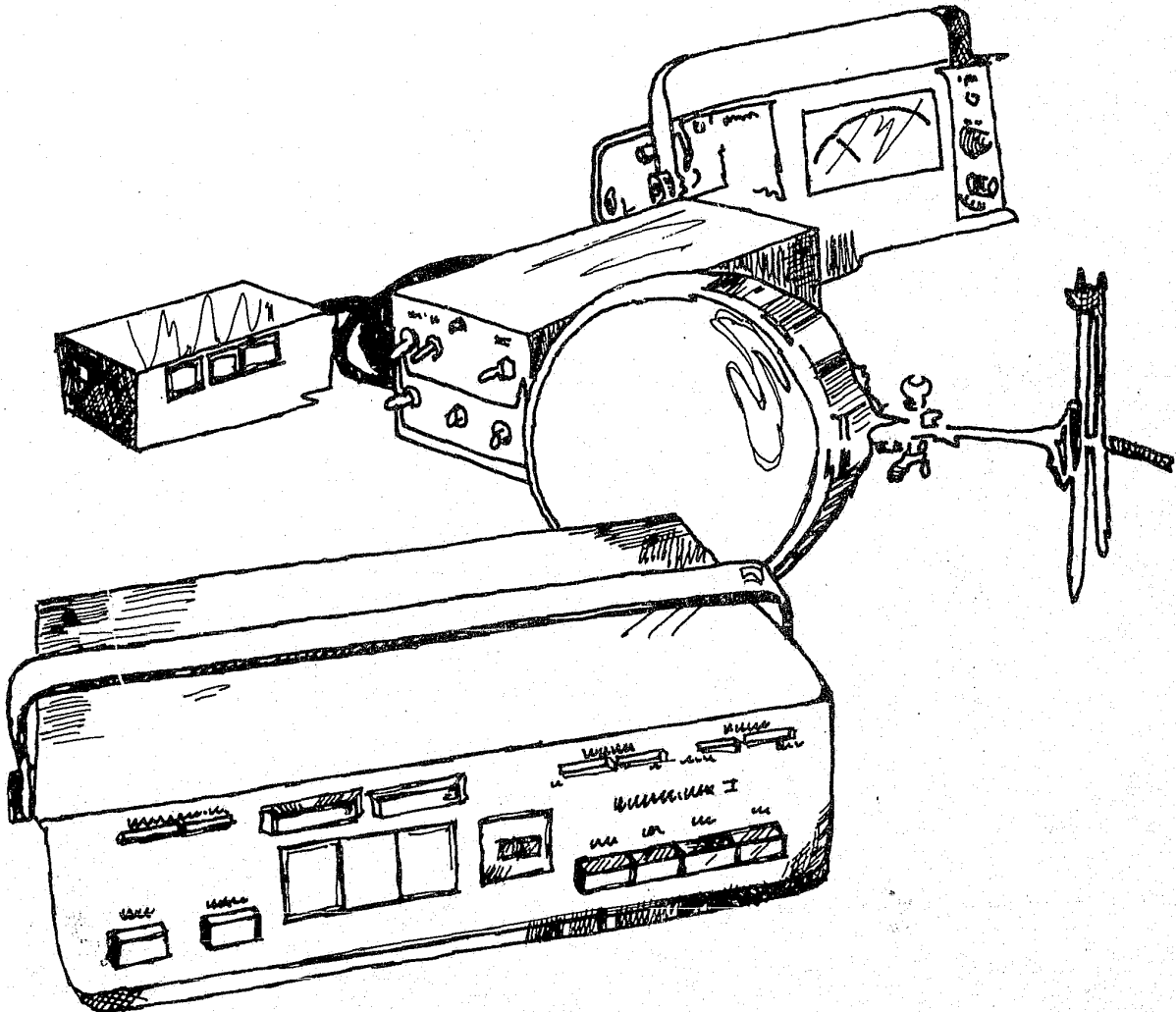


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# SCIENCE AND TECHNOLOGY IN LAW ENFORCEMENT



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SCIENCE AND TECHNOLOGY IN LAW ENFORCEMENT

ABSTRACT

This self-instructional unit is designed to provide the student with an overview of the types and functions of scientific instruments used by police officers for the detection and measurement of speeding violations.

