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ACQUISITIONS

# Defensive Pursuit

Colorado State Patrol

Advanced Driver Training Course

50309



## PREFACE

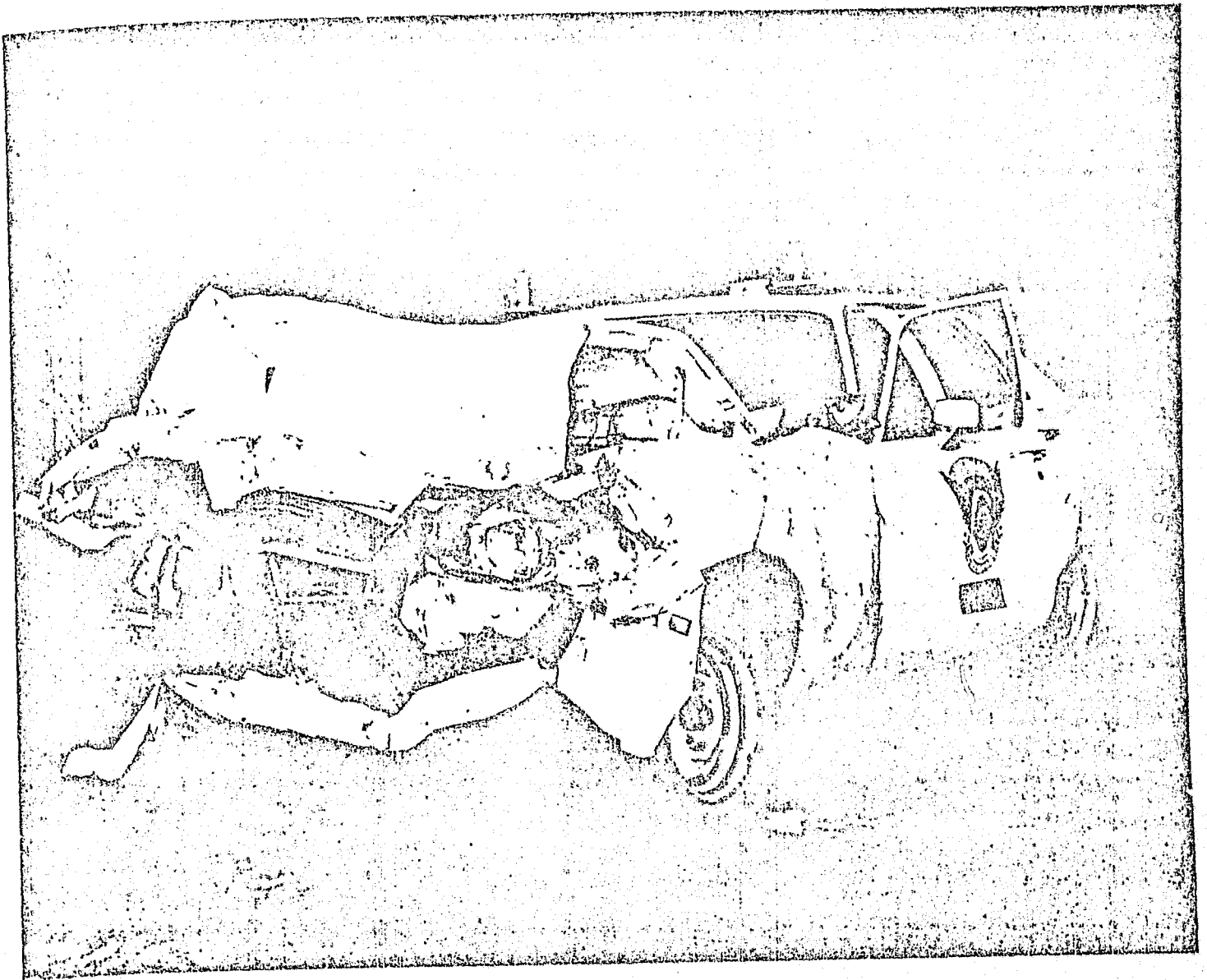
The purpose of the Colorado State Patrol Driving Course is to provide advanced training in the driving skills necessary to manipulate a vehicle under emergency operations. An additional course goal provides basic skills necessary to increase the safety of our patrolmen and the motoring public, during traffic operations of our pursuit units. The training will teach the student driver the techniques necessary for the safe operation of the vehicle when turning around and backing are required. The training offered by this course will increase the chances of escaping collisions due to sudden hazards and potential accident situations.

The State Patrol has long been recognized as the leader of Law Enforcement Agencies in Colorado, regarding safe pursuit driving training. The academy has recently added several new units of instruction to increase and strengthen the already proven driving program.

This manual contains a detailed description of the various units of instruction, as well as the philosophy behind this form of training.

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# DEFENSIVE DRIVING

## DEFENSIVE DRIVING

### UNIT OBJECTIVE:

To train the student driver in the proper techniques for the safe operation of a patrol vehicle during routine and emergency operations. The student driver will also be trained in the proper seeing techniques for safe operations.

The average student trainee, entering the Colorado State Patrol Academy, arrives armed with a negligible amount of defensive driver training. This unit of instruction will provide ten hours of advanced training in the area of defensive driving. The student trainee will receive two hours of classroom instruction. The classroom instruction acquaints the student with the various hazards associated with routine and emergency driving operations. It also provides a technique of self-conditioning one's mind to be more observant of his total driving environment.

After the classroom phase of training, the student is then taken into the field to physically practice this form of defensive driving. The field practice is broken into two four hour blocks. The first block is held prior to the pursuit driving phase of training, and the last block is held after the pursuit driving phase of training. The reason for dividing the two field blocks of the defensive driving unit of instruction is to stress the importance of defensive driving.

Emphasis in past training programs has been largely directed to the pursuit driving phase of training. This program has not lessened training in pursuit driving, but rather, complemented it with a stronger defensive driving unit of instruction.

## DEFENSIVE DRIVING

- A. A process for learning to see
  - 1. It is presumed everyone knows how to operate a Motor Vehicle
  - 2. It is presumed that everyone knows the laws
  - 3. Everyone does not know how to see
  - 4. The principle of seeing must be understood and the process practiced to be good defensive driver
- B. Three basic skills which form the basis for expert performance
  - 1. How to handle the vehicle
    - a. Involves the hands and feet manipulation of the controls, steering, braking and so on
  - 2. What to do in observing and applying the rules of the road
    - a. Passing
    - b. Dimming lights
    - c. Right of way
  - 3. When refers to timing of maneuvers
    - a. Proper timing is very important
      - i. When to pull out from the curb
      - ii. When to pass
      - iii. When to pull into traffic from a side road
    - b. In order to achieve proper timing, you must understand and practice correct "seeing methods"
      - i. They alone can help you avoid the conflicts which are part of the normal traffic environment
    - c. It is important to avoid conflicts
    - d. Conflicts lead to accidents

- e. A few basic points related to accidents should be examined before specific seeing methods are considered
  - i. Most accidents involved "good" drivers i.e., drivers who think they are good, but who still manage to have that once-in-a-lifetime serious or fatal accident
  - ii. In most accidents everybody makes mistakes
  - iii. In multiple car collisions the drivers usually did not see the dangerous situation coming up
  - iv. Or depended on others to recognize and avoid it
  - v. Over 70% of all accidents occur under conditions which we would consider "safe", clear, dry weather, on straight roads and in moderate traffic
  - vi. New officers believe that a marked patrol unit is immune to traffic accidents
  - vii. The answer to these; most drivers did not use the proper seeing methods to avoid these accidents

C. The Seeing Mind. To understand how correct seeing habits prevent accidents, it is necessary for the driver to understand something about the eye and how it works

1. The eye itself does not see
2. It is the instrument of seeing
3. It detects images which are interpreted by the brain
4. When you are alert, your attention shifts automatically at least every two seconds as you drive
5. The expert driver develops a few selective seeing habits that permit him to concentrate on important details



6. He shuts out non-essential parts of the traffic scene
  7. When you allow your eyes to hold on something that particularly attracts your attention, a dangerous fixed stare results
  8. The blank stare is even more dangerous since the mind is not interpreting the images sent it by the eye
    - a. This is most apt to occur when you are
      - i. Preoccupied
      - ii. Inattentive
  9. The eye uses two different kinds of detecting equipment
    - a. One is fringe or peripheral vision
      - i. Fringe vision is fuzzy, out-of-focus, but it does many jobs
        - (a) Picks up objects
        - (b) Picks up lights
        - (c) Picks up movements in the upper, lower and side range vision
      - ii. Your fringe vision could be termed "detection vision"
      - iii. One must remember that the ability of fringe vision to pick out details decreases as the driving speed increases
    - b. The other is your sharp central vision
      - i. This is a narrow three degree cone of clear vision
      - ii. Your central vision serves as "identification vision"
- D. Although not a function of the eyes, the Common Distractions

affect all drivers by reducing their seeing efficiency

1. Examples of Common Distractions
    - a. Route problems
    - b. Mental disturbances
    - c. Inside the vehicle
    - d. Scenery
    - e. Unfamiliar situations
  2. Expert seeing habits must be developed before you can qualify as an expert driver
  3. They are vital to continuous safe driving because they permit
    - a. Attention to key details with central vision with the assurance that fringe vision will pick up clues to potential conflicts
    - b. Resistance to distractions
    - c. Allowance for the time and space needed to adjust safely to each traffic situation
- E. The steps to expert seeing
1. Aim high in steering
    - a. Correct steering requires use of the high-aim steering formula
    - b. This calls for repeated glances well ahead at the center of the intended driving lane
    - c. The vehicle will then readily follow in the middle of this path
    - d. The same rule applies when turning a corner
    - e. Use of high-aim steering at night is also essential

- f. When no other cars are in the immediate vicinity at night, check beyond your own headlight spray for dark shapes or outlines
- g. Reduce speed until the position and relative speed of any faintly seen objects are determined
- h. With oncoming cars, check lane position and stability while they are still a long distance away
- i. Low-aim steering is often the reason a driver has difficulty holding his position in the center of his lane
  - i. Clues to drivers using low-aim steering —
    - (a) Hugs left side of lane
    - (b) Veers too far left to avoid objects on right
    - (c) Swings too wide in turns
    - (d) At night, apt to use upper beams when overtaking
    - (e) Sits on edge of seat peering at road in front of bumper
    - (f) Fails to reduce speed under conditions of poor visibility
  - ii. The restricted vision of a driver who is under the influence produces the same effect

2. Get the big picture

- a. The eyes should sweep over the scene for a full city block or for a half-mile on rural roads
- b. The sides and rear should always be included in this scanning process

