



A Division of Glatfelter Insurance Group



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EMERGENCY MEDICAL SERVICES VEHICLE OPERATION

PARTICIPANT MANUAL

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Please Read Carefully

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Preface

Developing a Culture of Safety in Emergency Medical Services

The 21st Century has impacted the clinical and operational functions within EMS systems. The emergence of new technology has shifted EMS to become increasingly data-driven. This approach has fostered an environment where innovative products and practices are cultivated in an effort to improve the safety of patients and providers.

The fire service has introduced a number of responder safety initiatives to address firefighter safety over the last few decades. With measurable improvement in emergency vehicle operations, many of the safety initiatives also provide guidance applicable to EMS. Safety must be embedded into the culture of the EMS field.

Response Policies

A need for cultural change was identified in relation to emergency vehicle operations and response policies. VFIS noted that vehicle crashes continue to be the second leading cause of responder fatalities, and an even greater number of civilians die in collisions involving responding emergency vehicles.

Many of the emergency response deaths result from excessive speed and unsafe driving, which can be related to the perception that the urgency of the mission justifies an elevated level of risk to the emergency responders and everyone else on the streets. In too many cases the risks that are created en route are greater than the dangers of the situation itself. The cultural change must be based on recognizing that EMS personnel cannot save lives at the scene of an emergency incident unless they arrive safely, and there is no justification for causing more harm enroute than they can prevent when they arrive.

The need for standard policies governing emergency response has been identified, possibly through the development of a new standard or by adding to the scope of an existing standard. These policies should determine when emergency response is and is not appropriate. Emergency Medical Dispatch (EMD) has provided a basis for evaluating response mode in many jurisdictions. It is important that emergency service organizations (ESOs) follow applicable state laws when adopting policies such as this. In addition, ESOs should adopt specific policies relating to responding in privately owned vehicles if members are allowed or may respond using vehicles not owned by the organization.

This cultural change has to begin with the enforcement of existing safe driving protocols by leaders and supervisors, as well as the mandatory use of seatbelts by all EMS personnel. Some EMS personnel do not use seatbelts that are provided in their vehicles, despite standards, organizational regulations, and state laws that require them. The failure to enforce and to follow these existing and basic safety procedures are evidence of the urgent need for cultural change.

Organizations should establish strict training and testing requirements, including medical evaluations and periodic review of driving records.

Drive with care — everyone wears a seatbelt ... **EVERYONE!**¹⁶

- Safe speed always under control
- Stop at red lights ... **STOP!**
- Remain seated and belted while in motion
- Protect the roadway/scene

Note: Since its inception VFIS has been an advocate for firefighter and EMS safety regarding vehicle operations. We are proud to participate with the other fire and EMS organizations of our nation in this endeavor.

EMS Safety Initiatives

The emergency medical services (EMS) community faces many challenges in providing patient care while maintaining the safety of their patients and themselves. One factor that influences patient care and safety is the ability of the EMS vehicle operator to safely maneuver to the scene and subsequently transport the patient(s) to a hospital or other health care facility.

The Department of Homeland Security (DHS)³² has identified a need to research best practices for ambulance operators and identify safety gaps. Recent research published by the DHS helped develop ambulance safety and design standards and recommendations. The project identified best practices for ambulance patient compartment design for crashworthiness, patient safety and comfort, as well as EMS provider safety and performance.

VFIS Education, Training and Consulting (ETC)

ESOs are continually faced with new challenges, issues, risks and an array of new opportunities. Meeting these challenges and taking advantage of opportunities often requires assistance that may not be available through traditional channels.

As the leader in emergency service insurance for more than 50 years, we have made it a point to provide our customers with quality education, risk control and management programs.

In tandem with our quality insurance coverages, VFIS offers clients beneficial programs and services, which are available to them at little or no cost:

- Education and training resources
- Training classes
- Consulting services
- Online training
- Risk control

VFIS has trained more than 175,000 emergency service personnel since 2006.

VFIS Online Safety Self-Assessment Tool

There are many proactive approaches to risk management. One hands-on approach in any organization is to evaluate risks on a regular basis. The Safety Self-Assessment process is designed to provide ESOs with the risk management resources they need to effectively run their operations.

Upon completion of the self-assessment survey, VFIS sends an emailed list of the support materials that we recommend, based on the assessment answers. VFIS provides direct and immediate access to our online materials.

Emergency Vehicle Driver Training

Pre-Quiz

1. Approximately how many ambulance-involved collisions occur annually?

- a. 5,000
- b. 10,000
- c. 25,000

2. According to the American Ambulance Association (AAA), nearly 75% of reported EMS LODD are related to _____.

- a. Health
- b. Transportation
- c. Patient
- d. Rescue

3. The leading factor contributing to emergency vehicle collisions is:

- a. Driver error
- b. Mechanical failure
- c. Ignorance of the driving public
- d. Other types of errors and/or unknown factors

4. Most intersection collisions involving emergency vehicles occur because the driver is not utilizing his/her emergency lights and siren.

True

False

5. The two principles that will usually be applied by a court when an emergency vehicle driver is charged in a collision are:

- a. Was the driver correctly applying a legal exemption to the traffic laws, and was the other driver correctly following all traffic laws?
- b. Was the driver responding to an emergency, and did he/she exercise due regard for the safety of others?
- c. Did the driver use all available evasive maneuvers, and could the other driver have avoided the accident?
- d. Did the driver follow the agency's policies, and was anyone injured?

