HANDBOOK
For
DATA COLLECTORS

Ramp Metering Project

Version One

Georgia Institute of Technology
School of Civil and Environmental Engineering
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SECTION 1

DAILY OPERATING PROCEDURE

1. Check Web Site for Cancellations and to Confirm Schedule and Assignment
   - http://transaq.ce.gatech.edu/ramps
   - Weather Cancellations will be Posted by 9:00 AM Each Morning

2. Meet in Room 305 SEB to Checkout Equipment by 2:50 PM

3. Meet in the Parking Lot on the West Side of the SEB for Shuttle to Field Sites
   - Shuttles will Leave at 3:00 PM

4. Setup Equipment and Start Data Collection at 3:15 PM

5. Stop Data Collection at 7:00 PM and Break Down Equipment

6. Wait for Shuttle Pickup by 7:15 PM
   - Do not Leave Site or Leave Equipment Unattended

7. Return to Campus and Check in Equipment
   - Report any Problems
   - Report Time on Time Sheet
SECTION 2
REQUIRED SAFETY CRITERIA

Style of Dress:

All data collectors must wear long pants (i.e. shorts are not acceptable). Each data collector (person) located adjacent to or in the proximity of a road must also wear a safety vest and hard hat. Individuals positioned in moving vehicles are not required to wear the vest and hat while inside the vehicle. The use of headphones or portable radios will not be permitted.

Safety precautions at the Data Collection Site:

1. At no time will a person assigned to collect data enter the active traveled way (the region between edges of road dedicated to vehicle activity).

2. Each person will be dropped-off and picked-up at his or her specific data collection location (unless other arrangements are made with either Dr. Daniel, Dr. Guensburg, or Dr. Dixon prior to the day of data collection). When the transportation shuttle delivers individuals to a site, they must exit the shuttle on the side of the vehicle that is not adjacent to traffic. At no time should anyone leave the site without permission from the designated team leader. If an individual needs to leave his or her data collection post for personal reasons, he or she is to contact the team leader via radio or telephone and arrangements will be made for a vehicle to pick-up the person and transport them safely away from the site.

3. Each person should stay alert to errant vehicles. Avoid turning your back completely to traffic.

4. Do not interfere with existing traffic patterns or take any activity (other than those required for the data collection efforts) that may distract drivers or alter driver conditions.

5. Stay as far from the active traveled way as possible.

6. At certain sites, traffic control devices such as parked cars or cones will be positioned to enhance the safety of team members. At no time alter the configuration of these devices.

7. Each data collection site will have data collection zones indicated (generally using surveyor tape or paint). Each person must remain within this zone during the data collection efforts as well as during the intervals before and after collection when the transportation shuttle is not available.
8. If any team member is confronted or threatened during data collection by someone who wants the data collection equipment, do not resist -- surrender the equipment and then immediately report the loss to the team leader and then the police.

**Data Collection within a Moving Vehicle:**

1. When performing moving data collection studies, allow the driver of the vehicle to collect data only if the activity does not detract from his or her ability to drive.

2. When in a vehicle collecting data in the traffic stream, keep seat belts buckled and do not block the vision of or distract the driver.
SECTION 3

COMMUNICATIONS

Communications between the field workers and the senior staff on the project will be maintained through two-way radios and site visits. One senior staff member will also be equipped with a cellular phone during all data collection sessions. It is encouraged that all data collectors who own a cellular phone bring it with them to their field locations.

If the need to contact a senior staff member arises, they should be contacted with the two-way radio or a cellular phone directly or have another individual with such capabilities make contact them for you. If you are unable to make communications, wait at your site until a staff member reaches your location. Only leave your location in the case of an emergency.

CELL PHONE CONTACT NUMBER

404.[555].8258
SECTION 4

VEHICLE CLASSIFICATION CODES

1. MOTORCYCLE
2. CARS
3. PICKUPS, VANS, SPORTS UTILITY VEHICLES
4. BUSES
5. 2 AXLE, 6 TIRE SINGLE UNIT TRUCK
6. 3 AXLE SINGLE UNIT TRUCK
7. 4 AXLE SINGLE UNIT TRUCK
8. 4 OR LESS AXLE, DOUBLE
9. AXLE, DOUBLE
10. 6 OR MORE AXLE, DOUBLE
11. 5 OR LESS AXLE, MULTI-UNIT
12. 6 AXLE, MULTI-UNIT
13. 7 OR MORE AXLE, MULTI-UNIT
SECTION 5
LOCATION CODES

