

INSTITUTIONAL ISSUES AFFECTING
THE IMPLEMENTATION OF IVHS TECHNOLOGIES
TO COMMERCIAL VEHICLE OPERATIONS
IN THE STATE OF INDIANA

JAMES G. KAVALARIS
Research Assistant,
School of Civil Engineering,
Purdue University

ABSTRACT:

Weigh station and toll booth delay, licensing and taxation compliance overhead, and other inter-jurisdictional regulatory differences all contribute to increased motor carrier operating costs within the United States. Through the use of IVHS technologies such as Weigh-In-Motion (WIM) and Automatic Vehicle Identification transponders (AVI) to allow legal bypass of weigh stations, pre-clearance for safety inspections, automatic toll collection, and simplified "one-stop-shopping" for licenses, registrations, and permits, there exists the potential to increase motor carrier efficiency, decrease costs, and enhance the competitiveness of American-made products in the world market. In the context of existing operational field tests, this paper will present general estimates of present system costs and potential future system savings based on the present number of commercial vehicles in various use and travel distance categories within the United States, the average time these vehicles wait at weigh stations and toll plazas, the number of weigh stations and toll plazas encountered during these trips, the average toll paid, the economic value of time to commercial drivers and their cargo, the value and length of time clerical staff spend complying with commercial vehicle regulations, and the potential aggregate environmental benefits to be derived from decreased emissions and vehicle wear and tear via. decreased congestion and fuel burn.

1. INTRODUCTION

1.1 *Paradigm*

Americans enjoy unparalleled freedoms to travel throughout the United States. If one's driver's license, vehicle registration plates, taxes, and auto-insurance requirements are met within their home state, they may legally operate within all fifty states. Unlike nations that restrict travel from region to region, the United States has no agency to grant "interstate travel permissions", and has no "customs checkpoints" between states to enforce these and other regulations -- unless you are operating a commercial vehicle.

1.2 *Definitions*

The State of Indiana defines commercial vehicles as "any vehicle that is used for the transportation of persons for-hire or is designed, used, or maintained primarily for the transportation of property, and:

- (a) is a power unit having three or more axles regardless of weight;
- (b) is a power unit having a gross weight in excess of 26,000 pounds; or
- (c) is a vehicle used in combination when the gross weight of the combination exceeds 26,000 pounds" [On the Crossroads, 1].

1.3 *Present System*

Commercial vehicle operators must satisfy many requirements and secure a number of validation plates and/or stickers before ever delivering their initial load of goods. All new motor carriers must first acquire operating authority (permission to haul goods in a specified state) from either the Interstate Commerce Commission in Washington, D.C. (for inter-state carriers) or from the state they plan to do business in (for intra-state carriers). This authority, along with both proof of insurance and either a minimum rate schedule (for contract carriers¹) or a tariff (for common carriers²), must then be registered with the proper agency in each state they plan on driving through (the Department of Revenue in Indiana). When this is met, motor carriers must then purchase both an annual cab card (validation certificate to be kept in the vehicle) from either the National Association of Regulatory Administrators in Washington, D.C. (for inter-state carriers) or from their base state (for intra-state carriers), and an annual "bingo stamp" (validation sticker to be placed on the cab card) from the proper agency in each state they plan to drive in (the Department of Revenue in Indiana) [Love].

¹"A common carrier holds itself out to the general public to transport property or passengers within the scope of its operating authority" [On the Crossroads, 22].

²"A contract carrier operates under individual contracts with specific shippers and either dedicates vehicles to specific shippers or provides a distinct service for individual customers" [On the Crossroads, 22-23].

All motor-carriers must also register for and purchase Motor Carrier Fuel Tax Annual Permits and Compliance Emblems for each of their vehicles. This requirement may be met in two different ways, depending on where a vehicle travels and whether or not the states traveled through participate in the International Fuel Tax Agreement (IFTA)³.

