

1. Report No. TX-97/1985-2		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle HOUSTON <i>SMART COMMUTER</i> ITS OPERATIONAL TEST — FY 1996 STATUS REPORT				5. Report Date August 1996	
				6. Performing Organization Code	
7. Author(s) Katherine F. Turnbull, Stephen P. Farnsworth, and Darryl Puckett				8. Performing Organization Report No. Research Report 1985-2	
9. Performing Organization Name and Address Texas Transportation Institute The Texas A&M University System College Station, Texas 77843-3135				10. Work Unit No. (TRAIS)	
				11. Contract or Grant No. Study No. 7-1985	
12. Sponsoring Agency Name and Address Texas Department of Transportation Research and Technology Transfer Office P. O. Box 5080 Austin, Texas 78763-5080				13. Type of Report and Period Covered Interim: September 1995 - August 1996	
				14. Sponsoring Agency Code	
15. Supplementary Notes Research performed in cooperation with the Texas Department of Transportation. Research Study Title: Houston <i>Smart Commuter</i> ITS Operational Test Project Management Assistance and Study Design, Data Collection, Monitoring, and Local Evaluation Program					
16. Abstract The Houston <i>Smart Commuter</i> ITS Operational Test is assessing the potential to gain more efficient use of major travel corridors through greater utilization of high-occupancy commute modes, shifts in travel routes, and changes in time of travel through the application of innovative approaches using advanced technologies. The Houston <i>Smart Commuter</i> ITS Operational Test is a federally sponsored project and is being jointly funded by the Metropolitan Transit Authority of Harris County (METRO), the Texas Department of Transportation (TxDOT), the Federal Highway Administration (FHWA), and the Federal Transit Administration (FTA). The project contains two different, but compatible, components. One component focuses on encouraging a mode shift from driving alone to riding the bus through the provision of real-time traffic and transit information. The second component encourages carpooling through the use of real-time ridematching services. This report documents the activities conducted on the <i>Smart Commuter</i> ITS Operation Test in FY 1996. These include selecting the vendors and developing the commuter information delivery system, recruiting participants, collecting the base line data for the local evaluation, and other activities. The report also presents the anticipated activities and schedule for FY 1997.					
17. Key Words Intelligent Transportation Systems, ITS, Smart Commuter, Transit, Instant Carpooling, Real-Time Ridematching			18. Distribution Statement No restrictions. This document is available to the public through NTIS: National Technical Information Service 5285 Port Royal Road Springfield, Virginia 22161		
19. Security Classif.(of this report) Unclassified		20. Security Classif.(of this page) Unclassified		21. No. of Pages 34	22. Price



**HOUSTON *SMART COMMUTER* ITS OPERATIONAL TEST —  
FY 1996 STATUS REPORT**

by

Katherine F. Turnbull  
Research Scientist  
Texas Transportation Institute

Stephen P. Farnsworth  
Assistant Research Scientist  
Texas Transportation Institute

and

Darryl Puckett  
Associate Research Scientist  
Texas Transportation Institute

Research Report 1985-2  
Research Study Number 7-1985

Research Study Title:  
Houston *Smart Commuter* ITS Operational Test Project Management Assistance and  
Study Design, Data Collection, Monitoring, and Local Evaluation Program

Sponsored by the  
Texas Department of Transportation

August 1996

TEXAS TRANSPORTATION INSTITUTE  
The Texas A&M University System  
College Station, Texas 77843-3135



## **IMPLEMENTATION STATEMENT**

---

Metropolitan areas in Texas and throughout the country are facing major problems with traffic congestion, air quality concerns, and declining mobility. Intelligent transportation systems (ITS) and other advanced technologies are being used in many areas to help address some of these issues. The Houston *Smart Commuter* Operational Test represents one such effort.

The Houston *Smart Commuter* Operational Test is evaluating the potential for gaining more efficient use of major travel corridors through greater utilization of high-occupancy vehicle (HOV) commute modes, shifts in travel routes, and changes in time of travel through the application of innovative approaches using advanced technologies. Commuters who have quick and easy access to relevant, accurate, and up-to-date information on existing traffic conditions, bus routes, bus schedules, procedures for using the bus, and instant ridematching services in their homes and work places may be more likely to use public transportation and other high-occupancy commute modes. For example, the travel time savings and travel time reliability offered by the Houston HOV lanes provide incentives for changing travel modes. Individuals may alter their travel times or travel routes based on this information.

The results of the Houston *Smart Commuter* ITS Operational Test will be of benefit to TxDOT, METRO, FHWA, FTA, and other groups interested in utilizing ITS technologies to encourage HOV and alternative commute modes. This report provides a summary of the activities accomplished on the project in FY 1996 and the anticipated schedule for FY 1997.



## **DISCLAIMER**

---

The contents of this report reflect the views of the authors who are responsible for the findings and conclusions presented herein. The contents do not necessarily reflect the official views or policies of the Texas Department of Transportation. This report does not constitute a standard, specification, or regulation, and is not intended for construction, bidding, or permit purposes.

## **ACKNOWLEDGMENTS**

---

The authors would like to recognize a number of individuals who contributed to and assisted with this research study and the preparation of this report. First, the research team would like to acknowledge the assistance of John Gaynor, the TxDOT Project Director. Mr. Gaynor is providing guidance and assistance throughout the study and his involvement is greatly enhancing the research effort. Second, the authors would like to recognize the contributions of Wayne Jones, TxDOT, as well as Sholeh Karimi and Rita Brohman, METRO. The assistance of Bonnie Duke, TTI, in typing this report is also recognized by the authors. The help and contributions of all of these individuals is both acknowledged and greatly appreciated.



