FIRST INTERNATIONAL WORKSHOP ON VEHICLE-HIGHWAY AUTOMATION
AUGUST 11-12, 1997
SAN DIEGO, CALIFORNIA, USA

Opening Remarks by Dick Bishop, US DOT, General Chair

Good morning. I am Dick Bishop, Program Manager for Vehicle-Highway Automation R&D at the Federal Highway Administration with US DOT.

Welcome to the First International Workshop on Vehicle-Highway Automation. I say this on behalf of the FHWA and co-sponsors ITS America and the National Automated Highway System Consortium (NAHSC).

I am very pleased at the representation here from around the world. Asia and the Pacific Rim, Australia, Europe, and North America are very well represented.

We've all just experienced Demo '97 -- a remarkable achievement. We have instilled a new vision for the transportation profession and the driving public, that automated driving is do-able. We have created an expectation of gradually increasing capability, such that the average citizen can say, my car transports me, it protects me, and now helps me drive! And, this capability is a key aspect of meeting safety and mobility goals we all share for the next century.

Just as Demo '97 was not only about full automation, but a spectrum of evolutionary capabilities, so it is with this workshop. In my view, the term "vehicle-highway automation" refers to the full spectrum of capabilities, and thus the title of this workshop. I learned a new word from my French colleagues -- automatize -- which 1 understand speaks to this full spectrum and may be a fitting term. The term Automated Highway System, or AI-IS, refers to full automation, in my terminology.

In my view, the area with Intelligent Transportation Systems we call driver assistance or vehicle control or vehicle-highway automation -- whatever! -- is "ready to blossom." In the last five years, the "information layer" of ITS has moved from concept to implementation. In the next five years, I see driver assistance experiencing the same phenomenon, making for a very vigorous R&D arena.

So, why *are we* here for these two days? These are my goals: first, *enlightenment* -- *we* can come to know each other's activities and perspectives, enhancing our own understanding of the field; second, *momentum* -- we can continue the international momentum of Demo '97 and create new momentum assisting us all in articulating and supporting own programs at home; and third, *establishment* -- of an informal collaboration for years to come, including continuing annual workshops and task forces to examine key issues of broad interest.

And, for me in particular, the role of the infrastructure is very much on my mind during this workshop. How might the infrastructure enable vehicle-based systems to be implemented sooner?

Is the infrastructure essential or simply a value-add? Or is there no need for infrastructure and we should instead sit back and wait for the automotive sector to deliver these products? IF the infrastructure plays a key role, then we indeed have the chicken-and-egg situation which calls for government involvement and collaboration across sectors. If not, research activities are very different. So, I'll be listening and probing on these issues.

I look forward to getting to know each of you and hearing from you during these two days. I'm glad you're here.

REGIONAL PERSPECTIVES

Eduardo Barreto. EC

European Perspective/Current EU R&D total Budget - 12.3 billion ECU (1 ECU = US $1.10)
Telematics applications in transport 250M ECU

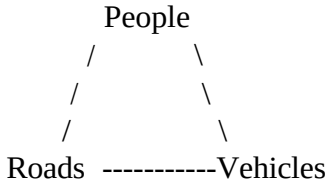
Telematics for vehicle control
. AC-assist - longitudinal collision warning/avoidance
- Chauffeur - cooperative driving (electronic towbar)< IVC/SDRC
- SAVE - driver monitoring and warning, emergency handling
- UDC - remote speed recommendations, autonomous vehicle control
- VASCO - DRSC validation

New Projects (starting maybe next year)
- RESPONSE - legal and liability aspects
- LACOS - lane change and departure
- IN-ARTE - driver support in rural environment

Action plan priorities
. RDS/TMC
- electronic fee collection
- data exchange and info management
- H M I
- system architecture (vehicle control is not one of these priorities)

Taro Ishi. VERTIS

ITS Conceptional model:



1973 - beginning of CACS (automated controls systems) program in Japan
Comprehensive plan for ITS in Japan: $775M (at 100 yen per $) - 1997 ITS-related budget

2nd Asia Pacific ITS Seminar was held in Cairns, Australia, July 21-22, 1997 -fourteen countries participated.

Rick Schuman. Director of Svstems Annlications. ITS America

It is difficult to characterize a consensus/status of ITS in the US
"We are surrounded by insurmountable opportunities." - Pogo - with ITS, even though great progress is being made, everywhere we look we see insurmountable opportunities. Telephone poll shows 8% have heard of ITS.
People don't think about safety except when (at the time) they are buying a vehicle, and that's not very often. (But that's the best time to get them to spend a few extra dollars for safety). This isn't a fad.. .and progress is being made relatively quickly.