BEHAVIORAL OBJECTIVES

- Describe the speed measurement methods currently in use in traffic law enforcement.
- Describe countermeasures used by motorists to detect the operation of radar units.
- Describe the TAGS system in use in Maryland.

## INTRODUCTION

As the traffic accident death rate has increased on the nation's highways, the two most frequent causes of accidents have been determined to be excessive speed and driving under the influence of alcohol or other drugs, often with the two causes combined. To aid the police officer's exercise of judgment in detecting these offenses, and to provide material evidence in court, a variety of scientific instruments and devices have been developed to measure accurately vehicle speed and the presence and/or the amount of alcohol or drugs in the body. A discussion of the scientific tests and instruments used to detect alcohol or drugs will be found in the units on driving while intoxicated.

This unit will focus on the application of technology to measure vehicle speed (radar, VASCAR, and speedwatch). In addition, a description of the TAGS system will be provided. The TAGS technique uses a mobile computer which provides the capability for high volume screening of on-the-road vehicles to detect those that may be involved in illegal activities.

## SPEED MEASUREMENT

### Speedometer Pacing or Clocking

This is a method widely used by law enforcement agencies today. A police vehicle with a speedometer calibrated for accuracy is controlled to equal the speed of the suspect vehicle while holding the distance between the vehicles constant. The speed reading on the police car's speedometer is an accurate reflection of the suspect vehicle's speed.

### Time-distance Methods

Speedwatch. This device is still used to some extent today and is alternately referred to as the "electric timer" or the Prather Speed Device, as it was originally called. A control panel containing a clock and a control switch is connected by an electric cable to two rubber tubes stretched across the width of the street at a distance of 132 feet apart. When the officer observes a possible offender approaching the first tube, he turns a switch to activate it. When the car crosses the first tube, a stopwatch is started, and the switch is returned to neutral to prevent interference from other vehicles crossing the tubes. When the car crosses the second tube, the clock stops and the speed of the vehicle in miles-per-hour is read from a calibrated scale on the clock dial.

Aerial speed measurement. Aircraft, both rotary and fixed wing, are used to time the speed of motor vehicles on roadways over measured, marked intervals. Using a stopwatch, the pilot can determine the average speed of a vehicle by measuring the time it takes to travel between two markers. The identification, location, and direction of travel of any offending vehicle is radioed from the aircraft's pilot to a waiting police officer, who can then apprehend the offender.

VASCAR. This is a relatively new computer-aided timing device that is coming into wider use. VASCAR stands for "Visual Average Speed Computer and Recorder." The control unit basically consists of a "time" switch, a "distance" switch, and a display of calculated speed. Both the control unit and the digital computer are mounted in the police car. When the police officer wishes to check the speed of a vehicle, he turns on the time and distance switches when the suspect vehicle passes the first reference point on the roadway. He turns off the time and distance switches when the suspect vehicle passes a second reference point. The average speed of the suspect vehicle is then calculated and automatically displayed.

VASCAR may be used when the police car is moving in the following situations:

- Following suspect car
- Suspect car following police car (in this case the distance switch would be initiated first)
- Suspect car is approaching police car from the opposite direction.

VASCAR can also be used in a stationary roadside position. In this case, the distance between two observable reference points would be entered into the computer, and the police officer would only use the time switch to calculate the average speed of passing vehicles.

### Radar

The police radar unit is designed to emit a continuous stream or beam of radiation. When a moving vehicle strikes the beam, it causes an echo wave to return to the radar set. The difference in frequency between the wave emitted and the echo wave returned from the moving vehicle can be translated into a very accurate reading of "instantaneous" vehicle speed or velocity. Police radar, as such, measures only the speed of a moving vehicle, not its relative position.

