

Final Report
Legal Constraints
To The Research, Development, and Deployment
of IVHS Technology in the United States

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Final Report

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I. Introduction

Intelligent Vehicle Highway Systems (IVHS) are a diffuse collection of automotive, communications, controls, traffic management, and systems technologies that hold the potential to improve highway safety, reduce traffic congestion, and improve the efficiency of highway transport in the United States. Numerous public and private organizations are working to develop and deploy IVHS technologies, prompted in part by the mandates and funding contained in the Intermodal Surface Transportation Efficiency Act of 1991, Public Law 102-240, 105 Stat. 1914, 3 U.S. Code & Admin. News 1526.

The way Americans drive is an integral part of most aspects of our daily life. Any technology that changes the way we drive will inevitably have to confront the manifold legal and institutional arrangements that have grown up around current patterns of vehicle and highway use. To be successful, an IVHS technology will not only have to be desirable from the perspective of the driver, public sector, and manufacturer. It will also have to be legally feasible to implement. This study addresses the legal feasibility of IVHS -- the constraints posed for IVHS technologies technologies by American law, legal

institutions, and lawyers.

From the outset of work on IVHS, perceived legal problems with the technology have been the basis for concern by all the actors involved. Now that IVHS research, development, and deployment has progressed for several years, it is possible to identify the legal constraints that have already materialized, as well as those that have not materialized. Based on a survey of relevant literature and interviews with numerous IVHS participants, this study discusses these legal constraints and suggests directions for further work. After an introduction to IVHS technologies and a summary of legal research to date on IVHS, the study describes (in Part II) its scope and research methods. In Part III, the study identifies the many types of players in IVHS and the fairly complicated legal relationships among them. As will become apparent, an understanding of the players and their legal relationships is key to comprehension of many of the most significant legal hurdles presently faced by IVHS participants.

Part IV of the study describes the legal constraints already experienced by IVHS participants. Part V describes legal constraints anticipated by IVHS participants. In Part VI, the study reviews and critiques various approaches that have been suggested or attempted for managing legal constraints. Finally, the study lists its conclusions and recommendations.

A. A Description of IVHS Technologies

The literature on IVHS is replete with descriptions of IVHS

technologies in varying levels of detail. The most useful such descriptions for a legal audience are cited in Part I of the Bibliography, which is Appendix A to this study. It is nevertheless appropriate here to briefly describe the major types of IVHS technologies that are specifically at issue in the analysis that follows.¹

1. Advanced Traffic Management Systems (ATMS). ATMS technologies collect, analyze, and permit dissemination of data on road use so as to provide more efficient management of traffic congestion and to improve safety. Some ATMS applications permit central surveillance and control of traffic signals across jurisdictional boundaries in a metropolitan area; others use sophisticated software and real time information about road conditions to detect problems, adjust traffic signals and information to motorists, and thereby maximize the efficiency of the road network. The data obtained through ATMS systems also permits more rapid response to traffic accidents by highway and emergency personnel. ATMS systems generally involve cooperation of state, local, and federal governmental units, as well as private contractors who supply and help to maintain and operate the hardware and software.

2. Advanced Traveller Information Systems (ATIS). ATIS technologies generally assist drivers of individual vehicles

¹The descriptions that follow are drawn in part from the following sources: IVHS America, Strategic Plan for IVHS in the United States (1992) and B. Galler, A Draft Glossary on IVHS (UMTRI 1992).

by providing them information about optimal routes, weather and traffic conditions, and other factors that may affect their choices of road, speed, and route. The most prominent ATIS technology discussed below is an on-board navigation system on cars, trucks, or busses that gives directions to drivers while they are operating their vehicles. A collision warning system could be understood as another type of ATIS, because it operates primarily by alerting the driver of an individual vehicle to traffic conditions.² ATIS systems generally require cooperation among component manufacturers and auto manufacturers or fleet operators, and some (but not all) involve integration with a government-coordinated traffic management system.

3. Advanced Vehicle Control Systems (AVCS). AVCS technologies improve safety and efficiency by shifting control of some traditional "driver" functions from the operator of the vehicle to the technology. AVCS technology can be autonomous in each car, as for example with distinct automatic braking units or intelligent cruise control incorporated into each vehicle at the discretion of the owner. Autonomous AVCS requires cooperation of component and automobile manufacturers or fleet owners, and may also require regulatory approval of some applications. AVCS

² The IVHS America Strategic Plan defines collision warning systems as Advanced Vehicle Control Systems, because collision warning systems may logically be connected to a technology that automatically brakes or steers the car in response to a warning. In practice, however, collision warning systems can and have been decoupled from automatic braking systems, and for legal purposes are better analyzed as ATIS.

technology can also be centrally controlled, as with headway keeping systems that increase highway throughput, platoon systems that permit one driver to control braking and throttling for a series of vehicles, and automated highways in which drivers surrender most control of vehicles to a central operating authority. Central control of AVCS requires the involvement of a wider array of public and private sector actors in the implementation and regulation of the technology.

4. Commercial Vehicle Operations (CVO). CVO technologies are IVHS applications that are of particular utility to fleet operators of trucks, busses, taxis, and emergency vehicles. These technologies, pioneered by commercial operators, may become attractive on some other private vehicles. One such example is automated toll systems on bridges and toll roads, which requires some sort of automatic vehicle identification (AVI) system, and the cooperation of the operator and toll authorities (often across jurisdictional lines) in design and maintenance of monitoring hardware and software. Automated Vehicle Location systems are another significant CVO technology in advanced stages of deployment. It is important for the lawyer to understand that any particular CVO technology may simply be an application of an ATMS, ATIS, or AVCS technology in the unique context of commercial vehicles. The separate treatment of commercial vehicles is justified most obviously by the vast and distinct regulatory regimes that apply to commercial vehicles (and not private vehicles) under state and federal law.

5. Advanced Public Transportation Systems (APTS).

APTS technology could be any other form of IVHS technology that is adapted, developed, or applied to public transportation, which like commercial vehicles is subject to unique funding, regulation, and political and legal constraints. APTS technologies of particular prominence includes any information system that conveys route, road condition, and location information to public transportation travellers before or during their trip. This study has not focused on any unique constraints to APTS, although the author has attempted to interview APTS participants. However, to the extent APTS systems involve applications of ATMS, ATIS, or AVCS technology, the constraints identified here may apply.

B. Legal Research To Date on IVHS Technologies

Legal research directly pertaining to IVHS technologies has so far remained quite sparse. The author has listed every published paper or manuscript dealing with legal issues related to IVHS in Part II of the bibliography attached as appendix A to this study. Existing research has focused almost entirely on two types of legal constraint to IVHS: Legal liability and intergovernmental cooperation.

Of all the issues that have prompted IVHS participants to seek legal advice, tort liability came first. The potential tort and products liability of IVHS designers, manufacturers, and highway operators has been a vocal concern of engineers, manufacturers, and planners since the early efforts of Mobility

2000 to define and crystallize America's IVHS efforts. In an early article published by the Society of Automotive Engineers³, the author of the present study hypothesized that the liability problems of IVHS vehicle information systems were not serious and could be managed using the same risk management devices commonly used for many other automotive and highway technologies. For IVHS systems that dilute driver control of vehicles, however, the SAE paper suggested that serious liability problems could arise, requiring more dramatic risk management methods. Subsequent work by Patrick Carty, Ed Ramsdell, and the author⁴ suggests that most IVHS information systems are in fact unlikely to significantly increase the liability risks of their manufacturers, owners, or operators.