# TABLE OF CONTENTS

---

LIST OF TABLES .....	x
LIST OF FIGURES .....	x
SUMMARY .....	xi
CHAPTER ONE — Introduction .....	1
CHAPTER TWO — Overview of the Houston <i>Smart Commuter</i> Operational Test .....	3
Background .....	3
Houston <i>Smart Commuter</i> Concepts .....	4
Organization of the Houston <i>Smart Commuter</i> ITS Operational Test .....	6
CHAPTER THREE — FY 1996 Accomplishments and Current Project Status .....	9
I-45 North Bus Component .....	9
I-10 West Carpool Component .....	15
Ongoing Coordination of the Local and National Evaluations .....	15
CHAPTER FOUR — Anticipated Future Activities .....	17
I-45 North Bus Component .....	17
I-10 West Carpool Component .....	19
REFERENCES .....	21

## **LIST OF TABLES**

---

Table 1. Data Collected in FY 96 for the Baseline Conditions . . . . .	13
Table 2. Anticipated FY 1997 Schedule for I-45 North Component . . . . .	17
Table 3. Anticipated FY 1997 Schedule for I-10 West Component . . . . .	19

## **LIST OF FIGURES**

---

Figure 1. Houston Freeway and HOV Lane System . . . . .	5
---	---

## SUMMARY

---

The Houston *Smart Commuter* Intelligent Transportation Systems (ITS) Operational Test is one of the federally sponsored advanced technology projects currently being conducted in the United States. The Houston *Smart Commuter* Operational Test is being funded and implemented through the joint efforts of the Metropolitan Transit Authority of Harris County (METRO), the Texas Department of Transportation (TxDOT), the Federal Highway Administration (FHWA), and the Federal Transit Administration (FTA). The Texas Transportation Institute (TTI), a part of The Texas A&M University System, assisted with the development of the operational test concept design and is responsible for conducting the local evaluation and providing ongoing project support.

The Houston *Smart Commuter* Operational Test is evaluating the potential for gaining more efficient use of major travel corridors through greater utilization of high-occupancy commute modes, shifts in travel routes, and changes in time of travel through the application of innovative approaches using advanced technologies. Commuters who have quick and easy access to relevant, accurate, and up-to-date information on existing traffic conditions, bus routes, bus schedules, procedures for using the bus, and instant ridematching services in their homes and work places may be more likely to use public transportation and other high-occupancy commute modes. The travel time savings and travel time reliability offered by the Houston HOV lanes add further incentives for changing travel modes. In addition, individuals may alter their travel times or travel routes based on this information.

The *Smart Commuter* Operational Test includes two different, but compatible, components to enhance use of the Houston HOV facilities. These components have been developed and funded as multi-agency projects. The first component of the *Smart Commuter* Operational Test, the bus component, focuses on the traditional suburb-to-downtown travel market in the I-45 North corridor. This element encourages a mode shift from driving alone to riding the bus, changing travel times, and shifting travel routes. These changes in travel decisions will result from the provision of current traffic and transit information to individuals in their homes and work places through state-of-the-art technologies. The second component focuses on the suburb-to-suburb travel market in the I-10 West corridor to the Post Oak/Galleria area. This corridor, which is more difficult to serve with traditional, regular-route bus service, provides the opportunity to test the use of a comprehensive employer-based carpool matching service. This system will include the ability to provide real-time carpooling and also to encourage an increase from two to three person carpools, which is the requirement on the Katy HOV lane during the morning and afternoon peak hours.

The report summarizes the activities conducted on the Houston *Smart Commuter* ITS Operational Test in FY 1996. The major activities on the I-45 North component included selecting the vendors and developing the commuter information delivery system, recruiting participants, and collecting the baseline data for the local evaluation. Major activities on the I-10

West component included monitoring the delivery of the new METRO rideshare computer and assessing potential approaches for utilizing it in the operational test. This report also presents the anticipated activities and schedule for FY 1997.

# CHAPTER ONE

## Introduction

---

The Houston *Smart Commuter* Intelligent Transportation Systems (ITS) Operational Test is one of the federally sponsored advanced technology projects currently being conducted in the United States. The Houston *Smart Commuter* Operational Test is being funded and implemented through the joint efforts of the Metropolitan Transit Authority of Harris County (METRO), the Texas Department of Transportation (TxDOT), the Federal Highway Administration (FHWA), and the Federal Transit Administration (FTA). The Texas Transportation Institute (TTI), a part of The Texas A&M University System, assisted with the development of the operational test concept design and is responsible for conducting the local evaluation and providing ongoing project support.

The Houston *Smart Commuter* Operational Test began in 1990. Since that time a number of activities have been accomplished. These include the completion of a preliminary feasibility study, development of a concept plan and proposal, securing funding for the first phase, and initiating the operational test. Interagency agreements between the various agencies have also been completed.

This document summarizes the activities conducted on the operational test during Fiscal Year (FY) 1996, the period from September 1995 to August 1996. It also outlines those activities anticipated in FY 1997. The remainder of the report is divided into four sections to accomplish this objective. Chapter Two provides an overview of the Houston *Smart Commuter* Operational Test. The major elements and the organizational structure for the operational test are summarized. Chapter Three describes the major activities and accomplishments completed during FY 1996. The status of the I-45 North bus component is presented first followed by the I-10 West carpool component. Chapter Four presents the anticipated work activities and schedule for FY 1997.