6. Whenever a person fails to exercise the degree of care that a prudent person would exercise under similar circumstances, the legal deficiency that results is defined as:

- a. Negligence
- b. Willful and wanton
- c. Gross negligence
- d. Disregard for the safety of others

- 7. The initial step in a comprehensive preventive maintenance program for emergency vehicles is the conducting of routine maintenance. The individual who has primary responsibility for the conducting of routine maintenance on an emergency vehicle is:**
- a. A qualified emergency vehicle technician
 - b. The emergency vehicle driver
 - c. The designated vehicle maintenance officer
 - d. Any individual as specifically identified by the emergency service organization
- 8. Prior to driving an emergency vehicle, a driver should practice effective start-up procedures. Which of the following is not one of the steps?**
- a. Circle of safety inspection
 - b. Donning of all Personal Protective Equipment (PPE)
 - c. Adjustment of cab features
 - d. Wearing of occupant restraints
- 9. A method for accomplishing the principles of defensive driving is to practice S I P D E. These initials stand for:**
- a. Search/scan, Identify, Predict, Decide, and Execute
 - b. Stop, Identify, Procrastinate, Decide, and Escape
 - c. Slow, Initiate, Progress, Decelerate, and Escape
 - d. Start, Initiate, Predict, Decelerate, Execute
- 10. A basic procedure that emergency vehicle drivers should use when the siren is operated on an emergency vehicle he/she is driving is to change the mode from wail to yelp:**
- a. Upon entering an intersection
 - b. Whenever traffic might become congested
 - c. Approximately 200 feet prior to entering an intersection
 - d. Not at an intersection; it confuses other drivers

Module I

INTRODUCTION

Module I Goal

A large number of emergency service personnel and civilians are being injured and killed each year as a direct result of inappropriately driven emergency vehicles. Participants in this course will have the opportunity to gain and/or verify a broad range of competencies associated with emergency vehicle driving. These competencies include basic understanding of emergency vehicle operations as well as the skills necessary for practical application.

Module I Objectives

Successful participants will be able to:

1. Summarize the goal of this Emergency Medical Services Vehicle Operations Program.
2. Describe the importance of an Emergency Medical Services Vehicle Operations Program.
3. Identify the critical elements of a comprehensive, Emergency Medical Services Vehicle Operations Program.

Module I – Glossary of Terms

The following terms are used in this module and may also be referenced in subsequent modules.

Best Practices - Reducing emergency vehicle near-misses, incidents, injuries, deaths, related property damage and operational effects starts with identifying a core set of “Best Practices.”

Best practices are defined as certain safety engineering approaches that have come into use in recent years that currently represent state-of-the-art in limiting losses. These Best practices need to be implemented and evaluated locally to match the needs and culture of the local emergency service organization. To be effective in implementing Best practices, the organization’s culture must be receptive to and accept the changes.

Competency course - A series of exercises or stations designed to measure the proficiency of an emergency vehicle driver while driving a specific vehicle.

Comprehensive emergency vehicle driver training – A program to train and educate emergency vehicle drivers that includes classroom instruction, competency course completion, street and highway driving, and testing to verify proficiency.

EVOC for Ambulances National Standard Curriculum - Department of Transportation (DOT), National Highway Traffic Safety Administration (NHTSA) included emergency vehicle operations for ambulances in the National Standard Curricula referencing guidelines established by the Highway Safety Act of 1966.

National Fire Protection Association (NFPA) – The NFPA is a private, nonprofit membership organization directed to advancing the cause of fire safety. The purpose of the association is to promote the science and improve the methods of fire protection and prevention, electrical safety, and related safety goals. To achieve those goals the NFPA obtains and circulates information on these subjects, and works to secure the cooperation of its members and the public in establishing proper safeguards against loss of life and property. The NFPA publishes consensus codes and standards in the furtherance of these purposes.

NFPA 1002 – *Fire Department Vehicle Driver/Operator Professional Qualifications.*

NFPA 1451 – *Fire Service Vehicle Operations Training Program.*

NFPA 1500 – *Fire Department Occupational Safety and Health Program.*

NFPA 1911 – *Inspection, Testing, Maintenance and Retirement of In-Service Automotive Fire Apparatus.*

NFPA 1915 – *Standard for Fire Apparatus Preventive Maintenance Program.*

Course Goal

Participants in this course will have the opportunity to gain and/or verify a broad range of competencies associated with driving emergency vehicles. These competencies include basic understanding of emergency vehicle operations as well as the skills necessary for practical application. The course is designed to present the necessary classroom experiences and competency course training, and must include testing in written form for both new and experienced emergency vehicle drivers.

Importance of Emergency Vehicle Driver Training

Urgent medical situations, local emergencies, and large-scale disasters all result in calls for emergency assistance. Regardless of the type and extent of the assistance needed, it is generally delivered by way of emergency vehicles. One common element in all emergencies is the need for the response vehicles to arrive on the scene safely. If they do not arrive, there is no service.

Each year approximately 20-25 percent of the emergency responders killed in the line of duty were in vehicles either responding to or returning from the scene of an emergency incident²². In recent years, a number of emergency vehicle drivers have been criminally charged for vehicular collisions when death or serious injury has occurred. As a result, many emergency service executives are among those being sued for the actions of their emergency vehicle drivers.

Instituting a comprehensive Emergency Medical Services Vehicle Operations Program is one of the best methods to attempt to ensure that all drivers perform responsibly and professionally. A comprehensive driver training program provides direct evidence that the emergency service organization recognizes the consequences of inappropriate driver behavior. Taking the necessary steps to initiate such a program, in accordance with *EVOC for Ambulances, National Standard Curriculum*²⁵ or *NFPA 1451*¹⁸, dramatically increases the likelihood that drivers will be proficient in emergency and non-emergency driving situations.

Comprehensive Emergency Medical Services Vehicle Operations Program

A formalized written statement should be adopted requiring all drivers to successfully complete a driver education and training program. The program should have written objectives to specifically address the critical areas of operation for an emergency vehicle driver. The program should reference current applicable standards for vehicle operation that may include American Ambulance Association best practices, ASTM standards, NFPA standards, Organization standard operating procedures/standard operating guidelines (SOP/SOG), and federal, state, and local requirements. The emergency service organization's driver education and training program should be based upon current recognized safety standards, and organizational policies, procedures, and guidelines as well as manufacturers' suggested procedures.

