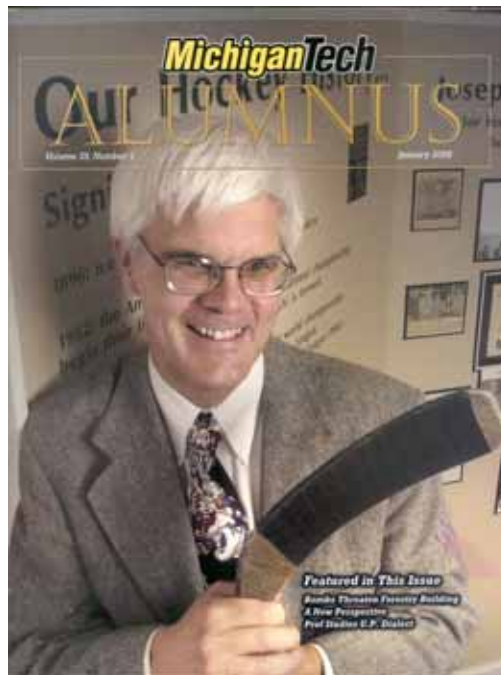


# TRAFFIC COUNTING

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Michigan Tech University

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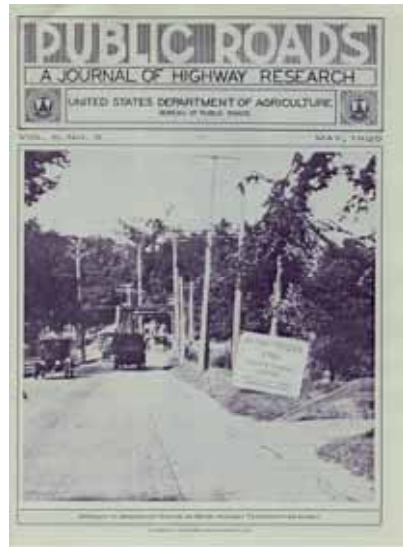


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There Was A Time In This Town  
When Traffic Didn't Really Matter.





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## Traffic Data Collection Program

- Studies carried out at regular intervals to MONITOR system performance and trends
- Studies to analyze specific problems

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## **Types of Studies**

- Inventories
- Traffic Observance Studies
  - traffic volumes
  - speed
  - parking
  - others
- Safety Studies
- Interview Studies
- Experimental Studies

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## **Study Components**

- Data Collection
- Data Reduction (Summarizing)
- Data Analysis (Interpretation)

8

## References

- **Manual of Transportation Engineering Studies**, Institute of Transportation Engineers/Prentice-Hall, 1994
- **Traffic Engineering**, 3<sup>rd</sup> Edition, Roess, Prassas, and McShane, Prentice-Hall, 2004

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## Institute of Transportation Engineers (ITE)

- the professional society of traffic and transportation engineers
- founded in 1930
- over 15,000 members worldwide
- **[www.ite.org](http://www.ite.org)**

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## Traffic Volume Studies

- **TRAFFIC VOLUME** – the number of vehicles that pass a point during a specified time period
- **DEMAND VOLUME** – the number of vehicles that want to, are expected to, or would pass . . .
- **CAPACITY** – the maximum number of vehicles that can or could pass . . .

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## Capacity Analysis

- Primary Reference in U.S. for capacity analysis and level of service analysis is the **HIGHWAY CAPACITY MANUAL (HCM2000)**, Transportation Research Board, Washington, DC, 2000
- Software: **Highway Capacity Software (HCS2000)**

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## Traffic Volumes

- The number of vehicles (or pedestrians) that pass a point during a specified time period (year, day, hour, or less than a hour)

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## Annual Traffic Volumes

- The number of vehicles that pass a point in a year

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## Daily Traffic Volumes

- The number of vehicles that pass a point in a day (veh/day, vph)
- **any day**
- **Average Daily Traffic (ADT)** – the number of vehicles that pass a point in x days divided by x days

