75789

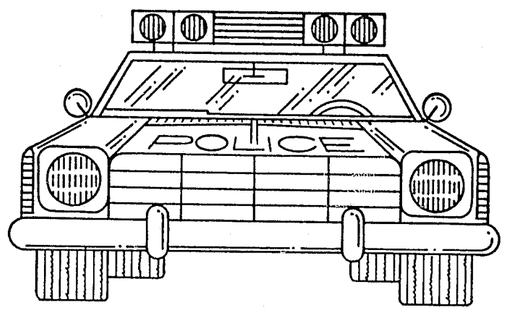
Training Program
for Operation of Emergency Vehicles

PURSUIT DRIVING FOR LAW ENFORCEMENT OFFICERS

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

PURSUIT DRIVING FOR LAW ENFORCEMENT OFFICERS

Advanced Unit:
Training Program for Operation of Emergency Vehicles



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FOREWORD

This Document, Pursuit Driving for Law Enforcement Officers, is the fourth in the Emergency Vehicle Operation (EVO) Curriculum. The other three are:

1. Course Guide--Training Program for Operation of Emergency Vehicles.
2. Instructor Lesson Plans--Training Program for Operation of Emergency Vehicles.
3. Trainee Study Guide--Training Program for Operation of Emergency Vehicles.

The Pursuit Curriculum was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration (NHTSA) under Purchase Order No. NHTSA 9-6219, by INNOVATRIX, Inc., Ingomar, PA. In preparing this curriculum, the INNOVATRIX staff relied heavily on the expertise of a number of persons and organizations.

Mrs. Dorothy McKinney, the Contract Technical Manager and Lt. Bob Forrest also at NHTSA, both helped in structuring the program. They provided a comprehensive review and critique of the draft curriculum.

Commissioner Elbert Peters of the North Carolina State Highway Patrol gave INNOVATRIX permission to use their material in formulating this curriculum.

Captain John Anderson, Commander of the California Highway Patrol (CHP) Training Academy, gave permission to the staff to use their Emergency Vehicle Operation Course (EVOC) materials. This Pursuit Curriculum relies heavily on the excellent EVOC program.

The staff is grateful to Commissioner Glen Craig, Captain John Voss and Captain Anderson of CHP who permitted the staff to monitor the administration of the EVOC program near Sacramento, CA.

The fine staff at the EVOC facility including Sergeant Wes Anderson and Officers Dick Gordon, Bill Kleinhans, Paul Vinson and Jim Young are to be commended. We would like to give our special thanks to Paul Vinson (EVOC) who spent many hours talking with the staff. He reviewed our ideas and provided innumerable valuable suggestions for this curriculum.

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INTRODUCTION

This EVO Curriculum Unit is designed as a practical, in-vehicle training program. To a large extent, the instructional events are based on those used in the excellent Emergency Vehicle Operations Course conducted at the California Highway Patrol Academy near Sacramento, CA.

Trainees qualified to take this unit have completed the Basic program (Parts I, II, and III). Therefore, they have the necessary background and skill to benefit fully from this Pursuit Driving Unit. Indeed, a number of elements in this program will be successful only if the trainees have this assumed level of incoming competence.

The success of this program will depend greatly on your performance as part of a team of good instructors. It's absolutely critical that you and all of the instructors be completely familiar with each unit of the basic EVO Curriculum. The last several units of Part I, the Part II Police materials, and Part III are particularly important.

Developing your competencies as an in-vehicle instructor will require dedication and practice. Altogether, it's a hard and demanding instructional task, but the payoff is great. Your efforts will enable police officers to handle, with greater skill and ability, potentially deadly pursuit situations.

ADMINISTRATIVE CONSIDERATIONS

Preparation for this Pursuit Driving portion of the EVO course is extensive. Even when appropriate facilities are available, preparation should be started several months before conducting the training. The major topics of concern to administrators in planning for and establishing a Pursuit Driving Course are: Facilities, Equipment, Instructor Qualifications, Trainee (Student) Qualifications, Class Size, and Preparation for Initial Administration. Each of these topics is addressed in the following sections.

Facilities

Safe and effective training for pursuit operation requires sophisticated facilities including classroom(s), a skid pan, an oval track, a "high-speed" track, intersection area, and a vehicle maintenance area. This document does not provide any engineering or construction information beyond general functional considerations.

The following paragraphs describe at a general (functional) level the requirements for a pursuit training facility.

Classroom(s)

The longer briefings and film sessions can be effectively conducted in a classroom setting. A lecturn, chalkboard, overhead (transparency) projector, 16mm sound projector, and screen are required. The room should be large enough to accommodate up to 20 attendees. Although the classroom or briefing sessions will be relatively short, good lighting and ventilation are important. For Modules 2-6 (vehicle operation) portions of the briefing may be conducted at the track, as appropriate.

Recommended Training Areas

Skid Pan. The skid pan should be approximately a 1/4 mile closed-loop (continuous circuit) polished concrete surface coated with water (via built-in recirculating sprinklers) to reduce the coefficient of friction to 25-30 percent of dry. The circuit should reproduce the various types of curves which could be encountered on rural roads. These include: 90°; hairpin; ESS; and curves of decreasing radius. The surface at the sides of the track should also be polished in the areas where spin-outs are likely when travelling in either direction.

It is desirable to have separate entry and exit points so that vehicles can travel the circuit one-at-a-time, at a slightly higher speed than is possible when several vehicles are using the pan at one time.

Figure 1 on the following page shows a recommended skid pan track which is a modified version of the facility used by the California Highway Patrol.

Oval Track. An oval track with a total length of approximately one mile is required for teaching the basics of high-speed cornering. The oval track should meet the following general requirements. The oval track will:

1. Have a road width of 18 feet to 24 feet.
2. On one leg (side), have a road width of 40 feet (for demonstrations) and bleachers for observers.
3. Be flat at one end and banked at the other.
4. Have a high-quality asphalt surface.
5. Be capable of sustaining a maximum speed of 50 mph on the flat end.
6. Have guardrails or flat spin-out areas on curves.
7. Have no fixed objects which could constitute a hazard (i.e. telephone poles, power lines, etc.).

An oval track reflecting the recommended elements is shown in Figure 2.

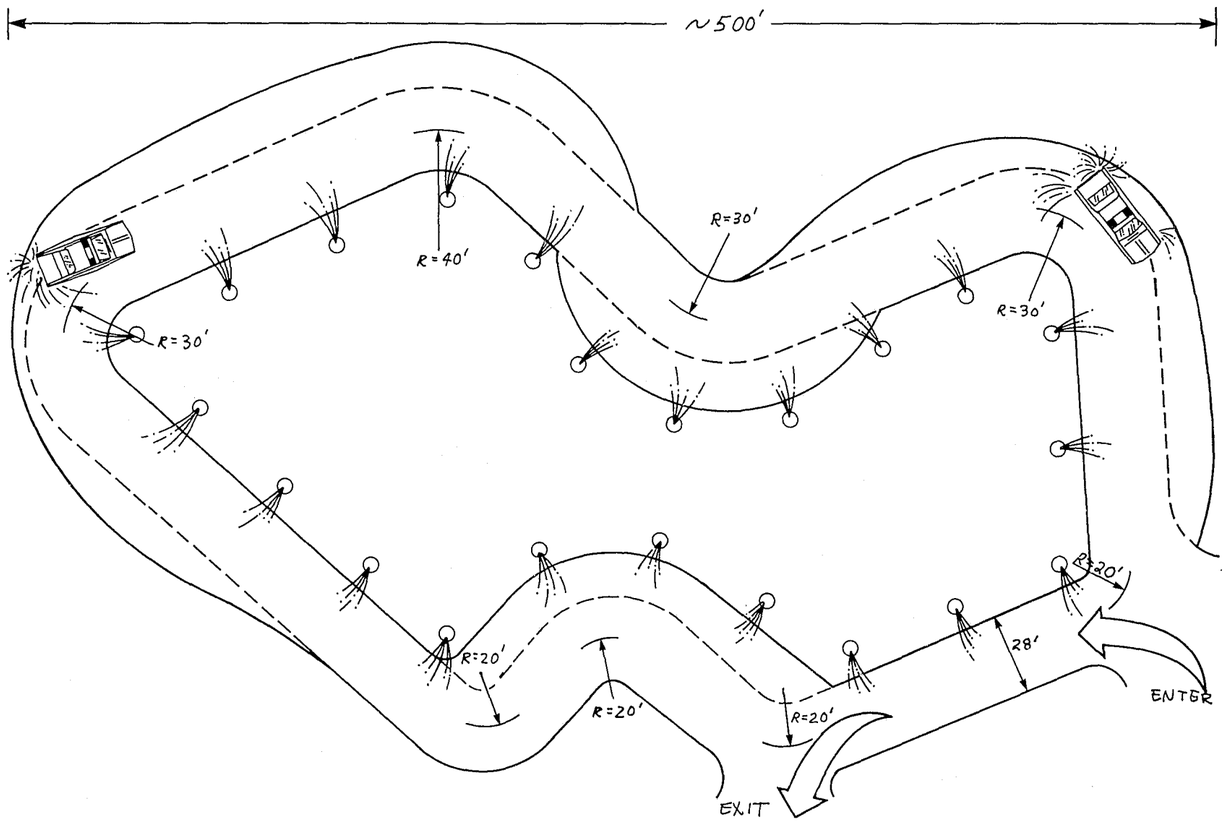

Figure 1. Recommended Skid Pan.

