SA 03 EVOC
Session 4 – Skid Control Lecture
LD 19 Emergency Vehicle Operations Course

Event Goal: To teach students how to identify, recognize, and control different types of skids. The Skid Pan, Skid Recovery and Skid Platform Car exercises will be explained.

Session Goal: This instruction will allow the student to understand and demonstrate driving practices involving a law enforcement vehicle when in a skid condition.

Learning Need

- Learning the common causes of a skid in order to avoid a skid condition.
- Learning how to control and recover from a skid is an essential skill for any law enforcement officer.
- Officers will understand the importance of early recognition, steering in the direction of the skid, and the importance of looking where you want the car to go not to where the vehicle may be skidding.

Learning Objectives:

- Distinguish between and describe the causes of the following types of skids: **(LD 19 IV. H. 1-5)**
- Explain the primary effects speed has on a vehicle in a turning maneuver **(LD 19. IV. F)**
- Identify the causes and contributing factors of vehicle hydroplaning **(LD 19. IV. I)**

Session Time: 1 Hour 15 minutes

Resources: • Classroom with Projector	
Session Summary: The student will learn how to initiate, control, and recover from various types of skids**.**	
Outline	**Instructor Notes**
I. Skid Control Lecture **Distinguish between and describe the causes of the following types of skids (LD 19 IV. H. 1-5)** **A.** There are five types of skids we will explore 1. Acceleration Skid a. Excessive acceleration for the roadway conditions b. Involves only the drive wheels c. Decreases "rolling friction" at the drive wheels d. Can occur from a standing start or while exiting a turn 2. All Wheel Lock Skid a. Lose rolling friction	**[A] Show video case study –** "Four types of skids"

b. No steering control c. Response to hazard one dimensional d. Stopping distance increased 3. Centrifugal Skid B. The two remaining skids occur during turning motions (oversteer and understeer) **Explain the primary effects speed has on a vehicle in a turning maneuver (LD 19. IV. F)** 1. There are factors to consider that determine <u>if</u>, <u>when</u> and <u>how</u> a vehicle will skid in a turn. **a.** Traction 1) Adhesion of tires to the road surface 2) As long as there is traction there is a potential for control 3) Limit of traction is a tires performance limit with a force exerted against it. 4) The force the tires have to overcome in a turn is centrifugal force **b.** Centrifugal Force 1) Made up of motion (speed) combined with directional change 2) Byproduct is weight transfer 3) Determines the severity and duration of the skid c. Road Position 1) Placing the vehicle on a path as you approach, go through and exit a turn that allows you to carry a maximum amount of controlled speed through a turn **2)** Use of proper road position lessens the chance of a skid **2.** Skid Possibilities in a Turn	**[B1a] Ask –** What can cause a loss of traction? **[B1b] Show photo case study –** "Centrifugal Force Possibilities" two separate photo slides Discuss: • Maximum amount of force tires can tolerate in a turn • Speed • Turning motion (Steering) • Road position (inside/inside/inside) <u>first slide</u> • Road position (outside/inside/outside) <u>second slide</u> **[B1c2] Ask –** What is the best road position (at a given speed) to lessen the chance of a skid? **[B2] Show photo case study – "**Oversteer and Understeer Skid." **Discuss:** • A Common cause of a oversteer skid

a. Oversteer skid 1) Rear wheels lose traction while front wheels maintain traction b. Understeer Skid 1) Front wheels lose traction while rear wheels maintain traction	is over acceleration while exiting a turn • Common cause of a understeer skid is excessive speed entering a turn
C. How Do You Control a Skid? 1. There are three devices available to control a skid: a. Steering b. Throttle c. Brake 2. Accurate eye placement and early recognition of a skid is also critical to controlling the skid	**[D] Explain** • Importance of steering in the same direction as the skid. If the rear of the car is skidding to the left, the input of the steering should be to the left. If the rear of the vehicle is skidding to the right, then the input of steering should be to the right. • Keep vision on the road way, and away from hazards. Look where you want to go, not where the vehicle is skidding.
D. Correcting an oversteer skid 1.Steering control a. Turn into the skid to the degree of the angle of skid b. Keep wheels pointing on the path you would want the vehicle to travel as if it was not skidding **c.** Recover steering at a controlled rate to minimize spring loading as the skid is reduced	**[D1c]** Demonstrate: string and weight prop spring
2. Throttle control a. Skids caused by acceleration, reduce the throttle application b. If in a high speed turn, maintain throttle and control skid with steering **c.** Add throttle if coming out of a skid before you want to	**[D2c] Explain-** coming out of a skid prematurely.
E. Correcting an understeer skid 1.Steering control **a.** Recover input of steering to point where understeer started to occur **b.** If unable to complete the steering motion, look for an alternative	**[E1a] Explain** • When an understeer skid occurs and the vehicle is not turning as much as you want, do not add more steering, reduce the steering angle to the point at which the vehicle again begins to turn
2. Understeer throttle control	**[E1b] Show video case study – "CHP Understeer Video"** **Explain** • How speed/road position and early corner entry played a role in the understeer collision • How having an alternative (Plan B) is important when experiencing an