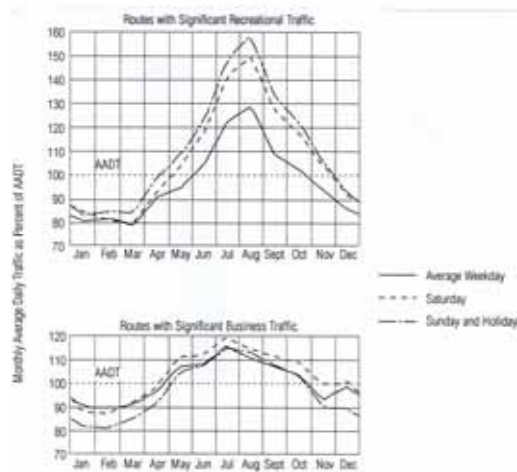
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- it is often necessary to compare volumes on different roads
- for comparison, one must adjust an ADT count for day of week and month to get the average day
- **Annual Average Daily Traffic (AADT)**
- ADT x adjustment factor = AADT
- Check with State DOT for adjustment factors

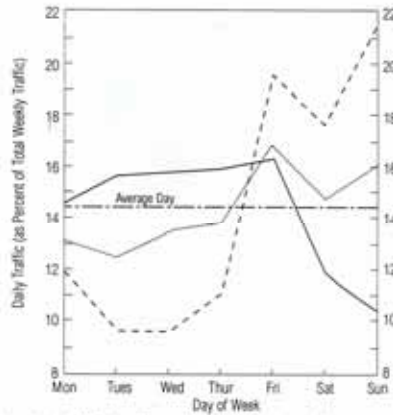
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## Monthly Traffic Volume Variations



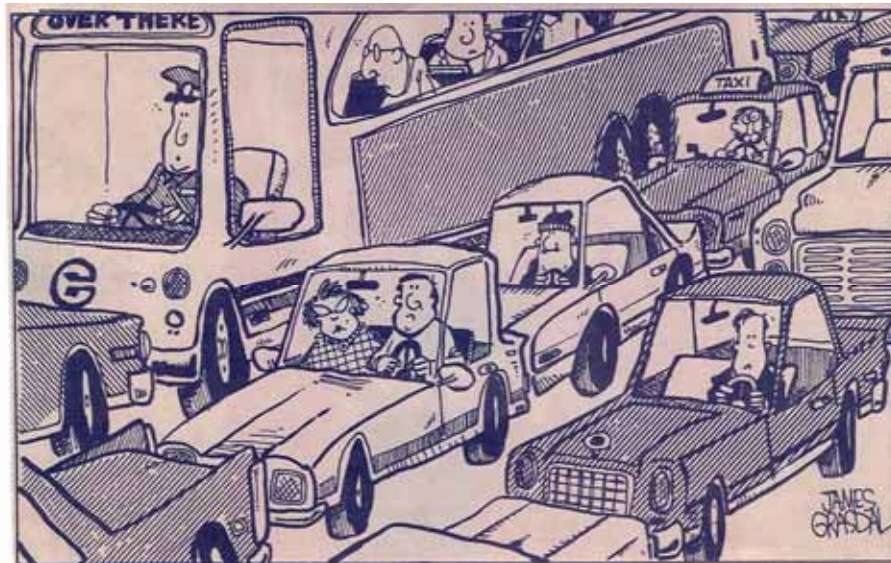
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# Daily Traffic Variations



Main rural route I-95, Southern Minnesota, AADT 10,823, 4 lanes, 1980.  
 Recreational access route MN 198, North-Central Lake Region, AADT 3,863, 2 lanes, 1981.  
 Suburban freeway, four freeways in Minneapolis-St. Paul, AADTs 75,000-130,000, 6-8 lanes, 198  
 Average day.

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## *Workshop Problem*

- total annual traffic = 290,800 veh/yr.
- to get AADT divide annual traffic by 365 = 797, say 800 vpd
- find average daily traffic in each month (MADT)
- January:  $19,800/31 = 640$  vpd
- determine Monthly adjustment factor for January:  $AADT/MADT = 800/640 = 1.25$

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- For August:  $30,000/31=970$
- Monthly adjustment factor =  $800/970 = 0.90$
- Pattern?
  
- For October:  $26,400/31=850$
- Monthly adjustment factor =  $800/850 = 0.94$

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- ADT count taken on Tuesday in October
  - Daily Factor = 1.12
  - Monthly Factor = 0.94
- $AAADT = 1000 (1.12)(0.94) = 1052.8$  vpd
- round off
  - 0-1,000                    nearest 10
  - 1,000-10,000            nearest 100
  - over 10,000              nearest 1,000

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Automatic counter at I.G.&N. R.R. overpass records daily traffic. Motorists are informed regarding current traffic flow by visible indicator.