- "Speedgun." This is a one-piece, hand-held or fixed mounted radar speed detection device, which is especially valuable in support of selective traffic enforcement. It operates on the



conventional Doppler radar principles that have been accepted by the courts nationwide. Speedgun II with Locksafe, a copywrited term, combines a "moving radar" capability with the "Speedgun"itself, thus making it possible to seek out speed violators while the officer is on routine patrol.

The unit is self-contained and draws its power from the automobile electrical system through the standard cigarette lighter plug. (It may also be operated from a portable battery pack.) It can read motor vehicle speed either while the police vehicle is stationary or moving, providing a digital readout of the police car speed and the target vehicle speed simultaneously. By reading out ground speed and target vehicle speed continuously and simultaneously, and manually locking both readings at the instant of determination, the officer can be assured that the technical computation is correct by comparing the ground speed reading to his calibrated speedometer.

Functions of the officer. With the Locksafe system, the officer must perform three distinct functions:

- Identification of the violator
- Recognition of the violation
- Locking of all readings and checking the ground speed reading of the police vehicle against the reading of the vehicle's calibrated speedometer.

When all these functions are present, the readings may be

considered reliable within established methods of detecting vehicle speeds by the use of Doppler radar.

- Stationary use. The unit may be operated while mounted on the police vehicle or hand-held by the officer, either in or away from the vehicle.
- Moving radar use. The unit can determine the speed of oncoming vehicles while the police car itself is moving in either a "meeting slow" mode (the police vehicle is moving between 20 and 35 miles per hour) or a "meeting fast" mode (the police vehicle is moving between 35 and 60 miles per hour).

### Radar Countermeasures

Certain devices have been employed to warn motorists of operating police radar or to interfere with the operation of radar.

- Radar detection. Small portable devices have been designed to emit a characteristic tone when exposed to the radar beam. These detectors are generally ineffective in urban and suburban areas because of interference from signals other than police radar. If the electromagnetic signal environment is "quiet" as in rural areas), these devices may detect the radar beam before a speed reading is obtained. However, in most cases, the average driver will not be able to reduce his speed significantly before a reading is obtained. Some states have made the operation of radar detection units by motorists illegal.

• Radar jamming. These portable, vehicle mounted devices are designed to interfere with the operation of radar in such a way as to cause an unstable or false speed reading. One type is a radio transmitter, which produces either an off-scale or unstable reading. This type is illegal because it violates FCC licensing laws. A second major type is an audio transmitter. It emits a low frequency audio signal which returns the radar's echo wave at a higher frequency than would be received from only the moving vehicle. This causes an off-scale speed reading.

• Summary. Although there are devices available to detect or disrupt radar operation, there is not yet an effective, reliable, economic, and legal instrument that will allow the average motorist to elude radar speed measurement.

TO CHECK YOUR PROGRESS PLEASE ANSWER THE FOLLOWING QUESTIONS.

Directions: Using your response sheet, circle the letter of the item which most accurately completes the following statements:

1. VASCAR may be used when the police car is:
  - a. Following a suspect car
  - b. Being followed by a suspect car
  - c. Being approached by a suspect car from the opposite direction
  - d. All of the above
  
2. Police radar measures:
  - a. The speed of a moving vehicle
  - b. The relative position of the moving vehicle
  - c. The distance between the police vehicle and the suspect vehicle
  - d. All of the above
  
3. The police officer must perform the following function with the Locksafe system:
  - a. Identify the violator
  - b. Recognize the violator
  - c. Lock all readings and check the ground speed reading of the police vehicle against the reading of the vehicle's calibrated speedometer
  - d. All of the above

TO CHECK YOUR ANSWERS TURN TO THE KEY ON PAGE XXI 21.  
REVIEW ANY ITEMS YOU MISSED BEFORE CONTINUING.

