taxes due. The four carriers together reported 6.33 full-time equivalent (FTE) clerical staff members working on fuel tax matters for their companies, which comprise 1,752 tractors. Using the respective clerical wages and benefits costs reported by each of the four carriers, the survey finds an average compliance cost just for clerical staff of \$71.38 per tractor per year for fuel tax compliance cost. It may be important to note that average clerical wages in Iowa may not represent wage levels in the U.S. as a whole.

Additionally, clerical staff training costs are also reported by three of the four carriers. Trainers, which are assumed to be in-house management personnel, are not included in the following estimate of training costs. The estimate includes the for hourly wages and benefits for the clerical staff while in training. This clerical training cost for the 6.33 FTE staff members can be averaged over the tractor fleet, and is estimated at between 35¢ and 83¢ per tractor per year.<sup>°</sup>

Other miscellaneous compliance costs in the area of apportioned fuel tax were estimated at \$1.34 per tractor per year, across all four carriers. They include long distance charges, postage, copying, and audit costs.

The first carrier estimated the value of driver time spent per year on licenses, permits, and registrations at about fifteen minutes per trip. This totals to about \$548,883 for the first

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<sup>°</sup> This range (35¢ to 83¢) was developed with data from two carriers only. These costs are in addition to other clerical training costs reported elsewhere, for instance in the previous credentials section.

carrier, or a weighted average of \$667 per tractor per year.<sup>d</sup> Added to this is \$72.50 per tractor-trailer per year for shop personnel training and sticker, card, and license plate inventory and placement.

The second carrier estimated the value of driver time spent per year on licenses, permits, and registrations at about thirty minutes per trip. This totals to about \$1,230,750 for the second carrier, or an average of \$2,250 per tractor per year. Added to this is \$443.51 per tractor-trailer per year for shop personnel training and sticker, card and license plate inventory and placement.

The third carrier estimated the value of driver time spent per year on licenses, permits, and registrations at about three minutes per trip. This totals to about \$7,656 for the third carrier, or an average of \$156 per tractor per year.

The fourth carrier estimated the value of driver time spent per year on licenses, permits, and registrations at about three minutes per trip. This totals to \$55,278 for the fourth carrier, or an average of \$166 per tractor per year. Added to this is \$7.51 per tractor-trailer per year for shop personnel training and sticker, card, and license plate inventory and placement.

**Toll Payments.** Three of the four participating carriers pay tolls in their carrier operations. Accounting, record keeping, and cash disbursement requirements present areas of compliance cost for those carriers who operate over toll facilities. The participating carriers report that they pay tolls to either 4, 18, or 20 different toll authorities in the course of a year. The three carriers have assigned 2.5 FTE clerical staff to handle toll charges and related accounting. This is \$38.17 per tractor per year for clerical staff costs related to toll payment. Some very small costs of staff training and telephone charges are also reported.

Driver time related to toll payment is estimated to be either 1, 2, or 10 minutes per trip on average. One carrier estimated the value of driver time spent per year on toll payments at ten minutes per trip. This totals to about \$365,924 for the first carrier, or a weighted average of \$444.62 per tractor per year.

Additionally, the carrier estimated the value of equipment time lost at the toll collection points as ten minutes at \$100 per hour per rig. This is \$2,083 per tractor per year in equipment

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<sup>d</sup> It is assumed that all tractors are in service year round. We know that down-time for tractors is generally less than 5%.

time-value costs. Added to this is an estimated \$200 per tractor-trailer per year for the wear and tear on tractors and trailers resulting from slowing down and/or stopping at toll payment locations.

The second carrier estimated the value of driver time spent per year on toll payments at one minute per trip. This totals to about \$41,009 for the second carrier, or an average of \$74.97 per tractor per year.

Additionally, the carrier estimated the value of equipment time lost at the toll collection points as one minute at \$40 per hour per rig. This is \$139 per tractor per year in equipment time-value costs. Added to this is an estimated \$500 per tractor-trailer per year for the wear and tear on tractors and trailers resulting from slowing down and/or stopping at toll payment locations.

The third carrier estimated the value of driver time spent per year on toll payments at two minutes per trip. This totals to about \$33,617 for the third carrier, or an average of \$101 per tractor per year.

Additionally, the carrier estimated the value of equipment time lost at the toll collection points as two minutes at \$26 per hour per rig. This is \$182 per tractor per year in equipment time-value costs. The third carrier did not estimate costs for wear and tear on tractors and trailers resulting from slowing down and/or stopping at toll payment locations.

## **CONCLUSIONS FROM THE COMPLIANCE COST SURVEY**

Conclusions drawn from this research project are subject to the limitations of time and project scope. The compliance cost data are from case studies, and as such, are not statistically significant. They are drawn from four carriers out of a potential industry pool of over 50,000 carriers. Although the research team maintained strict methodological rigor throughout the survey research and case study processes, the data are not seen to represent "industry averages" or "carrier trends." The synthesis of the information and analysis should be viewed as a case study and indicative of the likely costs of compliance. Therefore, many of the conclusions are felt to be generalizable to motor carriers across the country. More importantly, the documented level of compliance cost does present a significant opportunity for various applications of IVHS - CVO.

Variability among data from the four motor carriers in the case study is important to note since specific or isolated conclusions based solely on one data element are difficult to justify. For example, Table 3-3 shows wage and benefit levels, with two job categories varying by more than 200 percent from one carrier to the next. Further extreme variation in the data can be seen on Table 3-4 with carriers estimating the time spent at various inspection and weigh stations. Some of this variation may be explained by differing perceptions, but some variation is real, since each carrier faces different labor costs, and travels along different highways at different times of the day. It should be noted that the time and delay variations in Table 3-4 are not explained by industry segment (i.e. intrastate or interstate carrier).

The variation in compliance cost data reported, along with a number of other highly variable data elements reported, yield a widely distributed set of total compliance costs, shown in Table 3-5. Compliance costs ranged from \$1,152 to \$39,321 per tractor per year. This variability in the data, and indeed in the underlying costs, makes the process of reaching conclusions, based solely on the data, very risky and difficult. The following conclusions, however, are believed to be supportable by the research presented here.

**Compliance costs in the office are relatively small.** The data reported from all four carriers confirm that clerical, administrative, and office costs, including staff time, copying, postage, filing, accounting, and telephone charges make up a only small portion of overall compliance costs for the carriers in this case study. Table 3-2 shows that these costs are roughly \$214 per tractor per year. Overall compliance costs, however, are estimated at \$12,000 per tractor per year for the purposes of this study (see Table 3-5). So these direct office costs make up just over two percent of total compliance costs. These office costs, however, do not include costs associated with top managers and/or owners who may deal with compliance issues. So, the office costs estimate is somewhat conservative. In any event, office costs appear to comprise only a very small portion of total compliance costs when compared to driver and equipment costs and delays on the road and in the shop.

Table 3-3 shows the reported estimated wage and benefit levels for the four carriers participating in this survey. These results are presented so that comparisons of these case studies to other fleets or national statistics may be tempered by considerations of the prevailing wage

**Table 3-2 Clerical & Office Compliance Costs Reported**

	<u>Cost Per Tractor Per Year</u>
Licenses, permits, registrations	\$84.70
Fuel Tax Apportionment	\$73.07
Safety & CVSA matters	\$56.24
Tolls payment	Very small amounts
<u>Weight Regulation</u>	<u>None reported</u>
Total Clerical & Office Costs	\$214.01

levels in Iowa. Also, these personnel costs point out significant differences underlying the respective administrative cost structures of the four case study carriers. Even taking these differences into account, office costs remain a very small portion of overall compliance cost.

**Table 3-3 Annual Wage and Benefit Levels**

	<u>Clerical</u>	<u>Drivers</u>	<u>Shop</u>
Carrier A	\$15,000	\$30,000	\$31,200
Carrier B	\$34,000	\$45,000	\$41,000
Carrier C	\$35,000	\$25,000	\$22,500
<u>Carrier D</u>	<u>\$18,000</u>	<u>\$30,000</u>	<u>\$20,000</u>
Average	\$25,500	\$32,500	\$28,675

**High costs found in roadside delays and stops.** The major contributor to compliance cost appears to be delay time, or simply the time spent on weight regulation, safety regulation, checking licenses, permits, registrations and apportioned fuel tax requirements, and paying tolls. This time value has been calculated and summed for drivers, shop personnel, and equipment (tractor/trailer). It includes time for the activity itself, any queue delays, and transit time required to slow a vehicle and then to accelerate back to highway speeds where necessary. Table 3-4 reports the findings of the case studies on delay times experienced. Again, significant variation in the delays experienced by the four carriers is found. The final compliance costs reported in Table 3-4 do include a few other time-value factors (such as shop and office time).

Overall, roadside stops and delays (and related pre-trip activities) account for well over ninety percent of the compliance costs discussed in this study. This figure includes the driver cost, and the time value of the tractor and trailer.

**Table 3-4 Delay Times Estimated by Carriers (Minutes per trip per rig)**

	Carrier			
	1	2	3	4
Weigh Stations	10	40	2	3
Roadside Safety Screening	10	10	$\frac{1}{2}$	5
Safety Inspections	10	10	20	30
Fuel Tax Mileage Reporting	15	30	3	3
Toll Stations	10	1	0	2

**Carriers are uncertain of some of their economic costs.** Working through the research process with motor carriers, it is found that the majority of the carriers are very familiar with their costs as expressed in accounting or financial terms. They quickly and easily cite costs for tangible, cash-based items. For example, the carriers are very knowledgeable of the costs of equipment, fuel, repair parts and services, and other items and services that they commonly purchase. Carriers, however, have not studied their own economic cost structure, since this may be a time-consuming and costly exercise. For example, they may be unaware of the incremental profit or cost associated with a particular load or trip, or, what is more germane to this study, the incremental cost implications of an additional stop at a weigh station. All carriers, however, expressed an interest in knowing the full economic costs inherent in each aspect of their operation.

For example, the carriers placed a time value on a typical tractor-trailer unit at either \$26, \$40, \$60, or \$100 respectively per hour per rig. These estimates were obtained, in part, by amortizing out the cost of new equipment. Carriers also subtracted out the driver compensation from typical fully-loaded freight rate charged, on a per-hour basis, and carriers used depreciation schedules to arrive at these figures. All these methods are acceptable, but none of these methods alone or together yields a complete picture of economic cost for the carrier. It should be noted that although there was some difficulty in arriving at economic costs, the carriers all have a very keen intuitive knowledge about their economic costs.

**Intrastate vs. Interstate Carriers.** The findings do not suggest a great difference in overall compliance cost between those carriers primarily involved in intrastate carriage as

compared to those involved in interstate carriage. Since many carriers today have intrastate as well as interstate authority, the industry segments have become blurred.

The evidence, however, does suggest that the purely intrastate trips are subject to far less delay and time spent for roadside regulatory stops. They run over highways and roads with few or no permanent weight or inspection stations. Intrastate (home at night) trips are preferred by drivers, and these drivers were found to have longer service careers, and higher compensation levels, than (high turn-over) long-haul drivers. Also, intrastate carriers in Iowa will pay no tolls. But compliance with toll payment procedures was a very small cost component even for an interstate carrier who deals with twenty toll authorities. On the whole, aggregate differences in total compliance cost are not attributable to intrastate vs. interstate carriage.

**Implications for IVHS - CVO.** The research results give strong encouragement to those who would implement intelligent vehicle-highway systems capable of reducing time spent, delay, and congestion at credentials checks, weigh stations, and inspection stations. Clearly, these are critical areas in terms of reducing the economic costs of compliance for motor carriers. Also note, the case study presented herein does not address and add in the benefits to society (pavement condition, highway safety, greater levels of compliance) which may occur in addition to the possible compliance cost reductions for the carriers.

The goal of "One-stop Shopping" for licenses, permits, registrations, and authorities will lead to cost reductions for clerical staff. But, given that clerical costs are a minor portion of total compliance costs, "One-stop Shopping" does not lead to major cost reductions for the industry as a whole, in the context of the much larger "roadside" costs. Some carriers and some segments will see compliance cost reductions from "One-stop Shopping," but on the whole, carrier cost is just not in this area, according to this study. This is not to say, however, that the (public-sector) benefits do not warrant the creation of "One-stop Shopping."

Significant savings may accrue to state-level transportation and administration agencies which are able to implement a "One-stop Shopping" concept in their state and with a number of other states. These savings should ultimately have a positive effect on the carriers operating in those states. But the major benefits will be for the states and thus for the (fuel) taxpayers. Therefore, the most carrier cost-effective CVO development plans would focus on efforts to



eliminate roadside stops, delays, and time spent by drivers and tractor-trailers on regulatory matters relating to weight, safety, credentials, and tolls compliance.

**Compliance cost on a national scale.** Since a major benefit of any IVHS - CVO implementation would be reduced compliance costs for motor carriers across the U.S., the research team has taken the results of the four case studies and extrapolated them to the national scale. This study finds an estimated national compliance cost for the areas included in this study to be roughly \$6.4 billion. This assumes that our results roughly represent the industry as a whole, and this may be a faulty assumption. The scope of this study did not allow for a more extensive treatment of the national cost of compliance.

The method used to arrive at the \$6.4 billion figure is shown in Table 3-5. The U.S. Department of Commerce estimates that in 1987, there were 534,900 heavy duty trucks operating in for-hire carriage.<sup>e</sup> The Department of Commerce also reports that there were 796,100 light, medium, and heavy duty trucks in use, although many of these trucks are in private fleet operation.<sup>f</sup> Also, many of the carriers in this second category of trucks do not exhibit cost structures similar to the four carriers which participated in this study of compliance cost. Therefore, for the purposes of our study, the (1987) fleet inventory number of 534,900 heavy duty trucks in for-hire operation is used.<sup>16</sup>

It should be noted that a certain percentage of these compliance costs would probably not be eliminated due to automation of certain regulatory and enforcement processes, or due to changes in underlying law and rules. For example, drivers will still need to conduct pre-trip inspections, and even if permits, registration and authorities are secured electronically through a base state, the transaction will still possess an associated cost. Speculation about the percentage reduction in compliance costs that could be achieved from any given CVO initiative is beyond the scope of this study.

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<sup>e</sup> This is defined as "those vehicles operated by a company whose primary business is to provide transportation services, carrying freight belonging to others."

<sup>f</sup> This includes an expanded group of pick-up trucks, dump trucks, sanitation trucks, utility company trucks, wreckers, and beverage trucks, as well as semitractor-trailer vans, "reefers", livestock trucks, and flatbed trucks.

**Table 3-5 Total Compliance Costs Reported (Per tractor per year)**

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Carrier A	\$39,321
Carrier B	\$17,598
Carrier C	\$1,152
Carrier D	\$6,449
Cost Figure Used	\$12,000
Tractors in U.S.	534,900
<b>Estimated U.S. Compliance Cost</b>	<b>\$6.4 billion</b>

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Users of this national compliance cost estimate are cautioned to temper their use of the estimate with the knowledge that it is based on a very small sample of the trucking industry and represents only the types of business operated by the participants. The resulting estimate may have been very different if these businesses had operated in different traffic lanes, been domiciled in other states, or provided different types of services. As result, the analysis should be viewed as a case study of four motor carriers, and national estimates of industry aggregates are highly speculative.

## ENDNOTES

1. Federal Highway Administration, Automated Traffic/Truck Weight Monitoring Equipment (Weigh-in-Motion), Washington: USGPO, March 1990, p. 19-20. (Report #FHWA-DP-90-076-002).
2. Interview regarding demonstrations under way at the American Trucking Associations, October 29, 1991.
3. Interview with Mr. Mike Petrick, Center for Urban Transportation Research, University of South Florida, Tampa, November 4, 1991.
4. Time savings noted by Mr. Douglas McKelvey, FHWA, January 1992.

5. Hutchinson, B., B. Sanders, and W. Glauz, Effects of Current State Licensing, Permit and Fee Requirements on Motor Trucks involved in Interstate Commerce, Washington: USGPO, April 1975. (Report No. FHWA RD-75-40).
6. Interview, October 31, 1991, with Mr. Ray Weil, Office of Policy, Federal Highway Administration, Washington.
7. See: Public Law 96-296 (July 1, 1980).
8. 94 Stat. 811, Sec. 19. "Uniform State Regulation". (July 1, 1980).
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11. Hutchinson, B., B. Sanders, and W. Glauz, Effects of Current State Licensing, Permit and Fee Requirements on Motor Trucks involved in Interstate Commerce, Washington: USGPO, April 1975. (Report No. FHWA RD-75-40).
12. Unpublished notes from Mr. Edward Rastatter, Chief of Regulatory Review and Planning, U.S. D.O.T., Washington, 1990.
13. Interview with Mr. Edward Rastatter, Chief of Regulatory Review and Planning, U.S. D.O.T., Washington, October 31, 1991.
14. See: House File 3566 (Substitute for House File 2950 which passed out of committee). Had not become law at the time of this writing, October, 1991.
15. "Veto Threat Unlikely to Hamper Highway Bill," Journal of Commerce, October 24, 1991, p. 3B.
16. U.S. Department of Commerce, 1987 Census of Transportation: Truck Inventory and Use Survey, USGPO: Washington, 1987, Report No. TC-87-T-52, pp. 8, 13, 23.



## **CHAPTER IV**

# **INSTITUTIONAL BARRIERS AND OPPORTUNITIES**

This project is designed to investigate the institutional and policy barriers to, and opportunities for, implementation of various IVHS - CVO technologies, with the State of Iowa used as the case study. However, Iowa may not be typical of a number of other states in terms of its motor carrier regulatory framework and administrative procedures. The purpose of this chapter is to describe the principal institutional barriers and opportunities found in the literature and through discussions with carriers and regulators. Any implementation plan must recognize these barriers and opportunities so that pitfalls are avoided, resources are not misdirected, and industry acceptance of the planned CVO systems is high.

