

# **Metropolitan Transportation Management Center**

**A CASE STUDY**

***Houston TranStar***



**Maximizing Safety and Mobility  
for the Public**

October 1999

# Foreword



Dear Reader,

We have scanned the country and brought together the collective wisdom and expertise of transportation professionals implementing Intelligent Transportation Systems (ITS) projects across the United States. This information will prove helpful as you set out to plan, design, and deploy ITS in your communities.

This document is one in a series of products designed to help you provide ITS solutions that meet your local and regional transportation needs. We have developed a variety of formats to communicate with people at various levels within your organization and among your community stakeholders:

- **Benefits Brochures** let experienced community leaders explain in their own words how specific ITS technologies have benefited their areas;
- **Cross-Cutting Studies** examine various ITS approaches that can be taken to meet your community's goals;
- **Case Studies** provide in-depth coverage of specific approaches taken in real-life communities across the United States; and
- **Implementation Guides** serve as "how to" manuals to assist your project staff in the technical details of implementing ITS.

ITS has matured to the point that you don't have to go it alone. We have gained experience and are committed to providing our state and local partners with the knowledge they need to lead their communities into the next century.

The inside back cover contains details on the documents in this series, as well as sources to obtain additional information. We hope you find these documents useful tools for making important transportation infrastructure decisions.

A handwritten signature in black ink, appearing to read "Christine M. Johnson".

Christine M. Johnson  
Program Manager, Operations  
Director, ITS Joint Program Office  
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A handwritten signature in black ink, appearing to read "Edward L. Thomas".

Edward L. Thomas  
Associate Administrator for  
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Federal Transit Administration

## NOTICE

The United States Government does not endorse products or manufacturers. Trademarks or manufacturers' names appear herein only because they are considered essential to the objective of this document.

The following case study provides a snapshot of Houston’s TranStar transportation management center. It follows the outline provided in the companion document, *Metropolitan Transportation Management Center Concepts of Operation—A Cross Cutting Study*, which describes operations and management successful practices and lessons learned from eight transportation management centers in the United States and Canada.

This case study reflects information gathered from interviews and observations at the TranStar transportation management center. The authors appreciate the cooperation and support of the Texas Department of Transportation and its partners in the development of this document.

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## **Preface**

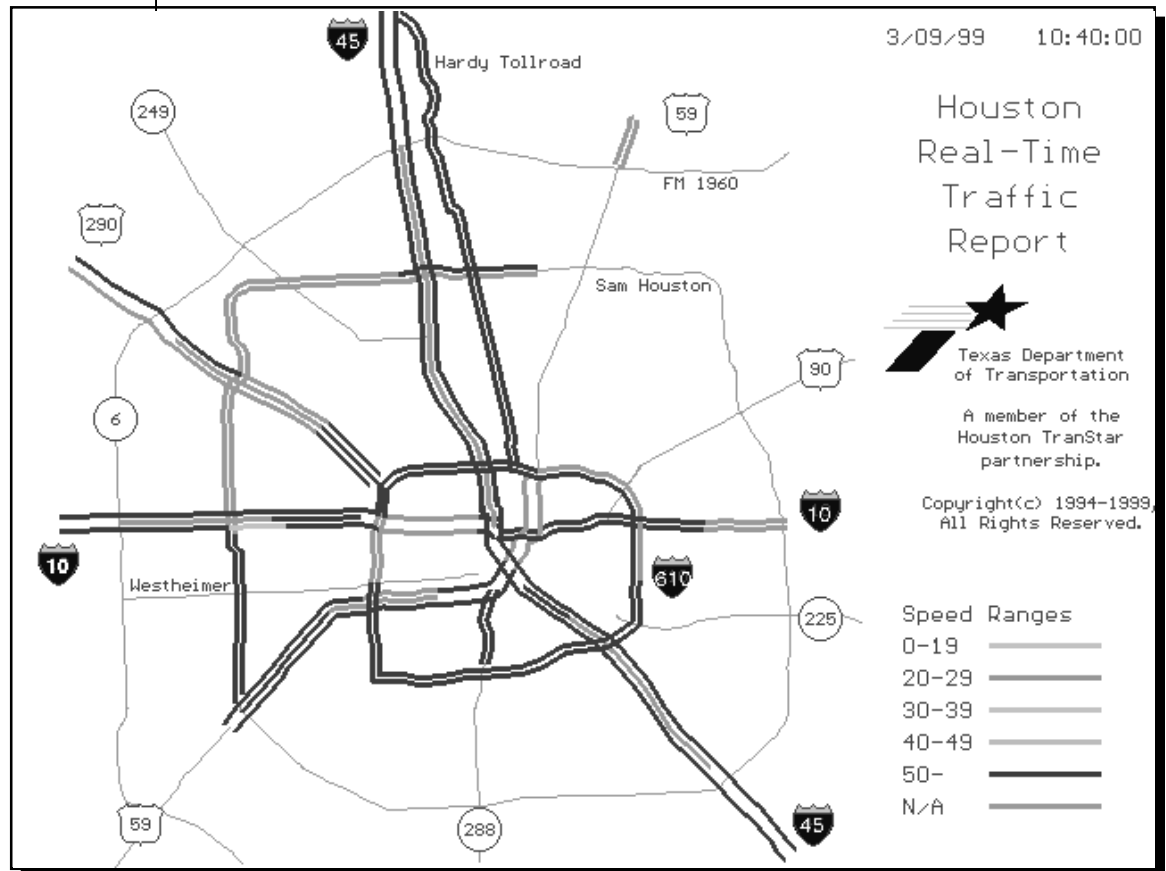
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# Background

