

**SA 03 EVOC**  
**Session 2 - Fundamentals Lecture**  
**LD 19 – Emergency Vehicle Operations Course**

**Event Goal:** To teach students how to safely operate and control a law enforcement vehicle in normal, emergency response, and pursuit conditions.

**Session Goal:** This Session will begin a student driving assessment. The Session will teach students how to accurately use the vehicle’s controls and the consequential physical dynamics that occur while operating a police vehicle. The Session will also introduce the students “two handed shuffle” steering and how to perform the tactical seatbelt removal (TSR).

**Learning Need:**

- Peace officers need to know the importance of defensive driving principles and techniques in order to develop safe driving habits.
- Peace officers must be proficient in the operation of the vehicle and know the dynamics forces at work. Proper steering control, throttle control, speed judgment and brake use enhances driving expertise. **(LD 19 IV)**

**Learning Objectives:**

- Distinguish between longitudinal and lateral weight transfer **(LD 19 IV. A)**
- Explain the primary effects speed has on a vehicle in a turning maneuver **(LD 19 IV. F)**

**Session Time:** 1 Hour 30 Minutes

**Resources:**

- Classroom
- Projector

**Session Summary:** The recruit will recognize the need to understand and incorporate the fundamentals of vehicle control into his/her driving habits with the goal of being able to drive with controlled speed in every driving situation.

Outline	Instructor Notes
<p>I. Fundamentals of Vehicle Control</p> <p>A. Vehicle Control is broken into two parts</p> <ol style="list-style-type: none"> <li>1. Driver Skill and Knowledge</li> <li>2. Vehicle limitations and capabilities</li> </ol> <p>B. The Six Fundamentals of Vehicle Control</p> <ol style="list-style-type: none"> <li>1. Speed Judgment</li> <li>2. Road Position</li> <li>3. Weight Transfer/Spring Loading</li> <li>4. Brake Control</li> <li>5. Steering Control</li> <li>6. Throttle Control</li> </ol> <p>C. Speed Judgment</p> <ol style="list-style-type: none"> <li>1. Define Speed Judgment               <ol style="list-style-type: none"> <li>a. Speed judgment is being able to tell at</li> </ol> </li> </ol>	<p><b>[A1] Ask</b> – What did the instructor do differently than you did with the vehicle on the pursuit course you just drove?</p> <p><b>[B] Note</b> – Three of these fundamentals relate to actually using the vehicle’s controls and three are more conceptual in nature.</p> <p><b>[C] Ask</b> – How fast can you drive your car in a straight line?</p> <ul style="list-style-type: none"> <li>• How do you know what speed to</li> </ul>