Research to date has not, however, yet validated the author's hypothesis that IVHS systems that dilute driver control of vehicles will result in serious liability. The author's study of litigation experience with cruise control systems (which take control of the throttle from the driver in various circumstances) suggested that manufacturers have been able to design the

³ Liability and Insurance Implications of IVHS Technology, SAE Technical Paper 901507 (1990).

⁴ See P. Carty, Legal Issues Relevant to the current IVHS Project of the Road Commission of Oakland County, Michigan (draft July 23, 1992); E. Ramsdell, Tort Liability and IVHS Today (draft manuscript May 1992); K. Syverud, Smart Car and Smart Highway Liability: Lessons From Experience with Airbags, Antilock Brakes, Cruise Control, and Cellular Telephones, University of Michigan IVHS Technical Paper (1992).

technology so as to limit both the likelihood of accidents and the likelihood that the technology will be blamed for accidents.⁵

Many IVHS applications require cooperation among the numerous governmental units -- at the local, state, and federal level -- which share responsibility for regulating and operating American cars and highways. Three studies have analyzed problems of intergovernmental cooperation on particular IVHS projects -- one involving CVO technology⁶, and the other two involving an ATMS project in Michigan⁷. These studies have found that coordination of efforts (and negotiations) among various governmental entities is time-consuming, and often requires research and technical expertise in state law and regulation. However, none of the studies reported that the need for intergovernmental cooperation was a serious barrier blocking the implementation of the IVHS application.

Aside from tort liability and intergovernmental cooperation, IVHS participants over the years have flagged numerous other potential legal barriers to the technology, including most prominently problems of privacy law, procurement law and

⁵ Syverud, *supra*, at 7-8.

⁶ Maggie, M., et al., Institutional Barriers & opportunities for IVHS Systems In Commercial Vehicle operations: An Iowa Case Study (May 1992 Draft Manuscript).

⁷ See P. Carty, *supra* note 4; J. Grubba, The Effect of IVHS Liability Issues On Intergovernmental Cooperation (Oakland County Road Commission July 1990).

intellectual property, and antitrust law. Published research on these issues as they apply to IVHS, however, remains very sparse. The Bibliography attached as Appendix A to this report lists general references on these issues that seem of most use to those particularly interested in IVHS.

II. A Description of the Research Methods

The purpose of the present study is not to solve all the legal problems posed by IVHS technology, but rather to identify those problems that require further attention and those problems that do not. To that end, the author employed the following research methods.

A. Literature Survey.

First, the author collected and reviewed a broad array of engineering and legal literature relevant to legal constraints to IVHS. Sources consulted included engineering journals, legal journals, treatises, and the popular engineering and science oriented press. The most useful and relevant available sources are cited in the Bibliography in Appendix A. While this bibliography is not comprehensive, it is the most thorough IVHS legal bibliography that has been assembled to date. To further improve this bibliography, a careful review of Transportation Research Board legal papers would be desirable.

B. Interviews

Following review of existing literature, the author interviewed by telephone or personal meeting dozens of engineers, lawyers, government officials, business executives, and

university-affiliated scientists and scholars who have been involved in IVHS research, development, testing, and deployment. The persons interviewed were asked to describe legal problems they had already experienced with IVHS work, legal problems they anticipated in the future, and the practical methods they had developed to address legal concerns. All persons interviewed were assured that they would not be specifically identified in this document as the source of particular remarks about problems experienced with other IVHS participants. The interviewees included parties responsible for IVHS projects at 1. automobile manufacturers, electronics and communications system manufacturers, and navigation and collision warning system manufacturers; 2. state, county, and local governmental units, including toll authorities and highway authorities; 3. university IVHS research and development programs; 4. Federal officials, including employees of the Federal Highway Administration (FHWA) and National Highway Traffic Safety Administration (NHTSA); and 5. lawyers in private law firms who have worked on IVHS legal issues for private and public clients. The interviewees included participants in ATMS, ATIS, AVCS, and CVO technologies.

C. Site Visits

The original research plan for this paper called for the author to conduct site visits at three representative IVHS research, development, and operational testing projects. In the course of this research, the author travelled to Washington D.C. and to three interviewees in the Detroit area to discuss IVHS

projects and, in two cases, to drive in cars and a truck equipped with IVHS technologies. Formal site visits, however, were not conducted. The interviews discussed in this study should nevertheless be understood to draw heavily on experience with the following FHWA supported IVHS projects, among others: FAST-TRAC, an operational ATMS system in Oakland County Michigan: TRANSCOM and related automatic toll collection and traffic congestion management efforts in the New York City metropolitan area: and several California IVHS demonstration projects and operational tests in which Caltrans, the state department of transportation, has been involved.

D. Legal Research.

It was beyond the scope of this study to conduct legal research into future solutions of IVHS legal constraints identified through the study. Any suggestions made herein for possible solutions to IVHS legal problems should be understood to require new research into the feasibility and statutory and common law viability of the suggestions.

III. Types of Organizations Involved In IVHS and Their Legal Relationships

During the course of this study, it quickly became apparent that one of the more significant obstacles to understanding IVHS legal barriers was the need to understand the incentives and relationships of the many types of organizations involved in IVHS efforts. Particularly for some private, for-profit IVHS participants, the structure and regulation of American highway

ownership and development is bewildering and daunting. Moreover, many of the IVHS programs discussed in this paper involve a wide array of public-private partnerships, intergovernmental arrangements, and private joint ventures. Universities and quasi-public organizations are also parties to many arrangements.

To a significant extent, some of the perceived "legal constraints" to IVHS are in fact simply the painful learning curve experienced by private companies who are dealing, for the first time, with established regulatory methods for highways and automobiles. This Part of the Study therefore identifies the players in IVHS, and the legal relationships between them, before turning to the specific legal constraints these players face.

A. Types of IVHS Organizations

1. Federal Government⁸

Federal IVHS involvement is fractured among at least three separate units of the Department of Transportation, each of which has its own legal staff and general counsel. The statutory mission and institutional culture of these three agencies -- FHWA, NHTSA, and FTA -- differs significantly in ways that significantly affect IVHS. Within the Transportation Department, two other units are involved in IVHS -- the Office of the Secretary (OST) and the Research and Special Programs Administration (RSPA). In addition, other federal agencies,

⁸ The allocation of organizational responsibilities for IVHS within the Department of Transportation is also described in Department of Transportation's IVHS Strategic Plan Report To Congress, pp. 21-25 (Dec. 18, 1992).

including the Department of Justice and the Federal communications Commission, have jurisdiction over certain perceived legal constraints to IVHS development and deployment.

(a) Federal Highway Administration

The Federal Highway Administration has been the most active participant in IVHS ventures. In addition to sponsoring and co-sponsoring basic and applied IVHS research, FHWA funds and helps coordinate IVHS Operational Tests and Deployment projects in numerous states, projects that involve vehicles and state and local highways as well as federal highways. Operational tests involve deployment of IVHS technologies on highways and vehicles under "live transportation conditions."⁹ The purpose of the tests is to identify how IVHS technologies interact with real world traffic conditions, and to promote progress toward further deployment, improvement, public acceptance, and market support for the safety-enhancing and congestion-reducing technologies. Almost all operational tests require FHWA cooperation and negotiation with units of state and local governments, as well as with private partners.