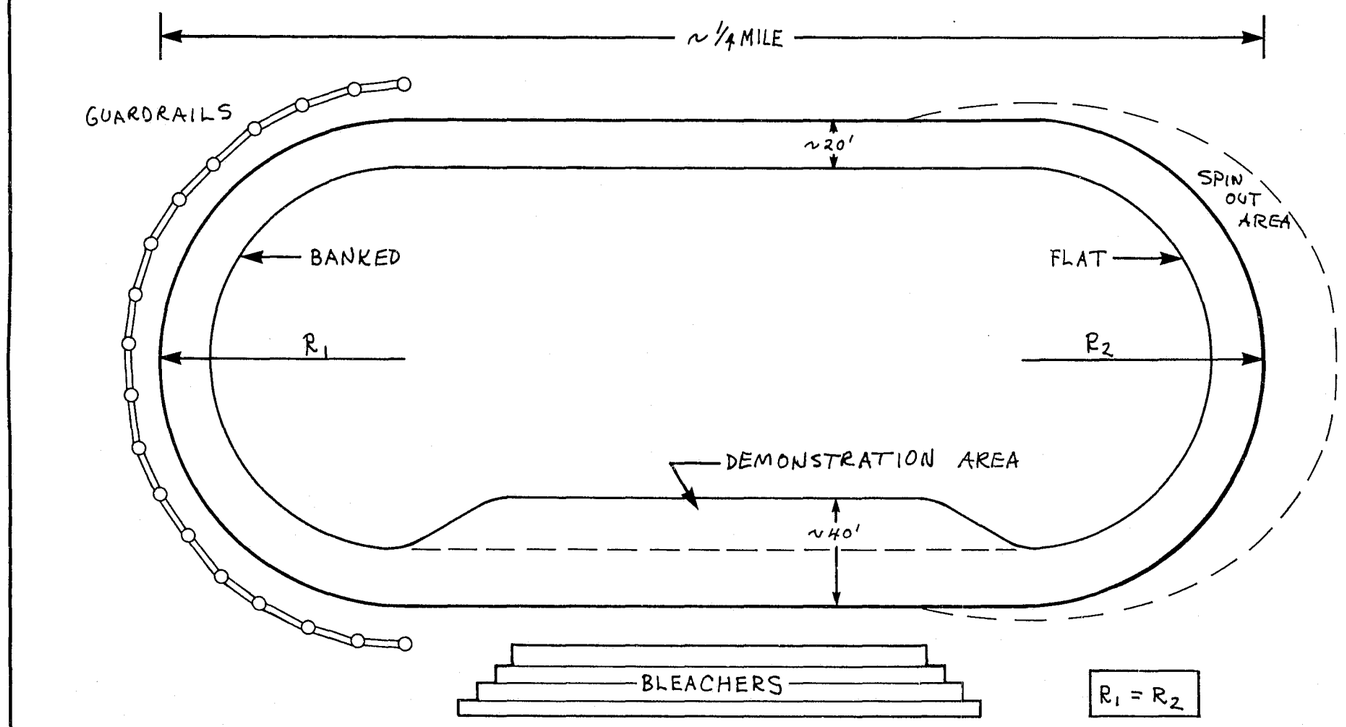

Figure 2. Recommended Oval Track.

High Speed Track. A closed loop, high-speed track of approximately two miles in length is required. The track should meet the following general requirements. The high-speed track will have:

1. Lanes approximately 24 feet wide.
2. High-quality asphalt surface. (Road surface and support should be resistant to winter freeze-thaw cycles--dips and potholes could be extremely hazardous during high-speed operation.)
3. Guardrails where appropriate.
4. Straight section(s) capable of safely sustaining highest production-vehicle speeds.
5. Curves, including the following:
   a. Banked 90° turn capable of sustaining highest production-vehicle speeds.
   b. Flat (smaller radius) 90° turn.
   c. ESS curve.
   d. "Hairpin" (120°-180°) curve.
   e. Curve with changing radius.
6. A strategic observation point from which all sections of track can be seen.
7. Have no fixed objects which could constitute a hazard (i.e. telephone poles, power lines, etc.).
8. Figure 3 shows a high-speed track which incorporates various types of curves. The "infield" could also have a "grid" of several intersecting streets for use in the Code-3 run and, if desired, for providing practice in small area vehicle maneuvering exercises.

Intersection Area. Figure 4 shows how a variety of intersections can be configured in a relatively small area. An effective Code-3 run (Module 6) requires intersections. The specific configuration shown in Figure 4 is not mandatory, but the general functional requirements must be met for the program to be effective.

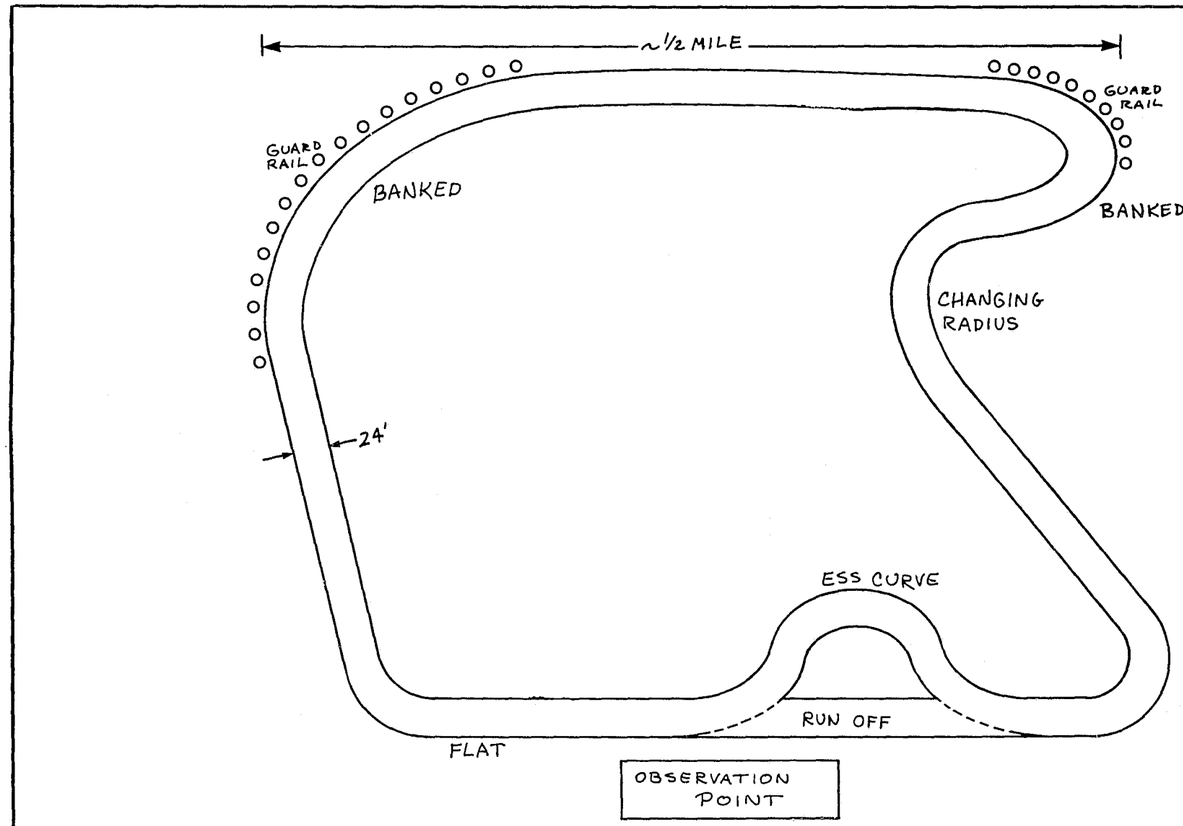

Figure 3. Recommended High-Speed Track.