Classroom Instruction

Eight hours (minimum) of classroom education are recommended. This session covers subjects that include, but are not limited to:

- Importance of Driver Training
- The Problem
- The Driver
- SOPs/SOGs
- Legal Aspects of Emergency Vehicle Driving
- The Vehicle
- Emergency Vehicle Operations/Safety
- Vehicle Inspections and Maintenance
- Emergency Vehicle Competency Course
- Written Test

Simulation

Simulation provides an opportunity for emergency vehicle operators to create a positive attitude toward operations by increasing their awareness through judgment and decision making skills when faced with

simulated hazards and events. Simulation does not replace actual behind-the-wheel driving as provided by the competency course and over-the-road evaluation. Learning opportunities from simulation include:

- Replaying situations through scenarios
- Non-skills intensive
- Proper judgment and driving tactics
- Dangerous situations without risk

Competency Course Completion

For successful completion, each driver should spend sufficient time on the competency course to demonstrate proficiency in the operation of an emergency vehicle. Drivers should demonstrate competency on each emergency vehicle they will operate. Specific proficiencies to be measured are:

- Use of Mirrors
- Braking and Stopping
- Turning
- Depth Perception (front and rear)
- Blind Right Side and Rear Positioning
- Backing
- Proper Communication

Optional proficiencies to be measured may include:

- Height Clearance
- Temporary Traffic Control Zone Set-up

Street and Highway Driving

Sufficient over-the-road driving (actual driving) must be observed to effectively evaluate the emergency vehicle operator. Additionally, organizations providing EMS transport should conduct training with an on-board patient (simulated or actual). Each driver should experience what it is like to be a patient in their ambulance. Each driver should spend sufficient supervised time on over-the-road driving to demonstrate proficiency in the operation of a vehicle. Again, the drivers should demonstrate competency on each type of vehicle they are expected to drive (minimum 10 hours).

Testing

A written test of information and topics presented during classroom instruction should be administered before or prior to initiating the competency course. To proceed to over-the-road training, satisfactory completion of the written test and competency course should be required.

Beginning to Drive

Personnel of an emergency service organization should not be permitted to drive without a valid driver's license. In addition, no personnel should be permitted to drive under emergency conditions until he/she has successfully completed a recognized comprehensive driver training program. The proficiencies demonstrated through the training program should be maintained and tested on a regular basis. Driving under emergency and non-emergency conditions, in-service training with didactic and practical sessions, and regular re-testing should be required to maintain essential competencies.

Best Practices

The "Best Practices" were developed from a series of emergency service-based issues and programs; however, they fit into a more global approach based on safety engineering principles. These include a four-step safety engineering approach to limit incidents and losses. They are listed in order of impact and magnitude of results:

- Engineer out the problem
- Train personnel on how to use the proper safety devices and to do the job correctly
- Implement administrative controls

Refresher Training

The organization's current emergency vehicle operators should receive annual re-qualification based upon their actual emergency vehicle driving activity. The type and length of education and training should be determined by the Authority Having Jurisdiction (AHJ). Factors to review include:

- Number of emergency calls driven
- Driving environment (rural, suburban, urban, off-road)
- Introduction of new vehicle/technology
- Length of service as a driver without a driving infraction
- Employment experience

Annual refresher training can be based on a variety of VFIS programs: *Safety and Risk Management Video Series*, *VFIS University* and any single module from this program. Specifically address relevant safety issues; such as: intersections, rollovers, private vehicle use, backing and *Traffic Incident Management (TIM)*.³⁶ Refresher training should also include annual over-the-road evaluation based on the *VFIS Street/Highway/Over-the-Road Driving Evaluation*. All proficiencies, as defined in this program, must be maintained and documented on a regular basis.

A Team Approach

Emergency vehicles are very different from passenger vehicles. Even the best drivers need help when it comes to maneuvering large, unwieldy apparatus. Officers/supervisors, drivers and passengers must realize that their attitude, perceptions of the driving public and the safety culture of the organization play major roles in response safety.³³

As a member of the team, it's part of your responsibility to ensure a safe arrival.

Module II

THE PROBLEM

Module II Goal

The goal is to identify the increasing seriousness of emergency vehicle collisions and the resulting impact upon all concerned.

Module II Objectives

Successful participants will be able to:

1. Explain the common-sense approach of safe driving under all conditions within the context of laws governing emergency vehicle operations.
2. Describe the high incidence of collisions involving emergency vehicles and the associated deaths and injuries to emergency service personnel and members of the public.
3. Describe the types, conditions, and causes of collisions involving emergency vehicles and their impact upon all concerned.
4. Identify and explain the factors that contribute to collisions involving emergency vehicles.

Module II – Glossary of Terms

The following terms are used in this module and may also be referenced in subsequent modules.

Auto Collision Insurance – Pays for loss or damage to your vehicle from overturns or collisions with another object.

Auto Liability Insurance – Covers injuries and damage you cause to other drivers and their vehicles when you are at fault.

Culture – Basic and shared assumptions of acceptable behavior.

National Highway Traffic Safety Administration (NHTSA) – NHTSA provides leadership to the motor vehicle and highway safety community through the development of innovative approaches to reducing motor vehicle crashes and injuries.

National Institute for Occupational Safety and Health (NIOSH) – NIOSH is the federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness. NIOSH is part of the Centers for Disease Control and Prevention in the Department of Health and Human Services.

United States Department of Transportation (USDOT) – USDOT oversees federal highway, ambulance transport, air, railroad, maritime and other transportation administration functions.

The Problem

Perspective

The realities and potential dangers connected to emergency vehicle responses are well documented. Organizations associated with emergency vehicle operations recognize these dangers and have long supported the idea that a safe response is more important than speed. It is essential that emergency vehicle drivers understand and abide by this simple yet profound concept. There are laws in every state that govern emergency vehicle response procedures. There is, however, a serious misconception that these laws alone will guarantee safe passage during emergency responses. They will not!



Many emergency vehicle drivers have a related misconception that the sole source of emergency response problems is the general public's failure to properly yield to emergency vehicles. It is not! Emergency vehicle drivers encounter civilian drivers on every response, but civilian drivers rarely encounter emergency vehicles during routine driving. While all licensed drivers should understand and comply with motor vehicle laws related to emergency vehicles, it is not realistic or practical to expect such compliance in all situations.

Another misconception associated with emergency vehicle response relates to the belief that emergency vehicle drivers can rely solely on warning devices and laws governing emergency vehicle responses, which grant the privilege of right of way. Neither of these will ensure a safe emergency vehicle response. Emergency vehicle drivers must understand that, as a practical matter, they only request the right of way. They cannot assume that they have it or drive as though they do.

Fatality, Injury, Collision and Near-Miss Data

A study by Ray and Kupas compared ambulance crashes in rural setting verses the urban setting.²⁹ They found that driver error was the cause of the collision in the urban setting 93 percent of the time and in the rural setting 75 percent of the time. Besides the number of incidents, the big difference between the urban setting and the rural setting was that ambulance crashes in the urban setting were more likely to occur in intersections and involve other vehicles, where vehicle or environmental conditions effected rural ambulance collisions more and they were more likely to collide with a fixed object rather than another vehicle.