(b) National Highway Traffic Safety
Administration

The National Highway Traffic Safety Administration

⁹⁸ See FHWA & FTA, Intelligent Vehicle Highway System (IVHS) Projects in the United States (May 1992) for definitions of operational tests and descriptions of specific FHWA operational test programs.

promotes automobile and highway safety pursuant to the National Traffic and Motor Vehicle Safety Act¹⁰ and other statutes. The principal tools NHTSA employs to promote this mandate are focused on motor vehicles (not highways) and include Federal Motor Vehicle Safety Standards (FMVSS), investigations and inspections, and product recalls.¹¹ NHTSA affects IVHS deployment primarily through research on IVHS safety enhancing technologies. Many private IVHS actors expressed interest in the course of this study in NHTSA safety standards as a method to promote IVHS technology by preempting state products liability suits. In theory, NHTSA safety standards could also promote particular IVHS applications by creating a demand for them (e.g. for collision warning systems on commercial passenger vehicles). Experience with other automotive technologies, however, suggests that private actors may be wary of markets for technologies created by regulatory regimes.¹² NHTSA-promulgated safety standards do affect liability of private manufacturers who fail to comply with the standards, and who produce evidence concerning design and

¹⁰ 15 U.S.C. 1381 et. seq.

¹¹ For history and analysis of NHTSA regulation of automobile safety, see particularly J. Mashaw and D. Harfst, *The Struggle for Auto Safety* (1990).

¹² See, e.g. "Why Eaton Got Out of the Airbag Business", *Fortune*, March 12, 1979, at 146.

risks in connection with standard-setting proceedings.¹³

(c) Federal Transit Administration.

The Federal Transit Administration has been involved in the funding, research and evaluation of IVHS APTS projects, often in cooperation with FHWA.

(d) Office of the Secretary of Transportation.

The Office of the Secretary of Transportation (OST) is responsible for ensuring that the various elements of the IVHS program are consistent with the Department's statutory responsibilities, including intermodal and international concerns and other DOT programs, and with National Transportation Policy. OST is also responsible for reviewing proposed budgets, evaluating significant legal issues related to IVHS, and initiating research on major IVHS policy and institutional issues that transcend the individual responsibilities of the operating administrations.

(e) Research and Special Programs Administration.

The Research and Special Programs Administration (RSPA) is interested in transportation system approaches and technologies with intermodal impacts, including the development and implementation of telecommunication and radionavigation policy. Through the R&D coordinating Council, RSPA provides

¹³ See Sklaren, The Effect of Current NHTSA Regulations and Enforcement Policy on Products Liability In the Motor Vehicle Industry, 21 Tort & Ins.L. J. 464 (1986); Note, The Relationship Between Federal Standards and Litigation In The Control of Automobile Design, 57 N.Y.U. L. Rev. 804 (1982).

policy direction and coordination of the Department's R&D activities.

(f) Other Federal Agencies

Many IVHS technologies require as part of their design the broadcasting of information between vehicles and IVHS operators. In some cases, this requires use of a segment of the frequency band under approval of the Federal Communications commission, an independent regulatory agency. Many IVHS participants have sought legal advice concerning access to and allocation of frequencies among IVHS and other proliferating information technologies.

To the extent that IVHS projects involve joint ventures, information exchange, and other cooperative endeavors between government agencies and actual or potential private competitors in certain product markets, federal antitrust concerns are involved and fall with the jurisdiction of the Department of Justice, and, to a limited extent, the Federal Trade Commission.

2. State and Local Governments

Jurisdiction over highways and automobiles is even more fractured at the state level than at the national level. In most states, vehicle and highway issues are addressed by, among others, a state department of transportation, numerous county and local highway departments, state police and law enforcement agencies, and a licensing agency or department of motor vehicles. Any particular IVHS technology or application is liable to cross these jurisdictional boundaries, and require some coordination of

activities by these distinct governmental units. In many cases, models for such cooperation have previously developed in the highway context and through metropolitan councils of governments. Similarly, inter-state cooperation has developed through occasional multi-state agencies such as the Port Authority of New York and New Jersey, specialized cooperation agreements, and interstate compacts.

3. For Profit Private Entities

Most private entities are interested in IVHS because it is a product on which they can earn a profit through sales to highway owners, manufacturers, or vehicle owners. The success of IVHS deployment in the United States will largely turn on the degree to which these market driven entities see a competitive rate of return from investment in IVHS research, development, and deployment. The primary private for-profit entities studied here are automobile manufacturers and communications and electronics manufacturers.

(a) automobile and automobile component manufacturers

All the major United States, Japanese, and European automobile manufacturers have ongoing IVHS research and development efforts, with Ford and General Motors being the principal United States players. Much of the ongoing work and operational testing involving Ford and General Motors vehicles involves in-vehicle navigation and information systems, and advanced cruise control systems. Automobile manufacturers are

also potential participants in the ISTEA mandated automated highway demonstration project.

Component manufacturer's, including ZEXEL (a maker of visual display navigation systems and Vorad (a maker of collision warning systems and automatic braking systems, funded in large part by the Allstate Insurance Company) have historically attempted either to work with auto manufacturers to permit incorporation of their product in vehicle design, or to design a product which can be installed in the aftermarket on vehicles already sold to the final or fleet owner by the auto manufacturer.

(b) communications and electronics manufacturers

Communications and electronics manufacturers make the hardware and software that enables the transmission, reception, and processing of data from vehicles and highways. These companies, which include Seimens and Motorola, often have as primary customers for particular products the governmental units that build, operate, and maintain highways.

4. Universities and Research Organizations

Numerous universities have in place programs to produce basic and applied research on IVHS issues. These universities, include Michigan, Berkeley, MIT, George Mason, Minnesota, Texas A & M. University IVHS participants are subject to unique procurement regulations and practices and need to promote an educational mission while conducting IVHS research. Universities are participants in many of the Operational Tests, including

FAST-TRAC in Oakland County, Michigan. In addition, an array of consulting firms have moved into the IVHS area, many of them specializing in government research contracts.

5. Quasi-Public organizations

(a) IVHS America

The Intelligent Vehicle Highway Society of America is a three year old Washington-based umbrella association dedicated to promoting research, development and evaluation of IVHS technologies. Many of the individuals, private organizations, and universities discussed above are members of IVHS America. IVHS America has been chosen by DOT to be its utilized Federal Advisory Committee to give it advice and guidance on IVHS issues. This means that IVHS America responds to specific requests for advice from DOT, and that federal employees of DOT play an active role on all IVHS America Committees. IVHS America has drafted a strategic plan, including budget recommendations for IVHS research and deployment for DOT, as well as an array of other program and policy recommendations. Almost all of the legal research conducted in the last two years about IVHS has been done by volunteers working under the auspices of the Legal Issues Committee of IVHS America. The Legal Issues Committee subcommittees include groups actively researching issues of tort liability and privacy, procurement and intellectual property, and statutory and regulatory barriers.

(b) Transportation Research Board

Most legal discussion of transportation issues by lawyers

occurs in forums created by the Transportation Research Board, a unit of the National Research Council which is an independent advisor to the federal government. There have been several TRB legal workshops related to IVHS, and TRB representatives have attended IVHS Legal Issues Committee Activities. Closer cooperation between these two groups is being promoted by both sides.

B. Legal Relationships Among IVHS Organizations

The many types of IVHS organizations identified above interact to promote IVHS technologies through a bewildering array of legal and institutional relationships. Most of these legal relationships are combinations or permutations of six different models.

1. Traditional Government Contractor Models

Much of IVHS activity is done through government contracts between federal agencies, state and local agencies, and private actors. Government contract law and custom varies considerably by jurisdiction and by department of the federal government. Many private actors in IVHS are accustomed to private procurement relationships, or to relationships with federal agencies such as the Department of Defense, but not with state and FHWA procurement practices.

