

**APPENDIX:  
SUPPLEMENTARY PAPERS**



# **ITS: Reauthorization Challenges Intelligent Transportation Systems**

**Luncheon Speech  
Representative  
James L. Oberstar**

**Monday, December 16, 1996**

**ITS: REAUTHORIZATION CHALLENGES**  
**INTELLIGENT TRANSPORTATION SYSTEMS**  
**James L. Oberstar**  
**At the 21<sup>st</sup> Century Transportation Infrastructure Symposium**  
**December 16, 1996**

When French President Charles de Gaulle first launched the TGV, the *train a grande vitesse* or very high speed train, his advisors all told him that it would be too expensive, the country couldn't afford it. President de Gaulle simply responded, "Does any other country have such a technology?"

As a student at the College of Europe many years ago I took the old train from Paris to Lyons, then a journey of four and one-half hours. In 1989, I took the same trip on the TGV. That trip took two hours and one minute. In 1988, the year before I took the trip, 500,000 people took the train to Lyons, and three million took the plane. Today, 500,000 go to Lyons by air, three and one-half million by train. This is intelligent traveling.

There are many definitions and many measures of intelligence, but one is the ability to invent, to innovate, to find new solutions, rather than slugging away at a problem with old ideas. If our current approach to solving congestion, pollution, and 40,000 highway deaths a year—pouring more concrete and more asphalt—sounds like slugging away at a problem rather than solving it, then it's time for an *intelligent* approach to the future of transportation: an Intelligent Transportation System.

We launched this approach in 1991, with ISTEA, the Intermodal Surface Transportation Efficiency Act. While people fully understood what Congress was about in writing this Act, they didn't fully appreciate that it marked the end of the Interstate Era and the beginning of a new era of transportation in its broadest context. With the help of Intelligent Transportation Systems, or ITS, we can put more cars on existing concrete, but that's only the start for an intelligent approach to transportation. We can expand the use of existing roadways to make them more efficient, especially in places where there really isn't any more space to pour more concrete. I'm for building and improving roads, don't get me wrong, but I also understand there needs to be a balance as we approach the reauthorization of ISTEA. We need to approach this problem with the understanding that it is about *transportation*, not just *highways*. We used to call it the Highway Bill when it came to the House Floor. As long as we continue to think of transportation as moving people and goods rather than as highways per se, we will be in a good position to do good things for the future of this country.

Our schedule for the Transportation and Infrastructure Committee for 1997 is beginning to take shape. The first bill that Chairman Bud Shuster and I will introduce will take the Highway and other transportation trust funds off budget. We got an overwhelming two-and-one-half-to-one margin vote on this bill in the House last year, but the Senate refused to take it up. I am sympathetic to the concerns about the impact such a move might have on social service programs—but taking the Trust Funds off budget is only fair. In 1956, when the Highway Trust Fund was accepted, the purpose was to create a dedicated revenue stream to see to completion the 42,000-mile Interstate program. It all worked well until about 1968 when Lyndon Johnson, at the peak of the Vietnam War, became concerned about inflation, and began to hold the money back from the Highway program in order to dampen the overheating economy. The Trust Fund money couldn't be spent on anything else, so it stayed in reserve, and grew and helped to conceal the deficit that the government was beginning to run in defense of Vietnam.

The Nixon Administration came in and found this little nest egg and liked it so much they kept more back, as did every President since. At one point, a \$19 billion surplus had built up in the Highway Trust Fund.

We are going to move on this issue as quickly as the leadership will permit us to get that bill through Committee, to the Floor and a vote and, hopefully, put the pressure on the Senate to do the same. I can also tell you that Chairman Shuster and I are going to have a very cooperative relationship in our Committee in the coming Congress as we did in the past Congress. Bud Shuster and I have worked very closely together for 22 years and before even that, when I was the Administrator for the Public Works Committee Staff during his first term on the Committee. I've always said there's no such thing as a Democratic bridge or a Republican highway.

Any disagreements won't be between parties, but between varying views of the future of transportation. There's the urban view, the suburban view, the rural view, the freight view and the passenger view. There will be a procession of governors who want to have the authority returned to them, or have their hands freed by having fewer program categories. They want to have a greater decision-making authority. In my view, if they want to make those decisions then they can raise the money. They can spend all the State money they want on what they want, but if Congress is going to raise the taxes and take the heat, then we're going to have to have a say in how these National programs are run.

At the end of the ISTEA process, I think we'll find the Act essentially as it is now, with some modifications or adjustments within overall programs. I'm certainly going to be a strong advocate for retaining ITS, which has been funded to the tune of more than a billion dollars over the past five years.

But there is no guarantee that ITS or other non-highway programs will remain. Should ITS continue to enjoy a set-aside? Should it be considered an operational program that States may but don't have to spend money on? Is it a required category, or just another way of manipulating money for the State, competing for dollars with conventional highways? How are we going to get the State Departments of Transportation, mayors, county commissioners and communities to spend their highway dollars on this new, relatively untried, unfamiliar technology when they have potholes to fill, shoulders to expand, roadways to improve? It's going to take the ITS community and enlightened State DOT Directors to get involved in the ISTEA debate and not get steamrolled by the old ideas and the old ways. I hope that forums like this, and the one we had last summer at the Humphrey Institute in Minneapolis, will help generate the ideas that go not only to Congress but to the State Highway Departments and Legislatures. You're going to need all people working together.

The focus has to be on **transportation**; on moving people and goods in the most efficient, least expensive, most environmentally sound and safest manner possible. We are not just talking about getting more cars on a given stretch of concrete, but getting people and goods to their destinations in the most effective, efficient ways.

Yes, we can coordinate green wave traffic lights; use traffic lights to admit cars one-at-a-time to freeways; identify congestion and route traffic around it; and use smart cards to avoid long lines and pollution at toll booths.

But we also have to think about the inner cities. How do you move poor people from one part of the city to another part? People need transportation to hold jobs. If we are going to get people off welfare and into employment, then we have to tailor our transportation to individual needs rather than just build more lanes on Beltways or new "outer Beltways" that immediately become as congested as the Inner Beltway.

The commercial sector has an equal need and application for Intelligent Transportation Systems. The Commercial Vehicle Information Systems Network, or CVISN, will provide many benefits in term of safety (automatic truck weight and safety checks; HAZMAT spill responses); efficiency (paperwork reductions—the "paperless" truck where all documents are computerized; GPS tracking; fleet management) and business efficiency. By 2005 it's possible that transactions among carriers, shippers, government agencies and insurance companies will all be done electronically.

But, of course, there are barriers to the deployment of these ideas, not only to getting the ideas out for public acceptance,

but also to getting them implemented. That means getting people at the State level to feel comfortable with ITS. State highway engineers are wonderful. They may not know how to build new technology with their transportation systems, so we need to expand the ideas coming out of research institutes and putting them in the hands of the highway engineers, planners, developers, builders, so that we integrate these new concepts into existing systems, and provide full-scale deployment in our transportation systems of the future.

Today, the State of Minnesota is, I think, very much advanced in all of these areas. They are using TV cameras to monitor freeway traffic so that commuters as well as highway traffic managers can see what the traffic looks like, and reroute traffic if needed. Minnesota is also creating in-vehicles maps. In the future, with Geographical Information Systems, drivers will be able to have a map readout in their own cars so they can see what's ahead before they get into a traffic jam. They can see where the accident is, and get around it, using the most efficient means to get from home to work or wherever they are going. We also need to make regular use of the fiber-optic cable systems and develop software and deploy it. In aviation, it's taken well over a decade to develop the new air traffic control technology that is being installed piece by piece. A lot of that aviation technology can be borrowed for surface transportation ITS.

Last Friday I had a meeting with a five-county group in the southern part of my Congressional District where we were trying to deal with a new phenomenon. This area is about 60 miles out of downtown Minneapolis/St. Paul. Many of those folks keep their jobs in the Twin Cities but move their families to the rural communities where the quality of living is better, the schools are good, and where they have a closer family association. They want to get to and from work in the most efficient way possible so that they can spend more time with Little League, with all the softball games, and at the hockey rink and weekend recreation. They hate the commute. They want car pools, van pools; they want transit systems; they want to make their movement to and from work as efficient and enjoyable as they possibly can.

The population movement of the 1990s is less city to suburb than between suburbs. The movement of commerce and business has been from suburb to suburb and now into ex-urbia. We have to follow up our transportation systems so that we respond to these new realities, as we go into the next century, so that our transportation systems reflect the needs and the interests of our mobile population, who want to live far out, and commute close in, in record time. The concept of designing the transportation system to meet the needs of the people and trying to stay ahead of these needs is what ISTEA is all about. This is why we created a role for Metropolitan Planning Organizations, which would involve more than the engineers, more than the governors, and reach out to the people whose lives and livelihoods are directly impacted by transportation.

A few years ago I traveled to Houston to talk about the future of infrastructure and learned there that the average speed on the Houston Beltway for four hours during morning rush and four more during evening rush is 17 miles per hour. The average is about 15 miles per hour on the Capital Beltway in Washington, D.C. There will be a time when all the cars on a freeway are just stuck. They are not going to move. Now, before that happens we who sit here today must think about the transportation needs of the future and realize that the folks who are wasting hundreds of dollars a year in traffic congestion, with its delays, frayed tempers and air pollution, are going to come back to us and say: "YOU FAILED!" "You didn't do your job. You didn't think adequately about the future. You responded only to the needs of the present."

That is what ISTEA is about. That is what Intelligent Vehicle Transportation Systems are all about. As business centers have cropped up in the suburbs, and housing spread to ex-urbia, and cars and trucks circulate between suburbs and between suburb and ex-urbia as well as in and out of our major cities, we have to develop transportation systems that continue to adapt to meet these needs. We have to be more like Charles de Gaulle and say not "How much does it cost?" but "Is it the best that we can do?" Can we look toward the horizon and say, "We are ahead of the curve, not behind it?"

That is what a symposium like this is all about; and those are the ideas that I hope will come out of this conference in the

next few days.

I wish you well, and thank you for being here today.





**Opening Remarks  
Edward L. Thomas  
Associate Administrator  
Office of Research Demonstration and Innovation  
Federal Transit Administration**

**Monday, December 16, 1996**

**21st Century Transportation Infrastructure Symposium:  
Linking Regional Planning and Operations  
for Effective ITS Deployment**

December 16, 1996

Suggested Talking Points for Edward Thomas, Associate Administrator

Good morning, to those of you traveling from outside the Washington Metropolitan Area, welcome to our Nation's Capital, and to the many familiar faces I see, greetings.

I want to start by thanking Dennis Judycki, Associate Administrator for Traffic Management and ITS Applications, and Tom Ptak, Associate Administrator for Program Development, and their staffs at FHWA for organizing this symposium. Let me also thank my former colleagues in the FTA Office of Planning and my team in the FTA Office of Research, Demonstration, and Innovation.

Having spent 50 percent of my career in transportation planning and the other 50 percent in research, development, and demonstration of innovations, the subject of this symposium is near and dear to me professionally.

More importantly, a stronger bond between transportation planning and operations is essential if we are to realize the anticipated benefits of ITS technology. Advanced information and communication systems provide the planning profession with opportunities to obtain models capable of analyzing short-range, multimodal, and intermodal improvements and public involvement techniques.

Fortunately, discoveries over the last twenty five years position planning to move responsively into the 21st century. Among these discoveries are: large, fast, yet inexpensive computers, geographic information systems, global positioning satellites, multimodal network models, household and activity-based demand models, and improved optimization algorithms.

Transit operators and managers are challenged with gaining a stronger understanding of their various markets, tailoring services and prices accordingly, and generally improving the quality of transit service by reducing travel time and improving safety and security.

Local and state system managers are constantly reminded of the need to maintain the highest level of service on our streets, freeways, and toll roads; to provide real-time information on the condition of the system so that travelers can plan their trips accordingly, and to offer incentives for more effective travel demand management.

Unless ITS becomes integrated into the systems planning process by demonstrating an ability to improve planning tools and to enhance system performance, ITS risks being confined to the sidelines of transportation decision-making.

As Secretary Peña called for in his announcement of Operation TimeSaver, the various ITS technologies must be integrated into a system-wide Intelligent Transportation Infrastructure (ITI). Only then can we realize the full benefits of the advanced technologies and have ITS evaluated as valid alternatives to transportation capacity improvements.

This symposium is a great step toward mainstreaming ITS. It is exciting to see such a wonderful mix of skills and organizations committed to bringing this effort about. Because only through such integration can ITS reach its potential.

ITS integration into the transportation mainstream faces many challenges, some technical and others institutional in nature. But, I'm confident in our ability to identify the critical issues and find the right solutions.

FTA Administrator Linton fully supports the Department's ITS and ITI Initiative and is encouraging efforts to mainstream proven systems and technologies.