### **IDENTIFICATION OF INSTITUTIONAL BARRIERS**

Initially, this study set out to examine twelve broad institutional issue areas, listed below. From a brief review of the literature, these issues seemed to make up the bulk of the obstacles to successful IVHS - CVO implementation. The initial institutional issues are:

#### Initial Institutional Issues

1. Changes to state and federal law
2. Changes to administrative rules and regulations
3. Changes in state and local government departmental policies
4. Motor carrier productivity and efficiency enhancement
5. Liability-shifting effects
6. Effects on transport market and industry structures
7. Effects on inter-jurisdictional cooperation, interstate operating authority, and interstate data exchange policies
8. Potential for regulatory efficiencies
9. Implications for organizational design and behavior
10. Data privacy issues
11. Rate and level of technological adoption expected
12. Implementation cost for governments and motor carriers

A number of these initial institutional issues have actually proven to be non-issues for the initial phases of the recommended CVO systems outlined in Chapter VI. Obstacles which proved to be less severe than expected included the liability-shifting issue, initial issue 5, since

no strategies which alter or remove any element of driver control are proposed herein. Changes to state law and regulation, original issues 1 through 3, though numerous, are not seen to be major impediments.

On the other hand, the possibility for inter-jurisdictional cooperation, initial issue 7, is viewed to be a very difficult obstacle, with states' rights, local initiatives, and widely varying practices among the several states. Data privacy, original issue 10, seems to be more important than expected, since carriers will seek to protect proprietary and competition-sensitive information from other carriers. This may, in turn, limit the kinds of data that carriers are willing to provide to any data base.

There are also important implications for organizational behavior, initial institutional issue 9. Traditionally, carriers and the agencies which regulate them have had a somewhat adversarial relationship. This has been a common response to government regulation of industry, not just in the transportation field. It seems that the lack of cooperation, communication, and harmony in the past may be clouding today's discussion of CVO applications. This "cloudiness" is itself an institutional barrier. A greater level of trust and confidence needs to be established between the industry and the government agencies.

It should be noted that "IVHS America" is a partnership between government, industry, and academia. It has an excellent operational system of cooperative committees, especially in the commercial vehicle operations area. This forum, IVHS America, may provide an important mechanism through which this adversarial relationship may be improved.

Additionally, several other institutional barriers and opportunities became apparent during meetings with motor carriers and the Iowa Department of Transportation. These added institutional issues are listed below.

#### Additional Institutional Issues

13. Importance of equipment compatibility with rail, ocean shipping, and intermodal AVI and AVL systems
14. The possibility of toll tags which also serve as all-purpose AVI
15. The difficulty in developing profitable public-private partnerships
16. Although the development of uniform technical standards is crucial, it appears to be under way
17. Need for special anti-trust treatment of some IVHS joint ventures
18. Development of protection for intellectual property rights of public employees
19. The availability and cost of additional satellite channels, if needed

20. Lack of technical expertise in some public agencies
21. Flexibility in allocation of motor fuel tax funds for IVHS projects
22. Development of projected cost and supply functions for IVHS equipment
23. Risk-sharing among public agencies or manufacturers
24. Government and Industry need to develop realistic tolerances for WIM scales

Representatives of industry and government who participated in this project agreed that the most significant barriers on this list include:

- The development of compatible systems, additional institutional issue 13.
- The need for flexibility in allocation of funds to IVHS, additional institutional issue 21.
- The lack of technical expertise in some public agencies is seen as very important, additional institutional issue 20.

The industry and government representatives recommend a balanced and slow approach in dismantling institutional barriers to IVHS - CVO. This could be accomplished by implementing those applications of the technology which are relatively non-threatening to both the carriers and state agencies with responsibilities for administering state relations with motor carriers. Then, estimate the true benefits and costs of various applications. Introduce flexibility into the laws and regulations to permit electronic applications, but continue to allow manual systems if carriers so choose. This will provide a market-like mechanism for the carriers' choice between alternatives.

An important and on-going analysis of institutional issues in commercial vehicle operation is being conducted through the committee structure of IVHS America. Their Institutional/Standards Subcommittee(s) have identified a number of institutional and standards issues achieve the IVHS - CVO function noted, as shown below:

- Transparent borders, including;
  - Uniform forms for registration and fuel taxes
  - Working system of vehicle identification
  - Eliminate duplication of interstate regulation
  - Standardized procedures in motor vehicle offices
  - Data needs/format/definition for records on each truck
  - Electronic specifications/communications/access
  - Procedures for auditing electronic logs
  - Specifications for on-board equipment
  - Compatible AVI equipment

■ Commercial driver and vehicle safety issues;

- Uniform driver licensing forms
- Standardized procedures
- Electronic system needs/specifications
- Compatible equipment specifications
- AVI standards<sup>1</sup>

In discussions, however, with a number of Midwestern motor carriers and the Iowa Department of Transportation, some CVO applications, for example, electronic log books, were seen to present very significant implementation barriers. These obstacles include high implementation costs, data privacy and personal privacy questions, inability to ensure 100 percent reliability of some devices, legal and commercial implications of system failures, legal challenges to various potential regulatory and enforcement techniques, and a difficulty in setting administrative and legal tolerances for weight and operating practices. The researchers in this study were able to narrow down all possible CVO applications to five of the "most promising" applications, based in large measure on the presence or absence of a significant level of institutional barriers.

Carriers and regulatory agencies are concerned with different institutional barriers and opportunities. It is clear that both motor carriers and state agencies were found to anticipate benefits from IVHS - CVO. Motor carriers will evaluate and adopt these technologies based on the potential of each technology for carrier productivity gains, greater customer satisfaction, economic efficiency, higher levels of equipment utilization, and lower compliance costs. Transportation (and regulatory) agencies will evaluate the technologies with an eye toward improved traffic management and reduced congestion, increased levels of infrastructure utilization, reduced regulatory costs, elimination of duplicate administrative functions, increased levels of compliance, and greater highway safety.

One important institutional opportunity for CVO is that the state-level motor carrier regulatory functions have become complex, with a small state such as Iowa issuing a multiplicity of permits and licenses to ever-growing numbers of vehicles. The State of Iowa, through the Motor Vehicle Division of the Department of Transportation, issues a number of different licenses and permits. They are shown in Table 4-1.<sup>2</sup> Issuance and record-keeping for all of



these licenses and permits is an ideal candidate for IVHS - CVO automation. Laws, administrative rules, and agency procedures, however, must be changed to accommodate automated systems. Once a state has developed a consensus that changes to its administrative rules are necessary, effecting those changes may be seen as a fairly mechanical process. At the federal level, however, due to the dispersion of political authority and the widely differing agency goals, administrative rule-making - though still a mechanical process - may prove to be much more difficult than state-level procedures.

**Table 4-1 Permits Issued by the Iowa Department of Transportation**

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1. Towing Permit  
\$2
  2. International Registration Plan  
\$1,700 deposit, fee varies based on weight & vehicle type
  3. Public Conveyance and Necessity Certificate  
\$5, \$10, or \$15 per vehicle, + \$50 handling fee
  4. Special Mobile Equipment Certificate  
\$15
  5. Interstate Commerce Commission Registration  
\$1 per stamp per power unit + \$25 one-time fee
  6. Single Trip Permit  
\$10
  7. Soil Conservation Trailer  
\$100
  8. Truck Operator Permit  
\$5 or \$10
  9. All Systems Permit (oversize)  
\$120
  10. Contract Carrier Permit  
5 or \$10
  11. Exempt Registration  
\$1 per stamp per power unit + \$25 one-time fee
- 

Institutional barriers are evident within the federal government. For instance, at a Congressional hearing on the collection and refund process for federal diesel fuel excise taxes from exempt users, the Internal Revenue Service refused to appear upon invitation from the Congressional body holding the hearings, the House Committee on Small Business. Based on

this refusal to appear, Members of Congress had to submit written questions to the IRS about its intended fuel tax collection procedures.<sup>3</sup> This obvious lack of cooperation on fuel tax collection among agencies constitutes another institutional barrier.

State actions which impede trade or commerce among the states are considered to be unconstitutional under the so-called "Commerce Clause" of the U.S. Constitution.<sup>4</sup> For instance, Pennsylvania's flat per-truck axle taxes and fuel decal taxes were recently ruled unconstitutional by the Pennsylvania Supreme Court based on an earlier U.S. Supreme Court decision, since the Pennsylvania taxes tended to favor in-state truckers on a cost per-mile basis.<sup>5</sup> These decisions further illustrate the fairness problems which may result from various state regulations on motor carriers.

Development of communications and technical standards for AVI tags and allied readers and transponders may present another obstacle to implementation of IVHS - CVO. A good deal of controversy has surrounded the development and selection of technical standards to be used in AVI equipment in the Crescent demonstration project, for example. Two competing specifications, one from Vapor Canada Incorporated, and one from Amtech Systems Corporation have been proposed. Several thousand transponders from Vapor Canada are now in use.<sup>6</sup>

Organizations such as the Institute of Electrical and Electronic Engineers, the Society of Automotive Engineers, and the Society of Automotive Manufacturers are working to develop technical standards for various IVHS components. These standards may or may not yield uniform, compatible national standards which are suitable for adoption as ANSI (American National Standards Institute) standards. But clearly, a compatible and open specification is desirable. This issue illustrates the need for more robust international standards-setting procedure(s) and/or institution(s). For the purposes of this report, however, the lack of uniform standards is considered to be a technical barrier, not an institutional barrier per se.

## STATE LAWS AND RULES

A number of state laws and regulations may need to be addressed in the course of IVHS - CVO implementation. The research team, however, does not believe that they present

insurmountable obstacles. Most of the changes which may be required are typical of administrative functions which progress from the era of manual processing to the era of computers and electronic communications.

Clearly more significant than changes to laws and rules will be the state legislatures' abilities to enact interstate compacts and pass enabling legislation which allow regulatory applications such as "One-stop Shopping" and multi-jurisdictional permits.

In Iowa, as in all states, a number of changes to law (Code of Iowa) and to administrative rules (Iowa Administrative Code) and to agency policies ("Policies and Procedures Manual") would be required to implement various automated and electronic applications of IVHS in commercial vehicle operations. A review of the Code and the Administrative Code and the "Procedures Manual" was conducted in mid-1991. Research revealed some thirty-nine instances in the law and seventy-five instances in the rules and twelve instances in the procedures where electronic or automated processing methods may violate current law or rules.\* Table 4-2 categorizes the instances in the law or rules which may not permit electronic or automated truck-related regulation and processing.

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\* Some policy-makers in the Iowa Department of Transportation hold that there is generally a permissive intent in the law and rules, and that interpretations which permit electronic and/or automated processing would probably be forthcoming in Iowa. The research team has not taken a position on whether permissive interpretations would be sufficient, or if actual changes to law and rules would need to be made.

**Table 4-2 Laws and Rules Which May Not Allow Electronic/Automated Applications**

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Type of Problem	Code of Iowa	Iowa Administrative Code
Written communication required, original or typewritten copy	10	23
Item must be carried in truck or with driver	14	18
Prescribed form or card must be used or filed	9	16
Documents must be signed	3	4
Non-automated technical or measurement devices are specified	0	6
Items must be mailed or postmarked	2	3
Confidentiality for written records	0	4
Document must have a seal	1	1
Total Instances	39	75

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CODE OF IOWA<sup>7</sup>

- §321        Motor Vehicles and the Law of the Road  
             pp. 2380-2498
- §321C       Interstate Driver License Compacts  
             pp. 2510-2521
- §321D       Interstate Vehicle Equipment Compacts
- §321E       Moving Vehicles of Excess Size and Weight
- §321K       Vehicle Roadblocks  
             pp. 2547-2548
- §324        Motor Fuel Tax Law  
             pp. 2579-2588  
             pp. 2591-2601  
             pp. 2602-2606
- §326        Motor Vehicle Registration  
             Also, Reciprocity, Liquid Transport Carriers, Supervision of Carriers  
             pp. 2608-2628
- §327D       Moving Livestock  
Ch 102      pp. 2636-2638

## CODE OF IOWA

### **§321**

#### **MOTOR VEHICLES AND THE LAW OF THE ROAD**

- §321.20      **Application for registration and certificate of title**  
Paragraph 1.  
Registration application signed "owner's signature written with pen and ink..."
- §321.24      **Issuance of registration and certificate of title**  
Paragraph 5.  
"The certificate shall bear the seal of the county treasurer, the deputy county treasurer, or the department director or deputy designee."
- §321.24      **Issuance of registration and certificate of title**  
Paragraph 5.  
"The owner shall sign the certificate of title in the space provided with pen and ink ..."
- §321.25      **Application for registration and title - cards attached**  
Paragraph 2.  
"Only cards furnished by the Department shall be used..."
- §321.32      **Registration cards signed, carried, and exhibited**  
Paragraph 1.  
"...shall write the owner's signature thereon with pen and ink in the space provided."
- §321.32      **Registration cards signed, carried, and exhibited**  
Paragraph 1.  
"Every such registration card shall at all times be carried in the vehicle..."

- §321.42      **Lost or damaged certificate cards and plates**  
Paragraph 2.  
"...the owner or lienholder shall apply for a certified copy of the original certificate of title..."
- §321.46      **New title and registration upon transfer of ownership - credit**  
Paragraph 5.  
"The seller or transferor may file an affidavit on forms prescribed and provided by the department..."
- §321.105     **Annual fee required**  
Paragraph 2.  
"...request that the plates..."
- §321.105     **Annual fee required**  
Paragraph 2.  
"...be mailed to owner's post-office address."
- §321E.10     **Truck trailers manufactured in Iowa**  
Paragraph 2.  
"Permits issued under the provisions of this section shall be in writing and shall be carried in the cabs of the vehicles..."
- §321K.1      **Roadblocks conducted by law enforcement agencies**  
Paragraphs 1(a) - (d).  
"...conducted to enforce compliance with...licensing...registration..."

**§324**  
**MOTOR FUEL TAX LAW**

- §324.12      **Loading and delivery evidence on transportation equipment**  
Paragraph 1.  
"...a serially numbered manifest...which shall have the following information...in the forms prescribed..."
- §324.13      **Evidence produced upon request**  
Paragraph 1.  
"...produce and offer for inspection the manifest of loading and delivery, invoices pertaining to the load and trip...payment of the motor fuel tax..."
- §324.18      **Refund permit**  
Paragraph 1.  
"A person shall not claim refund under this section until a person has obtained a refund permit from the department."
- §324.53      **Permit**  
Paragraph 7.  
"...carry in or on the vehicle a duplicate evidence of the fuel permit..."
- §324.54      **Fuel tax computation - refund - reporting and payment**  
Paragraph 4  
"...a quarterly (fuel tax) report on forms prescribed by the state..."
- §324.60      **Forms of report, refund claim, and records**  
Paragraphs 1.  
"...may prescribe forms of record to be kept by motor fuel distributors, motor fuel dealers, motor fuel carriers, special fuel dealers, special fuel users, and interstate commercial motor vehicle operators."
- §324.60      **Forms of report, refund claim, and records**  
Paragraphs 2.  
"...prescribed form."



- §324.61      **Timely filing of reports - extension**  
Paragraph 1.  
"...if postpaid, properly addressed and post-marked..."
- §324.70      **Discontinuance of licensed activity - liability for taxes and penalties**  
Paragraph 1.  
"...shall forward notice (of cessation of business) ... in writing..."
- §324.74      **Unlawful acts - penalty**  
Section 4.  
"... (not) alter any invoice, sales ticket..."
- §324.75      **Penalty for false certificate - place of trial**  
Paragraph 1.  
"...false certificate, false fuel receipt, false fuel sales ticket..."
- §324.80      **Microfilm or photographic copies - originals destroyed**  
Paragraph 1.  
"...reproduce and ... destroy (the motor fuels tax forms) originals..."
- §324.85      **Tax payment for stored motor fuel, gasohol, and special fuel - penalty**  
Section 1.  
"... (must) report that gallonage on forms provided by the department..."

**§325**  
**MOTOR VEHICLE CERTIFICATED CARRIERS**

**§325.12      Application for certificate**

Paragraph 1.

"All applications shall be in writing..."

**§325.26      Liability insurance, bond, financial responsibility, or proof of solvency and ability to pay**

Paragraph 1.

"...applicant has filed with the department an insurance policy, surety bond, or certificate of insurance, in form approved by the department, issued by an insurer..."

**§325.31      Distinctive markings on vehicle**

Paragraph 1.

"There shall be attached to each motor vehicle distinctive markings or tags prescribed by the department."

**§326**  
**MOTOR VEHICLE REGISTRATION RECIPROCITY**

- §326.14     **Plates and receipts**  
Paragraph 1.  
"The department shall issue registration plates and receipts pursuant to apportionment procedures or agreements..."
- §326.15     **Refunds of registration fees**  
Section 1.  
"...at the time of destruction or dismantling shall return the plates to the department and make a claim..."
- §326.17     **Iowa base plates**  
Paragraph 1.  
"...Iowa base plates shall be displayed on all such commercial vehicles."
- §326.22     **Operational laws of Iowa applicable**  
Paragraph 1.  
"The registration number plates, stickers, or other identification assigned and furnished to any vehicle...shall be displayed on the vehicle..."
- §326.45     **Issuance - title obligation**  
Paragraph 1.  
"...send the certificate of title to the vehicle owner..."

**§327**  
**MOTOR VEHICLE TRUCK OPERATORS**

- §327.15      **Insurance or bond**  
Paragraph 1.  
"...have filed with the department an insurance policy, policies, surety bond, or certificate of insurance in form to be approved by department
- §327.19      **Required marking**  
Paragraph 1.  
"There shall be attached to each motor truck distinctive markings or tags as shall be prescribed by the department."
- §327A.2      **Certificate required**  
Paragraph 1.  
"The carrier shall obtain from the department a certificate declaring that public convenience and necessity require such operation."
- §327A.14      **Prior service - rights transferred or assigned**  
Paragraph 2.  
"When an application for sale, lease, transfer, assignment, consolidation, merger, or acquisition (of a liquid transport carrier)...the department of transportation may enter an order approving and authorizing..."
- §327B.1      **Authority secured and registered**  
Paragraph 3.  
"Upon registration, the state department of transportation shall...issue annually a decal or sticker bearing the registration number..."
- §327B.1      **Authority secured and registered**  
Paragraph 4.  
"...department of transportation...shall adopt rules...for the identification of vehicles operated under reciprocity agreements."