## TAGS VEHICLE SCREENING PROJECT

The TAGS system, so called because it involves vehicle registration plate data, allows law enforcement officials to rapidly screen a high volume of vehicle registration plates. Designed by the Insurance Institute for Highway Safety and put into operation by the Maryland State Police and the Maryland Motor Vehicle Administration, the TAGS system provides the police with an improved technique for identifying and apprehending persons for such unlawful actions as:

- Driving with suspended or revoked permits
- Driving stolen vehicles
- Driving with stolen registration plates
- Driving unsafe vehicles.

### TAGS Equipment

The components of the TAGS system consist of a specially designed TAGS observation vehicle (an unmarked van-type wagon) that contains a computer, computer storage unit and two keyboard-display screen units connected to the computer.

The computer storage unit contains an updated (usually daily) computerized list of Maryland registration plate numbers. These plate numbers, taken from current police or MVA records, are broken down accordingly:

- Stolen vehicles - about 11,000 plates
- Stolen plates - about 9,000 plates
- Suspended or revoked driving permits - about 22,000 plates
- Warrants - about 4,000 plates.
- Repair orders - about 39,000 plates.

### TAGS Procedure

The specially equiped TAGS van, accompanied by and in radio contact with two on-duty state police cars, cruises a preselected section of highway at a speed slightly slower than the flow of traffic. This allows the two observers seated at the van's computer keyboard-display units to read the registration plates of passing vehicles and punch the plate numbers into the keyboard. Within one second, the computer compares these plate numbers with those in its storage units.

If the punched-in plate number matches one in the storage unit, the observer receives a visual display indicating the type of violation involved as well as other pertinent information about the plate. This information is then sent by radio to one of the accompanying state police cars. The police officer may at his discretion:

- Stop the vehicle without further investigation
- Radio the nearest Maryland State Police barracks for additional information or
- Place the vehicle under observation.

The above procedure has described a cruising tag search. Other types of search missions include:

- A parked tag search where the TAGS van is parked by a roadway
- A parking lot search where the TAGS van cruises slowly through the lanes of a parking lot
- A vehicle identification number search where police officers walk through a parking lot using portable radios to transmit the plate numbers to the TAGS van.

#### TAGS Effectiveness

During a trial operation in Baltimore County, the TAGS system produced ten matches of observed plates with plates in the computer storage unit for each six hour period of operation. A considerably higher rate, 50 matches per six hour period, was obtained in Baltimore City.

TO CHECK YOUR PROGRESS PLEASE ANSWER THE FOLLOWING QUESTIONS.

Directions: Using your response sheet, circle the letter of the item which most accurately completes the following statements:

4. The TAGS computer storage unit contains a computerized list of Maryland registration plate numbers that includes:
  - a. Stolen plates and/or vehicles
  - b. Suspended or revoked driving permits
  - c. Warrants and/or repair orders
  - d. All of the above
  
5. In a cruising tag search, the police officer may at his discretion:
  - a. Stop the vehicle without further investigation
  - b. Radio the nearest Maryland State Police barracks for additional information
  - c. Place the vehicle under observation
  - d. All of the above
  
6. In addition to the cruising tag search, search missions can include:
  - a. A parked tag search where the TAGS van is parked by a roadway
  - b. A parking lot search where the TAGS van cruises slowly through the lanes of a parking lot
  - c. A vehicle identification number search where police officers walk through a parking lot using portable radios to transmit the plate numbers to the TAGS van
  - d. All of the above

TO CHECK YOUR ANSWERS TURN TO THE KEY ON PAGE XXI - 14.