## CHAPTER TWO

### Overview of the Houston *Smart Commuter* Operational Test

This chapter provides an overview of the development of the Houston *Smart Commuter* ITS Operational Test. The background of the project is summarized first, then the concepts being tested are described. The organizational structure for the operational test and the roles and responsibilities of the different agencies are also outlined.

#### **Background**

Like many major metropolitan areas, traffic congestion continues to be a significant problem in the Houston area, especially during the morning and afternoon peak-periods. Although recent improvements in the transportation system have reduced congestion levels in some corridors, Houston ranks as one of the top ten most congested cities in the country (1). The annual cost of this congestion, based on the costs associated with time delay and fuel, is estimated to be approximately \$1.92 billion (1). Air quality and environmental issues are also major concerns. Houston is currently in severe violation of the Environmental Protection Agency (EPA) standards for ozone emissions. In order to meet requirements of the 1990 Clean Air Act Amendments, the area must develop measures to control growth in vehicle miles of travel and initiate other programs.

In response to the combination of increasing demands on the system and limited resources, the agencies responsible for transportation in the Houston area have often utilized innovative approaches to address mobility and congestion problems. The regular development and publication of a multimodal Regional Mobility Plan, the extensive system of high-occupancy vehicle (HOV) lanes, park-and-ride lots, transit centers, and express bus services, the expansion of the freeway and toll road system, and the development of TranStar, the Greater Houston Transportation and Emergency Management Center, represent just a few of the approaches that are being utilized in Houston.

The development of these projects has occurred through the coordinated and cooperative efforts of TxDOT, METRO, the City of Houston, Harris County, the Houston-Galveston Area Council (HGAC), and others. TTI has provided technical assistance on many of these projects. In preparing to move Houston forward into the 21st century, these agencies continue to work together to ensure that the transportation system will meet the needs of future generations. Incorporating advances in technology, such as those offered through the application of Intelligent Transportation Systems (ITS), is an important part of this overall approach.

The Houston *Smart Commuter* ITS Operational Test is a further example of this multi-agency approach. The development of the Houston *Smart Commuter* ITS Operational Test began in 1990. A planning and feasibility study funded by FTA, METRO, and TxDOT, was conducted by TTI in 1990 and 1991. This study examined the concepts behind the project, analyzed available literature on commuting behavior and mode choice selection, and examined the market potential for real-time traffic, transit, and rideshare information through the use of focus groups and surveys. Also assessed were potential technologies for providing the real-time traffic and transit information to individuals in their homes and work places. A series of reports documenting the different elements of the study are available (2, 3, 4, 5, 6). The final report, *The Houston Smart Commuter IVHS Demonstration Project: Concept Design and Implementation Program Outline* (6), summarizes the major elements of the operational test and contains a preliminary implementation program, budget, and evaluation plan for the project.

This report formed the basis for federal funding requests by METRO and TxDOT to FTA and FHWA, respectively. A total of \$5 million has been committed for the first phase of the proposed multi-year \$17 million Houston *Smart Commuter* ITS Operational Test. Both METRO and TxDOT have committed \$1,250,000 to fund the first phase; FTA has provided \$500,000 in funding, and FHWA has provided \$2,000,000. The concepts being tested in the *Smart Commuter* project are described next, followed by a more detailed discussion of the roles and responsibilities of the different groups involved in the project.

### **Houston *Smart Commuter* Concepts**

The Houston *Smart Commuter* Operational Test is evaluating the potential for gaining more efficient use of major travel corridors through greater utilization of high-occupancy commute modes, shifts in travel routes, and changes in time of travel through the application of innovative approaches using advanced technologies. Commuters who have quick and easy access to relevant, accurate, and up-to-date information on existing traffic conditions, bus routes, bus schedules, directions for using the bus, and instant ridematching services in their homes and work places may be more likely to use public transportation and other high-occupancy commute modes. The travel time savings and travel time reliability offered by the Houston HOV lanes add further incentives for changing travel modes. In addition, individuals may alter their travel times or travel routes based on this information.

The *Smart Commuter* Operational Test includes two different, but compatible, components focusing on enhancing use of the Houston HOV facilities. These facilities have been developed and funded as multi-agency projects. Figure 1 highlights the major freeway and HOV lane facilities in Houston.

The first component of the *Smart Commuter* Operational Test, the bus component, focuses on the traditional suburb-to-downtown travel market in the I-45 North corridor. This element encourages a mode shift from driving alone to riding the bus, changing travel times, and shifting