**IOWA ADMINISTRATIVE CODE<sup>8</sup>**

- §21    Ch. 85        Weights and Measures
- §567                Emissions  
                      Hazardous Materials carriers
- §661                Public Safety
- §701    Ch. 63-65    Taxation  
                      Registration, Automated Data Processing, Credits, Confidentiality, B-O-L,  
                      Manifests, Refunds, Reports, Licenses, Permits, Exemptions
- §761                Motor Carriers, Truck Operators  
                      Dimensions, Size, Equipment, Fuel Permits/stickers, Plates, License  
                      Applications, Receipts, Hazardous Materials, Highway Signs, Traffic  
                      Safety, Transportation Department
- §761    Ch. 4        D.O.T. Records
- §761    Ch. 160      Road Use Tax
- §761    Ch. 450      Motor Vehicle Equipment

## **IOWA ADMINISTRATIVE CODE**

### **§21**

## **AGRICULTURE AND LAND STEWARDSHIP**

### **Chpt. 85      Weights and Measures**

- 21-85.2(215)      "Platform scale defined"
- 21-85.3(215)      "For vehicle, axle-load, livestock, animal, crane and railway track scales"
- 21-85.11(2)(215)      "Electronic scales shall have..."
- 21-85.28(215)      "Wheel-load weighers and axle-load scales"

### **§567**

## **ENVIRONMENTAL PROTECTION**

### **Chpt. 100      Forms and Rules of Practice**

- 567-100.3(455B)      "...the application for solid waste management and disposal..."

### **Chpt. 141      Hazardous Waste**

- 567-141.4(455B)      "Standards applicable to transporters of hazardous waste...if discharged in Iowa...transporter shall notify local and state offices..."

### **Chpt. 149      Fees for Transportation, Treatment and Disposal of Hazardous Waste**

- 567-149.5(1)(455B)      "Form, manner, time and place of filing...Form 179...which is provided by the department..."
- 567-149.5(2)(455B)      "Form, manner, time and place of filing...shall present or mail the completed form..."

**§661**  
**DEPARTMENT OF PUBLIC SAFETY**

**Chpt. 25      Public Records and Fair Information Practices**

661-25.13(22)      "...types of departmental information and records that are confidential..."

**§701**  
**REVENUE AND FINANCE**

**Chpt. 63      Motor Fuel**

701-63.3(1)(324)      "Motor fuel distributor...file a monthly report...shall keep and preserve the following records..."

701-63.3(2)(324)      "Special fuel dealer-user-distributor...file a monthly report...shall keep and preserve the following records..."

701-63.3(6)(324)      "Microfilm and related record systems..."

701-63.3(7)(324)      "Automatic data processing records"

701-63.6(324)      "Timely filing of reports...postmarked...any report that is not signed...postmark on the envelope..."

701-63.12(324)      "Reports - records - variations...the department shall prescribe and furnish all forms..."

701-63.13(324)      "Form of Invoice...It must be prepared on paper..."

701-63.15(324)      "Original invoice retained by purchaser..."

701-64.5(1)(324)      "Tax reports - computations...must file a monthly report"

701-64.8(324)      "Refund to non-licensee - non-highway use or gasohol...submit the claim on a form provided by the department...the claim must be signed...the invoice must (be) original copy..."

- 701-64.17(324) "Terminal reports - records...must file monthly (with) the signature of the person..."
- 701-64.19(324) "Transportation reports...are to be filed by...common...or contract motor carriers..."
- 701-64.20(324) "Bill of lading or manifest requirements...have indicated thereon...have machine-printed thereon..."
- 701-65.13(324) "Exemption Certificates (Special Fuel)...an exemption certificate is to be completed...the original copy is to be retained..."

## §761 TRANSPORTATION

### **Chpt. 4     Public Records and Fair Information Practices**

- 761-4.9(5)(22) "Reports to the department, which if released, would give advantage to competitors and serve no public purpose (are confidential records)."
- 761-4.9(12)(22) "...the selection or handling of cases, such as operational tactics or allowable tolerances or criteria for the defense, prosecution, or settlement of cases, when disclosure of these statements would enable law violators to avoid detection...(are confidential records)"

(Note: The department has adopted the uniform rules on information practices. Those rules above are considered additions or exceptions to the uniform rules. See "Uniform Rules on Agency Procedure," which were accepted by the Governor on March 9, 1988, and are printed in Volume I of the Iowa Administrative Code.)



**Chpt. 400     Vehicle Registration and Certificate of Title**

- 761-400.1(1)(321)     "Certificate of Title means a document..."
- 761-400.1(11)(321)     "...and a registration card evidencing payment has been issued..."
- 761-400.1(12)(321)     "Registration card means a document..."
- 761-400.3(1)(321)     "To apply for a certificate of title or registration for a vehicle, Form 411007 shall be completed by the applicant."
- 761-400.3(9)(321)     "The applicant shall sign the application form in ink."
- 761-400.4(321)     "Supporting documents required"
- 761-400.5(2)(321)     "...special mobile equipment plates and certificates of identification..."
- 761-400.16(2d)(321)     "...an assigned identification number plate with a distinguishing number..."
- 761-400.18(321)     "Towing permit"
- 761-400.52(321)     "Odometer statement"
- 761-400.53(1)(321)     "Placement of validation stickers (autos)"
- 761-400.53(2)(321)     "Special fuel user identification sticker...displayed on the outside panel of the motor vehicle..."
- 761-400.54(321)     "The registration card for trailer type vehicles shall be carried in the vehicle...or in the towing vehicle..."
- 761-400.61(321)     Registration plates.

**Chpt. 420     Motor Vehicle Dealers, Manufacturers and Distributors**

- 761-420.4(3)(321)     "Demonstration permits for motor trucks and truck tractors...forms in triplicate...original copy of the permit..."

**Chpt. 424     Transporter Plates**

761-424.4(321)     "Transporter   plates...Eligibility   for   plates...Form 417003..."

**Chpt. 430     Motor Vehicle Leasing Licenses**

761-430.2(2)(321)     "...application...on Form 417034..."

**Chpt. 500     Motor Carriers - Interstate Registration and Operation of Vehicles**

761-500.2(3)(326)     "Issue license plates, stickers, or other identification to vehicles subject to proportional registration, issue reciprocity permits and stickers to qualified carriers, and issue temporary authority and trip permits..."

761-500.3(1a)(326)     "...the proper forms for registration, either original, Form 442016...or supplemental Form 442015...(for prorated registration)"

761-500.3(1d)(326)     "The carrier shall remit the (registration) fees...with copy 'C' of the statement."

761-500.3(1d)(326)     "...license plates and registration receipts shall be issued...while prorate decals and cab cards shall be issued to vehicles based outside the state."

761-500.3(3)(326)     "The carrier may purchase trip permits in advance by mailing a written request...(or) directly from truck stops...(or) be obtained by wire."

761-500.3(5)(326)     "Forms and Instructions (for prorate registration)"  
Numerous non-automated references.

761-500.4(2)(326)     "...carrier must provide documentary evidence that (it is) a trip-lease arrangement."

761-500.6(326)     "Iowa temporary prorate permits."  
Numerous non-automated references.

761-500.11(326)     "A carrier may obtain temporary written authority to operate vehicles that have been added to its prorate fleet..."

**Chpt. 505 Interstate Motor Vehicle Fuel Permits**

- 761-505.3(2)(326) "The (fuel) permit, either permanent (facsimile accepted) or temporary, must be carried on the vehicle..."
- 761-505.3(7g)(326) "The temporary (fuel) permit...must be carried with the commercial motor vehicle..."
- 761-505.4(4)(326) "(Fuel) Tax payment or refund - computation"
- 761-505.4(6a)(326) "...interstate fuel tax report...shall be deemed timely filed if postpaid...and postmarked..."
- 761-505.5(6)(326) "Records to be kept and preserved...fuel invoices...log books...trip sheets...credit card invoices"

**Chpt. 511 Special Permits for Operation and Movement of Vehicles and Loads of Excess Size and Weight**

- 761-511.3(5)(321E) "The (over size or weight) permit shall be carried in the cab..."
- 761-511.4(1)(321E) "(Over size or weight) permits may be obtained in person, by telephone-telegraph, or by mail..."
- 761-511.4(2a)(321E) "(Over size or weight) permits shall be issued on departmental forms 444003, 442009, and 442010..."

**Chpt. 520 Regulations Applicable to Carriers**

- 761-520.2(321) "Record keeping requirements...means the record keeping requirements in 49 C.F.R. Part 395..."
- 761-520.2(321) "Requirements of placarding and carrying hazardous materials shipping papers...means the requirements in 49 C.F.R. Part 177.817 and 177.823."
- 761-520.5(321) "...driver...shall carry at all times a notarized statement of employment."

**Chpt. 523    Truck Operators and Contract Carriers**

761-523.2(1)(321)    "Application for a permit to operate...on forms prescribed for that purpose and furnished upon request."

761-523.2(7)(321)    "The (operating authority fee) receipt shall be carried with the vehicle at all times."

**Chpt. 525    Motor Carriers and Charter Carriers**

761-525.5(1)(321)    "...application (for an operating certificate) shall be on a form provided...and shall be typewritten."

**Chpt. 528    Liquid Transport Carriers**

761-528.5(1)(321)    "...application (for certificate of convenience and necessity)...upon the forms prescribed...shall be typewritten."

761-528.5(3)(321)    "The (intrastate certificate fee) receipt shall be carried with the motor vehicle at all times."

**IOWA DEPARTMENT OF TRANSPORTATION**  
**POLICIES AND PROCEDURES MANUAL - ORGANIZATION**

**DIRECTOR/ADMINISTRATION**  
**Office of Audits**

- Part II. C. (1) "To review and evaluate the adequacy of motor carrier(s) mileage accounting system(s) to insure (1) compliance..."
- Part II. C. (2) (a) "Develop and maintain a prorate/fuel tax audit program..."
- Part II. C. (2) (b) "...for audit of Iowa based carriers on a three year basis."

**MOTOR VEHICLE DIVISION**  
**Office of Vehicle Registration**

- Part II. A. (4) "Prepare the vehicle registration plate and validation consignment..."
- Part II. C. (1) "Microfilm copies of titles..."
- Part II. D. (3) "Send letters concerning over(weight)...send copies to..."

**Office of Motor Vehicle Enforcement**

- Part II. A. (4) "Uniformed Field Enforcement (shall) check commercial vehicle operators for proper driver license, log book, health certificates, and other driver qualifications."

**Office of Motor Carrier Services**

- Part II. B. (2) "...assist in the completion of necessary application forms (I.R.P., ...)."
- Part II. B. (4) "...Complete applications (for fuel permits)..."
- Part II. B. (5) "...Complete applications (for over-dimensional overweight indivisible loads)..."
- Part II. B. (6) "...Complete applications (for special mobile equipment)..."
- Part II. B. (7) "Provide telephone/telegraph service to issue temporary credentials..."

Each passage noted above in the law and in the rules is unique, and each will require individually tailored language when (and if) the state legislature and/or the Department of Transportation decides to implement changes to allow automated and electronic processing and other facets of IVHS - CVO. Furthermore, new enabling legislation, which goes beyond simply "correcting" the non-automated references in current law, is probably necessary to ensure smooth implementation. No enabling legislation is proposed here, as this is beyond the scope of this report. However, Table 4-3 presents a few permissive (rather than mandatory) phrases and other suggestions which may be appropriate for insertion into the law and rules in the instances which contain non-automated references.

Changes to administrative rules and agency procedures are not seen as prerequisites for implementation of CVO demonstrations. To ensure, however, proper agency direction and to minimize disputes, it is recommended that rules and policies be changed to permit the electronic communications and multi-jurisdictional cooperation envisioned in the recommendations of Chapter VI of this report. Another important obstacle to IVHS - CVO are the great differences in the way states regulate trucking.

## **DIFFERENCES AMONG STATES**

The existence and history of important differences among the several states is another significant institutional barrier to IVHS - CVO. These differences may be found in a state's posture toward regulating all industry, in a state's level of motor carrier activity, or in a state's fiscal history of dependence on certain kinds of revenue. Carriers participating in this study were unanimous in their belief that differing regulatory and reporting requirements among the states constitute a large and most unnecessary cost burden for shippers, carriers, and ultimately consumers. Although the "states rights" concept has recently become more visible, there have been efforts at uniformity.

The Surface Transportation Assistance Act of 1982<sup>10</sup> requires all states to adopt uniform minimum requirements governing vehicle width, length, and weight. Generally, these limitations may be stated as 102 inches in overall width<sup>11</sup>, not less than 48 feet as a maximum length, and 20,000 pounds single axle, 34,000 pounds tandem axle and 80,000 pounds maximum gross

**Table 4-3 Suggestions for Changes to Law and Rules**

Type of Problem	Suggestions
Written communication req'd, original or typewritten copy	"Electronic transmissions are acceptable, and must conform to the standardized communication system of the I.D.O.T. and its requirements for communications protocol, baud rate, parity, and compatibility of operating system."
Item must be carried in truck or with driver	<p>"Electronic evidence, of (license, permit, etc.) if used as the sole copy of __ must be carried on board, in operational systems which are accessible at any time. The driver must be able to demonstrate at roadside that the appropriate..."</p> <p>"Automatic vehicle identification tags, if used as the sole on-board record of __, must meet the following specifications for operation within the State of Iowa...."</p>
Prescribed form or card must be used or filed	<p>"The following data elements, in the format and record layout prescribed, must be included in each (application)."</p> <p>"Facsimile copies of prescribed forms are acceptable.</p> <p>"Evidence of (permit, authority, etc.) may be carried on electronic media, including automatic vehicle identification tag, or magnetic media. Officers shall, if necessary, confirm this (information) within __ days."</p>
Documents must be signed	<p>"Filing or submission of an application for __ shall constitute an agreement on the part of the applicant to..."</p> <p>"Applicants wishing to use automated filing may post a bond with the I.D.O.T. to ensure..." (Delete the requirement)</p>
Non-automated scales	Change rules to allow W-I-M devices and establish weight and axle configuration tolerances for W-I-M devices
Items must be mailed or postmarked	"(Items) must be received in the offices of the I.D.O.T. (by a certain date) which in the case of electronic or facsimile filings, shall be the date appended to the electronic record by I.D.O.T. system equipment."
Confidentiality for written records	"The definition of all records considered private, confidential, or otherwise not open to the public shall be expanded to include records which are stored on magnetic media or are the output of magnetic media or an electronic communication."
Document must have a seal	Delete these requirements

weight. From state to state, however, there are hundreds of exceptions and variations, for different truck types, axle configurations, and roadway type and width.<sup>12</sup>

An important institutional consideration in looking at multi-state regulatory reform is that the agencies responsible for a given function differ from state to state. For vehicle size and weight enforcement, the responsible agencies along Interstate Highway 80 are shown in Table

4-4. Carriers and transportation officials report that communication becomes difficult between these various agencies, and "traditional" methods of operation may vary significantly.

**Table 4-4 Agencies Responsible for Size and Weight Enforcement**

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California	California Highway Patrol
Nevada	Nevada Department of Transportation & Nevada Highway Patrol, Commercial Section
Utah	Utah State Highway Patrol
Wyoming	Wyoming Highway Patrol
Nebraska	Nebraska State Patrol
Iowa	Iowa Department of Transportation, Motor Vehicle Division
Illinois	Illinois State Police
Indiana	Indiana State Police
Ohio	Department of Highway Safety & Ohio State Highway Patrol
Penna.	Pennsylvania State Police & Department of Transportation, Truck Weight Enforcement Division
New Jersey	New Jersey State Police
New York	New York State Police

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Another significant institutional barrier is the wide variety of state level regulations and requirements for motor carriers. Every motor carrier in this study noted frustration, as well as increased costs, in their attempts to satisfy dozens of states' conflicting and often obscure requirements. Significant differences among I-80 states' regulations on weight were not found. Size and authority restrictions, however, do differ along the corridor from East to West.



Table 4-5 illustrates the differences among I-80 corridor states on fuel tax rates and taxation methods.<sup>13</sup> Although rates differ, no evidence is found to suggest that a cooperative, multi-jurisdictional, automated electronic approach would not be feasible. All carriers participating in this study favored universal participation in multi-jurisdictional fuel tax apportionment (International Fuel Tax Agreement, IFTA) and in registration reciprocity (International Registration Plan, IRP).<sup>14</sup>

**Table 4-5 State Motor Fuel Tax Rates**

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STATE MOTOR FUEL TAX RATES		
Effective total tax I-80 Corridor States October 1, 1991		
	Gas/Diesel (¢ per gal)	Gas/Diesel Sales Tax (%)
1. California	15/15	6/6
2. Nevada	18/22	
3. Utah	19/19	
4. Wyoming	9/9	
5. Nebraska	23.4/23.4*	
6. Iowa	20/22.5	
7. Illinois	19/21.5*	0/6.25*
8. Indiana	15/16	5/5
9. Ohio	21/21* 3¢ surtax on report	
10. Penna.	12/12	6/6
11. N. J.	10.5/13.5	
12. N. Y.	8/10	7.25/7.25

\* Variable taxes

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The carriers which were interviewed would probably prefer an automated system if available and properly designed. They noted, however, that many other carriers would most likely prefer non-automated IFTA and IRP procedures. The general findings of this study confirm and support this preference for system choice. Therefore, in light of differences among the states, and among the carriers, a mandated electronic system (for any of the IVHS - CVO functions) is not advisable at this time.

To further illustrate the difference between state administrative regulation of motor carriers, a summary of state size limits along I-80 is presented in Table 4-6, while a summary of weight limits along I-80 can be found in Table 4-7.

