# USE OF PROBE VEHICLES TO MEASURE TRAVEL TIMES ON URBAN FREEWAYS IN REAL TIME 

by

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## Cellular Telephone/Probe Study

The Texas Department of Transportation (TxDOT) proposed to initiate a study that would provide travel time information to a central office for the purpose of operating changeable message signs. The study would utilize cellular telephone communications from volunteer drivers in the North Houston Corridor to collect the information for a one year period. During that time an Automatic Vehicle Identification (AVI) System would be designed and installed to replace the cellular telephone communications for travel times. Appendix A is a copy of the Proposal for this study.

The project was approved and the Texas Transportation Institute (TTI) began the study in early 1991. The two cellular telephone companies in Houston were contacted to determine if they were interested in participating in the project. The Houston Cellular Telephone Company agreed to provide free air time for the study for one year, provided that 200 new cellular telephone subscribers were provided by the study.

TTI developed specifications for the purchase of 200 telephones, and bids were received from 4 local companies that were affiliated with Houston Cellular. American Cellular won the award for providing the 200 units, and installing and maintaining the equipment for one year. The terms of the bid are provided in Appendix B.

TTI contacted several major employers in the Central Business District of Houston to determine if presentations could be made to their employees to ask them to volunteer the services of calling in the traffic information, in exchange for a free telephone and free air time for one year. Several companies responded favorably. A one page handout was distributed to the potential participants (Appendix C) and one company, Exxon USA, developed notices that were placed on bulletin board (Appendix D) and displayed through their computer system.

At meetings arranged during lunch breaks, TTI staff explained the study, and obtained information from those persons who were interested in participating. (Appendix E) When a person decided to join the study, an agreement was signed between the individual and the TTI outlining the requirements for successful participation in the study in order to qualify for the free telephone and air time charges. (Appendix F)

The study area consists of four roadways; two freeways, one High Occupancy Vehicle

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The study area consists of four roadways; two freeways, one High Occupancy Vehicle Lane, and one toll road. The length of the study corridor is approximately 20 miles. On each of the four roads, reporting stations were established from which each of the cellular telephone users (probes) were to report. (Appendix G) There are two sets of stations to correspond to the morning and afternoon peak direction of flow. At each of the reporting stations, a blue and white marker in the shape and size of freeway mileage panels were placed to remind the probes to place the calls. (Appendix H)

The exact procedures to be followed by the probes were outlined in handouts to insure that the reporting procedures would be consistent. (Appendix I) In addition to reporting the vehicle I.D. number and the station number, the probes were encouraged to provide any other information that might affect roadway capacity, such as vehicles or debris blocking lanes, ice or water on pavement surfaces, etc.

An office was established to receive the information by telephone and to process and distribute the information to various users. An agreement between TTI and Senterra Corporation, the Management Company for Greeway Plaza Office Development, to provide office space at cost for the duration of the study.

Three operators were provided to receive the telephone calls and input the data into the computer system. Two operators were provided by the two Traffic Advisory Services, Metro Traffic and Shadow Traffic. The third operator was hired by the project. These operators are on duty 5 days a week from 6-10 A.M. and 3-7 P.M.

The data is put into a computer system, called Houston Intelligent Transportation System, for processing, storage, and distribution. (Appendix J) This equipment was furnished by a project sponsored through the Southwest Region University Transportation Center.

The system has been operational since October 15, 1991. The study monitors the operation of the probes and keeps them informed of the progress of the study with monthly newsletters. (Appendix K) The information collected is processed and presented in several ways. A simple printout of the measured travel times and average speeds by sections is shown in Appendix L. Other ways of presenting the data will be developed for specific users. Graphical presentations will be used.

A summary of the cost to operate this study is presented in Appendix M. The interesting part of this analysis is the participation by the various public and private organizations and individuals.

