

# Caltrans Ramping up for Demo 2002

Long recognized as one of the most outspoken and active leaders worldwide in advancing the concept of vehicle-highway automation, the **California Department of Transportation** (Caltrans) is now further defining their approach to **Demo 2002**, announced last November at the ITS World Congress in Toronto.

“While we applaud the safety-focused USDOT IVI program, it does not go far enough,” says **Greg Larson**, Chief of the Caltrans Office of Advanced Highway Systems, citing the considerable need for congestion relief in California. “We see cooperative vehicle-highway automation as essential to the future of mobility in our state,” he continues.

Caltrans was a key participant in the National Automated Highway System Consortium (NAHSC) during 1995-98, and was host to Demo '97, which showcased a variety of approaches to fully automated highway

vehicles. After examination of deployment phasing -- based on NAHSC results, worldwide trends, and continuing investigations with their research partner **PATH** -- Caltrans has concluded that initial deployment of automated vehicle technology will most likely take place on transit buses and heavy trucks.



These truck/bus deployments will provide implementors with valuable experience in the technology, and will help establish public confidence in the systems, paving the way for automation for automobiles. This logic is consistent with research funding approaches taken to date by the European Commission (in their CHAUFFEUR project) and the Federal Transit Administration (in their Bus Rapid Transit (BRT) program).

Accordingly, Caltrans-funded research in automation has recently increased its attention on trucks and buses, which will also be the focus of Demo 2002. According to information provided by Caltrans, Demo 2002 will be primarily a demonstration of truck and bus automation. It will take place -- as did Demo '97 -- on the Interstate Highway 15 reversible express lanes located just north of San Diego, during several days during October 2002.

A “convoy” of three automated trucks and a “train” of three automated buses will demonstrate the technical feasibility of cooperative heavy vehicle automation. In addition to the demonstration, a conference and workshop on Automated Highway Systems will be held to discuss technical issues, deployment, and future plans.

## Closer Than You Think....

“*Cooperative heavy vehicle automation is closer to reality than you may think*” is the central message for key decision

makers in attendance at the demo and conference, a theme similar to the Dutch Demo '98 event (which was car/truck focused). Demonstrations such as these are seen as effective in raising the awareness of automated infrastructure-related decision makers and stakeholders, and in enabling them to see vehicle automation as a potential solution to some of the traffic congestion and safety challenges that impact today's surface transportation system -- both in California and nationwide.

Caltrans' target audience for this Demo includes representatives from local, state, and federal government (RTPAs, transit agencies, Caltrans, the California Highway Patrol, state DOTs, FHWA, FMCSA, and FTA); university research centers; truck and bus manufacturers; shipping companies; truck equipment suppliers; special interest groups (e.g., CTA, ATA, APTA, ITS America, environmental groups, etc.), the media, and both public and private sector international representatives.

Caltrans and PATH

(University of California's Partners for Advanced Transit and Highways) will not only organize Demo 2002 but will develop most of the vehicles and infrastructure for the demonstration. Larson says that other developers will be welcome to participate, provided the technologies they choose to demonstrate are consistent with the desired message (the viability of fully automated goods movement and transit).

### **The Case for Heavy Vehicle Automation**

The freight fleets and transit agencies that operate the types of vehicles featured at the Demo are expected to be early adopters of automation technologies. Both are sensitive to trade-offs of benefit and cost, and are likely to innovate when it makes economic sense. Well-trained, professional drivers typically operate these vehicles, and will know how to compensate for vehicle malfunctions. Likewise, professional, well-trained technicians maintain the platforms, so reliability of the critical subsystems will be high.

In addition, these platforms have high capital costs, so the added expense of including sensors, actuators,

computers, and communication equipment necessary for automation will be relatively small compared to overall cost of the vehicle. This rationale is borne out by the current rapid rates of adoption of collision warning for heavy trucks (estimated at 10,000 units per year) and, more recently, by the growing availability of Adaptive Cruise Control systems for trucks — several fleets are already equipping their trucks with this driver assistance feature.

Caltrans also sees potential advantages in providing separate infrastructure for automated vehicles — the demonstration will show how the automated trucks and buses could be operated on separate lanes to improve the efficiency and safety of their travel, and also relieve the public of the hazards of traveling amidst so many large vehicles.