Carol van Raalten. The Netherlands

The Netherlands has the lowest traffic fatality rate in Europe - 1 fatality per 3.5 km

Anthony Ockwell. Australia

Fatalities
- Speed-related - 30%
- Alcohol-related 30%
- Fatigue-related 27%

Areas of greatest congestion and with use of ITS-related products/services
- Melbourne
- Brisbane
- Sydney

ITS Australia formed in 1992. Issue: privacy.

Min-Hong: Han. Korea

Showed a video of driverless car (no one in front driver or passenger seats) traveling at 100 km/hr on busy freeway with autos and trucks.

Hideo Tokuyama. Japan

1977 automated vehicle tested at 30 km/hr

Milestones for AHS in Japan:
1989 - beginning of Automated Highway Safety System (AHSS)
1991-93 joint research PWRI and HIDO
1994-96 Joint PWRI/HIDO/24 private companies

1996 Comprehensive Plan introduced a three-phase AHS program:
- danger warning
- assistance for driving
- automated highway systems

AHS demos in Japan in 1995-96:
AHSRA Advanced Cruise-Assisted in Sept. '96
21 companies, road-vehicle cooperation, 120 organizations registered as assoc. members.
Three-phase R&D for AHS:
- information - e.g. warning info/alerts - AHS-i
- control - partial control - AHS-c
- automated highway (full automation) by beginning of 21"' century - AHS-a

Because AHS is related to safety, standardization is particularly important, and international cooperation is crucial.

Issues: definition of AHS, fully automated driving? AHS-i,c,a?
Name of AHS - vehicle highway automation? Advanced cruise-assist highway?

Process a - evolution b - (revolution) innovation

	current	*AHS-i*	*AHS-c*	*AHS-a*
info	P	P/S	P/S	S
control	P	P	P/S	S
responsibility	P	P	P	S

P-person, S-system

Dick Bishop. FHWA

Levels (L) for IVI:
1. information & warning
2. intervention & driver assistance
3. advanced driver assistance & automation

1st generation objectives
- car - level one (Ll)
- trucks - levels one & two (Ll on market)
- bus - Ll and L2
- special vehicles - Ll & L2 (snowplows, police cars)

Pavement Testing
Westrac - wire-following technology
State of Minnesota - precise differential GPS tech.

Off-highway
- Houston - bus maintenance. study
- Norfolk - port operations study

- Freight terminals - truck distribution, port-highway intermodal interface, rail-highway intermodal interface
- moving vehicles in tight patterns

Focus on continued progress incremental building blocks

Jim Rillings. NAHSC

AHS potential
- Improved safety
- Increased highway throughput
- Enhanced mobility
- Reduced environment impact

3 stages: 1 & 2 are completed; now in stage 3 - selecting specific concept attributes and developing a prototype:

Major activities
- focus on progressive development
- develop user services and market packages
- carry out critical issues studies

Initial AHS user services
- avoid longitudinal collision
- avoid lateral collision
- avoid intersection collision

Key concept issues
- distribution of intelligence
- traffic mix - manual and automated
- vehicle separation policy
- obstacle management
- role of driver
- deployment sequencing

Some statistics from the NAHSC Demonstration:
2500 registered industry representatives
2000 riders on I- 15 and mini-demo
15,000 vehicle miles on I-l 5 (press days, rehearsal, demonstration)
Safety was paramount. All participating orgs agreed to the demonstration safety plan with safety specifications for each scenario.

LESSONS LEARNED

Dr. Ghassan Freij, ERTICO

Strong R&D base.
Strong interest by industry
Increasing interest by governments.

Humans are the weakest link in the chain. Most concern is about "what happens" if tire blows, if system fails, etc? What happens now? Most people currently follow too closely 90% of crashes are driver error. Perhaps potential for more spectacular crashes but fewer crashes with fewer total casualties (similar to air travel).

Steve Roberts. Attorney. US

There is no central code that tells you what your liability is and what the liability limits will be. Lawyers can make estimates based on previous cases/statutes. But NB, all 50 US states have their own laws.

Tom Lambert. Houston Metro. US

"My expectations were vastly exceeded." We've done more than we ever thought we could do. Instead of saying that we are 15 years from full AHS deployment, let's say we have real-world applications that work today. What we're about are partnerships and applying international intelligence to finding real-world solutions to real-world problems.