The FTA Office of Research, Demonstration, and Innovation is committed to working closely with our Planning, Program Management, and Regional Offices and others to ensure that FTA's ITS program component is properly coordinated. In addition, we in FTA will continue to work closely with FHWA, FRA, and NHTSA to ensure development of an intermodal seamless transportation system.

In closing, FTA is an important player in the Department's ITS Initiative. We have already demonstrated that information and communication-based technologies can improve safety and security, increase the throughput of transit fleets, enhance the performance of transit equipment and infrastructure, and deliver more specialized and accessible services to low income, elderly, and other transit dependent populations.

To make our research, development, and innovation programs relevant, our reauthorization proposal is for a joint partnership initiative.



**Presentation and Handout  
Stephen Lockwood  
Vice President, PB Farradyne, Inc.  
Policy and Technology  
Challenges and Opportunities**

**Monday, December 16, 1996**

## **21st CENTURY TRANSPORTATION INFRASTRUCTURE**

- 1. Agenda “mainstreaming” ITS**
  - a) Basic assumption: ITS (broadest interpretation) is the future of service improvements
  - b) Multiple levels of interpretation irrelevant
  - c) From: immediate/programmatic (and necessarily constrained); to long-term/sectoral (and potentially broad)
  
- 2. Point of departure: both “evolutionary” and “visionary” points of view are necessary: The vision provides a vector for the longer range, more aggressive 21<sup>st</sup> century transportation development. Elements of the vision need to be reflected in short-range policy such as ISTEA reauthorization**
  
- 3. Short-term/“evolutionary” program: modify planning/programming process to implement ITI (within the Federal-aid program) evolutionary program: accepts short-run limitations of context**
  - a) objective: deploy ITI nationally as a baseline
  - b) assumes existing sectoral roles (public infrastructure monopoly) and complex jurisdictional structure
  - c) accepts operations as modest State/Local priority and limited resources earmarked to ITI
  - d) recognizes minor short-run changes in owner organizational structure/staff capacity possible
  - e) accepts traditional arms length relationships with private service providers
  - f) dependence on “champions” — assumes political/institutional rewards modest or unclear
  
- 4. Within the near-term horizon (H1) context: potential NexTEA ITS elements focus on generating visible deployment**
  - a) O & M funding eligibility
  - b) ITS planning/programming focus
  - c) grant conditioned to ITS standards
  - d) incentives for systems integration
  - e) emphasis on innovative finance (public/private partnerships, state infrastructure banks)

- f) “op tests” for operations planning
  - g) procurement deregulation
  - h) training
  - i) R&D at metro level
- 5. Bottom line: recognize limits of available Federal aid program points of leverage in the current political context of: deficit finance, devolution, anti-mandates, multiple competing priorities within Federal-Aid transportation program, etc.**
- a) Within that (H1) context: potential NexTEA ITS elements focus on generating visible deployment and capacity building
  - b) These actions crucial to maintaining program momentum and credibility
- 6. Evolutionary view is necessary (and a real challenge given lack of financial incentives) — but not sufficient**
- 7. A “visionary” component — a new paradigm for 21<sup>st</sup> century surface transportation — is necessary to set the direction of future change in the “TEAs” beyond NexTEA**
- 8. This longer range horizon vision (H-3) is based on the presumption that there will be consumer demand for significant “progress” in transportation-related services in the 21<sup>st</sup> century — as there has been in other public service sectors — and that the general institutional configuration will trend towards the dominant private enterprise model.**
- 9. The vision presumes future “transportation”**
- a) service is *the* mission — not just *one of many* missions
  - b) as a new product: a bundle of services (schedule adherence/routing/safety/security/support & amenity)
  - c) focused on traffic-responsive operations of the upper level network of transportation facilities in real time
  - d) utilizing the full range of supply management tools
  - e) combined with comprehensive in-vehicle information and safety systems
  - f) as well as managing demand (by mode/route/time etc.) through the provision of priced facilities and special service options (for both passenger and freight) (see Appendix A)
- 10. This vision implies a large number of new service components organized by**

**information/communications into a consistent systems framework by a market-oriented combination of revenue-driven service providers — the essence of ITS**

**11. Principal challenges to be addressed are institutional/financial**

- a) prioritizing operations and service — rather than construction and preservation
- b) developing coordinated metropolitan system operations/management
- c) inducing consumer demand — markets — with service options and prices
- d) introducing enterprise management and high-tech staff capabilities
- e) utilizing private resources for facility operations as well as provision
- f) supplementing on-budget tax funds with a range of beneficiary and customer-based revenues to support private investment
- g) aligning intermodal infrastructure with modern freight logistics
- h) monetizing consumption of valued natural resources
- i) replacing “planning” with performance-based evaluation

**12. Major institutional and financial innovation are required to support this reorganization of surface transportation sector**

**13. But needed changes may not be so radical as they seem**

- a) context is shifting (see Appendix B)
- b) other sectors (power, telcoms, water are moving in many of the same directions)
- c) privatization (toll-support enterprise management) is global trend in transport
- d) historic U.S. transportation institutions innovation was part of Interstate
- e) already bellwether examples in U.S.

**14. These factors in combination suggest that “progress” (if defined as identifiable customer-responsive transportation services) are inevitable. The question is when and how**

**15. The type of institutional and financial structure is exemplified in conventions of other public service/facilities systems (and, increasingly upper level highways systems overseas). These are increasingly price-based, competitive, privately managed “enterprises” and which transportation might approximate if it is to be an efficient, service-oriented, high-tech evolving sector**



- 16. The key barriers to the visionary future are principally institutional and financial. Some key barriers marginally affected by limited F-A program leverage and “soft” Federal aid program incentives. Therefore as we develop an evolutionary policy/program agenda, we also need to incorporate elements that are oriented to laying the ground work, opening the door for significant institutional/financial change “Beyond NexTEA”**
- 17. Therefore Agenda for “Beyond NexTEA” should introduce strong emphasis on evolving a suitable institutional/finance framework: “bring the future forward” with a focus on getting a best case (“models”) rather than raising lowest common denominator (“institutional MDIs”)**
- 18. Transition steps can be initiated in NexTEA:**
- a) Raise public and service providers’ expectations through system performance focus, benchmarking and incentives to prioritize the “operational mission” (management systems?)
  - b) Reduce dependence on HTF by permitting tolls on Interstate and empowering regional development of pricing programs on network basis using HOV/HOT lane incremental approaches
  - c) Focus on institutional innovation for operations/management through “Institutional Op tests” such as incentivizing new “Metropolitan Operating Authorities” for upper-level systems on an enterprise basis (move through “4-Cs”)
  - d) Create strong dialogue towards national cooperation with service provider/players at national level to minimize barriers to in-vehicle and related communications services
  - e) Dialogue re cross-sectoral support at the national level of substantial O & M costs associated with ITS for transportation-related service providers (emergency services, law enforcement)
  - f) Consider stronger incentives to induce/support private investment in both facility ownership and service provision by minimizing public subsidy of potential enterprise-based activities. “Make” markets by developing “take or pay” approaches to activities conventionally provided by public sector (“enterprise impact statement”)
  - g) Incentivize State/Local experimentation by bellwether states outside FA program context via funded Technical Experiment Program (TE) and op tests focusing on premium priced services, streamline procurement, new types of concessions for both roadway improvements and ITS services
  - h) Encourage transition to private management by staging through managed competition, shadow prices, franchises with new “public interest rules”
  - i) Undertake examination of infrastructure operations implications of contemporary logistics jointly with private freight/intermodal industry

- j) Consider ITS requirements on NAFTA/Intercontinental Highway System with ATMS/ATIS requirements and Mexican/Canadian continuity
- k) Establish ITS Academy

**19. These concepts should be embodied in policy and program in both Federal and state levels. In particular, their inclusion in NexTEA will establish some important vectors that subsequent policy and program evolution can build on towards realization of the 21<sup>st</sup> Century Vision**

**20. Closure**

## APPENDIX A: LONG RANGE VISION FOR SURFACE TRANSPORTATION

### Backcasting: A Vision from the Future

Realization of 21st century transportation improvements (ITS?) is likely to depend substantially to the capacity to evolve institutions that can capitalize on information, command, control and computation technology — just as the benefits of autobahn technology depended on the invention of the Interstate program, state DOTs and metropolitan planning. To envision the possibilities unlocked from today's discouraging inertia, let us "backcast" from the year 2050 in which metropolitan transportation by definition would have achieved the same measure of supply options and demand management as realized in other public service sectors like telecommunication and power. It is instructive to describe a possible path connecting such a future with the present as a future transport historian might recall it:

*The "Post Interstate" Era didn't really begin until early in the 21st century when transportation agencies gradually evolved into systems operators and service providers. As far back as the 2025, progressive states had already begun to develop priced toll networks on the upper level highway systems together with consistent application of advanced traffic operations and demand management.*

*To supplement public agency resources some of these facilities were developed and operated as private franchises while others were publicly-operated. Gradually, however, the exacting demands of operating and financing evolving technology led to new forms of collaboration between public highway agencies and major private transport and technology companies.*

*Various competing "Transcorps" were formed as public/private commercial consortia—to operate consolidated networks on a multijurisdictional basis. For example, the California Transport Department joined with Microsoft, Motorola and PacTel to form "Western Transcorp" whose shares are traded on the stock market to raise capital for highway automation.*

*With their long-term competitively-bid franchises and financing improvements out of road prices, the transcorps embarked on an aggressive program of improvements and innovation in major corridors.*

*Non-intrusive traffic detection technology and the original equipment vehicle location tags on all vehicles provided the basis for this new level of management. The transcorps used the combination of real time traffic information and pricing to moderate peak demand and to allocate the available capacity on a demand-responsive basis. At the same time, the Transcorps were able to send routing time advisories directly to personal communication devices to aid in traveler decisions.*

*Starting in the 2020s, drivers began receiving discounts if they use pre-trip registration, which allows the transcorps to more closely predict future traffic volume and patterns and anticipate problems. As a result, system operators in high demand areas are able to take reservations and guarantee arrival trip times. It is not surprising that the business of "guaranteed arrival time" insurance grew up about that time.*

*Electronic billing services keep track of time, distance, and type of service through embedded smart cards. Customers receive their transport bills consolidated with their communications bills so they can make the appropriate personal tradeoffs. "Congestion" is now an obsolete term because we use variable pricing and capacity manipulation to offer consistent service—just as had long been the pattern in telecommunications and power—way back in the 20th century.*

*The improving technologies of communications, command and control, combined with application of prices tended to dissolve modal distinctions. "One-size-fits-all" transit vehicles disappeared as smaller vehicles operation in a demand-responsive regime. Receiving preferential treatment on priced roadways offered a range of efficiencies and price combinations tailored to trip patterns and densities. Transit fleets were also to see the first significant operation of non-carbon propulsion.*

*Safety and environmental values had made enormous inroads into vehicle technology. The “new generation vehicles” of the 2010s combining hybrid drivetrain power, cleaner fuels, energy storage, light weight and advanced catalysts had tripled efficiency and substantially reduced rate of CO<sup>2</sup> and NO<sub>x</sub> production. At the same time on-board crash avoidance systems and guideway based “hands/feet off” operations led to “automated highway” intercity speeds limits of 150 miles per hour as well as advanced urban bus and truck platooning.*

*Traditional national and state transport agencies found themselves with important new roles providing policy and regulatory guidance to metropolitan transport operations commercialized via the transcorps. Two major challenges of the mid-21st century were integrating the local tax supported roads with the upper level priced network and developing the schedule of fees and incentives designed to incentive the gradual decrease of dependency on petroleum-based fuels and to encourage systems development with minimal ecological impacts.*

*Full-cost pricing was not achieved without considerable struggle and spread only gradually from the bellwether states as they were able to demonstrate the new forms of metropolitan transportation and land-use systems that offered predictable service and preserved their environmental resources. Even today in 2050, customers may grumble somewhat about the higher prices, but most believe the higher delay-free travel and improved environmental quality is well worth the price.*

## **APPENDIX B: TRENDS/FACTORS CHALLENGING EXISTING INSTITUTIONAL CONTEXT**

### Consumer demand

- higher value of time (competitiveness)
- performance expectation of perfect system info
- more price/quality options
- increased use/demand

### Infrastructure (infostructure?) Supply

- new technology push (leading sector impacts)
- information-intensivity (C2+IS)
- comms will be ubiquitous & create pressure
- network/system oriented

### Institutional trends

- deficit budgets
- deregulation/devolution
- commercialization
- new services

### ITS Reality is different

- layers show impact of comms/info
- sausage (small component that is part of conventional DPW)
- “mobility services” are necessarily a partnership among infrastructure, user and other service providers (institutional complexity)