**Table 4-6 Summary of Size Limits along I-80**

I - 80 States	Height	Width	Tractor Trailer length	Twin Combination	
	In Feet/Inches	In Inches	Interstate & National Network (Length Feet)	Interstate & National Network (Length Feet)	Straight Truck + Trailer (Length Feet)
California	14-0	102	48/53*	28-6	65
Nevada	14-0	102	53	28-6/NR*	70
Utah	14-0	102	48/53*	61*	65
Wyoming	14-0	102	60	80*	85
Nebraska	14-6	102	53	65*	65
Iowa	13-6*	102*	53*	28-6	65
Illinois	13-6	102*	53*	28-6	60
Indiana	13-6	102	53*	28-6	60
Ohio	13-6	102	53	28-6	65
Penn.	13-6	102*	53	28-6	60
New Jersey	13-6	102*	48	28	62
New York	13-6	102*	53*	28-6	60

\* Special conditions and exemptions may apply; NR: Not restricted

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Source: American Trucking Associations, Inc., "Summary of Size and Weight Limits," 1990.

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Research conducted for this study indicates that the most intransigent institutional issues seem to revolve around the need for inter-jurisdictional cooperation and interstate data exchange

**Table 4-7 Summary of Weight Limits along I-80**

I - 80 STATES	Single Axle Limits (lbs)	Tandem Axle Limits (lbs)	Axle Limits Triple (lbs)	Maximum Allowable Gross Weight In Interstate (lbs)
California	20,000*	34,000	34,000	80,000
Nevada	20,000	34,000	42,500*	80,000
Utah	20,000*	34,000	42,000	80,000
Wyoming	20,000*	36,000	42,500*	80,000
Nebraska	20,000	34,000	42,000*	80,000
Iowa	20,000	34,000	42,500*	80,000
Illinois	20,000	34,000	42,000	80,000
Indiana	20,000	34,000	42,500*	80,000
Ohio	20,000	34,000	48,000	80,000
Penn.	20,000*	34,000*	42,500*	80,000
New Jersey	22,400	34,000*	56,400*	80,000
New York	22,400	34,000*	42,500*	80,000

\* Special conditions and exemptions may apply

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Source: American Trucking Associations, Inc., "Summary of Size and Weight Limits," 1990.

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policies among the several states. The problems include a lack of enabling state legislation, incompatible or non-existent data processing systems, and an absence of the political and administrative desire to establish cooperative mechanisms among the states. Therefore, many of these institutional barriers may require new state laws, state-level administrative reorganization, and improvement of information processing and communications capacity in the states.

## OTHER COMPLIANCE COST ISSUES

A final institutional barrier to be discussed here is a reluctance of some motor carriers to embrace IVHS - CVO technology and functions. Two carriers participating in this study found that they did not have significant compliance costs in terms of licenses, permits, registrations, operating authorities, and even weight and safety compliance costs. Therefore, they exhibited little interest in automated systems to address these areas. These carriers, however, are not opposed to development of systems which would reduce "unnecessary" compliance costs.

More important to these two carriers are other areas of compliance cost, which are not related to IVHS. These carriers describe a tangle of intricate and costly state and federal laws and regulations related to employment practices and environmental regulation. The primary compliance cost problems for these carriers are not in areas which can be addressed by IVHS - CVO. These unrelated compliance cost issues include:

- Unemployment insurance (unemployment compensation)<sup>15</sup>
- Worker's compensation<sup>16</sup>
- Federal tax reporting
- Occupational Safety and Health Administration (OSHA) reporting and compliance
- Underground fuel tank inspections

The research team concludes that reduction of credentials-related compliance costs for motor carriers is important. It should be noted, however, that there may be institutional reluctance (among motor carriers) to some IVHS applications which require investment, since two of the four carriers interviewed for this study did not place a high priority on credentials-related compliance cost. Rather, they identified more pressing, more expensive areas of compliance cost, as shown above.

Chapter V describes several examples of multi-jurisdictional carrier regulatory organizations which have been able to overcome the significant institutional barriers discussed in this chapter, and in some cases, proceed with automated and computerized multi-state systems. These are examples of how inter-jurisdictional cooperation has been accomplished.

## ENDNOTES

1. IVHS America, CVO Committee, Institutional/Standards Subcommittee, "Draft Mission Statement," July 31, 1991.
2. Noted in Iowa Department of Transportation communication to Iowa Department of Economic Development, Business License Information Center, October 1, 1991.
3. "Diesel Fuel Excise Tax Collection Process," Hearing before the Subcommittee on Energy and Agriculture of the Committee on Small Business, United States House of Representatives, Washington: USGPO, March 3, 1988, p. 1. (Testimony of Rep. Charles Hatcher).
4. The Constitution of the United States of America, Article I, Section 8.
5. See: American Trucking Associations vs. Scheiner, June 23, 1987.
6. "HELP Officials Name New Board; Disband Executive Committee," Inside IVHS, Vol. 1, No. 16, August 5, 1991, p. 7.
7. Code of Iowa, Sections 321, 324, 325, 326, 327. (Laws of the State of Iowa).
8. Iowa Administrative Code, Sections 21, 567, 661, 701, 761. (Administrative Regulations of the State of Iowa).
9. Iowa Department of Transportation, "Policies and Procedures Manual - Organization," Ames, Iowa.
10. See: Public Law 97-424.
11. See: Public Law 98-17, (April 5, 1983). It established a uniform national width limitation on interstate and federal aid highways.
12. For complete state-by-state requirements, see "Summary of Size and Weight Limits," Alexandria, Va.: American Trucking Associations, Inc., January 1991.
13. "State Motor Fuel Tax Rates," Traffic World, April 16, 1990, p. 26. Also, "State Fuel Taxes," Interstate Information Report (ATA), October 7, 1991, p. 4.
14. International Fuel Tax Agreement and the International Registration Plan.
15. Social Security Act of 1935, See: 49 Stat. 620.
16. See: Code of Iowa, Chapter 85.



## **CHAPTER V**

# **EXAMPLES OF MULTI-JURISDICTIONAL COOPERATION**

Since a major institutional barrier to successfully implementing IVHS - CVO is the issue of multi-jurisdictional cooperation and data exchange, the research team sought out existing examples of this cooperation among the states on motor carrier administrative and regulatory issues. There are both automated data systems (CDLIS, AAMVAnet) and manual reporting systems operating effectively and efficiently, in the case of the Iowa Department of Transportation. Carriers noted that many states are not as service-oriented as Iowa. The multi-jurisdictional organizations which were researched and described as examples of multi-jurisdictional cooperation are IFTA, IRP, the CDL Program and CDLIS, AAMVAnet, (and AASHTO VAN), MOOO, and CVSA. Each is described in the following sections.

### **INTERNATIONAL FUEL TAX AGREEMENT**

The International Fuel Tax Agreement (IFTA) is a multi-jurisdictional motor fuels use tax collection and administration agreement. Motor fuel taxes are considered a "first structure" type of tax on motor carriers. IFTA was formed as a pilot project in 1982 by the states of Arizona, Iowa, and Washington. It uses the concept of a base state jurisdiction for each licensee (motor carrier), and that base jurisdiction administers the agreement for their licensees. The base jurisdiction issues a license and a decal annually which qualifies the licensee to operate in all member jurisdictions without further licensing.<sup>1</sup>

Each state may administer IFTA through different public agencies, and in many cases, IFTA functions are not centralized in one state agency. In Iowa, IFTA operations are centralized in the Iowa Department of Transportation. In some states, a revenue or finance agency may handle the fees for fuel taxes, while a public utilities commission or department of transportation handles the applications.<sup>2</sup>

Data elements collected on the IFTA application include federal employer identification number, owner, partner, or corporate name, legal business name, physical location and address

of the business, and the IFTA jurisdictions for which application is being made. Carriers specify how many decals are required, and note the fees they are paying with the application.

The annual IFTA license application fee for Iowa is ten dollars per fleet, plus twenty-five cents per decal. For non-IFTA base state carriers, the application fee for the Iowa Interstate Fuel Permit is also ten dollars.<sup>3</sup>

Member states include Arizona, Arkansas, Colorado, Idaho, Indiana, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, Nevada, North Carolina, North Dakota, Oklahoma, South Dakota, Utah, Washington, Wisconsin, and Wyoming.<sup>4</sup> All participating carriers in this study strongly favored universal implementation of IFTA.

Motor carriers and the Iowa Department of Transportation reported difficulties in working with non-IFTA states, and all expressed a desire for IFTA to become a uniform practice in the U.S. Under Title IV of the Intermodal Surface Transportation Efficiency Act of 1991, all states are required to participate in IFTA.<sup>5</sup> The deadline for state participation in IFTA is September 30, 1996. Currently, states are required only to be a member of a multi-state agreement, not necessarily IFTA.

Fuel tax from IFTA states is calculated quarterly, based on total miles reported by a motor carrier and total fuel purchased. An average mile-per-gallon rate is calculated for each company's entire fleet. Carriers pay the fuel tax in their base state. Currently, the Iowa Department of Transportation receives fuel tax revenues via electronic funds transfer (EFT) only from other IFTA states. Therefore, the Iowa Department of Transportation must maintain dual (manual/electronic) deposit records. IFTA member jurisdictions are required to conduct peer review audits, and must audit at least 25 percent of the interstate carriers based in their jurisdiction every three years.<sup>6</sup>

Some states not presently participating in multi-jurisdictional arrangements have very small highway systems and may experience adverse revenue impacts if they were to participate. There are also revenue-timing issues for some states, in that they may be required to wait to receive their fees through the multi-jurisdictional organization, as fees are later distributed back to each member. As a result, revenue returned through the agreement may be delayed.



## INTERNATIONAL REGISTRATION PLAN

Proportionate interstate registration of heavy vehicles (registration reciprocity) was initially carried out under Uniform Vehicle Registration and Proration Agreement, and since 1974, under its successor, the International Registration Plan (IRP). IRP is sponsored by the American Association of Motor Vehicle Administrators (AAMVA). Registration fees are known as a "second-structure" type of motor carrier tax. Carriers operating in two or more IRP states pay registration fees to each participating state in proportion to the number of miles traveled in that state.<sup>7</sup>

Table 5-1 shows the volume of motor truck registrations found nationally, with over 44 million trucks and buses registered. Of course, most of these are light-duty trucks. In Iowa, 59,277 trucks and buses received new registrations in 1989, which is an average of 4,940 new registrations per month.

This large volume of generally routine motor truck registrations represents a tremendous automation opportunity for the State of Iowa. The state could develop an automated registration and licensing system utilizing IVHS - CVO concepts, including automatic vehicle identification tags. Once automated, the state may be able to reduce manual processing and paper handling, improve accuracy and timeliness, and information availability.

Participation in IRP has generated some of these benefits already. A uniform application form is used for all IRP registrations. Data elements include the owner's name and address and

**Table 5-1 Motor Truck Registrations**

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	New in 1989	Trucks 1989 Total*
Iowa.....	59,277	765,000
12 I-80 Corridor States...	1,871,107	14,658,000
Total U.S.....	5,100,195	44,294,000

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\* 1989 estimate, includes buses.

Source: "New Registrations by States," MVMA Motor Vehicle Facts & Figures, 1990, pp. 20, 22.

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base state, number of power units, number of trailers, semi-trailers, and auxiliary axles, weight group, a vehicle description, and a uniform (estimated) mileage schedule. The base state still must manually prepare and send paper-copy cab cards, validation stickers and vehicle identification plates.<sup>8</sup>

Not all states participate in reciprocal registration. The more widespread IRP membership becomes, however, the greater the adverse revenue impact on nonmember states may be, thus leading to greater economic pressure to join IRP. Title IV of the Intermodal Surface Transportation Efficiency Act of 1991 requires all states to participate in IRP not later than September 30, 1996. Currently, 42 U.S. states are members of the IRP. Non-members include Alaska, Delaware, Hawaii, Maine, Massachusetts, Nevada, New Jersey and Rhode Island. Alaska, Delaware, and Nevada are members of a parallel organization, the Uniform Compact.<sup>9</sup> All participating carriers in this study strongly favored universal implementation of the IRP.

The registration fee on trucks and truck tractors is based on the combined gross weight of any combination of vehicles greater than 3 tons GVW.<sup>10</sup> There is a twenty-five dollar one-time filing fee, and one dollar fee for authority per "Bingo stamp." Fees are reduced proportionately if trucks are registered part-way through the year. Currently, the Iowa Department of Transportation receives IRP funds via electronic funds transfer (EFT) from the state of Missouri. Audits of apportioned registrations are required by IRP, and each jurisdiction must audit 25 percent of its carriers every three-year period.<sup>11</sup>

One computer system used for automated IRP record-keeping is the Vehicle Information System for Tax Apportionment (VISTA). First instituted in 1987, there are now sixteen user states. VISTA was developed by Lockheed Information Management Services (Lockheed IMS), and is operated by Lockheed IMS and the American Association of Motor Vehicle Administrators. VISTA assigns each account a five-digit reference number, and allows user states to automatically issue registrations in other VISTA states.

## **COMMERCIAL DRIVERS LICENSE AND THE COMMERCIAL DRIVERS LICENSE INFORMATION SYSTEM**

The Commercial Drivers License (CDL) is a comprehensive license for drivers of commercial vehicles. It is designed to improve highway safety by ensuring that operators of large trucks and buses are qualified to operate those vehicles. National driving-history checks and uniform testing of driver knowledge and vehicle handling (skill test) is required. In many states, the CDL replaces what was known as the chauffeur's license. Minimum national standards for commercial motor vehicle drivers were set out in the Commercial Motor Vehicle Safety Act of 1986.<sup>12</sup> All U.S. states are required by federal law to have fully operational CDL systems by April 1, 1992.<sup>13</sup>

Every license issued under the CDL program can have various endorsements (double or triple trailers, tank vehicles, hazardous materials) and may have restrictions, limiting a driver to vehicles without air brakes, for instance. CDL applicants are checked for outstanding traffic violations and license suspension, and are not allowed to hold a CDL in more than one state. A CDL must be issued by the driver's jurisdiction of domicile.<sup>14</sup>

The fee for a CDL in Iowa is sixteen dollars for two years and thirty-two dollars for four years - the same fee as a chauffeur's license. There is a one-time fee of five dollars each for CDL endorsements, as needed. There is a one-time ten dollar fee for vehicles with air brakes, and vehicles with passengers. For hazardous materials endorsement, a five dollar initial fee, plus five dollars each time the license is renewed. Fees are set by the respective states.<sup>15</sup>

Each state determines the period between required renewal of a CDL, most renewal procedures, and age and qualifications of its intrastate commercial drivers. Interstate drivers need to meet federal age and medical standards.

The Commercial Drivers License Information System (CDLIS) is the automated information system to support CDL issuance and tracking. It is a centrally indexed, distributed data processing system that allows the driver licensing agency in each state to communicate with a central (or regional) CDLIS computer. Two types of records are maintained through CDLIS. There is a central file with a short record for driver identification tied to each CDL issued and there is an extensive state-based record with a commercial driver's status and driving history.

"The central file and state data bases are linked via AAMVAnet to create a distributed data base, known collectively as CDLIS"<sup>16</sup>

This CDLIS national telecommunications network (known as AAMVAnet) was made operational in 1989, developed by the American Association of Motor Vehicle Administrators. The design and implementation is being developed by AAMVA and the Federal Highway Administration (FHWA), coordinated with the National Highway Traffic Safety Administration's National Driver Register Problem-Driver Pointer System. The CDLIS and AAMVAnet are being implemented by commercial vendors under contract to the states.

AAMVAnet is also planning to support the AASHTO\* Value Added Network (AASHTO VAN). This network will provide a mechanism for data interchange among member DOT's, utilizing mainframe-to-mainframe connectivity to move large volumes of data.<sup>17</sup> AASHTO VAN has also been suggested as a candidate for the national heavy vehicle electronic license plate (HELP) system, for overweight truck permitting, and for use as a weather and road information system. Funding for these systems was initially provided through grant assistance from the FHWA and member agencies. The grant funds are augmented by, and will eventually be replaced by user fees.<sup>18</sup>

## **MULTI-JURISDICTIONAL OVERSIZE/OVERWEIGHT ORGANIZATION**

The Multi-Jurisdictional Oversize/Overweight Organization (MOOO) is currently in its formative stages. Its goal is to automate the process of over-dimension and overweight permit issuance among the states. In October 1991, participating states included Iowa, Kansas, Missouri, and Wisconsin. Six others states have declared an intent to participate, and they include: Illinois, Indiana, Kentucky, Michigan, Minnesota, and Ohio. Some states have reported that they find it difficult to finance even a personal computer and a modem for MOOO participation. Nebraska has indicated a desire to participate, with the exception of their 54,000-pound limit on triple trailers. MOOO has a 60,000-pound ceiling.

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\* American Association of State Highway and Transportation Officials

The system allows states to transmit electronic permit applications and load specifications from their mainframes or personal computers back and forth over an IBM network, or over the AASHTO VAN, or over AAMVAnet. Each network uses a different fee structure, and states are free to choose their network. By November 1991, the system is expected to be in operation.

MOOO prescribes uniform standards and guideline and procedures for the application and issuance of oversize and overweight permits. Data elements collected include driver, vehicle and load information, dimensions, weight, and insurance information. It also planned to allow an automated carrier interface which will be demonstrated in Spring 1992 by IBM and the Specialized Carriers and Rigging Association.<sup>19</sup>

## COMMERCIAL VEHICLE SAFETY ALLIANCE

The Commercial Vehicle Safety Alliance (CVSA) is an organization of state and provincial governmental agencies and industry representatives dedicated to improving commercial vehicle safety. One way in which they do this is by performing motor vehicle inspections. Table 5-2 shows overall U.S. safety inspection data from 1984-1987, while data on specific safety violations by heavy duty trucks is presented in Table 5-3. CVSA states inspect vehicles using a common inspection program, and those that pass are issued a CVSA decal. The decals are colored differently for each quarter of the year. Clipping a specified corner of the annual decal indicates the month of issuance. Generally, when a vehicle travels into another state within the three months from issuance of the decal, it will not be reinspected. CVSA specifies minimum safety standards, member jurisdictions may require more stringent standards.<sup>20</sup>

**Table 5-2 Safety Inspections in the U.S.**

	1984	1985	1986	1987
Inspections	150,000	350,000	550,000	1,000,000
Vehicle out of service	50,000	100,000	200,000	350,000
Driver out of service	15,000	22,000	30,000	50,000

Source: "Safety Inspections," Traffic World, December 5, 1988, p. F. Information from the Office of Technology Assessment.