According to a study of ambulance crashes in the greater Denver, Colorado area from 1989 to 1997 found that 91 percent of ambulance crashes occurred during the emergency mode of operation.³ Another study compared like-sized non-emergency type vehicles to ambulances which is significant because the similar non-emergency vehicles of like-size were more likely to be involved in rear-end collisions where ambulances were more likely to be involved in intersection collisions such as a T-bone style crash suggesting that operating a vehicle the size of an ambulance in an emergency response mode changes the probable collision type.⁹

FEMA's Emergency Vehicle Safety Initiative, claims that nearly _____ percent of EMS fatalities are transportation-related.³⁴ According to the American Ambulance Association, an estimated 10,000 ambulance-related collisions occur annually, with many of them resulting in injury or death.²

The USDOT statistics² for emergency vehicle collisions show an annual average of 83 deaths to both emergency responders and members of the public, as well as injuries to more than 6,000 individuals in recent years. EMS vehicles were involved in crashes that killed 48 civilians in one recent year. These include drivers and passengers of another vehicle as well as pedestrians and bicyclists.

Recent Statistics

NFPA reported 830 collisions involving emergency responder's personal vehicles occurred in one recent year while responding to or returning from incidents.²² These collisions resulted in an estimated 185 injuries.

Based on a loss study by VFIS, emergency vehicle incidents have been analyzed by frequency, severity, contributing factors, and intersection collision details. The results of these studies show that both the frequency

and severity leaders for ambulances occur during intersection incidents.

Auto Collisions

Ambulances: Intersection Crashes

Auto Liability

Ambulances: Intersection Crashes

Impacts of Vehicle Collisions

The severity of emergency vehicle collisions covers a wide range of negative results. In all cases, however, there are four areas of results from all but the most minor of incidents. These include:

1. _____
2. _____
3. _____
4. _____

There is an adverse effect on all concerned whenever an emergency vehicle collision occurs. All emergency vehicle drivers must be trained to recognize these adverse effects and do everything possible to avoid being involved in a collision. Additional consequences can include:

- _____
- _____
- _____
- _____
- _____
- _____

Anything that the emergency vehicle driver can do to reduce the risk of a collision has a positive effect on the other emergency service operations.

Emergency Vehicle Crash Case Studies

The following examples of emergency vehicle incidents have been extracted from a variety of public records. They exemplify the variety of problems themselves and other problems that emergency vehicle responders have created.

Lessons Learned:

- Emergency vehicle drivers should learn from other's mistakes. these lessons learned were common recommendations within NIOSH investigations following emergency vehicles crashes and fatalities.
- Provide initial and refresher training to all drivers on each vehicle that may be called upon to operate.
- Ensure seatbelts are properly worn at all times by drivers and occupants of all vehicles.
- Confirm that all vehicle modifications are completed by a qualified source and are designed and installed within the manufacturer's specifications and applicable standards.
- Be aware of programs that provide assistance in obtaining alternative funding, such as grant funding, to replace or purchase fire apparatus and equipment.

Case Study 1 – Type III Ambulance – Non-Emergency Transport

Career Fire Fighter/Emergency Medical Technician Dies and Paramedic is Injured in a Three-Vehicle Collision – Nebraska

On August 6, 2003, a 43-year-old career fire fighter/emergency medical technician [the victim] died after the ambulance he was driving was struck from behind and pushed into a straight truck. The victim and a lieutenant/paramedic were conducting a non-emergency transport between two hospitals. The ambulance was traveling through a highway work zone and as the ambulance driver slowed down to move around a line painting crew, a tractor semi-trailer struck the rear of the ambulance and pushed it into the straight truck. Although the victim was using the vehicle occupant restraint, the front cab sustained such extensive damage that he was fatally injured. The lieutenant/paramedic and a patient, who had been riding in the ambulance patient compartment, were also injured during the collision.

Contributing Factors

- Ensure that EMS workers use the patient compartment vehicle occupant restraints whenever possible.
- Consider using shoulder straps with occupant restraints on patient cots to limit the movement of the patient from the cot during a vehicle crash.
- Develop and evaluate occupant protection systems designed to provide crash protection for EMS workers and the mobility necessary to access patients and equipment within ambulance patient compartments.

Key Recommendations

- Organizations should ensure that EMS workers use the patient compartment vehicle occupant restraints whenever possible.
- Organizations and emergency medical service providers should consider using shoulder straps with occupant restraints on patient cots to limit the movement of the patient from the cot during a vehicle crash.
- Ambulance manufacturers, EMS providers, and researchers should develop and evaluate occupant protection systems designed to provide crash protection for EMS workers and the mobility necessary to access patients and equipment within ambulance patient compartments.
-

Reference: A Summary of a NIOSH fire fighter fatality investigation - F2003-33

Case Study 2 – Type III Ambulance – Emergency Response

Career Fire Fighter/Emergency Medical Technician Dies In Ambulance Crash – Texas

On January 19, 2003, a 28-year-old male career firefighter/emergency medical technician (EMT) [the victim] died when the ambulance he was riding in crested a hill and was struck head-on by an oncoming vehicle. The victim was riding restrained by a three-point lap and shoulder safety belt on the passenger side while enroute to an emergency medical call. Following the collision, both vehicles caught fire and the victim was entrapped. The driver/paramedic was transported by ambulance to a local hospital where he was treated for numerous injuries and discharged four days later. The victim was pronounced dead at the scene and was transported to the office of the medical examiner.

Key Recommendations

- Organizations should provide defensive driver training to all emergency vehicle operators.
- Organizations should ensure that all drivers are trained and certified in emergency vehicle operations.
- Organizations should develop standard operating procedures (SOPs) for responding to, or returning from, an alarm and monitor to ensure their use.
- Organizations should ensure that the load carrying capacity of all apparatus is equal to, or less than, the Gross Vehicle Weight Rating (GVWR).