Stefan Becker. Germany

AHS may have some accidents but overall safety will be improved. System development and market introduction need the integration of driver/systems/legal aspects. "What is the optimal level of support for the driver?"

Job Kliinhout. The Netherlands

Soon we will reach the limits of what we can do (to reduce congestion) through ATMS and ATIS, and we will need AHS. We will soon need to change the name of AHS to focus more on the (contribution) of the vehicle. Conclusions of Dutch:

- We need to move quickly into AHS solutions
- That's not as simple we thought

Warning system only is useless. Public wanted to spend money on information products rather than AHS. Less difference between American and European drivers than between genders. Unite AHS with other ITS technologies and programs.

Nobuvuki Ohtera. Japan

AHS development stages:
Survey user needs -

- public acceptance
- market opportunities
- benefits/costs

Construct AHS architecture - role sharing, human/system, system/infrastructure, system requirements, technical development -

- human/machine interface
- standardization
- security
- system reliability
- balance between function and cost
- implementation, market strategy
- education and training
- legal issues - liability and insurance

AHS development Key Issues:

- standardization
- requested function and cost
- harmonization between AHS and other ITS applications

Promote international cooperation and harmonization.

Shinichi Yahazi. Japan

ASV (Advanced Safety Vehicle)

- preventive safety technology
  drowsy/non-attentive driver warning system
- accident avoidance technology
  automatic collision detection and prevention system
- damage decreasing technology - e.g., occupant protection systems
  (e.g., side air bags), pedestrian injury severity reduction system (air bag opening outward from front of car)
- autonomous driving technology
- post-impact injury mitigation prevention system
  fundamental automotive engineering technology

Q&As/DISCUSSION

Steve Roberts -

- at AHS check-in have something that shows driver accepts liability and understands risk.
- have “chip” in air bag that shows whether bag deploys properly
- can’t talk about liability in abstract - must estimate based on specifics
- keep moving forward and then deal with specifics at appropriate time.

Tom Lambert -

- great potential for automated maintenance applications

Steve Roberts -

- two ways to bear the financial aspects/risks: tax - govt bears the responsibility
  (spread across all users), consumer (through insurance)

Steve Shladover -

- we technologically can have automated systems that can exceed the capabilities of humans to operate the vehicle within specific parameters.
- with automated control, the consumer should conceivably pay less for insurance - if the system is demonstrably safer than current conditions.

Job Klijnhout -

- short-term deployment issues are important. I am against saying that we can have long-range research without concern for short-term applications.

Steve Roberts -

- current cruise control, as far as I can see, has no safety benefit. It is merely for convenience, and yet, manufacturers are still willing to put them in vehicles. Any system that reduces accidents by 80% (as Eaton Vorad cites on trucks) should be a roaring success in the marketplace and should not present a liability problem.

Ghassan Freij -

- The question of whether we should go with (Japanese) track A or track B illustrates that we don't (truly) understand drivers' needs. (Driver wants something that is cost-effective and works everywhere, all the time.)

Comment -

- that based on belief that product liability is less a problem for Japanese or Europeans, it would seem to encourage American manufacturers to market these innovations first overseas (or let foreign manufacturers lead the way).

Comments at break -

- really enjoying interaction and info in Q&As
- much of the canned presentation is already known
- in Q&As much, particularly the discussion of legal and liability concerns, is new and interesting.

GLOBAL ROLLOUT

Sadavuki Tsugawa

AVCS products in Japan
'83 driver drowsiness warning system
' ? vehicle gap (measurement) for trucks
'95 adaptive cruise control

Systems suitable for Japan

- auto driving
- platooning for trucks
- platooning for small vehicles (two-dimensional)
- station car
- automated driving for buses

Chicken-egg situation about importance of auto-infrastructure

Needs in Japan are different than Europe or America.

Compared to US, Japan has more (%) of truck travel/less passenger autos. More pedestrians killed. Fewer auto passengers killed.

Susumi Okawa

Human error, especially elderly driver error prevention, is most important. 90% of fatalities are human errors. 57% inattention/distraction/delayed recognition. 18% misjudgment. 14% inadequate handling. 9% poor driving skills.