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<p>what <u>controlled</u> speed your vehicle can travel in any of the following situations</p> <ol style="list-style-type: none"> <li>1) Straight Line</li> <li>2) Approaching a turn</li> <li>3) Going through a turn</li> <li>4) Exiting a turn</li> </ol> <p>2. Speed Judgment Considerations</p> <ol style="list-style-type: none"> <li>a. Angle of the turn</li> <li>b. Width of the turn</li> <li>c. Visibility</li> <li>d. Weather conditions</li> <li>e. Type of road surface</li> <li>f. Camber of the roadway</li> </ol> <p>D. Road Position</p> <ol style="list-style-type: none"> <li>1. Define Road Position <ol style="list-style-type: none"> <li>a. Road position is placing the vehicle on a proper pathway as you approach, go through, and exit a turn that allows you to carry a maximum amount of <u>controlled</u> speed.</li> </ol> </li> <li>2. Road position possibilities in a 90 degree turn <ol style="list-style-type: none"> <li>a. <b>Inside/Inside/Inside</b> approach produces: excessive steering, minimum speed</li> <li>b. <b>Outside/Outside/Outside</b> approach produces: Moderate steering, moderate speed</li> <li>c. <b>Outside/Inside/Outside</b> approach produces: Minimum steering, maximum speed</li> </ol> </li> <li>3. Multiple Turns</li> </ol> <p>E. Weight Transfer</p> <ol style="list-style-type: none"> <li>1. Define Weight Transfer <ol style="list-style-type: none"> <li>a. The transfer of weight to the front, rear or side caused by acceleration, deceleration or turning</li> <li>b. When the speed or direction of travel of a vehicle is changed, the amount of weight being supported by each individual wheel will change</li> </ol> <p><b>Distinguish between longitudinal and lateral weight transfer (LD 19 IV. A)</b></p> </li> </ol> <p>F. Centrifugal Force</p>	<p>adjust to when approaching a turn?</p> <ul style="list-style-type: none"> <li>• What effects does speed have on your vehicle while going through a turn?</li> </ul> <p><b>[D1] Ask</b> – What is the goal of road position in regards to the amount of steering applied?</p> <p><b>[D3] Ask</b> – Why do you need to hold your steering at the apex of a multiple turn?</p> <p><b>[E] Ask</b> – Which tires carry more weight when braking and accelerating (longitudinal weight transfer – front tires)? When turning right or left (lateral weight transfer-<u>outside</u> tires)?</p>
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<p><b>K. Scale of Traction</b></p> <ol style="list-style-type: none"><li>1. <b>0 1 2 3 4 5 6 7 8 9 10</b><ol style="list-style-type: none"><li>a. 0 = no effect on traction</li><li>b. 1,2,3, = normal driving</li><li>c. 4,5,6, = moderate driving</li><li>d. 7,8,9, = high performance</li><li>e. 10 = loss of traction</li></ol></li><li>2. Traction Scale<ol style="list-style-type: none"><li>a. Extended Brake Release, Steering, Throttle</li><li>b. Shutoff point</li><li>c. Steering input</li></ol></li><li>3. Smooth and accurate coordination of the vehicle's controls will allow the potential for maximum controlled speed through turns</li></ol> <p><b>L. Review the Six Fundamentals of Vehicle Control</b></p> <ol style="list-style-type: none"><li>1. Speed Judgment</li><li>2. Road Position</li><li>3. Weight Transfer/Spring Loading</li><li>4. Brake Control ( Extended Brake Release)</li><li>5. Steering Control</li><li>6. Throttle Control</li></ol> <p><b>Peace officers must be proficient in the operation of the vehicle and know the dynamics forces at work. Proper steering control, throttle control, speed judgment and brake use enhances driving expertise. (LD 19 IV)</b></p> <p><b>M. Vehicle Capability and Limitations</b></p> <ol style="list-style-type: none"><li>1. Define Vehicle Dynamics<ol style="list-style-type: none"><li>a. Vehicle control originates through traction caused by gravity forcing the weight of the vehicle down, pressing the vehicle's tires against the road surface</li><li>b. As long as your tires have traction there is a potential for control</li><li>c. Anything that affects traction in a negative way affects control</li><li>d. Tires are your contact point with the roadway</li><li>e. An improperly inflated tire or new tire</li></ol></li></ol>	<p><b>[K] Ask</b> – When does loss of traction occur?</p> <ul style="list-style-type: none"><li>• When traction limits are exceeded (10)</li><li>• When improperly applying the brakes, steering and throttle</li></ul> <p><b>[K2] Describe</b> – explain the use of the controls using diagram (scale of traction power point)</p> <p><b>[M] Ask</b> – What are some factors that could affect control of the vehicle?</p> <ul style="list-style-type: none"><li>• Weather</li><li>• Tires</li><li>• Capabilities and operating condition of vehicle</li><li>• Driver</li></ul>
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<p>can make handling unpredictable and change the natural handling characteristic of the vehicle</p> <p>f. Anything that affects traction in a negative way affects control</p> <p><b>N. Handling Characteristics</b></p> <ol style="list-style-type: none"> <li>1. Oversteer             <ol style="list-style-type: none"> <li>a. Loss of traction at the rear wheels</li> </ol> </li> <li>2. Understeer             <ol style="list-style-type: none"> <li>a. Loss of traction at the front wheels</li> </ol> </li> <li>3. Neutralsteer             <ol style="list-style-type: none"> <li>a. loss of traction of all wheels</li> </ol> </li> </ol> <p><b>O. Vehicle Limitations</b></p> <ol style="list-style-type: none"> <li>1. Brake Lockup             <ol style="list-style-type: none"> <li>a. Loss of “rolling friction”</li> <li>b. response to hazard one dimensional                 <ol style="list-style-type: none"> <li>1) Either stop before you hit hazard</li> <li>2) Or stop <u>after you hit hazard!</u></li> </ol> </li> </ol> </li> <li>2. Rolling Friction             <ol style="list-style-type: none"> <li>a. In order for tires to steer they have to be rolling</li> <li>b. If you feel you are going too fast but are committed to a turn you have to release brake pressure in order for the car to <u>steer!