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## *Workshop Problem*

- DOW Factor for a Wednesday in July (Pattern 4) = 0.7181
- ADT = 2000 vpd
- AADT =  $2000 \times 0.7181 = 1436.2$
- round off – say 1400 vpd

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- Government agencies often publish AADT data – tables and maps
- many publish AAWDT, SADT, WADT and other daily volume data
- **example:** Michigan DOT publishes a traffic count map on the internet at [www.michigan.gov/mdot](http://www.michigan.gov/mdot)

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- **Annual Traffic Volume = AADT x 365**
- **Annual Vehicle Miles Traveled (AVMT)**
  - Average volume on a specific road segment multiplied by the length of the segment
  - **AVMT = AADT x 365 x segment length**

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## Crash Rates

- **Section/Segment of Road**  
Crashes per million vehicle miles traveled
- **Intersection**  
Crashes per million entering vehicles

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## *Workshop Problem*

- Annual Traffic on Mackinac Bridge
- $15,000 \times 365 = 5,475,000$   
say 5.5 million
- Annual vehicle miles traveled (AVMT)
- $5.5 \text{ million} \times 5 \text{ miles} = 27 \text{ million AVMT}$

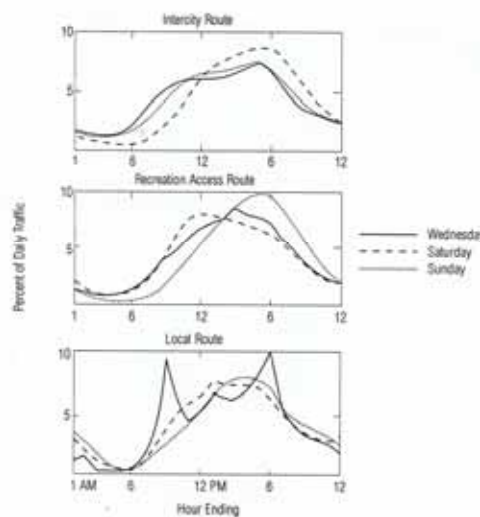
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## Hourly Traffic Volumes

- The number of vehicles that pass a point in a hour (veh/hr, vph)
- Peak Periods and Peak Hours
- Relationship between Peak Hour Volume and Daily Volume

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## Hourly Traffic Variations



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## Short Term Counts

- The number of vehicles that pass a point in, say, 15 minutes (5 minutes, 10 minutes)
- Volume will be expressed as vehicles per hour (**Flow Rate**)
- Flow Rate helps to identify peaking with a hour
- Peak Hour Factor (PHF)

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## Peak Hour Factor (PHF)

- Counts are often done of grouped in 15 minute intervals
- $PHF = \text{hourly volume} \div 4 \times \text{volume in the peak 15 minutes}$

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## *Workshop Problem*

### **Count Location 1**

- Flow Rate =  $200 \times 4 = 800$  vph
- PHF =  $800 / (4)(200) = 1.0$

### **Count Location 2**

- Flow Rate =  $500 \times 4 = 2000$  vph
- PHF =  $800 / (4)(500) = 0.40$

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## Volume Studies

- street/highway count (total, both directions)
- directional count
- classification count
- occupancy count
- turning movements/intersection count
- pedestrian count
- cordon count
- screenline count

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**Screenline** – an imaginary line between two areas