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## Automatic Vehicle Identification (AVI) Study

TxDOT proposes to replace the cellular telephone/probe system of collecting travel time infornation with an AVI system. Essentially, all of the reporting stations shown in Appendix G will be instrumented with antennae and readers that can automatically read electronic identification tags attached to the probe vehicles. The information will be transmitted to the HITS computer system over leased telephone lines to the study office at Greenway Plaza. The same computer programs for analyzing the cellular telephone data will be employed.

The AVI design will ise existing sign supports and roadway overpass structures where possible for mounting one antenna per lane of travel. One or more readers will be used at each site. A Dial-up telephone system will be employed initially, but this communications system will be replaced with the TxDOT owned fiber optic communications system when it becomes operational.

The current group of volunteer drivers will be asked to continue to serve as probes with the electonic I.D. tags and to continue to report incidents with their cellular telephones. Other volunteers, transit vehicles and emergency vehicles will be issued the tags to increase the coverage. The estimated cost tdo install the AVI System on the North Houston Corridor Study Area is $\$ 1.5$ million.

## PROPOSED USE OF PERSONAL VEHICLES AS ROVING SENSORS

It is proposed that commuters using the I-45 North Freeway/U.S. 59 Eastex Freeway Corridor be enlisted to serve as roving sensors (probes) of traffic conditions for the demonstration project on real time transportation information for Intelligent Vehicle Highway Systems. The purpose would be to- obtain travel time information on alternate routes and to detect and locate traffic incidents that would significantly increase travel times during the peak periods. Information from the commuters engaged in the collection of traffic conditions would be transmitted to a central office for processing, and the resultant information be made available to the public and/or specific agencies in various forms for various applications. The primary purpose of this exchange of information is to permit the users of the freeways, transitways and arterial streets to select the route that provides the best travel times through the corridor.

## CELLULAR TELEPHONE/RADIO VOICE COMMUNICATION

The first phase of this demonstration project proposes to use voice communication to transmit the information from the vehicles to the central office. The radios or cellular telephones would be used to simulate the collection of date by an automated system that would use automatic vehicle identification and location devices and a computer monitoring system.

## Objectives:

This study would accomplish several objectives:

1. Determine the variability of travel times by the three major freeway routes in the study corridor.
2. Evaluate the data reduction and processing requirements to provide the information to the users in a timely and effective format.
3. Evaluate the number of probes that are necessary to provide accurate and timely information for travel diversion in the corridor.
4. Determine the type and amount of data that needs to be collected from each of the probes to provide and accurate data base for travel diversion.
5. Assess the quality and quantity of in-vehicle information that is necessary to induce diversion to alternate routes.
6. Determine if low cost manual systems of surveillance are viable alternatives to more costly automated systems.

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## Study Procedures:

Persons who have radios or telephones that can be used to transmit travel information to a central office will be contacted to participate in the demonstration project for a specific length of time. A 3 to 6 month trial period is proposed for this initial study. Potential participants include:
o Commercial vehicle operators that have frequent trips in the study area, particularly those that serve the Houston Intercontinental Airport, such as Federal Express and Yellow Cab.
o GLK Drivers operating from the park and ride facilities in or near the study area.
o Commuters that live north of the City and work in the Central Business District or Greenway Plaza.
o Selected persons working for transportation agencies, such as the City, Metro, County and State, that travel the study corridor during the peak periods.

At least 200 persons should be enrolled in the project to provide the coverage and frequency desired.

## Information Transmitted:

Each person will be assigned an identification number. The person will call the central office at preassigned locations and report the following: ID. No. ; Location No.; Time of Day, if different from current time. Each person will be asked to call the central office whenever an incident is observed that will cause delay to traffic. For these cases, the person reports the following: I.D. No.; Location of Incident; Type of Incident; and Time of Day, if different from current time. The objective of the formate for transmission of information is to reduce the amount of airtime required. If the call can be completed within one minute of the time required, then the person would not have to state the time to the central operator.