- (1) The first registration method, restricted to inter-state vehicles traveling in at least two IFTA states, allows motor-carriers to complete fuel-tax requirements for all IFTA states by simply registering with the proper agency in their base-state (the Department of Revenue in Indiana). Motor carriers are then annually issued one license (a sticker to be affixed to the vehicle), and one set of credentials (to be kept in the vehicle) which allow travel through all IFTA member jurisdictions. In addition, participating motor-carriers only need to file one quarterly report which reflects the net tax or refund due for all IFTA member jurisdictions, and be subject to one audit, performed by the base jurisdiction (in most circumstances) [On the Crossroads, 26].
- (2) The second fuel-tax registration method, required for both non-IFTA participants and those IFTA participants that plan on driving in any non-IFTA states, requires motor carriers to purchase a separate Annual Permit/Cab Card (validation certificate to be kept in the vehicle), and a separate annual Compliance Emblem (sticker to be affixed to the vehicle) from either the proper agency in each non-IFTA state they plan on driving in (for inter-state carriers) or from the proper agency (the Department of Revenue in Indiana) in their base state (for intra-state carriers). Motor-carriers in this category must file separate quarterly reports to each jurisdiction they have registered with, and are also subject to separate audits by each of these jurisdictions [On the Crossroads, 26-33].

Similarly, all motor carriers must register for and purchase a license plate for each of their vehicles. This requirement also may be met in two different ways, depending on where a vehicle travels, and whether or not the states traveled through participate in the International Registration Plan (IRP)⁴.

³IFTA is a base-state fuel tax agreement based on miles traveled in each state. The current IFTA member jurisdictions are: Arizona, Arkansas, Colorado, Idaho, Indiana, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, Nevada, North Carolina, North Dakota, Oklahoma, South Dakota, Utah, Washington, Wisconsin, and Wyoming [On the Crossroads, 25].

⁴IRP is an apportioned base-state registration agreement based on miles traveled in each state. Current IRP member jurisdictions are: Alberta (Canada), Alabama, Arizona, Arkansas, California, Colorado, Connecticut, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, South Dakota,

- (1) The first registration method, restricted to inter-state vehicles traveling in at least two IRP states, allows motor-carriers to complete vehicle-registration requirements for all IRP states by simply registering with the proper agency in their base-state (the Department of Motor Vehicles in Indiana), and including proof of insurance and payment of the Federal Heavy Vehicle Use Tax (required "for all highway vehicles having a gross or combined gross weight of 55,000 pounds or more" [On the Crossroads, 6]). Motor carriers are then annually issued one license plate bearing the word "apportioned", and one cab card (to be kept in the vehicle), indicating the IRP jurisdictions in which the unit is registered and the registered weight for legal travel in each of those jurisdictions [Indiana Bureau, 15].
- (2) The second vehicle registration method, required for both non-IRP participants and those IRP participants that plan on driving in any non-IRP states, requires motor carriers to annually purchase a separate license plate (to be attached to the vehicle), and a separate cab card listing the vehicle's registered weight (to be kept in the vehicle) from either the proper agency in each non-IRP state they plan on driving in (for inter-state carriers) or from the proper agency (the Department of Motor Vehicles in Indiana) in their base state (for intra-state carriers) [On the Crossroads, 5]. As with IRP, both proof of insurance and payment of the Federal Heavy Vehicle Use Tax (if gross weight exceeds 55,000 pounds) is required.

Finally, if any vehicles need to be either overweight or oversize during a specific trip, then special permission must be obtained via the purchase of an oversize/overweight trip permit from the proper agency in each state that a vehicle needs to travel through while either oversize or overweight (the Department of Transportation in Indiana) [Indiana Department, 9].

To enforce these many requirements, all carriers must stop at each weigh station they encounter, and be subject to random inspection by a state's motor carrier enforcement section (usually part of the State Police) in order to confirm operating credentials; verify weight, tax, and other regulatory compliance; and ensure truck safety. In the early days of regulated commercial vehicle operations, stopping at every weigh station might have been the only feasible enforcement method, however, the electronics revolution is providing many new methods to achieve these goals in an efficient, effective, and equitable manner relative to all parties involved.

Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, & Wyoming [On the Crossroads, 1].

1.4 Future Concept

Collectively, these new methods (including electronic insurance filings, electronic license-plates, automatic mileage recording & trip-logs, site-specific highway warning systems, pre-clearance at weigh stations, and automatic funds transfers for tolls & taxes, etc.) have become known as IVHS-CVO (Intelligent Vehicle-Highway Systems -- Commercial Vehicle Operations). Instead of a multitude of requirements and enforcement procedures that are different enough to create excessive paperwork and delays between states, but identical enough to be considered redundant activities that add a disproportionate amount of cost relative to their benefits, IVHS-CVO uses the following technologies to eliminate these barriers to efficiency, while still maintaining the original intent of these regulations -- to provide for the health, safety, and welfare of the public.