Northside Drive
  Laser Range Finder-Ramp NSR-LRF 10
  Laser Range Finder-Overpass NSO-LRF 11
  Camera NSO-CAM 12

Howell Mill Road
  Laser Range Finder-Ramp HMR-LRF 20
  Laser Range Finder-Advanced HMA-LRF 21
  Laser Range Finder-Overpass HMO-LRF 22
  License Plate HMO-PLT 23

Mores Mill Road
  Laser Range Finder-Ramp MMR-LRF 30
  Laser Range Finder-Behind MMB-LRF 31
  License Plate MMO-PLT 32

West Paces Ferry
  Laser Range Finder-Ramp WPR-LRF 40

Peachtree Battle
  Laser Range Finder-Overpass MLO-LRF 50
  License Plate MLO-PLT 51

Probe Vehicle One (Dodge)
  Distance Measuring Device One DMI-1DC 01

Probe Vehicle Two (Ford)
  Distance Measuring Device Two DMI-2DC 02
SECTION 6
LASER RANGE FINDER (LRF) GENERAL OPERATIONS

At the data collection site, the following steps should be taken.

1. Setup tripod at specified data collection location--make sure that the tripod is stable.

2. Connect battery handle to LRF.

3. Mount LRFs on surveying tripods with disc and yoke attachment or on a camera tripod directly to battery handle base, before operation. Use of the LRFs in conjunction with the tripods produces the best results.

4. Power on LRF.

5. Test battery and LRF operation, LRFs will default to appropriate RTR mode when powered up. There is no need to adjust the LRF configuration during any portion of this project.

6. Power off LRF.

7. Insert formatted SRAM card with 100 null files (data.000, data.001, etc.) into PCMCIA card slot on gun; remember SRAM cards are inserted upside down when gun is in the off position.

8. Power on LRF.

9. Power on and set JAMAR board (see JAMAR operations).

10. Start data collection:

- For ramp locations track every fourth vehicle. For overpass locations track the fourth vehicle that passes under after your focus has returned back to the HUD.

- Fix LRF cross hairs in heads up display (HUD) on a location on the rear of a vehicle (e.g. the license plate).

- Track vehicle for as long as possible. The LRFs can take reading from distances of over 2000 feet. The distance from the gun to the vehicle will be shown in the HUD. Use these readings as an indication for if the gun is storing readings.

- Keep trigger pulled continuously for each vehicle being tracked.

- Stop distance measurement once a vehicle is out of sight or a fix is lost (i.e. flat line in HUD).
13. Avoid squeezing the LRF trigger with the SRAM card installed except when ready to actually collect sample data. Every time the trigger is depressed and released, a separate file on the SRAM card is created. If the trigger is depressed unintentionally, the number of readings (P=xxxxxxx) should be recorded on the vehicle log along with the JAMAR board time. A button should be depressed on the JAMAR board as a placeholder for the error file.

12. After approximately half an hour or 60-70 trigger pulls (i.e. vehicles) power off LRF and Remove SRAM card.

- Insert and remove SRAM cards only when LRFs are in the off position.
- Insert SRAM card into PCMCIA card slot (usually the top slot) on the site assigned laptop.
- Download SRAM card to site assigned laptop using DOWNLOAD program. Initiate the program by clicking on the DOWNLOAD icon on the laptop. You will be prompted for the location and SRAM card number.
- Insert SRAM card with new null files into the LRF and repeat data collection process (step 10), there is no need to begin a new JAMAR file.

13. Continue until end of data collection period at 7:00 PM.

14. Power off LRF.

15. Remove LRF from tripod and brake down equipment.
CAUTION:

Do not insert or remove SRAM cards when LRF is in the on position.
Do not open the case under any circumstances.
Do not point the LRF directly at the sun.
Do not place the LRF on an unstable surface.
Always transport the LRF in the yellow carrying case.
SECTION 7

JAMAR BOARD GENERAL OPERATIONS

At the data collection site, the following steps should be taken in conjunction with LRF readings.

1. Power on JAMAR board.

2. Make sure that the FHWA scheme F classification template is on the board.

3. Start a new count in saturation flow mode (SF) and enter a six digit numeric code (two digit site ID and four digit date, e.g. 210704 (site twenty-one April seventh)) for the count. JAMAR sequence (COUNT>NEW>SF>8-DIGIT>sitecode).

4. The screen will say “Sat Flow Study, Any Key to Start”, however when you are ready to start data collection, button 12 must first be pressed to start the data collection process.

5. The Board should be located near the LRF, preferably within arms length for quick pressing of button following release of trigger.