2. Deployment Projects and Operational Tests

As noted above, IVHS operational tests involve both traditional government contracts between FHWA and a state or local government agency, as well as subcontracts with state and

private entities. Both operational tests and early deployment projects require cooperation between public and private entities in funding and execution, and often require extensive negotiation concerning the allocation of legal rights and responsibilities. The negotiations have at times been extensive and ongoing, and have been the most fertile source of experienced legal barriers to IVHS.

3. Private Market Relationships.

Private IVHS companies have contracted with each other for the sale and development of IVHS technologies. These traditional commercial contracts often address issues of liability allocation and intellectual property rights. An example of such an agreement is the contract by which Vorad has installed collision warning systems on busses of Greyhound, Incorporated.

4. Government Franchises.

State and local governments may choose to franchise rights to develop and exploit IVHS technologies on particular roadbeds, tunnels, and bridges. The franchise agreements can provide for division of profits, maintenance responsibilities, and liability allocation.

5. Privatized Infrastructure.

California and Virginia have to some extent promoted IVHS technologies through the private development of toll roads. These publicly owned and privately operated roads, to be built pursuant to complicated statutory authority and agreements

negotiated over lengthy periods of time, may well prove to be the most viable test beds for experimentation with IVHS technologies that involve congestion pricing and automatic vehicle identification. The California negotiations over four private toll road rights of way have largely "invented the wheel" in connection with public-private contractual arrangements concerning liability allocation, intellectual property, procurement, and environmental issues.¹⁴

6. Advisory Relationships

Finally, IVHS America, the Transportation Research Board, and many private and state governmental actors interact with the Federal Department of Transportation through formal advisory relationships to promote research on particular issues related to IVHS. The legal constraints to these relationships, particularly in the context of IVHS America, seem to be only dimly understood by most IVHS America members, although DOT lawyers are better informed. Both the author of this study and most of the interviewees for this study would benefit significantly from a primer by a government lawyer on the powers and limitations of utilized independent advisory committees. There is a strong impression among a large fraction of the private organization membership that IVHS America is supposed to be an activist promoter of particular IVHS technologies to DOT agencies, even in the absence of requests for DOT for advice, and

¹⁴ See the sources cited in Part VI. of the Bibliography attached to this report as Appendix A.

even when particular technologies may raise serious concern among other interest groups affected by IVHS. If this impression is incorrect, organizations are sometimes looking to IVHS America for lobbying when that effort should be directed elsewhere.

IV. Legal Constraints Already Investigated or Experienced by IVHS Organizations

The study interviews and literature search revealed that six categories of legal problems have already been investigated or experienced by various IVHS participants: Tort and Products Liability Issues; Procurement and Intellectual Property Issues; Intergovernmental Cooperation Issues; Privacy Issues; Contract Negotiation Issues; and Federal Communications Commission Regulatory Issues. Of these six, the only issues that have actually materialized in disputes that have significantly stalled or constrained IVHS projects are Procurement and Intellectual Property Issues and Contract Negotiation Issues. All other issues have, once investigated in actual IVHS projects, turned out not to pose serious obstacles.

A. Tort and Products Liability

The vast majority of persons interviewed volunteered legal liability as a serious constraint to IVHS; a constraint meriting extensive research and tort reform. However, of the IVHS applications that have currently reached operational tests or other deployment on actual highways and cars, none has produced a single lawsuit or even threat of a lawsuit arising out of tort or product liability law. The only civil suits remotely related to

IVHS technologies so far have involved challenges to privatized toll roads in California based on environmental law and on state labor law.¹⁵ For most parties involved in ATMS and ATIS technologies, tort and products liability is viewed as a serious problem that "someone else must be having, but we don't have." The exception involves parties involved in vehicle control systems.

1. Potential Liability Assessed: ATMS and ATIS

Virtually all the ATMS and ATIS participants in both the public and private sectors had looked into tort liability, and virtually all have concluded it is not a serious problem in their particular context. Thus, one state transportation official active in several operational projects commented, "we are sued for everything under the sun, including painting our signposts green rather than white, but we have never been sued in connection with IVHS technology". The only liability problems feared by AVI and Toll authority interviewees concerned patent infringement liability for unartfully designing around other people's patents. Makers of in vehicle map displays and navigation systems similarly reported no serious tort liability concerns, and no lawsuits or claims in connection with their

¹⁵ Caltrans won a civil lawsuit alleging that the signing of an agreement with private toll road developers constituted a "project" implemented in violation of procedures required by the California Environmental Quality Act. Caltrans also won a suit by the state engineering employees union that alleged private toll road agreements contracted out "public work" in violation of labor statutes. The latter case is now on appeal.

products. ATMS participants reported no claims and no serious worries in connection with the special tort liability risks of ATMS systems. At least in the context of ATMS and ATIS, tort liability seems to be a phantom that FHWA should publicly dissolve.

2. Impact of Potential Liability on Investment and Deployment Decisions: AVCS

Participants in efforts to develop AVCS systems expressed greater concern about tort and products liability problems. Few AVCS systems other than mildly advanced cruise control have been in fact deployed other than on a few vehicles under very limited conditions. Nevertheless, one automobile manufacturer, one automatic braking system manufacturer, and one control system component manufacturer indicated that decisions whether to invest in and propel development of AVCS technology had been delayed or adversely affected by product liability concerns. one private participant insisted that IVHS will essentially remain "information technology and a few pie-in-the sky pork barrel control technology demonstrations, at least in this country, until you lawyers do something about products liability law." A story published in the Wall Street Journal, but subsequently disavowed by Vorad, Inc., indicated that the company had dropped automatic braking controls from the system sold to Greyhound after concerns surfaced about potential product liability. Despite this concern, several interviewees volunteered that they are in fact pursuing research and development activities related to control systems technologies. Research at private IVHS

participants includes significant investment in automatic braking systems and intelligent cruise control. Private and public participants, as well as universities, also appear anxious to participate in research and development of the demonstration automated highway.

'3. Methods Employed to Manage Liability Risks

Many persons interviewed indicated that, although liability concerns for ATMS and ATIS were not serious, they had nevertheless been concerned enough to explicitly manage them through contractual provisions, insurance, and other means. Some public agencies have required private contractors to promise to completely indemnify them for tort settlements, judgments, and defense costs. Others -- particularly in Caltrans projects -- have crafted ownership of the technology to take advantage of state sovereign immunity. California has crafted a supplemental health insurance program for injuries related to some PATH projects, and then succeeded in crafting agreements -- which Caltrans believes to be enforceable -- whereby participants in demonstration projects voluntarily assume the risk of any injuries that result from the project, and limit their compensation to that provided by the health insurance program. Since health insurance covers significantly fewer items of damage than tort liability (and excludes pain and suffering and emotional distress), this significantly lowers liability exposure.

B. Procurement and Intellectual Property

Almost every respondent identified specific procurement related concerns that have already operated as legal constraints to IVHS technology. The one exception was an interviewee involved with in vehicle displays, who said his company had had no procurement problems (and who incidentally reported that he was also not aware of any problems caused for this technology by state regulation of in-vehicle monitors or televisions).

The procurement problems that IVHS participants have experienced, however, are extraordinarily varied. The analysis below categorizes the complaints, and then analyzes the actual impact of these problems and the methods already developed to manage them.