2. AVAILABLE TECHNOLOGIES

2.1 *Weigh-In-Motion (WIM)*

Weigh-In-Motion refers to various technologies that enable vehicle weights to be determined without the need for a vehicle to physically stop on a static scale. The three basic WIM operating scenarios are:

- (a) 20 mph WIM with legal and non-complying vehicles sorted off the mainline;
- (b) 40 mph WIM with legal and non-complying vehicles sorted off the mainline; and
- (c) 65 mph WIM with mainline sorting and pre-clearance allowing total enforcement station bypass for legal vehicles [Center for Urban, 20]

In spite of their potential for increased operational capabilities, however, most high-speed WIM systems are still controversial, with present accuracy to within only 20% of a vehicle's true weight (as determined by static scales)⁵ [Lombard, 22].

2.2 *Automatic Vehicle Classification (AVC)*

Automatic Vehicle Classification refers to various technologies that automatically determine vehicle length, height, and number of axles for classification purposes. This equipment is typically integrated with WIM systems.

⁵This wide variation in accuracy is mainly due to a truck's natural bouncing motion while traveling down a road (i.e. trucks passing over a WIM device while on the downward portion of this bounce can have a heavier than true weight recorded; likewise, trucks passing over a WIM device while on the upward portion of this bounce can have a less than true weight recorded).

2.3 *Automatic Vehicle Identification (AVI)*

Automatic Vehicle Identification refers to assorted technologies that uniquely identify vehicles as they pass specific points on the highway (for automatic toll payments, and/or electronic licensing, etc.), without requiring any action by the driver or an observer. "This is accomplished via. a vehicle-mounted transponder or tag; a roadside reader unit, with its associated antennas; and a computer system for data processing and storage" [Transportation Research, 12].

3. PRESENT OPERATIONAL FIELD TESTS

3.1 *H.E.L.P. / Crescent*

There are presently two major operational field tests in the United States to demonstrate IVHS-CVO technologies. The first field test, H.E.L.P. / Crescent, is a project to design and implement an integrated IVHS-CVO system along I-5 and I-10 through the states of Texas, New Mexico, Arizona, California, Oregon, Washington, and the Canadian Province of British Columbia. Using interconnected AVI, AVC, and WIM technologies such that all data is processed by a central computer for use by both government and the trucking industry for regulatory, weight enforcement, and fleet-management purposes, "the goal is to have a system in which a truck, entering the system in British Columbia, can drive through the entire network without having to stop at other weigh stations or ports-of-entry" [Federal Highway, 25]. There are presently 25,000 transponder-equipped trucks [Reith, 4] and 40 equipped enforcement stations participating in this program. A detailed system evaluation is currently underway.

3.2 *Advantage I-75*

The second major IVHS-CVO operational field test, Advantage I-75, is a public / private partnership to facilitate motor-carrier operations by allowing transponder-equipped and properly documented trucks to travel any segment along the entire length of I-75 in Florida, Georgia, Kentucky, Tennessee, Ohio, and Michigan, and Canadian Highways 401 and 402 (Windsor, Ontario through Quebec City, Quebec) at mainline speeds with minimal stopping at weight / enforcement stations. "Pre-clearance decisions at downstream stations will be based on truck size and weight measurements taken upstream and on computerized checking of operating credentials in each State" [Federal Highway, 24]. Emphasis is on utilizing off-the-shelf technologies configured for decentralized control so that each state may retain its constitutional and statutory authority relative to motor carrier operations. A system design has been completed by *JHK & Associates*, with initial implementation currently underway [Federal Highway, 24].

4. COSTS

4.1 *Motor-Carrier Baseline Costs*

The first step in quantifying any system costs and benefits is to determine existing baseline costs for both the motor carrier industry and regulatory agencies so that the relative magnitude of any potential benefits can be evaluated as to whether or not any potential benefits are significant enough to warrant system implementation.