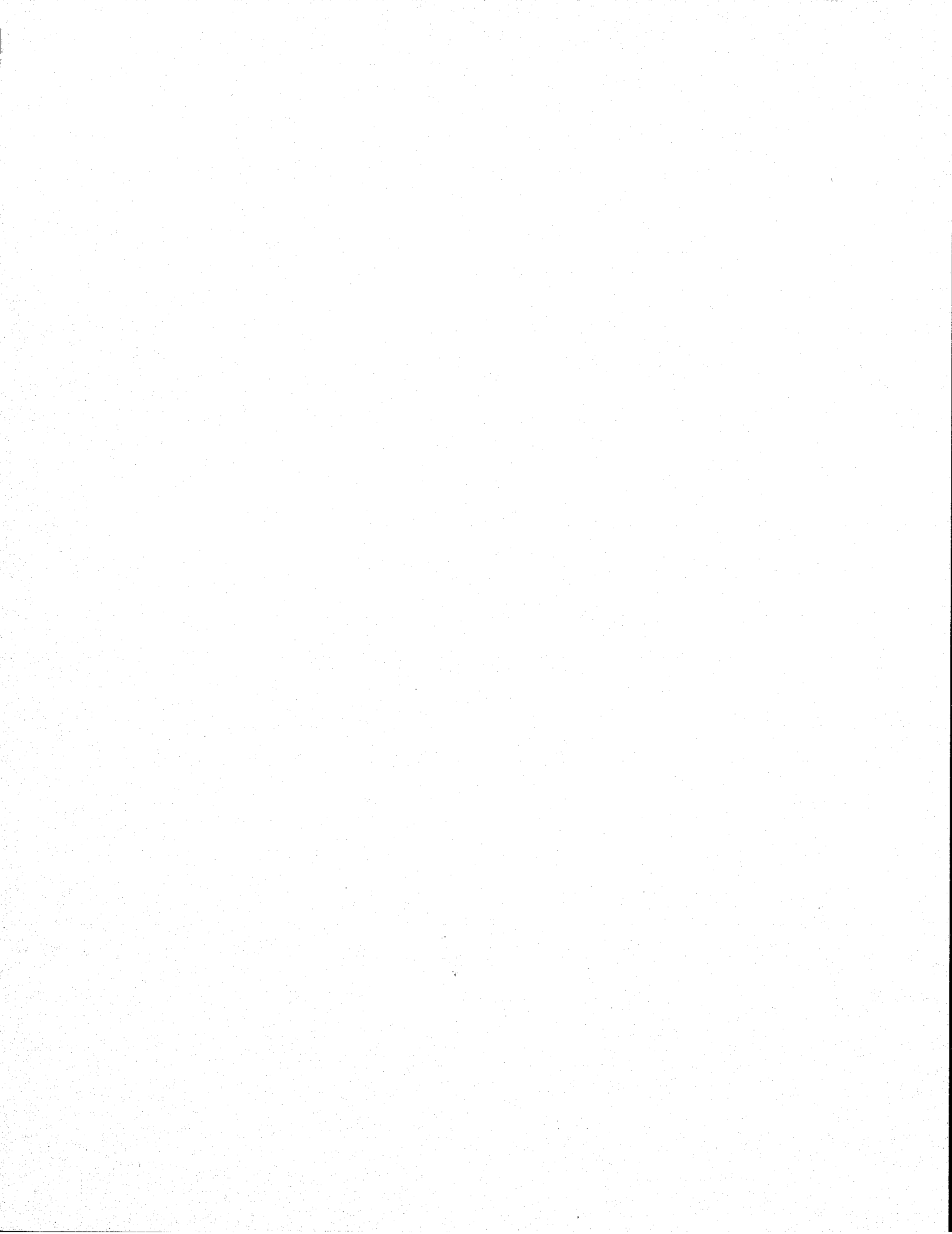
THIS COMPLETES SELF-INSTRUCTIONAL UNIT XXI. YOU MAY WISH TO REVIEW SPECIFIC SECTIONS OF THIS UNIT BEFORE PROCEEDING TO THE POSTTEST.



XXI

KEY TO EMBEDDED QUESTIONS

	Refer to Page XXI -
1. d. All of the above	5
2. a. The speed of a moving vehicle	5
3. d. All of the above	6
4. d. All of the above	11
5. d. All of the above	11
6. d. All of the above	12



**END**