- c. The sharp central vision is not permitted to fix on anything for more than an instant
- 3. To help drivers get the big picture, a viewing formula has been developed which includes three basic procedures
  - a. Sweep eyes over the scene, halting only for an instant on any one object, resulting in
    - i. Driver being able to observe problems facing other drivers in time to avoid being forced into abrupt changes of speed and direction
    - ii. Driver being able to get a better check at intersections due to repeated glances
    - iii. Driver being able to pick a safe time to look away from the road
    - iv. Drivers who don't sweep their eyes over the scene, but who limit themselves to one small piece of the traffic picture are guilty of Small Picture Viewing
    - v. The penalty for this is practically certain to be a serious accident
    - vi. Clues to small-picture viewing
      - (a) Close following of other vehicles
      - (b) Hard stops or turns
      - (c) Traffic delays due to poor positioning or timing of moves
      - (d) Delayed response in reacting to signals from other drivers or in observing traffic situations

- b. The second procedure in the Big Picture viewing formula requires proper spacing between vehicles
    - i. The rule is to allow more than one car length for each 10 miles per hour
    - ii. Or leave a two second interval between your vehicle and the vehicle in front
    - iii. This rule must be observed in order to give other seeing rules a chance
    - iv. Results
      - (a) Are free to see the big picture
      - (b) Have time for making proper responses
      - (c) Allow adequate braking distance
  - c. The third big picture viewing procedure is to build the ground-viewing habit
    - i. Glancing at the ground beside the front wheel of other vehicles before overtaking to pass or before meeting oncoming cars is a valuable habit
    - ii. Any right or left swing of the wheels tells instantly that the vehicle is about to veer
    - iii. At the same time relate the position of the other vehicle to adjacent fixed objects to aid in judging its speed
4. Keep your eyes moving
- a. Build the habit of shifting the eyes every two seconds
  - b. Keep glancing near and far and to each side
  - c. Constant eye movement prevents the loss of fringe vision

- d. Keeping your eyes moving calls for you to dispose of eye-holding problems quickly. Do this by
  - i. Adjusting speed
  - ii. Changing lanes
  - iii. Signaling or all three if needed

NOTE: A SPECIAL PROBLEM FOR AN OFFICER ON PATROL

- e. The habit of disposing of eye-holding problems has these good results
  - i. It forces adjustment of speed to visibility along driving path
  - ii. It prevents over-concentration on one part of the scene while moving blindly into an accident producing situation
  - iii. Prevents the over-relaxing that invites sleep or highway hypnosis
- f. Keeping your eyes moving permits a check of mirrors at least every five seconds
  - i. The instant a conflict is indicated ahead, double-check the rear for clearance before applying brakes or changing lanes
  - ii. The habit of frequently checking the rear-view mirrors pays off because the driver
    - (a) Is aware of other vehicles
    - (b) Has clearance to brake or swerve
    - (c) Knows when to signal

5. Leave yourself an out

- a. First, strive for a space-cushion

- i. Maneuver for better spacing by moving forward or dropping back
- ii. Pick lane with the best view of traffic and which offers the least chance of conflict from the front, rear or sides
- iii. At intersection stops, leave a space-cushion between your vehicle and the vehicle in front of you
  - (a) Stop so that you can see the front vehicle's rear tires
- iv. Allow the vehicle in front to pull out to re-establish a space cushion
- v. Allow extra space ahead
  - (a) "Boxed-in" with no swerving space on either side
  - (b) On slippery or irregular road surface
  - (c) View is obscured of the path ahead
  - (d) Vehicle is close behind - "driving blind"
- b. Second, adjust speed to visibility
  - i. Reduce speed when rounding curves, topping hills and when darkness or other hazards lower your visibility.
  - ii. At blind or unmarked intersections, when no other vehicle is running interference for you, speed must be appropriate to visibility and foot moved to brake pedal
- c. Third, leave yourself an out in doubtful situations by reducing speed and touching brakes

- i. Childrer, cyclists, animals and absent-minded pedestrians are common causes of doubtful situations for the alert driver
- ii. Traffic light is "stale green", ready to change
- iii. Driving path comes near any fixed hazard
- iv. Passing near parked car with driver at the wheel who could pull suddenly into traffic lane
- v. When oncoming vehicle may turn left in front of your vehicle
- vi. A side-road driver approaches too fast at intersection

6. Make sure they see you

- a. This means that you must be certain any pedestrians or other drivers who might cause a conflict have seen your vehicle
- b. Proper communication with them is essential to safe driving
- c. The expert signals others of his intentions early, while he still has time and space in which to avoid them if they do not respond
- d. There are three situations in which other drivers or pedestrians are most apt to become a hazard to you
  - i. If they are in the path ahead and could cause a conflict
    - (a) Signal immediately if they do not recognize your right-of-way
    - (b) Signal with a tap on the horn or a flick of



the lights, or both

(c) Make certain they stabilize in response to the signal

ii. Drivers who might cause a conflict from their position in the rear of your vehicle

(a) If a sudden slowdown is unavoidable, warn the driver in back immediately

(i) Flash the brake lights

(b) Even in a routine stop, get your brake light on early to warn the drivers behind you

(c) In preparing to turn, get in the proper lane early

(d) Signal well ahead of maneuver

iii. A conflict is always possible when meeting or passing another vehicle

(a) Check the big picture — is there anything which might cause the driver to change path

(b) Turn on lights at or before sundown

(c) Signal before passing if there is the slightest doubt that the driver may not hold a steady position

(d) Once he's stabilized, get your eyes up in center of lane ahead and pass briskly

F. The common conflicts at night that result in accidents are usually

1. Striking on object in the forward path

2. Swerving from the driving path into the other lane or off

the road

3. Hidden or unobserved obstacles in the vehicle's path during turn around maneuvers
  4. Improper parking
- G. The common conflicts occurring in the daytime are most often one of the following types
1. Slow down or stop and being hit from the rear
  2. Start up and being struck from the side or rear
  3. Crowding or blocking other vehicles when changing lanes
  4. Improper parking
- H. The Acid Test of AN EXPERT DRIVER is — driving five to ten years without needing a tire-skid or a violent swerve to escape an accident

The experts do it. You can too!

DRIVER TRAINER'S GUIDE  
FOR "IN-VEHICLE" PORTION OF DEFENSIVE DRIVING

By far the most important part of the Defensive Driving Training is the "In-Vehicle" portion of the training. This consists of the instructor "coaching" the driver trainee in the "driving commentary" technique of defensive driving. For effective "In-Vehicle" training, prior classroom instruction is necessary to establish a basic foundation of the principles involved.

"Coaching" by the driver trainer should be utilized to bring situations to the attention of the driver trainee which apparently have been overlooked. If the trainee has not made an appropriate response to a traffic situation, the trainer should enumerate the possible consequences pro and con with a suggested driving reaction to the situation.

When giving the commentary, some good habits to develop and pitfalls to avoid are listed below:

1. Be sure to mention that all drivers may be guilty of mistakes during the driving. You may want to invite questions from the group, but it may be wise to point out that you will create brief opportunities for questions while stopped for a light, etc.
2. If the starting point is several minutes of open road, or does not present good exposure for commentary, this time can be utilized for discussion of a variety of items like side-road country drivers pulling onto the highway, the dangers of wide open intersections, the advantages of checking the road shoulder for escape from oncoming vehicles, and traffic from the rear.
3. Always try to pick major thoroughfares with a wide variety of traffic problems. A congested, bumper-to-bumper street "kills" a commentary unless the traffic keeps moving at a good speed. The route should include freeways, urban traffic, residential areas, as well as roads which will present routing problems.
4. It is important to maintain a speed fairly consistent with the flow of traffic. If you drive too slowly, the group will think you are being unrealistic. Be cautious about appearing to be reckless with too high a speed.
5. Caution the students in making definite predictions, such as "There is nobody in that parked car", "He is going to turn right because he is signaling a right turn", or "He sees me and won't pull out." Invariably these statements will backfire. It might be better to say "I think he

sees me, but I am prepared in case he comes out."

6. Develop the habit of mentioning a wide variety of traffic situations and conditions. There is usually a strong tendency to keep repeating the same observations.
7. Caution students to avoid repeating "fill-in comments" when a lag occurs. Example - "Now we are proceeding smoothly along", "I'm maintaining a safe speed", or "We are traveling along at (or under) the speed limit."
8. Be sure the student is maintaining an appropriate cushion of at least two seconds between vehicles and refers to this cushion occasionally comparing it to that maintained by drivers around him, and to the fact that he is traveling as fast as most of them, but with better visibility and reaction distance.
9. Also check the smooth stop procedure at lights, stop signs, etc. and the correct space cushion, ie, see the bumper or rear wheels.
10. Remember that the passengers in any vehicle feel the roughness of stops and turns with greater sensitivity than the driver himself.
11. Never allow the commentary to run too long; 25 to 30 minutes per man is normally long enough to establish the concepts of good driving principles.

## IN-VEHICLE TRAINING GUIDELINES

### UNIT REQUIREMENTS

#### A. City Driving

1. Two or three lane one-way street with cars parked along one or both sides
2. Blind intersections, controlled and uncontrolled
3. Intersections controlled by signal lights
4. Intersections controlled by stop signs
5. Intersections controlled by yield signs
6. Right turns from one-way and two-way streets
7. Left turns from one-way and two-way streets
8. Stop sign intersection with limited visibility requiring pull-up and second stop
9. Main and side streets

#### B. Rural Driving

1. Two lane road with:
  - a. Intersections
  - b. Turns onto and off of two lane road
  - c. Stop signs
  - d. Curves with limited visibility
  - e. Humps, bridges, hills