The American Trucking Association has determined that total truck operating costs for 1990 were \$1.077 per mile, including tractor and trailer depreciation, interest payments, license plate and fuel tax permits, federal highway use taxes, insurance, in-frame overhaul costs, down payments for vehicle replacements, preventive maintenance programs, tires, repairs, fuel, tolls, driver food/lodging, and driver salaries [Center for Urban, 13]. Of these, it was determined that only \$0.05 per mile was related to regulatory costs for fuel tax and operating license registrations, operation authority permitting, and other use tax permits [Center for Urban, 16]. When multiplied by an estimated 6.05 billion annual truck-miles traveled in the State of Indiana (assuming 30% trucks on interstate routes and 20% trucks on all other state highways) [Lombard, 39], it can be estimated that baseline interstate motor-carrier costs in the State of Indiana are approximately \$6.52 billion, with \$0.30 billion of that related to the above regulatory costs.

4.2 *State Agency Baseline Costs*

As part of the Advantage I-75 Motor Carrier Project, The Center for Urban Transportation Research at the University of South Florida-Tampa prepared an assessment of state regulatory costs relative to vehicle inspection and enforcement. Considering labor costs (salaries and benefits for weight inspectors, officers, and scale technicians), operating overhead, maintenance costs, and capital depreciation of equipment, it can be estimated that "the average cost per enforcement station was approximately \$310,000 (annually) and the average cost per employee was approximately \$27,000 (annually) [Center for Urban, 15]. When multiplied by fourteen weigh stations in the State of Indiana, it can be estimated that State of Indiana's annual baseline costs relative to vehicle inspection and enforcement is approximately \$4.34 million.

This above baseline cost can then be added to the annual budget for the Indiana Department of Revenue's Motor Carrier Tax & Authority Section (\$4.37 million [Paquette]) to yield an estimated \$8.71 million for total annual state agency motor-carrier related baseline costs in the State of Indiana.

4.3 *Conceptual IVHS-CVO System Costs*

It has been estimated that Automatic Vehicle Identification (AVI) transponders cost \$50 each [Transportation Research, 52] (not including an additional \$30 per vehicle for installation costs), AVI readers cost \$7,500 each, AVI antennas cost \$2,000 each, and

integrated Weigh-In-Motion/ Automatic Vehicle Classification (WIM/AVC) equipment costs approximately \$70,000 per site (including installation) [Application for Federal, 23].

Assuming fourteen existing weigh-station sites for both WIM/AVC equipment and AVI readers & antennas, twelve sites at major truck ports-of-entry into the State of Indiana for AVI readers & antennas, and 15 sites at both interchange and barrier-type collection booths along the Indiana Toll Road for AVI readers (with 4 antennas per site to handle each lane of traffic), it can be estimated that capital costs for IVHS-CVO equipment in the State of Indiana (excluding costs for system design and maintenance, etc.) could be at least \$1.33 million.

5. BENEFITS

5.1 *Travel Time Savings*

As part of the Florida study for Advantage I-75, researchers also prepared a detailed assessment of the maximum potential benefits from IVHS-CVO system implementation. Using methodologies from the AASHTO Benefits Manual, it was determined that IVHS-CVO could save \$1.59 per reduced weigh station stop (considering "reduced wear and tear on the vehicle plus the driver's time involved in braking the vehicle"), could save \$0.864 per reduced minute idling (considering "driver time and vehicle wear-and-tear"), and could capture lost motor-carrier revenue at a rate of \$0.882 per reduced minute of delay (based upon an industry average 5% gross profit margin with 100% time-sensitive truck loads) [Center for Urban, 22-25].

Using these above values, and taking into consideration both an estimated 62.4 million annual truck passes through weigh stations in the State of Indiana⁶, and estimated delay reductions of 1.62 million truck-hours via. 65 mph mainline WIM, 1.26 million truck-hours via. 40 mph WIM, and 0.36 million truck-hours via. 20 mph WIM [Center for Urban, 26-28], expected travel time cost savings in the State of Indiana can be estimated (assuming 100% participation of the motor-carrier industry) as detailed in Table 1.

⁶Derived from 6.05 billion annual truck-miles traveled in the State of Indiana [Lombard, 39 and 51], divided by an assumed 227.85 miles per truck trip along the Advantage I-75 corridor, and multiplied by an assumed 2.35 weigh station passes per truck trip along the Advantage I-75 corridor [Center for Urban, 20].

TABLE 1: Estimated Travel Time Cost Savings in the State of Indiana due to IVHS-CVO with 100% participation by the motor-carrier industry.