Reference: A Summary of a NIOSH fire fighter fatality investigation - F2003-05

Case Study 3 – Type I Ambulance – Non-Emergency Transport

Career Fire Fighter/EMT Dies in Ambulance Crash - Florida

On August 23, 2004, a 22-year-old male career fire fighter/emergency medical technician (the victim) died after the ambulance in which he was riding crashed into a tree. The ambulance, with a patient on board, had proceeded through an intersection with lights and siren activated when the driver lost control after losing traction on a wet road. The victim, who was belted into the captain's chair in the patient compartment, died on impact and was pronounced dead on scene. A paramedic who was also sitting in the rear of the ambulance was ejected and sustained serious injuries. He was transported to a local hospital via ambulance.

Key Recommendations

- Organizations should replace worn tires as part of the apparatus maintenance program.
- Organizations should ensure that drivers operate emergency vehicles at speeds appropriate for the conditions to prevent hydroplaning and loss of vehicle control.
- Organizations should ensure that drivers receive some form of driver training at least twice a year.
- Ambulance manufacturers, researchers, and standard setting bodies should continue to improve vehicle safety standards and designs for increased crash worthiness of ambulance patient compartments for occupant survivability.

Reference: A Summary of a NIOSH fire fighter fatality investigation - F2005-12

Case Study 4 – Type III Ambulance

Career Firefighter/Paramedic Dies Two Days after Being Ejected during Ambulance Rollover Incident—Georgia

On Dec. 26, 2009, a 37-year-old male career firefighter/paramedic (the victim) was ejected from the front passenger seat of a fire department ambulance during a rollover incident. The ambulance was responding with lights and siren to a car fire with injuries. A motorist in a privately owned vehicle (POV) turned into the path of the ambulance as it was passing the POV. The ambulance struck the POV, lost control and left the right side of the roadway. The ambulance overturned three times and the victim was ejected. The driver sustained minor injuries. The victim's use of a seat belt could not be determined with certainty. The victim was airlifted by helicopter to a local trauma center where blunt force chest injuries and underlying medical conditions, contributed to his death.

Contributing Factors

- Failure of the motorist to yield the right-of-way to an approaching emergency vehicle with audible and visual signals in use
- Ejection of the victim
- Blunt chest trauma resulting in multiple rib fractures
- The victim's underlying medical conditions

Key Recommendations

- States and authorities having jurisdiction should take steps to ensure that motorists are aware of, understand, and follow state traffic codes/laws pertaining to yielding the right-of-way to approaching, authorized emergency vehicles using audible and visual signals.
- Take steps to verify that seat belts are properly worn at all times.

Additionally, governing municipalities (federal, state, regional and local) should:

- Consider enacting legislation to include drivers and occupants of emergency vehicles in existing seat belt legislation and/or repeal existing laws that exempt drivers and occupants of emergency vehicles from mandatory seat belt use.

Reference: A Summary of a NIOSH fire fighter fatality investigation - F2009-30

Criminal/Civil Consequences

As society increases its demand for accountability of emergency service personnel, drivers as well as leaders are being charged criminally and civilly as a result of their actions or lack of actions. Some examples include:

Ohio

An Ohio court convicted an EMT-Paramedic of involuntary manslaughter and sentenced him to two to ten years in prison in the deaths of a pregnant woman and her unborn fetus. A six-year-old passenger was also injured in the incident. According to a spokesman, "Failure to exercise due regard for the safety of others" was an overwhelming factor in the case.

Georgia

An owner of a private ambulance service, who was also an EMT-Paramedic, was found guilty of vehicular homicide. He was sentenced to a year in county jail after driving an ambulance under emergency conditions and colliding with a car at an intersection. The young woman driving the car was killed in the collision. The ambulance driver was sentenced to a prison term, lost his business, declared bankruptcy, and was divorced.

New Jersey⁷

A high school senior survived after an ambulance slammed into her car, according to her attorney. Two years later, she is suing the driver, the emergency squad and the town for a crash that she says still causes her pain. She is suing the ambulance driver, the emergency squad and the town for the incident, according to a civil complaint filed. The driver was responding to a call while traveling against the flow of traffic on a one-way street. He T-boned the passenger side of a sedan at an intersection, pushing the sedan into a building. The complaint claims the emergency squad and town government "vicariously liable" for the crash.

California¹¹

An ambulance company settled a lawsuit involving an EMT who allegedly fell asleep at the wheel an ambulance as it struck a disabled vehicle on a highway, injuring a passenger. Ambulance dash cam footage shows the EMT appearing drowsy. The passenger underwent back surgery as a result of injuries from the incident. The case was settled for an undisclosed amount of money.

Louisiana⁴

A pregnant woman suffered head and spine injuries in an ambulance crash that occurred while was awarded \$117 million by a jury. The complaint alleged the driver became distracted after dropping an electronic device on the floor of the ambulance, the precursor to colliding into a truck. Despite an array of previous driving infractions, the driver did not participate in the required remedial actions prescribed by the ambulance service policies.

Emergency vehicle drivers and leaders of emergency service organizations are not exempt from criminal and civil prosecution. Emergency vehicle drivers assume a tremendous responsibility every time they get behind the wheel. They are held to a high standard of accountability that increases continually. The leaders of emergency service organizations share both this responsibility and accountability.

Module III

THE DRIVER

Module III Goal

The goal is to understand that the first, and possibly the most important, step in emergency vehicle driver training is the effective selection of drivers. The various components of the physical and mental well-being of the driver are identified. Recognize the necessity of qualification and re-qualification of driving skills.

Module III Objectives

Successful participants will be able to:

1. Explain why personnel selection is critical in developing an effective emergency vehicle driver program.
2. Identify the numerous human aspects of the emergency vehicle driver selection process, and explain their significance.
3. List the abilities necessary for driving emergency vehicles.
4. Explain the importance of maintaining accurate and complete personnel files, both for the protection of the emergency service organization and the individual emergency vehicle driver.
5. Identify the importance of maintaining emergency vehicle driving proficiency through an ongoing requalification program.

Module III – Glossary of Terms

The following terms are used in this module and may also be referenced in subsequent modules.

Domain – A sphere of activity, concern, or function.

Motor Vehicle Record (MVR) – A motor vehicle record is the driving history of an individual maintained by the state in which the driver is licensed. It records all motor vehicle violations incurred by the driver, any collisions in which the driver has been involved, and other pertinent information regarding the driving record of the individual.

Phase – A distinct stage of development or pattern of behavior.