All U.S. states are members except South Dakota and Hawaii, and both states have indicated an interest in joining CVSA. There are no truck-related fees at the time a CVSA decal is issued. Member states pay a flat fee for belonging to the CVSA, and the CVSA receives industry financial support as well.<sup>21</sup>

The CVSA procedure handles an important task, and one which covers a large number of vehicles and inspections. Table 5-2 points out that there were some one million safety inspections in 1987. Table 5-3 shows a distribution of the most common safety violations found in those inspections.

**Table 5-3 In-field Safety Violations Heavy Duty Trucks**

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	Percent of Total Violations
Lighting and electrical	40%
Brake systems	25%
Tires	6%
Emergency equipment	5%
Wheels	5%
Hazardous materials	3%
Exhaust system	2%
Suspension system	2%
Other	12%

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Source: Tyworth, J., J. Cavinato and C. Langley,  
Traffic Management, Reading, Mass.: Addison-Wesley,  
 1988, p. 366.

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By way of conclusion, after a brief review of the multi-jurisdictional compacts, agreements, automated systems, and organizations discussed in this chapter, it is clear that multi-state cooperation and data exchange are not only possible, but are indeed widespread. This bodes well for the implementation of a multi-state corridor or network of intelligent commercial vehicle-highway systems.

## ENDNOTES

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7. Hoffer, G.E., and J.T. Lindley, "Registration Reciprocity, the International Registration Plan, and Effective Motor Carrier Tax Rates," Transportation Journal, Spring 1981, pp. 37-47.
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9. Iowa Department of Transportation, International Registration Plan - 1991 Renewal Instructions, p. 2.
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11. American Association of Motor Vehicle Administrators, International Registration Plan - Uniform Operation Audit Procedure Guidelines, April 1988 (Revised September 6, 1990), p. iii.
12. See: Public Law 99-570.
13. See: 49 C.F.R. 383.
14. U.S. Department of Transportation, Federal Highway Administration, Commercial Driver's License Standards: Requirements and Penalties, Revised November 20, 1989, p. 10.
15. Iowa Department of Transportation, "News Release," May 4, 1990.

16. "AAMVAnet Applications," Pamphlet of AAMVAnet, Inc., Arlington, VA, received January 1992, p. 1.
17. "AASHTO Value Added Network," A pamphlet of AASHTO, Washington, 1991.
18. U.S. Department of Transportation, Federal Highway Administration, "The Commercial Driver's License Information System (CDLIS)," November, 1989, p. 1-2.
19. Interview with Ruth Skluzacek, Iowa Department of Transportation, October 1, 1991.
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21. Telephone interview, Commercial Vehicle Safety Alliance, October 1, 1991.



## **CHAPTER VI**

### **MOST PROMISING CVO APPLICATIONS**

Interviews with motor carriers, and regulatory and safety agencies discovered both enthusiasm and some skepticism about various IVHS - CVO applications. The research team, however, generally found broad agreement that several applications appear to be most promising. Those IVHS - CVO applications which are most promising are also seen to present the fewest institutional barriers to successful implementation. The concept of "transparent borders" is deemed very important by all motor carriers who participated in the study. "Transparent borders" would allow a system of "One-stop Shopping" for licenses, registrations, and permits. Clearly, this is an important priority for motor carriers.

The IVHS - CVO applications which were found to be most promising include 1) Weigh-in-Motion (WIM) with Automatic Vehicle Identification (AVI), 2) pre-clearance for safety inspections using AVI, 3) "One-stop Shopping" for licenses, registrations and permits, 4) automatic toll collection using Electronic Toll and Traffic Management (ETTM) systems, and 5) automated, apportioned fuel tax administration using instrumented state line crossings.

Hazardous materials tracking and electronic placarding are found to be promising, though they have significant detractors in the trucking industry. Among the problems noted are the potential for discriminatory enforcement (this is discussed later in more detail).

Other applications, including load tracking, automatic vehicle location, navigational aids, and certain vehicle control systems were favored by the motor carriers, but introducing these technologies seems to be a market function and does not require direct state or federal government intervention. Carriers will continue to evaluate new technologies and applications as they come on the market as an on-going process through their equipment suppliers.

#### **WEIGH-IN-MOTION USING AVI**

This process has been described as a part of the "transparent borders" concept, where state-by-state regulation of motor carriers is virtually invisible to the trucks as they pass ports-of-entry. This capability for weigh-in-motion is, in large part, a result of successfully using full highway speed weight detection devices. The three common weigh-in-motion devices include

load cells, capacitor pads, and Piezo-electric cable which is buried in the surface of the pavement. As (axle) weights are detected, gross vehicle weight can be determined. State weight and size regulation has taken on increased importance as the demands for highway maintenance, improvements, and construction outstrip the financial resources of many state-level highway agencies.

Recently (1987-90) the number of trucks being weighed by states has increased by about nine percent annually. The number of citations has increased by about two percent annually over the same period. From 1986 to 1990, there has been a 42 percent increase in the number of divisible load overweight permits issued, and a 29 percent increase in the number non-divisible load overweight permits issued.<sup>1</sup>

These statistics point to the need for some automation of this increasingly important and ever larger task of weight and size regulation. The weigh-in-motion process comprises a number of associated functions, including:

- A truck passes across state lines uninterrupted, at "mainline" speeds, having met all its regulatory requirements in a base state.
- The weight, axle loads, and configuration are electronically noted and either pass "inspection" or are flagged for further, possibly non-electronic review.
- This includes all the verification issues, whether a vehicle complies with applicable laws and regulations, and has operating authority.
- Electronically checking permits, licenses, CVSA "stickers", and safety inspection record(s).
- The transparent border crossings also may date and time stamp on-board equipment to ease in calculation and/or auditing of apportioned fuel tax collections.

## **PRE-CLEARANCE FOR SAFETY INSPECTIONS**

The ability to pre-clear trucks electronically is dependent on the implementation of a "transparent borders" concept. This concept refers to the ability of each state or jurisdiction to electronically verify, at speed, whether trucks are in compliance.

Truck safety continues to improve while inspection costs continue to rise. The need to inspect ever-growing numbers of trucks follows substantial increases in vehicle-miles-traveled (VMT). For example, auto and truck VMT is expected to increase from 1.9 trillion VMT in 1988 to 3.8 trillion VMT by the year 2020.<sup>2</sup>

In "Roadcheck '91," the continent-wide check of truck safety, 18 percent of the 30,700 vehicles stopped were placed out-of-service due to brake adjustment problems. Others were placed out-of-service due to electrical systems inadequacies, improperly secured freight, and missing or out-of-date credentials. Thirty-five percent of the vehicles were equipped with another variety of in-cab technology, the speed radar detector. Only 31 percent of the drivers had a Commercial Driver's License (CDL) which must be held by all drivers by April 1, 1992.<sup>3</sup>

Pre-clearance safety inspection systems, which are recommended in this study as one of the most promising CVO applications, operate as follows:

- CVSA sticker becomes electronic or magnetic.
- A vehicle is inspected by a "certified" CVSA state (assuming agreement among the several states as to the validity of such a certification) and the vehicle is electronically tagged.
- For instance, if a vehicle has been inspected in the last three months, it may not be subjected to further routine inspections.
- Initially, corridors may be established for this application (I-75).

Remote safety and vehicle inspections have also been proposed. They are more complex, and more controversial, and are not favored by participating carriers. The current study does not recommend implementation of the remote safety inspections (beyond CVSA-type applications) at this time. Remote inspections include checking the status or condition of vehicles (i.e. out-of-service components) or of the driver remotely with on-board sensors which report to an on-board computer and/or to roadside readers or satellite interfaces. They include:

- Vehicle condition checks
  - ◆ Brake pressure, brake linings, tire inflation
- Driver condition checks
  - ◆ Check current CDL status

- ♦ On-board sensors to detect inebriation
- ♦ Steering wheel reversals - the on-board computer system would detect the frequency of reversals slowing, while the angle increases, indicating driver performance degradation, i.e. fatigue/illness/inebriation
- ♦ Interrogation of driver logs, hours of service

One scenario in remote safety inspections involves sensors which feed data to the on-board computer (OBC) about truck or driver behavior. The OBC may take the first step of informing the driver or displaying a warning in the cab (or the carrier's office through a satellite link) of this behavior, and possibly suggesting corrective procedures. In the second step, once time for corrective action has been allowed, and if conditions persist, roadside enforcement may be notified. Remote safety inspections face significant institutional and cost barriers.

Research findings indicate that safety and inspections officers still want to visually inspect trucks and trailers. Departmental administrators are concerned about the certainty and accuracy of remote vehicle inspections. Concern is also voiced about the need to occasionally have a driver get out of the truck and assess his/her condition, and to discuss safety and equipment with the driver.

Carriers were opposed to the remote inspections concept due to its potential for liability-shifting, high implementation cost, privacy concerns, and inability to ensure system accuracy. Carriers were skeptical about remote safety and vehicle inspections. They questioned the level of technology which would be necessary, and some believed it would entail too great a cost to install the required roadside instruments and computer facilities in the state agencies. They were also concerned about the cost and maintenance of on-board equipment, which may be required for remote safety inspections. They noted that an entire fleet could not be equipped at once, necessitating a continuance of dual systems.

Also proposed are highway-specific warning systems into the cab. Trucks could receive in-cab information about steep grades approaching. For instance, roadside systems could calculate a safe speed of descent for an instrumented vehicle which transmits its particular axle configuration and vehicle weight through its AVI tag to allow the truck to go downhill without brake-fade. Ramp roll-overs could be reduced on ramps which are known to be a problem. Again, roadside systems could calculate a safe gear/deceleration speed for ramp approach for

an instrumented vehicle which transmits its particular axle configuration and vehicle weight and estimated freight center of gravity to allow the truck to round the ramp without flipping.

This study will recommend only the electronic pre-clearance safety inspection concept. This concept requires some state agency reorganization as well as certain technical roadside infrastructure. The institutional barriers to the above-noted highway-specific (grade or ramp) warnings may prove to be significant due to the liability-shifting effects.

All carriers, and the Iowa Department of Transportation staff interviewed endorsed the concept of electronic pre-clearance for safety inspections, and therefore, it seems to be a most promising application.

### **"ONE-STOP SHOPPING"**

"One-stop shopping" has been broadly defined to mean that carriers may comply with all truck regulations at one geographic place. In this concept, all 50 states would be computerized and linked together for the purpose of issuance and collection of operating authorities, federal and (multi-)state fuel taxes, trip permits, overweight permits, and so on. Possibly toll authorization could also be purchased.

Motor carriers would communicate with their "base state" via telephone, a modem, or similar arrangement (or even in person). As a centralized governmental process, the impetus for permits may start to diminish. Issuance and collection of fees would be more certain, and regulation and enforcement may be of a different nature, more administrative and technical.

A state's willingness and ability to successfully participate in a one-stop shopping concept is found to be, in large measure, a function of the following seven factors:

- The state's commitment to automated data processing, including its level of data processing experience, current practices, and technical expertise on its staff.
- The state's financial condition, including its willingness and ability to develop creative financing mechanisms for IVHS - CVO.
- The state's experience and level of participation in automated, multi-state and interstate transportation and motor carrier administrative systems.

- The level of complexity of state laws, rules, and regulations related to motor carriers; and the level of complexity of its tax structure.
- The degree of centralization of motor carrier services, regulation, and enforcement activities within state government.
- The state's historical relationship with motor carriers, and the degree to which a state is structured to be service-oriented. For instance, does the state currently have in-state one-stop shopping?
- Truck traffic volumes in the state; extent, condition, and congestion of interstate highways and enforcement facilities in the state.

## **ELECTRONIC TOLL AND TRAFFIC MANAGEMENT**

The current study also finds Electronic Toll and Traffic Management to be a very promising application, and it meets criteria for recommendation. There are only a few tolled bridges and they carry minimal commercial vehicle traffic. Although Iowa carriers pay many tolls in other states.

Electronic Toll and Traffic Management (ETTM) includes collecting motor carrier tolls automatically by an electromagnetic signal which passes from a small tag on the vehicle to a reader at the toll booth. The transmission takes place at full highway speeds in most cases and does not require any activity by the driver. Currently, automatic toll collection systems are operating on the Dallas North Tollway, the Lincoln Tunnel (New York-New Jersey), the Greater New Orleans Bridge, major Philadelphia-New Jersey bridges, and the Oklahoma Turnpike System. ETTM is planned for implementation at Illinois toll roads, the Dulles Toll Road (northern Virginia), and the Verrazano-Narrows Bridge (New York City).

The Dallas North Tollway was installed with the Amtech Systems Corporation "TollTag" system in June 1989 by the Texas Turnpike Authority and "toll tag only" lanes were implemented in 1990. Credit card-sized toll tags may be purchased at a store near the tollway for forty dollars (cash, check, or credit card). The tag is placed on the inside of the windshield and read electromagnetically at the toll booth. The toll will signal, "Valid Tag," give the driver a green light, and automatically deduct the toll plus five cents for processing. When the motor

carrier's account reaches less than ten dollars, a "Call Tag Office" signal appears on the screen with the "Valid Tag" signal. If the carrier pre-paid the forty dollars, the tag may be renewed automatically. Studies have shown that the system gives the Texas Turnpike Authority the equivalent of two extra lanes of traffic in rush hour.

The Port Authority of New York and New Jersey is also using toll tags and readers supplied by Science Applications International Corporation (SAIC) of San Diego. These tags are mounted on the roof of buses and read by overhead antennae. The buses have their own bypass lane plus another lane is also equipped with one antenna and a reader which can be used by buses during peak hours. During regular hours, this lane can be run by an attendant to collect non-automatic tolls. Vehicles which are not tagged or cannot be read are detected by an induction loop embedded in the roadway. The vehicle is then videotaped for a short time in order to be identified. The information gathered by the reader is stored locally and also in the microcomputer-based support system at the Lincoln Tunnel Administration Building. The data includes date, time, lane, and ETTM identification. This information is sent to the Port Authority office for summary reports and billing purposes. According to recent audits, accuracy rates of 99.95 percent have been achieved.<sup>4</sup>

On the Greater New Orleans Bridge and the New Orleans Expressway, drivers use one windshield tag. The ETTM computer can be instructed to make specific tags invalid, thus stolen toll tags are not usable.

For tolls on major Philadelphia-New Jersey bridges, commuters place a bar-coded sticker on the side window of the vehicle. A remote scanner reads the bar code information and translates it into numeric data. A valid sticker merits a reduced toll of twenty-five cents versus ninety cents per trip without a sticker. There are also 30-day stickers available. A driver with an invalid sticker is not given the green light and cannot pass beyond the barrier without paying the toll. Passage speed through the tolls is about 10 miles per hour.

The Oklahoma Turnpike's ETTM collection was installed in early 1991. Its "toll-only" PIKEPASS lanes allow traffic speeds up to 65 miles per hour. The system is read-only and tolls are collected once the vehicle exits. Customers may pay the toll fees through a wire transfer of funds, credit cards, check, or cash. The Oklahoma Turnpike System increased its tolls for

non-automatic users at the same time they implemented the PIKEPASS system, leading to greater public acceptance of the automated system.

The Illinois State Toll Highway Authority (ISTHA) is now studying automatic toll collection and the possibility of implementing an ETTM system for Illinois tolls. ISTHA has tested various ETTM equipment and procedures including the implementation of Amtech Systems Corporation and Eureka hardware.

The Virginia Department of Transportation has planned an ETTM system for the Dulles Airport Toll Road. Toll collection will include conventional as well as automatic collection. The Virginia Department of Transportation has completed the design of the system and is reviewing proposals for implementation.

Radio frequency-based vehicle identification is now being tested on the Verrazano-Narrows Bridge (New York City) by the Triborough Bridge and Tunnel Authority. The testing began in early 1991 and will continue until implementation, possibly in 1992.

It is clear that electronic tolls using AVI tags are becoming widespread and face few institutional barriers. It is recommended that states with toll facilities proceed to instrument their toll facilities accordingly.

## **AUTOMATED APPORTIONED FUEL TAX ADMINISTRATION**

An integral part of the "transparent borders" concept for commercial vehicles would be an automated tax reporting system. Automated reporting, collection, and auditing among several states has been identified as crucial by the Federal Highway Administration.

Gasoline and diesel fuel gallonage taxes are an important source of revenue for states and the federal government. Highway user fees (both auto and truck) were 33.5 billion dollars in 1989, with fuel taxes accounting for 55.3 percent of that. The motor fuel gallonage tax in Iowa (on both autos and trucks) generated 330.5 million dollars in state revenues in 1989, 18.3 billion dollars for all the states together.<sup>5</sup>

The tax on (non-ethanol blended) gasoline in Iowa is twenty cents per gallon, and twenty-two and a half cents per gallon on diesel fuel. The federal tax on gasoline is nine and one-tenth cents per gallon, and fifteen and one-tenth cents per gallon on diesel fuel.<sup>6</sup> Use of these fuels



in gasohol is partially exempt from federal excise tax, and is taxed at a reduced rate of three and one-tenth cents per gallon.<sup>7</sup>

Some users of diesel fuel and gasoline are exempt from federal motor fuel excise taxes, including farmers and ranchers, the fishing industry, off-road users, and state and local governmental units. Although the Internal Revenue Service argues that there is widespread tax evasion and corruption on exempt fuel purchases, Congress has recently taken action to relieve these industries (not motor carriers) of the burden of paying the taxes, and then having to file for a refund. The exemption for farmers has been estimated at 426 million dollars annually.<sup>8</sup>

Currently, development of equipment which would automatically record state line crossings on a truck's on-board computer is under way within the Heavy Vehicle Electronic License Plate (HELP) project. As proposed, a state-line beacon would send a marker message from the roadside to the vehicle, which is recorded in the truck's on-board computer. Location data would be accompanied by date, time, and odometer reading. The information would then be down-loaded at the carrier's terminal, and if accepted by the appropriate state agency, this could be used for calculating fuel taxes and replace manual trip sheets and associated clerical and accounting tasks. Installation of the roadside equipment has been proposed for the Washington-Oregon and Oregon-California state lines.