ITS Home Page (JAPAN)
http://www.nihon.net/its/j-html/index.html
TRTS AHS Task Force
http://www.cac.wisc.edu/trbahs
MOTIV
http://www.bmbf.de

Coop. Infrastructure with human factors conditions is lst priority in R&D.
Road surface condition detection
Level -
1 - detection
2 - detection and prediction
3 - detection, prediction and estimation

International cooperation items:
- human ability investigation, psychologically and physically
- elderly driver-vehicle interfaces

Dick Bishop -

Re: Japanese model of tracks A & B
doesn't have to be either A or B. I can see in the US doing both A and B simultaneously.
When: 1st generation operational testing of IVI - 2002 (during NEXTEA era)
Car - level 1 AICC, forward-radar, impaired driver truck - levels 1 & 2 and lane-keeping (level one on market)
Bus - levels 1 & 2 lane-keeping
Special vehicles - levels 1 & 2 - snowplow lane-keeping, bus maintenance. - level 3 (full automation) designated lane - 2005 (at least shared use with mix of vehicles).

Wouldn't have said this before the demo but think it is a definite possibility.

Discussion on global rollout:

Estimates

- dedicated AHS lanes for buses/vehicles other than cars (in Japan 1998)
- AICC '97-'98
- lane-keeping for trucks - warning 1999 - automated 2001
- impaired river, drowsiness 2000-2
- anticollision and AICC for cars 2002-4
- infrastructure-vehicle interface, AICC 2000
- specific services for elderly?

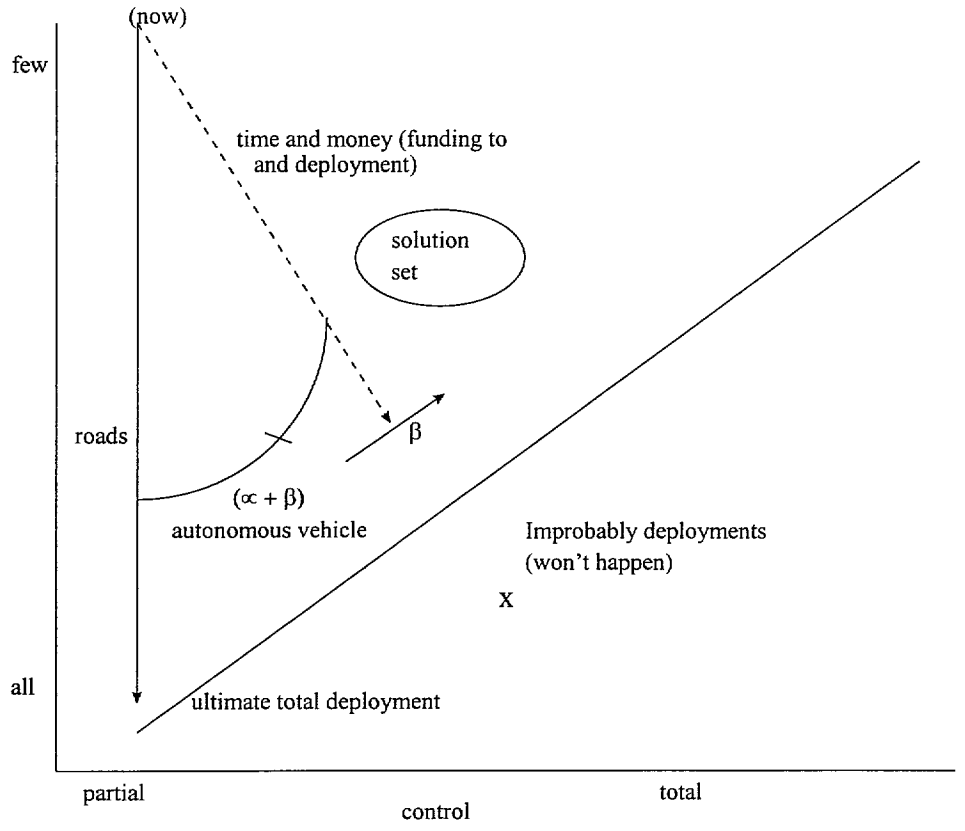
Concerns expressed that "absolute" lane-keeping (continuous control) would permit possibility of a colossal accident - agreement on value of lane departure warning.

Min-Hong: Han(?) - I think the mention of these dates/years is meaningless because the technology exists now. It is simply a matter of how fast the manufacturers and consumers make it happen.

Michel Parent - The electric station car already exists today. The next generation with some AHS technologies will be available within five years. Stop & Go AICC; probably not before 2002.

Steve Shladover - Software issues are more difficult than hardware issues and let's not minimize the difficulty of solving these issues and the difficulty in developing a system that detects pedestrians before 2005.