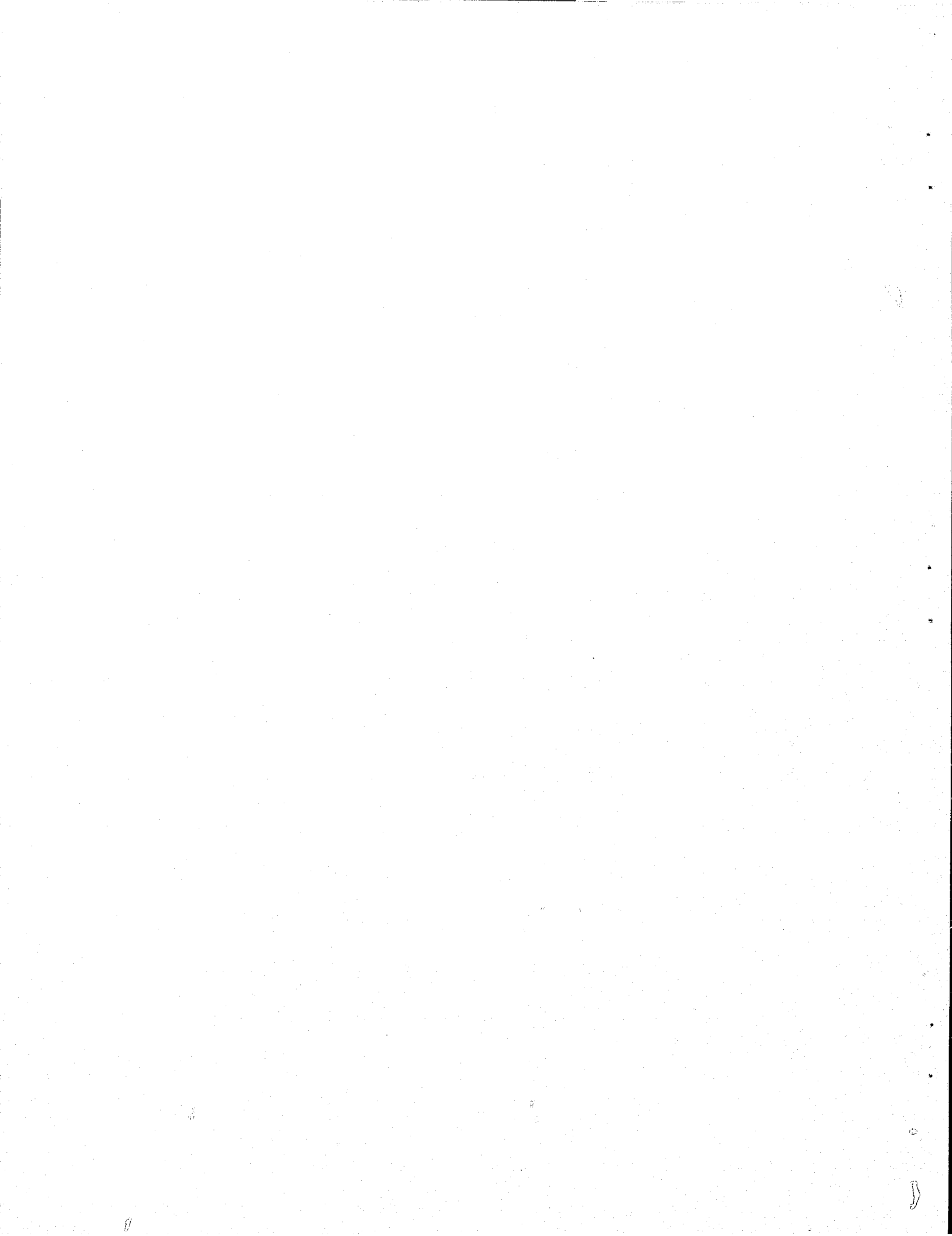
#### C. Interstate Driving

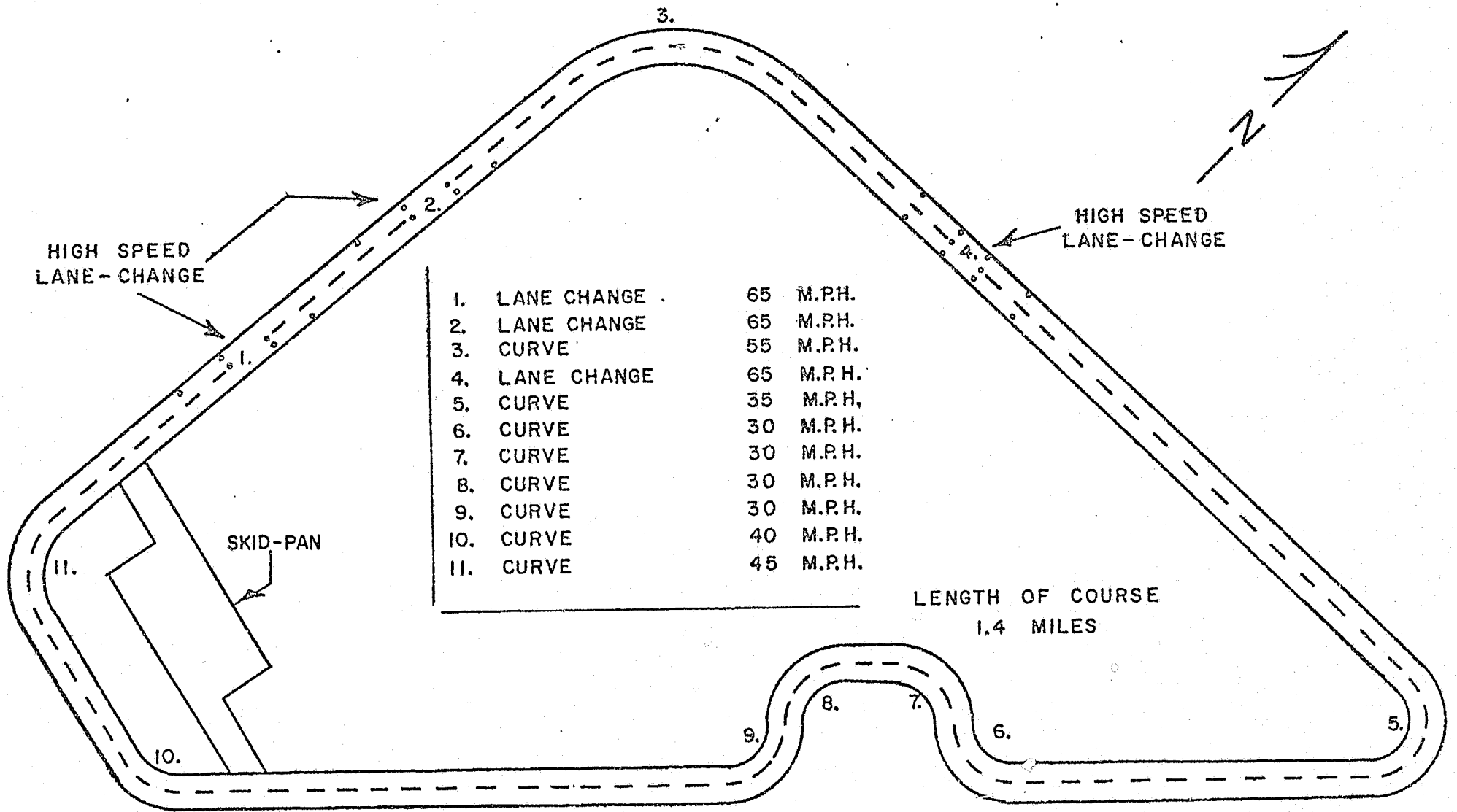
1. Section of road having unclear highway signs
2. Ramps onto and off of Interstate highway
3. Busy merging lanes



PURSUIT

DRIVING





PURSUIT DRIVING COURSE  
CAMP GEORGE WEST  
GOLDEN, COLO.

Figure 1



## FACILITIES AND EQUIPMENT

### TRACK DESCRIPTION (FIGURE 1):

The Colorado State Patrol Academy driving track is located on South Table Mountain, approximately one mile east of Golden, Colorado. Located at the top of this flat-topped mountain, is a standard two laned highway and a skid pan.

The highway consists of two twelve foot lanes that are one and four tenths miles in length. The road surface is the standard black top, oil based surface, with slightly higher oil content than used on the majority of our state highways. The higher surface oil content provides a slicker surface to increase the likelihood of sliding upon the curves. The total track is set up in an irregular, triangular configuration. It has eight curves varying in the degree of arc. Each curve was engineered for a predetermined speed. Three high speed lane changes are included.

In addition to the one and four tenths miles of highway, a skid pan is located at the south end of the track. It is a rectangular, black topped area with two entries into the track. The skid pan is utilized for a base of operations, low speed skids, backing exercises, quick turn around drills, and parking.

### VEHICLE DESCRIPTION:

The vehicle utilized on the pursuit driving track is a standard police vehicle with safety modifications. The primary modification is the addition of a roll bar to protect the occupants in case of a roll-over accident. Attached to this roll bar are two sets of shoulder harnesses, that work in conjunction with the two oversized seat belts, to securely restrain the occupants in case of an accident situation (figure 2).

Helmets are also provided for the safety of the occupants. Vehicle checks and safety procedures will be outlined in a later chapter.

Miscellaneous support equipment includes a van and trailer. The trailer contains all of the maintenance equipment necessary for logistical support.

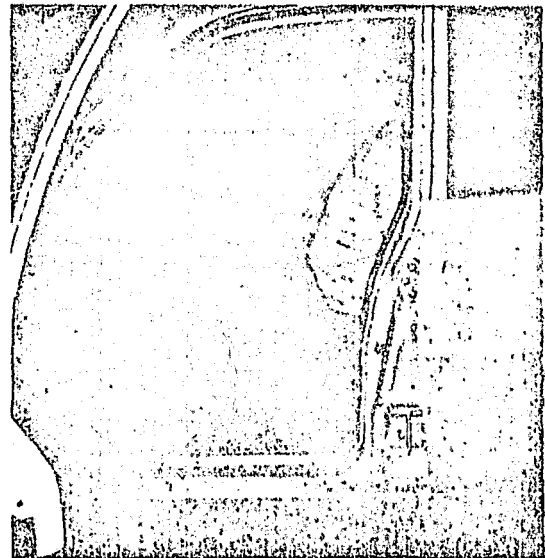


Figure 2

## THE THREADING SYSTEM OF STEERING

### THEORY:

The threading system of steering is a positive technique. It enables the driver to establish and maintain maximum control of his vehicle when negotiating curves at higher speeds. The pursuit driver's hands are always in proper position to make a recovery, in loss of control situations. Therefore, it provides better control in hazardous situations.

Under normal pursuit driving situations, the threading system enables smoother handling in the curves. With minimal hand movement a pursuit vehicle can be safely and easily maneuvered through a curve. Once the threading system becomes nearly instinctive, the driver has time to monitor the other important facets of pursuit driving, i.e., lane positioning, power train, and braking.

### TECHNIQUE:

Proper hand positioning is mandatory when utilizing the threading system of steering. The driver's hands should grip the steering wheel at the ten and two position (figure 3) firmly but comfortably, with the thumbs resting on the face of the steering wheel. Hand positions are indicated by number with reference to the circumference of the steering wheel, equal to the face of a clock (example: twelve o'clock would be at the top of the steering wheel).

To illustrate, the hand movements for negotiating a curve which arcs to the right are as follows: as the driver and vehicle approach the curve, the driver drops the left hand from the ten o'clock position to a position at or below nine o'clock, depending upon the severity of the arc of the curve (figure 4). Grasp the steering wheel with the left hand and gradually feed the steering wheel up with the left hand through the right hand.

If the proper procedure is used the left hand should have returned to the base position when the vehicle reaches the half-way point on the curve (figure 5). Once the vehicle has passed this half-way point, the right hand should be dropped from the two o'clock base position to a position at or below the three o'clock position (figure 6). Grasp the wheel with the right hand and gradually feed the steering wheel up through the left hand to recover when exiting from the curve. As the vehicle exits the curve, the right hand should have returned to the base position (figure 7).

It is important to note that the hands or arms should never cross when negotiating a curve. Crossed hands severely limit the chances of recovery should a loss of control situation arise. It is also important to remember, when one hand is in motion the other hand should be stationary at the base position. For a left turn, simply reverse the operation.