#### **AUDITS OF APPORTIONED FUEL TAX**

One proposal is where a truck's on-board computer is date-stamped with secured codes as to time and date of entry and time and date of exit, and miles in each state (between state-line electronic beacons). The carrier would then down-load this data at their terminal, or potentially to an officer's computer system at a weight station or inspection area.

The state-level departments of transportation, finance, revenue, and so on do not currently accept this type of reporting. If they did, apportioned fuel tax audits could be more automated, and may require less staff time (for both state level agencies that administer fuel taxes and carriers) and reduce the need for assembling manual trip sheets, mileage calculations, and maintenance of these paper records.

## **OTHER PROMISING APPLICATIONS**

Other technologies seemed to be promising but were not identified as applications which were as easily embraced by the motor carrier industry or by public regulatory agencies. These additional applications face modest institutional issues that act as barriers to their implementation or are much more broad in their scope and are more costly than the "most promising" applications.

## **HAZARDOUS MATERIALS APPLICATIONS**

Federal rules regarding the definition of, and the surface transportation of hazardous materials may be found in the Code of Federal Regulations at 49 C.F.R. Part 173. These materials may include explosives, blasting agents, flammable and combustible liquids, solids, and gases, oxidizing materials, corrosives, poisons, compressed gas, radioactive materials, and other noxious or anesthetic materials. Hazardous materials electronic placarding, on-board detection and safety devices, and remote interrogation of the hazardous materials manifest and log book, as well as product tracking, have been proposed.

Carriers reported that across the country, hazardous materials trucks are already the object of roadside safety inspections well in excess of the rate experienced trucks hauling by non-hazardous cargo. Since many (almost all) of these carriers are self-insured, they have a strong incentive to operate safe and legal trucks. Also, due to the specialized nature of the tank wagons and other trailer equipment, hazardous materials trucks experience a greater degree of empty back-hauls than dry vans or flat beds. Furthermore, carriers that haul hazardous materials are often specialized carriers, with product-specific expertise and significant investments in dedicated over-the-road equipment.

For these reasons, carriers did not generally favor remote interrogation of hazardous materials bills of lading, or hazardous materials electronic placarding. They believe that the potential for undue or discriminatory enforcement, as well as the logistics and potential costs of implementing such a system, will dissuade carriers from participating, unless mandated, which is also not favored. This leads to the conclusion that the institutional barriers to electronic placarding or manifests of hazardous materials present too great an obstacle to implementation

at this time. Nonetheless, the concept and rationale behind this application of electronic hazardous materials placarding is quite sound.

## NAVIGATIONAL AIDS

Issues of route guidance, route selection, and navigational aids are viewed by the FHWA mostly in terms of Automated Traffic Information Systems (ATIS). They are primarily seen as an urban issue, not rural. Commercial vehicles, however, operating in both urban and rural areas, need to know congestion, weather, and incident-related information, as well as construction zone and maintenance site information. This research found that these navigational aspects of CVO are very important to carriers, regardless of the geographic location of their terminals, or whether they travel in urban areas or not.

All carriers participating in this study agreed that the communication and vehicle location (AVL) technologies which motor carriers find valuable are already being installed and utilized by the carriers. Market forces are driving the installation of satellite communication systems, and a number of carriers are experimenting with route selection computer programs.

There are a few institutional barriers to expanded use of navigational aids. Chief among them is the public-sector cost of installing geographic locator beacons at important intersections or along stretches of highway for non-satellite applications. For satellite applications, there seems to be a shortage of channels due to the small number of successful satellite launches, relative to demand for satellite services. This has been driving up the price of this kind of communication.

There may also be "piggy-back" IVHS - CVO applications for equipment installed for navigational purposes. Geographic locator beacons could also be used for port-of-entry purposes. On-board computers used in navigational service could also be used for collection and storage of other types of regulatory and fuel data. Satellite dishes installed on trucks for navigational purposes could also communicate with traffic management centers and weather centers.

## CONCLUSIONS

Five applications of IVHS - CVO (discussed in Chapter VI) are recommended for immediate application. They include 1) Weigh-in-Motion (WIM) with Automatic Vehicle Identification (AVI), 2) pre-clearance for safety inspections using AVI, 3) "one-stop shopping" for licenses, registrations and permits, 4) automatic toll collection using Electronic Toll and Traffic Management (ETTM) systems, and 5) automated, apportioned fuel tax administration using instrumented state line crossings. These applications all meet the criteria set forth above. Also promising are hazardous materials applications and navigational aids, but it may be appropriate to continue to analyze the institutional dynamics and costs before proceeding. Demonstration of the five recommended applications should provide an adequate foundation for further CVO applications.

## ENDNOTES

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8. "Collection of Federal Fuel Taxes," Hearing before the Subcommittee on Energy and Agricultural Taxation of the Committee on Finance, United States Senate, Washington: USGPO, March 16, 1988, p. 5. (Testimony of Senator Phil Gramm).



## **CHAPTER VII CONCLUSIONS**

### **A NEW PARADIGM NEEDED**

One important conclusion from this study is that there are indeed significant institutional barriers to be addressed in the implementation of IVHS - CVO. Among the federal and state agencies, motor carriers, and researchers interviewed, broad agreement is found that insufficient attention has been given to the institutional and policy dimensions of IVHS - CVO implementation. Research results indicated that additional work on institutional and policy issues is needed in terms of research, within the motor carrier community, and among policy-makers and their staffs. The conclusion is, that for successful IVHS - CVO implementation, the search for institutional barriers must become part of a new paradigm, or a new way of thinking about the application of technology to motor carrier operations and regulation.

The carriers participating in this study were well-informed about a number of state-of-the-art applications of motor carrier management and operations technology. They are larger, well-managed carriers who receive visits from sales representatives, literature, and participate in demonstrations of the newest systems available in the marketplace. However, an information deficit is present, not among this type of carrier, but among smaller local and regional carriers, many of whom are only marginally profitable. They are found to be generally more risk-averse, and unwilling to experiment with new technology. Many are not fully aware of what is available in the marketplace, and what changes they may see in state regulatory structures. This points out the need to include these carriers and their needs in thinking and understanding institutional barriers to IVHS - CVO. This "new paradigm" may be extended to include them through continued efforts of industry associations, university outreach programs, and state agency planning processes.

### **MOST SIGNIFICANT INSTITUTIONAL BARRIER**

This study finds that the most significant institutional barrier may be the inability of the several states to cooperate on inter-jurisdictional and multi-jurisdictional motor carrier regulation. This inability stems from a diversity of policy goals and policy hierarchies among

the states. For instance, some states find that revenue generation is the most important aspect of their motor carrier regulation, while other states may have regulatory and enforcement cost reduction as their primary goal. Heavily urbanized states may want to invest in IVHS projects which address congestion, route guidance, and incident management. More rural states may want to concentrate on remote inspections or improving the efficiency of medium- and long-haul freight movements. Some states have traditionally invested in sophisticated, "high-technology" transportation solutions, while others have pursued a simpler, low-cost approach. Many states have been early and enthusiastic participants in multi-jurisdictional regulatory structures, while others have developed their own solutions.

The difficulty in forming multi-state solutions to transportation issues is why this study examines a number of multi-jurisdictional organizations, including the International Fuel Tax Agreement and the International Registration Plan, which provide models of regulatory cooperation and technical communication between a number of states. The conclusion is clear. There is adequate evidence of non-mandated, inter- and multi-jurisdictional cooperation on motor carrier regulatory issues has and may continue evolve. On the whole, the states will cooperate and exchange information when the costs of doing so are kept low, and the benefits from doing so are obvious.

## **TRADITIONAL ADVERSARIAL RELATIONSHIP**

The traditional adversarial relationship between the motor carrier industry ("the regulated") and federal and state transportation agencies ("the regulators") also constitutes an institutional barrier, albeit one which seems to be quite manageable in the case of Iowa. A high level of trust and respect seems to exist between the participating Iowa-based motor carriers and the Motor Carrier Division of the Iowa Department of Transportation. The researchers also note that nationally, there has been good cooperation between industry representatives and regulators working on various IVHS America committees, particularly the CVO Technical Committee and Institutional Committee. These types of committees, as well as participation in institutional barriers studies such as the Iowa study, provide appropriate forum to develop government-industry cooperation, and break down the traditional adversary barriers that may exist.



It should be noted that the level of trust and cooperation seen in Iowa (and in IVHS America) may be the result of an unintended selection bias on the part of the research team in determining which motor carriers would be asked to participate. The ownership, management, and corporate philosophy of the carriers which were asked to participate all show evidence of well-managed companies which have traditionally had high levels of compliance, superb safety records, and a history of participation in various research and demonstration projects. It should be noted that other carriers and independent owner-operators may not share this level of trust and confidence about potential CVO implementation.

## **LEGAL CHANGES FOR IOWA**

As shown in Chapter IV several sections of the Code of Iowa would require minor, technical changes if the five IVHS - CVO applications recommended in Chapter VI of this study were adopted. Table 4-2 summarizes some thirty-nine areas of the law which would need to be changed to accommodate the electronic communications and reorganized regulatory procedures envisioned in the five recommended, "most promising" applications of the current study.

In addition to these minor, technical amendments, it may also be necessary to enact permissive legislation which would provide basic IVHS - CVO structures for the implementation of these procedural changes. For instance, automated weight and safety regulation and enforcement, automated apportioned fuel tax procedures, and "One-stop Shopping" for licenses, permits, and registrations could be included in Sections 321, 324, and 326 of the Code of Iowa.

These amendments to the law would provide an opportunity for the Iowa Department of Transportation and the motor carrier industry in Iowa to work out a "legislative plan" for Iowa implementation. Once passed, the amendments would provide specific guidance to the administrative agencies in interpretation and enforcement of the laws through the rule-making process, discussed below. These changes to the law do not constitute significant institutional barriers in the case of Iowa.

An important legislative initiative that would be required for implementation of these IVHS - CVO applications is legislation which would permit the State of Iowa, through the Department of Transportation or other agencies, to enter into interstate and multi-state compacts,

where such compacts advance the best interests of the State of Iowa. The likely purpose(s) and optimal structure of such multi-jurisdictional compacts are outside the scope of this study.

The Iowa Department of Transportation has promulgated a number of administrative rules in accordance with Iowa's "Uniform Rules on Agency Procedure."<sup>1</sup> Research revealed at least seventy-five changes to rules which would be necessary to accommodate the electronic communications and reorganized regulatory procedures envisioned in the five recommended applications. The affected areas of the Iowa Administrative Code are shown in Chapter IV. Changes to the rules are summarized in Table 4-2. As with changes to the law, these changes to rules are not seen to be insurmountable institutional barriers to successful implementation of the five recommended areas of IVHS - CVO

## **OTHER INSTITUTIONAL BARRIERS**

Institutional issues previously noted in this concluding section include: 1) the need for a new paradigm, or way of thinking about IVHS - CVO; 2) the lack of state-level impetus to develop multi-jurisdictional arrangements; 3) the traditional adversarial relationship between carriers and regulators; and 4) the legal and administrative and policy changes which will be necessary.

In addition to these four institutional issues, this study has illuminated a number of others. Chapter IV identifies several institutional barriers and opportunities which provided a starting point for this study. Several of these institutional issues do not pose a problem for the five applications recommended in this study. For instance, liability-shifting may prove to be a major institutional barrier to systems which remove elements of driver control. Since none of our five recommended applications remove any element of driver control, liability-shifting will not be an issue. There are, however, several other institutional issues which may affect the recommended applications.

Data privacy and fair information practices may prove to be a sticking point, as state departments of transportation gather data on truck weights, movements, ownership, and equipment condition. This is information in which a carrier's competitors may have an interest. Some carriers can use this type of data for corporate planning and strategic marketing, as well

as in optimal competitive route and lane planning. In this study, most of the contract carriers stated that they would "definitely" obtain this information, once available. Unfortunately, companies wishing to maintain their privacy may choose not to participate in the automated systems. Additionally, carriers and industry associations voiced concern over the use of the data by various states to implement weight-distance taxes.

Implementation cost for state and local governments will also prove to be an important institutional barrier. In this era of budget cutting, hiring freezes, and shrinking federal aid, local and state governments will find it difficult to devote and train staff, purchase the necessary hardware and software, and operate and maintain CVO systems.

Another institutional barrier is the difficulty in developing working public-private partnerships for IVHS - CVO implementation. Private-sector goals include developing proprietary products, gaining market share, and making a profit. Public-sector goals often include encouragement of competition in contract bidding and systems development. Other public-sector goals may include least-cost development, and budget and fiscal-year constraints. However, government and industry can work together. Chapter IV discusses one successful example of this partnership, IVHS America.

A final institutional barrier to effective planning and implementation of IVHS - CVO is the apparent lack of IVHS technical and policy expertise in state agencies. This finding was confirmed by all participants in this study, including the Iowa Department of Transportation. As state funds for employee education, training, and travel are reduced, employees are not exposed to the latest trends in motor carrier regulatory and administrative technology. This points to the need for increased training and education programs for Department of Transportation personnel. Compared with a number of states which are not involved with any IVHS demonstration or research projects, the Iowa Department of Transportation seems to be relatively more aware of various IVHS concepts.

## **FIVE RECOMMENDED APPLICATIONS**

This study of institutional barriers to IVHS - CVO finds that those applications which require participation by governmental agencies seem to experience much higher levels of institutional obstacles than those carrier applications which are simply private sector arrangements. So, only applications which have some public-sector (governmental) component are included. For example, installation of roadside instrumentation or changes to laws and regulations require public-sector involvement. Certain capabilities for route guidance or load tracking, for instance, do not require public-sector involvement and will proceed at their own rate under market conditions, given an absence of other institutional barriers.

Once an application is found to require significant public-sector involvement, it is further evaluated using four criteria. First, identification of those IVHS - CVO applications with low levels of institutional barriers in Iowa are a primary objective of the current study, and will be high on the list of recommended applications. Also, recommended applications must be found to be technically feasible, and to exhibit long-run benefits in excess of costs, in the estimation of carriers and government agencies in this study. IVHS - CVO applications recommended in this study must have the potential for consensus. That is, be favored by both carriers and transportation agency representatives. To summarize, applications which are recommended herein must meet the following criteria:

- Low levels of institutional barriers.
- Technically feasible.
- Long-run benefits.
- Favored by carriers and agencies.

The five recommended applications of IVHS - CVO which are discussed in Chapter VI include: 1) Weigh-in-Motion (WIM) with Automatic Vehicle Identification (AVI), 2) pre-clearance for safety inspections using AVI, 3) "One-stop Shopping" for licenses, registrations and permits, 4) automatic toll collection using Electronic Toll and Traffic Management (ETTM) systems, and 5) automated, apportioned fuel tax administration using instrumented state line crossings. These applications all meet the criteria set forth above.

A state or group of states could use a phased-in approach to IVHS - CVO implementation. Starting with the easiest tasks, those applications which exhibit the fewest institutional barriers, and working toward applications which are more advanced, more complex, and potentially more controversial.

This phased-in approach will provide an initial, real-world experience with IVHS. States may then evaluate the outcomes of these early trials. Successful implementation patterns and strategies may then be identified. The five most promising applications recommended in this study, if implemented, may provide this kind of "test bed" ideally along an automated I-80 freight corridor.

### ENDNOTES

1. "Uniform Rules on Agency Procedure," Iowa Administrative Code, Chapter X, April 6, 1988, pp. 1-14.



**APPENDIX A  
ANNOTATED BIBLIOGRAPHY  
INSTITUTIONAL ISSUES OF IVHS  
IN COMMERCIAL VEHICLE OPERATIONS**

1. "AEI's Newest Hurdle: Putting Data to Use," Modern Railroads, April, 1990, pp. 29-32.

Provides a description of rail and intermodal use of programmable Automatic Equipment Identification tags and readers, in freight tracking and terminal (yard) operations. Describes efforts at setting rail standards, and tests by intermodal freight carriers.

2. American Association of Motor Vehicle Administrators, International Registration Plan with Official Commentary, Rev. March 1, 1991.

3. Articles of Agreement and Procedures Manual, IFTA International Fuel Tax Agreement, Rev. March 1991.

4. Ayland, N., F. Sommerville, and J. Siviter, "Automatic Monitoring and Enforcement of Traffic Highway Violations," VTI Rapport, Vol. 365-A, 1990, pp. 105-119.

The article describes work by Castle Rock Consultants to automatically monitor and photograph vehicles which violate highway regulations. Automatic enforcement of truck bans were studied. Similar systems which can enforce weight, speed, and stop light violations are noted. (United Kingdom)

5. Batz, T.M., "The Utilization of Real-time Traffic Information by the Trucking Industry," IEEE Transactions on Vehicular Technology, Vol. 40, No. 1, February, 1991, pp. 64-67.

Transcom network, ATA-Transcom demonstration, 12 carriers.

6. Becker, Jay, "Intelligent Vehicle/Highway Systems," APWA Reporter, November, 1990, pp. 6-7.

Article notes Mobility 2000's call for \$35 billion in IVHS research and development, and describes benefits including improved mobility, reduced congestion and emissions, and greater highway safety.

7. Behrendt, Jurgen, "Future Traffic and RTI Status Report of the Federal Republic of Germany," VTI Rapport, Vol. 364-A, 1990, pp. 69-90.

8. "Beep! Paul Revere Updated in N.Y.," New York Times, June 2, 1991.



9. **Castle Rock Consultants, "Heavy Vehicle Electronic License Plate (HELP) Program," Leesburg, Va., January 1991.**

A working paper prepared for the Crescent Implementation Group on the various applications determined to be demonstrated in the Crescent Project. Output report contents, data elements, project software, and information streams are discussed.

10. **Chang, Edmond C.-P., Ph.D., P.E., "Toll Collection Based on AVI Technology," Technical Quarterly, Vol.6, Issue 2, March, 1991, pp. 10-13.**

This paper summarizes the application of AVI/TOLL technologies and operational efficiency of toll collection designs for improved highway AVI/ETC/ATM operations.