## APPENDIX C: PROGRAM CONCEPTS

1. Facilities consolidated into “seamless” operated networks
  - a) adoption of O & M as priority mission of infrastructure owners
  - b) development of operational capability
    - (1) staff technical capacity for operations
    - (2) real-time O & M coordination
    - (3) real-time IM capability
  - c) forming of new interjurisdictional relationships
    - (1) vertical (S/L)
    - (2) horizontal (local/local)
    - (3) intersectoral (policy, emergency, etc.)
    - (4) develop new operating agencies (MOPs)
2. Bundled services: not just “capacity” (ex: (routing/security/safety/yellow pages))
  - a) integrate non-operations features working with private and other providers
  - b) establish clearinghouse or ISP
  - c) new forms of relationships with national players (automotive, information)
3. System performance as key objective
  - a) develop new mission priority in public works environment
  - b) use performance data to judge institutional progress
  - c) enterprise management style (incentives)
4. Revenue flow via commercialized user services (priced)
  - a) capitalize on tolling opportunities
  - b) open IS to tolls
  - c) grow toll networks
  - d) expand congestion pricing program (use HOT lane evolution as strategy)
5. Investor ownership with capital/operations/financed from revenue stream)
  - a) eliminate state/local legal constraints to commingling, concessions, etc.
  - b) eliminate tax constraints to private investment and management
  - c) develop competitive franchises, concessions for facilities, networks
  - d) work with private sector to expand service bundle on fee basis
  - e) shift to private management (in stages) through concessions with shadow pricing to actual user-fee based franchises
6. Introduction of competition (deregulate existing monopoly)
  - a) competitively bid outsourcing of certain functions currently public (managed competition)
  - b) develop new forms of partnerships with ranges of risk/reward sharing
7. Provision of premium/discount and specialized services options for consumer markets
  - a) maximum flexible, segmentable facilities (express/local/reversible)
  - b) develop HOV/HOT lane options
  - c) develop intelligent intercontinental (NAFTA) system (ITS on IS plus border crossing plus Canada, Mexico trunks)

d) develop staff/legal capacity to procure evolving technology

8. Enterprise management structure (possibly privatized)

- a) establish enterprise independence from legislative/political interference
- b) place management rewards on performance basis

9. Public interest focus on policy and regulation—not production of service

10. Incorporation of external costs (full cost pricing?)

- a) use environmental costs as discriminator in investments

11. Capitalizing on new technology for value-added options and efficiency improvements

## **ENTERING WEDGES FOR 21st CENTURY SYSTEM**

1. Raise expectations through system performance focus/mission.
2. Empower regional pricing programs on network basis.
3. Incentivize new "metropolitan operating authorities."
4. Create closer national industry cooperation with service and product providers/players (public and private).
5. Minimize public conduct/subsidy of potential enterprise-based activities to "make a market" and attract investment.
6. Incentivize state/local experimentation by bellwether states outside FA context (ex: premium services, new forms of public/private partnerships).
7. Stage to private management via managed competition, shadow prices, franchises with new "public interest rules."
8. Examine operational implications of contemporary logistics jointly with private freight/intermodal industry.
9. Consider ITS requirements on NAFTA/Intercontinental Highway System with Mexican/Canadian continuity.
10. Establish ITS Academy.











**Presentation  
Joseph Sussman  
Professor, MIT  
Strategic Planning Issues**

**Monday, December 16, 1996**

## **WHY ITS DEPLOYMENT IS HARD**

SYSTEMIC NATURE OF ITS

Vehicles and Infrastructure

Public and Private Resources

## **THE BASIC ITS INSIGHT: TRANSPORTATION AS A LINKED VEHICLE/INFRASTRUCTURE SYSTEM**

### **ITS-4 TECHNOLOGIES**

- **SENSING**
- **COMMUNICATING**
- **PROCESSING**
- **METHODS**

## **WHY ITS DEPLOYMENT IS HARD — II**

ORGANIZATIONAL READINESS

Academia — New Transportation Professional

State, Local and Federal Government

Private Sector (Siemens Example)

## **WHY ITS DEPLOYMENT IS HARD — IV**

ITS' ADVANTAGES DON'T MESH WITH POLITICAL  
REALITIES

Intermodalism

Regional Scale

HANDOUTS FROM PRESENTATION

*Surface Transportation Policy Project Progress*, Volume VI, Number 1, January–February 1996

From the Director's Chair

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by Hank Dittmar, Executive Director

“Transportation and Information Technologies for Sustainable Technologies”  
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**From the Director's Chair:**  
**“Technologies and Sustainability—Not Necessarily a Contradiction”**  
**by Hank Dittmar, Executive Director**

Secretary of Transportation Federico Peña announced a new technology initiative at the 75th annual meeting of the Transportation Research Board. *Operation TimeSaver* has the goal of equipping seventy-five metropolitan areas with a core Intelligent Transportation Infrastructure within the next decade.

DOT has chosen to apply available technology in communications and management to traffic, transit, and information problems suffered by commuters, instead of pursuing expensive science fiction scenarios to automate cars and roads a la Robert Heinlein's story *The Roads Must Roll*. Secretary Peña is to be commended for focusing on tools to help manage the current system, rather than costly and potentially destructive gimmickry.

*Operation TimeSaver* sets a measurable goal and commits to achieve that goal within a defined time frame. The announcement appropriately focused on the fact that investing in management and information technology to handle traffic and improve transit performance is more cost effective than adding new road capacity in metropolitan areas. Peña noted that equipping the Washington, D.C. region with the intelligent transportation infrastructure would cost \$300 million; about the cost of eight miles of urban freeway or one freeway to freeway interchange. ITS technologies need to be viewed as a cost effective alternative to building new roads. These technologies may also have a longer term impact, offering the potential for dynamic management of the transportation system in real time.

A new study being undertaken by STPP, the University of Minnesota's Humphrey Institute, and the Claremont Graduate School is exploring the potential of transportation technologies to contribute to a more sustainable future. Our project, *Transportation Technologies for Sustainable Communities*, is funded by the Minnesota DOT. The project proposes that ITS and communications technologies can help resolve the apparent conflict between the transportation system, its economic role, and its impact on society and the environment.

If transportation technologies are implemented in a way that embraces sustainability—defined as meeting today's needs in the areas of economy, social justice, and environment without sacrificing the ability of future generations to make the same choices—they can help us meet these goals and measure the impact of our transportation choices.

We can look forward to a future where we define desired levels of system performance in terms of accessibility and mobility; emissions and system condition; use technology to manage traffic and transit; and report on results to the taxpayer on a regular basis. Our study will use community focus groups as well as construct a scenario for sustainable technologies to build upon *Operation TimeSaver's* promise.

This issue of *Progress* examines the emerging ITS Infrastructure. The Humphrey Institute's Dave Van Hattum reports on our joint initiative, NRDC's Janet Hathaway looks at the potential for ITS to revolutionize transit performance, and STPP's Chris Bender suggests that ITS can improve safety and save money in rural areas as well as in the metropolitan areas emphasized in *Operation TimeSaver*.



**“Transportation and Information Technologies for Sustainable Technologies”**  
**by Dave Van Hattum, Humphrey Institute of Public Affairs, University of Minnesota**

In 1974, when Americans were still reeling from dramatic hikes in gasoline prices, who would have thought that the number of miles driven in the US would roughly double within two decades?

It wasn't that hard to imagine—that's what happened over the two previous decades. However, a major difference is that those same drivers increasingly started to run up against all sorts of limits.

Metropolitan areas started seeing their highways clog up sooner than predicted, generating greater levels of air pollution, reducing productivity, and creating new demands for ways to control all the new traffic problems.

Communities face a number of challenges related to transportation—noise and emissions from congestion; encroachment on open and civic spaces by urban sprawl; and inequitable access to employment and goods and services by low-income, elderly, and handicapped residents.

Communities are experimenting with a variety of new policies to address these concerns. At the same time, the emergence of new technologies may offer completely new approaches for communities in the future.

Technological innovation is critical to designing transportation systems that simultaneously promote economic growth, social equity and environmental protection. Equally important is an appropriate fit between new technologies and the needs of local communities.

A collaborative study, *Transportation Technologies for Sustainable Communities*, is underway by the Humphrey Institute of Public Affairs, the Claremont Graduate School, and Surface Transportation Policy Project. The Minnesota Department of Transportation and the ITS Joint Programs Office of the U.S. DOT funded this unique partnership. The study hopes to link technology development of intelligent transportation systems (ITS) and telecommunications with community defined priorities.

ITS refers to a wide range of information processing, communication control, and sensor technologies. ITS applications such as travel and transportation management, public transportation operations, and electronic payment are being developed through Federally funded operational tests across the nation.

ITS and telecommunication substitutes for travel offer the prospect of increasing the efficiency of the transportation system without further intruding upon neighborhoods, wildlife habitats, and open space.

Environmental organizations and others have raised concerns about the social and environmental impacts of ITS; and in particular the impact on transit use, social equity, and demand for travel. According to Tom Horan, Claremont Graduate School Institute for Applied Social and Policy Research Director, “this study can provide a policy architecture for deployment of ITS in communities seeking to maximize environmental gain.”

In framing transportation's contribution to sustainability, we define sustainable communities as human scaled and spatially defined communities that:

- a) consider the full social and environmental cost in the provision of resources and services;
- b) respect ecological carrying capacity; and
- c) balance the needs for greenspace, economic development, and access to resources.

*Transportation Technology for Sustainable Communities* has three major components:

- 1) a concept review defining key components of sustainable communities and transportation linkages;
- 2) focus groups and workshops with key transportation professionals, community stakeholders, and technology innovators; and
- 3) the development of sustainability indicators.

Research is taking place in Minnesota and nationally. The study is being integrated into Minnesota Guidestar's Polaris (Minnesota's ITS program) project whose objective is to develop a statewide ITS architecture. Architecture, as in "ITS architecture," refers to an overall system design that describes how ITS subsystems communicate with each other and are integrated to achieve overall strategic goals.

The next stage will be to engage community stakeholders, transportation planners, and policy makers in refining this framework and describing how emerging transportation/communication technologies could promote community sustainability. Using this framework, we hope to move from broad issues to guiding principles and indicators and, finally, to specific recommendations for the Minnesota Guidestar and Federal ITS programs.

The primary implication of the sustainability framework is that ITS should not be viewed strictly as a traffic management tool, but rather as an information source for overall system performance.

This perspective has important implications for developing a statewide architecture, achieving a balance of supply and demand side applications, initiating public-private partnerships, and devising public outreach strategies. For example, we recommend that emission management be investigated as a component of Minnesota's statewide ITS architecture. ITS traffic information services should be bundled with other information provided through the ever expanding telecommunication infrastructure. Finally, and most importantly, we are testing new public outreach techniques that address system-wide performance.

Planning for community input into the design of ITS and telecommunication systems to meet critical social, economic, and environmental goals provides an opportunity to operationalize transportation sustainability. The framework we are developing represents a starting point for ongoing communication between public and private sector ITS and telecommunications implementors; transportation, land use, and air quality plans; and community stakeholders.

*If you would like a copy of the Humphrey Institute study, "ITS and the Environment: New Models for Federal, State and Local Cooperation," please contact Dave Van Hattum at 612.625.1017. Proceedings of a series of national conferences on ITS and the Environment and other related studies are available by calling Tom Horan at 909.621.8581.*

**Commuting for Better Transit**  
**Janet S. Hathaway**  
**Senior Attorney**  
**Natural Resources Defense Council**

Effective transit requires major economic and policy commitments, problematic in this era of scarce governmental resources. Today's information and communication technologies are cost-effective ways to enhance transit and shared-ride services.

Reliable transit is valuable. Travelers are most comfortable with transit which adheres to a predictable, known schedule, or when it is so frequent that a schedule is not needed to avoid long waits. Communication technologies can improve transit reliability.

**A dynamic transit information service** can provide accurate schedule information, updated to take into account traffic jams, construction delays, or weather related problems. Because it can be offered at a modest cost, most transit services offer only a printed schedule. It is more costly to provide passengers with up-to-date, "real-time" information about transit arrivals and departures, but that information is more valuable to riders. Travelers may access such information by telephone, personal computer, or interactive television, whether at home, work, or a public information kiosk. Travelers may reduce wait time by planning to arrive at the bus or train to coincide with arrival of the vehicle. The costs of such a service can be partially underwritten by subscriptions from business wishing to advertise through the service.

**Traffic signalization giving transit priority** can effectively increase travel speeds of buses and other roadway transit vehicles. Such systems can be operated manually by drivers. More sophisticated systems can operate automatically and vary the signal according to various traffic and roadway factors including the length of traffic queues, the levels of roadway congestion, and the need to make up time in order to meet the transit schedule.

**Automatic vehicle location systems** can help transit operate more efficiently and reliably. Management can rapidly identify vehicles falling behind schedule, and can assign additional vehicles to address routes with unusually high ridership.

An additional benefit of real-time vehicle location information is the ability to rapidly dispatch police, fire, or other emergency vehicles to assist the transit vehicle. Transit drivers in dangerous areas appreciate rapid response to silent alarms they can activate in the event of traffic accidents or threats to passenger safety.