Future Operating Scenario	Stopping Costs (millions)	Idling Costs (millions)	Potential Lost Revenue Captured (millions)	TOTAL SAVINGS (millions)
65 mph WIM, Mainline By-pass	\$99.2	\$83.4	\$85.2	\$267.8
40 mph WIM, off-line sorting	\$99.2	\$65.3	\$66.7	\$231.2
20 mph WIM, off-line sorting	\$99.2	\$18.8	\$19.2	\$137.2

5.2 Safety Enhancement

The Florida Advantage I-75 Study also attempted to quantify potential safety improvements from IVHS-CVO implementation due to reduced congestion and weaving movements by exiting and entering trucks in the vicinity of enforcement stations. "By analyzing data for truck accidents occurring within a 1/2-mile radius of the diverge and merge ramp junctions at weigh stations along the 1,760-mile I-75 corridor and 501-mile Canadian Highway 401-420 for the three-year period 1987 through 1990" [Center for Urban, 33], it was determined that the "median truck accident rate at all the weigh stations ... is 92.25 accidents per 100 million truck-miles of travel, which is significantly lower than the national average of 219. In addition, according to selected weigh station personnel ... the damage done to the vehicles involved in these accidents was generally minor and did not affect traffic flow" [Center for Urban, 37].

Assuming an even more conservative 42.1 accident rate per 100 million truck-miles of travel (based on the Bridgeport, Michigan weigh station in order to better normalize for Midwestern drivers and weather conditions) and an average cost of a truck accident at \$3,100 for property damage only (according to a 1988 report by the Institute of Transportation Studies at the University of California, Irvine) [Center for Urban, 33], these values can be multiplied by an estimated 2.91 billion truck-miles of travel along Interstate routes in the State of Indiana [Lombard, 39] to estimate a potential maximum annual safety savings of \$3.8 million in the State of Indiana.

5.3 Paperwork Reduction

As part of an institutional barriers study relative to commercial vehicle operations in the State of Iowa, the Midwest Transportation Center prepared a rough assessment of potential benefits from uniformity in compliance requirements. Based on information from National

Cooperative Highway Research Program Report #303, typical state benefits of \$3.6 million (10% AVI participation) to \$5.5 million (30% AVI participation), and typical motor carrier benefits of \$17.7 million (10% AVI participation) to \$53.0 million (30% AVI participation) could be realized [Maze, 18]. In addition, the Indiana Department of Revenue estimates that computerizing their procedures, including electronic insurance filing capabilities, could free their auditors to focus on audits, rather than constantly helping to keep back-logged paperwork from becoming unmanageable [Copenhaver].

5.4 Increased Enforcement Revenues

The Florida Advantage I-75 Study estimates a one percent violation rate for *monitored* truck traffic along weigh station routes, and that as much as one-third of the annual traffic in these areas could be *unmonitored* due to peak-time wave-by around the scales whenever vehicles back-up onto the mainline roadway, and during off-peak times when the weigh stations are closed [Center for Urban, 47]. Since IVHS-CVO technologies can provide for both increased weigh station capacities and 24-hour truck monitoring under certain configurations, it can be calculated that if these existing unmonitored trucks could be monitored (estimated at approximately 8.85 million trucks per year in the State of Indiana)⁷, and if the Florida rates (including a \$250 average amount per violation in Florida) are used for this estimate, the State of Indiana could gain \$22.1 million annually from these additional violation citations (8.85 million x 0.01 x \$250).

5.5 Other Benefits

In addition to the above quantifiable benefits, the Advantage I-75 Study also noted the following other potential benefits:

- (a) "Lower prices to the general public as a result of more efficient movement of goods;
- (b) Increased data collection and information sharing for planning, registration/permitting, emergency response, enforcement, and revenue collection;
- (c) Improved two-way communications between states/provinces and truckers; and
- (d) Real-time travel condition monitoring to improve trip-making for all motorists in IVHS-CVO equipped corridors" [Center for Urban, 18].

⁷Derived from one-third of 6.05 billion annual truck-miles traveled in the State of Indiana [Lombard, 39 and 51], divided by an assumed 227.85 miles per truck trip as determined for the Advantage I-75 corridor [Center for Urban, 20].