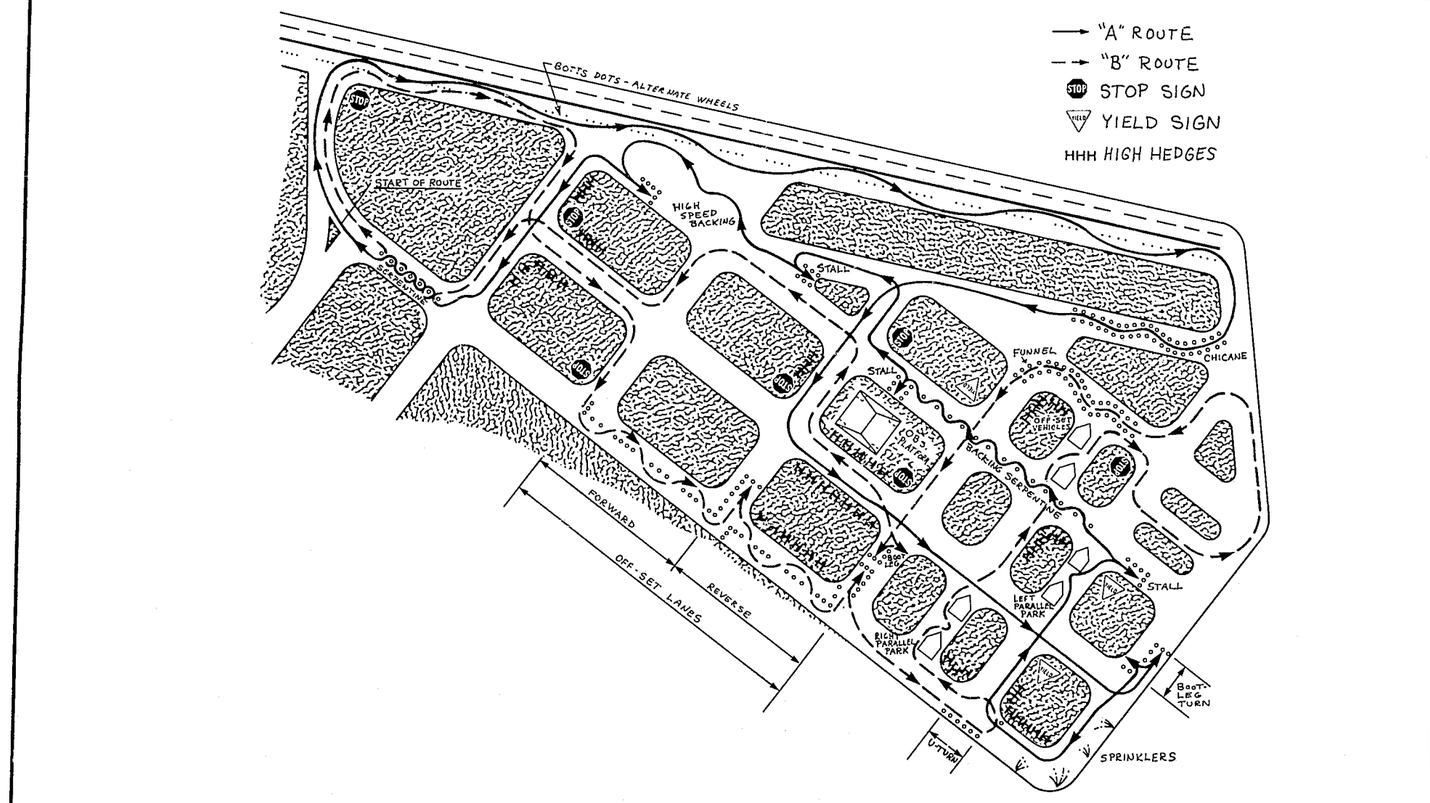

Figure 4. Example Urban Intersection Area.

Alternatives to Recommended Training Areas

In certain circumstances it may be impossible to provide all of the recommended training areas. It should be noted that any deviation from the recommendations will represent a less desirable training facility which may not produce optimum results. The less desirable facilities would almost surely require a considerably extended training schedule and could compromise the quality of training. In every case, however, any facility must meet all safety and environmental criteria.

Given these caveats, the following alternatives can be considered:

1. Skid Pan. Any fairly smooth black-top area which can be "flooded down" and made slippery (with foam, detergent, oil, etc.) could suffice for a skid pan. The "track" can be painted and traffic cones used where appropriate.
2. Oval Track and High Speed Track. Some abandoned airports and certain kinds of commercial race tracks can be used for teaching high-speed operation. Such alternative facilities are much harder to control for safety and could force an over or under-emphasis on certain elements of the skill development program.
3. Intersection Area. Although intersections can be laid out in a large parking lot, an ideal alternative would be an abandoned military base. Also, some airports (abandoned) have intersecting runways and taxi strips, etc., that could be used for the intersection area training functions.

Although necessity may force the use of alternative facilities, no compromises should be made on vehicle criteria/safety as listed later in this section.

Maintenance Facility

The vehicles used in this program will require constant mechanical inspection and frequent maintenance. To keep the program flowing smoothly, on-site maintenance capability and spare vehicles of each type will be required. Clearly, if on-site maintenance is not possible, a larger number of spare vehicles will be needed. Minimally, it is necessary to have the ability to fuel, charge batteries, replace wheels and tires, and perform "quick" tune ups.

Equipment

Vehicles

A. High-speed vehicles (one vehicle for each trainee).*
   1. Equipped with the Police Package, but of the size and type normally used in locale.
   2. Excellent condition. NOTE: Vehicles with up to 50,000 miles on them are suitable, provided they have been well-maintained and are structurally sound.
   3. Equipped with:
      a. Heavy-duty roll bar.
      b. Heavy duty wheels, painted white to detect cracks.
      c. Reinforced rear axles.
      d. Aircraft-type driver and passenger restraints.
      e. Door strap for additional roof support (driver side only).
      f. Large identification number painted on front doors.
      g. Two-way communications equipment.

B. Skid pan vehicles (trainee/vehicle ratio of 2:1). These vehicles should be of the size and type normally used in the locale, equipped with "racing slicks."

C. Oval track vehicles are the same vehicles used on the high-speed track.

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*This allows for "spares" and for using the high-speed vehicles on the oval track.

D. Emergency standby vehicle should be available at all times when trainees are on the high-speed or oval track. It should be a four-wheel drive vehicle, well marked, with two-way communications equipment. Special equipment includes:
   1. Chemical fire extinguishers.
   2. 350 gallon pumper unit.
   3. First aid equipment.
   4. Pry bars.
   5. Winch

E. Large fire truck with a 1,200 gallon tank, gravity or pumper.

F. "Civilian" vehicles to be used for "violator" car in Code-3 pursuit in "urban" area. Special equipment includes:
   1. "High performance" engine and (desirable) four-speed transmission.
   2. Roll bar.
   3. Communication radio.
   4. Switch to activate/disable brake lights.
   5. Seat and shoulder belts.

Other Range Equipment

A. Traffic cones and pylons.
B. Roller tape or 100-foot type measure.
C. Several cans of different colors of spray paint.
D. Safety helmets for all instructors and trainees.
E. Extra tires, wheels, and jacks.

Instructor Qualifications

A great deal of care should go into the selection of Pursuit Driving Instructors. An instructor/trainee ratio of 1:3 is most desirable. This ratio allows one instructor each to work at the skid pan and oval track and two instructors at the high-speed track. Developing a competent team of instructors is critical for the success of the program. Physical ability, experience, and psychological considerations (temperament) are particularly important.

Physical Ability

Pursuit Driving Instructors should be in excellent physical condition, have 20/20 vision, and good reflexes.