Houston TranStar is a multiagency transportation management center (TMC) providing traffic management, traveler information, and emergency management for the greater Houston area and Galveston. Agencies involved include the Texas Department of Transportation (Tx DOT), the City of Houston, Harris County, and Houston Metro. (Houston and Harris County Offices of Emergency Management are also present.) The facility opened officially in April 1996, although interim operations had been under way since December 1995 (and earlier in an interim leased facility).

The mission of Houston TranStar is to maximize safety and mobility for the public. The objectives include the following:

- Manage emergency response
- Promote emergency management awareness and public safety
- Promote the benefits of Houston TranStar
- Increase efficiency and improve productivity
- Increase mobility, manage congestion, and enhance safety.



# Design and Implementation

General system design parameters for TranStar are the following:

- The control center is a 54,000 square-foot facility located on the west side of Houston, with immediate access to I-10 and the I-610 beltway. There are roughly 75 prime-shift personnel in the facility. Expansion of the facility is being considered to accommodate additional components of the four core agencies. Cost for the center and its contents (including Advanced Traffic Management System software) was \$13.7 million.
- A typical operator console has a computer workstation with two 19-inch monitors, four 9-inch video monitors, communications panel with stalk microphone, and a telephone. The front of the control room features four 120-inch video screens, which can be divided into multiple images.
- TranStar resources include variable message signs, highway advisory radio, loop detectors, closed circuit television, lane control signals, ramp meters, a motorist assistance patrol, and an automatic vehicle location-based congestion detection system extending beyond the detectorized area. An extensive (3,000 intersection) traffic signal system upgrade/replacement is also under way.
- Incidents are detected by visual monitoring of congestion level on the area map, through cellular 911 (to Harris County) calls, reports from law enforcement officers and the motorist assistance patrol, or by visual monitoring of scrolling camera images. Incidents are entered manually in the computer system, which logs all data received and actions taken. Operators can choose from categories of variable message sign messages, edit the messages, and initiate them for selected periods of time. Changes in lane control signals are implemented similarly. Highway advisory radio messages are created and recorded manually at a separate workstation. Video control is maintained from a separate control panel at the operator console.
- Traffic media have broadcast booths behind the control room.
- Houston METRO, the transit service provider in Harris County, Texas, is one of the four primary partners in TranStar. Its personnel perform bus fleet dispatch and management from within the TranStar control room, providing full access to all TranStar information and capability. METRO also performs project management, special events planning, HOV facility operation, and enforcement functions from TranStar.

*TranStar operations and maintenance personnel work together to assess and repair field equipment.*

*Houston TranStar's TMC is staffed by city, county, transit, and state personnel who cooperate on all aspects of transportation management.*



# Design and Implementation

## Method of Implementation

- Conventional design and construction contracts have been used for control center facility and field equipment implementations, with much earlier design done by Tx DOT personnel. The transportation management computer system was developed and supported by a consultant. The automatic vehicle location system was designed by Texas Transportation Institute, which operates and maintains it.
- Metro Traffic is being considered as the sole information service provider under a no-cost contract to the agencies.

