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Caltrans Division of Research, Innovation and System Information

Caltrans

RESEARCH CONNECTION

Vehicle-Assist and Automation (VAA)

Self-Guided, Magnetic Bus Technology Improves Safety, Costs, and Efficiency

Lane Transit District

DEPARTMENT OF TRANSPORTATION UNITED STATES OF AMERICA

AC TRANSIT

CALIFORNIA PATH

Welcome

Coco Briseno

Division Chief

Caltrans Division of Research,

Innovation and System Information (DRISI)

VAA Background

Prakash Sah

Branch Chief

Public Transportation & Modal Branch

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Agenda

Item:	Time:	Topic:	Presenter:
1.	9:30 AM	Introduction/Opening Remarks	Coco Briseno
2.	9:35 AM	Background	Prakash Sah
3.	9:45 AM	Technical Elements	Han-Shue Tan Jihua (Jill) Huang
4.	10:30 AM	Contractual Issues (Non-Technical)	Wei-Bin Zhang
5.	10:45AM	Summary of Lessons	Tom West Prakash Sah
6.	10:55 AM	Questions/Comments	All
7.	11:25 AM	Closing Remarks	Greg Larson

Vehicle Assist and Automation (VAA) is…

a technology that guides buses by magnets, just as trolleys are guided by cables.

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Why VAA?

- **Problems and Challenges**
  - Right-of-way purchase costs are high and increasing
  - Transit agencies seek safe and cost-effective transit systems
  - Transit customers demand high-quality transit service
- **Potential Benefits**
  - Reduced right-of-way requirements and infrastructure costs
  - Reduced accidents
  - Reduced operating and maintenance costs
  - Smoother ride and level boarding for faster travel and reduced dwell time
  - “Rail-like” status
    - More attractive to choice riders
    - Encourage transit oriented development

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Demonstration of Automated BRT

Automated Bus Demonstration at APTA 2003 in San Diego.

Demonstration of Lane Assist and Precision Docking Systems at ITS World Congress 2005 in San Francisco.

Demonstration of Automated BRT

Field Tests and Demonstration of Lane Assist Systems along AC Transit's E-14 BRT Route

- First time tested of the magnetic guidance in real world urban settings
- The system demonstrated its repeatability and reliability under real-world conditions (with street crowns and obstacles, mixed with city traffic)
- Lessons learned benefits later VAA development and deployment
- Workshop with California transit agencies received positive response

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US DOT VAA Program

The U.S. Department of Transportation (DOT), through the Federal Transit Administration (FTA) and Research and Innovative Technology Administration (RITA), ITS Joint Program Office (JPO), awarded three cooperative agreements to demonstrate, in revenue service, one or more vehicle assist and automation (VAA) applications for bus-based, full-size public transit vehicles.

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Caltrans VAA Program

- Objective
  - Demonstrate the technical feasibility of lateral vehicle guidance and how vehicle guidance can improve transit agency operational efficiency, performance and service quality.

- Partners
  - LTD – Eugene, Oregon
  - AC Transit – Alameda County, California
  - UC Berkley PATH Program
  - FTA – Federal Transit Administration

Introduction of Researchers

Wei-Bin Zhang

Han-Shue Tan

Jihua (Jill) Huang

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VAA Technical Applications

Han-Shue Tan

Jihua Huang

California PATH

VAA Contractual Issues

Wei-Bin Zhang

California PATH

Close Collaboration

Close collaboration between FTA, Caltrans, PATH and Project Partners.

- Caltrans project manager plays a proactive role in coordination with USDOT project manager and project partners
- USDOT's continuous support
- Unprecedented support from transit agencies
- A collaborative evaluation partner – University of South Florida

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Project Delays Caused by Contractual Complications

- Delay of the contract to UC Berkeley (6 month delay)
- Private partners – sole source justification. The subcontract with TRW fell apart after one year of contract negotiation due to liability and contractual issues, resulting substantial increase of development in house (12 months delay)
- The subcontract with transit agencies experienced difficulties (8 months delay)

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Uncertainties

- Reduction of spendable budget due to change of subcontract process (overhead increase)
- Complications involving the installation of magnetic markers
- Additional resources for vehicle installations and component repairs

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Uncertainties, cont.

- More trips than planned for system debugging, driver training and dealing with technical ‘glitch’
- Added safety verification effort
- These uncertainties have caused to various degrees time delays and cost overrun

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Technical ‘Glitch’

- The test at LTD Oregon has experienced a glitch due to a combination of a computer failure and a human error
- Concentrated resources have been devoted to thoroughly investigate this event, and to develop remedies for additional safety oriented improvements, and implementation and testing of these remedies
- These efforts added efforts have delayed the field operational test at LTD (4 months delay)

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Liability Issues

- Liability issues – a new territory for all
  - Need for additional vehicle insurance
  - High risk insurance explored, but not able to acquire
  - Caltrans' review on liability issues in light of recent growing interest in vehicle highway automation
    - Extensive discussion between Caltrans and University of California
    - New liability arrangement
    - 11 month delay, resulting in not enough time to complete field testing at AC Transit

As the Result …

- The real-world challenges and uncertainties were difficult to plan for in the initial scope of work due to the early deployment nature of this project
- Because of the deployment and safety critical natures of this project, the development efforts can not be reduced to accommodate the original schedule and budget
- Impacts: The cumulative efforts for overcoming the uncertainties have resulted in 48 months time delay and 50% budget increase
- Thanks for the great support from Caltrans, FTA and transit agencies, particularly the additional funding support by Caltrans

VAA Summary of Lessons

Prakash Sah

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and

Tom West

California PATH

Lessons Learned

VAA represents a good example of a continuous effort to taking research toward deployment

Uncertainties and unexpected challenges, technical and non-technical, are inherent with research projects of deployment nature

Lessons Learned

Consideration of ‘unexpected’ must be given throughout the planning and execution process of the project of deployment nature

A partnership between government sponsors, research organizations and industrial partners is the key for successfully bringing research results to deployable products

VAA

Questions?

Closing Remarks

Greg Larson

Office Chief

Office of Traffic Operations Research

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