Experience

Experience in teaching Part III (in-Vehicle) of the EVO course does not qualify an instructor to teach the Pursuit Driving Unit. High-speed driving, even under strictly-controlled conditions, is inherently more dangerous than low-speed driving. Consequently, Pursuit Driving Instructors must be experienced and skilled in high-speed driving techniques before they instruct the trainees.

Psychological Considerations

High-Speed Driving Instructors must be patient and capable of maintaining good "moods" in a physically tiring and repetitious environment. They must be capable of analyzing trainee deficiencies and presenting criticism to trainees in a constructive manner. A good instructor will be able to incorporate changes in the layout or content of this Pursuit Driving Unit in order to better accommodate local needs.

Trainee Qualifications

All trainees enrolled in this Pursuit Driving course must have completed Parts I and II of the basic EVO course, and must have completed the In-Vehicle (Part III) portion of the EVO course. Trainees without this background will not possess the skills necessary to keep the traffic moving at a consistent pace; blockages on the course will occur, and the efficiency and effectiveness of the training will suffer.

Trainees should be in good physical condition and have excellent vision. Additionally, they should be authorized representatives of a law enforcement agency and should possess a valid driver's license.

Class Size

The Pursuit Driving portion of the EVO course has been designed for administration to a class not exceeding 12 trainees. Reduce class size if:

1. The instructor/trainee ratio exceeds 1:3.
2. A full complement of working vehicles is not available (see section on Equipment for further definition).
3. Facilities (range areas) do not meet suggested size or configuration specifications (see section on Facilities).

Preparation for Initial Administration

After the location and design of the facilities have been determined, and an appropriate number of instructors secured, it will be necessary to complete several additional activities before the first administration of the course can be held. The following paragraphs address these activities.

Insurance

Appropriate insurance coverage for all facilities, equipment, instructors, and trainees must be obtained. This point cannot be emphasized too strongly. Advice regarding insurance coverage can usually be obtained through the state, or through the local or municipal solicitor's office.

Establish Standards for the Facility

Speed. References to speed have been purposely omitted in the training materials. It is impossible to state maximum speeds; every facility will be unique. In order to establish such "standard speeds" for a specific facility, it will be necessary for instructors to "test drive" the oval and high speed tracks. Ideally, several instructors, working together, will determine the maximum possible speed for each segment of the track, as well as a speed attainable by "most" trainees. It should be noted, however, that establishment of standards for the latter is an ongoing process. Before "trainee-attainable" speeds can be firmly established, it will be necessary to gather information on several classes of trainees.

Spacing. The specific size and configuration of the skid pan, high-speed track oval track, and intersection area will dictate how many vehicles can safely be run on each at a given time. Suggestions for making these determinations follow:

1. High-Speed Track--Approximately two trainees per track mile. Note, however, that track layout (sequence of curves, etc.) may indicate a lower number of trainees per track mile. Specific determinations should be made by instructor testing. These tests should simulate actual usage conditions as closely as possible.
2. Skid Pan--A skid pan of the size and type illustrated in Figure 1, page 4, can be used by a maximum of four trainee vehicles at a time. Depending on the size and configuration of the specific skid pan, this number should be adjusted upwards or downwards. Note, however, that trainee entry-level skill will influence the number of trainees that can safely use the skid pan at a given time.
3. Oval Track--The oval track illustrated in Figure 2, page 5, can accommodate three trainees at a time. This number could be adjusted upward if the track is larger.
4. Intersection Area--The intersection area may vary significantly from the example cited herein. The facility shown in Figure 4, page 8, could accommodate as many as ten trainees operating simultaneously during the Code-3 run.

Scheduling

The trainee/instructor ratio, the facilities, the number of vehicles available, etc. must all be considered when formulating a basic schedule for the Pursuit Driving Course. Assuming the functional requirements noted throughout this curriculum are satisfied, the Pursuit Course requires two days. If any of the listed requirements cannot be satisfied, the course may require an additional day or more. The Schedule (Figure 5) on the following page shows one way of providing all trainees with skill training at each of the four facilities. This schedule requires two ninety-minute sessions of films (see Appendix B for listing of possible films). If an additional instructor is available, Commentary Driving* exercises can be substituted for one film session.

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*A good driver-education instructor can help the trainees experience the benefits of Commentary driving. Three or four trainees can ride with the instructor and participate profitably in the 90 minutes scheduled.

		GROUP A	GROUP B	GROUP C
DAY 1	8:00 - 8:30	Initial Briefing		
	8:30 - 10:00	Demonstrations		
	10:00 - 11:30	Skids I	Films I	Films I
	11:30 - 12:30	Lunch		
	12:30 - 2:00	Oval I	Skids I	Films II
	2:00 - 3:30	High Speed I	Oval I	Skids I
	3:30 - 5:00	Skids II	High Speed I	Oval I
DAY 2	8:00 - 9:30	Oval II	Skids II	High Speed I
	9:30 - 11:00	High Speed II	Oval II	Skids II
	11:00 - 12:30	Films I	High Speed II	Oval II
	12:30 - 1:30	Lunch		
	1:30 - 3:00	Films II	Films II	High Speed II
	3:00 - 5:00	Code-3 Run and Debriefing		

Figure 5. Suggested Schedule.

Review and Select Films

Review the films referenced at the end of this program. Select two sets (about one hour total in each set) for use in the Films I and Films II sessions. The films should be selected to complement the specific goals/philosophy of your program.

DESCRIPTION OF UNIT

The Pursuit Driving Course Unit contains six modules. The unit is geared toward developing trainee skill in high-speed pursuit driving. Trainees will have an opportunity to practice and demonstrate their abilities in three skill areas--skid pan, oval track, and high-speed track. Three important points should be noted:

1. No Trainee Study Guide is provided for this part of the course.
2. Trainees should have completed Parts I, II, and III of the basic EVO course before taking this training.
3. It is assumed that Instructors should be qualified by both training and experience to teach high-speed driving.

Module 1: Initial Briefing

This module is conducted in the classroom. It is intended to familiarize trainees with the "groundrules" for training as well as to provide an overview of the course.

Module 2: Demonstrations

The demonstrations in this module take place on a straight section of the oval track. Trainees participate as observers, only. These demonstrations are designed to illustrate some of the more critical aspects of high-speed driving.

Module 3: Skid Pan

A short briefing precedes skid pan practice. Emphasis is on skid-control and skid-use maneuvers.

Module 4: Oval Track

Following a short briefing and demonstration by the instructor, trainees have an opportunity to practice the basic principles of negotiating curves at speeds approaching the maximum (for the curve). Emphasis in this module is on smooth steering and proper road conditions.

Module 5: High-Speed Practice

A short briefing and instructor demonstration precede trainee practice. This module should develop his high-speed driving skills, with proper emphasis on the trainee's recognition of his/her own physical and psychological limitations. Trainee first practices with instructor riding as passenger. When instructor is satisfied with trainee's level of comptence, trainee "solos" for the remainder of the time period.

Module 6: Code-3 Run

Following a short briefing, trainees have an opportunity to "chase" an instructor who drives at a constant high speed around the high-speed track. If sufficiently skilled, the trainees catch the violator within three circuits. They then experience the emotional aspects of a high-speed "urban" pursuit under controlled conditions. A short debriefing concludes the training.

INSTRUCTOR PREPARATION ACTIVITIES

General

1. Review all relevant portions of the Basic EVO Course. These include:
   a. Unit I-E--Important Physical Forces and EV Control.
   b. Unit I-F--Operation.
   c. Unit I-G--Handling Unusual Situations.
   d. Unit II-P--Operation of Law Enforcement Vehicles.
   e. Unit III--In-Vehicle Practice.

   It is also advisable to read over the Course Guide for the basic program.
2. Review the Administrative Considerations section of this unit, paying particular attention to the Preparation for Initial Administration.
3. Develop the following:
   a. Maximum-speed criteria for the oval and high-speed tracks.
   b. Trainee-attainable speed criteria for the oval and high-speed tracks.
   c. Spacing (load) considerations for the skid pan, oval track, high-speed track and intersection area.
   d. A basic schedule for the entire Pursuit Driving Course. (See Schedule, page 16.)
   e. Schedule of films for the Film I and Film II sessions.
   f. Option--Commentary Driving program to replace one film session (Emphasis would be on maintaining an appropriate visual horizon, detecting hazards, and on maintaining awareness of the total driving environment.)