6. After release of the trigger on the LRF, immediately press the button on the JAMAR board that corresponds to the type of vehicle tracked.

NOTE: Change the JAMAR board batteries with the provided AA-batteries if a BATT: LOW message is received.
SECTION 8
CAMERA OPERATIONS

At the data collection site, the following steps should be taken to record the traffic entering the study area on northbound I-75 or at designated intersections.

1. Set up tripod at designated location. Pick a location that will capture the target movements and is free from obstructions.

2. Mount camera on tripod.

3. Connect camera to 8-hour battery pack.

4. Power on camera and insert blank videotape

5. Slide the [CAMERA/VCR] selector to “CAMERA”

6. Slide the [S-VHS ON/AUTO/OFF] selector to “OFF”

7. Remove lens cap.

8. Before recording make sure of the following
   - Adjust the field of view so that all traffic lanes are captured on tape--use zoom to adjust.
   - Press the [DATE/TIME] button and verify that the correct date and time can be seen in the viewfinder.

9. Press Start/Stop button to initiate recording

10. During the data collection session use the viewfinder to check the following:
    - Power supply (a 2-hour back up battery is provided although it should not be needed).
    - Field of view (make sure camera has not been moved from original position).
    - The camera is in recording mode (i.e. not on pause)

11. Press Start/Stop button to stop recording at 7:00 PM.

12. Disconnect Battery and put camera back in case.
SECTION 9

LICENSE PLATE SURVEY OPERATIONS

At the data collection site, the following steps should be taken. On most days the license plate survey will take place on either the Howell Mill Road overpass or the Mores Mill Road overpass.

1. Locate a position on the overpass above lane one (inside lane)

2. Once your recorder and binoculars are ready start data collection.

3. First record the survey location, date, and start time.

4. Start collecting license plate State and number. Remember to speak clearly and loudly into the recorder microphone.

5. After a plate is recorded, let three vehicles pass and record the license number of the fourth vehicle.

6. Continue this cycle for 15 minutes and then rotate to lane two. Continue to rotate survey from lane to lane every 15 minutes.

7. Change tapes as necessary. Write location and data on tape labels.

8. At 7:00 PM stop collecting license plate numbers.
SECTION 10

PROBE VEHICLE DRIVING AND DATA COLLECTION PROCEDURE

Directions for Driver:

1. After leaving Georgia Tech, drop off data collectors assigned to vehicle for drop-off/pickup at their respective sites in the field. If you do not have passenger proceed to step five (5).
2. After dropping off last passenger, return south via Interstate-75.
3. Travel I-75 south to Exit 102 – 14th and 10th Streets.
4. At 14th Street intersection, turn left and cross I-75, remaining in left lane.
5. Turn left at intersection of Williams Street and 14th Street (immediate next light) and continue onto I-75 Northbound on-ramp.
6. Enter and drive along I-75 as per Car Following Procedure, which follows.
7. Exit the freeway at Exit 108 – Mt. Paran Road and turn left at the light, onto Mt. Paran Road.
8. Turn left at next light (U.S. 41) and return to 14th Street via I-75.
9. Repeat steps 3-9 as many times as possible before 7:00 P.M. On final southbound trip, pickup data collectors assigned to you.
Data Collection:

In order to acquire data with instrumented vehicles, a procedure was developed. This procedure was used in the collection of all data using instrumented vehicles. It was adapted from the procedures Sierra Research, Inc. developed in its work (Austin, DiGenova, et al. 1993).

Car Following Procedure:

1. Enter the freeway.
2. Driver spots the first white vehicle downstream (in front) of him/her, and enters the lane in which that vehicle is found (when it is safe to do so). Once in the lane, the vehicle immediately in front of the driver is the target vehicle. Driver indicates which vehicle is the target vehicle to the instrument person(s).
3. Follow the target vehicle and mimic its behavior as best as possible, while maintaining a safe distance from the vehicle (headway). This means the driver brakes when it brakes, changes lanes when it changes lanes, speeds up when it speeds up, and maintains the speed at which it travels, including above the speed limit (vehicles should not exceed the general flow of traffic).
4. A target vehicle must be acquired before the beginning mark for the run (a designated roadside sign) is reached. A target vehicle must be tracked through the run until the ending sign is reached.

Target Vehicles: The target vehicle is the vehicle that the instrumented vehicle is following. The instrumented vehicle is trying to capture the speed and acceleration activity of the target vehicle.