6. INSTITUTIONAL ISSUES

6.1 *Regulatory vs. Enforcement Agencies*

While it has been shown that many state regulatory agencies are starting to embrace IVHS-CVO, some state enforcement agencies are simultaneously emphasizing the need for caution during IVHS-CVO development so that systems are not implemented that disproportionately enhance motor-carrier efficiency at the expense of enforcement agency abilities to effectively maintain highway safety for the public's well-being. Enforcement agencies stress that pre-clearance around weigh stations cannot be based on vehicle weight alone, but must also take into consideration answers the following questions:

- (a) "Has a North American Standard (NAS) inspection been performed?"
- (b) Has the vehicle been issued a Commercial Vehicle Safety Alliance (CVSA) decal?
- (c) Have any of the above inspections ordered the vehicle Out-of-Service?
- (d) What is the driver's name and are there any outstanding civil or criminal warrants against that driver?
- (e) Does the driver possess a valid Commercial Driver's License (CDL) along with the proper endorsement or other state recognized license substitutes?
- (f) Does the driver possess a valid medical certificate?
- (g) Does the driver possess an Hours of Service record that includes a notation as to the amount of "driving" and "on duty" time remaining as of the time when pre-clearance is requested?
- (h) Are enforcement personnel satisfied that the driver, at the time of the pre-clearance request, is not under the influence of alcohol or drugs?" [Folstad, 1].

6.2 *Motor Carrier Operators*

Similarly, in spite of preliminary results from IVHS-CVO development teams praising these technologies as the basis for paperwork reduction measures and travel time savings, motor-carrier operators have also voiced concerns that need to be addressed through the quantification of specific benefits to be derived from their active participation and accompanying investments in these systems. As revealed by the Florida Study for Advantage I-75, a frequent trucker perception expressing this uncertainty is that "under the current rules, trucks will still be required to register with each State traveled. If anything, it would seem that additional paperwork would be required to establish IVHS registration and to establish and make advance payments to an IVHS account" [Center for Urban, 41]. In short (if somewhat exaggerated), motor-carrier operators tend to rather endure "sixteen different paper methods" to handle a given process, rather than having to purchase and maintain "sixteen different AVI transponders". This motor-carrier conservatism towards IVHS-CVO is such that the Advantage I-75 Policy Committee recently agreed to not charge motor-carriers for transponders needed to participate in the Advantage I-75 program, and have instead included these costs in the government funded portion of the project [Hartman, 1]

7. ANALYSIS AND CONCLUSIONS

7.1 *Magnitude of Travel Time Savings vs. Baseline Operating Costs*

Travel time savings due to IVHS-CVO implementation represents a 2.1% to 4.1% reduction in total baseline trucking costs in the State of Indiana (\$6.52 billion). Even though seemingly minimal, when these savings are compared to a national average gross operating margin for motor-carriers of five percent (\$326 million for operations in the State of Indiana), estimated travel time savings could alone represent between 42.1% and 82.1% of motor-carrier profit -- "potentially the difference between bankruptcy and continued operation for motor-carriers along a project corridor" [Center for Urban, 46].

7.2 *Implementation Strategies*

Since new technologies, when introduced into a process, are most successful when initiated with a clearly defined purpose that addresses a specific need expressed by those at the grass-roots level of a given process, it is critical to first identify existing areas of high operating/compliance costs for motor carriers, and high administrative/regulatory costs for government, where IVHS technologies have the potential to help enhance efficiency. With these needs identified, optimal solutions can be implemented from a wide array of potential technological and non-technological solutions. This avoids the attitude of "have technology - - need application" which can often lead to non-optimal solutions yielding increased costs and excess equipment, including technologies introduced exclusively for the sake of either having something new to look good within an office (even though it would probably sit unused in the corner of that office), or to get publicity for some undisclosed goal -- unrelated to the specific technology itself.

With this process complete, a multi-state policy commission, consisting of representatives from both the public and private sectors, can be established to address specific institutional barriers and propose any necessary legislation or administrative rules that will allow for efficient, effective, and equitable implementation of these technologies into an integrated IVHS-CVO network with transparent borders between the participating states.

7.3 *Financing*

In addition to state and local funds, and private contributions in both the form of cash and donated services and/or equipment, the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA '91) authorizes \$660 million over the next six-years to promote compatible standards and protocols for widespread use of IVHS technologies, including the development of specific corridors which meet certain transportation and environmental criteria (to be funded with 80% Federal dollars [United States, 42]). Furthermore, ISTEA '91 includes specific "provisions for planning grants to State and local governments to study the feasibility for development and implementation of IVHS" [United States, 33].