Module 1: Initial Briefing

1. Read over the entire module. Add to those materials any information that may be specific to your facility (e.g., special safety considerations).
2. Review the roster of trainees and divide the trainees into three groups (three or four per instructor). The distribution should include a balance of trainee entry-level experience (if known) across instructors.
3. Prepare a typewritten list of group assignments and post it on the classroom bulletin board.
4. Prepare a typewritten schedule of the entire course and post it on the classroom bulletin board.

Module 2: Demonstrations

1. Read over the entire module.
2. Set up the Rolling Friction and Stopping Distances demonstrations. Practice these demonstrations thoroughly to ensure they will occur as planned. Remember: you may need to adjust cones (distances) and speeds for the specific vehicle used in the demonstration.
3. After you have the cones adjusted to your satisfaction, mark the placement of the cones with a dot of spray paint, using a different color for each demonstration.
4. With the assistance of another instructor, practice the siren audibility demonstration. Remember: the required speeds and distances for the procedure may have to be adjusted for specific siren, vehicle, and track layout.

Module 3: Skid Pan

1. Read over the entire module.
2. Obtain a drawing of the skid pan, and prepare enough copies for all trainees.
3. Prepare a briefing. Include at least the following topics;
   a. Purposes of skid pan training.
   b. Safety rules on the skid pan (e.g., distance between vehicles, speed).
   c. Procedures (for Sessions I and II) and definitions.
      1) Understeer.
      2) Oversteer.
      3) Countersteer.
      4) Distinction between skid control and skid use.

Module 4: Oval Track

1. Read over the entire module.
2. Obtain a drawing of the track, and prepare enough copies for all trainees.
3. Prepare a briefing. Include at least the following:
   a. Safety rules on the oval track.
   b. Purposes of the exercises on the oval track.
   c. An explanation of the differences between banked and unbanked turns and the appropriate vehicle "path" at each curve.

Module 5: High-Speed Practice

1. Read over the entire module.
2. Obtain a drawing of the high-speed track, and prepare enough copies for all trainees.
3. Prepare a briefing. Include at least the following topics:
   a. Purposes of high-speed practice.
   b. Safety rules on the high-speed track.
   c. Procedures and definitions.
      1) Curves on the track.
      2) Entry position for curves.
      3) Use of skids.

Module 6: Code-3 Run

1. Read over the entire module. Pay particular attention to the procedure for the timed chase and for the pursuit.
2. Select instructor as the "violator".
3. Conduct several timed chase runs around the high-speed track to select a best specific speed (65-75 mph). The speed is selected so that an average-to-good trainee will catch the instructor ("violator") within three circuits of the track.
4. Plan and mark with arrow signs one or two routes for other trainees to be following through the intersection area during the Code-3 run.
5. Using the "hot" violator car, develop different routes through the intersection area. These will be used in the Code-3 runs, and each will require three to five minutes for completion.

6. Practice simulating hazards for the Code-3 run. Possible hazards include:
   a. Pedestrian starting to step into street from a blind area (obscured by hedge).
   b. Motorist pulling into intersection just as the pursuit approaches the intersection.
   c. Motorist in left lane (violator will pass on right to try to "draw" pursuing officer into mistake of passing on the right).
   d. Rolling an inflated inner tube in front of pursuing officer.
7. Plan places in chase where "dispatcher" will call officer for status, location, etc.; these would be just before hazards.
8. With the assistance of the other instructors, have the "violator" practice the urban run while being chased by another instructor. The violator should be able to keep sufficiently ahead of the pursuing officer that the officer cannot determine the license number.

TRAINEE KNOWLEDGE AND PERFORMANCE OBJECTIVES

Module 1: Initial Briefing

By the end of this module the trainee will:

1. Be familiar with the facilities, safety rules, equipment, and schedule.
2. Understand the basic purposes of the course and that this training represents only the beginning of skill development for high-speed pursuit competency.

Module 2: Demonstrations

By the end of this module the trainee will:

1. Understand the effects of rolling friction.
2. Understand the effects of different types of braking on stopping distances.
3. Understand the effects of different types of tires on stopping distances.
4. Understand that the warning effect of the siren diminishes as speed increases.

Module 3: Skid Pan

By the end of this module the trainee will:

1. Be able to create oversteer and understeer situations.
2. Be able to apply appropriate countermeasures to compensate for both understeer and oversteer.
3. Make use of rear-end skids to negotiate a skid pan efficiently.

Module 4: Oval Track

By the end of this module the trainee will:

1. Understand the difference in handling characteristics between banked and unbanked roads.
2. Know the "feel" of a vehicle that:
   a. Has entered a curve properly.
   b. Is "set" in the groove properly.
   c. Exits efficiently from a curve.

Module 5: High-Speed Track

By the end of this module the trainee will be able to demonstrate the ability to properly negotiate various types of curves at a high speed, safely.

Module 6: Code-3 Run

By the end of this module the trainee will:

1. Be able, within three circuits of the high-speed track, to "catch" an instructor travelling at a constant speed.
2. Use lights and sirens to best effect during the Code-3 chases.
3. Corner smoothly and effectively during the chases.
4. Keep the violator "within a reasonable distance" in the "urban" area.
5. Clear intersections and accomplish other safety-necessary tasks during the pursuit.
6. Respond appropriately to simulated hazards occuring during the pursuit in the "urban" area.

INITIAL BRIEFING

A. Facilities. Location of:
   1. Restrooms.
   2. Helmets.
   3. First aid kits.
   4. Maintenance area.
   5. Water fountain.
   6. Fire extinguishers.
   7. Parking areas:
      a. Trainees' personal vehicles.
      b. Training vehicles.

B. Safety Rules:
   1. Always fasten seat belt before putting vehicle in motion.
   2. Full harness fastened in all high-speed vehicles.
   3. Instructors' directions must be followed exactly.
   4. Do not leave area of operation without permission.
   5. No smoking in vehicles when in motion.
   6. Two hands on steering wheel at all times.
   7. Report any mechanical deficiencies to instructor.
   8. Keep windows completely up or completely down.
   9. Remain alert for instructors' radio instructions.
   10. Weapons should not be brought to class.

C. Overview of the Training:
   1. Training will include briefings and demonstrations, but will focus on two skill development areas:
      a. Skid control and use.
      b. High-speed operation.
   2. Training will NOT produce top-notch, high-speed drivers.
      a. Skills must be practiced over a long period time--this training will provide a basis that will allow trainee to teach himself.
      b. The instructors' level of competence is the result of continued, long-term practice; it is not attainable by trainees in the short time available for this course.

D. Automotive Equipment:
   1. High-speed vehicles:
      a. Number.
      b. Identification system.
      c. Special equipment (i.e., communications, safety harness).
   2. Skid pan vehicles:
      a. Number.
      b. Identification system.
      c. Special equipment.

E. Emergency Standby Equipment:
   1. Location.
   2. How to contact.

F. Schedule:
   1. Group assignment.
   2. Instructor assignment.
   3. Daily start/stop times.

G. Attitude:
   1. Effective operation of a law enforcement vehicle in pursuit situation requires maturity.
   2. Safety of the officer and the general public requires rational, not emotional, application of the officer's skill.
   3. Instructors will be on the lookout for overly timid driving and excessively aggressive driving.
   4. Trainees who continue to be overly timid or aggressive cannot receive an unqualified satisfactory rating.

DEMONSTRATIONS

Rolling Friction

The following demonstrations are performed by an instructor. Trainees observe from a position that affords good visibility without compromising safety. Figure 6 (next page) illustrates the general configuration of these demonstrations. The purpose of the Rolling Friction demonstrations is to illustrate that directional control is impossible with locked wheels.

Straight Skid

A. Preparation:

1. On a two-lane stretch of roadway, three cones are placed across the roadway approximately 60 feet before a marked crosswalk.

2. Several cones are placed within the crosswalk to simulate children.

B. Procedure:

1. Instructor drives a vehicle toward the cones (speed determined during instructor preparation).

2. When the vehicle strikes the middle cone, instructor applies brakes causing them to lock.

3. Just before striking the simulated children, instructor releases brake pressure (stops skid) and swerves to avoid the hazard.

4. Demonstration is repeated through 2, above. This time, however, instructor does not release skid and, consequently, does not avoid hazard.