Most students, when attempting this method of steering for the first time, find it extremely awkward. As they become more proficient with this technique, the general consensus, is that it



Figure 3

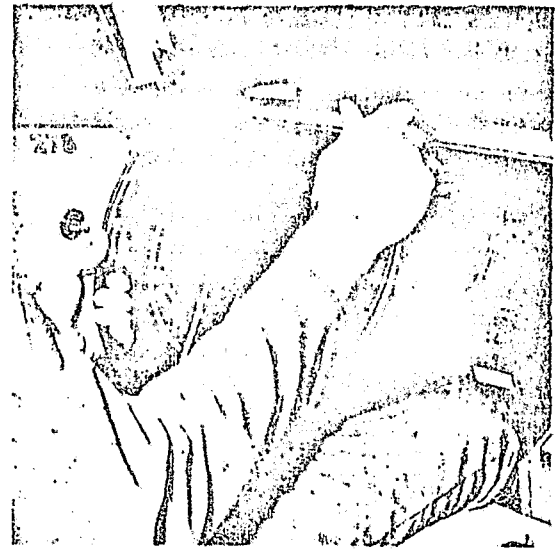


Figure 4

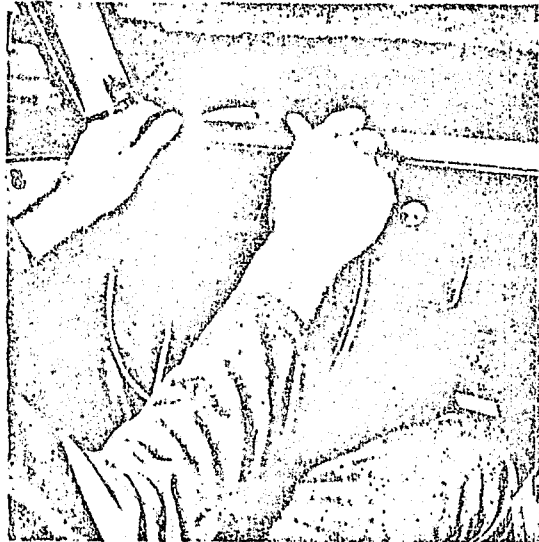


Figure 5

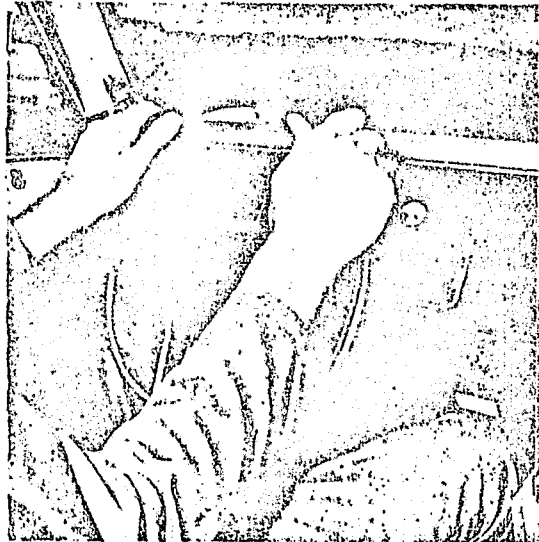
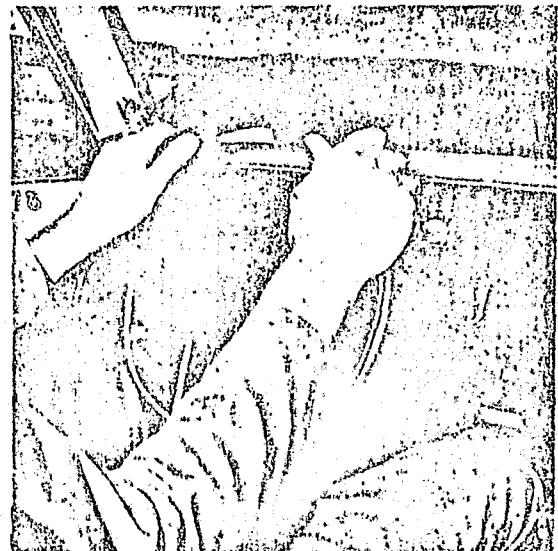


Figure 6

Figure 7



is smoother and safer than the techniques the students previously used.

This technique of steering is not an inherent trait. It is a learned and practiced skill. Only through constant practice, can one expect to successfully utilize this technique in a pursuit situation.

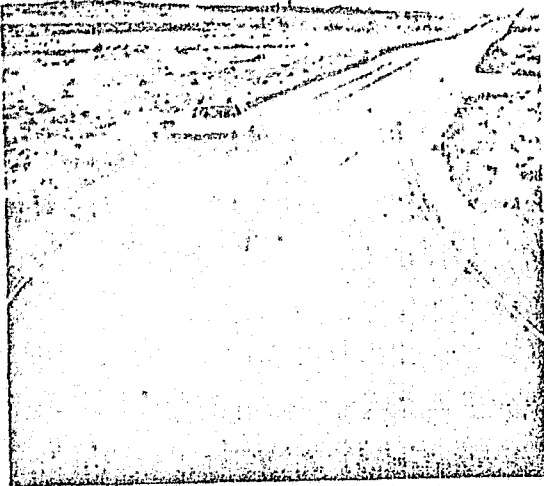


Figure 8

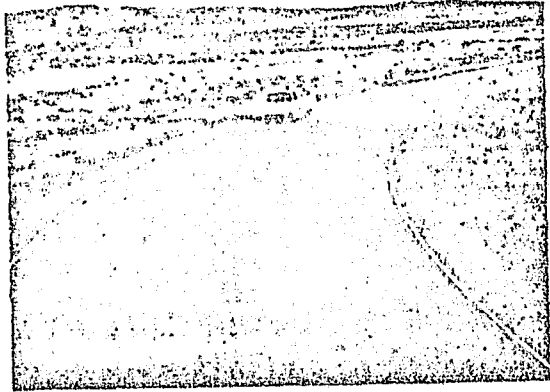


Figure 9

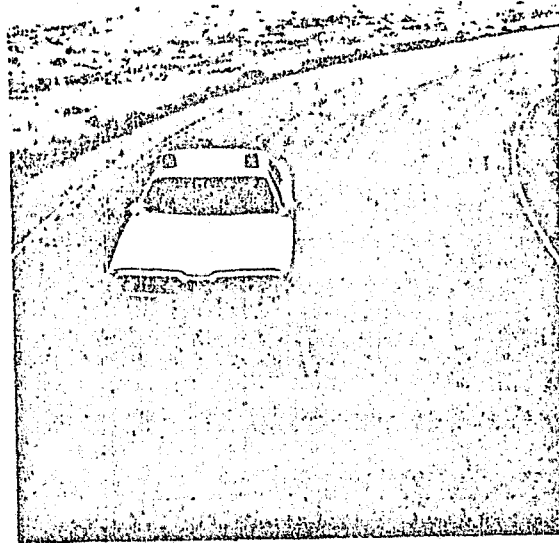


Figure 10

Figure 11

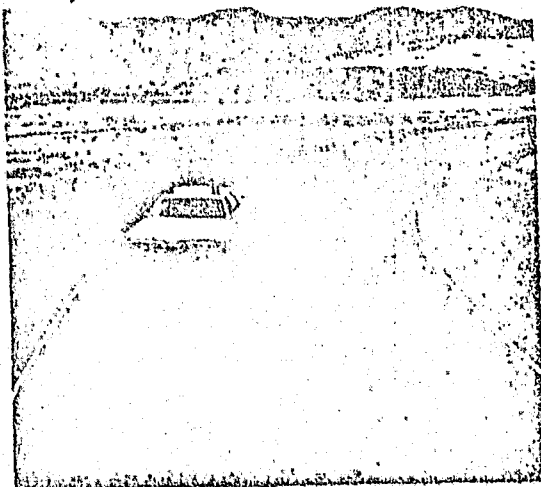
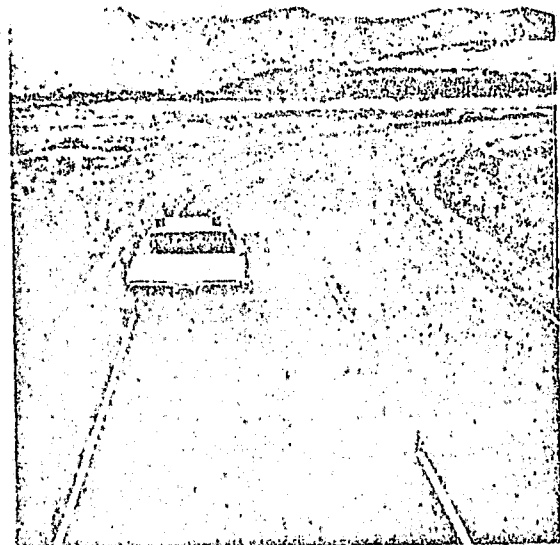


Figure 12



## LANE POSITIONING

### THEORY:

The standard pursuit vehicle is approximately six feet, eight inches wide. The standard highway lane width varies from twelve to fourteen feet. When, upon a curve, the driver of a pursuit vehicle uses the entire width of the lane for negotiating that curve, the severity of the arc of the curve is lessened. This lessens or eliminates centrifugal drift and increases vehicle control and stability.

Centrifugal drift is the result of centrifugal force constantly pulling on the vehicle in an outwardly direction from the center of the arc of the curve. The centrifugal drift of a vehicle is directly proportionate to the arc of the curve and the velocity of the vehicle.

A primary factor which effects the amount of the centrifugal drift on a curve, is the coefficient of friction at the particular time the curve is being negotiated. The coefficient of friction is the cohesive quality of the road in relation to the weight of the vehicle and the quality and composition of its tires. In other words, one would rightfully expect more centrifugal drift on a curve that was wet than on the same curve when it was dry. One should also realize that the same curve could be taken at a faster and safer speed, if the arc were lessened by utilizing the full width of the traffic lane. Therefore, proper lane positioning is of vital importance to the driver of a pursuit vehicle.

### TECHNIQUE:

The pursuit driver positions his vehicle on the road so that as he approaches a curve, his vehicle is on the high side of the lane (figure 8). He then steers into the curve, utilizing approximately the first quarter to reach the low side of the lane (figure 9). NOTE: USE ONLY ONE LANE - DO NOT CROSS THE CENTER LINE. The vehicle holds this low side through the center portion of the curve (figure 10). When exiting the curve, the driver steers the vehicle out to the high side of the curve to curtail or possibly eliminate the centrifugal drift (figure 11). If proper lane positioning was maintained throughout the curve, the vehicle would have exited smoothly and in a direct line with the lane edges (figure 12).