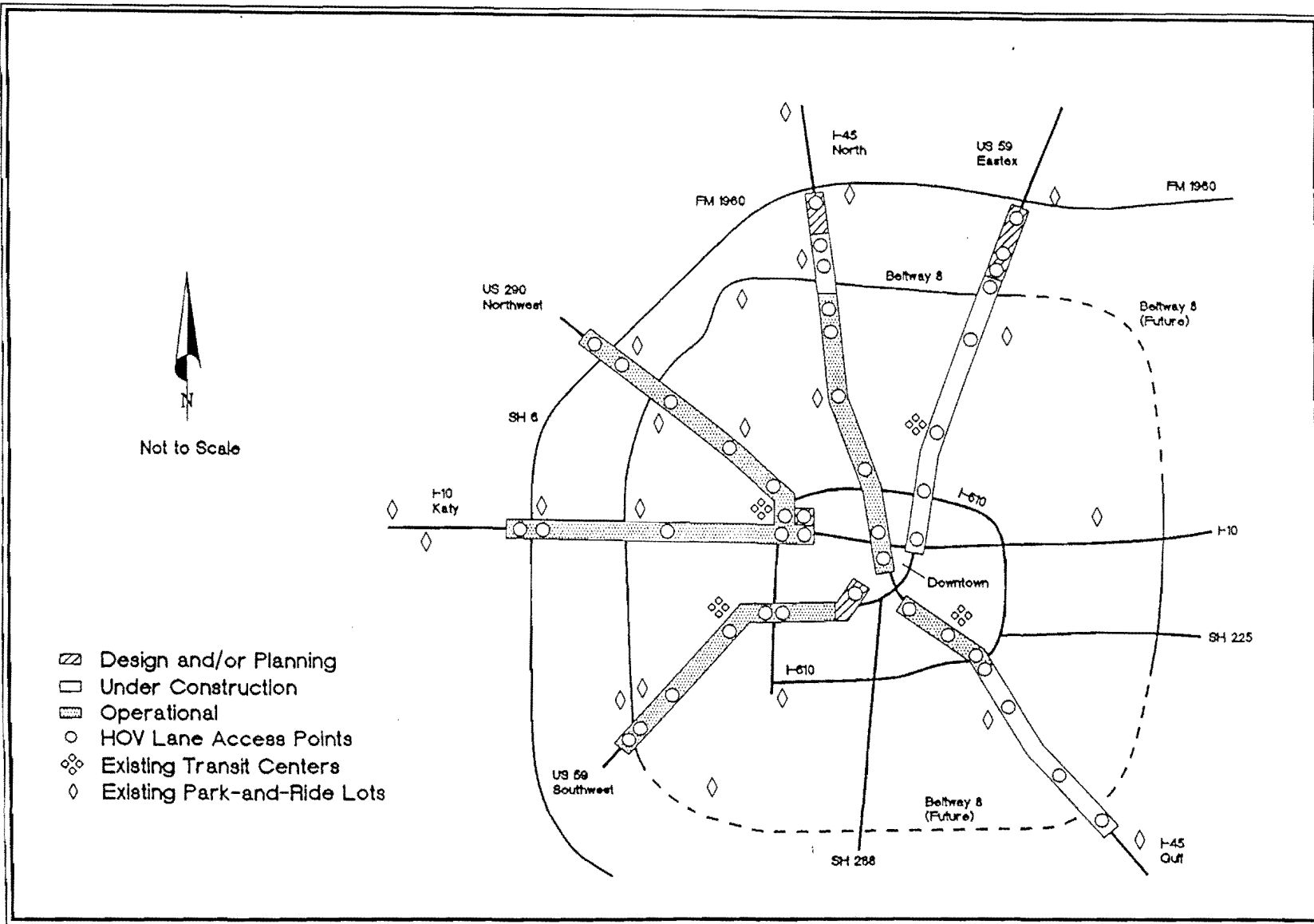


Figure 1. Houston Freeway and HOV Lane System

travel routes. These changes in travel decisions will result from the provision of current traffic and transit information to individuals in their homes and work places through state-of-the-art technologies. Changes in travel behavior are being evaluated by comparing the sample group with a control group that does not receive the current traffic and transit information device.

The second component focuses on the suburb-to-suburb travel market in the I-10 West corridor to the Post Oak/Galleria area. This corridor, which is more difficult to serve with traditional, regular-route bus service, provides the opportunity to test the use of a comprehensive employer-based carpool matching service. This system will include the ability to provide real-time carpool matching and also to encourage an increase from two to three person carpools, to meet the current requirement on the Katy HOV lane during the morning and afternoon peak hours.

The two components of the *Smart Commuter* Operational Test, the advanced traffic and transit information in the I-45 North corridor and the comprehensive employer-based instant rideshare matching service in the I-10 West corridor, are being implemented and evaluated over a five year period. As noted, funding has been secured for the first phase of the operational test which includes finalizing the local evaluation plan, selecting the technology to provide the real-time information to individuals in their homes and work places, implementing the operational test, and completing the first six month and first year evaluations.

The *Smart Commuter* Operational Test represents the first major test of the use of ITS technologies to encourage an increase in average vehicle occupancy. It provides an opportunity to test the ability to collect, process, and transmit current traffic and transit information and instant rideshare matching services to individuals in their homes and work places through a variety of advanced technologies. The *Smart Commuter* Operational Test also provides an opportunity for highway and transit interests to work together to better manage the overall transportation system through the innovative application of ITS technology, enhanced information, and improved services.

### **Organization of the Houston *Smart Commuter* ITS Operational Test**

The development of the Houston *Smart Commuter* ITS Operational Test has been accomplished through the joint efforts of METRO, TxDOT, FHWA, FTA, HGAC, and TTI. This multi-agency coordinated approach is also being used to implement, monitor, and evaluate the operational test. This section outlines the overall organization of the operational test and the roles and responsibilities of the different agencies.

METRO, TxDOT, FHWA, and FTA have agreed on the overall organization structure for implementing and evaluating the Houston *Smart Commuter* ITS Operational Test. METRO is providing the overall project management responsibility for the operational test and has appointed a project manager. TxDOT is involved throughout the project and is coordinating with METRO on key activities. FTA and FHWA are providing federal oversight. TTI is responsible for the local evaluation and ongoing technical assistance. The roles of each agency are highlighted next.

**METRO.** Houston METRO is responsible for the overall management of the operational test. METRO has appointed a project manager and is providing other support functions for the project. METRO has received funding from FTA for a portion of the project and has executed an agreement with TxDOT for the pass through of funding from FHWA.