## Testing

- Integration occurs in three stages—device to communications hub, hub to control center computer room, and computer room to workstation. Testing is required in construction contracts; Tx DOT inspectors witness the testing.
- Operational readiness testing was performed by operations personnel, project staff, and the computer system developer. A test database exists to support such testing.

## Training

- The computer system developer provided training for initial operations personnel. Training for new personnel is primarily on the job. Additional training is provided as new functions are brought online. Refresher training is performed. New operators take about 1 month to become efficient.

## Documentation

- Memoranda outline operator roles and responsibilities. Operational procedures are developed on an as-needed basis. New procedures are prepared as new organizational units move to the control room.
- An indexed online Help function is available.
- “As-built” plans and equipment documentation for field devices are retained at the nearby Tx DOT district offices.
- The computer system provides an alphabetically indexed Help function with information commands, system functions, and use of the equipment.

# Operations

- The system covers 108 centerline miles of interstate, with additional centerline miles monitored by the automatic vehicle location congestion monitoring system. Eventual coverage will be 160 centerline miles.
- The control room is staffed by most agencies 24 hours a day, 7 days a week; total morning peak control room staff is 14, including all agencies. Tx DOT traffic management stations are staffed in three shifts with a 30-minute overlap. Tx DOT has three traffic management operators during prime shifts and an additional dedicated operator for ramp metering. Tx DOT is responsible for freeway mainlanes, Houston Metro for HOV lanes, and the city and county for their respective frontage roads and arterials.
- Tx DOT operations personnel are involved extensively in determining field equipment status, communicating this information to maintenance, and verifying repairs.
- Coordination between the agencies is mostly in person or by telephone. Agencies with field personnel communicate with them via two-way radio. Tx DOT dispatches contract wreckers by telephone.
- Although device responsibility is clearly delineated by agency, agencies share access to variable message signs and closed circuit television.
- County and Houston Metro law enforcement are located in the control room for direct interface.
- Tx DOT has retained a consultant to evaluate coordination and integration between the six control centers statewide.
- Tx DOT operations coordinates by phone and e-mail with Tx DOT maintenance, which is located nearby.
- The TranStar organizational structure is unique. Operations personnel for each agency report to agency-specific on-site managers, who in turn report to a TranStar Leadership Committee, which reports to the TranStar Executive Committee. The role of the TranStar Director, funded jointly by the agencies, is primarily to facilitate interaction between agencies. Managerial personnel are accessible by pager when they are off site.
- The facility houses a separate emergency management center from which emergency operations occur. Reports of emergency operations regarding major fires or severe weather cited outstanding benefits of collocating emergency and transportation management personnel.
- About 20 special events are planned by Houston Metro every year, including some lasting several days. Special events plans are extensive and detailed, incorporating inputs from many involved agencies.

## Workload and Performance

## Coordination

## Conflict Resolution

## Nonstandard Operations

# Maintenance

## Fault Detection and Correction

- The system automatically indicates the status of some equipment in which it detects loss of communication or malfunction by changing the device icon color on the system maps . Primary fault detection is performed by operations, who report via phone and e-mail to maintenance, and who receive reports of repair assignments and status.

## Configuration Management

- The system contains a challenging number of different brands and models of device for each type of equipment. This increases the need for more technical expertise, additional stocking of spare parts, and continued efforts to test various devices.

## Logistics

- Tx DOT maintenance uses an automated maintenance management system and e-mails equipment status and actions between operations and maintenance.

## Maintenance

- Device warranties are required under most construction contracts. Tx DOT has also procured maintenance contracts for some equipment. The Texas Transportation Institute, which operates and maintains the automatic vehicle location system, also has subcontracted its maintenance.