11. **Chen, K., and R.D. Ervin, "American Policy Issues in Intelligent Vehicle-Highway Systems," Socioeconomic Aspects of Intelligent Vehicle Highway Systems, University of Michigan IVHS Technical Report 90-12, August 1990, pp. 2-14.**

A number of policy issues need to be resolved before IVHS can be implemented in America, and we need a well-articulated, well-accepted national policy on IVHS. Some "macro" institutional issues discussed include user expectations, the role of government, building public-private partnerships in IVHS implementation, and legislative action on legal liability associated with IVHS technologies. Some "micro" issues include financing mechanisms, involvement of numerous levels of government agencies, common information presentation formats, and the setting of technical standards.

12. **Chen, K., and R.D. Ervin, "Developing a Program in Intelligent Vehicle-Highway Systems in America," Proceedings of the 20<sup>th</sup> International Symposium on Technology and Automation, Volume 2, Florence, Italy, May 29-June 2, 1989.**

13. **Chen, K., and R.D. Ervin, "Intelligent Vehicle-Highway Systems: U.S. Activities and Policy Issues," Technological Forecasting and Social Change, 38/4, 1990.**

14. **David, Yves, "Evaluation of the Perspectives of Driving Aids Based on Short Range Transmission Links between Ground and Vehicles and between Vehicles," VTI Rapport, Vol. 364-A, 1990, pp. 91-102.**

An analysis of the requirements concerning the development of short range microwave links for road traffic informatics (RTI) functions. The object of the paper is to present the main result of a more extensive reflection on the interest and feasibility of the electronic aids involving these links. (France)

15. Dingle, Julie, "Intelligent Vehicle-Highway Systems - Public/Private Partnerships." Presented at the ASCE Conference, Minneapolis, August 21, 1991.

This abstract reviews federal law and some administrative rules which guide the development of public-private partnerships in the IVHS arena. Intellectual property rights, privacy issues, and anti-trust policy in cooperative ventures. The author is an attorney with the FHWA.

16. Dupin, Chris, "Transport Companies Roll Along with EDI Plans," The Journal of Commerce, May 28, 1991, p. 3C.

17. Eastburn, M. and L. Christensen, "Reducing Vehicle Fleet Costs: A Case Study," International Journal of Physical Distribution and Materials Management, Vol. 16, No. 1, pp. 63-72.

Describes the experience of a large supermarket group in the United Kingdom with computer vehicle scheduling and PARAGON software.

18. "Electronic Tolls: AVI Technology Makes Toll Collection Fast and Convenient," HNTB Designer, Vol. 45, 1991, pp. 4-7.

The article discusses design and architectural issues in automatic toll collection using AVI technology in several U.S. locations, including Bay Harbor Islands, FL; Dallas, TX North Tollway; and California projects.

19. Fearnside, John J., "Institutional Considerations in the Evolutionary Development of IVHS," (ASCE Paper in printing).

20. Federal Highway Administration, "Intelligent Vehicle Highway Systems Commercial Vehicle Operations High Priority National Program Area," Washington, D.C., February 22, 1991.

This document describes the problems to be addressed, approach to be taken, and on-going related activities, as well as proposed future activities. A CVO-IVHS multi-phase planning chart is included.

21. Francois, Francis, "IVHS America - We Begin," Presentation to Intelligent Vehicle Highway Society of America, March 18, 1991.

22. Horan, Thomas A., "National IVHS Legislation: What It Can and Can't Do,"

(ASCE Paper in printing).

23. "IVHS Funding Legislation Tacked Onto Highway Bill," IVHS America, Vol. 1, No. 4, June, 1991.

24. IVHS America, "Article of Incorporation of Intelligent Vehicle - Highway Society of America (IVHS America)."

25. IVHS America, "Status Report November 1990 Steering Committee," Washington, D.C., November 1, 1990.

This report covers association activities and research progress to date. Organization structure, and membership rosters are given.

26. Johnson, Gregory S., "New Rail ID Tags May Be Mandatory," The Journal of Commerce, May 9, 1991.

27. Johnson, Gregory S., "Rail ID Technology to Be Studied Further," The Journal of Commerce, May 13, 1991.

28. Karlsson, Tage, "RTI-Current Global Project," VTI Rapport, Vol. 364-A, 1990, pp. 103-115.

Discussion of numerous cross-national pre-competitive IVHS-type products and technologies and their developmental histories.

29. Lambertus, Wynne L., "A Future with Smarter Cars and Smarter Highways," pc-trans, March/April, 1991, pp. 18-27.

30. Lamm, Lester P., remarks during opening session, IVHS America, 1991 Annual Meeting, Reston, Virginia, March 18, 1991.

31. Lee, Wayne, "Proposed Roadside Inspection Program Worries Truck Groups in California," The Journal of Commerce, April 5, 1991.

32. Lentz, J. and L. Larson, "Advantage I-75," Presentation to the Subcommittee on

Highway Transport, American Association of State Highway and Transportation Officials, December 11, 1990.

33. Lockheed Integrated Systems Company, Proposal for Crescent Demonstration Project, Volume I: Technical Proposal, March 12, 1990, submitted to Arizona Department of Transportation.

34. Melchers, Walter, "A New Way of Broadcasts for Motorists," VTI Rapport, Vol. 365-A, 1990, pp. 87-103.

The European Broadcasting Organization intends to build a European traffic radio data system which would be in use by 1995. "Trafficwarnservice" in West Germany must be regulated by that time. (Germany)

35. Midwest Transportation Center, "28 Percent of Trucks Sidelined After 3-Day Safety Inspection," Traffic World, May 27, 1991, p. 55.

36. "Moving with the Times," Heavy Duty Trucking, May, 1991, pp. 47-69.

This article reviews mobile messaging and truck telecommunications and satellite communications systems, and describes the role of fleet management, and the process of vendor selection.

37. "New Rail ID Tags May Be Mandatory," The Journal of Commerce, May 9, 1991.

Automatic Equipment Identification has been recommended for all rail cars by January 1995. This includes AEI tags estimated at \$30 each, while at-speed interrogator units could cost up to \$30,000 each. Private car owners with more than 70,000 cars doubt that installation can be complete by 1995.

38. "North American Van, Qualcomm Sign Pact," The Journal of Commerce, February 4, 1991.

39. "Proceedings of a Workshop on Intelligent Vehicle/Highway Systems by Mobility 2000," San Antonio, TX, February 15-17, 1989.

This progress report presents the status of a number of IVHS areas. The commercial vehicle discussion includes a review of commercial drivers' needs, including improved highway safety, amelioration of the regulatory burden faced by commercial operators, and applications which increase truck productivity.

40. **"Proposed Roadside Inspection Program Worries Truck Groups in California," The Journal of Commerce, April 5, 1991.**

California Air Resources Board is holding hearings on its proposal to institute roadside inspections for heavy-duty vehicles with excessive emissions or malfunctioning exhaust systems. Repairs would be required immediately, and civil penalties of up to \$1500/day may be imposed.

41. **"Public Agency Support Is Key to IVHS Program Success," IVHS America, Vol. 1, No. 2, April, 1991, p.1.**

42. **"Rail ID Technology to Be Studied Further," The Journal of Commerce, May 13, 1991.**

43. **Rao, K. and W. Grenoble and R. Young, "Traffic Congestion and JIT," Journal of Business Logistics, Vol. 12, No. 1, 1991, pp. 105-121.**

44. **Rowe, S. Edwin, "Public Agency Issues in the Implementation of IVHS," Applications of Advanced Technologies in Transportation Engineering (ASCE), 1991.**

The author discusses multi-jurisdictional coordination as a pre-requisite for IVHS implementation. He notes that some strategies (i.e. ramp metering and route diversion) may arouse local political opposition. Lack of technical expertise in public agencies is noted as a potential problem, as is the need for new funding mechanisms for IVHS. He recommends a more flexible approach to the allocation of gasoline tax funds, so that they may support IVHS operations.

45. **"Siemens Plans Troy Test of Ali-Scout IVHS System," Inside IVHS, Vol. 1, No. 1, pp. 1-3.**

Previews plans for a Troy, Michigan, area test of Siemens IVHS technology, in reportedly 1000 vehicles. Infrared transmitters and receivers are used in the route guidance and driver information system.

46. **Sjöberg, Lars-Erik, "Future Traffic and Road Traffic Informatics (RTI)" VTI Rapport, Vol. 364-A, 1990, pp. 59-67.**

Discusses the role of IVHS-type technologies in future road design, and in road productivity, and in road maintenance, especially in winter. (Sweden)

47. Sperling, D., "Technological Determinism vs. Consumer Preferences: The IVHS Implementation Dilemma," (ASCE Paper in printing).
48. Stadden, Kenneth, "Moving with the Times," Heavy Duty Trucking, May, 1991, pp. 47-63.
49. Stafford, Frank P., "Social Benefits of IVHS Systems," Socioeconomic Aspects of Intelligent Vehicle Highway Systems, University of Michigan IVHS Technical Report 90-12, August 1990, pp. 44-52.

This article quantifies reductions in travel time which may occur as a result of IVHS technologies. A mean-preserving reduction in the dispersion of travel times is found to be a benefit.

50. Syverud, Kent, "Liability and Insurance Implications of IVHS Technology," Socioeconomic Aspects of Intelligent Vehicle Highway Systems, University of Michigan IVHS Technical Report 90-12, August 1990, pp. 61-74.

Investment in IVHS may be deterred by liability concerns and costs, particularly in terms of automobile accident insurance and lawsuits. The author suggests that these risks "should be managed through state or federal" legislation.

51. "Tri-State Group Drafts Electronic Toll Standards," Inside IVHS, Vol. 1, No. 1.
52. "28 Percent of Trucks Side-lined After 3-Day Safety Inspection," Traffic World, May 27, 1991, p. 55.
53. Underwood, Steven E., "Social and Institutional Considerations in Intelligent Vehicle-Highway Systems," Socioeconomic aspects of Intelligent Vehicle Highway Systems, University of Michigan IVHS Technical Report 90-12, August 1990, pp. 15-43.

The author addresses the likely barriers to IVHS, as well as benefits from adoption. The article describes the "Delphi" technique used for this study.

54. Underwood, S., K. Chen and R. Ervin, "IVHS Driving Forces and Barriers," The Private Carrier, January 1991, pp. 26-27.

Using the "Delphi Technique," experts forecast the likely development schedule for various IVHS technologies. A brief review of majority use issues objectives of IVHS.

- 55. U.S. Department of Transportation, "Automated Traffic/Truck Weight Monitoring Equipment: An Overview of Issues and Uses," Washington, D.C., March 1990.**

This review of Demonstration Project No. 76 deals with Weigh-in-Motion objectives, including data collection and pavement design issues, and WIM operational characteristics, including vehicle processing rates, accuracy, and different WIM technologies.

- 56. U.S. Department of Transportation, "Automated Traffic/Truck Weight Monitoring Equipment: WIM/AVC Equipment Reference Booklet," Washington, D.C., October 1989.**

For Demonstration Project No. 76, twelve weigh-in-motion equipment and service vendors are identified, with product descriptions and corporate addresses given.

- 57. U.S. Department of Transportation, "Discussion Paper on Intelligent Vehicle-Highway Systems," Washington, D.C., May 1989.**

Covers types of IVHS systems, foreign programs, examples of existing programs, impact of IVHS technologies on the US economy, IVHS goals and preliminary agenda, and organizational options. Includes a list of companies submitting IVHS product information.

- 58. U.S. Department of Transportation, "Marketing Highway Technology and Programs," October, 1990.**

- 59. U.S. Department of Transportation, "Overweight Vehicles - Penalties and Permits," Washington, D.C., March 1991.**

This Report to the Congress provides an inventory of state practices in the area of commercial vehicle weight enforcement. Appendices include relevant federal laws, as well as a state-by-state summary of appropriate state agencies, and each state's fees and fines. A number of states were identified which do not conform to federal requirements and law.

- 60. United States General Accounting Office, "Smart Highways, An Assessment of Their Potential to Improve Travel," May, 1991.**

- 61. VTI Swedish Road and Traffic Research Institute, "VTI Annual Report," 1989/90.**

62. Ward, Jerry, "Urban Transportation: An Examination of Options from the Top Down," Rockwell International Corporation, Seal Beach, Ca., April 15, 1991.
63. Ward, Jerry, "IVHS - Matching Public Goals and Public Actions," Rockwell International Corporation, Seal Beach, Ca., March 1, 1991.

Among other things, states that except to support the regulatory function, it does not appear that public funds are necessary to support IVHS research and development.

64. Waters, C.D.J., "Computer Use in the Trucking Industry," International Journal of Physical Distribution and Logistics Management, Vol. 20, No. 9, pp. 24-31.

Recent software developments in the areas of OBC with cellular telephone and satellite communications, electronic mail with digitized voice communications, electronic logbook with digitized signature pads, automatic weighing and transponders, on-line databases for routing and mileage, OBC linking up with roadside computers or satellites for routing.

65. Willis, David K., "IVHS Technologies: Promising Palliatives or Popular Popycock?" Transportation Quarterly, Vol. 44, No. 1, January 1990, pp. 73-84.

The article reviews literature to date, and the promise of IVHS to address congestion, safety, and highway productivity.



**APPENDIX B**  
**MOTOR CARRIER AND IOWA DOT**  
**INTERVIEW SUMMARIES**

## IOWA DEPARTMENT OF TRANSPORTATION

July 16, 1991  
September 19, 1991

An initial IVHS-CVO "brain-storming" session was held with administrators from various Iowa DOT divisions, including Motor Carrier Services, Motor Carrier Enforcement, Driver Services, and the Office of Transportation Research. Several follow-up meetings and discussions were also held to discuss concerns, and areas of interest and need for IVHS-CVO applications. Since Iowa is a member of the International Registration Plan (IRP), the Interstate Fuel Tax Agreement (IFTA), the Commercial Vehicle Safety Alliance (CVSA), and is currently on-line with the Commercial Drivers License (CDL), we discussed why, and in what respects, Iowa differs from other states on motor carrier regulatory and administrative issues.

The research team presented six key definitional areas of IVHS-CVO, all technologically feasible, which are thought to be most likely to have a near-term effect on policy and procedure at the Iowa DOT. Current U.S. demonstration projects were reviewed and it was agreed that lowering institutional barriers is crucial to the success of any IVHS-CVO demonstration. Current modes of cooperation among the states were discussed, including I.R.P., I.F.T.A., C.V.S.A., and M.O.O.O. Fuel tax procedures and problems, such as the need for automated, accurate mileage information and problems of the operation of dual (manual/electronic) systems highlighted the need to address an automated apportioned fuel tax system.

Other issues in the discussions included safety inspections and the methods for officers to utilize these systems. Data privacy and the role of state-collected data were discussed. Concepts of automated corridors vs. regions or local areas were debated. And, applications for route guidance, weather information, and navigational aids were reviewed. Due to estimation and measurement problems, the state does not utilize formal investment criteria relative to this type (IVHS-CVO applications) of project. The potential for, and benefits of IVHS-CVO operations were discussed and thought to be promising.

### Participants included:

Shirley Andre, Motor Vehicle Division  
Ralph Ager, Director, Motor Vehicle Enforcement  
Mike Winfrey, Asst. Director, M.V. Enforcement  
Ruth Skluzacek, Director, Motor Carrier Services  
Sharon Green, CDL Coordinator  
Bill McCall, Director of Research  
Tom Maze, Mark Maggio, Carol Collins, I.S.U.

## UMTHUN TRUCKING COMPANY

September 27, 1991

Umthun Trucking Co. is a family-owned, Iowa-based, irregular route truckload carrier with 420 employees. It has four company-owned terminals in Iowa and three other terminals in Texas, Ohio, and Indiana. During the meeting at its Eagle Grove offices, research areas of interest were discussed, including hours of service regulations, automatic toll debit and pass-through systems, Automatic Vehicle Identification (AVI) equipment, fuel tax procedures, and in-vehicle communications systems. Also covered were weigh-in-motion (WIM) and safety pre-clearance concepts, automatic funds transfers, fuel decals, and problems of regulating over-dimension loads.

A discussion of the effects IVHS-CVO may have on the motor carrier industry and market structure was conducted and, in the case of Umthun, almost all of their mileage is on primary and secondary roads. The company was concerned about the automation of functions in only some states rather than all states, the lack of nation-wide "one-stop shopping," and having enough time to process permits and very numerous decals. Umthun is very pleased with Iowa DOT's use of "VISTA," and their ability to provide "one-stop shopping" for Iowa.

The company is actively evaluating new technology as it becomes available. They are concerned about the possibility of IVHS-CVO being used as a method to impose additional taxes on the motor carrier industry. The company sees potential in IVHS-CVO for improving highway safety.

### Participants included:

- Mr. Steve Umthun, Finance Manager
- Ms. Valerie Hanson, Licensing & Permits
- Mr. Norm Helmke, Manager, Administration
- Mr. Mark Maggio, I.S.U.

## **CRST INTERNATIONAL, INC.**

June 7, 1991

Headquartered in Cedar Rapids, CRST International, Inc. is one of the nation's largest motor carriers. CRST is a family-owned common and contract truckload carrier with 3,500 employees and seven operating subsidiaries. CRST has initiated a demonstration program with Rockwell International's Collins Commercial Avionics featuring instant two-way satellite communication, and they have experimented with a number of other new routing and truck management technologies. CRST uses the team driver concept.

During the meeting, the research team presented six key definitional areas of IVHS-CVO and reviewed current IVHS projects. Insurance issues and highway safety were reviewed, and ideas to improve information flow about highway conditions (weather/congestion/incidents) were discussed. The company sees modest though important benefits from W-I-M applications, and potentially greater benefits from satellite tracking and AVL, and pre-clearance for safety inspections.