**TxDOT.** TxDOT is involved in all aspects of the operational test. TxDOT has received funding from FHWA for a portion of the project and has executed an agreement with METRO to pass these funds through. TxDOT has also been responsible for developing the real-time traffic information system that forms a major part of the I-45 North component.

**U.S. DOT — FHWA and FTA.** FHWA and FTA representatives are providing federal oversight and guidance throughout the operational test and participate in periodic meetings as appropriate. Although FTA has the overall federal monitoring responsibilities for this operational test, these responsibilities are being shared and coordinated with FHWA, especially the FHWA Austin office.

**TTI.** TTI is responsible for conducting the local evaluation of the operational test under contract to METRO and TxDOT. This includes finalizing the study design and local evaluation program (7), and completing the ongoing data collection, monitoring, and evaluation activities. TTI is also responsible for coordinating the local evaluation with the national evaluation being sponsored by FTA. The Volpe National Transportation Systems Center is administering the national evaluation. The Volpe Center is using Multisystems to conduct the national evaluation of the Houston *Smart Commuter* ITS Operational Test. TTI is also providing ongoing technical assistance for the project.



## CHAPTER THREE

### FY 1996 Accomplishments and Current Project Status

A number of activities were completed on the various elements of the Houston *Smart Commuter* Operational Test during FY 1996. On the I-45 North bus components, major activities included selecting the vendors and developing the commuter information delivery system, recruiting participants, and collecting the base line data for the local evaluation. The I-10 West carpool component is being coordinated with the testing of the new METRO rideshare computer and other activities. This chapter highlights the major accomplishments and activities completed on the operational test during FY 1996.

#### **I-45 North Bus Component**

Activities completed on the I-45 North Bus component of the Houston *Smart Commuter* Operational Test during FY 1996 focused on the selection of the vendors for the commuter information delivery system, developing and integrating the hardware and software for the information delivery system, recruiting participants, and collecting and analyzing the baseline data for the local evaluation. These activities are summarized next.

#### *Information Delivery System*

As noted previously, METRO has overall project management responsibilities on the Houston *Smart Commuter* Operational Test. Thus, the procurement of the in-home and in-office information delivery system followed METRO policies and procedures. A joint working group of METRO, TxDOT, and TTI representatives developed an initial draft Request for Technical Proposal (RFTP) in 1993 and 1994. This document was modified to meet the METRO procurement requirements and to provide more flexibility on potential technologies.

METRO used a two-step procurement process to select the contractor to develop the information delivery system. Under this procurement method, the first step involves the request, submission, and evaluation of technical proposals to determine if the proposer meets the minimum requirements outlined in the RFTP and if the proposer is qualified to perform the work. In the second step, METRO issues formal invitations to bid only to those firms that successfully completed the first step and that are, in METRO's opinion, technically and financially capable of performing the required work.

METRO issued the RFTP for the information delivery system in March, 1995. The RFTP was advertised in local and national trade publications, magazines, and newspapers. In addition, a variety of mailing lists were used to notify potential bidders of the project. A pre-proposal meeting was held in March, 1995, for interested vendors. METRO staff reviewed the RFTP, and potential bidders had the opportunity to ask questions concerning the project. A period for written questions provided additional opportunities for vendors to clarify specific issues. A letter to all vendors attending the pre-proposal conference provided answers to these questions.

METRO received four proposals in response to the RFTP. One of these was determined not to meet all of the specifications outlined in the RFTP and was eliminated from further consideration. The three remaining teams made formal presentations to METRO and TxDOT staff. The three teams were then invited to submit formal bids on the information service delivery system. METRO and TxDOT staff evaluated the final bids, and a recommendation was made to the METRO Board of Directors in the Fall of 1995.

The Board approved the selection of the TRW team at its November 1995 meeting. A notice to proceed was authorized by METRO and a kick-off meeting with representatives from the TRW team, METRO, TxDOT, and TTI was held in December. The TRW team is comprised of the following firms:

TRW — Principal,  
S&B Infrastructures, Houston,  
Fastline Traffic, San Francisco,  
Celebration Computer Systems, Houston,  
Software Decisions, Inc., Houston,  
A&W Couriers, Houston, and  
CUE Networks Corporation, Houston.

The commuter information delivery system includes two elements — a handheld personal information device and an interactive telephone system. The TRW team developed components of the two systems during 1996. The following description summarizes the basic elements of each system and the activities completed by the TRW team.

- **Handheld Personal Information Device.** Traffic and transit information will be provided to *Smart Commuter* participants through the use of the Sony Magic Link™ Personal Intelligent Communicator (PIC)-1000. The Magic Link™ is a commercially available battery-operated handheld personal information device. The LCD touch screen allows users to access a wide-range of programs and information. The basic Magic Link™ unit includes functions such as a datebook, a notebook, a calculator, a spreadsheet, a dictionary, games, and other capabilities. It also includes a communication platform that will allow users to access telephone, e-mail, fax, pager, and other devices.

The TRW team used the Magic Link™ as the basic platform for the operational test. A number of enhancements have been made to the Magic Link™ for the project. First, information on METRO services has been added, including bus routes, schedules, and fares. Maps showing the locations of the park-and-ride lots in the I-45 North corridor, as well as in the downtown area, were developed and incorporated into the Magic Link™.

Participants will also be able to access real-time traffic information for the I-45 North HOV lane and Freeway, as well as the Hardy Toll Road. The real-time traffic information from the TranStar facility is being sent through an FM

Subcarrier subsystem. To obtain the real-time information, a participant attaches a radio antenna to the Magic Link™. The real-time information is updated every ten seconds or as needed.