Following Above Speed Limit: Target vehicles can travel above the speed limit. On some facilities it is quite common. If runs are aborted because the target vehicle goes above the speed limit, the data sample will be biased due to the lack of vehicles in the sample which travel above the speed limit. Permissions must be obtained from the appropriate regulatory authorities to exceed speed limits for purposes of data collection. For this project, since permission has not been obtained, vehicles shall not exceed speeds above the general flow of traffic.

Changing the Target Vehicle: Each selected target is followed as long as reasonably possible. If a target cannot be followed safely through a lane or speed change, a new target is chosen.
   a. If a vehicle gets between driver and the target vehicle, the vehicle immediately in front of the driver becomes the [new] target vehicle. If no vehicle is immediately in front of the
driver, a new target vehicle will be acquired using the same procedure used to acquire the initial target.

b. If a vehicle changes lanes in busy traffic [or some other erratic maneuver] and cannot be followed, the driver will duplicate the maneuver safely as soon as possible. Once the maneuver is complete and the driver is in the new lane, the vehicle immediately in front of the driver becomes the [new] target vehicle.

c. If a vehicle exits or obviously is going to exit, a new target is selected. The vehicle immediately in front of the driver becomes the [new] target vehicle.

d. If a target vehicle is changed during a run, the change and the point at which it occurs should be noted in the vehicle log. The distance from the start of the run to the location of the change should be noted in the vehicle log by pressing the DISP/HOLD button on the NS-60 and recording the number.

Instrumented Car Travel at Other Times: At all times when the instrumented car is not following a target (e.g., while trying to acquire a new target in busy traffic), the instrumented car will match the general flow of through traffic around it.
Directions for DMI Operator:

The DMI (distance measurement instrument) operator will ride along in probe vehicle and run the Nitestar NS-60 device as well as the laptop used for downloading of data while the driver completes a prescribed circuit on I-75. The procedure to be used follows:

1. Setup computer while driver drops off passengers and returns to start of course (14\textsuperscript{th}/Williams St. on-ramp).
   a. Plug adapter into serial port of laptop computer and connect computer to the NS-60 with provided cable.
   b. Turn on computer and NS-60. Allow computer to boot up.
   c. Open Windows Explorer and open the DMI directory.
2. Make sure the NS-60 is in COUNT HOLD mode, and units in feet.
3. Run a test of the data collection program to verify that data is being transferred to the laptop.
   a. Run the application entitled Qbasic, which will open a DOS window.
   b. Press Esc or click on <escape> to start program.
   c. Press Alt-F, then O, to open a file. Select DMIRUN.BAS and press Enter.
   d. Press Shift-F5 to begin collecting data from the NS-60. The display on the laptop should be a string of timestamps with three columns of zeros.
   e. Press RUN/HOLD on the NS-60 to begin counting. The display should begin counting with columns for timestamp, distance travelled, delta distance, and speed.
   f. Press RUN/HOLD to stop counting.
   g. Press Ctrl-Break on the laptop to close the data window.
   h. Press Alt-F, then X, to exit the DOS window
   i. Press CLEAR to clear memory of the NS-60.
   j. Open the file testout.dat with a word processor to verify that data was written during the previous steps. If not, check connections and or reboot, then repeat steps 3a through 3i until data is written to the test file.
   k. Close data file.
4. When driver re-enters freeway at Williams St., be prepared to begin counting.
5. Repeat steps 3a-3d and collect a few seconds of blank test data to delineate “real” distance data.
6. Press RUN/HOLD exactly when the vehicle passes the Northside Drive exit sign to begin collecting “real” data. Try not to disturb the device while collection is in progress.
7. Target vehicles should be identified before reaching Northside Drive sign. Record vehicle information for each run on the log sheet.
8. If the target vehicle is changed during the run the new vehicle should be noted in the log along with the distance from the beginning of the run at which the change occurred. The distance from the beginning of the run can be noted by pressing DISP/HOLD on the NS-60. Pressing DISP/HOLD again sets the counter to the current distance.

9. Press RUN/HOLD exactly when the vehicle passes the second mark at Mt Paran Road ½ mile exit sign.

10. Repeat steps 3g-3j.

11. While driver is returning to 14th Street, verify that data was written to the file testout.dat.

12. Rename the file testout.dat using the following naming scheme:
    Filename = VMMDDRR.dmi, where V is the vehicle designation (1 or 2), MM is the two digit month designation, DD is the two digit day designation, and RR is the two digit number of the run just performed (i.e., the first run of the day is 01).

13. Fill out log sheets for each run.

14. Repeat steps 4-13 until approximately 7:00 P.M.

15. Return to campus after picking up any passenger that were dropped off at the beginning of the session.