a. Come off throttle to reduce speed
b. Don't reapply throttle until understeer is no longer present

F. Key factors in skid Control
1. Look where you want the car to go, not where the car is skidding.
2. Early recognition of the skid is critical to controlling the skid
3. Accurate coordination of steering and throttle is necessary for skid control
4. Controlling spring loading by accurate recovery of steering reduces the chance of a secondary skid

G. Hydroplaning
Identify the causes and contributing factors of vehicle hydroplaning (LD 19. IV. I)
1. Loss of traction between the tire and the roadway surface caused by water that could not escape from under the tire.
2. Factors that contribute to hydroplaning
a. Speed
b Water depth
c. Tire condition(tread depth)
d. Weight of the vehicle

H. Active Safety Technologies
1. Electronic Stability Control (ESC)
2. Traction control (TC)
3. Anti-lock braking (ABS)

I. The Skid Courses
1. Course Design and Construction
a. Both courses are made of polished concrete
b. Both courses have an automatic watering system
c. Purpose is to teach skid control in a <u>safe low speed</u> environment
d. Techniques of skid control are understeer skid.

[F1] Explain
- How the eyes and hands are connected and when you look at an object your hands will follow.

[F2] Understeer or oversteer skid requires steering in the direction of the skid

[F4] Show slide study – "Oversteer Skid Control"
Explain
- Importance of Road Position
- Smooth steering to Apex
- Recognize the vehicle is skidding
- Do not brake
- Steer in the direction of the skid
- Keep eyes focused on where you what to go, not where the vehicle is skidding.

[G2] Ask – Which factor is under you control while driving?

[H] Show CHP Electronic Stability Control Video

[J] Show the video case study – "Skid Pan"
Explain
- How to initiate an oversteer skid
- How to control an oversteer skid
- How to recover an oversteer skid when exiting a turn

[K] Show the video case study – "Skid Recovery"
Explain
- How to initiate a oversteer primary skid
- How to control a oversteer primary

the same on dry pavement as they are on wet pavement. **J.** Skid Pan 1. The student will learn: a. How to initiate a skid through acceleration b. Control the skid through the turn c. Recover the skid exiting the turn **K.** Skid Recovery Course 1. The student will learn: a. How to initiate a primary skid b. Learn to control a primary skid c. Learn to control a primary and secondary skid **L**. Skid Pan Safety Rules 1. Maximum two vehicles on the course at a time 2. Maximum speed 15MPH 3. Keep one half course separation between vehicles 4. Follow primary instructor's directions **M.** Skid Recovery Safety Rules 1. Maximum speed 25MPH 2. Only one vehicle skidding on course at a time 3. Follow primary instructors directions **N.** Skid Car 1. Discuss a. Vehicle is on a hydraulic platform **b.** Hydraulic components located in the trunk can change the traction level to induce either oversteer or understeer c. Castor wheels allow end of vehicle loosing traction to respond to handling characteristic acting upon the vehicle	skid • How to control a oversteer primary and secondary skid **[L] Show the video case study – "Skid Pan Safety Rules"** **Explain** • How the safety rules apply as it relates to the skid pan **[M] Show the video case study – "Skid Recovery Safety Rules"** **Explain** • How the safety rules apply as it relates to the skid recovery course **[N] Show slide case study - "Skid Car"** **Explain** • How the platform car works **[N1b] Explain –** How the system adjusts weight and the effect on traction **[O]** Later, students will participate in learning activities Nos. 16,17, and 23 (which will be completed in Session 5)

O. (see instructors note)	