There is other information that is desired to have in the control center; the location when traffic speeds drop below 30 miles per hour and the location when traffic speeds resume to above 40 miles per hour. It may be difficult to obtain this information from all of the probes, but a selected number may be asked to provide this additional information.

## Central Office Operations:

Several operators will man the telephones and radios to receive and record the information transmitted by the probes. In a three hour peak period, with 200 vehicles traveling through the corridor, each vehicle would generate an average of 5 calls, or a total of 1000 transmissions. if each call requires 15 seconds for processing, the total transmission time would be 250 minutes of air time over a three hour period. With a four telephone system, and with 20 percent of the calls made on radio, the total per operator would be approximately 50 minutes of air time over a 180 minute period, but with a peaking of 60 percent during one hour. That is, 30 minutes of air time during the peak hour per operator.

With some experience and diligence by the drivers and operators, the time required for transmission can be reduce to 5 to 10 minutes. For example, a typical call from an driver on the North Freeway would be; N26 - L1-8:36, meaning North Freeway driver number 26, at Location 1 at 8:36. If we can drop the time reading, the message can be delivered in a very short time, and confirmed by the operator. The time required for the report of the incident is expected to take a longer time of transmission.

The operators will enter the information into a computer data base that will compute the average speeds and travel times for the various roadway segments and total trip paths through the study corridor. The data will be formatted in graphical and tabular forms for study.

## Evaluation:

The output of the travel time information will be inputs to programs to study the impact of diverting traffic from one route to another. The amount of time saved will be applied to the numbers of vehicles that would be able to take advantage of the diversion to determine the total travel time savings.

## AUTOMATED VEHICLE IDENTIFICATION/LOCATION SYSTEMS

The second phase of the study proposes to automate the transmission of information concerning the vehicle identification, location and time. The same information as transmitted before to the central office operator would be put into the computer direct for the processing of travel times and speeds. For special information concerning the location and type of incidents, either special digital codes or voice communications could be used.

## Types of AVI/AVL Systems Available

There are a number of technologies that could be employed to provide the type of information requested of this study; Global Positioning System (GPS), LORAN C Systems, Dead Reckoning/map navigation, Roadside Reader/transponder. Most of these systems will provide more information, more often than the manual system could, but at a higher cost. Some systems require an expensive device to be installed on the vehicle, while others require expensive devices to be installed outside of the vehicle.

There are questions of reliability, accuracy and maintenance and operations costs that need to be answered before determining the type of system to be deployed. Many of the systems have not been applied with the same requirements of this project. Others have not been fully field tested in the urban environment.

It is proposed that companies with equipment for AVI and AVL be invited to submit letters of interest for providing a system with their technology to track up to 100 vehicles at one time, with new information on locations and identifications every 5 minutes for each vehicle. The system would be consist of instrumentation of at least 300 different vehicles, with expansion capabilities to 1,000 or more. These numerical requirements would be subject to change depending on the experience of Phase 1 of the study, the scope of the demonstration project, and the outlook for funding.

For those companies that submit a letter of interest and adequate supporting documentation, a pre bidders conference would be held with the committee to have the suppliers of the equipment to discuss and explain their systems.

## Potential Funding Sources:

It would appear that a project to equip 300 vehicles with automated sensors systems to cover three of more freeways, 20 miles long, would be expensive, and that several funding sources may be required. Some funding sources that have been suggested include:

Energy Funding<br>Metro<br>State (SDHPT through 3-G funds, research, Interagency)<br>State Construction Funding - U.S. 59 Eastex Reconstruction<br>Private Sector Participation<br>Commercial Interests



## APPENDIX B

## TERMS OF THE CELLULAR TELEPHONE BID

Terms of the bid for the cellular Telephones which American Cellular will provide are:

* Houston Cellular Tate Plan 26

Monthly Access Charge
Peak Period Usage 7am-7pm
Off Peak Usage 7pm - 12 pm
Night Usage 12pm - 7am
Wide Area Access Charge

* 200 cellular telephones installed

Motorola MC 310 , or
NEC 3800
Hands free installed, or the transportable model.