The Magic Link™ screen automatically defaults to a map of the I-45 North corridor. The user can then access more detailed screens with specific information on travel speeds, travel times, and other information. Icons show the travel speeds and travel times for the I-45 North HOV lane, the general purpose freeway lanes, and the Hardy Toll Road. Other screens are accessed by simply touching the face of the Magic Link™. In addition, participants will be able to complete the periodic surveys and travel diaries needed for the local evaluation using the Magic Link™.

All of these elements have been developed by the TRW team. The specific components unique to the *Smart Commuter* Operational Test include the system interface document to the TranStar real-time traffic database provided by TxDOT, the link through the FM subcarrier, the design of the maps and icons for the traffic and transit information, the METRO route, schedule and fare information, and user surveys and travel diaries.

- **Interactive Telephone System.** Participants will also be able to access traffic and transit information by telephone. The telephone system is being provided in response to concerns that the tall buildings in the downtown area may block the signal from the FM subcarrier to the Magic Link™ units. The telephone system will ensure that participants have continuous access to the traffic and transit information.

Celebration Computer Systems of the TRW team developed the interactive telephone system. The system utilizes pre-recorded speech files which are produced and stored digitally. *Smart Commuter* participants access the system by calling a local telephone number. After a welcome message, participants are asked to enter their personal identification number (PIN). Participants may then obtain information on travel times, bus routes and schedules, and construction activities for the I-45 North HOV lane, the freeway lanes, and the Hardy Toll Road. The information is updated every ten seconds or as needed so that callers receive current traffic conditions and scheduled departure times for the next few buses. The system provides inbound information in the morning and outbound information in the afternoon. A caller can either step through the various messages or go directly to specific information.

The TRW team first developed a flow chart outlining the various elements in the interactive telephone system. This diagram was then used to complete the other steps, which included establishing the interface with the TranStar real-time traffic database, recording the voice messages, developing the time clock, and other activities.

### *Participant Recruitment*

A number of techniques were used to recruit participants for the operational test. The recruitment process focused on commuters who lived in the Kuykendahl park-and-ride lot market area and who work in downtown Houston or in areas with good bus service from the corridor. The following techniques were used by METRO in the participant recruitment process.

- **Direct Recruitment with Downtown Employers.** METRO staff distributed information on the *Smart Commuter* Operational Test to approximately 90 employers in the downtown area. Information on the program was also provided to the Downtown Houston Association.
- **Changeable Message Signs.** Short messages were displayed on the changeable message signs located along the I-45 North Freeway requesting volunteers for the program. A telephone number was provided so that interested commuters could call to obtain more detailed information.
- **Press Releases.** METRO issued a series of press releases describing the *Smart Commuter* Operational Test and the need for participants. The press releases generated newspaper articles, television reports, and radio stories, which included the METRO contact person's telephone number.
- **Information Booths.** METRO staff set up booths at the Woodlands Mall in the I-45 North corridor and at the Park Mall in the downtown area. Information was distributed to potential participants during the lunch hour at the Park Mall and on a Saturday at the Woodlands Mall.

Potential participants were identified through all of these approaches. As of mid-August, 1996, approximately 550 participants have registered to participate in the test group. METRO and the TRW team have developed the training materials and established the approach to be used in providing the Magic Link™ unit to the participants. As discussed in Chapter Four, it is anticipated that these activities will occur in December. Very few individuals have expressed interest in participating in the control group, however. As a result, the approach being used with the control group has been modified. The modified control group technique is discussed in the next section.

### *Baseline Data Collection for the Local Evaluation*

During FY 1996, TTI researchers collected and analyzed a wide-range of information from METRO, TxDOT, and previous TTI studies to establish the baseline conditions before implementation of the operational test. The data identified in Table 1 were collected, analyzed, and included in the local evaluation to document conditions before the start of the operational test.



**Table 1. Data Collected in FY 96 for the Baseline Conditions**

Information	Source	Time Period	Description
Bus Assignments	METRO	Quarterly- December 1990 to March 1996.	Daily revenue miles and revenue hours for Kuykendahl and Spring park-and-ride lot buses.
Transit Operating Cost	METRO	Quarterly- October 1990 to March 1996.	Daily average bus operating costs for the Kuykendahl and Spring park-and-ride lots.
Bus Ridership	METRO	Monthly- October 1990 to April 1996.	Average weekday passenger boardings at the Kuykendahl and Spring park-and-ride lots.
Passenger Fare Revenue	METRO	Monthly- October 1990 to March 1996.	Average weekday fare revenue for the Kuykendahl and Spring park-and-ride lots.
Transit Pass Utilization	METRO	Monthly- October 1990 to April 1996.	Number of passes and commuter tickets used at the Kuykendahl and Spring park-and-ride lots.
Park-and-Ride Lot Utilization Level	METRO	Quarterly- December 1990 to March 1996.	Number of vehicles parked at the Kuykendahl and Spring park-and-ride lots.
Person Movement by Mode	TTI*	Bi-annual- March 1990 to March 1996.	Peak-hour, peak-direction measurement of mainlanes and HOV lane taken at West Little York.
Vehicle Movement by Mode	TTI*	Bi-annual- March 1990 to March 1996.	Peak-hour, peak-direction measurement of mainlanes and HOV lane taken at West Little York.
Average Peak Hour Speed	TTI*	Bi-annual- March 1990 to September 1995.	Average speeds for mainlanes and HOV lane between Shepherd and Hogan.
Average Travel Time	TTI*	Bi-annual- March 1990 to September 1995.	Average travel time for mainlanes and HOV lane between Shepherd and Hogan.
Accident Rate per Lane	TTI*	Monthly- January 1990 to December 1995.	Per lane accident data for mainlanes and HOV lane.
Efficiency per Lane	TTI*	Bi-annual- March 1990 to September 1995.	Mainlane, HOV lane, and combined per lane efficiencies for segment between Shepherd and Hogan.

