

## Point of View

# Intelligent Vehicle-Highway Systems:

## Boon or Boondoggle?



**CARL THOR**



We hear a lot about the projected benefits of intelligent vehicle-highway systems (IVHS) technology. Advanced applications in traffic surveillance and control, route guidance, and vehicle identification all appear to offer significant benefits to alleviate traffic congestion and improve traffic capacity and safety.

The enormous costs—direct and indirect—of these programs, however, are being glossed over. More important, alternative measures that might be more effective in the long run are being overlooked. This search for a technical fix to traffic congestion problems is really a Band-Aid approach that does nothing to address the cause of the disease—transportation and land use policies that encourage automobile dependency.

### IVHS Potential Benefits

Freeway management and condition-responsive traffic control systems would improve traffic flow, save time, and conserve fuel by routing traffic around bottlenecks and enhancing flow as needed. Advanced traveler information systems (ATIS) would provide information to trav-

elers before they begin their trips, helping them choose a route and mode to minimize travel time. Up-to-date information obtained en route would guide drivers in response to changing conditions.

Other developments, such as weigh-in-motion and automated vehicle identification, would reduce the costs of toll collection and truck weigh stations. In-vehicle features such as crash-avoidance systems and navigational aids would make driving safer and more convenient.

IVHS also would provide a great deal of work for transportation engineers, contractors, and manufacturers of electronics, computers, traffic control equipment, and vehicles. Naturally, these people are for the program, just as they supported the Interstate highway system 40 years ago. The discussion of IVHS, because of its esoteric nature, has been largely confined to this group. The goals of the IVHS program are laudable, but have the costs and alternatives been adequately considered or communicated to the general public?

### IVHS Costs Spell Trouble

Much is said about the benefits, but when asked about cost, IVHS proponents begin clearing their throats and mumbling such vague statements as, "The potential costs of various IVHS applications can be quite high," (1) and "Installation, operational, and maintenance costs . . . can be offset by user fees" (2). Cost appears to be almost an afterthought.

These technologies are expensive to develop and implement; projects typically

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LEAGUE OF AMERICAN WHEELMEN

cost millions of dollars. Mobility 2000, a public-private group of specialists in government and industry, recommended spending \$40 billion by 2010 (3). Costly maintenance and short lifespans, typical of most computer-based systems, can be expected. I am not satisfied with the assumption that because they carry potential benefits, these programs, regardless of cost, are necessary or inevitable.

The public resists expenditures that benefit only the largest cities. Indeed, urban mass transit programs suffer from the same problem, and arguments over fair allocation of highway funds dominated the debate on the 1991 surface transportation legislation. The public is also likely to resist the added cost of IVHS technology in new vehicles.

What about those who do not own an automobile or can only afford the cast-off vehicles of the more affluent? This segment of society becomes further disenfranchised, unable to participate in the benefits of IVHS technologies.

Most IVHS programs assume and depend on high participation rates among the traveling public. If many vehicles lack the technologies because of their cost, as seems likely, the effectiveness of the overall system will be limited.

## Indirect Costs: Issues of Equity

IVHS promises to accelerate a long-standing inequity in transportation—the tendency of the highway system to lock out users of nonmotorized transport modes. Pedestrians and bicyclists are unwelcome on many roads and barred by law from others. Their needs are largely ignored by planners and engineers, yet their number continues to increase (4). Because of the beneficial effect on traffic congestion, environmental quality, and transportation infrastructure costs, pedestrians and bicyclists should be applauded and encouraged, not subjected to even more exclusive and inhospitable roadways.

But where is the place for pedestrians and bicycles (or motorcycles) in a highway network that depends heavily on in-vehicle computer and communication technology, even to the point of automated vehicle control? How would these elements of the traffic stream be detected or incorporated into the IVHS framework? I find it ironic that the nonmotorized modes, important to a sustainable transportation system, would be further hampered or entirely excluded by many IVHS projects.

## Human Factors: The Weak Link

Many drivers are already uncomfortable or nervous behind the wheel, and drivers fiddling with onboard computers and reading information displays while driving will not enhance safety. Picture a harried worker, running late, worried about an important meeting, drinking coffee, smoking, talking on a cellular phone, using an onboard computer display to find a quicker route to the office—all this while driving on a congested freeway at high speed. Most travelers would not want to share the road with this driver!

The safety issue illustrates that the human factor may be the weakest link of IVHS. There will always be people who cannot afford or refuse to equip their vehicles with the necessary hardware, people (visitors, for example) who do not have the equipment, and people who, because of ignorance, stubbornness, or impairment by drugs or alcohol, misinterpret or do not use the information available to them. These people will, at best, limit the effectiveness of the system and, at worst, endanger themselves and others.

The authors of a recent *ITE Journal* article (2) discussed how the sociopolitical factor might interact with IVHS technology. Describing an automated congestion pricing system in Hong Kong, the authors stated, "Although the program was . . . a technological success, the perception that an additional tax was being imposed and the aversion to 'Big Brother' government tracking individual tripmaking led to the discontinuation of the program."

## Myth of Congestion Relief

One of my college professors told how the first bridge across the Hudson River at New York City was severely congested almost from the day it opened. A second bridge was built to relieve the congestion, but it, too, immediately became clogged. There is fallacy in the belief, often used to justify new highways and now heard in support of IVHS, that increasing road capacity will alleviate traffic congestion. Travel demand is not a static commodity; it responds dynamically to the supply of capacity. Increasing



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ing capacity tends to relieve congestion in the short term but soon stimulates additional travel demand.