Houston Cellular Telephone Company will provide free air time for calls made to the study number.

# REAL TIME INFORMATION PROGRAM TRAVEL TIME DEMONSTRATION PROJECT 

The State Department of Highways and Public Transportation (SDHPT) is seeking volunteers to participate in a travel time demonstration project in the North Corridor of Houston. This would include the following roadways:
o I-45 (North Freeway) from the Hardy Tollroad Interchange or FM 1960 to the Central Business District.
o North Freeway High Occupancy Vehicle Lane (HOVL) from the Northern Terminus (Beltway 8) to the Central Business District.
o Hardy Tollroad from the I-45 (North Freeway) Interchange or FM 1960 to the Central Business District.
o US 59 (Eastex Freeway) from FM 1960 to the Central Business District.

The project will be conducted by the Texas Transportation Institute of the Texas A\&M University.

Participants will leave their home/office at a specified time during morning and afternoon peak traffic periods. They will use a cellular phone (provided by the SDHPT) to call a Central Control Office at predetermined locations along their routes. They will also report incidents to the Central Control Office as they are encountered.

The purpose of the project is to provide timely information on traffic conditions of the four roadways during peak periods of operation. The Central Control Office will be able to monitor the traffic conditions of the four roadways simultaneously and relay this information to motorists by radio and Changeable Message Signs. This will enable motorists to alter or select a route that reduces their travel time.

Volunteers will be asked to commit to the program for one year and to participate on an average of approximately three days per week (9/91 to 9/92).

In consideration of the services provided by the Participant, the telephone will become the property of the Participant after successful completion of the requirements of the one year study. During this period, the Participant will incur no cost for the use of the telephone, other than air time charges that may be incurred during personal use of the telephone. Telephone calls made to the Project to report traffic information will not be charged to the Participant.

For the Project to be successful, it will require responsible participation by the volunteer. However, if for some reason the volunteer chooses to drop out of the study, the phone will be removed free of charge or the individual may purchase the telephone at the retail price plus installation charges.

This is an opportunity for you, as a private citizen, to assist a transportation agency in an effort to improve travel times on roadways in the Greater Houston Area.

Dick McCasland
701 North Post Oak, Suite 430
Dennis Smalley
Houston, Texas 77024
Tel (713) 686-2971
Fax (713) 686-5396


EXXON USA
BE A PART OF THE "TRAFFIC SOLUTION" AND GET A FREE CELLULAR CAR PHONE

## Employees who commute downtown from the following areas are needed for a State Dept. of Highways \& Public Transportation study:

o I-45 N. from Hardy Tollroad Interchange or FM 1960<br>o N. Freeway HOV Lane from Beltway 8<br>o Hardy Tolliroad from the I-45 N. Interchange or FM 1960<br>o US 59 from FM 1960

## STUDY PURPOSE

Texas A\&M will be conducting a study to provide timely information on North Corridor traffic conditions during peak travel coming to and from work. This will allow motorists to select a route that best reduces their travel time. The program will be conducted for 12 months (9/91-9/92).

## FREE CELLULAR TELEPHONES

Volunteers will be provided with installed, hands-free cellular telephones which they will use to report their travel positions at designated locations traveling to and from work.

## COST TO PARTICIPANTS

Installation, monthly fees, and all charges for calls to the Traffic Control Center are free to the volunteer. Only air time for personal calls will be charged to the individual. (No personal calls - NO COST.)

At the end of the 12 month study, the telephone will be given to the volunteer who will have the option to continue cellular phone service through a personal account with one of the area cellular phone services.

If for some reason a volunteer chooses to drop out of the study, the phone will be removed free of charge, or the individual can purchase the telephone at the retail price plus installation charges.

INFORMAION MEAINGS WIIL BE HELD IN THE C-IEVEL AUDITORIUM

8.