**Automated ride-matching services** can facilitate the use of multiple passenger cars or vans. Ride-sharing is an alternative to single occupancy travel which has the potential to reduce environmental impacts while providing comfortable, affordable, and reliable transportation. Passengers may prefer ride-sharing to transit because it offers door-to-door service and a guaranteed seat. Ride-sharing networks allow both subscriptions for daily commute trips and requests for special or unique trips. Riders can read newspapers, make acquaintances, or just relax. The major impediment to ride-sharing is finding a "match" (and here, real-time information services become valuable).

**A demand-responsive pick-up by a car or "jitney"** is similar to ride-sharing in its passenger amenities but more like a taxi in guaranteeing pick-up upon demand. Jitneys, like ride-sharing, can be operated either privately or by a transit agency. Jitney services are likely to be cheaper to operate than conventional transit in low density areas, particularly during off-peak times. A jitney may increase transit use if it collects suburban travelers to deliver them to a rail station or major transit line. Jitneys may also be ideal for suburb-to-suburb travel, where ride-matches may be harder to make.

Technologies alone cannot solve our problems with air pollution, energy consumption, and resource depletion. But some technologies can serve us well in our quest to travel more efficiently, use less energy, and improve air quality.

*This article has been excerpted from a paper, "Rides On Demand: Could This Be Transit?" For more information, please contact Janet Hathaway, Natural Resources Defense Council, 415.777.0220.*

**Technology Applications for Rural America**  
**Christopher Bender**  
**STTP Communications Coordinator**

Transportation challenges vary significantly between rural and metropolitan areas. Congestion is probably the greatest challenge in our nation's cities, but in rural areas congestion is limited to a few specific spots or in conjunction with certain incidents.

Safety is the biggest challenge in rural areas. Rural roads account for 81 percent of public road mileage. Forty-one percent of vehicle miles traveled in the US are on rural roads, accounting for 61 percent of fatal accidents

The typical fix to rural safety challenges has been capacity expansion. In many states, the primary transportation plan consists of building four lane divided highways across rural America. This strategy does little to address the reasons for safety problems in rural areas. Most rural travel occurs in remote areas where the challenges of warning travelers about weather conditions, road conditions, or incidents are exacerbated. Nor does trying to build a solution with more or wider roads do much for assisting law enforcement and emergency services learn and react to incidents.

The application of technological measures to increase safety on rural roads could greatly effect the number of lives lost on our roadways.

Most of the attention focused on Intelligent Transportation Systems (ITS) focuses on their application in urbanized areas to deal with congestion and traffic flow. However, we can utilize ITS in rural areas to meet the safety challenges of rural areas by providing information and communication services to travelers, law enforcement, and emergency services.

ITS offers an array of solutions that are more fiscally responsible, less destructive to the environment and communities, and likely to have greater positive impact with regards to safety than our current road-building credo.

The Federal Highway Administration (FHWA) is conducting a study to look at ITS rural applications with its Rural Advanced Traveler Information Systems (rural ATIS). Rural ATIS will provide an assessment of rural users' needs and develop a range of possible applications.

The study began with a national survey and focus groups to understand rural users needs. The study communicated with members of the general public, as well as police, EMS, highway, tourist, commercial operator, and travel organizations officials. Overwhelmingly, participants indicated that ITS applications should focus on information relating to problems that occur while traveling.

ITS can be used to develop mechanisms for notice of safe speeds due to weather conditions, incidents, road closures, geometric design, or congestion. Applications can be developed to lower the time necessary to contact EMS and for transport to medical facilities.

ITS can also be used to promote tourism and freight movement, and thus spur economic development. Rural areas can use technology to better manage their transportation needs and increase economic activity. All of this can be accomplished without increasing capacity or geometric designs.

Rural ATIS has developed a series of concepts in response to the identified needs of rural travelers from the focus groups and surveys. The concepts are categorized into three general areas: Emergency Response, Safety and Hazard Warning, and Traveler Services Information.

The Emergency Response concept includes initiatives for cellular, satellite, and CB radio mayday systems for emergency response.

The Safety and Hazard Warning concept includes warning systems for road conditions. An example is the Vehicle-Based Adaptive Safe Speed System which will present the driver with a recommended safe speed for given geometric conditions. The system uses information on vehicle weight, vehicle type, roadway geometry, and road surface conditions to recommend a safe speed. Static and dynamic roadway data will be combined with vehicle data in an on-board processor to compute the safe speed. The Roadside Safe Speed System will also use information on vehicle characteristics, roadway geometry, and road surface condition to recommend a safe speed. Static and dynamic roadway data will be combined with detected

vehicle characteristics and roadside processors, and a safe speed will be presented to the driver on a roadside changeable traffic sign.

Traveler Services Information provides travelers with navigation, traffic, and tourist information using in-vehicle and roadside technology.

Based on an evaluation of these concepts and recommendations from an expert advisory panel, a number of these concepts will be selected for further analysis. The analysis will include discussions of institutional, legal, and technical issues, national implications of each concept, and identification of possible applications sites.

*For more information, on the Rural ATIS program, please contact Dave Warren, FHWA, 703.285.2426.*



**Presentation  
John C. Cox, Jr.  
President,  
Southern California Economic Partnership  
Using Advanced Information,  
Management, and Marketing Techniques to Increase the  
Performance and Efficiency of the Surface Transportation System:  
Representing a Private Sector Point of View**

**Monday, December 16, 1996**

## **21st Century Transportation Infrastructure Symposium Linking Regional Planning & Operations for Effective ITS Deployment**

As a backdrop to my comments, it seems appropriate to remind everyone of the principles formed recently by ITS America Reauthorization Task Force. In many ways, they reflect some of the common themes we have heard across the country.

### **ITS AMERICA ISTE A REAUTHORIZATION PRINCIPLES**

1. Complete deployment of basic ITS passenger/freight services by 2005.
2. Support continued Research & Technology and emphasize system integration.
3. Maximize long-term predictability and stability.
4. Create maximum flexibility and allow for ITS training, operation, and maintenance.
5. Maintain regular reports on progress, performance, and effectiveness.
6. Encourage innovative financing techniques.
7. Eliminate deployment barriers and use innovative, flexible procurement methods.
8. Continue a targeted Federal role in public/private partnerships, rapid development of industry standards, markets, essential R&D, and insure interoperability by funding components which are consistent with the adopted model architecture and standards.

In order to put a fresh face on where we go from here, I believe it is very important to “to step out of the box” and look at the surface transportation system from a new perspective. Traditionally, transportation infrastructure has been considered “public service” public works projects. Over time, the surface transportation system has become somewhat more sophisticated through the use of strategic lane stripes, lane widening, ramp meters, or incident removal techniques to “channel” and “manage traffic flow.”

With the availability of today's sophisticated vehicle traffic detection, data collection/distribution systems, and the computerized management systems, we are now in the business of “processing” vehicles through a much more constrained vehicle distribution system. The operations, maintenance, management, and marketing of such a system requires fresh ways of addressing this new “customer service” business.

The question becomes, what methods should be used to plan, operate, maintain, manage, and market such a system. If, as suggested, the system now provides a “customer service,” then consumer marketing techniques must be considered to optimize service performance and consumer satisfaction. The following observations reflect some of the guiding principles and comments collected through private sector ITS discussions.

## **GUIDING PRINCIPLES:**

- Deliver the underlying fundamental quality of life benefits of a sound, effective and efficient transportation system.
- Access to mobility.
- Access to Jobs.
- Economic Viability.
- Safe, Secure Environment.
- Service Convenience.
- Environmental (Air, Land, Water, Habitat) Protection.
- Use advanced information, management, and marketing techniques to increase the performance and efficiency of the surface transportation system.
- Provide strong Public Sector Leadership required to Champion and maintain the Vision of a "World Class" Transportation System.
- Consider the private operating Telecommunications Model as the means of providing the customer traveler information and system management.
- Maintain the public sector incentive funding to insure fundamental intermodal deployment, integration, and interoperability of the core intelligent transportation infrastructure.
- Use ongoing Consumer Market Research to collect valuable information and analytical data of customer use behavior and satisfaction with the transportation service so as to make informed investment, operating, management, and marketing decisions.
- Use Consumer Market Research to develop a better understanding of what impact Traveler Information and Telecommunications has on the Surface Transportation System.
- Encourage and facilitate national, regional, and local public/private partnership collaborations to insure effective interoperability.
- Modify Planning, Funding, Procurement, and Approval Processes so as to allow greater flexibility and quick response to market changes.
- Encourage and support training programs to insure a supply of skill labor.
- Support generic Industry Outreach and Education Marketing Programs that convey the quality of life benefits of a Smart "World Class" Transportation System.
- Leverage Market Forces to the advantage of surface transportation performance.
- Recognize "MARKET BASED" Private Sector marketing activity which has a transportation and air quality benefit but is not Required by Legislation, Regulation, Planned, Programmed as part of a SIP, or provided by the public sector. (A form of innovative financing).

- Use the strengths and expertise of various segments of the public and private sectors to maximize cost effective system deployment and operation.

**The PUBLIC SECTOR - Understands the public policy and process necessary to build public works capital improvement projects:**

- Provides the core infrastructure data collection system.
- Traffic Flow Detectors.
- Traffic Control Devices.
- Public Agency Transportation Information.

**The PRIVATE SECTOR - Offers the skills and experience to operate, maintain, manage, and market a performance-based and efficient customer service delivery system:**

- Provides traffic management, information system management.
- ATMS/ATIS could follow Telecommunications Model.
- The private sector understands the complexities of technology.
- The Market Forces
- The Economic Drivers
- The Customer Demands
- The Market Growth Factors
- The Returns on Investment
- The Standards Requirements
- The Regulatory Requirements
- The Systems Operations Requirements
- The Distribution Systems
- The Inter-Operability Requirements
- The Training Requirements
- The Marketing, Advertising, Outreach/Education Requirements
- The Asset Management Process
- The Asset Broker Function
- THEY RESPOND QUICKLY TO MARKET TRENDS
- THEY ARE BUILDING IT TODAY!

## MARKET GROWTH INDICATORS

### TRAVELER INFORMATION MARKET (in addition to existing Print/Broadcast Media)

- 750,000 In-vehicle navigation devices on Japan's roads today
- **10 percent of all Japan's new vehicles Navigation equipped in 1996**
- 20,000 Trucks currently use PrePass (automatic vehicle identification, weigh-in-motion sensors, vehicle-to-roadside communication) transponders in California, Arizona, and New Mexico.
- Big 3 and Japan automakers are setting port standards for plug-and-play communications gear
- Every **major** auto industry player has Navigation device - GM, Ford, Chrysler, Toyota, Honda, Nissan, BMW, Mercedes, Delco, Donso, Sony, Siemens
- New MobileWeb controller/server will turn vehicle into rolling WEB Site providing applications from traffic conditions to delivery fleet truck tracking
- Worldwide Navigation sales expected to be \$2.5 Billion in 1998
- 30 percent of all new US vehicles expected to be equipped with turn-by-turn Navigation systems by 2000, 250,000 US Navigators sales per year by 2001
- **25 million Navigators on US roads by 2005;** 22 million In Japan (Will they have traffic content?)

### TRANSPORTATION MANAGEMENT SYSTEM MARKET FORECAST

- **\$16.5 billion worldwide ATMS Equipment Market over 15 years**
- \$30.8 billion Commercial Fleet Management Systems
- \$7.1 billion Electronic Toll Collection Equipment
- \$1.8 billion Public Vehicle Transportation Management Systems
- \$0.4 billion Commercial Vehicle Operations ITS equipment

### TELECOMMUNICATIONS

- 38.5 percent of all US households have 1 or more personal computers
- 67 percent of households with \$40,000+ income have PCs
- 30 percent of households with Less than \$30,000 income have PCs
- **53 percent of all US households will have a PC by 2001**
- 18 million US households have more than one phone line
- 11 percent annual growth in California second lines
- 144 percent growth in California ISDN.lines
- 15 million Internet Users in the US in 1996

## **TELECOMMUTING**

- **45 million individuals operated home offices in 1995**
- **23 million Americans telecommuted in 1996**
- **2/3 of Fortune 1000 companies have telecommuting programs**
- About 8,000 home-based businesses are started daily
- 23 percent growth per year in "SOHOT" Market (Small Office/Home Office Telecommuters)
- 10 million messages a day are sent by E-mail
- 95 percent of US Companies with 1000+ employees will be connected to the Internet by 2000
- 1.5 million Internet Phone Products Shipped in 1996
- **Desktop Videoconferencing equipment sales to reach \$15 billion by 2000**
- For every 1,000 workers who telecommute, annual savings would be 121,667 gallons of gas, 11 tons of hydrocarbons, 3 tons of carbon monoxide and 4 tons of nitrogen oxide.