1. A Categorization of Procurement-Related IVHS Complaints

Intellectual Property-Related Complaints. The most common complaint arising out the operational tests was directed at FHWA and involved the alleged insistence of FHWA on retaining intellectual property rights to products and applications developed in part through federal funding. Thus, in one interview a participant in ATMS technology commented that "FHWA should be trying to promote investment in this technology -- Why should we invest in it if the agency is going to take away the integrated software and sell or give it away in competition with us." The author of this study made no attempt to verify whether this complaint accurately reflects FHWA policy or practice with respect to intellectual property rights. To the extent the complaint erroneously portrays FHWA, through educational programs

to correct any misimpressions. Private participants definitely would like the right to market commercially products and applications developed through FHWA sponsored operational tests. Federal officials and some private interviewees acknowledged that products developed with government money should belong to the public; others argued that most operational tests involve cost sharing, and that in this context some property rights should be retained by the contractor. of all the subjects discussed in the interviews, this one provoked the most passion, although the passion often came from private parties who had not previously been involved in state or federal highway procurement.

At least one advisor to a state toll authority was emphatic that the toll authority should not have to share software design rights with FHWA just because the software is used in a demonstration project: "That just encourages creative accounting to show the design was not done with federal dollars. Instead, FHWA should just ask for a license to use the system for free in any federal facilities like national parks and for free in emergencies."

Bonding Requirement Complaints. Two interviewees identified state bonding requirements, imposed on traditional highway construction contractors, as an undesirable additional expense for IVHS technologies. They urged that states seek warranties from private IVHS providers rather than bonds that assure performance. These complaints could be relatively easily handled simply by clarifying, under state law, when bonding requirements

do and do not apply to the components of ATMS and ATIS technologies. As with many of the procurement complaints, this is essentially a problem of state law which needs to be addressed and resolved at the state level, using lawyers who know state procurement customs.

State Procurement Related Complaints. Several persons interviewed noted that some operational tests, set up as contracts between FHWA and a state agency, followed by subcontracts between the state and local governments and private entities, require simultaneous compliance with two levels of procurement law and procedures, often on short notice. This creates serious problems when there is an urgent need to contract for work in a brief period of time, and problems when state and federal rules overlap or seem inconsistent (e.g. state vs. federal prevailing wage laws, and state and federal equal employment opportunity laws). Must the subcontracts comply with both standards, or only one?

University-Related Complaints. Universities are unhappy with earmarking of funds for particular programs and with what they perceive as uncertain support for university-based IVHS basic research. Private companies and local government units expressed concern about special standards that kick in when there is university involvement in an operational tests, and the additional accounting burden this imposes.

Other Complaints. Some respondents noted that they find it difficult to respond to broad agency announcements and requests

for bids because the most useful personnel to work on the project are not allocated to a legally separate government contracts subsidiary created for the purpose of maintaining separate books for cost accounting purposes. This organizational constraint, created by the desire not to open all of a corporation's books to federal audit, adds a significant increment of cost to efforts to respond to procurement requests.

Finally, one respondent complained of resistance within the FHWA and FTA to deviations from competitive bidding processes even where such a deviation would normally be approved by other federal administrative agencies. The respondent particularly referred to special, non-competitive bidding procedures utilized by NASA and the Department of Defense, but did not specify how those procedures deviated from FHWA procedures.

2. Impact of Procurement and Intellectual Property Problems

According to the interviewees, no project has failed and no participant has withdrawn from FHWA projects due to procurement related-concerns. Procurement issues, however, seem to have been the most time-consuming and irritating legal constraint that IVHS participants have confronted. The negotiations have been drawn out, particularly over intellectual property issues.

3. Methods Employed to Manage Procurement Problems

The most novel method employed to date in connection with procurement problems arises in the California toll road agreements. There, because the highway itself is proprietary to the private concern (which in facts ends up making the state a

contractor that provides some maintenance and security), the private concern can retain intellectual property rights on any technology developed or installed on the road.

C. Intergovernmental Cooperation

Many IVHS applications, including ATMS and some ATIS technologies, could be stymied should local governmental agencies or units refuse to cooperate in implementation. One locality, for example, might resist cooperation in an ATMS system in order to reduce traffic flow on its streets, while trying to take advantage of ATMS benefits in neighboring localities. This holdout problem has been described elsewhere¹⁶. Similarly one state agency, such as a licensing or weighing authority, could restrict the ability of that state to cooperate fully in interstate CVO operational tests and development projects.

Generally, the problem of the arbitrary, hold-out jurisdiction in IVHS has not yet materialized. In the Oakland County FAST-TRAC project, in the IOWA CVO study, and in the TRANSCOMM toll coordination efforts in New York City, many jurisdictional units and agencies had eventually to work together to reach agreement on implementation of the project. Although this effort took a lot of lawyer time and patience, and numerous meetings, agreements were achieved that have permitted the projects to proceed. The need for consensus at each step has

¹⁶ See K. Chen & F. Stafford, A Sociotechnological Perspective on Public-Private Partnership for IVHS Infrastructures (U Mich. IVHS Technical Report 92-01)

constrained the ability to rush to implementation in these cases, but such a rush would often overlook the many distinct interests involved in the projects.

D. Privacy

ATMS and AVI technologies generate information about vehicles and their drivers -- their location, activities, and to some extent their identities. That information may be valuable for many purposes beyond traffic control -- it may be commercially valuable just as mailing lists are today, and it may be useful to law enforcement agencies, process servers, and others. To the extent the information is in the hands of state and federal government units, it may be accessible to the general public under state and federal freedom of information acts, or it may be barred from release to the public under privacy statutes and the common law of invasion of privacy. To the extent access to this information undercuts the privacy which has traditionally been one the great attractions of the private passenger vehicle, privacy problems may undercut user acceptance of the technology.

1. Privacy concerns of IVHS participants and users

The interviews identified few actual privacy problems experienced by IVHS users and participants. According to one interview with a truck component manufacturer, truck drivers were initially resistant to IVHS systems that used computers to follow locations of individual drivers. But experience with the technology in the driver's hands has overcome this resistance, to the point that most drivers now like the technology.

2. Methods employed to address privacy concerns.

In California, one state legislator actively opposed IVHS applications on private toll roads on privacy grounds: his opposition was defeated, in part by adding a requirement that there always be a free alternative highway where privacy is not infringed. For automatic vehicle identification systems on private vehicles, privacy problems can be overcome simply by letting drivers remove the tags at will. Video enforcement against toll jumpers has not produced privacy complaints in the New York City projects. The biggest privacy concern faced there concerns the use of a central clearinghouse to reconcile bills from the automatic toll facilities in numerous jurisdictions. They are unsure whether, under state law, these records are public records to which disclosure statutes apply. This would seem to be a fertile and finite area for future research, starting with the 'sources cited in Part IV of the bibliography attached as Appendix A.

E. Contract Negotiation

Many of the problems that were identified above and by the persons interviewed as being related to procurement, intellectual property, or liability could also be viewed as simple contract negotiation problems. IVHS involves new technologies, new players who in some cases do not know each other or the applicable law, multiple applicable statutes, and new contracting procedures. In this context, there is often no "norm" or "off-the-rack" set of terms which have been tried and tested, and from

which the negotiations can commence. Furthermore, participants are unusually concerned about uncertain contingencies (such as confidentiality and intellectual property rights), and less likely to trust that ambiguities in contract drafting can be left to future resolution by courts or arbitrators.

Thus, several of the persons interviewed described IVHS contracts as "the most complex I have ever negotiated". One California official said that some agreements required "sweating blood for two years." Another public official expressed particular concern that he would be "giving away the store" if intellectual property rights to an IVHS technology of uncertain future application subsequently turned out to be of immense value.