TUESEAY/.114V30, 1991 . 12.00 NOON

## NORTH CORRIDOR <br> TRAVEL TIME DEMONSTRATION PROJECT

I am interested in participating in the study.

I may be interested in participating in the study.

## NAME:

(PLEASE: PRINT)
ADDRESS:
HOME PHONE: $\qquad$ WORK PHONE: $\qquad$
PRIMARY ROUTE TO AND FROM WORK
$\square$ I-45 (NORTH) FREEWAY $\square$ HARDY TOLL ROAD
$\square$ US 59 (EASTEX) FREEWAY $\square$ I-45 (NORTH) HOVL
Point of Entry in AM $\qquad$ PM $\qquad$
Departure Time: From Home: $\qquad$ AM From Work: $\qquad$ PM
Return To: Bill Figglesworth Rm 3829 EB Ext. 6-4402

## AGREEMENT TO PARTICIPATE IN THE NORTH HOUSTON CORRIDOR TRAFFIC INFORMATION DEMONSTRATION PROJECT


#### Abstract

The undersigned (Participant) agrees to participate with the Texas Transportation Institute (TII) in the collection of traffic information in the North Houston Corridor for a one-year period, beginning within 30 days from the effective date of this agreement. The information will consist of specified traffic reports concerning the morning and afternoon commute trip to and from home to work, Mondays through Fridays, excluding holidays. The information will be transmitted over mobile cellular telephones provided by TTI to the Participant.


The cost of the cellular telephone, installation of the telephone and antennae in the Participant's vehicle, and the monthly assessment costs to the Houston Cellular Telephone Company will be paid by TTI during the one year of the study.

Air time charges for telephone calls made to the TTI project number to report traffic information will not be charged to the Participant. These costs will be paid by Houston Cellular Telephone Company.

Air time charges for personal calls made by the Participant to numbers other than the project number will be paid by the Participant.

In consideration of the services provided by the Participant, the telephone will become the property of the Participant after successful completion of the requirements of the one-year study. Successful completion of the requirements will be determined to be participation in the collection of traffic information for at least 75 percent of the weekdays, excluding holidays. For example, from September 1, 1991 to August 31, 1992, there are 261 weekdays, for which there are six national holidays (Labor Day, July 6th, Thanksgiving Day, Christmas, New Years Day, and Memorial Day). Seventy-five percent of 255 days is 191 days. Therefore, the Participant would be required to report traffic conditions on 191 weekdays during one year.

At the end of the one year study, the Participant would assume the full responsibilities for the monthly costs of the telephone. These costs include: the monthly access fee, the wide area coverage fee, air time charges, and any enhanced services that the Participant selected in the Customer Service Agreement with Houston Cellular Telephone Company.

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If the Participant elects to leave the Project prior to completing the 191 days of traffic reporting, there are two options available:

1. The telephone equipment can be returned to TTI at no cost to the Participant and this agreement with the Participant is terminated.
2. The Participant can pay TTI for the cost of the telephone and installation charges (see special note below) and then assume the monthly access charges with the Houston Cellular Telephone Company.

Until such time as the Participant has completed the study or has elected to leave the project and exercise one of the two available options, the equipment remains the property of the State of Texas and can not be transferred to another individual or entity during that time by the Participant.

The Participant will be fully responsible for the operation of his/her vehicle during the conduct of the study. TTI will not be liable for property damage or injuries resulting from accidents occurring during the study period.

APPROVAL: I, $\qquad$ have read and understand Name (please print or type)
the terms of this Agreement and agree to abide by them.