## USE OF POWER

### THEORY:

A tight power train goes hand in hand with proper lane positioning. A tight power train insures maximum contact between the road and the tires, no sudden loss of control, and smoother entry and exit on curves. Many accidents have occurred on surfaces that have had an excellent coefficient of friction, as well as a poor coefficient of friction, due to the loss of a tight power train. Proper application of power is essential for negotiating curves at higher speeds.

As a rule of thumb, one may determine if he is using an improper power train as follows:

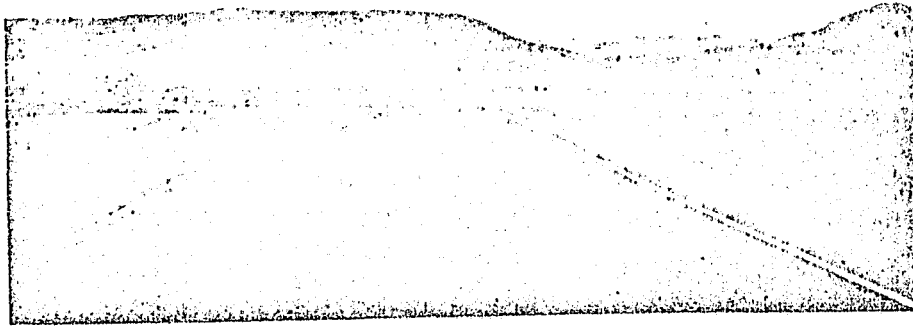
1. Vehicle drifts to low side of curve = insufficient power application.
2. Vehicle drifts to high side of curve = excess power application.

### TECHNIQUE:

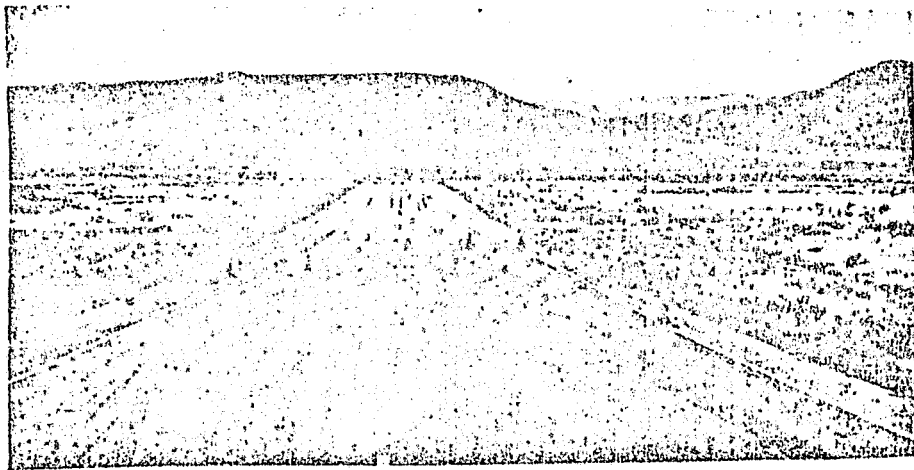
Set the throttle of the vehicle so that the vehicle approaches a curve at its maximum allowable safe speed. Hold that speed throughout the curve, while utilizing the other techniques previously listed in this manual.

Three sensory sources should be utilized to hold this speed. The first is eyesight. Monitor the speedometer when entering the curve, when halfway through the curve, and when exiting the curve. The speedometer should maintain the same reading. The second sensory source is hearing. Constantly monitor the pitch of the engine. Too low, too high, or a shift in pitch indicate an improper train. The last sensory source is feeling. One should feel a constant pattern of vibrations with his right foot on the accelerator pedal, with his body on the car seat and with his hands on the steering wheel.

Through the constant monitoring of the vehicle with all of the listed sensory sources and the adjustment of power to maintain these impulses, the driver should be able to maintain the proper power train.



HIDDEN



HAZARDS



## HIDDEN HAZARDS AND BRAKING

### COURSE OBJECTIVE:

To acquaint the student with the proper braking and steering techniques required when faced with a hidden or sudden hazard on the road. The course will also provide instruction in the physical limitations and capabilities of a pursuit vehicle.

### STUDENT OBJECTIVES:

To obtain a degree of proficiency in the techniques of successfully avoiding sudden or hidden hazards.

The hidden hazard drill is the final phase of the pursuit driving course. The student driver should have reached an adequate level of competency in the general pursuit driving course before attempting this phase of training. The training will concentrate on proper braking and steering techniques to be utilized to avoid a hazard.

To utilize proper steering and braking when confronted with a hazardous situation, one must be aware of the physical capabilities and limitations of the vehicle. One must immediately be aware of the physical law of the vehicle's center of gravity. Every vehicle has a center of gravity. This is a balanced point on the vehicle which is its center of mass. If one were to lift the vehicle at this point the vehicle would balance. The center of gravity plays an important role in vehicle control.

When a vehicle's brakes are locked and it is skidding, it will continue to travel in the direction that its center of gravity is traveling. Attempting to steer in either direction will be of no value: As long as the wheels are locked, the vehicle will continue to travel in a line with the center of gravity. Even if the vehicle is spinning, it will continue on this line.

To avoid this hazardous situation one must learn to utilize two principles. The first is the principle of rolling friction braking. Rolling friction braking is hard, continuous braking without wheel lockup. It has been proven, the best braking occurs just prior to wheel lockup. It is also a fact that a vehicle can still be steered when utilizing this method of braking. The second principle is steering with the center of gravity. If loss of control should occur in an emergency situation, control can be regained only by turning the front wheels in line with the direction of travel of the vehicle's center of gravity. When this is performed, the front end of the vehicle will immediately face the direction of travel of the total vehicle, and the rear end of the vehicle will follow suit.

The student driver, having learned to utilize these two principles, should react in the proper manner, if a hazardous situation occurs. Practice with these principles will eliminate the panic, locked wheel braking habit that most citizens and officers use when confronted with a sudden hazard. The officer will still

react immediately, but he will brake forcefully without wheel lockup, while searching for an out. Once the out is found, he may either continue to brake and steer, or he may apply power and avoid the hazard.

A special note should be made to advise the student; use the same steering technique utilized in the high speed lane changes.

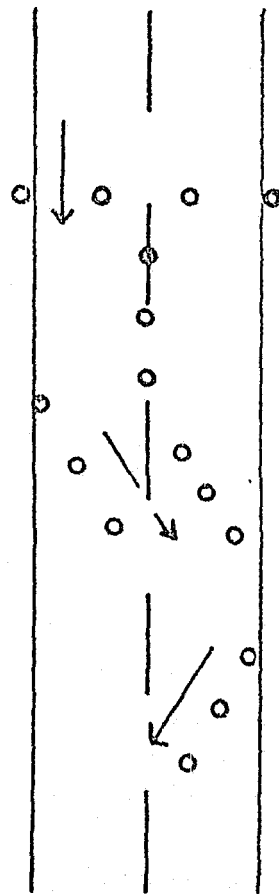
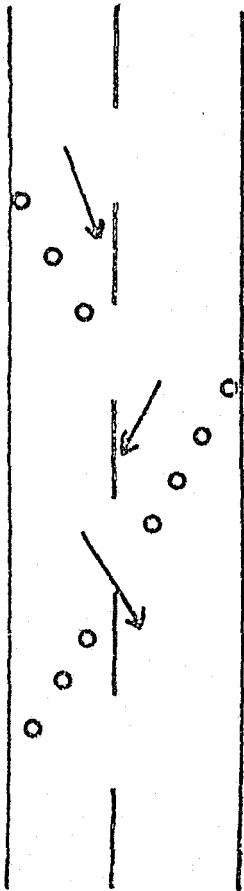
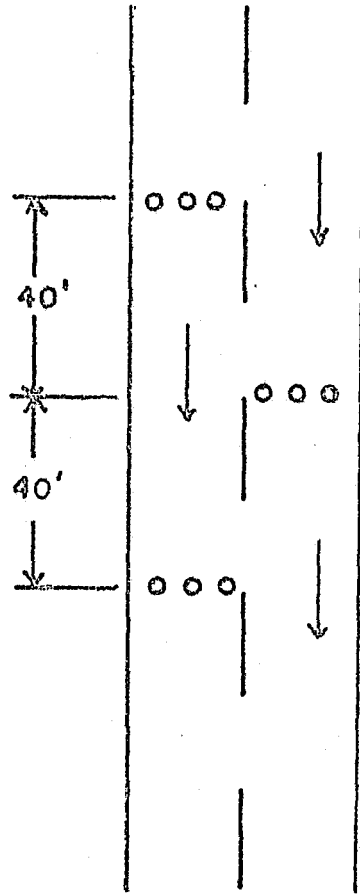
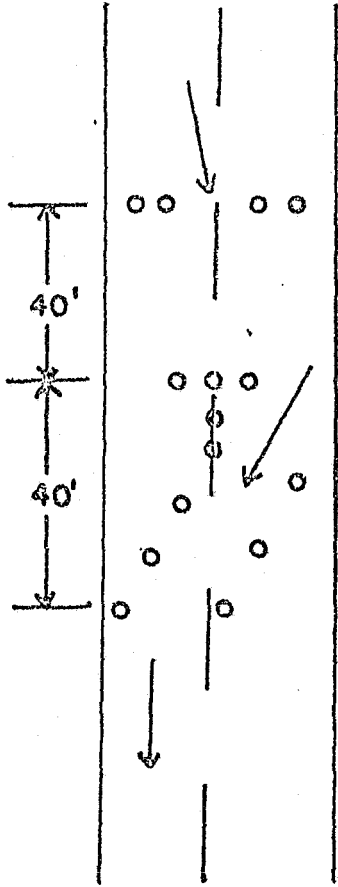
To introduce the proper braking techniques, a demonstration in rolling friction braking should be performed.

Traffic cones are placed across one-half of the roadway simulating a stopped vehicle. An instructor approaches the hazard at 50 m.p.h. applying a four wheel lockup at a distance of 60 ft. The instructor then attempts to turn the steering wheel to avoid the hazard. The vehicle will continue in a straight line through the cones. The cones are then reset and the test is conducted again in a similar manner. On the second run, however, the instructor brakes hard, but without skid. At approximately thirty feet from the first cone, the instructor steers the vehicle either to the right or left, to avoid the hazard.

After demonstrating the proper braking and steering techniques required in avoiding a hazard, the instructor should acquaint the students with the hidden hazards course they will be required to drive. The students will be required to drive the remainder of the pursuit driving track, with the exception of one lane change (either on the north or west side of the track) where the hidden hazards will be placed.

The various basic cone patterns will be illustrated on the following page.

HIDDEN HAZARDS



## BACKING

### UNIT OBJECTIVE:

To identify the various hazards and problems confronting the pursuit vehicle operator, when performing a backing maneuver. This unit will also provide instruction in the proper techniques for backing a pursuit vehicle during emergency turn around operations, as well as routine backing movements.

