ITS Field Operational Test Summary

Faster and Safer Travel Through Traffic Routing and Advanced Controls

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Introduction

The Faster and Safer Travel Through Traffic Routing and Advanced Controls (FAST-TRAC) ITS Field Operational Test integrates Advanced Traffic Management System (ATMS) and Advanced Traveler Information System (ATIS) components in Oakland County, Michigan. FAST-TRAC's purpose is to improve mobility and safety on the increasingly congested arterial roads and freeways of the county. The project intended to combine the ATMS component - the Australian SCATS (Sydney Coordinated Adaptive Traffic System) adaptive traffic signal control - with the ATIS component - the roadside beacon-based Siemens Ali-Scout system.

This massive deployment commenced in 1991. The implementation phase of the FAST-TRAC project will conclude in June 2000. In February 1998, the test partners decided to eliminate the Ali-Scout component but continue implementation of the other components and features. The evaluation of the system is continuing.

Project Description

Implementation of FAST-TRAC began in August 1991 and continues. The system is now fully operational. There are 350 intersections under SCATS control. During the Field Operational Test data collection and analysis period, there were approximately 100 Ali-Scout beacons operating. The County's Traffic Operations Center intended to integrate the ATMS and ATIS components. Figure 1 presents the FAST-TRAC coverage area.

The ATMS component of the system is SCATS. SCATS is a third generation traffic management system. The FAST-TRAC project is the first major SCATS installation in North America. In its adaptive mode, SCATS operates in real time, adjusting traffic signal timing throughout the network in response to variations in traffic demand and system capacity. A voice-grade phone line connects each local traffic signal controller to a regional computer. The regional computer provides strategic control and links system operators and the individual signal controllers. Together, the regional computer and the local controllers comprise an autonomous traffic control system. To manage the entire traffic network, the system adds a central management computer.

The principal purpose of the SCATS system is to minimize overall stops and delays on the network. During congested conditions, the system maximizes roadway capacity and minimizes the possibility of traffic jams by controlling queue formation.

The FAST-TRAC project has one significant departure from other large SCATS installations. In other installations, the system collected real-time traffic data using loop detectors. FAST-TRAC uses the Autoscope video-imaging sensor. The main advantage of using these sensors is their ease of installation compared to the loop detectors. The Autoscope sensors also have reduced

maintenance costs.