Signature

Name (please print or type)

Street Address

City
State
Zip

Telephone Number

## NORTH HOUSTON CORRIDOR

AM PEAK SOUTHBOUND


## NORTH HOUSTON CORRIDOR

## PM PEAK NORTHBOUND




COIORS

> IEGEND BACKGROUND - WHITE(refl) - BIUE (refi)

- Optically center numeral about vertical centerline

D 10
MILEPOST MARKERS

| CONVEMTIONAL USE |  |  |  | EXPWY-FWY USE |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 010.1 <br> (1 digit) | $\begin{gathered} \text { D10.2 } \\ \text { (2-diqits) } \end{gathered}$ | 010.3 <br> (3-digits) | D10-4 <br> (1-digit) | $\begin{gathered} 010-5 \\ \text { (2-digits) } \end{gathered}$ | $\begin{gathered} 010-6 \\ \text { (3-dipits) } \end{gathered}$ |
| A | 10 | 10 | 10 | 12 | 12 | 12 |
| B | 18 | 27 | 36 | 24 | 36 | 48 |
| C | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 |
| D | 3 | 3 | 3 | 3 | 3 | 3 |
| E | 48 | 48 | 48 | 4 C | 4C | 4C |
| F | 2 | 2 | 2 | 3 | 3 | 3. |
| G | 6 C | 6 C | \% 6C | 10 C | 10C | 10C |
| H | - | 3 | 3 | - | 3 | 2.1/2 |
| ! | 1.1/2 | 1-1/2 | 1.1/2 | 1-1/2 | 1-1/2 | 1-1/2 |
| K | 3-5/8 | 3-5/8 | 3-5/8 | 45/8 | 4.5/8 | 45/8 |
| 1 | 3-7/8 | 3.7/8 | 3.7/8 | 4.7/8 | 4.7/8 | 4-7/8 |
| M | 3 | 3 | 3 | 4 | 3 | 3 |

PROCEDURE FOR PLACING CALLS TO INFORMATION CENTER
A. FOR NORMAL CALLS TO REPORT LOCATION

1. PUSH "POWER ON" BUTTON
2. FIRST CALL - DIAL FULL NUMBER ex: 840-9477 (or *TTI)
3. PUSH "SEND" BUTTON
4. OPERATOR ANSWERS
5. STATE YOUR ASSIGNED I.D. NUMBER ex: THIS IS NUMBER 121
6. STATE THE LOCATION NUMBER ex: AT STATION 101
7. OPERATOR ACKNOWLEDGES
8. PUSH "END" BUTTON

AS YOU APPROACH THE NEXT LOCATION NUMBER:
9. SECOND CALL - PUSH "SEND" BUTTON
10. OPERATOR ANSWERS
11. STATE YOUR ASSIGNED I.D. NUMBER ex: THIS IS NUMBER 121
12. STATE THE LOCATION NUMBER ex: AT STATION 102
13. OPERATOR ACKNOWLEDGES
14. PUSH "END" BUTTON

CONTINUE THROUGH ALL STATIONS, REPEATING THE STEPS WITH DIFFERENT STATIONS NUMBERS
B. FOR CALLS TO REPORT ON ACCIDENTS, INCIDENTS OR ROADWAY CONDITIONS

SUPPOSE BETWEEN STATION 104 AND 105 YOU SEE AN INCIDENT, SUCH AS AN ACCIDENT WITH VEHICLES STOPPED IN THE RIGHT LANE OF THE FREEWAY

1. PUSH "SEND" BUTTON
2. OPERATOR ANSWERS
3. STATE YOUR I.D. NUMBER
ex; THIS IS NUMBER 121
4. STATE INCIDENT
ex: THERE IS AN ACCIDENT SOUTHBOUND IN MOVING THE MOVING LANE
5. STATE LOCATION
ex: NEAR THE WEST ROAD OVERPASS SOUTHBOUND DIRECTION
6. OPERATOR ACKNOWLEDGES
7. PUSH "END" BUTTON

IF THE OPERATOR WANTS MORE INFORMATION CONCERNING THE ACCIDENT, SHE WILL ASK FOR SPECIFIC DETAILS BEFORE ACKNOWLEDGING AND ENDING THE CALL.
C. GENERAL QUESTIONS CONCERNING THE PROCEDURES FOR MAKING CALLS TO THE CENTRAL INFORMATION CENTER