</u></li> </ol> </li> <li>3. Excessive or Harsh Steering             <ol style="list-style-type: none"> <li>a. Causes increase in centrifugal force</li> <li>b. Causes excessive weight transfer</li> <li>c. Makes handling characteristic more pronounced</li> <li>d. Reduces potential for control</li> </ol> </li> <li>4. Over Acceleration Exiting a Turn             <ol style="list-style-type: none"> <li>a. reduces exit speed</li> <li>b. Makes current handling characteristic more pronounced</li> <li>c. reduces potential for control</li> </ol> </li> </ol> <p><b>P. Vehicle Control is improved when:</b></p> <ol style="list-style-type: none"> <li>1. Brakes, throttle and steering are operated in an accurate manner             <ol style="list-style-type: none"> <li>a. Combining an understanding of vehicle capability and limits, with driver skill and knowledge is the recipe for driving with</li> </ol> </li> </ol>	<p><b>[O1a] Show video case study</b> – “Loss of Rolling Friction” – Freeze video to demonstrate loss of rolling friction and how wheels slide along roadway.</p> <p><b>Discuss:</b></p> <ul style="list-style-type: none"> <li>• How loss of rolling friction occurred</li> <li>• The potential results of loss of rolling friction</li> <li>• How to regain rolling friction</li> </ul> <p><b>[O2b] Show video case study</b> – “Rolling Friction” – freeze video to demonstrate how friction is maintained while the wheels are rolling.</p> <p><b>Discuss</b></p> <ul style="list-style-type: none"> <li>• How friction is maintained as long as the wheels are rolling</li> <li>• The ability to control the vehicle increases with rolling friction</li> </ul> <p><b>[O3] Show video case study</b> – “Excessive or Harsh Steering” freeze video at key points to clearly show how excessive steering has an impact on the control of the vehicle</p> <p><b>[O4] Show video case study</b> – “Over Acceleration Exiting a Turn” freeze video at key moments to demonstrate over acceleration and its effects on the vehicle</p> <p><b>Discuss:</b></p> <ul style="list-style-type: none"> <li>• What effect does over acceleration exiting a turn have on the vehicle?</li> </ul>
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<p>controlled speed</p> <p>b. Gaining a working knowledge of the fundamentals of vehicle control is essential to performance driving</p> <p><b>Q. Driving in Reverse</b></p> <p><b>1.</b> Backing accidents are the most common preventable accident on the Department</p> <p><b>2.</b> The same vehicle fundamentals apply both in forward and reverse</p> <p><b>3.</b> What makes driving in reverse so difficult?</p> <p>a. Visibility</p> <p>b. Location of vehicle’s controls</p> <p>c. Trailing wheel adjustment</p> <p>d. Caster effect</p> <p>e. Delayed steering response</p> <p><b>4.</b> Visibility</p> <p><b>5.</b> Location of Vehicle’s Controls</p> <p><b>6.</b> Trailing wheel adjustment</p> <p>a. Rear Wheel Cheat</p> <p>1) Leading wheels steer the vehicle when driving forward</p> <p>2) Trailing wheels travel inside the path of the leading wheels</p> <p>b. Front End Swing</p> <p>1) Trailing wheels steer the vehicle when driving in reverse</p> <p>2) Trailing wheels travel outside the path of the leading wheels</p> <p><b>7.</b> Caster Effect</p> <p>a. Caster effect keeps front wheels relatively straight when going forward</p> <p>b. Caster effect wants to make wheels steer when driving in reverse</p> <p><b>8.</b> Delayed Steering Response</p> <p>a. Occurs because the same timing perception developed going forward is used when backing</p> <p>b. Compounded by the trailing wheels beginning the steering motion</p>	<p><b>[Q1] Ask</b> – What makes driving in reverse so difficult?</p> <ul style="list-style-type: none"> <li>• Visibility</li> <li>• Officer’s use only mirrors to see</li> </ul> <p><b>[Q4] Show photo case study</b> – “Reverse Driving Photo” Photos will demonstrate what the officer will see from two body positions. First photo will show limited visibility from a normal driving position. The second photo will show the increased visibility from the modified body position</p> <p><b>Discuss:</b></p> <ul style="list-style-type: none"> <li>• The differences between the two reverse driving positions</li> <li>• What the differences create from a visibility and control standpoint</li> </ul> <p><b>[Q5] Show photo case study</b> – “location of vehicle’s controls”</p> <p><b>Discuss:</b></p> <ul style="list-style-type: none"> <li>• Position of controls</li> <li>• Right foot still operates the brake and throttle</li> <li>• Two hands are now on the steering wheel at all times</li> </ul> <p><b>[Q6a] Show video case study</b> – “Rear Wheel Cheat”- Freeze the video to show how close the rear wheel travel to the inside of an object when traveling forward</p> <p><b>Discuss:</b></p> <ul style="list-style-type: none"> <li>• Importance of being visually aware of obstacles to the inside</li> </ul> <p><b>[Q6b] Show video case study</b> – “Front End Swing”- Freeze the video to show</p>
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<p><b>R.</b> (See instructor note)</p>	<p>how far the trailing wheel travel to the outside of an object when traveling in reverse.</p> <p><b>Discuss:</b></p> <ul style="list-style-type: none"><li>• Importance of being visually aware of obstacles to the outside</li></ul> <p><b>[Q7] Show video case study – “Caster Effect”</b></p> <p><b>Discuss:</b></p> <ul style="list-style-type: none"><li>• How wheels will stay relatively straight when going forward</li><li>• How wheels will turn when traveling in reverse</li><li>• The importance of maintaining control of the vehicle with both hands on the steering wheel</li></ul> <p><b>[R] Students will now meet with their instructors to complete Learning Activities No. 5 and 6.</b></p>
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