The Driver

Importance of Driver Qualification

Driver error is identified as the number one cause of emergency vehicle collisions. Studies related to driver error indicate that there are three principles of safe emergency vehicle operation. They are the selection, training, and proficiency of the driver. Appropriate driver selection and qualification procedures are absolutely essential if training is to be effective and if proficiency is to be maintained. A comprehensive approach to the selection of emergency vehicle drivers is the key element to developing and maintaining safe emergency vehicle operations.



The major considerations of such a program are:

- Human Aspects
- Acquired Abilities
- Personnel Files
- Driver Recertification

Human Aspects

While human attitude and activity can be altered with appropriate training, it is nearly impossible to change basic human nature. The various aspects of human nature described in the following table affect driver perceptions and activity, and thus have a strong influence on the performance of emergency vehicle drivers. The chart groups human activities of feelings, thoughts, and actions within two categories, “Safety Issues” and “Self-Control Issues.” Human aspects can be evaluated with positive and negative values.

Aggressive Driving

	DOMAIN	PHASE	NAME	VALUE	DESCRIPTION
SAFETY ISSUES	Feelings	Safety Issues	Attitude	Negative Positive	disregard for rules
					respect for authority
	Thoughts	Safety Issues	Knowledge	Negative Positive	unaware of safety principles
					safety literate
	Actions	Safety Issues	Alertness	Negative Positive	faulty actions
					correct actions
SELF-CONTROL ISSUES	Feelings	Self-control Issues	Emotional Control	Negative Positive	rude and opportunistic
					prudent and fair
	Thoughts	Self-control Issues	Judgment	Negative Positive	subjective, untrained thinking
					trained reasoning and objectivity
	Actions	Self-control Issues	Calmness	Negative Positive	tense, nervous, unpredictable
					relaxed and steady

A traffic safety phenomenon known as aggressive driving, which emerged as an issue in the 1990s, was and remains a major concern for the motoring public and law enforcement. One definition of aggressive driving is: "The operation of a motor vehicle in a manner which endangers or is likely to endanger persons or property."²⁵

Approximately 9,900,000 crashes occur in the United States each year.²⁵ Estimates indicate that a substantial number of these crashes are caused by aggressive driving. These estimates are based on the numbers of violations committed by the drivers involved in crashes and reported by law enforcement as the contributing factor.

Perhaps the biggest cause of unsafe highways is the unwillingness of people to scrutinize their own conduct, preferring to blame other drivers. According to several recent studies, most people have an inflated self-image of their motoring ability, rating the safety of their own driving as much better than the average motorist's.³⁰ Two out of three drivers (67 percent) rate themselves almost perfect in excellence as a driver (9 or 10 on a 10-point scale), while the rest consider themselves above average (6 to 8). The studies suggest that most drivers overlook their own faults and overestimate their competence. **One common trait among aggressive drivers** _____.

Driver Readiness

Youthful, middle-aged and mature drivers all have positive and negative qualities that they bring with them when they sit behind the steering wheel. Youthful drivers may have quicker reactions, but may lack driving experience and the ability to control their emotions. Middle-aged drivers may have good experience, but may be complacent about their abilities and the need to maintain their skills and training. They may also develop medical conditions that affect their driving abilities. Mature drivers may be cautious and experienced, but may have declining physical abilities or ailments that adversely affect their capability to safely operate emergency vehicles.

Age and Maturity

Emergency vehicle drivers should not be under 18 years of age. This is particularly true with vehicles over 26,001 lbs. GVW, which drivers under 18 years old are generally prohibited from operating under USDOT regulations.

Inexperienced drivers of any age should not be front-line drivers until they qualify with experience, demonstrate maturity, and have documented training.

Health

It's important for emergency vehicle operators to be well-rested and prepared to drive. Driver readiness is determined by a number of factors, which include fatigue, health and mental health.

Sleep deprivation is linked to increased errors in judgment in critical tasks such as emergency vehicle driving.²⁸ Drivers must be alert, vigilant and able to make quick decisions, especially when they operate in the emergency mode. For more information on sleep deprivation see resources folder in your Instructor's Kit to include; an International Association of Fire Chief's (IAFC) report *The Effects of Sleep Deprivation on Fire Fighters and EMS Responders*.¹⁰

The emergency service organization should provide a medical evaluation to determine the physical ability of personnel to operate an emergency vehicle and perform related tasks. The medical evaluation should be completed by a physician or other licensed health care professional.

Many over-the-counter medications can cause drowsiness. Be aware of the symptoms before consuming medications that have a label warning against operating vehicles or machinery.

Personal problems may contribute to unsatisfactory mental health status. Examples include financial problems, family conflicts, grief or employment problems. These may contribute to negative behavior and/or distract from the act of driving.

Fatigue

The impact of sleep deprivation and fatigue on emergency services personnel, including vehicle operators, continues to gain attention. Shift work, shift work-related stress, health condition of personnel, post-shift recovery, and a variety of other factors contribute to sleep deprivation and fatigue in the field. While minimal research has been conducted specifically addressing the EMS industry, evidence exists to suggest sleep deprivation and fatigue negatively impacts the performance of EMS personnel.

Evidence can be found in other shift-working and transportation industries. EMS has been forced to defer to the research findings from other industries until research can be completed to address the intricacies of EMS systems. The emerging problem of sleep deprivation and fatigue in EMS will be better understood as additional data becomes available.

For decades, NIOSH has acknowledged that working shift hours can be “linked to negative health effects and deficits in performance leading to injury and error”.²⁴ This research did not include EMS, but featured a variety of shift-working occupations including: nurses, police officers, taxi drivers, air-traffic controllers, and others. The International Association of Fire Chiefs¹⁰ funded a review in 2007 which formally recognized firefighters, EMS personnel, and other emergency responders are at risk for deteriorated on-duty job performance due to fatigue and sleep deprivation.

The impairment of emergency vehicle operators due to fatigue and sleep deprivation is key area of concern. The AAA Foundation for Traffic Safety¹ claims drivers who sleep six to seven hours per night are twice as likely to be involved in a collision as drivers sleeping 8 hours or more. Drivers sleeping less than 5 hours increased these chances by four to five times. An Australian study cited by AAA, provided evidence that going 18 hours without sleep is comparable to the reaction-time effects of a blood alcohol concentration (BAC) of .05. After a 24 hour period, the effects equate to a .10 BAC. The National Sleep Foundation reported 60% of adult drivers admitting to driving while feeling drowsy due to sleep deprivation; nearly a third indicated they had fallen asleep while driving.