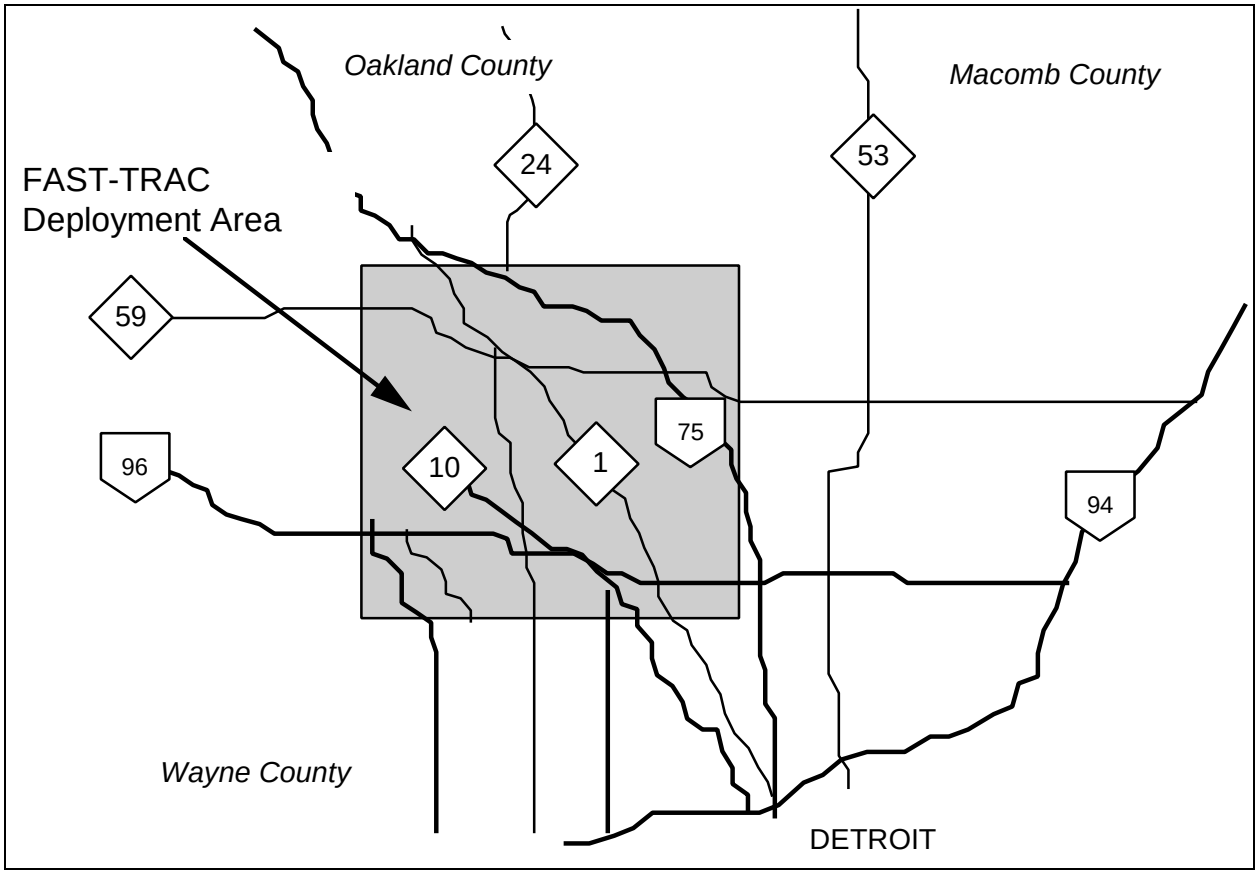

Figure 1: FAST-TRAC Coverage Area

The ATIS component of the system proposed in the original project concept was the Ali-Scout system developed by Siemens. Ali-Scout is a route guidance system that provides dynamic navigation information to motorists. Ali-Scout takes into account link congestion levels that influence travel times on various possible travel routes. Ali-Scout has three major components: a central computer that calculates route guidance information, a network of roadside infrared beacon sites that communicate with the vehicles, and participating vehicles. The participating vehicles are equipped with an on-board navigation processor, infrared communication devices, and a driver interface display.

In operation, drivers enter a destination code into the onboard computer or choose a preprogrammed destination. Using the infrared communication link between the vehicle and the roadside beacons, the Ali-Scout system exchanges traffic and route guidance information. As it travels, the vehicle acts as a traffic probe, gathering travel time, stop times, last beacon identity and vehicle type. When it passes the next roadside beacon, the vehicle transfers this information to the beacon, which forwards it to the central computer.

The vehicle also receives route guidance information from the beacons. This route guidance information includes recommended routes, digitized road maps, and traffic condition information. Inside the vehicle, the driver follows the recommended route guided by a directional arrow on the display. As the vehicle passes each beacon, it receives more network traffic condition data.

Considering this information, the Ali-Scout system provides timely navigational information to the driver using both voice and display commands. Approximately a quarter mile before the destination, the vehicle receives the last navigation information and the driver completes the journey on his or her own.

The Road Commission for Oakland County is the program leader and has overall FAST-TRAC program management responsibility. The Commission coordinates with managers from the other significant partners to set goals and objectives, establish major milestones, and track program progress. Major program elements are organized under committees. Project direction on many aspects is determined by the consensus of members on the committees

Test Status

The FAST-TRAC project completion date is June 2000. The system is operational and is serving Oakland County well. Phase IIB and Phase III (final deployment phase) activities are ongoing. Test personnel conducted an assessment of the dynamic route guidance feature of the Ali-Scout component. During this testing, however, personnel discovered that integrating the Ali-Scout and the SCATS systems was not technically feasible. The evaluator is conducting a "systems integration case study." This study focuses on the lessons learned from the attempted integration. The study also assesses the system's transferability to other locations in the country.

Test partners decided in February 1998 to eliminate the Ali-Scout component of the test.

Although final results are not available, several interim analyses have been completed. Preliminary studies to determine the effectiveness of the SCATS system were conducted in the spring of 1994. Initial findings indicated:

- **Speeds:** Installation of the system resulted in increases in average speeds of up to 19% on major arterial roads during peak periods and in the peak direction of travel. On lesser arterial roads, during peak periods, the results were less impressive. These less impressive results are primarily a function of SCATS, since it gives priority to major arterial roads. SCATS appeared to handle peak period traffic volumes very well. Analyses indicated, however, that average speeds dropped both immediately before and after peak periods
- **Delays:** At several intersections, average delay decreased on major road approaches but appears to have increased on minor approaches. Nevertheless, total intersection delay decreased at most intersections. This result occurred despite the addition of left turn phases at many of these intersections
- **Accidents:** Analysis of traffic accidents at nine intersections (where left turn phasing was installed in conjunction with SCATS) showed mixed results. Total accident frequency increased by 27% after the system was implemented. Left turn accidents, however, decreased from 27 in the 'before' period to only 3 in the 'after' period. This 89% reduction was mostly attributed to the installation of the leading-protected left turn phases at these intersections.
- **Responsiveness:** In addition to the mobility and safety benefits realized, a significant benefit of installing the system has been the flexibility it provides traffic managers to respond to changes in traffic flow, local policies, special events and other considerations.

In addition to these preliminary results, early lessons learned from the FAST-TRAC Project include:

- The Road Commission for Oakland County learned that, though video image processing was not a mature technology at the time of installation, it is a viable traffic detection technology.
- The integration of the ATMS and ATIS has the potential to offer benefits above and beyond those that can be offered by either system individually.
- Institutional, jurisdictional and legal challenges far out weighed the technical complexities involved in implementing such an integrated ATMS-ATIS.

Test Partners

AWA Traffic Systems – America

Chrysler Corporation

City of Troy, Michigan

County of Oakland, Michigan

Federal Highway Administration

Ford Motor Company

General Motors Corporation

Michigan Department of Transportation

Michigan State University, Detroit, Michigan

Nissan Motor Company

Road Commission for Oakland County

Siemens Automotive

University of Michigan, Ann Arbor, Michigan

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