Example: Wisconsin-Michigan border  
AADT = 50,000 vpd

**Cordon Line** – an imaginary line around an area

Example: UP

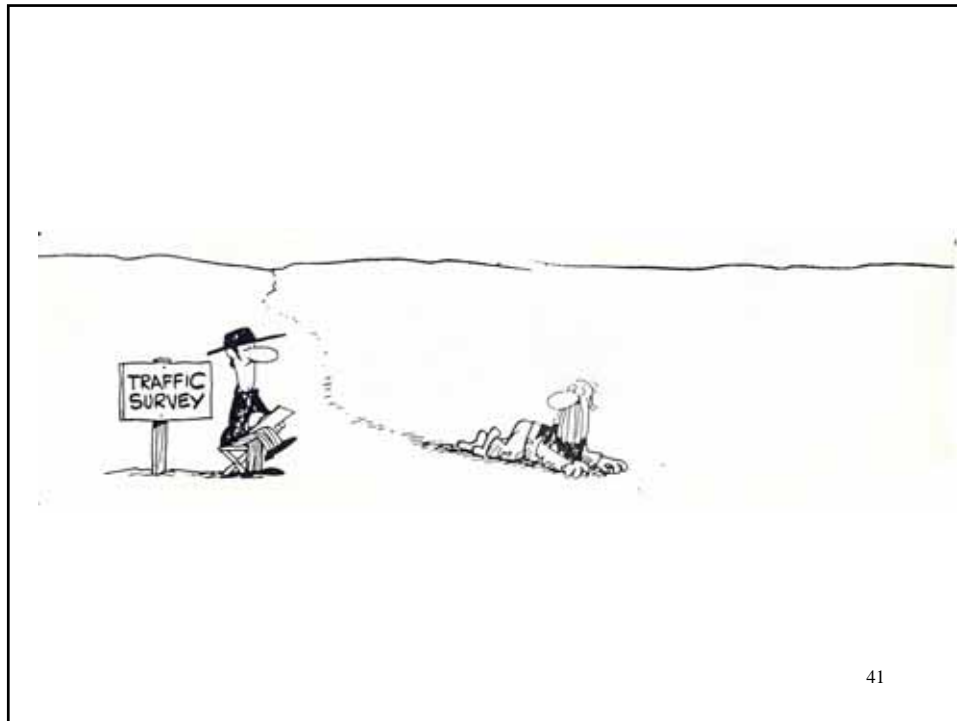
Wisconsin-Michigan	50,000
Mackinac Bridge	15,000
International Bridge	10,000
Total AADT	75,000 vpd

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## Counting Techniques

- Determine appropriate locations and times for counts
- Identify appropriate method for collecting the data
- Organize the field effort
- Develop data reduction, analysis, and presentation techniques

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## Methods for Counting Traffic Volumes

### **(1) Machine/Automatic Count**

ATR – Automatic Traffic Recorder

### **(2) Manual/Observation Count**

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## Machine Counts

Two functions:

**(1) Detect or sense the traffic**

- pneumatic (rubber) road tube
- piezoelectric strips
- induction loops
- others

**(2) Make a record of the traffic that has passed the point**

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## Permanent Counter

- count continuously, typically for the whole year
- induction loop used to detect the traffic, and the recording device is often in an office location
- used at control stations
- data can be used to develop adjustment factors

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## Permanent Count Location



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## Portable Counter

- counter is installed for a shorter time period – a day, two days, a week
- typical installation will use a road tube to detect the traffic and a portable unit will be used to record the data
- several types of recording equipment
  - Accumulating Counter (Junior Counter)
  - Printed Tape
  - Data File for Computer Processing

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## Installing an ATR



## ATR Manufacturers

- Diamond [www.diamondtraffic.com](http://www.diamondtraffic.com)
- IRD [www.irdinc.com](http://www.irdinc.com)
- Jamar [www.jamartech.com](http://www.jamartech.com)
- Metro Count [www.metrocount.com](http://www.metrocount.com)
- Nu-Metrics [www.nu-metrics.com](http://www.nu-metrics.com)
- TimeMark [www.timemarkinc.com](http://www.timemarkinc.com)
- many others

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## Manual Counts

- A person observes or counts the traffic and records the information
  - classification count
  - occupancy count
  - pedestrian count
  - intersection count



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## Tips for Conducting Field Studies

- Choosing a Study Method
- Preparations
- Conducting the Study
- **SAFETY**

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## Manual Count Equipment

- lumber tally method
- tally counters
- electronic counterboards
- laptop computers
- videotape