\*Information collected as part of TxDOT-sponsored research study.

As mentioned previously, the approach for the control group in the I-45 North corridor was modified during the year. The control group is intended to help identify the commute behavior of individuals who do not have access to the real-time information provided through the operational test, but who do have access to radio and television traffic reports and other sources of information. It was realized in the initial operational test study design that recruiting 700 individuals to participate in the control group might be difficult. Unlike the test group, who are provided with a Sony Magic Link™ and access to the telephone information system, the control group receives no real benefits from the project, but completes the surveys and travel diaries. Recruiting 700 individuals who live and work in the targeted area proved to be a problem. As a result, a modified approach was developed for the control group on the I-45 North component on the *Smart Commuter Operational Test*.

The modified approach builds on techniques used successfully in the past by TTI, METRO, and TxDOT on other projects. It also obtains the desired information and maintains the integrity of the control group and the operational test. The revised approach will identify commuters traveling in the general purpose lanes on I-45 North. These individuals will be sent a letter explaining the project and will be asked to complete a survey and travel diary at the start of the project and periodically throughout the operational test. The surveys will be conducted in the same general time frame as the surveys of the test group; before the start of the operational test, at six months, at one year, at two years, and at three years. The following highlights the major steps in this process:

- TTI researchers will record license plate numbers of vehicles traveling in the general purpose lanes on the I-45 North Freeway during the morning peak-period;
- The licence plate numbers will be sent to the Department of Motor Vehicles (DMV), and a list of names and addresses will be provided to TTI from DMV;
- TTI researchers, working with METRO and TxDOT staff, will finalize the letter, survey, and travel diary to be sent to the individuals who will be requested to participate in the operational test. A self-addressed stamped return envelope will be provided. It is anticipated that approximately 2,000 surveys will be sent to help ensure an adequate ongoing sample size;
- TTI will mail the surveys and travel diaries to the individuals;
- TTI researchers will code and analyze the survey responses, along with those from the test group, as part of the overall local evaluation, and
- Surveys and travel diaries will be sent again at six months, one year, two years, and three years. The same procedure for mailing, coding, and analyzing the results will be used at each of these time periods.

## **I-10 West Carpool Component**

The major activities completed on this element of the Houston *Smart Commuter* Operational Test focused on coordinating the delivery and testing of METRO's new rideshare computer and identifying approaches for its use in the project. This section summarizes these activities.

### *New METRO Rideshare Computer*

METRO purchased a new rideshare matching software and hardware system in 1994. The new rideshare computer, which was designed and developed by GDE Systems, was delivered to METRO in the Spring of 1995. A few issues were identified with the system during the acceptance testing period. These concerns, which related primarily to the map database, were addressed by METRO and GDE Systems during 1995 and 1996, and the new rideshare system is now in use.

Potential approaches for using the new rideshare computer with the I-10 West component of the *Smart Commuter* Operational Test were identified and discussed during FY 1996. A preliminary outline was developed for an initial operator assisted test. This approach focuses on a large employer or group of employers in the Post Oak/Galleria area. Employees would be able to access an operator assisted real-time rideshare matching system.

A draft registration form was developed to include the additional items needed for the *Smart Commuter* Operational Test. An approach was outlined to modify the rideshare database to accommodate this information, and locating a remote access computer at the offices of participating employers was discussed.

### **Ongoing Coordination of the Local and National Evaluations**

TTI researchers continued to coordinate activities related to the local and national evaluations of the *Smart Commuter* Operational Test during FY 1996. In addition to collecting and analyzing the baseline data described previously, TTI researchers periodically consulted with representatives from Cambridge Systematics and Multisystems, the consulting firms responsible for the national evaluation. Periodic telephone conversations were held to discuss the status of various elements of the operational test and to ensure ongoing coordination between the local and national evaluation.



## CHAPTER FOUR

### Anticipated Future Activities

---

The previous chapter presented a summary of the activities conducted on the Houston *Smart Commuter* Operational Test during FY 1996 and the current status of the project. This chapter briefly summarizes the anticipated schedule for FY 1997 and future activities. The schedule of activities for the I-45 North component are presented first, followed by the I-10 West component.

#### **I-45 North Bus Component**

The major activities anticipated in FY 1997 on the I-45 North portion of the Houston *Smart Commuter* Operational Test include completing the functional and acceptance tests of the information delivery system, finalizing the recruitment process and conducting the training sessions, completing the pre-test participant surveys and travel diaries, conducting the pre-test control group surveys and travel diaries, implementing the operational test, analyzing the before surveys and data, and conducting the six-month data collection, participant and control group surveys, and the local evaluation. Each of these items is briefly described next, and the anticipated schedule is presented in Table 2.