## **TELESERVICES**

- 16 percent of US voice-traffic volume over Internet by 2000
- WEB Advertising Revenue to reach \$5 billion by 2000
- On-line investors have 1.5 million accounts
- Video Conference Lunches offered by Apple Cafe
- Pavilions Supermarkets offer ShoppingLink
- **40 percent of US Supermarket chains offer home shopping service**
- 80 percent of Chicago's Peapod shoppers use on-line grocery shopping services
- **Auto-By-Tel sold over 20,000 vehicles in August 1996**
- Amazon.Com of Seattle sells several thousand books a day online from 1.1 million book titles offered
- Online shoppers spent \$1.25 billion in 1996
- **20 percent of '97 Software Sales expect to use electronic distribution**
- A 2 hour movie will take 7 minutes to download by 2000

All of these intelligent transportation activities, including telecommunications applications, are having an impact on the transportation system. We don't know exactly how much. Market research in this area would give us better insights.

Some say "the technological revolution is in progress." The Intel computer on a chip technology has moved from a 0.06 MIPS system 25 years ago to a 300 MIPS 686 system today. The 1286 system is expected to operate at 100,000 MIPS in 15 years, another reminder that our transportation planning, implementation, and improvement programs must be extremely flexible to accommodate the rapid improvements in technology.

## **OVERARCHING OBSERVATIONS**

### **I. MARKET FORCES - "What are the key external and internal forces, trends and resources, barriers and opportunities, given the increased emphasis on operating and managing the existing transportation system more efficiently?"**

#### **A. EXTERNAL**

##### **1. CONSUMER DEMANDS**

##### **a. CONVENIENCE**

- (1) Access
- (2) Time

##### **b. SAFE TRAVEL CONDITIONS**

- (1) Warning Systems
- (2) Collision Protection
- (3) Anti-Skid Braking Systems

##### **c. INFORMATION**

- (1) Directional Signage
- (2) Construction Warnings
- (3) Bus Routes/Schedules

##### **d. AFFORDABLE DEVICES**

- (1) Price Points - \$20/Month Info Service; \$500 Appliance; \$20,000 Auto
- (2) Easy to Use
- (3) Dependable
- (4) Low Maintenance

2. PRIVATE ENTERPRISE CONCERNS
  - a. MARKET OPPORTUNITIES
  - b. RETURN ON INVESTMENT
  - c. COMPETITIVE ENVIRONMENT
  - d. MARKET RESPONSIVE
  
- B. INTERNAL (PUBLIC SECTOR)
  1. POLICY MAKER CONCERNS
    - a. SOCIAL/EQUITY ISSUES
    - b. ENVIRONMENTAL ISSUES
    - c. BUDGET CONSTRAINTS
    - d. POLICY CONSTRAINTS
    - e. PROCESS REQUIREMENTS
  2. IMPLEMENTORS
    - a. DELIVER A PROJECT, NOT PERFORMANCE RESULTS
  
- C. TRENDS
  1. TECHNOLOGY
    - a. MORE OF IT
    - b. MORE EFFECTIVE
    - c. MORE AFFORDABLE
    - d. SHORTER LIFE CYCLES (18 Months to 5 Years)
  
- D. RESOURCES
  1. LABOR
    - a. General Shortage of Required Skills
    - b. Lack of Training
  2. FINANCIAL
    - a. Government Funds are Limited
    - b. ITS is not a Private Investment Market
  
- E. BARRIERS
  1. ITS IS A PUBLIC WORKS PROJECT
  2. LIMITED CORE INFRASTRUCTURE
  3. LIMITED COMMUNICATION STANDARDS AND PROTOCOLS
  4. LIMITED CONSUMER MARKET
  5. NO MARKETING EFFORT
  
- F. OPPORTUNITIES
  1. SEEDS HAVE BEEN PLANTED
  2. SOME CORE INFRASTRUCTURE IN PLACE
  3. SOME FUNDING AVAILABLE
  4. TECHNOLOGY AVAILABLE
  5. PRIVATE SECTOR POISED TO INVEST

**II. PLANNING PROCESS - "What and how can changes in Planning Process (including definitions of "planning") accommodate regional systems management operations and integrated information systems?"**



- A. CURRENT SYSTEM BARRIERS
  - 1. CONTRACTUAL CONSTRAINTS
  - 2. TIMELY
  - 3. LABORIOUS
  - 4. PROCESS DOES NOT ACCOMMODATE NEW TECHNOLOGY
  - 5. LACK OF TRAINED LABOR FORCE
  
- B. OPPORTUNITIES
  - 1. ADOPT CUSTOMER SERVICE MENTALITY
  - 2. USE MARKETING TECHNIQUES
    - a. Track Market Penetration
    - b. Track Market Growth Potential
    - c. Monitor Performance & Effectiveness
  - 3. USE DESIGN BUILD PROCESS
  - 4. USE PROCESSING SYSTEM MODEL
  - 5. USE PRIVATE SECTOR SPECIALITIES
  - 6. STIMULATE TARGET MARKET GROWTH
  - 7. ACCOMMODATE MARKETING REQUIREMENTS
  - 8. RECOGNIZE "MARKET BASED" ACTIVITIES

**III. INSTITUTIONAL ISSUES - "What institutional and organizational barriers exist that prevent the inclusion of operations in the planning process? What are the key activities and related institutional characteristics and capabilities required in terms of roles, relations, organization, staffing (public and private), etc., to deploy and manage/operate an information-intensive system; to improve operation of roadway transit services; and to improve operations of the agencies?"**

- A. LACK OF SOLID VISION
  - 1. PROVIDE A "WORLD CLASS" OR "BEST OF CLASS" SYSTEM
  - 2. DIFFERENT OPERATING STYLES
  - 3. PUBLIC SECTOR - PUBLIC SERVICE
  - 4. PRIVATE SECTOR - CUSTOMER SERVICE
  
- B. RESPONSIBILITIES
  - 1. PUBLIC SECTOR - BY THE BOOK PROCESS PROJECT DELIVERABLE
  - 2. PRIVATE SECTOR - CUSTOMER SATISFACTION/RETURN ON INVESTMENT
  
- C. NEW LEVELS OF SYSTEM MANAGEMENT
  - 1. PUBLIC WORKS MANAGEMENT
  - 2. PRIVATE SYSTEMS MANAGEMENT
  
- D. TECHNICAL HURDLES
  - 1. STANDARDS
  - 2. INTEROPERABILITY
  - 3. TRAINING
  - 4. OPERATIONS & MAINTENANCE

**IV. INFORMATION SYSTEM ROLES - "What are the roles of various information systems (particularly the ITS, the GIS, and the Transportation Management Systems - CMS, IMS, etc.) in improving roadway and transit systems performance and the operations of various agencies? In what ways can new technologies, systems concepts, and enterprises enable new levels of systems management? What are the major technical and institutional hurdles?"**

A. INTELLIGENT TRANSPORTATION SYSTEMS

1. SAFER VEHICLES
2. INCIDENT REDUCTION

B. GEOGRAPHICAL INFORMATION SYSTEMS (GIS)

1. LAND USE CONDITIONS
2. LANDMARKS
3. DIRECTIONAL ASSISTANCE

C. TRANSPORTATION MANAGEMENT SYSTEMS (TMS)

1. TRAFFIC FLOW EFFICIENCY

V. URBAN FORM, LAND USE, ENVIRONMENTAL QUALITY OF LIFE

A. "WHAT TRENDS ARE PERTINENT TO PROVIDE INFORMATION-BASED TRANSPORTATION?"

1. ON-LINE/INTERNET MARKET GROWTH

"DOES INFORMATION REDUCE TRANSPORTATION ENVIRONMENT EXTERNALITIES?"

2. YES, TELECOMMUNICATIONS AND INFORMATION PROVIDE MORE MODE CHOICE, ROUTE DEVIATION, AND TIME OF TRAVEL

B. "WHAT ARE MARKET, INSTITUTIONAL, AND POLITICAL IMPLICATIONS?"

1. A better educated consumer, customer, decision maker

**VI. POLICY ISSUES - "What are the policy implications of information-based transportation at both the Federal and State level? What specific issues (barriers, opportunities) need to be addressed before information technologies, systems, and enterprises can deliver maximum benefits? What policy instruments are most appropriate: legislation, regulation, financial incentives, model arrangements, etc.? What are the likely effects of the National Information Infrastructure (NII) and the new telecommunications law on the regional transportation planning process?"**

A. POLICY IMPLICATIONS

1. SELLING PUBLIC DATA
2. NOT GIVING AWAY POTENTIAL REVENUE STREAMS
3. ALLOWING PRIVATE SECTOR OPERATORS

B. WHAT WILL DELIVER MAXIMUM BENEFITS?

1. ADOPTING INTEROPERABILITY STANDARDS
2. USING PRIVATE SECTOR OPERATORS
3. PROVIDING SEED FUNDING TO GROW MARKETS

C. APPROPRIATE POLICY INSTRUMENTS - USE ALL OF THE FOLLOWING:

1. LEGISLATION
2. REGULATION
3. FINANCIAL INCENTIVES
4. MODEL ARRANGEMENTS

VII. **RESEARCH GAPS - "What research gaps exist that relate to information-intensive transportation technical, institutional/financial, and organizational arrangements, particularly with respect to transportation planning, programming, operations, and management?"**

- A. INFORMATION EFFECTIVENESS
  - 1. TRAVELER INFORMATION IMPACT ON SYSTEM
    - a. Newspaper Pre-trip Reports
    - b. Television Pre-trip Reports
    - c. Radio In-route Reports
  
- B. TECHNICAL
  - 1. GREEN TIME CONTROL
  - 2. TRAFFIC DETECTOR PENETRATION
  - 3. INTEROPERABILITY EFFECTIVENESS
  
- C. ORGANIZATIONAL STRUCTURE
  - 1. THE MISSION
  - 2. OPERATING CULTURE
  - 3. SKILLED MANAGEMENT STAFF
  - 4. SKILLED OPERATIONS AND MAINTENANCE STAFF
  
- D. OPERATIONAL
  - 1. SKILL-LEVELS AVAILABILITY
  - 2. TRAINING REQUIREMENTS
  
- E. FINANCIAL
  - 1. RETURN ON INVESTMENT
  - 2. IDENTIFYING NON-PUBLIC REVENUE STREAMS
  - 3. PRIVATE SECTOR INTEREST (NOT A "MARKET" YET)

## SUMMARY

Completing the deployment of the core ITS infrastructure continues to be a basic objective in order to deliver the underlying fundamental quality of life benefits of a sound, effective, and efficient transportation system.

A continued targeted Federal role in public/private partnerships to stimulate rapid development of industry standards, markets, essential R&D; funding components which are consistent with the adopted model architecture and standards; and facilitate national, regional and local public/private partnership collaborations is essential to insure interoperability and demonstrate the strong Federal leadership required to Champion and maintain the Vision of a "World Class" Transportation System and maximizes long-term predictability and stability.

Using the strengths and expertise of various segments of the public and private sectors and the operation, advanced information, management, and marketing techniques will increase the performance and efficiency of the surface transportation system.

Eliminate deployment barriers, modify Planning, Funding, Procurement, and Approval Processes, and use innovative, flexible procurement methods to produce greater flexibility and quick response to market changes.

Use Consumer Market Research to collect valuable information and analytical data to:

- Determine customer use behavior and satisfaction with the transportation service, so as to make informed investment, operating, management, and marketing decisions.
- Develop a better understanding of what impact traveler information and telecommunications has on the surface transportation system.

Support generic Industry Outreach and Education Marketing Programs that convey the quality of life benefits of a Smart "World Class" Transportation System and training programs to insure a supply of skilled labor.

Recognize "MARKET BASED" Private Sector marketing activity which has a transportation and air quality benefit but is not Required by Legislation, Regulation, Planned, Programmed as part of a SIP, or provided by the public sector. (A form of innovative financing).

The Federal-Aid surface transportation programs should produce opportunities to plant more seeds, stimulate, and leverage the market forces. These strategies are of paramount importance to the effectiveness of our future surface transportation system.

Today, roughly 98 percent of all US households have a television set in their home. Will 98 percent have access to real-time intermodal transportation information by 2005?

# SPECIAL VOLPE CENTER RESEARCH SESSION

## "Identify Research Needs Associated with Information-Intensive Transportation"

### DOT Round table: Macro Trends & Research Developments

## GUIDING QUESTIONS *Answers by John C. Cox, Jr*

### 1) QUALITY OF LIFE ISSUES

- How would free and perfect transportation-related information affect lifestyle and market decisions and how might these decisions, in turn, affect the environment, land use patterns, urban form, and the overall quality of life in communities?

ANSWER: *In the first place, nothing is free or perfect. More important, information in of itself does not make a market. Marketing communications certainly is a very important component for product/service awareness and influences use. Many factors influence choices or preferences. It would take a very expensive information campaign supported by extensive scientific research to influence significant quality of life issues. The anti-smoking campaign is a prime example.*

### 2) TRANSPORTATION/COMMUNICATIONS

- To what degree is transportation becoming a sub-branch of the broader sector encompassing information-intensive transportation and communications services?