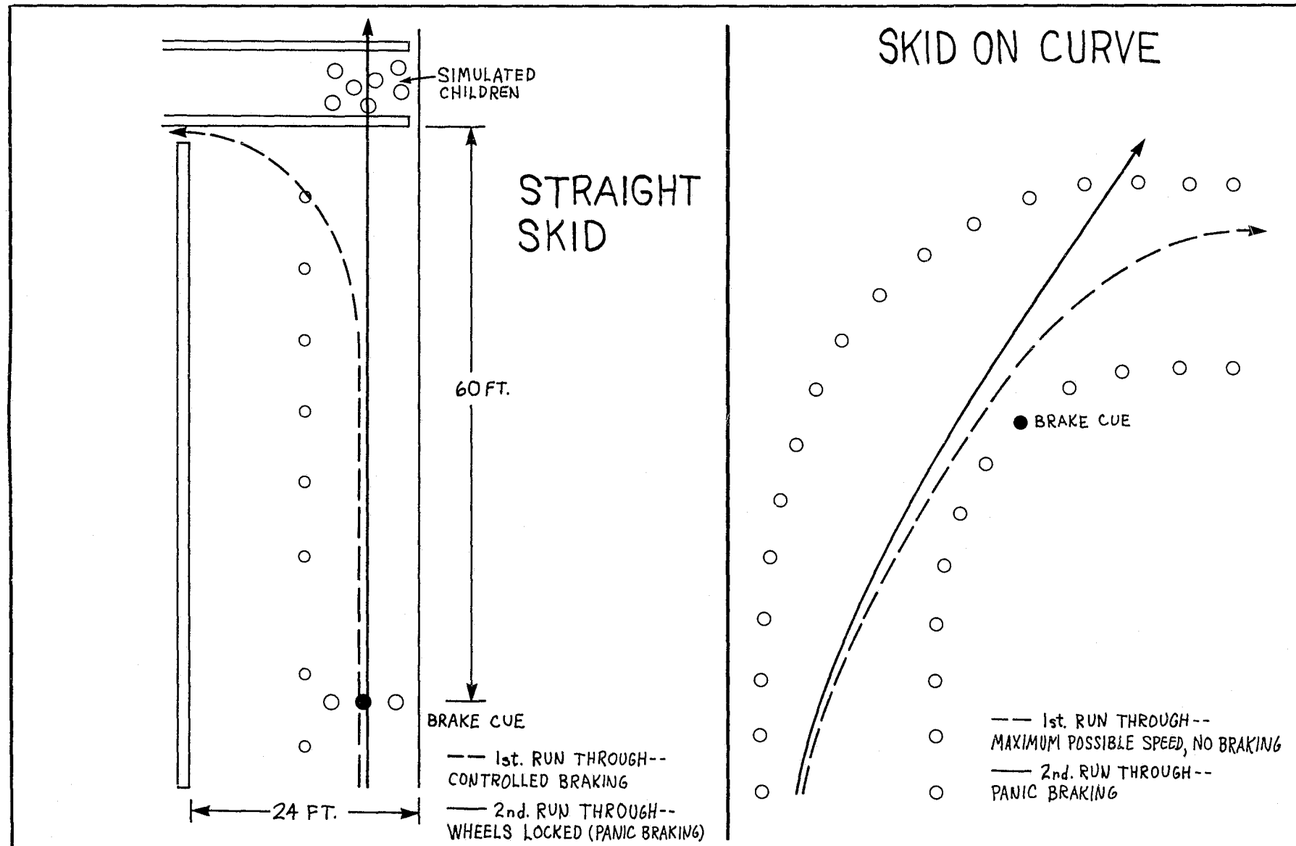

Figure 6. Layout of Demonstrations.

Skid on Curve

A. Preparation: Two rows of cones are set up to simulate a curved freeway off-ramp.

B. Procedure:

1. Instructor drives smoothly through curve at maximum speed (for curve).

2. Instructor repeats demonstration, but as vehicle enters curve, instructor locks brakes causing vehicle to go over cones.

Stopping Distances

The following demonstrations, performed by an instructor, will illustrate the effects of tire tread and pavement condition on stopping distances.

Dry Road

A. Preparation:

1. Two vehicles, one with deep tread radial tires and one with slick tires, are used in this demonstration.

2. A single cone is placed at the edge of a two-lane roadway as a braking cue.

B. Procedure:

1. Instructor, driving vehicle equipped with radial tires, will build speed to approximately 50 mph.
2. As the front of the vehicle reaches the cue cone, instructor will brake into a locked-wheel skid.
3. Instructor, driving vehicle equipped with slick tires, will repeat the demonstration.
4. Relative stopping distances are discussed with trainees.

Wet Road

A. Preparation:

1. Two vehicles used in Dry Road Demonstration are required.
2. A 12-foot wide, 200 foot stretch of roadway is covered with water (using a water truck).

B. Procedure: Same procedure as for Dry Road, above.

Siren Audibility

The following demonstration will illustrate the diminished warning effect of sirens at high speed. Instructors will operate vehicles and trainees will ride as passengers in "violator" vehicles (3-4 per vehicle).

A. Preparation:

1. Two vehicles required:
   a. Lead "violator" vehicle, operated by instructor with 3-4 trainees as passengers.
   b. Pursuit vehicle equipped with standard siren operated by instructor with one instructor passenger.

B. Procedure:

1. Violator vehicle proceeds onto high-speed track, reaching and maintaining speed of 65 mph.
   a. Windows may be up or down.
   b. Instructor maintains steady stream of "chatter" within vehicle.
2. Pursuit vehicle reaches and maintains speed of 65 mph, maintaining a distance of approximately 100 yards between lead car and pursuit vehicle.
3. Pursuit vehicle siren is engaged.
4. Instructor in violator vehicle tells trainees to turn and observe location of pursuit vehicle. He tells them siren has been operating for the last 1/2 mile (siren is inaudible).
5. Both vehicles proceed to a straight portion of the track, maintaining speed of 65 mph, and distance of 100 yards.
6. As vehicles enter straight, driver of pursuit vehicle again engages siren and increases speed, closing distance between vehicles.

7. Instructor in lead vehicle tells trainees to turn and observe location of pursuit vehicle when distinct identification of siren is made (distance will be approximately 10-40 feet).

8. Demonstration is repeated, giving all trainees an opportunity to participate as passengers.

SKID PAN EXERCISES

A. Purposes:

1. To illustrate the forces which apply when a vehicle is in an understeer ("snow plow") or oversteer situation (Session I).
2. To show trainees how to countersteer to control skids (Session I).
3. To show trainees how a skid may be used to position the vehicle so it can negotiate curves most efficiently (Session II).

B. Instructional Procedure--Session I:

1. Conduct briefing.
2. Demonstrate:
   a. Appropriate path or track around the skid pan.
   b. Cause of understeer (excessive speed into curve).
   c. Cause of oversteer (too large a steering input).
   d. Effective countersteering techniques.
3. Instruct trainees to maintain appropriate distance between vehicles.
4. When control is lost, trainee pulls to center-field area and reenters track when there is sufficient space between other vehicles.
5. Approximately two-thirds of the way through Session I have trainees reverse direction.

C. Instructional Procedure--Session II:

1. Demonstrate:
   a. Entry to skid pan at a speed about 20 percent higher than closed-loop speed.
   b. How to use the resulting rear-wheel skid(s) to optimize the path around the skid pan.
2. First trainee enters skid pan from entry ramp.
3. As first trainee reaches half-way mark second vehicle enters.
4. When first trainee is exiting, second vehicle is at half-way point and third is entering.
5. Only two vehicles are on the pan at the same time. Four to six trainees can participate (depending on size of skid pan).

D. Possible Performance Problems

1. Too fast, indicated by continually losing control ("spin out" or "snow plow").
2. Too slow, usually indicated by minimal or no skid in curve and by other vehicles "bunching" up behind slow trainee.
3. Use of brake during turns with resulting loss of directional control.
4. Countersteering inappropriately.
   a. Excessive steering input resulting in a secondary skid.
   b. Steering input made too early or late to achieve best path.

E. Criteria for Excellent Rating (based on observation at end of Session II):

1. Curves entered at a speed just below maximum.
2. Smooth countersteering motions that do not create a secondary skid.
3. Using skid(s) to optimize path around skid pan.
4. Appropriate level of aggressiveness.

OVAL TRACK

A. Purposes:

1. Illustrate the differences in handling characteristics on banked and unbanked curves.
2. Provide trainees with an opportunity for repeated vehicle control practice on a single curve.
3. Help trainees learn the "feel" of a vehicle that:
   a. Has entered a curve properly.
   b. Is "set" in the groove properly.
   c. Exits efficiently from a curve.