**Table 2. Anticipated FY 1997 Schedule for I-45 North Component**

<b>Activity</b>	<b>Schedule</b>
Conduct Functional and Acceptance Tests	September - November 1996
Finalize Recruitment Process and Conduct Training	September - November 1996
Conduct Pre-Test Participant Surveys	September - November 1996
Conduct Pre-Test Control Group Surveys	September - November 1996
Implement Operational Test	December 1996
Analyze Before Surveys and Data	November - December 1996
Conduct Six-Month Data Collection, Surveys, and Local Evaluation	May - August 1997

- **Conduct Functional and Acceptance Test of the Information Delivery Systems.** The performance and acceptance tests of the information delivery systems will be conducted in this step. Activities include the 15 day functional test of the Magic Link™ and telephone system hardware and software components, and the 30 day acceptance test.
- **Finalize Test Group Recruitment and Conduct Training.** Recruitment of participants for the I-45 North bus component will be completed in early September. As of mid-August, approximately 550 individuals had registered to participate in the operational test. Recruitment activities will continue during August and September to obtain the desired number of individuals. It is anticipated that training for the participants will be scheduled in September. METRO and the TRW team will hold training sessions in downtown Houston and at selected locations in the corridor. Participants will learn how to use both the Magic Link™ units and the interactive telephone system at these sessions.
- **Conduct Pre-Test Participant Surveys.** Individuals participating in the test group will complete surveys and travel diaries prior to the start of the project. The surveys will be distributed to participants before the training session. Providing a completed survey will be a condition for receiving a Magic Link™ unit at the training session.
- **Conduct Pre-Test Control Group Surveys.** Using the modified approach described previously, TTI researchers will conduct the surveys of the control group. Steps in this process will include reading license plates of vehicles traveling in the I-45 North Freeway general-purpose lanes, obtaining addresses through the DVM, and mailing the surveys and travel diaries.
- **Implement the Operational Test.** Full implementation of the I-45 North component will occur upon successful completion of the functional and acceptance tests. It is anticipated that the operational test will be initiated in December 1996.
- **Analyze Before Surveys and Data.** TTI researchers will compile, reduce, and analyze the participant and control group surveys and travel diaries in this step. The results of the surveys and travel diaries will be compiled with the other baseline data to establish the conditions and travel patterns prior to implementation of the operational test.
- **Conduct Six-Month Data Collection, Surveys, and Local Evaluation.** Participants in the test and control groups will be asked to complete surveys and travel diaries after the project has been in operation for six months. Updated data on transit and traffic conditions in the corridor will also be obtained. The survey and data collection results will be analyzed and compared to the baseline data and pre-test surveys. TTI researchers will analyze the results and will complete a six month evaluation report.

In addition to these major activities, METRO, TxDOT, and TTI staff will also monitor the I-45 North component and address any issues that may arise. Ongoing communication and coordination will also occur with the national evaluation program.

### **I-10 West Carpool Component**

The major activities anticipated to be completed in FY 1997 on the I-10 West component include finalizing the initial test concept, recruiting the test companies and employees, completing the before data collection, and initiating the operational test. Each of these items is summarized next. Table 3 presents the anticipated schedule for these activities.

- **Finalize Initial Test.** The approach to be used in the initial phase of the I-10 West component will be finalized in this step. The revised rideshare registration forms and any enhancements to the METRO rideshare computer to accommodate the demands of the operational test will be completed. The estimated schedule for these activities is approximately four months.
- **Recruit Initial Test Companies and Employees.** It is anticipated that one to three large companies in the Post Oak/Galleria area will be recruited to participate in the initial phase of the I-10 West project. Employees within these companies will then register for the real-time matching system. Information on these individuals will be entered into the database, and the operation of the system will be tested. It is anticipated that these activities will take approximately four months.
- **Complete Before Data Collection.** The before data collection will begin approximately four months before the anticipated start of the operational test. The measures of effectiveness data collection activities and procedures outlined in the local evaluation plan will guide this effort. The before data collection activities will include travel surveys for the test and sample groups, current bus ridership and HOV lane information, and other relevant information.
- **Initiate Operational Test.** It is anticipated that the I-10 West component of the operational test will begin in April or May of 1997.

**Table 3. Anticipated FY 1997 Schedule for I-10 West Component**

<b>Activity</b>	<b>Schedule</b>
Finalize Initial Test	September-December 1996
Recruit Initial Test Companies and Employees	January-April 1997
Complete Before Data Collection	January-April 1997
Initiate Operational Test	April/May 1997





## REFERENCES

---

1. Hanks, James W. and Timothy J. Lomax. *Roadway Congestion in Major Urban Areas 1982 to 1988*. College Station, Texas: Texas Transportation Institute, 1990.
2. Texas Transportation Institute. *Houston Smart Commuter IVHS Demonstration Project: Review of Existing Market Research Information*. College Station, Texas: Texas Transportation Institute, October 1990.
3. Texas Transportation Institute. *Houston Smart Commuter IVHS Demonstration Project: Bus and Carpool Concept Definition*. College Station, Texas: Texas Transportation Institute, February 1991.
4. Gelb Consulting Group, Inc. *Exploratory Research on the Smart Commuter Concept*. College Station, Texas: Texas Transportation Institute, March 1991.
5. Texas Transportation Institute. *Houston Intelligent Transportation Systems*. College Station, Texas: Texas Transportation Institute, April 1991.
6. Turnbull, Katherine F. *Houston Smart Commuter IVHS Demonstration Project: Concept Design and Implementation Program Outline*. College Station, Texas: Texas Transportation Institute, June 1991.
7. Turnbull, Katherine F. and Sarah M. Hubbard. *Houston Smart Commuter ITS Operational Test and Local Evaluation Program*. College Station, Texas: Texas Transportation Institute, 1994.