ANSWER: *Telecommunications is a sub-branch of Transportation and vice versa. Regardless of how they are positioned, telecommunications has become a significant transportation mode representing a 5 to 20 percent share of market.*

### 3) INSTITUTIONAL ISSUES

- What institutional issues does the shift to information-intensive transportation raise, and what new institutional arrangements could facilitate the use of information technologies to maximize the benefits to local communities?

ANSWER: *It means shifting the transportation information component responsibility to the private sector. They are much better trained and equipped to respond to the service demands of the customer.*

#### 4) PUBLIC INVOLVEMENT

- Do information and communications technologies provide opportunities for improved public involvement in the transportation decision-making process?

ANSWER: *No. From a public participation standpoint, not any more than the televised public meetings.  
Yes. If true, consumer market research is used as the means of gathering consumer attitude, behavior, and purchase or use intents. Yes. From a consumer use standpoint, better information and communications provides the user the greater opportunity to [make] better travel decisions.*

- Are new public involvement processes needed to exploit these opportunities, and what are the potential pitfalls?

ANSWER: *No. There is no better test of consumer acceptance than product or service use. If the product and services are available, the customers will be involved and will provide significant feedback. We need to be able to collect, track and analyze that data as accurately as possible.*

#### 5) PLANNERS/OPERATORS

- How can transportation professionals (e.g., planners, operators) harness new technologies to improve the performance of the transportation system and, in doing so, address the broad economic, social, and environmental concerns expressed by communities?

ANSWER: *Transportation professionals must understand and insure the technological deployment requirements of the transportation and telecommunications core infrastructure if they are going to provide the quality of life benefits of a safe, secure, mobile, information accessible, and economically sound community. They must become educated on the use of advanced technologies and modify their habits to recognize and use the major role the private sector plays in technology performance and effectiveness.*





# **Planning Breakout Session Notes**

**Gary Ritter**  
**Session Leader**

**Monday, December 16, 1996**

## **December 16, 1996, Planning Breakout Session Notes**

### **21st Century Transportation Infrastructure Symposium:**

### **Linking Regional Planning and Operation for Effective ITS Deployment**

The session was chaired by Gary Ritter, Volpe Center ITS Program Coordinator, who was assisted by Susan Grosser, Federal Transit Administration, in capturing major discussion points, and by Ken Tersero, the official session recorder. The breakout session addressed two general questions and two specific questions as indicated below. The summary notes provided herein were taken by the session Chair and have not been compared or reconciled with other accounts of the discussion, including the subsequent report to the plenary session regarding breakout session deliberations, and so may contain additional or conflicting information.

*General Question A: Given the increased emphasis on operating and managing the existing surface transportation system more efficiently, as opposed to increasing systems capacity through major capital investments, what are the key factors (external and internal forces, barriers, opportunities) to be considered?*

- ITS/ITI lacks a "rallying slogan" or "imperative" comparable to "get the farmer out of the mud." Saving time, while important to travelers, does not resonate with public officials and planning staff responsible for highway and transit facilities.
- The planning focus is on TIPs and SIPs and how to apply Federal funding to alleviate existing or anticipated operational problems through major capital improvements to regional highway and transit systems, and less so on how to use technology to enhance day-to-day operations.
- Systems management has yet to take root as an integral regional planning function (as opposed to a TSM-like "add-on"). Management is a difficult "sell" to the public, even though the lack of travel predictability is irksome to most. Existing system performance measures for use by planners are inadequate for assessing and expressing the benefits of ITS strategies.
- Given that ITS can be applied in many different ways, it is difficult to explain to decision makers what ITS is and isn't in the absence of a particular deployment or application concept that would yield a particular result.
- Special Federal funding is needed to "promote" ITS. The number one barrier is dollars. State and local agencies perceive ITS as a new thrust over and above existing activities, therefore it should provide new or supplemental funding to cover the additional cost of ITS. And, most elected officials have a comparatively short time horizon.
- Avoiding the appearance of a Federal mandate, especially in the absence of Federal funding, is critical for success.

- ITS can be a constructive "agent of change" for achieving greater cooperation among regional transportation agencies.

*General Question B: With respect to transportation planning, programming, operations, and management for information-intensive transportation, what research gaps exist, and what kinds of studies, research, and operational tests are most promising (technical, institutional, financial, organizational/staffing)?*

- Early Deployment Planning, Priority Corridors, Operational Tests, and the Model Deployment Initiative have been helpful in stimulating and forging interagency working relationships among planners and operators within regions. "New" funding (so that pre-existing agency-specific funding commitments are not placed at risk) and flexibility on how it can be used would be helpful in getting agencies to work together.
- Ways to use ITS to promote the "I" in ISTEA are needed. Research is needed to discover how ITS concepts can be applied to reduce inefficiencies at intermodal interfaces. The benefits of ITS need to be demonstrated convincingly in real world applications, and widely publicized.
- Research is needed to establish under what circumstances it would be advantageous for public agencies to function as traffic / transit information producers vs. consumers (i.e., the extent to which needs can be met cost-effectively by commercial offerings or shared capabilities).
- Support in the development of more advanced transportation modeling tools for ITS analysis, especially relative to air quality conformity determinations.
- Investigations into how ITS-generated data and information can be used as a rich source of transportation planning data should be a priority.

*Planning Breakout Question 1: What changes in the planning and programming process are desirable to accommodate regional systems management, operations, and integrated information systems?*

- Planning is still largely unimodal, however, this is unlikely to change given modally-oriented Federal deployment funding programs.
- Attain national consensus on a few ITS/ITI basics that focus on "deploying" something. This will help get away from the notion of ITS as a multi-purpose "enabler," and avoid the confusion that arises when everyone has a different idea of what ITS is (i.e., is ITS for capacity and efficiency, for environmental enhancement, or both? If both, how much of each?).
- The ITS transportation planning process needs to be more aware of and suitably coordinated with public sector communications infrastructure planning activities, including but not limited to the activities of established state telecommunications agencies.
- A dynamic planning process is needed to address regional ITS integration and operation issues between public sector agencies and private sector providers. It was noted that planning makes sure that "lanes meet" across boundaries, and the same is needed for traffic management and operations. A requirement for planning and operations people within a region to work together was offered as one suggestion.

- Given the anticipated private sector financial contributions to ITS deployment (80 percent) overall, new mechanisms for planning public infrastructure investment needed to stimulate private initiatives are needed. Planning as usual won't do. Accelerated public sector planning and deployment processes are needed.

*Planning Breakout Question 2: What is required in terms of activities, roles, relations, organization, staffing (public and private), etc., to deploy and manage/operate an information-intensive system which improves operation of the roadway and transit service?*

- Technical staff at the larger MPOs are fairly familiar with ITS in concept. This is less so with regard to smaller MPO member agencies and the elected officials who govern the MPO. These people need to be educated on the benefits of ITS in light of competing imperatives they may perceive relative to available funding. MPO staff can serve as a first line "educator" but needs to have suitable educational materials to illustrate the benefits and advantages of choosing ITS.
- Considerable differences concerning transportation improvement priorities often exists within major metropolitan areas. MPO staff must be able to address the distributional aspects of ITS benefits; among and between central city and suburban or among various modal interests, for instance. Incentives and organizational mechanisms are needed to promote "regional" planning and deployment rather than merely "regional coordination" of jurisdictional efforts.
- There needs to be a recognition among the requisite parties that transportation system operation and management planning is a topic of regional and intermodal scope and transcends single agency jurisdictions. Federal leadership is needed to help state and local transportation staffs and officials approach transportation systematically rather than focusing on the individual parts (i.e., NAS, STP, transit, etc.), so that when regional transportation issues are considered the discussion is not just about "how the pork is sliced and passed out."
- ITS should not become the tail wagging the transportation dog. It needs to be recognized that transportation is a means to an end not an end in itself and that transportation systems need to be considered in the context of urban systems (housing, economic development, education, public safety, etc.) overall.
- A new funding stream for an ITS regional operating authority would be needed. However, it was not at all evident that such regional authorities are preferred over greater inter-agency cooperation and partnership with the private sector.
- The ITS scanning reviews should be made a routine activity, not something special.

A concerted ITS planning activity is needed. One in which goals, deployment objectives, and ITS Architecture decisions are cascaded in a coordinated, interwoven fashion from the Federal, to State and local governments. A starting point is to achieve more effective transfer of the National ITS Architecture findings and conclusions to State and local agencies so that they can take the next steps in adopting regionalized versions.

**Information Systems Breakout Report**  
**Thomas O. Mottl**  
**Session Leader**

**Monday, December 16, 1996**

**December 16, 1996**  
**Information Systems Breakout**

**Thomas O. Mottl, Session Leader**

Participants in the Information Systems Breakout identified the following as key factors to be considered in operating and managing surface transportation systems more effectively and efficiently:

- A broad system perspective in planning and making decisions.
- User needs and communicating ITS value and benefits to the customer.
- Teamwork and partnerships (ownership) which cut across project phases and requirements (cross-function) and organizations (cross-culture).
- Public policies which stimulate and support the above three factors.

These factors reflect the increasing need for transportation operating agencies to deal with issues related to services, products, customers, and partnerships rather than narrowly "design and build" projects. Thinking in terms of systems and communicating proactively, both vertically and horizontally, were central themes throughout the Information Systems Breakout Session. Public policies to promote and facilitate related activities both between the public and private sectors and between public agencies at various levels were highlighted as especially important.

Lack of easily perceived "tangibility" in benefits obtained from information systems used in surface transportation operations is considered a key issue in building the political and public consensus necessary to gain budget "clout" necessary to deploy and support them. Feedback on "pothole repairs" near someone's business or house or in a heavily traveled roadway was contrasted with feedback on improved average intersection transit times (obtained through better traffic monitoring and signal light timing) as an example of this issue. Raising awareness and visibility of public benefits of ITS in general was cited as a critical issue for motivating and sustaining spending on information systems for transportation infrastructure development and related operations and maintenance.

The issue of what roles information systems might play in improving roadway and transit systems performance and the operations of various agencies were considered at two levels. In terms of top level system concepts, comments indicated that activities such as the National Information Infrastructure (NII) initiative seemed to have little relevance to transportation and ITS in particular. Further discussion indicated that this was partly due to the fact that there is (in the view of session participants) no clear picture or understanding of what the NII was, what it would do, or how it "connects" with ITS. The opinion was also expressed that there already is enough "complexity" in ITS concepts without becoming involved with the even more abstract NII ideas. It also seemed to participants that the NII was focused on "ultimate high-

tech solutions."

On more immediate operational levels, such as operational traffic and traveler information systems, key questions, interests, and concerns centered on functional, operational, and policy issues, not technical. An example was the generally held view that policies of state DOT agencies typically avoid telling drivers what to do, but rather focus on making information available to the driver for individual decisions and choices. (This was contrasted with transit agency operations, where directing the traveler is accepted policy.) Under such policy restrictions, variable message sign investments could lose out to alternative capital needs, limiting ITS operational effectiveness. Discussion of other similar issues seemed to raise the question, "What is the 'business model' for state operated ITS systems?" Information systems carry the connotation of products, services, and customers. To design, build, and operate such systems successfully requires a clear and consistent notion of what business you are in, want to be in, or can be informed with. Is a classical business model which involves developing a product and selling it to a customer appropriate for and consistent with State-owned and -operated ITS under current policies and regulations?

Discussion of GIS (Geographic Information Systems) applications seemed to indicate that from an information systems standpoint, GIS technology is "lifeblood" for MPO operations and planning. This view seems to stem from the basic functionality of a GIS that is a multidimensional computerized data base with user-friendly geographic or other kinds of graphical map interfaces. These systems are reported to be very flexible, broadly applicable, and easy to use, and appeal to a lot of different interests and needs.

The final area in which information systems impacts were considered was education, training, and system performance assessments. The nature of the computer, telecommunications, and information appliances associated with ITS creates a natural environment for education and training. While the actual events of a transportation scenario are transient, with information technology these events can be captured and stored for reuse in a variety of ways related to education and training. Applications could include operator training and education, more general professional capacity building, or public relations. In addition, information captured by ITS information systems provides the means for measuring overall system performance. Absent such performance assessment capability, it would be very difficult to justify ITS investments and expenditures in competition with other conventional, more visible and easily understood transportation expenditures.

In terms of barriers and opportunities related to obtaining maximum benefits from information technologies, systems, and enterprises, elimination or changes to legislative and political barriers which restrict or preclude communication, collaboration, and partnerships was felt to be critical. State codes often create barriers in the design, procurement, and management of the high-tech systems required for ITS, including use of new types of professionals such as the "systems engineer." Identifying the real needs and functionality required of ITS, which is by nature cross-jurisdictional, is vital for cost effective design and the ultimate utility of such systems. Communication, cooperation, and collaboration among local government agencies is key in this regard, and a variety of barriers to these processes exists, both formal and informal. In this regard, a key need is to develop understanding of how to educate and "sell" key policy makers to remove these barriers.