John MacGowan - Development will happen more quickly if a commitment to introduce these systems rapidly is made.



Legend for MacGowan's chart: Angle of progress is a function of
∝ - market demand forces
β - vehicle platform
Partial control on all roads and total control on a few roads.
Autonomous vehicle means no infrastructure cooperation to operate.

Michel Parent -It is hard to stay focused on AHS and not drift off into other areas of ITS

Jean Pierre Medevielle -You can't look at it that way. The objective is to build upon existing knowledge and to be evolutionary. It is an interesting exchange of info and it is good to see that all these nations are dealing with same issues. (enjoyed presentation of lawyer...helped to put American position in perspective and to understand need for incremental deployment). Human factors issues are also very interesting and very important. AHS needs to consider human engineering as integral part of AHS development, similar to SATURN).

"The demo is very impressive, and the workshop is very good for me.
(The review/summary/overview helped to set the stage.)"

Se-Young Oh - I'm involved in AHS research so I'm glad to compare my work and work in the US (importance of human factors and commercial considerations). I'm amazed by the enormous scale of this effort. The World Congress seems to be more a political event, and this is a technological event. It will be a long time if ever before we have a perfect system. I hope we don't need to have a perfect system to have a commercial system..

Dr. Christine Johnson - Addressed the evening Reception.

Common elements in science history

- visionaries/champions that can articulate the issues and the technology
- problems - only when we have problems do we seem to be willing to overcome the barriers
- ripeness of technology/an intellectual body of information
- value in healthy collaborative competition

All of these elements exist in ITS/AHS development. We can no longer protect our way into a safer highway (We live in a global economy.) We have no alternative to have our science and technology development to be global also. To share information - the only way to survive and get ahead.

Theme -
What is the relationship between the infrastructure and the vehicle product development? Does the infrastructure have a role in accelerating the development/implementation of vehicle products?

INDUSTRIALIST PANEL

Ulf Palmquist -

EUCAR started in 1994 replacing a joint committee whose members are most Euro auto manufacturers; has nine thematic groups including vehicle control and traffic management.

EURCAR projects related to AHS

Chauffeur
Urban drive control
AC-ASSIST
AWARE and OLMO
X-bywire
VMBD

National activities:

MARTA - France
RTA-UK (road side communications)
MOTIV - Germany (road and traffic info)
COMBI-ROAD - Netherlands

European projects under formation

RESPONSE - legal and liability issues
AHS in Europe - technical development

In Europe a number of fragmented projects; need to focus R,D & T. Today AHS-a is beyond the horizon of product planners. Still R&D.
Legal, liability issues must be resolved.

Need more benefit/cost.
Coord. action from all stakeholders.
Evolution toward AHS-a
Manufacturers will "buy" AHS when they know they can sell it.

- Technology alone is not enough for commercial development
- cost requires high integration of functionality
- global standards for interfaces and functions, not products

Joe Perkowski -

4 points - construction industry & AHS

- Teaming relationship
- Management of projects
- Process of constructability
- Technology

Construction focuses on projects rather than products. Looks at AHS as a series of projects. Little R&D.

Part 1 - Teaming

- real projects involving existing technology
- consortium and consensus building (in development, not during actual construction)
- ownership in part by construction industry
- evolution rather than revolution is critical

Part 2 -Managing projects

- trend toward cost-sharing
- minimize scheduling disruptions during testing

Part 3 - Constructability

- estimating true project cost requires a sophisticated review of history of project and evaluation of factors
- managing subcontractors
- procurement process - purchasing, determining lifecycle costs

Part 4 - Technology

- plays a secondary role
- barriers - building/reversible
- mounting instrumentation on infrastructure (how/where)
- roadway geometry data
- infrastructure building blocks (evolutionary)

Ashok Ramaswamy-

Inhibitors
- cost of technological advancements
- product liability
- low-risk auto culture
-