The backing course is a continuance of the entire pursuit driving course. It is designed to allow most of the training vehicles to continue making laps on the outer track while others are performing exercises within the boundaries of the skid pan.

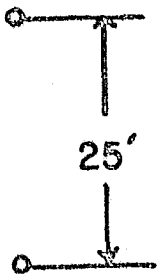
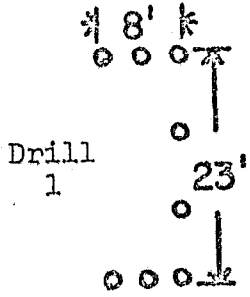
The exercises are divided into two general areas. The first area consists of four exercises that instruct and condition the trainee in the techniques of the four point method of safe backing. The second area is concerned with the teaching of the proper techniques for quick turn-arounds. Quick turn-arounds will be discussed at a later time in the next section.

The four point method of backing stresses visual continuity referenced to vehicle point-space displacement. In other words, if the driver maintains visual contact with the four exterior points of his vehicle in reference to the vehicle's direction of travel, he can back the vehicle without colliding with hidden objects.

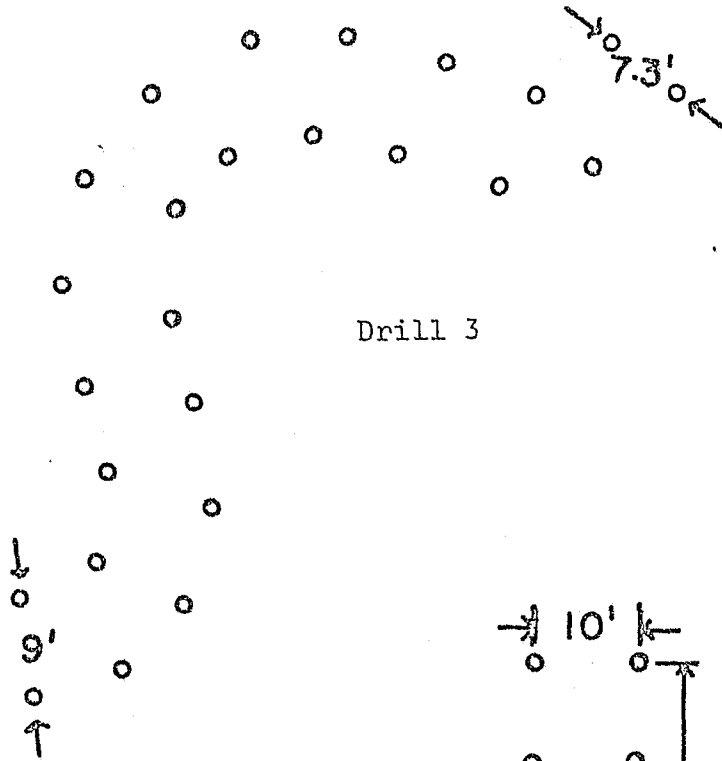
The technique utilized by the driver consists of positioning himself so that his head is near the center of the vehicle. To do this, he must brace his left foot against the left front firewall of the vehicle and extend his body so that it is positioned in a diagonal line across the driver's seating area. His head should be positioned near the top center portion of the interior of the vehicle. His left hand should be on the steering wheel while the right hand and arm are braced on the front seat's back support. The eyes should be constantly scanning the four points of the vehicle while it travels in a reverse direction.

By constantly monitoring these points the driver insures the safety of the total vehicle. This technique effectively reduces the blind spots which generally occur during backing operations. Refer to the four backing drills listed on the following page.

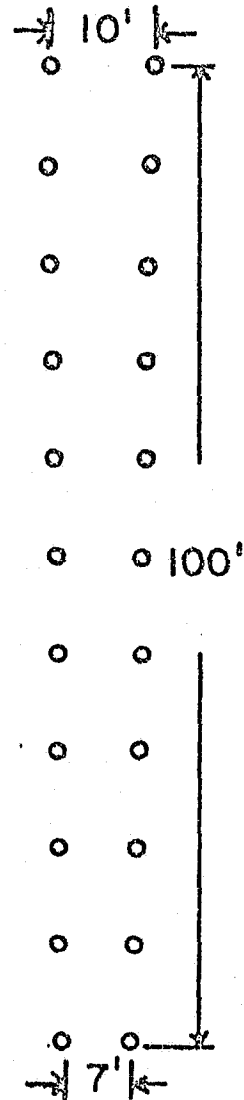
BACKING EXERCISES



Drill 2



Drill 4



## QUICK TURN AROUNDS

The various techniques for quick turn-arounds must emphasize safety as well as quickness. Safety and lower maintenance costs must be considered before instructing in any one type of turn around technique.

There are several quick turn around techniques which are available for the driver to use during a tactical situation. Three of these techniques will be listed in this unit of instruction.

### U-TURN:

If ample space is available, this turn around is the safest maneuver for reversing a vehicle's direction. The u-turn is initiated by the driver checking to see that the road is clear of traffic. He then pulls to the far right side of the road, turns the steering wheel to the full counter clockwise position, and completes his turn.

### BOOTLEG:

This turn around is a fast method of reversing directions in a tactical situation. The "bootleg" has been used by the patrol for many years, and has consistently proven its worth when executed in the proper manner.

NOTE: Only the most practiced driver should attempt such a maneuver due to the exact timing required to successfully complete such a turn. If a driver applies too little power the vehicle will stop across the center of the road at a very hazardous angle. If the driver applies too much power the front end of the vehicle will slide past the desired positioning in the opposite lane. Improper power usage can also cause the engine to stall.

The proper procedure, when utilizing this technique, is to stop the vehicle to the far right side of the road, utilizing as much of the shoulder as possible. Proper placement should include a visual check of the right-hand edge of the road for any obstructions or hazards. With the vehicle stopped and parallel to the edge of the road, the driver should check for any vehicular traffic in the area. Once the area is clear of all traffic, the driver should back the vehicle while slowly turning the steering wheel counter clockwise. The right front wheel should travel in a line close to the line of the edge of the road. Continue steering counter clockwise until a full reversal of direction has been obtained. Stop the vehicle, shift the gears to the drive position and straighten the front wheels. The driver then accelerates the vehicle to the desired speed. Refer to quick turn around drill number one.

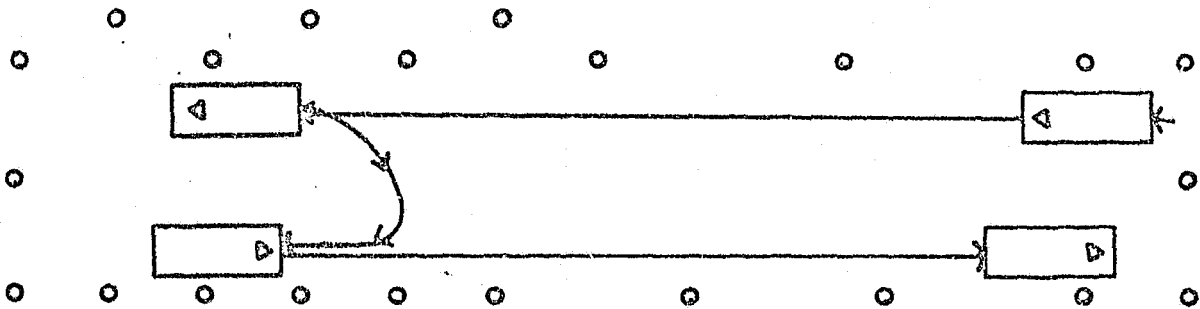
### FORTY FIVE - NINETY TURN:

This technique for reversing a vehicle's direction of travel should be utilized when a quick turn around is required on a narrow road while the vehicle is in motion.

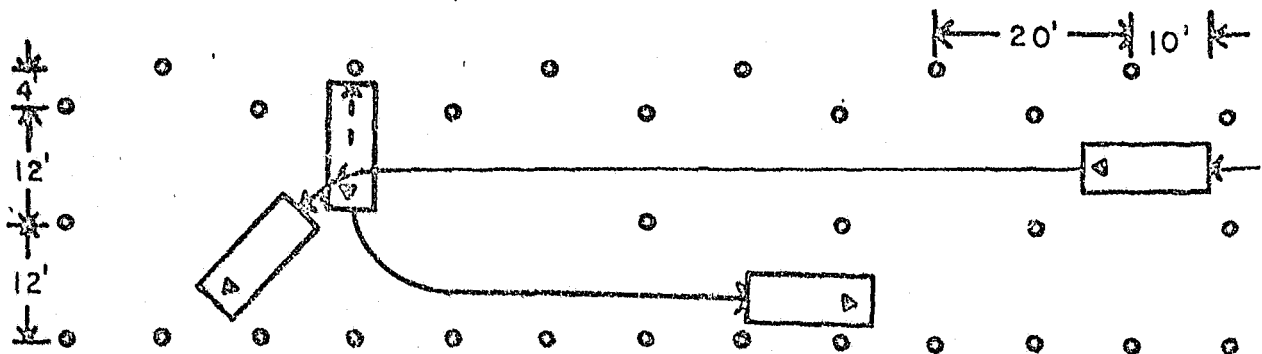
To reverse the direction of travel the driver first uses the rolling friction method of braking. He continues to slow the vehicle's speed until it is traveling at a rate of twenty miles per hour. He then sights out the front window until an obstacle on the right side of the road crosses across the right front point of the vehicle. At this point, he immediately steers the front end of his vehicle into the opposite lane while braking the vehicle to a full stop. By sighting the obstacle, in this manner, and steering at the proper time, the operator has eliminated the possibility of striking it. As the vehicle's transmission is placed in the reverse gear the driver turns the steering wheel to the full clockwise position. The vehicle is then backed to a stop with the back wheels resting on the edge of the roadway, at a ninety degree position in relation to the roadway. The driver quickly scans the roadway to the left and right while simultaneously turning the steering wheel fully counter-clockwise and engaging the transmission to the drive position. The vehicle is then maneuvered into the opposite lane.

There are four advantages of this technique for reversing direction. First, it provides a constant monitoring of the traffic lanes. Second, the operator is never backing the vehicle "in the blind". Third, the extreme, structural stress factor has been reduced substantially. Fourth, this maneuver, when initiated while moving, is easier and quicker than the "bootleg" technique. Refer to quick turn around drill number two.