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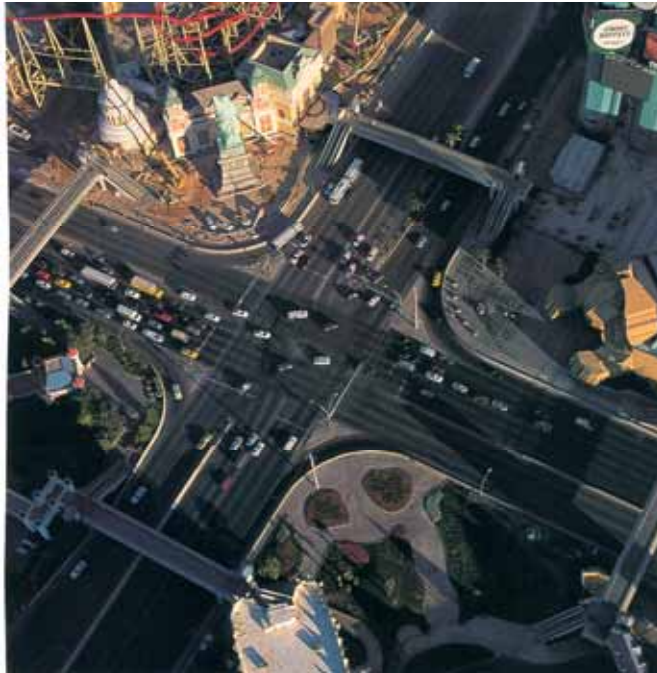


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## Intersection Counts

- also called **Turning Movement Counts** or **Driveway Counts**
- used in intersection design, intersection control, signals warrants and signal timing
- in addition to counting vehicle movement, may also classify the vehicles and count pedestrians
- **Intersection Turning Movement Diagrams**

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## *Workshop Problems*

- **Good and Dusty Intersection**

Peak Hour: 3:30 – 4:30 pm

$$\text{PHF} = 281 / (4)(77) = 0.91$$

- **Somewhere Intersection**

Peak Hour: 4:45 – 5:45 pm

$$\text{PHF} = 2764 / (4)(726) = 0.95$$

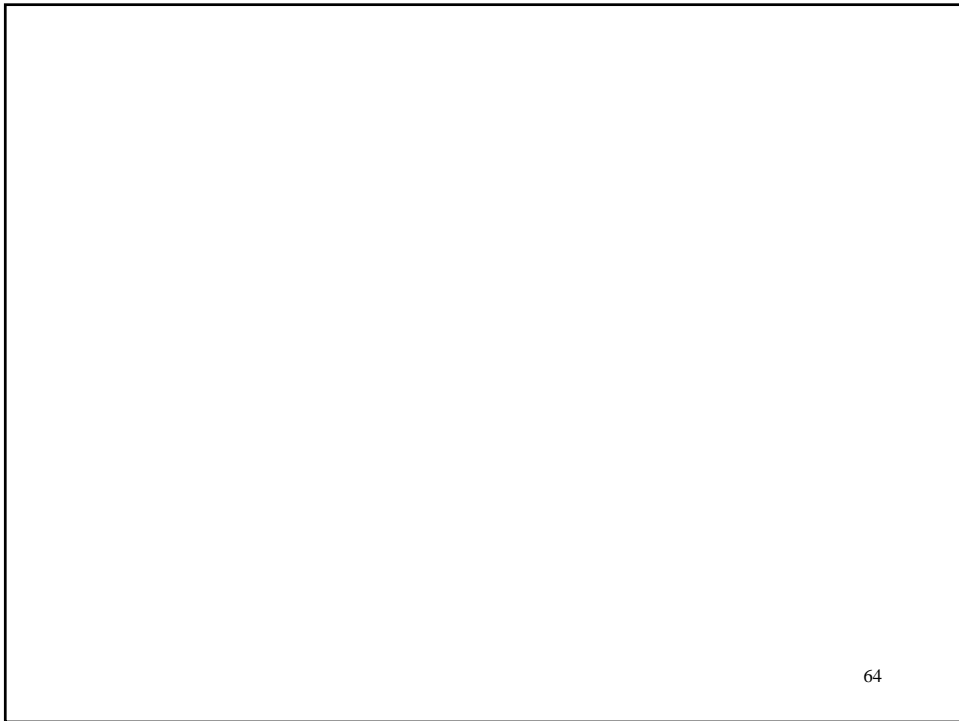
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"Dr. Sproute, may I be excused? My brain is full."