State laws which regulate fatigue and sleep deprivation of drivers differ by state. An organization should establish SOP/SOG's to prevent fatigue and sleep deprivation effecting emergency vehicle drivers. Consideration may also be given to shift scheduling policies to ensure drivers are attentive and adequately rested and ready for the transport or emergency that they will be expected to operate safely to and return safely from.

Habits

A habit is a characteristic produced by constant repetition of an action. Adults develop driving habits that can influence the safe and proper operation of an emergency vehicle. Poor habits must be identified and corrected by constant repetition and reinforcement of the proper action until they become new habits.

Acquired Abilities

These abilities are usually specified by the agency as the minimum acceptable criteria. They must demonstrate competency to the emergency service organization prior to a driver being sanctioned to operate emergency vehicles. They are typically regulatory in nature and philosophy, and generally include the following:

Driver's License

Both knowledge and ability are prerequisites to obtaining a license. A license grants the privilege to operate a vehicle on the public highways. A number of states have added more requirements for obtaining the privilege of driving. Larger/heavy vehicles may require a commercial driver's license.

State and Local Laws

These laws establish the requirements for operating vehicles on public highways. In some cases, specific exemptions may be granted, or withdrawn, for drivers of emergency vehicles. A driver's license violation of one of these provisions may result in the loss of driving privileges.

Driving Skills/Characteristics

The manipulative skills necessary for space and speed management such as coordination of steering, accelerating, and/or braking functions of an emergency vehicle are essential. How individuals coordinate and handle vehicles is based on a number of driving characteristics they have acquired from the time they began to drive. These characteristics, good or bad, will be reflected when driving an emergency vehicle. Characteristics that are desirable need to be reinforced, while a concentrated effort is needed to eliminate the undesirable characteristics.



Overall evaluation of these aspects on a continuing basis is important. Close scrutiny of an organization's emergency vehicle drivers is a necessity. Major changes in one or more of the human aspects could occur at any time. Negative changes can be triggered by a significant emotional event. The effect and the length of time that negative influences can persist are unique to each individual.

Defensive Driving Techniques

Defensive driving skills are acquired over time and must be constantly reinforced. They include successfully completing a program that introduces and reinforces concepts such as:

- Space management
- Following distance and rate of closure
- Hazard identification
- Correct braking techniques
- Speed management
- Rollover prevention

Personnel Files

Driving an emergency vehicle is a privilege. Not everyone can or should drive an emergency vehicle. The selection process for appropriate candidates is a critical part of the driver training program. The performance records for individual drivers should be compiled, regularly updated, and stored in a secured central location. The personnel file should contain the qualifications of each individual. The information in the file can be used as a reference for selecting emergency vehicle drivers, identifying individuals requiring additional training, and recognizing drivers who are in need of recertification.

Training records

A key component of the personnel file is the individual's training record. Most organizations not only keep track of classes attended, but they also have an evaluation system designed to document and monitor knowledge and proficiency.

Typically the training records include:

- Classes attended (proficiency not verifiable)
- Classes successfully completed (proficiency at time measured via testing or simulation)
- Certification (proficiency measured and certified by the organization)
- Licensing (proficiency measured and licensed by the organization)

Individual personnel files are a legal document. Files and the information contained in them can be used either on behalf of or against an individual or an organization. It should be emphasized that the absence of documentation, such as well-maintained personnel files, creates a high level of potential liability for emergency service organizations. The information in the personnel file of an emergency service worker should relate to their knowledge and capabilities as an emergency vehicle driver. This information should address several issues:

Physical capability

Is the driver physically able to perform the function of an emergency vehicle driver?

Driving record

Does the individual have a good driving record?

Driver training

What classes has this driver attended and how did he/she perform on practical evaluations?

Driving log

Maintaining accurate and current personnel records is essential. These records provide documentation of whether or not a person has demonstrated respect for motor vehicle operations and laws. Personnel records also provide a certain degree of protection for the person(s) authorizing the candidate to be an emergency vehicle driver. Experience indicates that it is far better to have fewer drivers than to have emergency vehicle drivers with poor driving records.

There are a number of potential control measures to determine the driving record of each current driver and driver candidate. Knowing the drivers' on- and off-duty driving habits and records is an important tool in both selecting and maintaining the safest drivers for emergency vehicles. Routine administrative reviews of all drivers' Motor Vehicle Record (MVR) is one of the most effective ways to know the specific driving habits of individual drivers. Information gained as a result of these control measures should become part of the individual's personnel file and serve as a source of information for determining initial and ongoing training needs.

These include:

- Checking motor vehicle records (MVRs) before a person begins training
- Checking MVRs annually or at a minimum of once every three years
- Making a photocopy of each emergency vehicle driver's license and placing it in the driver's personnel file on a yearly basis

Suspected drug and/or alcohol abuse

An emergency service organization should have a substance abuse policy that includes the conditions under which an individual can be tested and disciplined if necessary. One such criterion in emergency service organizations is that, if a vehicular collision occurs, the driver or the entire vehicle crew is tested. The collision constitutes "reasonable cause" for the testing. The testing provides both the emergency vehicle driver and the organization with proof of no such substance abuse. It should also be noted that the Federal Public Safety Officers Benefit for emergency service personnel does not recognize fatalities caused by alcohol-related incidents.

Driver Requalification

An individual may have acceptable human aspects and acquired abilities at the time of selection. He/she may also demonstrate proficiency in all of the competencies associated with driving emergency vehicles. However, if these skills are not applied at regular intervals, proficiency decreases, thus the need for continual requalification. Driver requalification should be a requirement of the organization. For example, if a driver is regularly operating an emergency vehicle under both emergency and non-emergency conditions, requalification may be nothing more than a check ride. Conversely, requalification may involve a complete retesting on a vehicle if a driver has not driven it in more than 6 months or only once in 18 months. Development of a requalification program should be based on several considerations:

- Actual emergency vehicle driving experience, both emergency and non-emergency; observed proficiency and supervisory reports as to performance in the field
- Length of time since last requalification
- Introduction of new emergency vehicles
- Introduction of new technology on existing emergency vehicles

Driver requalification is a vital element in maintaining a valid and professional emergency vehicle driver program. Whether a personalized program or one with established thresholds is adopted, it is important that requalification of all drivers be an integral part of the program.