### **Increasing Shipments Mean More Trucks on the Road**

With the explosive growth of electronic commerce, the amount of goods that are shipped by truck is expected to increase significantly over the next ten years. The truck automation aspect of the demonstration is intended to show a "freight rail-like" transportation system that improves the efficiency of goods movement relative to today's system. The cooperative lateral and longitudinal

control technologies that automate the truck operation will enable them to travel safely with only minimal spacing, reducing the amount of fuel consumed by taking advantage of “drafting” techniques to decrease aerodynamic drag. In addition to decreasing operating costs in the highly competitive shipping industry, this reduction in fuel consumption will lead to an environmental benefit due to a corresponding decrease in the amount of exhaust emissions.

The three trucks will pull different trailer types, including a container, a “lowboy,” and an equipment trailer. There may also be double or triple trailers in the demonstration. The Caltrans/PATH work in this area marks the second major initiative world-wide for heavy truck automation — the European CHAUFFEUR program implemented close-headway “electronic tow-bar” operations on two Mercedes trucks during its first phase of research (1996-99). CHAUFFEUR II, led by Daimler-Chrysler and partners Iveco and

Renault VI, is now underway to further advance this work (see related *IVQ* articles throughout 1999).

**Making Bus Transit More Like Rail ... and More Attractive?**

Despite numerous attempts to entice commuters to use public transportation instead of their private cars, the commuter market share of transit has remained

rail and will have the capability to easily and inexpensively convert existing infrastructure for its use, perhaps even with narrower lanes to make most efficient use of existing right-of-way.

By employing advanced Bus Rapid Transit technologies, automated buses may be able to compensate for urban sprawl by quickly moving commuters along highway corridors where the

mainline traffic is heavily congested. The cooperative lateral and longitudinal control technologies that automate the bus travel will also enable features such as precision docking, which, when coupled with low floor buses, will support quick and easy entry and exit by passengers and reduce the amount of time the bus spends at stops. In addition, the control technologies will benefit bus operating

agencies by enabling automated low speed maintenance (washing, re-fueling, etc.) at the “bus barn” at night, thus reducing the level of manual labor and the costs associated with these operations.

Guided bus operations are now being implemented in

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**Chief, Caltrans Office of Advanced Highway Systems**

stagnant for the past twenty years at about 5%. The bus automation demonstration is intended to show a “commuter rail-like” transportation system that will provide an increased level of service to commuters. It will also offer significantly lower infrastructure costs relative to light

several cities in Europe (see the *Winter 2000 IVQ*), and similar systems for buses are under consideration for several US transit properties.

The vehicles in the Caltrans demonstration will include two forty foot buses and one sixty foot articulated bus. These buses will be powered by compressed natural gas.

### Simulation to Visualize the Future

The event will also include a presentation of “what could be”, using 3-D computer simulation tools currently under development. The presentation for the truck portion may show a visualization of the heavily truck-traveled I-10 corridor near the ports of Los Angeles and Long Beach, which will tie the demonstration in with the National Automated Truck Facility Study currently underway. Similarly, the bus presentation may show a future

view of the I-15 reversible express lanes, in order to help local decision makers visualize what automated buses would look like travelling along that corridor.

Static displays and exhibits are also planned that will showcase current and future heavy vehicle safety and automation technologies.

### What Will the Vehicles Do?

Caltrans, working with PATH, has defined a complete set of maneuvers that they believe are both achievable by 2002 and fully representative of operations required for heavy vehicles in daily use. All of these maneuvers were demonstrated by PATH on automobiles in 1997 and refinements have continued since then. PATH has also been developing automation capabilities on a Freightliner Class 8 tractor since 1998 (see

earlier *IVQ* articles) and has demonstrated precision docking using a passenger car, in 1998 and 1999. The following maneuvers are planned within a set of realistic driving scenarios:

- Merge
- Lateral Control
- Longitudinal Control
- Platoon Formation
- Platoon Split
- Lane Change
- Precision Docking (buses)
- Low Speed Bus Maintenance
- Automated Truck Backing

Fiscal year 2001 funding is currently programmed to begin development of the demo vehicles.

Guidelines for outside participation and solicitations for research support are expected to be released early in the new fiscal year, which begins in July 2000.

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*Many thanks to Greg Larson of Caltrans for providing supporting material for this article. For more information, contact Greg at [Greg\\_Larson@dot.ca.gov](mailto:Greg_Larson@dot.ca.gov) or see [www.path.berkeley.edu/PATH/Research/](http://www.path.berkeley.edu/PATH/Research/).*