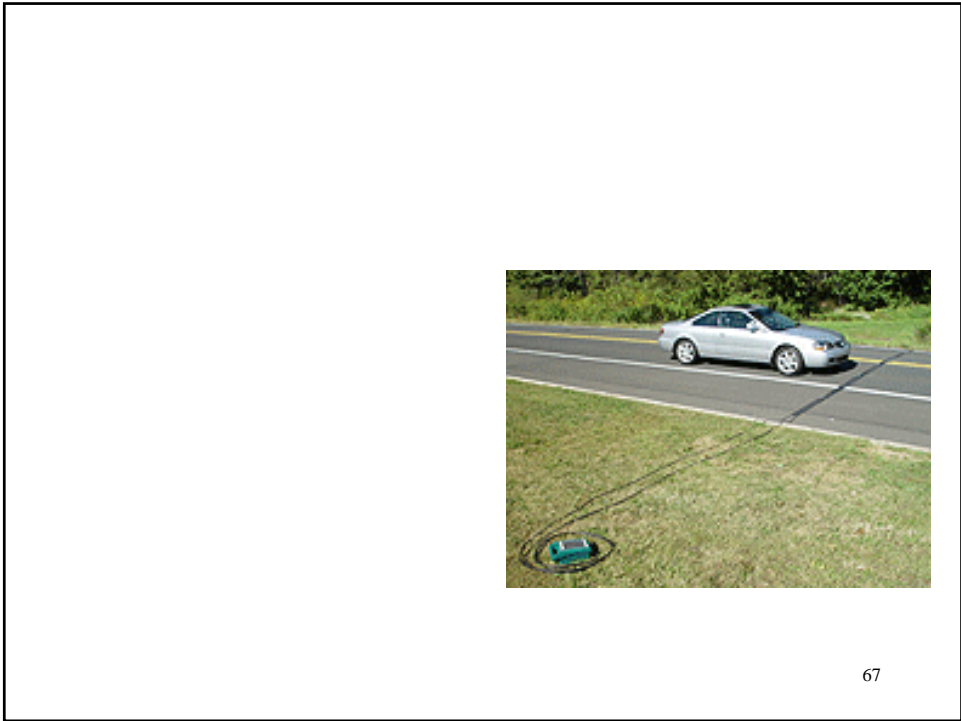




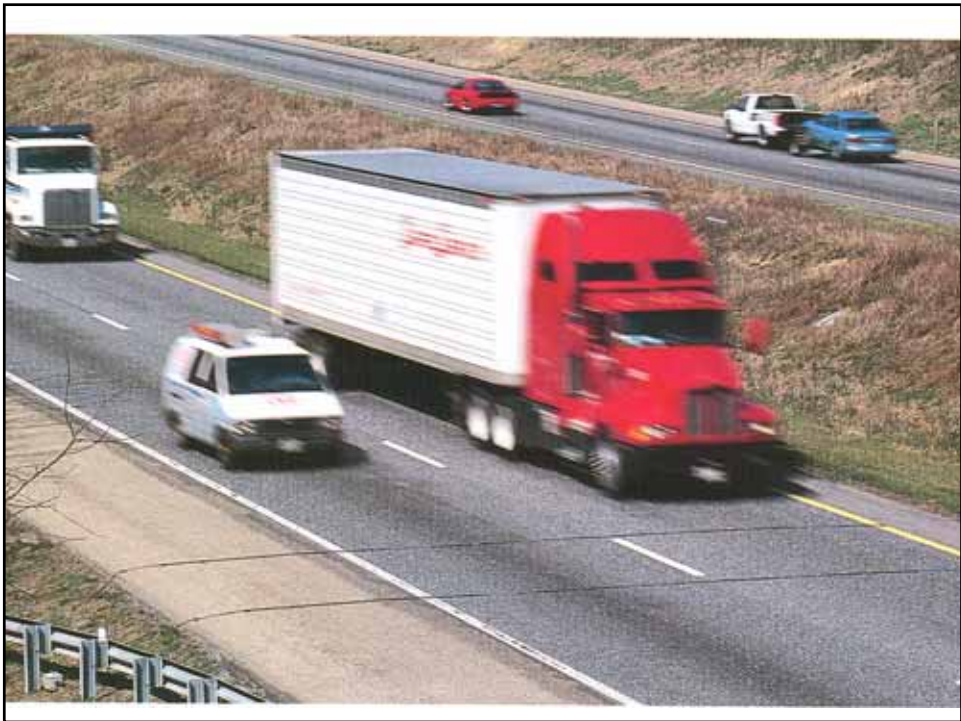
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