*TranStar staff prepare detailed transportation management plans for the complex and massive special events occurring in the Houston area.*



**For further information, contact:**

## Federal Highway Administration Resource Centers

### **Eastern Resource Center**

10 S. Howard Street, Suite 4000 – HRA-EA  
Baltimore, MD 21201  
Telephone 410-962-0093

### **Southern Resource Center**

61 Forsyth Street, SW  
Suite 17T26 – HRA-SO  
Atlanta, GA 30303-3104  
Telephone 404-562-3570

### **Midwestern Resource Center**

19900 Governors Highway  
Suite 301 – HRA-MW  
Olympia Fields, IL 60461-1021  
Telephone 708-283-3510

### **Western Resource Center**

201 Mission Street  
Suite 2100 – HRA-WE  
San Francisco, CA 94105  
Telephone 415-744-3102

## Federal Transit Administration Regional Offices

### **Region 1**

Volpe National Transportation Systems Center  
Kendall Square  
55 Broadway, Suite 920  
Cambridge, MA 02142-1093  
Telephone 617-494-2055

### **Region 2**

1 Bolling Green  
Room 429  
New York, NY 10004  
Telephone 212-668-2170

### **Region 3**

1760 Market Street, Suite 500  
Philadelphia, PA 19103-4124  
Telephone 215-656-7100

### **Region 4**

Atlanta Federal Center  
61 Forsyth Street, SW  
Suite 17T50  
Atlanta, GA 30303-3104  
Telephone 404-562-3500

### **Region 5**

200 West Adams Street  
24<sup>th</sup> Floor, Suite 2410  
Chicago, IL 60606-5232  
Telephone 312-353-2789

### **Region 6**

819 Taylor Street  
Room 8A36  
Fort Worth, TX 76102  
Telephone 817-978-0550

### **Region 7**

6301 Rockhill Road, Suite 303  
Kansas City, MO 64131-1117  
Telephone 816-523-0204

### **Region 8**

Columbine Place  
216 16<sup>th</sup> Street, Suite 650  
Denver, CO 80202-5120  
Telephone 303-844-3242

### **Region 9**

201 Mission Street, Suite 2210  
San Francisco, CA 94105-1831  
Telephone 415-744-3133

### **Region 10**

Jackson Federal Building  
915 Second Avenue, Suite 3142  
Seattle, WA 98174-1002  
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## Notes

# THIS DOCUMENT IS ONE IN A SERIES OF PRODUCTS THAT ADDRESS ITS ISSUES PERTINENT TO A VARIETY OF AUDIENCES

ELECTED AND APPOINTED OFFICIALS • SENIOR DECISION MAKERS  
TRANSPORTATION MANAGERS • TECHNICAL EXPERTS

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ADDITIONAL TRANSPORTATION STAKEHOLDERS

## *Products Available in This Series:*



—**Benefits Brochures** quote how ITS technologies have benefited specific areas.



—**Technical Reports** include results from various Field Operational Tests.



—**Cross-Cutting Studies** present current data from related ITS applications.



—**Implementation Guides** assist project staff in the technical details of implementing ITS.



—**Case Studies** provide in-depth coverage of ITS applications in specific projects.

## *ITS Topics Addressed in This Series:*

- COMMERCIAL VEHICLE OPERATIONS
- EMERGENCY SERVICES
- ENABLING TECHNOLOGIES
- EMISSIONS MANAGEMENT
- FREEWAY AND ARTERIAL MANAGEMENT
- PLANNING AND INTEGRATION
- REAL-TIME TRAVELER INFORMATION
- TRANSIT, TOLL, AND RAIL MANAGEMENT
- WEATHER INFORMATION FOR TRAVELERS AND MAINTENANCE

FOR A CURRENT LISTING OF AVAILABLE DOCUMENTS, PLEASE VISIT OUR WEB SITE AT:

[www.its.dot.gov](http://www.its.dot.gov)

## ITS WEB RESOURCES

ITS Joint Program Office:

<http://www.its.dot.gov>

ITS Cooperative Deployment Network (ICDN):

<http://www.nawgits.com/jpo/icdn.html>

ITS Electronic Document Library (EDL):

<http://www.its.fhwa.dot.gov/cyberdocs/welcome.htm>

ITS Professional Capacity Building Program Catalogue:

<http://www.its.dot.gov/pcb/98catalg.htm>

Federal Transit Administration:

<http://www.fta.dot.gov>

## INTELLIGENT TRANSPORTATION SYSTEMS



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400 7th Street, SW  
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Facsimile: (202) 493-2027

Federal Transit Administration  
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