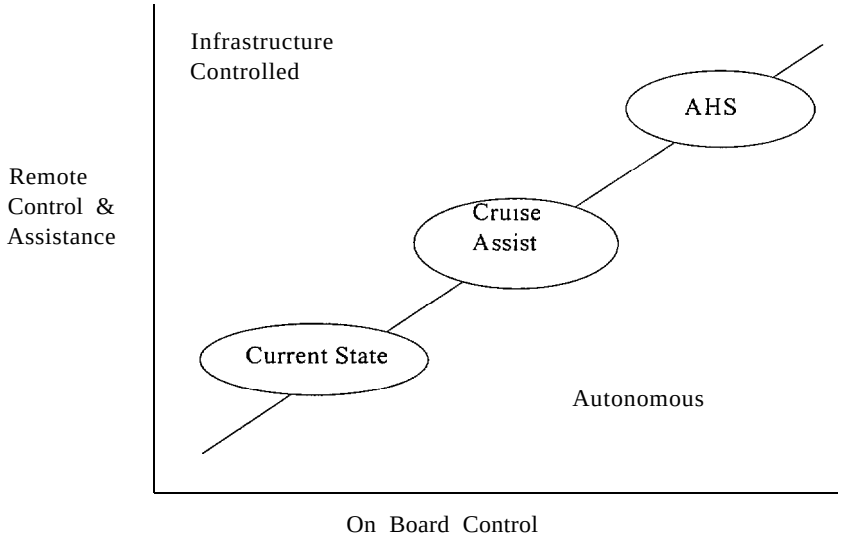
Cost is key factor to manufacturers. Must produce intelligent vehicles that people can afford.

Enablers
- technology
- market demand
-

The ultimate test is what the consumer is willing to pay. Although ITS can drive down associated costs by decreasing accidents/crashes, the consumers' initial and primary focus is the sticker price. Lane-keeping with magnetic markers will be more reliable and less costly than vision-based products.. .(but national deployment issues)

Toshitake Noguchi-

ASHRA - 21 core members. 120 associate members



Discussion:

Min-Hong Han - Confusion about terms relationship between ITS, IVHS, AHS, etc., AVCS, AVCSS

US	Eur	Japan
	----------	=
M S	AVS	AHS-I ?

IVHS –– ITS ---------- AVC&SS –– AHS

Steve Shladover prefers “advanced vehicle control and safety systems” to describe M S - a

NB: Automatise - Automating the driving functions

Ulf Palmquist- Basic needs/value is determined by consumers

Dick Bishop- Do you satisfy need with infrastructure support. Or just with vehicle equipment?

Ulf Palmauist- “no clear yes or no”

Pierre-Yves Texier - The fact that we can do things we could never do before may generate a (demand) need.

Joe Perkowski - The demand is to satisfy a need (solving a problem or providing enhanced performance).

Jean Medevielle - Stop thinking of products and instead think in terms of services.

Job Klijnhout and Michel Parent and Robert Cone - AHS is still in its infancy. We have not identified the services that people really want. We are too tied to the conventional auto as a vehicle base; we need to be more visionary. The best solution may not be a better car. People want mobility - not necessarily a car. (but Eduardo likes to drive - wants his car)

OPERATORS PANEL

Michael Avery -

Panel outline -

- identify key issues from operator’s perspective
- set vision - how to achieve goals
- set “stake in ground” for timing

Australia is third most urbanized nation. Almost all people live in cities. Five cities with more than one million people - Sydney, Melbourne, Brisbane, Perth, and Adelaide. Most cars in Asia except Japan. Several toll roads in Australia are privately built, owned and operated - a consideration for MS

Key transport issues in Australia by org.

- federal
- state (investment, safety)
- local
- private - increased patronage, safety
- mining - low cost

Issues of interest

- nonstop trucks
- road changing

Key transport issues in Asia

- ♦♋♐♏♦♎
- mixed traffic
- public transport
- infrastructure investment

Hamed Benouar (Caltrans] - Caltrans vision: transportation is an asset (not a problem)
transportation systems must be balanced, integrated, inter-modal.

New technologies:
ITS - through advanced information and communications systems
AHS - through automation
AHMCT - through automation

What Caltrans expects from AHS

- enhance safety
- reduce congestion - save time
- environment
- reduce pollution
- reduce cost
- provide comfort and efficiency
- enhance quality of life

AHS development

- national consensus but regionally customizable
- “partnership every step of the way” cooperation
- early benefits realized through incremental deployment
- benefits to all regions (rural and urban)
- system maturity guaranteed through staged deployment

AHS challenges

- balance conventional vs. New tech solutions
- prioritizing new tech and AHS goals
- evaluate AHS feasibility
- evaluate AHS performance
- assess MS costs
- how to implement AHS
  financing (who pays)

infrastructure cost savings
vehicle costs
how to stage infrastructure deployment with vehicle deployment
institutional issues

More than 25 million vehicles in So. Calif. Must have early benefits while keeping a long-term vision. Operators goals - safety, mobility, efficiency. AHS is important for the sustainability of the highway system.

