

Precursor Systems Analyses of Automated Highway Systems

Introduction to Precursor Studies

The Federal Highway Administration (FHWA) awarded fifteen Precursor Systems Analyses (PSA) research contracts totaling \$14.1M to investigate the issues and risks related to the design, development, and implementation of Automated Highway Systems (AHS). These contracts, each of approximately one year duration, were awarded during the period July through September, 1993, based on a Broad Agency Announcement issued by FHWA in November, 1992. The AHS program is part of the major initiative of the US Department of Transportation in Intelligent Vehicle/Highway Systems.

The purpose of this CD ROM archive is to highlight the research activities performed under the AHS PSA studies. These PSA studies were conducted as part of the early stages of the government's AHS Program. This compendium of AHS PSA research activities serves to highlight the areas of research and the contractor teams working within these areas.

AHS PSA CONTRACTS

These fifteen PSA contracts were focused upon sixteen activity areas which were defined in the original Broad Agency Announcement. Contractors and contractor teams were assigned one or more activity areas to investigate.

Several contractors addressed each of the activity areas. This overlap added value to the overall body of research, in that each discrete effort provided a different perspective and emphasis in identifying and analyzing issues and risks. Further, three teams, Calspan, Delco, and MITRE were selected to address all sixteen activity areas. These teams have generated additional insights into the issues because of the extensive interdependencies across the activity areas, which were addressed most effectively within a single contract team. The perspectives and experience of Calspan and Delco are highly complementary,

with Calspan providing a broad systems analysis and Delco providing analysis from the perspective of the vehicle industry. Additional vehicle industry insights will be gained by subcontractors on the various teams, notably Ford Motor Company as part of the Raytheon team.

The perspectives and experience of the highway engineering profession is crucial to this research, and transportation consultants are well represented within the contract teams performing the highway-based analyses. In order to enhance the results of the analyses and maintain a “real-world” perspective, frequent contact was made with state and local highway officials so as to gain feedback on issues such as AHS deployment, operations and maintenance, and network-wide impacts. In particular, the Calspan team included several state level transportation agencies for this purpose.

These analyses benefited substantially from the experience and expertise of the defense industry, as several of the contractors selected have had extensive involvement with complex defense system on the scale of an AHS. For example, Lockheed Martin is the system integrator for the DOD Demo II project involving autonomous ground vehicles for military applications, which has clear technological similarities to the future AHS.

There are four efforts involved with subjects outside the 16 primary activity areas. The Raytheon team investigated the application of Knowledge Based Systems to AHS requirements. The Rockwell team studied one possible evolutionary scenario for AHS. SRI investigated the application of the Global Positioning System (GPS) Integrated Carrier Phase techniques to vehicle position monitoring for AHS. Finally, TASC performed an analysis of the feasibility of integrating existing models in diverse areas such as vehicle dynamics, sensor characteristics, traffic flow, and environmental factors into a coherent modeling framework, to enable researchers to evaluate high level AHS concept alternatives.

The PSA analyses were conducted in a highly interactive and collaborative environment. By creating an atmosphere of collegiality among the individuals performing the research. The program benefited substantially from the resulting synergy. This group of PSA researches has displayed a broad range of perspective and expertise across both industry and government, in order to meet this objective.

Contract Team Members

Battelle Team

Battelle
BRW
Mass. Institute of Technology
Ohio State University
Transportation Research Center
University of Minnesota

BDM Team

BDM
Cambridge Systematics, Inc.
George Mason University
SNV

Calspan Team

Calspan
BMW
Dunn Engineering
Farradyne Systems, Inc.
Parsons Brinkerhoff
Princeton University
TRANSCOM
Connecticut DOT
Massachusetts DOT
New Jersey DOT
New York State DOT
NY State Thruway Authority

Delco Team

Delco Systems Operations
DMJM
Hughes aircraft Company
Univ. of Calif. (PATH)
General Motors Corporation

Honeywell Team

Honeywell Technology Center
Purdue University
Univ. of Calif. (PATH)
University of Minnesota
Calif. Polytechnic State Univ.

Lockheed Martin Team

Lockheed Martin

Northrop Team

Northrop
PATH

PATH Team

PATH
Bechtel
California DOT
Calif. Polytechnic State Univ.
Lawrence Livermore Nat. Lab.
Rockwell International
Univ. of Southern California

Raytheon Team

Raytheon Company
Daimler Benz
Ford
Georgia Institute of Technology
Tufts University
Univ. of Southern California
VHB
Rockwell Team

Rockwell International Corp.
Univ. of Calif. (PATH)
Systems Technology, Inc.

SAIC Team

SAIC
McDermott, Will & Emery
McGuire, Woods, Battle & Booth

SRI Team

SRI

TASC Team

TASC

TRW Team

TRW

UC Davis Team

Univ. of California, Davis
California DOT