1. HOW WILL YOU REMEMBER THE CENTRAL INFORMATION CENTER OFFICE TELEPHONE NUMBER?
a. TAPE THE NUMBER ON THE BACK OF THE TELEPHONE.
b. PROGRAM THE NUMBER IN THE FIRST POSITION IN THE MEMORY FOR SPEED DIALING.
2. HOW WILL YOU REMEMBER YOUR IDENTIFICATION?
a. TAPE A CARD ON THE BACK OF THE TELEPHONE.
3. HOW WILL YOU REMEMBER LOCATION NUMBERS?
a. YOU WILL BE GIVEN A MAP WITH THE DESCRIPTION OF ALL THE STATION WITH THEIR LOCATION NUMBERS IN THE STUDY AREA.
b. THE SDHPT WILL INSTALL ROADSIDE SIGNS , WHITE LETTERS WITH BLUE BACKGROUND WITH THE NUMBERS.
c. AFTER THREE OR FOUR DAYS YOU WILL HAVE THE LOCATIONS COMMITTED TO MEMORY.
d. IF YOU HAVE ANY QUESTIONS, CALL THE OPERATOR. (OUR CENTRAL INFORMATION CENTER OPERATOR)
4. GENERAL GUIDELINES ON REPORTING INCIDENTS
a. GIVE THE INFORMATION IN A BRIEF FORM
b. MOST IMPORTANT ITEMS OF INFORMATION ARE LOCATION AND IF LANES ARE BLOCKED
c. IF IN DOUBT AS TO WHETHER AN INCIDENT IS IMPORTANT ENOUGH TO REPORT, PLACE THE CALL.

## Houston Intelligent Transportation System

LAN - Token Ring Topology running Netware 3.11


## Houston Intelligent Transportation System

## Ultimate System with AVI Input and Remote User Output




TEXAS TRANSPORTATION INSTITUTE

No. 1
NORTH CORRIDOR TRAVEL STUDY NEWSLETTER
Nov 1991

The project officially began on October 15th with 50 probes (participants). This number increased to 90 probes by October 21, and to 125 on October 28. At the time of this newsletter we have individuals that have contacted us, and are being processed, which will bring the total to around 150 . Of this number, the distribution within the corridor is approximately $40 \%$ each for both I-45 and U.S. 59 and 10\% each for Hardy and the HOVL.

We have approximately 50 positions still available. If possible we would like to fill these with people that normally drive the corridor from 8:00 to 9:00 a.m. If you have a friend or coworker who drives during this time period who might be interested in joining the project, please have them call our office at 686-2971 - attention Dennis Smalley.

All persons who have received their telephones by October 28 should be actively participating by calling in incidents as well as the standard information at the stations. If you are having any problems with the telephones or with the procedure for reporting, please give us a call at 686-2971.

## Station Signs

There is a small problem with station signs. Some signs located on the right side of the roadway on $1-45$ are partially hidden by barricades. Some signs on the Hardy Toll Road and the North HOVL have not been installed. In those cases, the locations as described in the map you received from $T 11$ should be used.

## Hints for Better Telephone Usage

1. *TTI is available for use. The problem some phones experienced this month has been solved. However, the 8409477 number can also be used. Both of these numbers are toll free.
2. The telephone should be set to receive System "A" only. The "A" System in Houston is the Houston Cellular Telephone Company who is providing the free toll numbers.
3. When receiving a busy signal, immediately push the End Button, follow immediately by pushing the Send Button. Repeat the process until a connection is made.

## Billing Situation

1. When you receive a bill from Houston Cellular, please make prompt payment to Houston Cellular of only those items for which you are responsible:
a. You are responsible for the Air Time Charges. This may include Roamer Charges and Local Land Charges.
b. You are responsible for Options that you might have selected.
c. You are not responsible for the Monthly Access ( $\$ 27.00$ per month), Wide Area Access ( $\$ 2.75$ per month),
and Start of Service (\$40.00 one time charge) fees.
2. When the billing cycle is established, your monthly bill should reflect credits for those items that will be paid by TTI.