It is clear that contract negotiations in this area are more difficult than for most traditional highway procurement. While that may be an inevitable attribute of any new technology affecting this many diverse parties and posing so many opportunities and risks, it would be of considerable help if FHWA could devise methods to streamline and standardize these negotiations. Several persons interviewed expressed the belief that even a simple compilation of typical contract terms that have been employed previously would help clarify the agenda for negotiations, particularly if the compilation carried some endorsement from a neutral source (IVHS America is one possibility).

The trend in IVHS contracts also seems to be that they

become considerably more complicated, and difficult to negotiate, as the project reaches subsequent stages. This is disturbing, and more than one interviewee attributed it to conscious decisions of the participants to leave contentious issues out of early phases of agreements. The interviewees had few concrete suggestions for improving contract negotiations, although almost all favor efforts to educate participants about common problems and contract clauses employed successfully in other contracts and contexts.

F. Federal Communications Commission.

In several interviews, ATIS and ATMS participants indicated they had consulted lawyers and attended meetings concerning allocation of the limited frequency space by the FCC. One interview expressed particular concern that some competing uses of frequency space are attempting to grab frequencies by asking parties with whom they contract to withdraw applications for frequency bands and to support their requests for frequencies.

V. Legal Constraints Anticipated by IVHS Organizations

The analysis so far has concerned only those legal constraints which IVHS participants have already investigated or experienced. In the interviews and literature survey, the author also inquired into legal constraints that do or should concern participants even though they have not yet been researched or experienced. Below, the report briefly addresses concerns falling into these categories.

A. Tort and Products Liability Concerns

Participants in IVHS AVCS research are seriously worried about the potentially catastrophic liability that could attach to (1) a design defect in a control system or (2) a central system control failure in a headway keeping system or automated highway. No party seems to have done any legal research on the legal problems of automated highways, nor to have ideas about where that research should commence. All private and university parties I spoke with agreed that legal research should be a significant component of any project to establish a demonstration automated highway. Some expressed hope that demonstration projects involving control systems would produce sufficient data to document their safety and assuage liability concerns.

B. Antitrust Concerns

No one I interviewed viewed antitrust law as a significant potential constraint to any IVHS technology. Several commented that the antitrust problems attendant upon IVHS are conceptually identical to other antitrust problems in other industries, and that the patterns of acceptable conduct are reasonably well known and defined.

C. Procurement and Funding Concerns

Many participants expressed concerns that the instability of procurement and funding for IVHS projects, in part because of change in administrations and in part because of budget deficits, rendered heavy institutional commitments to some IVHS projects quite risky. Even with significant future commitments for

spending in ISTEA, the practice of subsequent earmarking and reallocation of funds by Congress, if continued, may cause some private and university participants to lose interest in IVHS. Similarly, a sudden shift in transportation priorities toward other modes of transportation would seriously undercut willingness to commit long term to IVHS related research and development.

D. Regulatory Concerns.

Several of the persons interviewed explained that, over time, the move to road pricing may eventually inspire greater regulatory involvement in the way tolls and fees are set by state and local authorities. California's negotiations for private toll roads eventually produced a fairly complicated set of mechanisms to monitor the rate of return to investors in private toll roads, and will thereby produce an industry in the highway community that is regulated quite differently than traditional private contractors.¹⁷

E. Privacy Concerns.

No IVHS participants viewed privacy issues as posing serious obstacles to future IVHS research, development, or deployment. In this context, the author's research on privacy issues related to other technologies convinces him that privacy problems may be more serious in the future than is currently anticipated. Most

¹⁷ Price Waterhouse: Final Report on Required Return on Investment and Mechanisms For Return Administration in the California AB 680 Projects (September 4, 1990)

IVHS systems will generate data. Some of that data will cover large numbers of vehicles and will be quite valuable in certain circumstances. Past experience with databases in government possession indicates that, at some point, litigation concerning the access to the data under state and federal privacy and freedom of information laws will likely follow IVHS.¹⁸ Such litigation has followed, for example, e-mail transmissions among government employees, at least under Michigan State Law. To preserve privacy and to prevent a public backlash against the technology, it will be important to plan ahead to manage privacy issues, and to assure that in the original collection of data some anonymity of the operator of a vehicle can be assured.

VI. Approaches to Managing Legal Constraints

A. An Overview of the Approaches

Many approaches to managing legal constraints to IVHS have been mentioned, researched, and/or attempted in the last few years. This section of the study critically appraises approaches to the most serious constraints that have been experienced or are anticipated: Tort Liability Constraints; Procurement, Intellectual Property and Contract Negotiation Constraints; and Privacy Constraints.

¹⁸ See K. Laudon, *The Dossier Society: Value Choices in the Design of Information Systems* (1986); Casey, *Entrepreneurship, Productivity, and the Freedom of Information Act* (1983); Flaherty, *Protecting Privacy in Surveillance Societies* (1989)

None of the tort liability approaches are entirely satisfactory, and one of them -- the choice of manufacturers to implement IVHS technologies abroad prior to implementation in the United States -- has serious implications for United States competitiveness in highway and automobile technology. Procurement and intellectual property constraints, like contract negotiation constraints, may be best tackled through an educational program, put together by experienced lawyers, aimed at private and governmental contracting parties. Privacy constraints are to some extent inevitable given conflicts between desire of some parties for access to information about vehicles and operators and desire of others to keep that information confidential. The necessary compromises of these conflicts can be best promoted by research efforts to identify guiding principles for the assembly, maintenance, and distribution of IVHS data. Finally, this part suggests reforms in IVHS organizational structures that would promote a more integrated and systematic attack upon IVHS legal barriers.

B. Tort Liability Approaches

The following seven approaches toward managing potential tort and products liability of IVHS technologies have been suggested in the literature surveyed or in interviews with IVHS participants. While many of these approaches seem viable to manage the relatively minor liability concerns of IVHS information systems, none seems both desirable and viable for advanced, centrally controlled automatic vehicle control systems.

1. Indemnification

Individual actors have avoided tort liability in IVHS operational tests by obtaining indemnification clauses in their contracts. Indemnification clauses effectively immunize one party from liability by requiring another party to reimburse any settlements, judgments, and legal expenses incurred by the beneficiary of the clause. Local government units in some operational tests have insisted upon and obtained indemnity agreements. Similarly, Congress has occasionally provided for federal indemnity of participants in certain desirable industries that pose a remote risk of catastrophic loss (examples include government contractors in the commercial nuclear power industry, and satellite owners in the commercial satellite launch industry)"¹⁹

Indemnification is a workable way to allocate liability costs in individual contracts when total potential liability appears to be relatively small relative to the size of the contract. Statutory indemnification is also feasible where, although the potential liability is catastrophic, there is a strong legislative consensus in favor of the technology and against extensive tort liability. Because tort reform of this nature is particularly difficult for automotive products, especially when the federal government is constrained by deficit spending, indemnification by statute for AVCS will be difficult

¹⁹ See Syverud, Liability and Insurance Implications of IVHS Technology, SAE Technical Paper 901507 (1990).

to obtain. It may, however, be effectively the only means to achieve significant deployment of automated highway systems in the United States²⁰.

2. Federal or State Legislation.

Tort liability can also be managed through a variety of other state and/or federal legislation. Examples would include legislation immunizing manufacturers or highway owners from liability for IVHS related injuries; assigning IVHS related injuries to an administrative compensation system such as a state worker's compensation or federal childhood vaccine related injury fund; reforming products liability actions to limit design defect liability; reforming civil procedures to eliminate or cap unpredictable elements of damages such as pain and suffering, emotional distress, and punitive damages; or extending the sovereign immunity of governmental entities to contracting parties. Numerous legislative efforts to promulgate such tort reforms have not previously eliminated serious products liability constraints for some technologies, however, and the strenuous resistance that could be expected to such reforms in the context of automobile technology leaves the author doubtful that these legislative solutions are likely for AVCS applications.

