



ELECTRONIC CAPTURE OF PERSONAL TRAVEL ACTIVITY AND VEHICLE OPERATING CONDITIONS IN THE YEAR 2000 ATLANTA REGIONAL HOUSEHOLD TRAVEL SURVEY



Jean Wolf and Dr. Randall Guensler

Abstract

The Strategies for Metropolitan Atlanta Region Transportation and Air Quality (SMARTRAQ) is a major research endeavor funded by the Federal Highway Administration, the Atlanta Regional Commission (ARC), and the Georgia Department of Transportation (GDOT). The basic research goal is to collect and analyze sufficient travel diary data (6000 to 8000 households) to develop an enhanced suite of travel demand models capable of addressing the land use, travel behavior, and air quality issues critical to Atlanta.

Automation of Travel Data Collection

- Improves the accuracy and completeness of data relative to manual methods (e.g., missed trips, missing trip elements, trip start and finish times, trip lengths)
- Collects new data elements that were infeasible without automation (e.g., complete trip routes, speed and other vehicle / engine activities on a second by second basis)

Automation Packages for Atlanta 2000

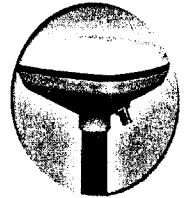
- **Passive In-Vehicle GPS System**, with a differentially corrected GPS receiver, antenna, and data logger to capture all vehicle trips
- **Handheld Electronic Travel Diary with GPS** to capture personal trip information for all modes of travel
- **Comprehensive Travel Monitoring System**, which includes an electronic travel diary, rugged laptop, differentially corrected GPS, and OBD engine monitor, to capture detailed trip and engine/vehicle activity information

Passive In-Vehicle GPS System

System Features

- System provides detailed travel data for sub-sample of general purpose survey
- System allows for calculation of under-reporting and mis-reporting correction factors for general purpose survey
- Components include GPS, data logger, power supply, power and data cables
- Non-invasive -- no mechanic required for installation
- Entirely passive -- no user interface; participants will fill out a paper travel diary

CSI SDG-12 All-in-One GPS / DGPS solution



Psion Workabout Data Logger

Advantages of Using GPS

- Collect accurate trip origins and destinations without burdening the respondent
- Obtain land use information from a GIS database using O-D coordinates
- Capture the entire travel route - not currently captured in manual recording methods due to respondent burden
- Automatically capture accurate trip start and finish times, as well as trip lengths
- Record every trip and route, allowing for recovery of omitted trips and trip links

Electronic Travel Diary with GPS

Palm IIIx



System Features

- System will capture detailed travel data related to physical activity
- Combining electronic travel diary with GPS:
 - Provides integrated data streams (trip and route)
 - Captures accurate routes for all modes of travel
 - Facilitates linkages between land use and mode choice (i.e., accessibility)
 - Provides accurate wait and mode transfer times

Advantages of Using an Electronic Diary

- Provides more accurate data (time stamps, eliminates written transcription errors)
- Reduces respondent burden
- Provides more detailed and focused trip-specific and mode-specific data using tiered input elements
- Enables automatic detection of missed trips
- Reduces post-processing labor (no data entry, fully automated end-to-end)

Garmin GPS Receiver / Antenn





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Comprehensive Electronic Travel Monitoring System

System Features

- Captures relationships between driver behavior and vehicle activity for ozone sub-sample
- Most components will be stored in a sealed (vehicle's trunk)
- GPS antennas located on top of the trunk or roof
- Full instrumentation package to have independent power supply
- Non-invasive (no mechanic required for installation)



CSI SDG-12 All-in-One GPS / DGPS solution



Snap-On Scanner



Panasonic Toughbook 27 Rugged Laptop

Benefits of Engine Monitoring

- Captures driver behavior (throttle position, speed/accel., engine load, etc.)
- Provides accurate engine start and warm-up activities
- Captures driver and vehicle interactions (significantly elevated emissions)
- Coupled with GPS data, provides mapping of driver behavior to road network
- Offers ability to link with ATMS traffic condition data

Deployment Plans

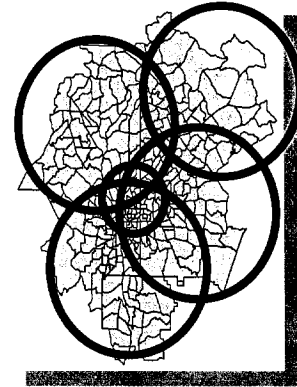
Proposed Quantities of Equipment Packages

- 32 in-vehicle passive GPS data logging systems
- 32 handheld electronic travel diaries with GPS
- 8 comprehensive electronic travel monitoring systems
- Three quarters of equipment will be deployed on any given day

Deployment Goals

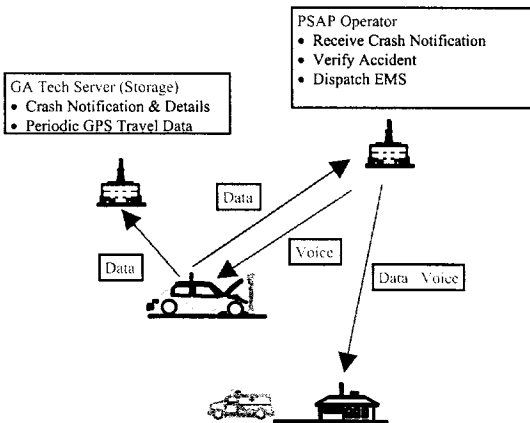
Given 20 weeks for the general purpose survey and 3-day survey length, the target sample sizes are:

- 504 households with passive in-vehicle GPS
- 504 households with electronic diary and GPS (capturing all modes)
- 126 households with vehicle instrumentation and electronic diary (all modes, detailed vehicle data)



Regional Deployment Zones

NHTSA Speed / Crash Study



Project Description

- **Objective:** to investigate and provide an understanding of the relationship between vehicle speeds and crash risk under various environmental and physical conditions
- **Goals:** Collect sufficient data to determine:
 - risks of crash involvement for drivers exceeding the speed limit
 - relationships between speeds at which drivers typically drive and the likelihood of getting into speed related crashes
 - driver profiles for crash and non-crash involved drivers
 - the prevailing traffic conditions at the time of the crash
- **Scope:** 1000 vehicles in metro Atlanta will be instrumented for two-years
- **Equipment:** telematics platform with digital communications, crash detection module with a tri-axial accelerometer, and a differentially corrected GPS
- **System Functionality:** GPS data (with accurate second-by-second speed traces) transmitted periodically from the vehicles to a central data storage; crashes automatically detected and crash notifications sent to a PSAP workstation