## HOVL Probes

We would like to remind those probes on the HOVL that your first station is 104 in the AM and your last station is 154 in the PM. Both of these stations are at the northern terminus of the HOVL. These are common stations with the freeway mainlanes.

## Special Notes

- You are reminded that the $\$ 200$ penalty that is noted in your contract with Houston Cellular, if you break the one year contract, does not apply to you. This is the responsibility of Texas Transportation Institute.
- If you have a question regarding the contract, program, etc., please contact this office and not Houston Cellular. The problem is that not all Houston Cellular employees are aware of this program.

However, if you have a question regarding your personal air time, we would ask you to call Houston Cellular, Customer Service at 850-1211.

- Remember to advise the Study Office if you are going to be away for an extended period.

YOU ARE DOING A GREAT JOB!!!

Dick McCasland
Dennis Smalley

T．T．I H HUSTON TNTELEGENT TRANGFORTATION SYGTEM


## I－45 NOETH FFEEWAY

Herdy Tola Fd to Holewarth
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## HARDY TOLL RGAD

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| E． |
| $1 . E$ |

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6.6
2.3
6.4
3.0
-8.8
Spese （mph）

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Shedherd to I－b10 Non Loop byo I－610 No LoOp to I－10 kety FToy

6542E50
2：

$$
59
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Sources Texas Transpartetian Institute 3ह00 Euffalo Speedway（840－9470）

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## ESTIMATED COST TO OPERATE DEMONSTRATION STUDY USING PERSONAL VEHICLES WITH CELLULAR TELEPHONES

## INTRODUCTION

A proposal to operate a traffic information center for two years to collect information on the four major routes in the North Houston Corridor is being prepared. The approach to be used to collect the information on travel times and incidents during the peak periods is to employ volunteer commuters as traffic reporters, or "probes", to transmit information at regular intervals by cellular telephones to operators stationed in a traffic information center. The operators would put the information into a computer and a system wide status report would be calculated at frequent intervals. These status reports would be made available to a number of users, such as; TxDOT Communications Center, Federal Express, Yellow Cab, Metro, and public traffic advisory services. The information would also be used by other related projects, such as GIS Development Project, and SMART Commuter Project.

## ESTIMATION OF COSTS --CELLULAR TELEPHONE OPTION

The basis for calculating the cost estimates are that a minimum of 200 vehicles would be equipped with cellular telephones and would operate 5 days per week during two 4-hour time periods per day for one year.

Equipment Requirements:
Cellular Telephones
200 units @ \$ 95 per unit plus $\$ 40$ activation fee
\$ 27,000

## Computer System for Data Recording

6 small computers with terminals connected to one master computer system
\$ 20,000
The computers will be provided by the Southwest Region
University Transportation Center Study
Telephone Line Charges
4 telephone line installation @ $\$ 100.00$ per line ..... \$ 400
4 telephone lines @ \$ 40.00 per month for 12 months ..... \$ 1,920
TxDOT will fund the communications costs.
Center Office Space and Furniture
Office Space - 1000 sq. ft. @ $\$ 6.00 /$ year for one year ..... \$ 6,000
Furniture for three operators, supervisor and data processor ..... \$ 600
Furniture and office space for the four operators and thesupervisor may be provided by the TxDOT or a study participant.
SUMMARY
One Time Costs: Cellular Telephones ..... \$ 27,000
Computers ..... 20,000
Central Office ..... 1,000
Total one Time Costs ..... \$ 48,000
24 Month Costs: Cellular Access Charges ..... \$71,400
Cellular Air Time Charges ..... 189,000
Central Office Staff ..... 157.016
Telephone Lines ..... 1,920
Office Space ..... 6,600
Total Monthly Costs for $\mathbf{2 4}$ Months ..... \$425,936
Average Monthly Costs are approximately $\mathbf{\$ 3 5 , 4 9 5}$