Hideo Tokuyama - Analysis of traffic fatalities in Japan:
40% related to detection delay (AHS-i will reduce this)
35% relating to driving ops (AHS-c will reduce this)

Setting the target year for development will be effective
International cooperation is indispensable
Operational compatibility
Efficient technological development
Rduced cost

Tom Lambert - Choose our terms and acronyms carefully and consistently - or else we'll confuse the public and lose their support as well as confusing ourselves

Safety is inherent in all operations but we must convince public that AHS increases mobility, reliability, efficiency and cost-effectiveness.

Dedicated lane is a feasible option for transit.

There is much potential for AHS in maintenance and for emergency services.

Max Donath - Son at demo. "It's like a ghost. It's awesome." Interstates are relatively safe. Maybe should invest in improving safety in other areas. Running off roads and collisions with animals are important/frequent causes of crashes in rural Minnesota.

Focus on truck operations.
- % of trucks involved in crashes is greater than cars.
- Lifetime (use) of trucks is typically 1 million miles or more (my estimate 10 plus times the life of a car)
- Cost of rigs and cargo
- Fleet operations
- Professional drivers

Human factors issues -
- must engage the driver while assisting
- must educate the drive (e.g., experience with ATSS)
- need standards across industry

GPS as a mapping tool and for GIS data
"Is the human in charge or is the computer in charge?'

Older drivers, by 2020
51 million drivers 65 yrs. or older
22 million drivers 75 yrs. or older
7 million drivers 85 yrs. or older

Impact on other modes - e.g. RR crossings

Conclusions of panel (Michael Avery)

Operators are focused on mobility of goods and people.
AHS is being considered only if it solves problems.
AHS is only one part of solution
None of the issues raised are "stoppers"
Consider trucks, public transport, and emergency services,

Discussion:

Jim Rillings - disagreed with Hideo's chart that shows driver control decreasing and automated control increasing to total control. "I don't think you can go very far toward total automated control (in AHS-c) without confusing the driver about who has control." Not a smooth gradual transition from AHS-c to *AHS-a*.

Bill Stevens - It takes a long time (advanced planning to change infrastructure)

Hamed Benouar - You have to make changes incrementally with incremental costs

Tom Lambert - You have to be able to show some "wins"

Max Donath - No Minnesota DOT plans for dedicated lanes - decision made that can't use magnetic nails because temperature changes will cause problems with pavements.
Avoid dependency on instrumenting the highway (state DOTs don't have resources)
Hands-off feet-off is a long way off.
Several precursor studies show that it's better to invest in in-vehicle systems that are paid for by vehicle owners.
(Bill Stevens said although some studies support Max's statement that was not a general consensus and several other studies shows that having infrastructure support increased the efficiency and proficiency of in-vehicle automation.)

Jim Rillings - Infrastructure has to come first quickly followed by vehicles (for systems that are infra supported) - in response to comment that vehicles won't be developed until there are roads that will allow these systems to be used.

John MacGowan- Do increment improvements for safety and then at some time in the future we can connect the dots to improve mobility. (added comment by another - maybe will be able to connect dots when automobiles can take advantage of infrastructure improvements).

Tom Lambert Transit is not just buses, trains, etc. Expand the box, car pools are transit.
Trend seems to be toward more dedicated busways, more lane-miles.

STRATEGY

Hot Issues (Dick Bishop)

- Infrastructure as an enabler (voting on most important issues)
  - sensor friendly
  - designated lane
- Deployment paths
  - "A" - OEMs
  - "B" - after market and private roads
- User services definition

Job Klijnhout - no good dialogue between DOTs and manufacturers.
What are the DOT benefits? Assess benefits and effectiveness
User acceptance/public perception
Link with other - sustainability, benefits, effectiveness

Matthias Schulze - We have three different AHS's (US, Europe, Japan)
How does AHS have to
be tailored to meet different regional needs?
(commonality and tailoring)

Eddy Llaneras - Define functional standards and needs.
Assess benefits and effectiveness.
MMI integration (man-machine interface within vehicles)
System integration
Public education - awareness/realistic expectations..don't overstate or oversell benefits,

Yasuhiko Iwasaki - Define AHS - common understanding, steps. Identify/solve product liability issues.

Jim Rillings - We need to show leadership in developing these technologies to create the demand. Establish vision. Provide leadership. This could be an alternative deployment path. Should we focus on commercial vehicle applications.

Steve Shladover - Establish and understand vision - there may not be a universal, worldwide vision.

Scott Andrews - Planning/coordinating future activities/other activities must be done.