Fuel tax apportionment and inter-state relations and cooperation were discussed as a major institutional barrier to IVHS-CVO. Current court decisions overturning weight-distance taxes were noted as they apply to facets of IVHS-CVO. The company is interested in applications which reduce congestion, and those which provide "One Stop Shopping". However, there was consensus that the industry would strongly object to remote electronic interrogation of driver log books and electronic manifests. Although CRST believes that many of the benefits from IVHS-CVO actually accrue to the taxpayers and the motoring public, they are supportive of a number of IVHS-CVO applications.

Participants included:

John M. Smith, President & C.E.O.  
Liz Jensen, Director, Licensing & Fuel Tax  
Tony Bacino, Safety Director  
Tom Maze, I.S.U.  
Mark Maggio, I.S.U.

## **SUPER VALU STORES, INC.**

July 11, 1991

The Super Valu distribution center in Des Moines, and its private motor fleet of about 125 tractor-trailers, serves company and non-company retail grocery stores within 350 miles of Des Moines and handles about 36,000 truckloads per year. During the meeting, the researcher presented six key areas of IVHS-CVO, and reviewed the current IVHS projects. The fleet is illustrative of those fixed-route carriers, where temporary (trip) permits are not needed. Each truck, however, is weighed as it departs, and weights of grocery items can vary significantly.

WIM and pre-clearance concepts for weight and safety inspections were found to be helpful, although scale delays for this fleet are almost nil. Electronic interrogation of log books and manifests was acceptable to the fleet. Calculation of state fuel tax, one-stop shopping, weight tolerances, navigational aids, and driver information systems were covered. Super Valu indicated interest in AVL, portable time and temperature freight monitoring units, and the I-80 corridor concept, although their trucks do not log a great deal of miles on interstate corridors.

Super Valu is interested in testing new concepts and has done so. New technology, however, cannot be adopted if a return on investment cannot be demonstrated to the stockholders. Even a \$50 tag may be too great a cost if financial benefits could not be shown.

Participants included:

Mr. John Tierney, Transportation Manager  
Mr. Mark Maggio, I.S.U.

## **RUAN TRANSPORTATION SYSTEM MANAGEMENT COMPANY**

September 11, 1991

The Des Moines-based Ruan Transportation Company comprises a number of multi-faceted truck transportation companies offering common and contract carrier service and tractor-trailer leasing in 48 states and Canada. Ruan has 2,800 employees and a fleet of some 7,000 tractor-trailers. The company is one of the largest truck leasing organizations in the nation.

During the meeting, the group engaged in a broad discussion of motor carrier regulatory administration and technology, and various related managerial practices among carriers. Varying state requirements and the remote likelihood of federal pre-emption for one-stop shopping were seen as problems, while AVI tags with WIM scales, through-clearance for weight and safety inspections, and universal membership in IFTA and IRP were favored.

Ruan contracts with an unrelated third party provider for licensing and permit services. This provides Ruan with the expertise and the benefits of scale economies developed by the third party provider. It seems critical that these agents and third party provider companies be included in assessments of the viability and institutional work necessary for implementation of relevant IVHS-CVO applications.

### **Participants included:**

Russ Cerniglia, Dir., Licensing & Government Relations  
John Zirkelbach, Saunders, Inc. (Birmingham, AL)  
Mark Maggio, I.S.U.

**APPENDIX C**  
**SURVEY QUESTIONNAIRE**  
**MOTOR CARRIER COMPLIANCE COSTS**

## ESTIMATE OF COMPLIANCE COSTS - WEIGHT ENFORCEMENT

This questionnaire is only looking at compliance costs, which can be defined as the administrative, bureaucratic, legal, and bookkeeping costs required to meet the provisions of the applicable rules or laws. Compliance costs have been called "**red tape**" by some critics, and do not include normal operating costs of doing business in a safe and efficient manner. Thanks for your time!

### EXAMPLE: COMPLIANCE COSTS VS. OPERATING COSTS

Time spent waiting in line at a weigh station or filling out overweight permit application forms are compliance costs. Reloading an overweight rig is not a compliance cost. Regardless of the state's method used to enforce vehicle weights, overweight vehicles will always have to be re-loaded.

- A. Year: For the 12 months ended \_\_\_\_\_
- B. Fleet: Number of tractors: \_\_\_\_\_  
Number of trailers: \_\_\_\_\_  
Number of company drivers: \_\_\_\_\_  
Number of Owner-operators: \_\_\_\_\_

#### Company costs

1. Long-distance telephone charges related to weight enforcement, calculation, and dispute resolution (if any): \$ \_\_\_\_\_ per year
2. Clerical, accounting, or managerial costs related to weight enforcement, including postage, copying, forms, etc. (if any): \$ \_\_\_\_\_ per year
3. Estimate of annual cost of lost business as a result of delays at weigh stations (if any) or from delays in getting proper overweight permits: \$ \_\_\_\_\_ per year



### **Drivers**

4. Driver time spent on weight enforcement, log book entry, including time on company scale and at roadside weigh stations: \_\_\_\_\_ minutes per trip (on average) per driver
5. Percentage of all trips using team drivers: \_\_\_\_\_ %
6. Average number of trips per year each driver makes: \_\_\_\_\_ trips per year
7. Average annual wages and benefits cost for one driver: \$ \_\_\_\_\_ per year
8. Average time required to train a driver about weight enforcement: \_\_\_\_\_ hours per year (give an average estimate for your drivers)
9. Other driver costs related to weight enforcement:

### **Equipment costs**

10. Estimate annual wear and tear on tractors which results from slowing down and stopping at weigh stations annually: \$ \_\_\_\_\_ per tractor
11. Estimate average time lost while at roadside weigh stations for each truck: \_\_\_\_\_ minutes per trip. (Might be the same as #4 above.) What is the value of the time lost for the tractor and trailer, per hour? \$ \_\_\_\_\_ per hour

### **Shop personnel**

12. Time required for shop personnel to weigh trucks and keep necessary records for each truck, if any: \_\_\_\_\_ minutes per trip
13. Time required to train a maintenance shop worker about weight enforcement and scale operation: \_\_\_\_\_ hours per year (give an average estimate for maintenance shop personnel)
14. Average annual wages and benefits cost for one shop worker: \$ \_\_\_\_\_ per year
15. Other maintenance shop costs related to weight enforcement compliance:

## ESTIMATE OF COMPLIANCE COSTS - ROADSIDE SAFETY INSPECTIONS

This questionnaire is only looking at compliance costs, which can be defined as the administrative, bureaucratic, legal, and bookkeeping costs required to meet the provisions of the applicable rules or laws. Compliance costs have been called "red tape" by some critics, and do not include normal operating costs of doing business in a safe and efficient manner. Thanks for your time!

### EXAMPLE: COMPLIANCE COSTS VS. OPERATING COSTS

Time spent placing CVSA stickers on a vehicle and keeping an inventory of those stickers are compliance costs. Replacing worn or "bald" tires on a tractor is not a compliance cost. Regardless of the state's method used to inspect and enforce vehicle safety rules, "bald" tires will always have to be replaced.

1. Year: For the 12 months ended \_\_\_\_\_
2. Fleet: Number of tractors: \_\_\_\_\_  
Number of trailers: \_\_\_\_\_  
Number of company drivers: \_\_\_\_\_  
Number of Owner-operators: \_\_\_\_\_

#### Office Staff

1. Filing and storage costs for paper inspection reports: \$ \_\_\_\_\_ per year
2. Number of employees (full-time equivalent, include clerical, accounting, and management) who work on paperwork related to safety inspections: \_\_\_\_\_  
FTE's
3. Average annual wages and benefits cost for one clerical or managerial employees: \$ \_\_\_\_\_ / year
4. Time required to train management and clerical personnel about safety inspections paperwork: \_\_\_\_\_ hours per year (give a total estimate for all your office staff together)

5. Long-distance telephone charges related to roadside safety inspections compliance and dispute resolution: \$ \_\_\_\_\_ per year
6. Other clerical, accounting, or managerial costs related to safety inspections, including postage, copying, forms, etc.:
7. Estimate of annual cost of lost business as a result of delays at inspection stations (if any) when the vehicle was in compliance: \$ \_\_\_\_\_ per year

#### **Drivers**

8. Driver time spent at roadside safety inspections: \_\_\_\_\_ minutes per trip
9. Average number of trips per year each driver makes: \_\_\_\_\_ trips per year
10. Percentage of all trips using team drivers: \_\_\_\_\_ %
11. Average annual wages and benefits cost for one driver: \$ \_\_\_\_\_ per year
12. Other driver costs related to non-automated roadside safety inspections:

#### **Equipment costs**

13. Estimate average time lost while at roadside inspection stations, when truck inspection is required, for each truck: \_\_\_\_\_ minutes per trip. (Might be the same as #8 above.) What is the value lost for the tractor and trailer, per hour? \$ \_\_\_\_\_ per hour

### **Shop Personnel**

14. Time required for shop personnel to handle CVSA stickers, and paper work related to roadside safety inspections (if shop personnel handle any): \_\_\_\_\_ minutes per trip on average
15. Time required to train maintenance shop personnel about safety inspection paper work and CVSA stickers : \_\_\_\_\_ hours per year (give an average estimate for all maintenance shop people)
16. Average annual wages and benefits cost for one shop worker: \$ \_\_\_\_\_ per year
17. Other maintenance shop costs related to safety inspection compliance (Do not include mechanical work or parts):

## ESTIMATE OF COMPLIANCE COSTS - LICENSES, REGISTRATIONS, PERMITS

This questionnaire is only looking at compliance costs, which can be defined as the administrative, bureaucratic, legal, and bookkeeping costs required to meet the provisions of the applicable rules or laws. Compliance costs have been called "red tape" by some critics, and do not include normal operating costs of doing business in a safe and efficient manner. Thanks for your time!

### EXAMPLE: COMPLIANCE COSTS VS. OPERATING COSTS

Time spent filing applications for licenses and registrations in several states for your fleet or telephone calls to obtain trip permits are compliance costs. The actual fees or cost of those licenses are not considered compliance costs. Regardless of the state's administrative methods used to issue registrations and trip permits, carriers will still have to pay the actual license or permit charges.

1. Year: For the 12 months ended \_\_\_\_\_
2. Fleet: Number of tractors: \_\_\_\_\_  
Number of trailers: \_\_\_\_\_  
Number of company drivers: \_\_\_\_\_  
Number of Owner-operators: \_\_\_\_\_

### Office Staff

3. Number of employees (full-time equivalent, include clerical, accounting, and management) who work on licenses, registrations, and permits: \_\_\_\_\_ FTE's
4. Average annual wages and benefits cost for one clerical or managerial employees: \$ \_\_\_\_\_ / year
5. Time required to train management and clerical personnel about licenses, registrations, and permits application, payment, record-keeping, and auditing: \_\_\_\_\_ hours per year (give a total estimate for all your office staff together)

6. Annual costs for other personnel (CPA, accounting staff) used only in audits of your licenses, registrations, and permits (if not already included in #3 above): \$ \_\_\_\_\_ per year
7. Long-distance telephone charges related to licenses, registrations, and permit applications, payment, and dispute resolution: \$ \_\_\_\_\_ per year
8. Other clerical, accounting, or managerial costs related to licenses, registrations, and permits, including postage, copying, forms, etc.:

### **Drivers**

9. Driver time spent on licenses, registrations, and permits: \_\_\_\_\_ minutes per trip
10. Average number of trips per year each driver makes: \_\_\_\_\_ trips per year
11. Average annual wages and benefits cost for one driver: \$ \_\_\_\_\_ per year
12. Percentage of all trips using team drivers: \_\_\_\_\_ %
13. Time required to train a typical driver about licenses, registrations, and permits: \_\_\_\_\_ hours per year (give a average estimate for all drivers)
14. Other driver costs related to licenses, registrations, and permits:

### **Shop personnel**

15. Average number of license plates, registration cards, and permit (Bingo) stickers placed on or in each truck in one year: \_\_\_\_\_ plates, cards, and stickers
16. Time required for shop personnel to inventory, check off, remove, replace, or add one plate, card, or sticker to a truck: \_\_\_\_\_ minutes per item

17. Time required to train maintenance shop personnel about license plates, registration cards, and permit (Bingo) stickers: \_\_\_\_\_ hours per year (give a average estimate for all maintenance shop people)
18. Average annual wages and benefits cost for one shop worker: \$ \_\_\_\_\_ per year
19. Other maintenance shop costs related to license plates, registration cards, fuel and mileage cards, permit stickers, or Form D cab cards with stickers (Bingo):

## ESTIMATE OF COMPLIANCE COSTS - APPORTIONED FUEL TAXES

This questionnaire is only looking at compliance costs, which can be defined as the administrative, bureaucratic, legal, and bookkeeping costs required to meet the provisions of the applicable rules or laws. Compliance costs have been called "**red tape**" by some critics, and do not include normal operating costs of doing business in a safe and efficient manner. Thanks for your time!

### EXAMPLE: COMPLIANCE COSTS VS. OPERATING COSTS

Time spent calculating your fleet average of miles per gallon, or sitting with fuel tax auditors from various jurisdictions are compliance costs. The actual fuel taxes paid not considered compliance costs. Regardless of the calculation and bookkeeping methods used to determine and collect fuel tax revenue, carriers will still have to pay the actual fuel taxes.

1. Year: For the 12 months ended \_\_\_\_\_
2. Fleet: Number of tractors: \_\_\_\_\_  
Number of trailers: \_\_\_\_\_  
Number of company drivers: \_\_\_\_\_  
Number of Owner-operators: \_\_\_\_\_

### Office Staff

3. Number of employees (full-time equivalent, include clerical, accounting, and management) who work on fuel taxes: \_\_\_\_\_ FTE's. Include time spent on calculation and record keeping related to fuel **purchases**, as well as state-by-state fuel **usage**.
4. Average annual wages and benefits cost for one clerical or managerial employees: \$ \_\_\_\_\_ / year
5. Time required to train management and clerical personnel about fuel tax reporting, collection, and auditing: \_\_\_\_\_ hours per year (give a total estimate for all your office staff together)



6. Annual costs for other personnel used only in fuel tax audits (if not already included in #3 above): \$ \_\_\_\_\_
7. Long-distance telephone charges related to fuel tax reporting, mileage calculation, payment, and dispute resolution: \$ \_\_\_\_\_ per year
8. Other clerical, accounting, or managerial costs related to fuel taxes, including postage, copying, forms, etc.:

### **Drivers**

9. Driver time spent on fuel tax calculation/reporting/mileage on trip sheets: \_\_\_\_\_ minutes per trip
10. Average number of trips per year each driver makes: \_\_\_\_\_ trips per year
11. Average annual wages and benefits cost for one driver: \$ \_\_\_\_\_ per year
12. Percentage of all trips using team drivers: \_\_\_\_\_ %
13. Time required to train driver about fuel tax mileage and reporting: \_\_\_\_\_ hours per year (give an average estimate for all drivers)
14. Other driver costs related to fuel taxes:

### **Shop personnel**

15. Number of hours per year spent by shop personnel to record fuel purchases, if any, if not performed by office staff: \_\_\_\_\_ hours per year
16. Average number of fuel tax stickers placed on each truck in one year: \_\_\_\_\_ stickers (if not already included in licensing and permits section)

17. Time required for shop personnel to check off, remove, replace, or add one sticker to a truck: \_\_\_\_\_ minutes per sticker
18. Time required to train maintenance shop personnel about fuel tax stickers: \_\_\_\_\_ hours per year (give an average estimate for all maintenance shop staff)
19. Average annual wages and benefits cost for one shop worker: \$ \_\_\_\_\_ per year
20. Other maintenance shop costs related to fuel taxes:

## ESTIMATE OF COMPLIANCE COSTS - TOLL PAYMENT

This questionnaire is only looking at compliance costs, which can be defined as the administrative, bureaucratic, legal, and bookkeeping costs required to meet the provisions of the applicable rules or laws. Compliance costs have been called "red tape" by some critics, and do not include normal operating costs of doing business in a safe and efficient manner. Thanks for your time!

### EXAMPLE: COMPLIANCE COSTS VS. OPERATING COSTS

Time spent determining alternative non-toll routes or costs of checking driver's actual tolls for reimbursement are compliance costs. The actual toll charges themselves are not considered compliance costs. Regardless of the calculation and bookkeeping methods used to determine and pay toll charges, carriers will still have to incur the basic toll charge itself.

1. Year: For the 12 months ended \_\_\_\_\_
2. Fleet: Number of tractors: \_\_\_\_\_  
Number of trailers: \_\_\_\_\_  
Number of company drivers: \_\_\_\_\_  
Number of Owner-operators: \_\_\_\_\_
3. Estimated number of tollway authorities to which we make payment: \_\_\_\_\_  
Tollway Authorities per year

### Office Staff

4. Number of employees (full-time equivalent, include clerical, accounting, and management) who work on toll accounting: \_\_\_\_\_ FTE's
5. Average annual wages and benefits cost for one clerical or managerial employees:  
\$ \_\_\_\_\_ / year

6. Time required to train management and clerical personnel about tollway accounting procedures in your company: \_\_\_\_\_ hours per year (give an average estimate for all office staff)
7. Long-distance telephone charges related to toll payments and dispute resolution: \$ \_\_\_\_\_ per year
8. Other clerical, accounting, or managerial costs related to toll payments, including postage, copying, forms, etc.:

#### **Drivers**

9. Driver time spent on tollway payment: \_\_\_\_\_ minutes per trip
10. Average number of trips per year each driver makes: \_\_\_\_\_ trips per year
11. Average annual wages and benefits cost for one driver: \$ \_\_\_\_\_ per year
12. Time required to train driver about tollway procedures: \_\_\_\_\_ hours per year (give an average estimate for all drivers)
13. Percentage of all trips using team drivers: \_\_\_\_\_ %
14. Other driver costs related to tolls:

#### **Equipment costs**

15. Estimate annual wear and tear on tractors which results from slowing down and stopping at toll collection stations annually: \$ \_\_\_\_\_ per tractor
16. Estimate average time lost while at toll collection stations for each truck: \_\_\_\_\_ minutes per trip. (Might be the same as #9 above.) What is the value lost for the tractor and trailer, per hour? \$ \_\_\_\_\_ per hour