A specific policy area of importance to successful deployment of ITS systems which was discussed briefly is that of telecommunications. Creation of linked transportation and telecommunication policies which recognize the close ties between these two areas was judged to be essential to realizing effective and efficient ITS operations.

Finally, on the question of what research gaps exist and what types of studies, research, and/or operational tests are most needed, three specific areas were discussed. First, the impact of information systems on travelers was an area of great interest and uncertainty, and viewed as appropriate to classical research methodologies. A more difficult and complex but related research issue is the overall affect on ITS performance of a reactive driver or traveler receiving continuous, real-time operational information.

In general it was felt that conventional "research" was not of primary importance to successful operations and management of surface transportation systems. However, research in the form of pilot studies was felt to be useful and was advocated by the group. In particular, it was felt that such research could result in better understanding of local jurisdictional issues based on determining "customer" wants and needs. In this context, GIS systems were promoted as key research tools for such studies because of their natural "fit" with the problems and their ability to graphically represent results in user-friendly formats meaningful to those at the local level.

On a related topic, it was the consensus of the group that consolidating results from all pilot studies and conducting ongoing assessments was especially important to developing meaningful, stable understanding of a wide range of ITS issues from technical to human factors to market acceptance. The difficulty of obtaining separate funding for such work after pilot studies are concluded led to the suggestion that such efforts be mandated by Federal agencies, and an incremental line item included in all ITS pilot programs to support them. Such funding would guarantee that comprehensive data bases were developed and timely assessment results available to guide future development and deployment decisions.

The Information Systems Breakout Session concluded with a spirited discussion on the importance to ITS deployments of vertical and horizontal communication, and the significance of the Internet in enabling such communication. The consensus of the group was that virtually all State DOT's and Federal transportation agencies have significant communications networking infrastructure in place today in the form of web sites and e-mail. However, discussion indicated that while these networking tools provide a basis for building bridges between organizations and facilitating communication between people with varying responsibilities and interests, there is growing organizational concern over their misuse in the course of day-to-day business. As a result, firewalls are reportedly being built to control or limit e-mail capabilities. The consensus was that such action would lead to lost opportunity in terms of the investment required, restrictions on desirable networking and information exchange between individuals and organizations, and create organizational morale issues. However, it was remarked by several participants that not infrequently the response to such restrictions was for individuals to go around firewall barriers by subscribing on an individual basis to on-line services.



**Presentation  
Gene Ofstead  
Assistant Commissioner, Minnesota DOT  
Panel Discussion of State and Local Challenges**

**Tuesday, December 17, 1996**

## 4 Stages

- Beginning
- Maintaining/Growing/Accelerating
- Taking the Discontinuous Step (break-through)
- Moving to Level 2 Technology

## Stage 2 —Key Issue

### *Maintaining/Growing/Accelerating*

- Resources
- Expanding Participation Beyond the Usual
- Keeping a High Profile (*especially internal*)
- Supporting Chaos (*creating awareness*)
  - State ITS Chapter
  - University Researchers
  - CVO/Safety/Travel Information Services

## Stage 3 — Key Issues

### *The Discontinuous Step*

- Commitment of Partners
  - Outcomes Focus
  - Really Sharing Control
  - Synergy Through Trust
- Unconventional Taxing (*product sales as capital source*)
- Organizing to Implement New Thinking  
(*Put new wine in new wine skins*)

## OUR CURRENT STRUGGLE

(From Stage 2 to Stage 3)

- Gaining Trust for New Alliances
- Reorganizing for Next Step
  - Right people
  - Acceptance from the Established Organizations
- Estimating Growth of Product Markets
- Public Acceptance of New Ways

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**Presentation**  
**Ginger Gherardi**  
**Executive Director, Ventura County Transportation Commission**  
**Panel Discussion of State and Local Challenges**

**Tuesday, December 17, 1996**

## **PLANNING PRINCIPLES**

- NO SUCH THING AS “ULTIMATE SYSTEM”**
- WHAT WE DO TODAY IS DISPOSABLE - SHORT TERM**
- PROVIDE FOR FUTURE TECHNOLOGY - INCORPORATE CONCEPT ONLY INTO LONG-RANGE TRANSPORTATION PLAN**
- ITS ARE “LIFESTYLE TOOLS” - WAYS OF THINKING/ACTING/MANAGING/OPERATING - ALL AROUND US PART OF DAY TO DAY CHORES.**



## **IMPLEMENTATION**

- **LEARN HOW TO COMMUNICATE IN PLAIN ENGLISH!**  
**NEVER, NEVER USE WORDS LIKE:**

**ITS, ITI, SYSTEM ARCHITECTURE,  
PROTOCOLS, ETC.**

**ALWAYS USE WORDS LIKE:**

**NEW, BETTER, HIGH TECH, CUTTING EDGE  
- STIR IMAGINATION, MARKET CONCEPTS.**

- **DON'T TRY TO BE TOO GLOBAL! HAVE A CLEAR VISION OF WHAT YOU WANT TO ACCOMPLISH**
- **BE OPEN TO OPPORTUNITIES**

## **IMPLEMENTATION (CONTINUED)**

- . DON'T BE AFRAID TO TRY SOMETHING NEW -  
CONSIDER IT A WORK IN PROGRESS!**
- . IMPLEMENT SMALL USABLE PROJECTS WITH  
CLEAR PUBLIC BENEFIT, EASY TO IMPLEMENT.**
- . SUCCESS & SUPPORT MEASURED BY PUBLIC IN  
PERCEIVED PERSONAL BENEFIT &  
CONVENIENCE**

### **VCTC- 3 IMPLEMENTED PROJECTS (2 MORE IN PLANNING)**

- 1. ON-LINE TRANSIT ROUTING - ALL SO.  
CALIFORNIA, EXCEPT SAN DIEGO  
COST - \$60,000 STATE TDM  
IMPLEMENTATION - 3 MOS.**

## **IMPLEMENTATION (CONTINUED)**

### **2. COUNTYWIDE PASSPORT - RF SMART CARD COST - THROUGH**

**VOLPE/CALTRANS \$150,000**

**LOCAL 70 BUSES - 10 SYSTEMS-GOOD**

**PLANNING REPORTS - 2+ YEARS**

**TO IMPLEMENT - PUBLIC CONVENIENCE -**

**MO. PASS -DEBIT**

### **3. TTY DEVICES FOR CALL BOXES - DESIGNED, MANUFACTURED BY PRIVATE SECTOR - COMPETITIVE BID - 0 LOCAL COST. BEING INSTALLED NOW - CHANGED 911 DISPATCHING 1 INFORMATION FOR CALIFORNIA HIGHWAY POLICE.**

## **TRANSIT ISSUES**

- **OPERATIONAL COSTS, NOT TREATED SAME WAY AS HIGHWAYS - NEED TO MODIFY OR CLARIFY FUNDING STRUCTURE TO PERMIT OPERATIONAL, MAINTENANCE COSTS OF ITS SYSTEMS THAT CROSS OPERATORS. NEED TO MEASURE LONG TERM PLANNING BENEFITS & SAVINGS.**
- **NEED OPERATIONAL TEST TO CROSS MODES/RAIL/BUS/ROADS**

## **REALITY? OR JUST “ISSUES”**

- I. THE NATIONAL CULTURE “THING”  
(OUR GENERIC WAY OF LIFE)**
- II. LACK OF “STRUCTURES” TO DEAL WITH LARGE  
ISSUES**
- III. MAJOR PRIVATE SECTOR ISSUES ARE SIMILAR  
TO GOVERNMENT ISSUES (TRANSIT vs.  
FREIGHT)**
- IV. THE GOVERNMENT GAP BETWEEN  
OPERATIONS & STRATEGIC INITIATIVES IS  
LARGE (TRB #249)**
- V. THE TIME GAP FOR GOVERNMENT PROCESS vs.  
PRIVATE PROCESS IS A BIG PROBLEM**
- VI. PLANNING MAY NOT BE THE ISSUE OR  
SOLUTION**

## **MOVING FORWARD**

- 1. LOOK AT WHAT IS WORKING (i.e., OTHER MODELS)**
  
- 2. CLOSING THE TIME GAP  
VISION STRATEGY BUSINESS PLANS  
- LET THE QUICKEST LEAD**
  
- 3. PICK TARGETS (MARKET DRIVEN LINES)  
- MIRTS  
OTHER “NON-GOVERNMENT” OPPORTUNITIES**
  
- 4. DON’T GET MIRED DOWN  
- KEEP DOING “STUFF”  
- USE CHAOS AS AN OPPORTUNITY**
  
- 5. CONTINUE TO SEE ITS AS A LEVER FOR MAJOR INSTITUTION**
  
- 6. SUPPORT BELLWETHER EFFORTS**

**Presentation**  
**Les Jacobson**  
**Traffic Services Manager, Washington DOT**  
**Panel Discussion of State and Local Challenges**

**Tuesday, December 17, 1996**

## **ITS PLANNING**

### **FEDERAL ROLE - STRONG LEADERSHIP**

#### **1. NATIONAL DEPLOYMENT PROGRAM**

- **DRAWN FROM STATE/REGIONAL DEPLOYMENT PLANS**
- **SELECT INITIAL SYSTEMS**

#### **NATIONAL HIGHWAY SYSTEMS**

- **ENGAGE PRIVATE SECTOR**

#### **BUILDS PUBLIC SECTOR**

#### **BUILDS USER PRODUCTS**

#### **2. STATE DEPLOYMENT PROGRAM**

#### **3. REGIONAL DEPLOYMENT PROGRAM**

- **INCLUDES ITS IN RTP**

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### **PATH TO DEPLOYMENT**



## **FEDERAL PROGRAM (FUNDING)**

- 1. RESEARCH & TESTING (200 M)**
- 2. INTEGRATED DEPLOYMENT INCENTIVE  
(200 M)**
  - NATIONALLY SIGNIFICANT**
- 3. DEPLOYMENT INCENTIVE (1B+)**
  - ENABLES STATES/REGIONS TO BUILD NATIONAL ITS ELEMENTS**
  - PROVIDES INCENTIVES TO STATE TO BUILD STATE ELEMENTS**

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**USE MATCH REQUIREMENT = INCENTIVE**

## **ITS PLANNING**

### **FEDERAL ROLE - STRONG LEADERSHIP**

#### **1. NATIONAL DEPLOYMENT PROGRAM**

- **DRAWN FROM STATE/REGION DEPLOYMENT PLANS**
- **SELECT INITIAL SYSTEMS NATIONAL HIGH WAY SYSTEMS**
- **ENGAGE PRIVATE SECTOR**

**BUILDS PUBLIC SECTOR**

**BUILDS USER PRODUCTS**

#### **2. STATE DEPLOYMENT PROGRAM**

#### **3. REGIONAL DEPLOYMENT PROGRAM**

- **INCLUDES ITS IN RTP**

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**PATH TO DEPLOYMENT**

## **FEDERAL PROGRAM (FUNDING)**

- 1. RESEARCH & TESTING (200 M)**
- 2. INTEGRATED DEPLOYMENT INCENTIVE (200M)**
- 3. DEPLOYMENT INCENTIVE (1B+)**
  - ENABLES STATES/REGIONS TO BUILD NATIONAL ITS ELEMENTS**
  - PROVIDES INCENTIVES TO STATE ELEMENTS**

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**USE MATCH REQ = INCENTIVE**