B. Instructional Procedure--Session I:

1. Present briefing and redefine possibly unfamiliar terms that may be used: high, low, late, early, inside, outside, apex, set, drift, understeer, oversteer, etc. (If the trainees don't understand all of the necessary words, skill development may be slower than necessary.
2. Demonstrate proper negotiation of curves at both ends of the oval. Speed should be just below the maximum for the curves. Demonstrate again smoothly and slowly.
3. Ride with each trainee to ensure he/she knows:
   a. The proper vehicle path.
   b. The proper point for braking into the curve.
   c. Exactly when the vehicle's suspension is set in the curve.
   d. When to accelerate within, and coming out of the curve.
4. Trainees practice alone working for proper position and smoothness.

C. Instructional Procedure--Session II:

1. Demonstrate negotiation of the oval track at speeds just below the maximum.
2. Have trainees increase the speed with instructor riding as passenger.
3. Allow trainees to negotiate the oval at higher speeds.
4. Until it is smooth and accomplished, critique trainees' performance often (every three or four circuits). Encourage trainees to describe their feelings and performance levels.

D. Possible Performance Problems:

1. Incorrect entry position.
2. Incorrect speed at entry.
3. Shying from outside edge.
4. Accelerating before vehicle is "set" in the groove.
5. Picking an inappropriate apex.
6. Inefficient exit.

E. Criteria for Excellent Rating:

1. Three consecutive smooth circuits of entire oval at speed approaching 90 percent of maximum for oval track.
2. Appropriate level of trainee aggressiveness.

HIGH SPEED PERFORMANCE DRIVING

A. Purposes:

1. To help trainees overcome apprehension of driving at higher speeds.
2. To help trainees develop confidence in the handling capabilities of the "standard American car" (their law enforcement vehicle).
3. To help trainees develop visual skills necessary for driving at higher speeds.
4. To provide repeated opportunities for trainees to refine their skill in negotiating curves at high speed.
5. To provide opportunity for trainees to apply and integrate the skills developed in skid pan and oval track practice.
6. To give the trainees an opportunity to recognize their own physical and psychological limitations.

B. Instructional Procedure--Session I:

1. Conduct briefing.
2. With trainee as passenger, complete two circuits of the track at moderate speed, pointing out the various turns and curves and the proper procedure for negotiating them.
3. Complete two circuits of the track at high speed. (NOTE: Point out that this high-speed demonstration is not to represent a goal for the trainees; they will not have sufficient practice to attain such speed and smoothness.)
4. Ride as a passenger and allow trainee to drive the track several times at moderate speed. Encourage trainee to work for smoothness. Speed will "take care of itself" as confidence and familiarity are gained.

CONTINUED

1 OF 2

5. When trainee has demonstrated familiarity with the track and reasonable competence at higher speeds, allow trainee to "solo."
6. Approximately 3/4 of the way through the session, stop track and have all trainees reverse direction.
7. As specific trainee performance problems are noted, pull trainee over and provide guidance.

C. Instructional Procedure--Session II:

1. Review application of high-speed driving techniques for each curve of the high-speed track.
2. Allow trainees to drive the circuit, watching for performance problems.
3. Reverse the track during the session.
4. Stop the trainees, one at a time, every 15-20 minutes. Use this opportunity to discuss their difficulties, offer critique, and, if necessary demonstrate or ride with trainee.

D. Trainee Performance Problems:

1. In cornering, four of the more difficult things for trainees to learn are:
   a. Selecting the appropriate entry speed.
      1) If the speed is over the maximum for the curve, the vehicle will understeer (snow plow).
      2) If the speed is too far below the maximum, the rear wheels will not drift (oversteer) as they should for most efficient cornering.
   b. Setting the vehicle in the groove. (Slight acceleration after the vehicle is "set.")
   c. Choosing an appropriate apex or series of apexes.
   d. Whether to come out high or low (the decision depends on the path to be followed after the present curve).

2. Other typical trainee "mistakes" on a high speed track are:
   a. Jerky steering input (usually because steering input was made too late).
   b. "Shying away" from guardrail.
   c. Failing to establish separate apexes in complex combination curves such as an ESS.
   d. Panic braking (and failure to negotiate curve).
   e. Not hearing radio commands ("off in another world").
   f. Braking or accelerating after loss of control. (Best approach is to stay off both and try to stay on the hard road surface.)

E. Criteria for Excellent Rating:
   1. Optimal vehicle path.
   2. Proper curve entry and exit speeds.
   3. Smoothness of control.
   4. Appropriate level of aggressiveness.

F. Examples of the desired vehicle path and relative speeds* for representative curves are given on the following pages. The example types of curves include a banked curve (A), flat turn (B), ESS curve (C), and a combination of two curves, one of which has a changing radius (D). The ESS and combination curves illustrate the proper position for exiting from one curve which leads directly to another curve.

*The displayed speed indications are relative to the specific curve. For example, the "fast" indication on curve "A" might be 105 mph, while on curve "C" the "fast" speed might be 50 mph.

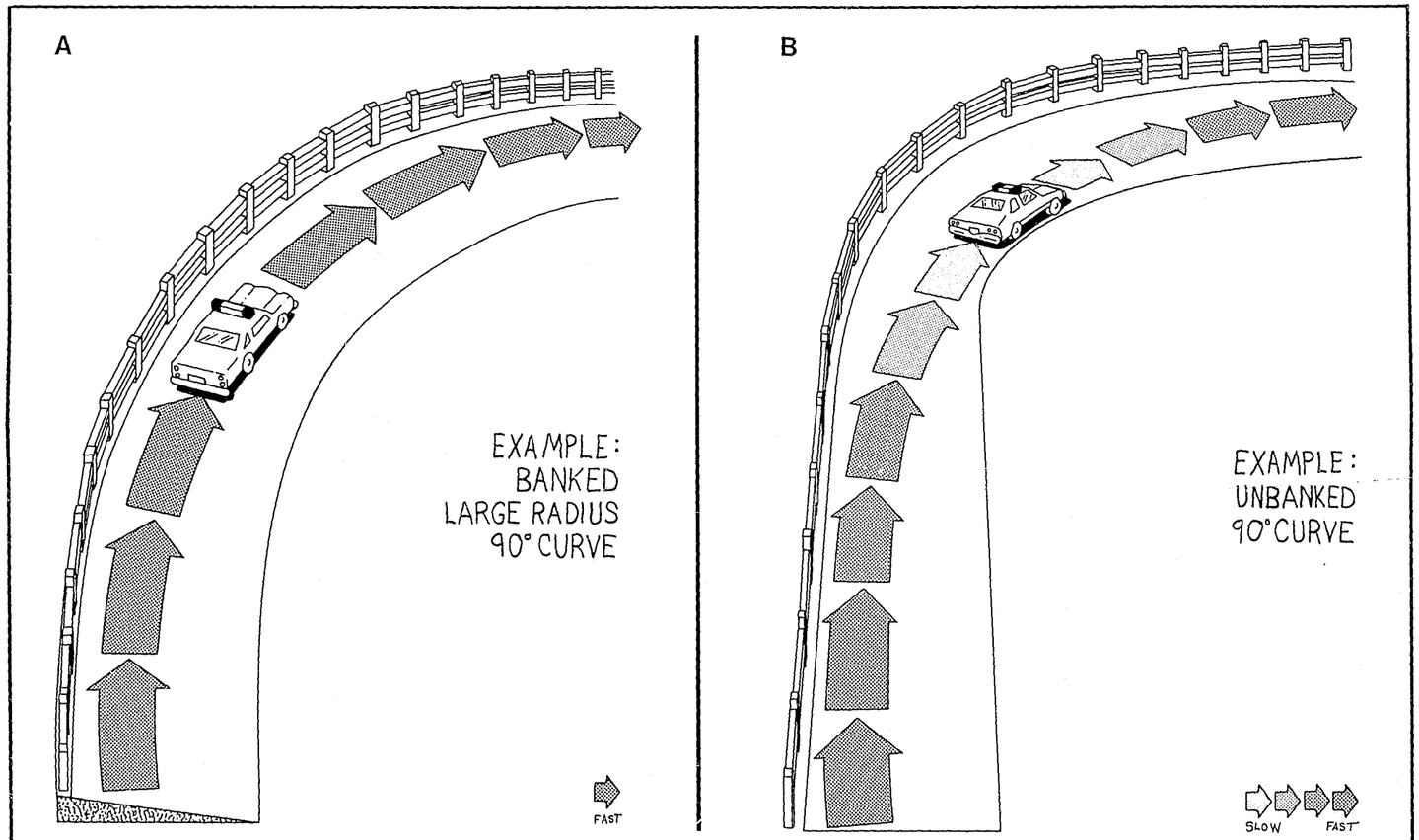

Figure 7. Example 90° Curves.