QUICK TURN AROUND DRILLS

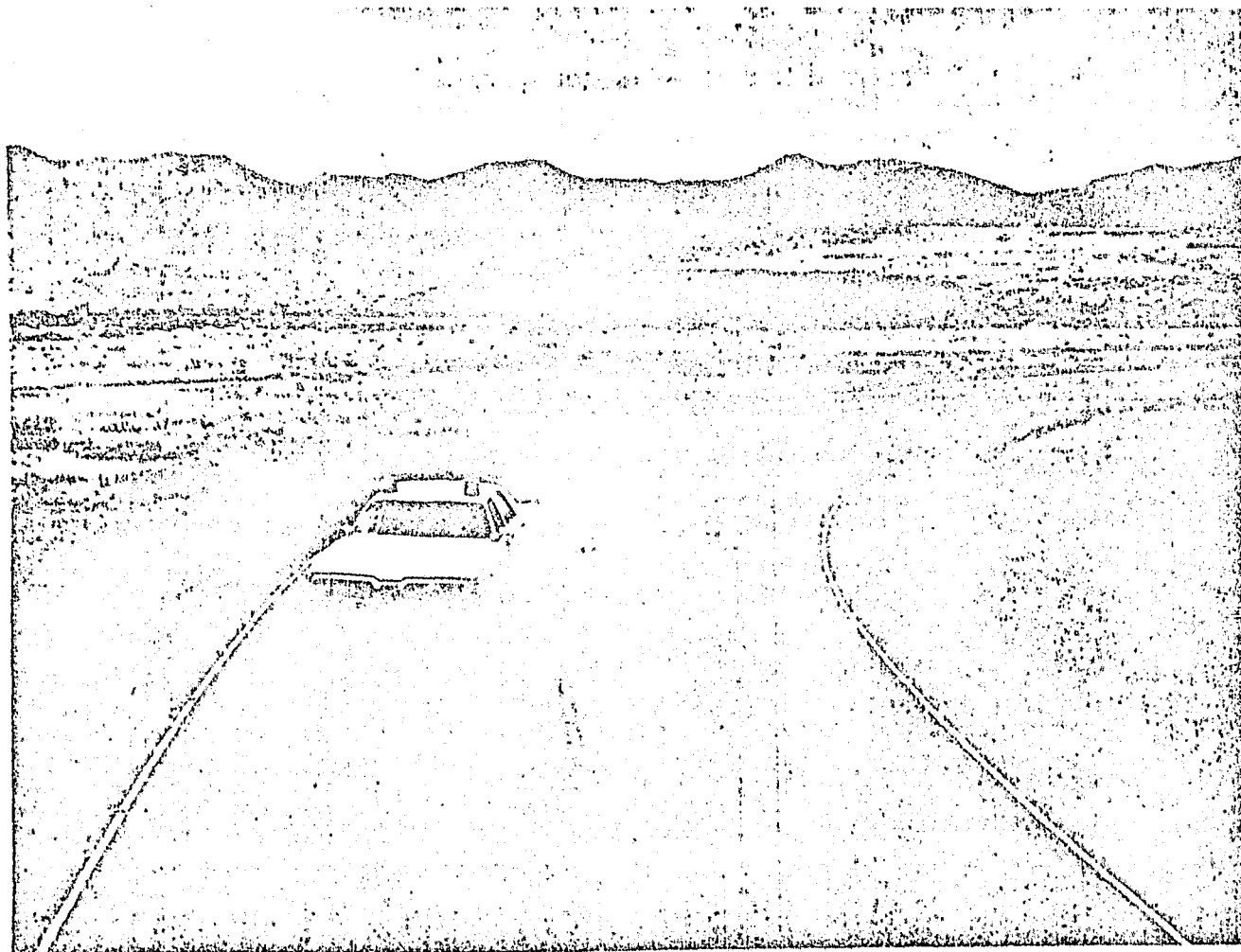


Drill 1



Drill 2

# TRACK OPERATIONS SCHEDULE





COLORADO STATE PATROL  
TRACK OPERATIONS SCHEDULE

I. SESSION ONE

- A. Perform daily pre-operational checkout (Listed in classroom lesson plan)
- B. Gas vehicles
- C. Load up and drive to the track
- D. Set speed cones
- E. Demonstrate the proper technique for changing tires and jack usage
- F. Oral orientation of days activities
  - 1. Direction of travel
  - 2. Safety rules
  - 3. Driver change over
  - 4. Vehicle operational checks
  - 5. Speed
- G. Physical orientation ride of track at speed limit
  - 1. Instructor driving
  - 2. Three or four students riding
- H. Student driving and orientation to the threading technique
  - 1. One student driving with one instructor coaching
  - 2. Minimum of three laps
  - 3. Emphasize threading technique
  - 4. Speed should be at 10 miles under the posted limits the whole day
  - 5. Check ride all of the student drivers

- I. Set up for rest of session
  - 1. Rotating - one student driver and one student coach
    - a. Three laps at a turn
  - 2. Instruction as needed
    - a. Spot checks by instructor
- J. Complete operations at end of session
  - 1. Collect cones
  - 2. Park vehicles in garage
  - 3. Turn in vehicle keys

## II. SESSION TWO

- A. Perform daily pre-operational check out
- B. Gas vehicles
- C. Load up and drive to the track
- D. Set speed cones
  - 1. Check and change worn tires while setting up track
- E. Oral orientation of days activities
  - 1. Direction of travel
  - 2. Safety rules
  - 3. Vehicle operational checks
  - 4. Speed
    - a. Start at 10 m.p.h. under limit and work up to 5 m.p.h. under limit
- F. Student reorientation to track at 10 m.p.h. under limit
  - 1. Student driving with student coach
  - 2. Rotate every three laps
- G. Student driver checkout at 10 m.p.h. under limit by instructor

1. One lap at 10 m.p.h. under limit
  2. Work up to 5 m.p.h. under limit
    - a. As many laps as needed
    - b. Minimum of three laps
  3. Work on lane positioning and power train
- H. Set up for rest of session
1. One student driver with one student coach
    - a. Rotate every third lap
  2. Speed should be 5 m.p.h. under posted limits
  3. Instruction as needed
    - a. Spot checks by instructor
- I. Complete operations at end of session
1. Collect cones
  2. Park vehicles in garage
  3. Turn in vehicle keys

### III. SESSION THREE

- A. Perform daily pre-operational check out
- B. Gas vehicles
- C. Drive to track
- D. Set speed cones
  1. Check and change worn tires while setting up track
- E. Oral orientation of days activities
  1. Direction of travel
  2. Safety rules
  3. Vehicle operational checks
  4. Speed
    - a. Start at 5 m.p.h. under limit and work up to limit

- F. Student reorientation to track at 5 m.p.h. under limit
  - 1. Student driving with student coach
  - 2. Rotate every three laps
- G. Student driver checkout at 5 m.p.h. under limit by instructor
  - 1. First written evaluation due (refer to evaluation sheet at back of instruction lesson plan)
    - a. One lap
  - 2. After written evaluation either work with student at 5 m.p.h. under limit or work student up to speed limit
    - a. Depending upon success at 5 m.p.h. under limit evaluation
  - 3. Minimum of three laps
  - 4. Try to unify the coordination of all required skills
- H. Set up for rest of session
  - 1. One student driver with one student coach
    - a. Rotate every third lap
  - 2. Speed should be at the posted limits
  - 3. Instruction as needed
    - a. Spot checks by instructor
- I. Complete operations at end of session
  - 1. Collect cones
  - 2. Park vehicles in garage
  - 3. Turn in vehicle keys

#### IV. SESSION FOUR

- A. Perform daily pre-operational checkout
- B. Gas vehicles

- C. Drive to track
- D. Set up cones
  - 1. Speed cones on track
  - 2. Cones for backing exercises in skid pan
  - 3. Check and change tires
- E. Oral orientation of days activities
  - 1. Direction of travel
  - 2. Safety rules
  - 3. Vehicle operational checks
  - 4. Speed equal to speed limit
  - 5. Explain backing exercises and quick turn around drills
- F. Demonstrate backing exercises and quick turn around drills
  - 1. Show four point method of backing
  - 2. Body positioning
  - 3. Vehicle positioning
  - 4. Emphasize "safety"
- G. Student reorientation to track at speed limit
  - 1. Student driving with student coach
  - 2. Rotate every three laps
- H. Student driver written evaluation at speed limit
  - 1. One lap for evaluation
  - 2. Minimum two laps for instruction
  - 3. Polish driving skills
- I. Set up for rest of session
  - 1. One student driver with one student coach

- a. Rotate every third lap
2. Speed limit driving on track
3. One-half of the vehicles making laps on track, the other half working on backing and quick turn around drills
  - a. Use quick turn around drill number one (refer to backing section)
  - b. Use backing drills numbers one and two (refer to backing section)
- J. Complete operations at end of session
  1. Collect cones
  2. Park vehicles in garage
  3. Turn in vehicle keys

#### V. SESSION FIVE

- A. Perform daily pre-operational check out
- B. Gas vehicles
- C. Drive to track
- D. Set up cones
  1. Speed cones on track
  2. Cones for backing exercises in skid pan
  3. Check and change tires
- E. Oral orientation of days activities
  1. Direction of travel
  2. Safety rules
  3. Vehicle operational checks
  4. Speed equal to speed limit
  5. Explain backing exercises and quick turn around drills

- F. Demonstrate backing exercises and quick turn around drill
  - 1. Use backing exercises numbers three and four
  - 2. Use quick turn around drill number two
- G. Student practice three laps at speed limit
- H. Student driver written evaluation at speed limit
  - 1. One lap for evaluation
  - 2. Minimum two laps for instruction
  - 3. Polish driving skills
- I. Set up for rest of session
  - 1. Speed limit on track
    - a. Students driving
  - 2. Same vehicle set up as in session four (1/2 on track, 1/2 in skid pan)
  - 3. Use skid pan set up previously mentioned
- J. Complete operations at end of session
  - 1. Collect cones
  - 2. Park vehicles
  - 3. Turn in vehicle keys

## VI. SESSION SIX

- A. Perform daily pre-operational checkout
- B. Gas vehicles
- C. Drive to track
- D. Set up cones
  - 1. Speed cones on track
  - 2. Hidden hazard cones (see hidden hazards section of manual for various cone formations to use)
    - a. Do not set this course up until after evaluation

rides

3. Cones for backing exercises in skid pan
4. Check and change tires
- E. Oral orientation of days activities
  1. Direction of travel
  2. Safety rules
  3. Vehicle operational checks
  4. Speed equal to speed limit
  5. Explain backing exercises and hidden hazards
- F. Demonstrate Rolling Friction Braking (refer to hidden hazards section in manual)
  1. Use backing exercise number four
  2. Use quick turn around drill number one
- G. Student practice - three laps at speed limit
- H. Student driver written evaluation at speed limit
  1. One lap for evaluation
- I. Set up for rest of session
  1. Same vehicle set up as in session four (1/2 on track, 1/2 in skid pan)
  2. Set cones as listed above
- J. Complete operations at end of session
  1. Collect cones
  2. Park vehicles
  3. Turn in vehicle keys

## VII. SESSION SEVEN

- A. Perform daily pre-operational checkout
- B. Gas vehicles



- C. Drive to track
- D. Set up cones
  - 1. Speed cones on track
  - 2. Hidden hazard cones
    - a. Do not set this course up until after evaluation rides
  - 3. Cones for backing exercises in skid pan
  - 4. Check and change tires
- E. Oral orientation of days activities
  - 1. Direction of travel
  - 2. Safety rules
  - 3. Vehicle operational checks
  - 4. Speed equal to speed limit
  - 5. Explain final evaluation
    - a. Threading
    - b. Power train
    - c. Lane position
    - d. Hidden hazards
    - e. Maintaining posted speed
    - f. Braking
    - g. Backing
- F. Student practice - three laps at speed limit
- G. Final evaluation
  - 1. One lap at speed limit
  - 2. Backing
    - a. Use backing exercises one and four
    - b. Use quick turn around drill number one

- c. Two tries at each drill
- 3. Hidden hazards
  - a. Three laps each
- H. Complete operations at end of session
  - 1. Collect cones
  - 2. Park vehicles
  - 3. Turn in vehicle keys

## PURSUIT DRIVING

Unit Objective: To provide the trainee with a basic knowledge of the techniques and skills necessary to safely operate an emergency vehicle in a pursuit situation.