## **LINKING PLANNING & OPERATIONS**

### **CHALLENGES:**

- **VIEW ITS AS TRANSPORTATION ELEMENT,  
NOT SEPARATE PROGRAM**

- **COLLABORATION:**

**ROLES APPROPRIATE FOR ALL  
ORGANIZATIONS**

**- ENLIGHTENED SELF-INTEREST**

- **REGIONAL (NATIONAL) SYSTEMS THAT  
PRESERVE LOCAL DETERMINATION**

- **PERFORMANCE MONITORING &  
EVALUATION**

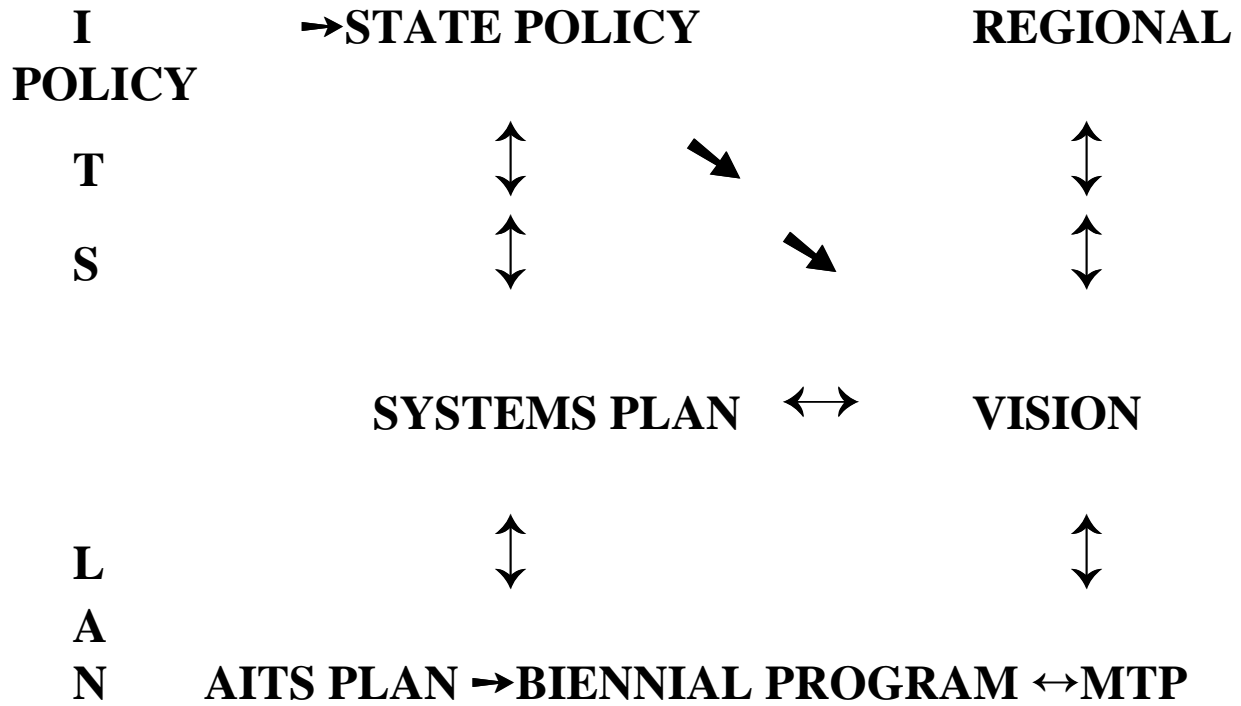
- **FLEXIBILITY OF APPROACH**

**LOCAL/REGIONAL UNIQUENESS**

**LEAD/RESPOND TO TRENDS**

**MIGRATE TO MATURE MODEL(S)**

## LINKING PLANNING & OPERATIONS (CONTINUED)



**PRIORITIES:**

- MAINTENANCE**
- OPERATIONS**
- PRESERVATION**
- IMPROVEMENT**



**21st Century Transportation Infrastructure Comments**  
**Sigmund Silber**

**Monday, December 16, 1996**

***NOTE: Mr. Sigmund Silber attended the two day symposium. Mr. Silber provided the following comments to the Office of T and ITS Applications, Federal Highway Administration after the symposium.***

### **21st Century Transportation Infrastructure Comments**

After sitting through a very stimulating two days, I wish to focus my comments in three areas:

- The disconnect between the planning frameworks we have established and the way people in the field think.
- The problem which is emerging with the rubric: “ITS”
- A need for additional scenario planning tools.

#### **DISCONNECT RE PLANNING FRAMEWORKS**

U.S. DOT has spent a lot of time and effort developing certain planning frameworks. These include but are not limited to the Goals/Objectives/Strategies benefit analysis framework which is in the National Program Plan and a number of frameworks resulting from the National Architecture Project including the Market Packages framework and the cost analysis methodology which is close to being a tool that implementors can use.

Both during the plenary and breakout sessions, I found little if any awareness of any of these planning frameworks. If such frameworks were understood and accepted, we wouldn't be having conversations on how should we look at ITS and how the National Architecture relates to what is going on in each community.

There are a number of possibilities. One is that we have just not done enough to disseminate the information on these planning frameworks. A second possibility is that these planning frameworks are not useful or usable in that they do not mesh with either the way implementors think or the way they need to assemble information in order to get project approved. Either way, this is a problem that might usefully be addressed.

My suggestion would be to use a case study approach to work with one or two MPOs and perhaps State DOT's to see that they know about these frameworks and how they would feel about using them.

Frameworks provide a language for communication. If we are not all speaking the same language, there will always be difficulties in communicating.



## **PROBLEMS WITH THE ITS RUBRIC**

Many at this two-day meeting made the valid point that ITS is not separate from the other things they are doing. Of course, systems built today will use information technology.

Rather than focusing on ITS being something that is very different from previous transportation solutions, it might be better to focus on the way that utilizing information technology provides new options to planners. A framework that I am experimenting with is as follows, and others might find it useful.

We can look at Information-Intensive Transportation (IITS) as allowing new types of integration/interconnections/interaction including:

- \*Between travelers and the transportation infrastructure (in a multi-modal context) as well as agents of the transportation infrastructure (e.g., ISP's).
- \*Between travelers and businesses serving travelers. Clearly this will result in increased economic activity and a decreased importance of these businesses being located where they are visible from the highway.
- \*Between the driver/vehicle team and the transportation infrastructure (including agents of the transportation infrastructure). Much of this communication today is between the infrastructure and the driver, but increased vehicle to infrastructure interconnectivity is likely.
- \*Among transportation infrastructure systems including systems operated by different institutional entities and systems associated with differing transportation modes. This is an area which is very conducive to synergy. The interconnection of pockets of functionally produces entirely new capabilities.
- \*Between and among the various subsystems within the vehicle. This may be seen as totally the province of the automotive companies, but this is an area where much increased functionality and safety will be gained and intra-vehicle integration may enable some of the other forms of integration identified below.
- \*Between drivers and vehicles. Today the vehicle is controlled by the driver with little modification of the interaction between the vehicle and the driver. In particular, there is little ability to:

-Have the vehicle learn from past experience with this particular driver.

\*Between passengers and vehicles.

\*Among vehicles. This is one of the alternatives being considered by AHS which may accelerate trends which otherwise might occur more slowly but which are inevitable.

\*Between vehicles and fleet managers for fleet management purposes.

\*Between vehicles and cargo for safety reasons (there has been recent interest in this with respect to airplanes after

\*Between transportation units (vehicles, trains, ships, planes, etc.), cargo, shippers, receivers and fleet managers for logistics purposes.

service, etc.).

There are many advantages to using a framework such as above. It helps to relate information technology to transportation at addressing. It helps to define public and private roles. It helps to keep our thinking broad rather than focused on particular systems or institutions. It may provide an alternative way of looking at and tabulating benefits and possibly cost-

Perhaps most importantly, it indicates that we can not ignore the vehicle. ITS will have only a minor impact on transportation if we view it as simply the modernization of traffic control centers and other public sector systems.

information technology to facilitate integration/interconnection/interactively as a complement/supplement to both the user service and market package frameworks for purposes of benefit assessment and also for creating a longer-term vision

fundamentally changed by information technology may be very helpful to transportation planners and legislators.

## **NEED FOR NEW SCENARIO PLANNING TOOLS**

transportation system are subject to differences of opinion as is the relative effectiveness of ITS investment (compared to less information) in general and the various subsets (market packages, user services, etc.) of this technology.

Scenario planning provides a way of translating a myriad of possibilities into a smaller number of distinct scenarios each of which lends itself to analysis, i.e., how likely is each scenario and how should we respond to each scenario.

Factors to be considered in scenario planning for vehicle transportation might at a macro level include:

\*VMT Growth

-Levels of individual VMT (mainly population growth and travel patterns, but of course there are other variables including mode shift).

-Levels of commercial VMT.

-At wholesale level mainly driven by economic activity.

-At retail level driven by economic activity but there is a driving force of electronic commerce which is substituting package delivery for consumer take-home of purchased goods.

\*Ratio of ITS effectiveness to traditional transportation investments.

-Congestion and related areas.

-Safety.

Certainly scenario planning applies to transit as well as private vehicle transportation and here one of the key variables would be the growth in transit usage.

Planners are also interested in ITS effectiveness at a less macro level and might wish to focus on the individual ITS technologies. Scenario planning can address any variables of interest to the planner.

The advantage to scenario planning is that it deals with concepts and discrete values for variables. For many purposes and audiences, this is easier to accept than the complicated and often incomprehensible formulae that come out of modeling exercises. In reality, we are talking about the same thing, but scenario planning moves a technical approach into the realm of planners.

One of the nice features of this type of planning is that it can be at a national level or for each State, Metropolitan area or Congressional District.

I have faxed separately two examples using this technique. One is vehicle transportation example, the other a transit example tied to an institutional issue, namely, welfare reform. Of course both are hypothetical examples and the variables utilized, the potential outcomes of these variables, and the way that the cells in the matrix have been grouped into scenarios may not be valid for the two particular geographies that I selected. But hopefully these hypothetical scenario matrices demonstrate the approach.

Often just developing this scenario matrix helps people make decisions by transforming a myriad of variables into a smaller number of meaningful scenarios - some of which stand out as being more likely than others and, through their definition, are suggestive of the required actions needed to respond. The process of developing scenario matrices and discussing the initial versions of the matrix in a group setting often leads to increased clarity of the situation as the matrix is refined. I have found this process to be very effective in consensus building.

The matrix is constructed in a way (i.e., mutually exclusive outcomes for each dimension) that probabilities can be assigned to the outcomes, hence to each of the cells in the matrix, and by aggregation of the various scenarios. Sometimes this is important. I have developed a very simple approach to doing this forecasting, but there are many other approaches which can be utilized.

Having a good approach for forecasting outcomes, and hence, which scenarios are most likely, also allows for ongoing monitoring of the situation. We may initially project that certain outcomes are more likely than others and therefore certain scenarios are more likely. But events often unfold differently than we had forecast. The approach that I use, even though it is relatively simple, allows for ongoing reassessment of the situation.

An additional advantage is that once having established and gained consensus for the criteria to be used in assigning probabilities to outcomes and hence scenarios, both the initial assessment and future reassessments can be conducted without the rancorous debates that often surround such activities when they are conducted on the basis of who is most convincing or powerful.

I would recommend that scenario planning methodologies, including possibly the one that I have described in this communication, be disseminated to state and local planners and perhaps some training sessions should be arranged to assist in gaining familiarity with these approaches.

Perhaps we should seek language in the ISTEA Reauthorization that tasks USDOT or ITS-A, or perhaps each MPO, to perform the above or related scenario planning. Such scenario planning would provide an opportunity for input from the entire transportation community and other stakeholders.

Prepared by Sigmund Silber  
12/24/96

**HYPOTHETICAL SCENARIO PLANNING MATRIX**  
**Philadelphia Metropolitan Area - Year 2010**  
**ITS Effectiveness Relative to New Construction Alternatives**

<b>VMT Average Annual Growth</b>	<b>1:00 or less</b>	<b>1.25 to 1</b>	<b>1.5 to 1</b>	<b>2 to 1</b>
<b>2% or Less</b>	<b>S1</b>	<b>S3</b>		<b>S2</b>
<b>4%</b>	<b>S5</b>	<b>S4</b>	<b>S3</b>	
<b>6%</b>			<b>S4</b>	<b>S3</b>

- S1 = No Major Problem, Conventional Approaches Will Meet Demand**
- S2 = Cost of Meeting Demand Will Be less Than Currently Planned**
- S3 = Demand Will be Met at Current Expenditure Levels if ITS is Widely Deployed**
- S4 = Some Degradation in Mobility or Major Increase in Infrastructure Investment**
- S5 = Major Degradation in Mobility or Tremendous Increase in Infrastructure Investment**

This matrix shows three possible outcomes for VMT growth and four possible outcomes for ITS relative effectiveness. This leads to twelve pairs of outcomes. The scenarios group pairs of outcomes which will have a similar impact on communities, thus simplifying the planning process to consideration of five different scenarios. It is possible to forecast the likelihood of each outcome pair and by aggregation, the likelihood of the associated scenario.

Prepared by Sigmund Silber  
1/3/97

**HYPOTHETICAL SCENARIO PLANNING MATRIX**

**Impact of Welfare Reform  
Boston Metropolitan Area - Year 2005**

**Changes to Public Transit System**

**Number of Persons to  
be Incorporated into  
Workforce**

	<b>Minimal</b>	<b>Improved Scheduling</b>	<b>Flexible Hours</b>	<b>Flexible Routes and Improved Scheduling</b>
<b>25,000 or Less</b>		<b>S2</b>		<b>S1</b>
<b>25,001 to 50,000</b>	<b>S4</b>			
<b>Above 50,000</b>			<b>S3</b>	

- S1 = No Major Transportation Problems**
- S2 = Difficulties Associated With Coverage but not Capacity**
- S3 = Difficulties Associated With Capacity but not Coverage**
- S4 = Both Coverage and Capacity Difficulties**

This matrix shows three possible mutually exclusive outcomes for desired/required employment growth of persons formerly on welfare and four possible mutually exclusive outcomes for transit system improvement. This leads to twelve pairs of outcomes. The scenarios group pairs of outcomes which will have a similar impact on welfare reform, thus simplifying the planning process to consideration of four different scenarios. It is possible to forecast the likelihood of each outcome pair and by aggregation, the likelihood of the four scenarios.