3. Preemption/NHTSA Safety Standards

²⁰ See *id.*

As suggested by a previous article²¹, NHTSA safety standards may under certain narrow circumstances be construed as preempting state civil damages suits that seek to impose inconsistent design choices on manufacturers. Such preemption has permitted automobile manufacturers to escape liability for failure to provide an airbag in some suits²².

In interviews for this study, NHTSA attorneys were skeptical that the preemption cases would provide meaningful refuge for IVHS participants in the future. Recent Supreme Court case law in other contexts has continued to interpret preemption narrowly²³. Since NHTSA does not traditionally bless particular automotive designs, preemption of defective design automotive products liability claims is unlikely. NHTSA instead normally promulgates minimum standards of performance. Under such standards, a jury can be permitted to conclude that a particular IVHS project meeting the minimum standard was nevertheless

21 Syverud, Smart Car and Smart Highway Liability: Lessons from Experience with Airbags, Antilock Brakes, Cellular Telephones, and Cruise Control (U. Mich. IVHS Technical Paper 1992).

22 For a survey of the caselaw in this area, see Annotation, Federal Preemption of State Common Law Products Liability Claims Pertaining to Motor Vehicles, 97 ALR Fed. 854 (1991 & 1992 Supp.)

23 See *Cippolone v. Liggett Group, Inc.*, 505 U.S. _____, 120 L. Ed. 2d 407 (June 24, 1992) (preemption of state failure to warn claims by Federal Cigarette Labeling Act requires clear conflict between state and federal warnings).

defective because of an alternative and superior available design".

Of course, NHTSA could in theory promote AVCS systems by setting mandatory standards for auto safety that require them -- by, for example, providing that all cars must have automatic braking systems. However, NHTSA would require substantial evidence from experience with the technology before imposing such a rare standard. It is difficult to develop such experience with the technology in the United States as long as liability problems threaten even the earliest operational tests.

Implicit in this gloomy picture is that FHWA or some other government entity may need to heavily fund early stages of AVCS demonstrations in order to generate sufficient experience with the technology to make liability risks seem relatively small and manageable.

4. Sovereign Immunity

Some potential liability can be avoided by allocating ownership of the liability-producing technology to a state or local entity that enjoys partial immunity from suit. Several of the operational test agreements allocate liability among the participants for precisely this purpose. The Transportation Research Board is currently engaged in a study of varying state sovereign immunity arrangements. FHWA or IVHS America should build on that work and apply the findings to IVHS applications.

²⁴ See generally Note, Preemption of Air-bag Litigation, 76 Va. L. Rev. 577 (1990).

A thorough study of government contractor immunities under the Federal Tort Claims Act and state statutes would also be helpful; the author's search turned up no single comprehensive reference on this subject.

5. Foreign Implementation

The substantive law of products liability of automobile and component manufacturers in the European Community and Japan is remarkably similar to the law in the United States. Foreign causes of action for design defect and strict liability resemble closely the causes of action under state tort law in this country. However, a number of procedural factors -- including the limits on types of recoverable damages, the restriction on use of expert witnesses hired by the parties, the absence of juries, and the availability of no-fault compensation through social insurance schemes -- make design defect litigation considerably less frequent and less costly in Japan and Europe than in the United States²⁵.

This difference in procedural law makes it attractive to corporations with international operations to introduce new technologies first in foreign countries, then to perfect any safety related problems abroad before bringing innovation home to the American market. In one sense, foreign consumers are used as guinea pigs while products are perfected, and injuries are subsidized by the public insurance schemes of foreign countries.

²⁵ See Ervin, An American observation of IVHS in Japan (University of Michigan 1991).

In several interviews, private developers of IVHS control systems indicated a strong preference toward foreign introduction of new designs prior to introduction in the United States. This development would be very undesirable if it were to undercut American competitiveness in IVHS innovation and to cause governmental IVHS programs here to lag behind European and Japanese counterparts²⁶.

6. Insurance

At least one company, Vorad, has obtained help from the insurance industry to promote development of a safety enhancing vehicle control technology. Because collision warning systems and automatic braking systems have the significant potential of reducing automobile accident claims, Allstate has provided much of the capital for development of these potentially risky technologies. The insurance industry has been noticeably absent from the IVHS movement (other than this one example). An educational program aimed at insurers might generate sufficient venture capital to inspire corporations to risk liability problems.

7. Corporate Reorganization

Finally, some IVHS participants could manage liability risks simply by leaving the most risky technologies to new, independent, and thinly capitalized firms that have few assets

²⁶ See generally Alexander, *Comparative Innovation in Japan and the United States* (1990); Acs & Audretsch, *Innovation and Technological Change: An International Comparison* (1991)

at stake in the event designs go awry. To the extent IVHS projects have required cooperative agreements, however, even this method would be difficult.

C. Procurement, Intellectual Property, and Contract Negotiation Approaches

1. Education. As noted above, many procurement, intellectual property, and contract negotiation problems can be attributed to unfamiliarity of participants with each other, with the uncertainties of new IVHS technologies, and with state and FHWA procurement procedures. Over time, many people in this field will have climbed the steep learning curve, and some of the problems will subside. To hasten that process, IVHS participants who are experienced in maneuvering around contract negotiation roadblocks should be encouraged to share their expertise with newcomers to IVHS projects. The January 1993 workshop on these issues, to be sponsored by the Legal Issues Committee of IVHS America, should be looked to as a model for similar sessions aimed not only at lawyers, but also at contracting officials and decisionmakers at private organizations.

2. New Models for Highway Procurement. The analysis of procurement problems in the earlier sections of this paper suggested specific reforms in old practices, such as removing state bonding requirements for ATMS and ATIS systems and providing guidance for preaudit clearances of subcontractors. In a sense, these may simply be symptoms of a broader problem. Existing procurement arrangements for IVHS may be constructed on

a model that simply no longer applies to high-tech highways. Someone with experience in procurement of sophisticated, innovative technologies should compare FHWA and state highway procurement methods to methods used in these other, arguably more relevant contexts. A comprehensive study could be conducted under the auspices of, or supplementary to, the work of the IVHS America Legal Issues Committee Procurement Task Force.

3. Intellectual Property Rights Allocation.

Everyone involved in the disputes over intellectual property rights to IVHS applications developed with partial federal funding conceded, after some questioning, that both the United States and the private market participants often have legitimate interests in intellectual property rights, and that a fair method to protect those interests is all that is required. The author suspects that if IVHS America convened a meeting or conference to identify principles governing allocation of intellectual property rights in the abstract -- rather than in the context of a particular project -- a consensus could be achieved with relative ease. This is the sort of function IVHS America is uniquely suited for, and the author would recommend it receive a high priority in future legal activities.

D. Privacy Approaches

The author recommends a similar approach to resolving privacy related constraints. IVHS America should work toward identifying the public and private interests affected by availability and/or confidentiality of IVHS data. IVHS America

should then attempt to secure general agreement to a set of general principles on privacy issues -- principles that can be subsequently invoked and relied upon in the design of information systems and the retrieval and dissemination of IVHS data.

An alternative approach is to wait to see if and when privacy disputes materialize. It could well be that none will for some time, and that we should leave well enough alone. However, privacy issues tend to materialize in high-profile litigation which casts negative shadows on the "big brother" technology involved.