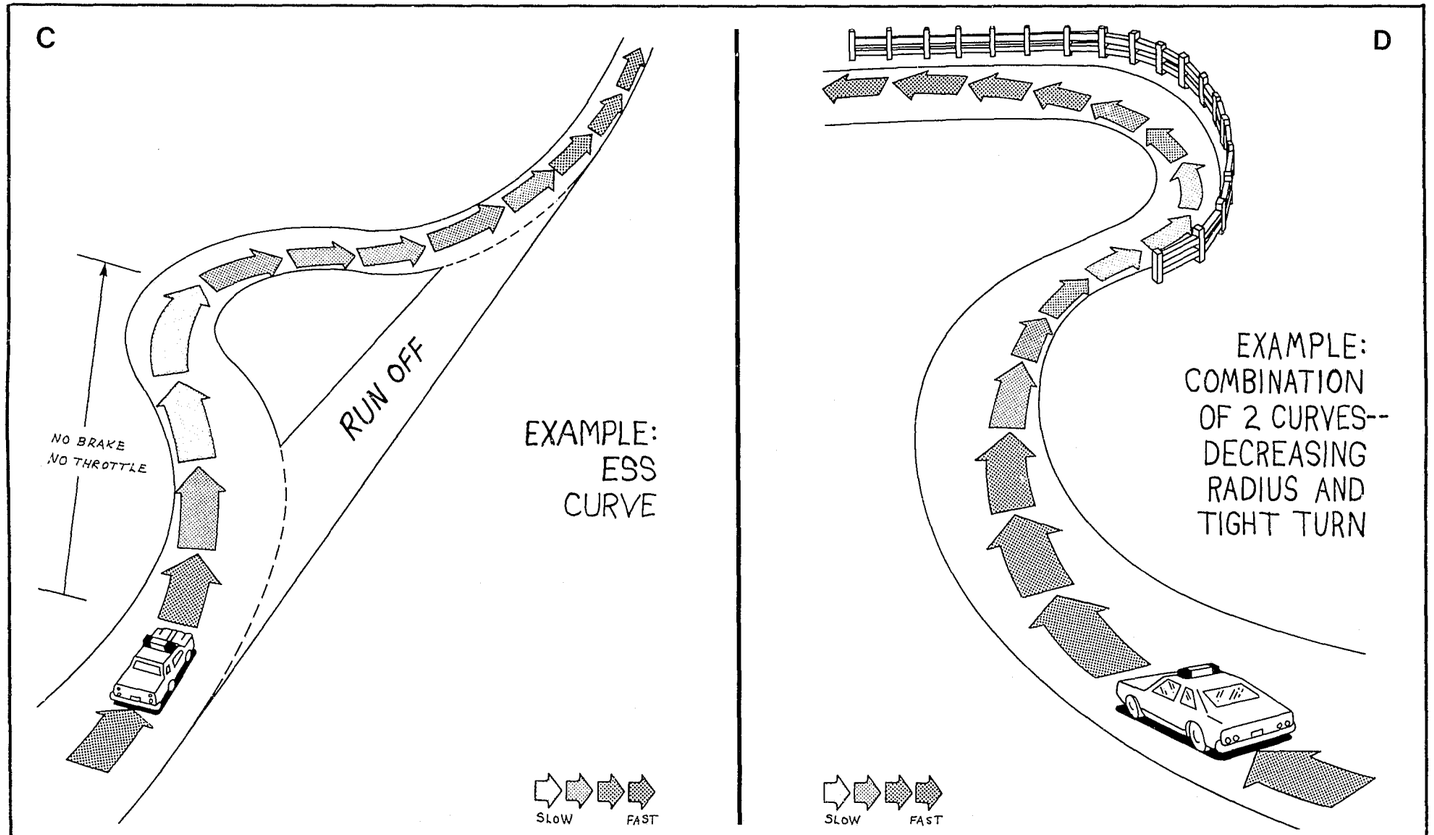

Figure 8. Example Complex Curves.

A. Purposes:

1. To provide an opportunity for each trainee to conduct a high-speed chase and a Code-3 pursuit under controlled conditions.
2. To have trainees experience the strong emotional aspects of a chase.
3. To show trainees that pursuit driving is an extremely complex task, and that full proficiency is difficult to achieve.
4. To expose trainee to hazards likely to be encountered during pursuit driving.

B. Instructional Procedure--Timed Chase:

1. The entire timed chase occurs on the high speed track.
2. Instructor ("violator") accelerates to the predetermined speed (e.g., 75 mph) and:
   a. Never exceeds that speed.
   b. Slows as necessary to negotiate curves safely.
   c. Occasionally drives an inefficient path through a curve to confuse the pursuing officer.
3. Officer-trainee starts chasing violator exactly 15 seconds later, using lights and siren.
4. "Dispatcher" from observation area calls out the time interval between vehicles two or three times in each circuit.
5. Chase ends when pursuing officer can call out license plate number or after three complete circuits.

C. Instructional Procedure--"Urban Area" Pursuit:

1. "Violator" (skilled driver in a "hot" car equipped with a roll bar and brake light activating switch) drives a path around the intersection area.
2. Pursuing officer chases violator and follows rules for safe pursuit.
3. Violator is free to take any of the predetermined paths.
4. "Dispatcher" asks pursuing officer for location, progress and vehicle description at critical points in the chase.
5. Pursuing officer encounters "hazards" at intersections, in blind spots, in passing situations, and when "violator" flashes brakes but doesn't slow down, etc.
6. Pursuit ends when officer-trainee can provide sufficient identifying data about violator, or after four or five minutes.

D. Criteria for Excellent Rating:

NOTE: With only 16 hours of instruction and practice, it is difficult for trainees to satisfy all of the following criteria. Indeed, a "hidden agenda" here is to humble the trainees sufficiently that they don't become too reckless or overconfident on the job.

1. Effective use of lights and siren(s).
2. Smooth and effective cornering on high-speed track and in intersections area.
3. Keeping the "violator" within a reasonable distance (neither too close nor too far) in "urban" pursuit.
4. Only answering calls from the dispatcher when appropriate (i.e., not at critical times in the chase).
5. Clearing intersections visually and with siren, passing other motorists only on the left and avoiding other hazards in a safe manner.
6. Consistently driving within his/her physical and psychological limitations.
7. Continually exercises sound judgment while driving.

APPENDIX A

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APPENDIX B

Audiovisual Directory

AUDIOVISUAL DIRECTORY

The following four films are particularly relevant to the Pursuit Driving Course, and will require approximately two hours to view, including set-up and rewind time. Consequently, if you intend to follow the schedule shown on page 16, it will be necessary to obtain an additional film or films totaling 40 minutes in length. You may wish to consult the Audiovisual Directory in the Course Guide for a listing of other, possibly relevant films.

1. Defensive Driving III: Code 3 - 20 minutes
   Motorola Teleprograms, Inc.
   4825 N. Scott Street
   Suite 23
   Schiller Park, IL 60176

   This film illustrates effective emergency response driving. It also discusses legal liability and the physical principles affecting high-speed vehicles.

2. Defensive Driving IV: Pursuit Driving - 20 minutes
   Same as above.

   This film discusses the distinction between rational high speed driving and tactics which are dangerous and destructive.

3. Emergency Vehicle Operations Course - 25 minutes
   Aims Instructional Media Services, Inc.
   626 Justin Avenue
   Glendale, CA 91201

   This film illustrates high-speed control techniques being practiced by the California Highway Patrol. Brief references to the physical principles of momentum and coefficient of friction are made.

UNIT TITLE	Pursuit Driving for Law Enforcement Officers	UNIT PAGE	B-3

4. Police Pursuit - 15 minutes
   Film Communicators
   11136 Weddington Street
   North Hollywood, CA 91061

   This film illustrates the pursuit training of police officers.

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