Research in Australia has quantified a link between higher free-flow traffic speeds (lower congestion) and higher per capita gasoline consumption despite the improved vehicle fuel efficiency derived from smoother traffic flow (5). The effect of land-use patterns on highway travel demand, fuel consumption, and pollutant emissions is much more significant than the fuel-saving effects of improved traffic flow.

Viewed at close range, the ideas that increasing road capacity solves traffic congestion and improving traffic flow reduces fuel use and pollution appear to be true. When seen in a larger context, however, the validity of these notions, which are commonly used to justify IVHS development, is cast into serious doubt.

### Better Investment?

Traffic congestion cannot be alleviated in the long run by building more roads or even increasing the capacity of existing roads, the primary intent of IVHS. Former FHWA Administrator Robert Farris summed up the situation clearly (6): "We can no longer completely build our way out of the congestion crisis. . . . Time is too short, money is too scarce, and land is often not available." In light of this reality, the wisdom of applying costly, high-tech gadgetry to obtain marginal increases in road capacity is questionable at best.

Furthermore, the continued increase in automobile use throughout the world cannot be sustained. The United States accounts for as much automobile travel as the rest of the world combined. The problems of air pollution, acid rain, the greenhouse effect, wasteful energy consumption, and deteriorating public health, all hidden costs of the automotive transportation system, can no longer be ignored.

Clearly, another approach to the problem of traffic congestion is required. Even proponents of IVHS recognize that it would produce marginal improvements to traffic flow (15 percent), fuel consumption (3 to 12 percent), and pollution (8 to 15 percent)



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(7). The only sustainable solution is to reduce automobile transportation demand by changing land-use patterns and encouraging travel by foot, bicycle, public transit, and high-occupancy vehicles. It can be done. Communities throughout the industrialized world have achieved remarkable success in diverting traffic away from the automobile. Many cities in Europe, Asia, and even North America have raised bicycling to levels of 25 to 50 percent of internal travel. Some cities in Germany are narrowing arterial streets to constrain automobile use and create more space for alternative modes (8).

What makes these communities different from their automobile-oriented neighbors is strong public policy that promotes transportation alternatives. By investing in accessibility by foot, bicycle, and public transit and establishing economic and physical disincentives to private automobile use, these communities have succeeded in reducing automobile traffic demand.

When walking, cycling, public transit, and carpooling are made more convenient

than driving alone, people make the switch. The result is less traffic congestion, cleaner air, more livable cities, and reduced expenditures for highway and parking facilities, all achieved at modest cost compared with the automobile-only scenario.

The United States is trapped in a vicious cycle of public policy. Government does not promote balanced transportation because of pressure from the highway lobby, and the public does not raise the issue because it is hooked on the automobile and unaware of other possibilities. Walking, bicycling, and public transit are widely considered impractical, and rightly so, because of 50 years of building cities designed for access by automobile only.

Getting out of this vicious cycle will require the commitment to change land use and transportation planning and to make the investments necessary to ensure that facilities are accessible not just to automobiles, but to people—on foot, on bicycles, in wheelchairs, with strollers, and in public transit vehicles. It will not be easy, but what are the alternatives? When the

limits of what IVHS technology can do for traffic capacity are reached, we will still be in the same boat, but further up the creek.

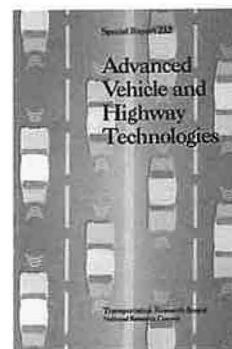
Although IVHS projects may be beneficial, IVHS should not be viewed as a cure-all. The program must be based on a realistic assessment of actual benefits and total costs, and it must be combined with an aggressive national program to promote transportation alternatives and transportation demand reduction measures.

One argument used to promote IVHS is that Europe and Japan are ahead of us in developing these technologies. Why is the United States falling from its leadership position in the global marketplace? I believe it has much to do with how transportation is handled. Whereas Europe and Japan maintain transportation systems based on a balanced mixture of modes, the United States has become overwhelmingly dependent on the modes that are most inefficient and costly to society. IVHS, for the most part, promises only to help us dig ourselves a deeper hole. Intelligent technology will not affect the fundamental causes of our transportation problems. Only intelligent policy making, planning, and engineering can do that.

## References

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## TRB Study Proposes National IVHS Program



The Transportation Research Board has released a new report endorsing public - private support for intelligent vehicle-highway systems (IVHS)—technologies that

could save lives, reduce accidents, and relieve traffic congestion. The report, *Special Report 232: Advanced Vehicle and Highway Technologies*, contains the findings of a special study committee convened to assess the prospects, objectives, and organizational requirements of a national IVHS initiative.

Calling for leadership by the U.S. Department of Transportation and the private, nonprofit group IVHS America, the committee proposed a national program of research, testing, and implementation.

TRB's endorsement is expected to provide additional support for existing proposals and for a portion of the Intermodal Surface Transportation Infrastructure Act of 1991, which calls for support of IVHS.

The committee noted that IVHS functions could include rapid response to road accidents, ridesharing, traffic-flow management, ramp metering on freeways, reserved lanes for buses and high-occupancy vehicles, toll collection, and road pricing. These applications would benefit individual travelers as well as private industry.

The study received support from the Federal Highway Administration, the National Highway Traffic Safety Administration, and the former Urban Mass Transportation Administration (now the Federal Transit Administration) of the U.S. DOT, as well as the National Cooperative Highway Research Program, the Motor Vehicle Manufacturers Association of the United States, Inc., Dupont Company,