E. Organizational Reforms: Toward An Integrated Attack on IVHS Legal Barriers

A final approach to overcoming legal constraints to IVHS technology involves focusing less on the constraints than the process by which lawyers are utilized by IVHS organizations. Almost all the lawyers interviewed in the course of this study were somewhat disillusioned with their IVHS experiences. "They give me incredibly general and ambiguous questions," said one state lawyer, "and then they expect incredibly specific answers and instantaneous solutions." Most lawyers expressed frustration with non-lawyer IVHS participants who viewed law and regulatory institutions as purely a nuisance, to be avoided wherever possible, rather than as the ways by which the public asserts its interests and constrains private actors to consider other concerns. It is clear that most lawyers would prefer to be asked to help define both IVHS problems and solutions, rather than be asked to produce solutions that have already been

selected to legal problems that are at best vaguely understood by IVHS actors who lack legal training.

One approach then, would be to view lawyers as potentially creating opportunities for IVHS, rather than simply overcoming legal constraints. This approach would require incentives for lawyers to become integrally involved in IVHS decisionmaking with non-lawyer IVHS participants, while at the same time retaining fora for legal issues' to be discussed among lawyers. Creative organizational and institutional thinking in this regard is desirable, particularly if FHWA desires to continue to mobilize the lawyer involvement in IVHS that will be essential to its ultimate success. Two possible methods to create lawyer incentives for IVHS involvement would include (1) funding a lawyer or legal scholar who would spend 6 months or more in residence at IVHS American working on IVHS legal issues: and (2) requesting IVHS participants to compensate and otherwise encourage their lawyers to become involved in IVHS meetings, symposia, and workshops.

VII. Conclusions and Recommendations

A.' Non-existent IVHS Legal Constraints

Based upon interviews and a literature survey (and not upon comprehensive research into state and federal law) it appears that certain possible IVHS legal constraints have not yet materialized and are unlikely to do so in the future. These "non-issues" include antitrust constraints and tort liability

constraints for ATMS and ATIS applications.

Of course, it is possible that antitrust law or products liability problems will emerge sometime in the future to constrain ATMS and ATIS. It seems unlikely however, and in the interim FHWA could provide a significant service by calling attention to the insignificance of these particular legal problems. By doing so, FHWA would discourage erroneous perceptions of antitrust and tort liability law from warping decisions of private and public actors who are involved in IVHS programs.

B. Manageable IVHS Legal Constraints

This study has found several substantial legal constraints to IVHS technology that are nevertheless manageable through a variety of feasible approaches. The author believes that many of the procurement, intellectual property, and contractual negotiation problems that inspire the most bitter complaints today can be overcome through educational efforts and experience of IVHS players with the unique procedures and problems of IVHS procurement at the federal, state, and local levels. The recommendations below attempt to accelerate the education process and the dissemination of knowledge gained through experience in related negotiations. Privacy issues, which will take longer to materialize, can be best managed at present by a concerted effort to identify the stakes of all affected participants -- including highway users and IVHS participants -- in the dissemination or confidentiality of IVHS data. Upon identifying the stakes and

potential conflicts, IVHS America should work toward drafting a statement of guiding principles on privacy issues for IVHS technologies.

C. Serious IVHS Legal Constraints'

The most serious legal constraint to IVHS research, development, and deployment seems to remain tort liability problems of advanced vehicle control systems. For automated highway systems and centrally controlled headway keeping systems, there will remain an outside chance of potentially catastrophic liability. It seems quite unlikely that the approaches discussed above for managing tort liability problems would be politically feasible for AVCS. Absent a substantial shift of responsibility for automobile accidents or significant legislative reform, tort liability is likely to deter significant private investment in advanced AVCS systems in the United States. Only if the projects are heavily funded by the United States, or if liability is transferred from the investors, is private progress in this area likely to succeed. A serious commitment to AVCS and to automated highways would therefore seem to require a substantial reworking of the operation of the tort system.

D. Directions for Future Research

The author recommends the following priorities in future legal work on IVHS technologies (cross references to pages where this legal work is discussed in the report follow each recommendation)

1. A lawyer familiar with the powers and limitations

of utilized independent advisory committees should prepare a brief report on that subject that clarifies for IVHS America members the constraints on its activities and advice. (p. 21)

2. FHWA and the IVHS America Legal Issues Committee should embark on a widely publicized educational program directed at informing IVHS participants about the lack of serious liability constraints to ATMS and ATIS systems. (p. 23-24)

3. The IVHS America Legal Issues Committee, perhaps in conjunction with the Transportation Research Board Legal Staff, should conduct a survey of state bonding requirements in government contracts, and should where appropriate recommend appropriate state clarification that ATIS and ATMS procurement normally would not require bonding. Should bonding be rejected for these technologies, research might suggest standard terms of warranties that would substitute for bonds. (p. 27)

4. FHWA should contract with a private contractor to conduct a thorough survey of federal and state privacy and disclosure laws and their applicability to data created by ATMS and ATIS technology. (p. 32).

5. IVHS America should compile examples of typical contract terms used in operational tests and other IVHS agreements in an effort to work toward simple, clear, and largely standard contract language.(p. 33)

6. Any ISTEA funded project to construct a demonstration automated highway system should include substantial legal research on the liability problems associated

with any real-world deployment of such a system.(p. 35)

7. DOT should identify whether NHTSA standard setting proceedings have desirable or undesirable effects on IVHS innovation in the United States, and should explore whether special NHTSA policies and procedures for IVHS technology are feasible. (p. 41-42)

8. FHWA and/or IVHS America should sponsor or encourage research into the availability of state sovereign immunity to minimize the potential tort liability of IVHS participants. (p. 42-43)

9. FHWA and/or IVHS America should sponsor or encourage research into whether American products liability law and procedure is in fact depressing rates of IVHS innovation in the United States compared to Japan and Europe. (p. 43-44)

10. IVHS America and FHWA should explore educational and other programs aimed at encouraging insurance industry participation in IVHS technology. (p. 44)

11. FHWA should encourage and sponsor workshops in which public and private IVHS participants who have successful experience in negotiating contracts and managing procurement and intellectual property issues educate new IVHS participants in the process. (P- 45)

12. FHWA, IVHS America, or an independent contractor with experience in procurement practices for innovative technologies should conduct a comprehensive study of current IVHS procurement procedures and recommend any special procedures,

amendments, or alterations that are appropriate for IVHS. The study should focus, to the extent feasible, on state as well as federal procurement practices (p. 45-46)

13. IVHS America should convene a workshop whose mission is to define proposed principles governing the allocation of intellectual property rights in the context of public-private partnerships. (p. 46) A similar workshop should attempt to define proposed principles governing privacy issues affected by the availability and/or confidentiality of IVHS data.

14. FHWA and IVHS America should attempt to give lawyers adequate incentives to become better integrated into the planning stages of IVHS decisionmaking, perhaps by funding a lawyer in residence at IVHS America (loaned from an IVHS America member), or by urging IVES participants to encourage and compensate lawyer participation in IVHS conferences, symposia, and workshops (p. 47-48).

APPENDIX A

**A Revised Bibliography On Legal Constraints
To The Research, Development, and
Deployment of IVHS Systems In
The United States**

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December 12, 1992

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Organization of the Bibliography:

- I. Descriptions of IVHS Technology & Programs
- II. Previous Research Directly Pertaining to Legal Barriers To IVHS
- III. Liability Issues
 - A. General Treatises
 - B. NHTSA, Standards & Preemption
 - C. Warnings
 - D. Seatbelts & Brakes
 - E. Liability & Innovation
- IV. Privacy Issues
- V. Procurement Issues
- VI. Ownership Issues

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