### I. TRACK DESCRIPTION:

A. Located on South Table Mountain

B. Track layout:

1. Two laned highway of standard width
  - a. 1.4 miles in length
2. Eight curves (refer to handout)
  - a. Varying degree of arcs
  - b. Varying speeds
    - i. Curves engineered for specific speeds
3. Three high speed lane changes
  - a. One on the north straight-away
  - b. Two on the west straight-away
4. One skid pan
  - a. Parking
  - b. Base of operations
  - c. Low speed skids
  - d. Backing exercises

### II. TECHNIQUES AND THEORY FOR NEGOTIATING CURVES

A. The threading system of steering

1. Theory

- a. A positive type of steering technique
- b. Enables pursuit driver to establish and maintain

maximum control of his vehicle

- i. Provides for better control in hazardous situations
- ii. The pursuit driver's hands are always in a position to make a recovery in loss of control situations
- iii. Smoother handling in curves
- iv. Driver can monitor speedometer at any point in the curve

## 2. Technique

### a. Base position

- i. Hands should grip steering wheel firmly but comfortably, with the thumbs resting on the face of the steering wheel at the ten and two position
- ii. Hand positions are indicated by number with reference to the circumference of the steering wheel equal to the face of a clock

### b. For right turn

- i. Drop left hand and grasp the steering wheel at or below the nine o'clock position
- ii. Gradually feed steering wheel up with left hand through the right hand
- iii. When the vehicle is half way through the curve the hands should be at the base position

NOTE: THIS CAN BE ACCOMPLISHED BY EITHER TAKING ONE DEEP GRASP OR BY USING A SERIES OF

### SHORT GRASPS

- iv. Drop the right hand and grasp the steering wheel at or below the three o'clock position
- v. Gradually feed steering wheel up with right hand through left hand to recover when exiting the curve
- vi. Return right hand to the base position when the maneuver is completed

NOTE: NEVER CROSS THE HANDS OR THE ARMS WHEN NEGOTIATING A CURVE. TO DO THIS SEVERELY LIMITS THE CHANCES OF RECOVERY SHOULD LOSS OF CONTROL OR A HAZARDOUS SITUATION ARISE

- c. For left turn, just reverse the operation

### B. Lane positioning on curves

#### 1. Theory

- a. Usage of the entire lane width to change the arc of the curve

- i. Provides maximum usage of the lane's width
- ii. Changes the arc so speed can be maintained in the curve

a) By lessening the severity of the turning portion of the curve, safety and velocity can be increased

- iii. Less skidding
- iv. More control through curve at maximum safe speed
- v. No rear end wag at the end of the curve,

therefore, immediate acceleration when exiting curve

2. Technique

- a. Approach curve from the high side of the lane
- b. Steer into the curve
  - i. Using approximately the first quarter of it to reach the low side of the lane

NOTE: USE ONLY ONE LANE-DO NOT CROSS THE CENTER LINE

- c. Hold the low side through the center portion of the curve
- d. When exiting the curve, steer out so that the vehicle also leaves on the high side

C. Use of power

1. Theory

- a. Tight power train insures:
  - i. Maximum contact of road with tires
  - ii. No sudden loss of control
  - iii. Smoother entry and exit on curves

2. Technique

- a. Set speed and power prior to curve
- b. Then hold it throughout curve
- c. Use three sensory sources to do this
  - i. Eyesight - monitor speedometer
    - a) When entering the curve
    - b) Halfway through the curve
    - c) When exiting the curve

- ii. Hearing - monitor engine pitch
  - a) Too low, too high, or shift in pitch indicates improper power train
- iii. Feeling - monitor vehicle vibrations with foot on throttle pedal and body on car seat
  - a) Should have a constant pattern of vibrations throughout curve
  - b) Vehicle response
    - i) Power too slow - the vehicle tends to drift to the low side of the curve
    - ii) Power too high - the vehicle tends to drift to the high side of the curve

#### D. Use of brakes

##### 1. Theory

- a. Proper braking techniques help to minimize the hazards of pursuit driving
- b. The sign of a professional pursuit driver can be equated to the minimal amount of brake usage

##### 2. Technique

- a. Use only the right foot for braking
- b. Brake only when the front wheels are straight
- c. Use constant pressure when braking, do not lock up the wheels
- d. Never brake while in a curve

### III. HIGH SPEED LANE CHANGES

#### A. Theory

1. Hidden hazards
2. Sudden vehicle path obstructions
3. Evasive action is necessary
4. This drill instructs the student in the techniques for safe reactions to these hazards
  - a. The vehicle must be maneuvered from one lane to an adjacent lane within 67 feet at 65 m.p.h.

#### B. Techniques

1. Center vehicle in lane
  2. Hands should be at the base position - do not thread wheel
  3. Maintain power train
  4. Pick the route between the obstacles
  5. Steer firmly into the adjacent lane
- NOTE: DO NOT WHIP THE WHEEL WHEN CHANGING LANES
- a. You have to whip the wheel twice as hard to equalize the vehicle's momentum
  - b. Loss of control is more likely to occur
6. Quickly counter the vehicle's momentum by applying just enough reverse force on the steering wheel to bring the vehicle back to its proper attitude and lane positioning
  7. Indications of improper maneuvering
    - a. Harsh tire squeal
    - b. Tail wag



- c. Excessive vehicle sway
- d. Tire noise hitting markers

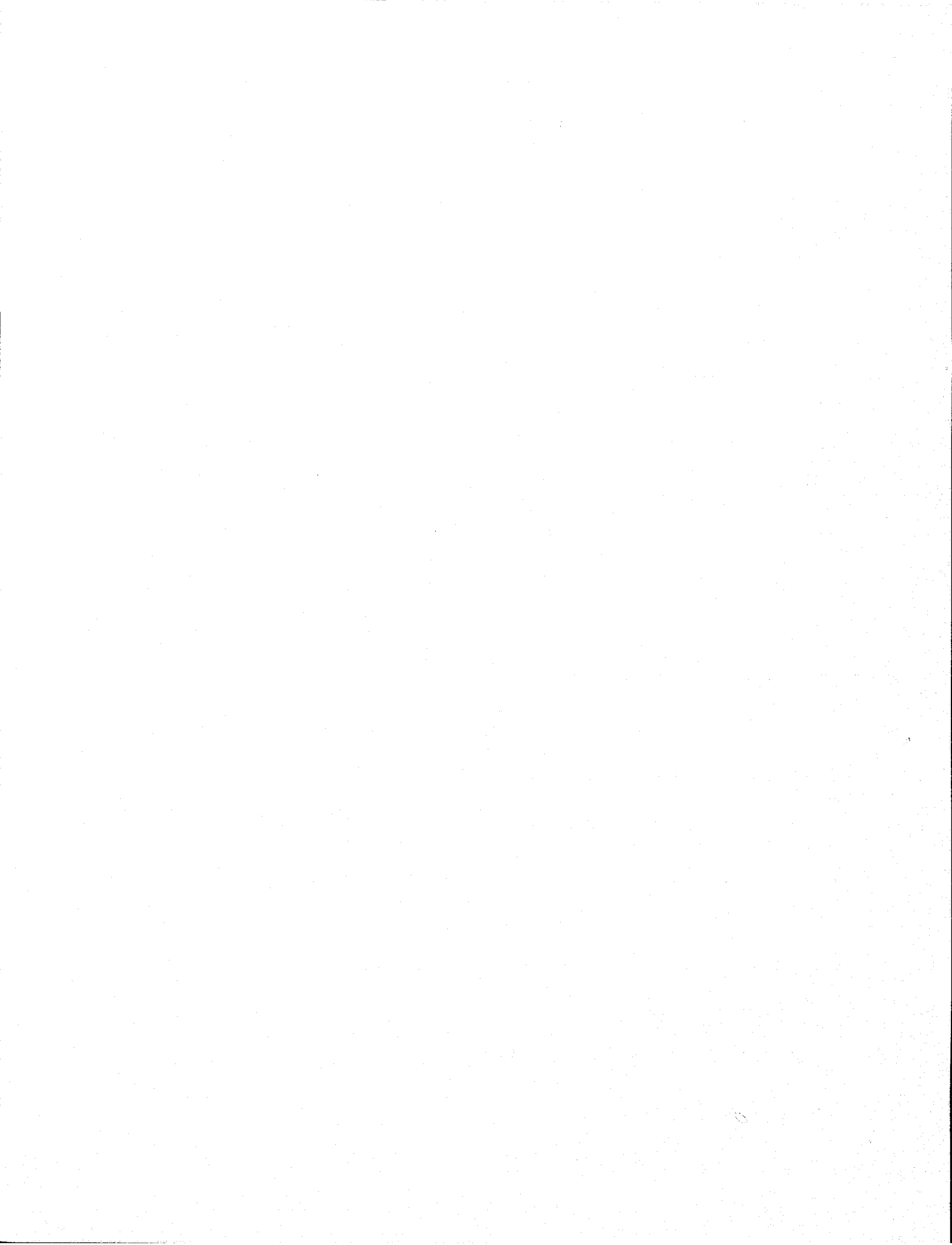
#### IV. EQUIPMENT CHECKS

##### A. Pre-operational

- 1. Gas and oil
  - a. Watch oil level
- 2. Radiator water
- 3. Battery water
- 4. Power steering fluid
- 5. Brake fluid
- 6. Transmission fluid
- 7. Air pressure in tires
- 8. Cracked rims
- 9. Hubcaps should be taken off
- 10. When driving be alert for:
  - a. Vibrations in steering
  - b. Unusual noises in engine
  - c. Unusual noises in vehicle
  - d. Unusual noises in instructor

##### B. Continuous operational checks

- 1. Cracked rims
  - a. Check at every driver change
- 2. Worn tires
- 3. Vehicle vibrations
- 4. Unusual swaying
- 5. Unusual vehicle or engine noises
- 6. Leaking fluids



**END**