Steve Roberts - Similarities expressed by DOTs, e.g., rear-end crashes but manufacturers may still be reluctant. Government incentives/facilitation of products.
Human-like driving - possible ?
Global timeline.

Jim Rillings - Japanese and US programs seem to be developing along similar lines but European program is developing differently.

Job Kliinout. - Because AHS has not been the goal of the European program.

Matthias Schulze - European umbrella program. Institutions can handle technology. Using roadside intelligence may be more feasible in UK (Europe?) (and Japan?) than in the US where major highway mileage is much greater.

Stefan Becker - Role of the drive (in autonomous ops).

John MacGowan - Defining the public-private partnership (incl. International) What are the sub-systems commercially available corresponding to "low level MS"? Develop a list (catalog) of subsystem functions now available (technology-based functions). Can be coupled with user services definition because functions provide specific user services.

Jim Rillings - Many folks said we don't want fully automated driving but we do want the vehicle to take over in an emergency. I submit that it is a more profound task than automated driving because the vehicle will have to decide when to take control. Steve Sladover agrees. People don't want vehicle to seize control from the driver while the driver is trying to control the vehicle (based on focus studies). People are more receptive to fully automated driving.

System integrity/fallback modes.

Some user services may not be do-able because of the complexity of being totally accountable for all possible/reasonable contingencies.
Link between determining DOT benefits and assessing benefits and effectiveness.
Transit applications.

Feedback -

Who should be invited?
Danger of open-invitation is that it becomes just another conference. The value of this workshop was
the great amount of information exchange.

(Ian Wilkinson - The 10-minute presentations were extremely effective to focus discussions but
maybe there were too many panelists.)

(About a 50-50 split in whether or not there were too many panelists. General consensus that
more discussion time is needed and that two days is the right length for the workshop.)
Suggestion to eliminate long "enlightenment" or background introductions.
Scott suggests more participation from automobile community at large.
Steve Shladover suggests consideration of breakout groups for more specific interactive discussions.
Suggestion to have briefing slides submitted in advance, distributed at conference or forwarded
by e-mail ("come with no paper and go home with no paper").

Next year's workshop and demonstration theme will not be technical feasibility. It will be on benefits and deployment, particularly early benefits and short-term deployments.

Demo of AVG systems
5 days
exhibition
Congress
June 15-19, 1998

Calif PATH
http://www.path.berkeley.edu (bmichael@eecs.berkeley.edu)

DERA
http://www.dera.gov.we/dera.html

NAHSC
http://nahsc.volpe.dot.gov

FIRST INTERNATIONAL WORKSHOP ON VEHICLE-HIGHWAY AUTOMATION
AUGUST 11-12,1997
SAN DIEGO, CALIFORNIA, USA

Closing Remarks by Dick Bishop, US DOT, General Chair

I would first like to offer our thanks to Miramar College for hosting our meeting. And, a hearty thank-you to all of our panel chairs -- they clearly each brought their own "touch" to the sessions, indicating a personal investment.

What has happened here in these two days? I offer a few observations which I hurriedly assimilated in the last few moments.

First, let the OEMs do what they are already doing. When we stray into issues that can only be answered within that industry, we do not serve our own ends and get no "traction" -- only speculation.

Second, I hear strong interest in cultivating new applications and early winners, and these types of events are ideal in spreading ideas.

Third, let us explore the territory. We have put various diagrams on the board, regarding evolutionary deployment. Rather than take a singular path from the "today" of the lower left to the "fully automated tomorrow" of the upper right, let us consider that there are beneficial systems and interim capabilities that are viable throughout that entire space. Its like the magnificent adventure of Lewis and Clarke in early American history, as they explored the unknown areas west of the Mississippi River, ultimately reaching the Pacific Ocean!

Fourth, and so important, let us bring coherence to our dialogue. We are unanimous in this -- let us develop common terminology and definitions concerning the various levels of vehicle-highway automation. Terms that will help us communicate among one another and also help us "sell" these new concepts to our own constituencies,

So, returning to the three words that I offered at the beginning of our gathering, how have we done? I observed that we enjoyed some *enlightenment* through listening to one another describe our programs and issues. We have added new *momentum* through this dialogue which will continue with informal dialogues, particularly through E-mail links; and also as we look forward to our next meeting in June in the Netherlands. And clearly *we* have *established* the international collaboration that I envisioned, an item cited as a priority from all quarters throughout our meeting; I see this collaboration continuing to grow.

Thank you for being with us and participating.