8. AFTERWORD

This nation must now commit itself towards expediting any necessary legislative and administrative law changes required to eliminate institutional barriers preventing the implementation of IVHS-CVO solutions that have been identified and agreed to through the above processes, and have the potential to increase motor carrier efficiency, decrease costs, and enhance the competitiveness of American-made products in the world market. These actions are needed if we are to prevent gridlock on our highway systems, gridlock in our administrative/compliance systems, and a further blunting of the economic edge that helped to build this nation into a world leader.

Now is the time for America's policy-makers to stop being timid when challenged by opportunities to take preventive actions on domestic issues that have been clearly shown to loom ominously over the horizon. The United States cannot continue to deal with crisis after crisis only after its detrimental effects are imminent and have begun to cripple the nation's social, economic, and political well being. This type of U.S. reaction only produces band-aid solutions that offer too little, too late, and at a price to the American taxpayers that is many times the cost that an original commitment to preventive action would have required.

Through genuine cooperation and a commitment to essential financial backing, America's public, private, and academic sectors can form a synergistic partnership based on communication, cooperation, and confidence in each others' ability to produce innovations for IVHS-CVO. With this preparation, all parties can continue to participate in a technological movement that may truly have lasting effects on the positive growth and development of this nation -- the United States of America.

REFERENCES

American Association of State Highway and Transportation Officials. A manual on User Benefit Analysis of Highway and Bus-Transit Improvements, 1977.

Application for Federal Assistance to Finance the Crescent Demonstration Project, A proposal submitted to the Federal Highway Administration by the Heavy Vehicle Electronic License Plate program, January 1990.

Castle Rock Consultants. Heavy Vehicle Electronic License Plate (HELP) Program: Executive Summary, April 1989.

Center for Urban Transportation Research, University of South Florida-Tampa. Assessment of Benefits for Advantage I-75, March 1992.

Copenhaver, Jill Wulf, Assistant Supervisor, Indiana Department of Revenue, Motor-Carrier Tax & Authority Section. Interview, 19 November, 1992.

- Federal Highway Administration, Office of Traffic Management and IVHS. Intelligent Vehicle-Highway System (IVHS) Projects in the United States, May 1992.
- Folstad, Daniel N., Assistant Commander, Motor Carrier Division, Michigan State Police. Response to Advantage I-75 survey from the Kentucky Transportation Center regarding *Basic Data Packet* needs, 1990.
- Hartman, Don. Letter to the Advantage I-75 Policy Committee regarding the Center for Urban Transportation Research (CUTR) *Assessment of Benefits for Advantage I-75 Report Review*, 11 May, 1992.
- Indiana Bureau of Motor Vehicles. 1991 International Registration Plan Manual, 1991.
- Indiana Department of Highways. Oversize-Overweight Vehicular Permit Handbook, 1988.
- Indiana International Fuel Tax Agreement Compliance Manual, 1993.
- IVHS America. Strategic Plan for Intelligent Vehicle-Highway Systems in the United States, 20 May, 1992.
- Love, Sharon, Indiana Department of Revenue, Motor-Carrier Legal Section. Interview, 19 November, 1992.
- Maze, T.H., and Mark E. Maggio. Institutional Barriers and Opportunities for I.V.H.S. in Commercial Vehicle Operations: An Iowa Case Study, February 1992.
- On the Crossroads of America: A Guide to Indiana Trucking, 1992.
- Paquette, Dave, Assistant Supervisor, Indiana Department of Revenue, Motor-Carrier Tax & Authority Section. Interview, 23 November, 1992.
- Reith, John L., Director, Department of Highway Policy, American Trucking Association. Review of Advantage I-75 Program System Design Workbook, 25 September, 1991.
- Transportation Research Board. Assessment of Advanced Technologies for Relieving Urban Traffic Congestion, National Cooperative Highway Research Program Report 340, December 1991.
- United States Department of Transportation. A Summary: Intermodal Surface Transportation Efficiency Act of 1991, December 1991.
- Willis, David K., Senior Vice President, American Trucking Associations Foundation, Inc. Presentation overheads: *Getting Customers to Buy IVHS Technologies -- Lessons from the Commercial Vehicle Sector*, 1991.