Additional resources for driver requalification include VFIS Safety and Risk programs, *VFIS Risk Communiqués* and *VFIS University*.



Module IV

SOPs/SOGs

Module IV Goal

The goal is to understand and appreciate the need for guidelines and policies addressing emergency vehicle issues. Review the content of local policies and guidelines.

Module IV Objectives

Successful participants will be able to:

1. Explain why the development and implementation of SOPs/SOGs are important to operating an effective program for training emergency vehicle drivers.
2. Describe the subject areas necessary for SOPs/SOGs that impact the certification, operation, and recertification of emergency vehicle drivers.

Module IV – Glossary of Terms

Administrative controls and compliance are important to operating an effective Emergency Medical Services Vehicle Operations Program. The following terms are used in this module and may also be referenced in subsequent modules.

Commission – 1. To actively do something. 2. The authority under which a person transacts business for another. 3. A body of persons acting under lawful authority to perform certain public services.

Guideline – A statement, indication, or outline of policy by which to determine a course of action. Any guide or indication of a future course of action.

Omission – 1. A failure to do something; esp., a neglect of duty. 2. The act of leaving something out. 3. The state of having been left out or of not having been done. 4. Something that is left out, left undone, or otherwise neglected.

Policy – A guiding principle or course of action adopted toward an objective or objectives to describe the general principle that will guide behavior. A definite course or method of action to guide and determine present and future decisions.

Procedure – Prescribes specific ways of doing specific activities. That which regulates the formal steps in an action. A series of steps followed in a particular order.

Regulation – A rule or order prescribed by authority to regulate conduct.

Rule – A principle set up by authority, prescribing or directing action or forbearance.

SOPs vs. SOGs

An issue sometimes arises within emergency service organizations about whether to use the terminology “standard operating procedures” (SOPs) or “standard operating guidelines” (SOGs). Some experts feel that the term “procedures” implies relatively inflexible task steps or instructions, while “guidelines” implies more discretion in performing the job. Since emergency incidents are unpredictable and flexibility is essential, these experts advise emergency service organizations to develop SOPs/SOGs, thereby reducing the need to identify exceptions, and perhaps even limiting liability due to actions by personnel. Other experts believe the opposite is true: the term “guidelines” implies too much flexibility and discretion, thus reducing control and increasing the likelihood of mistakes.

A review of related legal proceedings indicates that terminology is less important than content and implementation of SOPs/SOGs. Courts tend to assess liability based on factors such as:

- Systems in place to develop and maintain SOPs/SOGs
- Compatibility with regulatory requirements and national standards
- Consideration of unique organizational needs
- Adequacy of training and demonstration of competence
- Procedures used to monitor performance and ensure compliance

The following is a visual reference for the variation in the specific definition of terms.

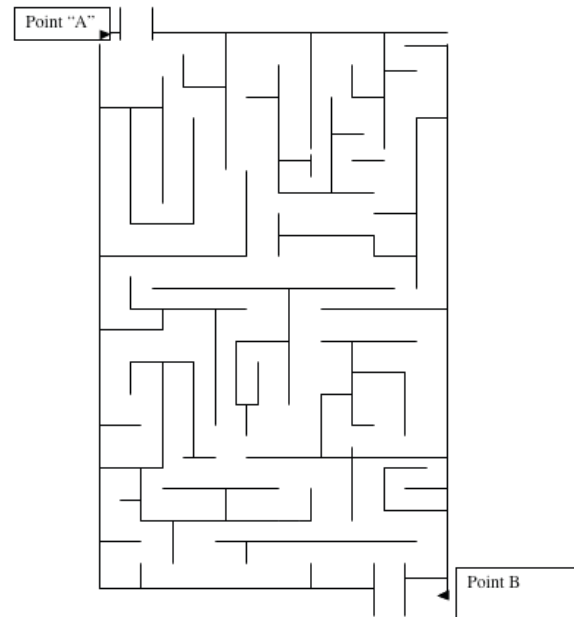
Example:

Policy – Go from Point “A” to Point “B”.

Procedure – Begin at Point “A” and go to Point “B” by following the prescribed directions.

Guideline – Begin at Point “A” and go to Point “B” (no explicit directions as a procedure).

Protocols, rules and regulations – Do not cross any line; do not backtrack.



Developing policies, standard operating procedures and guidelines overview

In today’s society it is essential that all emergency service organizations develop, adopt, implement, and enforce standard operating procedures and guidelines. The principle of public kindness is no longer acceptable practice. Concepts such as sovereign immunity (individual vs. government) have been significantly limited and narrowed by the courts. Many federal, state, and provincial laws allow for suits against individual leaders of emergency service organizations. Terms such as “duty of care,” “breach of omission or commission,” and “joint and several liability” have entered the vocabularies of emergency service personnel. One important way to prepare for this challenge is to develop, adopt, and implement a comprehensive set of SOPs/SOGs.

During the process of developing policies and SOPs/SOGs, the difference between these varied documents may become blurred. For instance, often the distinction between a policy and procedure is not clear. Policy is different from SOPs/SOGs. All procedures and guidelines come with policy. Policy can be viewed as attitude, philosophy of the organization’s personnel, and intent of top management. It provides a framework and guidance to organization personnel when making decisions.

Significance of SOPs/SOGs

There are numerous legal and regulatory requirements for developing, adopting, and reinforcing SOPs/SOGs. The reasons for adopting SOGs can be characterized in five primary areas:

1. All Personnel Understand What Is Expected or Required

Whether new or experienced, all personnel must be informed of expectations and provided guidance in the performance of his/her official duties. Specific examples relating to the emergency vehicle drivers include:

- Eligibility qualifications and certification requirements to become an emergency vehicle driver.
- Training schedule, expectations, and requirements for emergency vehicle drivers.
- Annual requirements for maintenance of emergency vehicle driver certification.
- General conduct and obligations of an emergency vehicle driver.

2. Intended Compliance with All Necessary Requirements Is Identified

The development and adoption of SOGs does not guarantee compliance with all regulations. It does indicate the organization's intent to follow the applicable laws and requirements. SOG examples that apply to emergency vehicle drivers include:

- Compliance with organizational rules and requirements as they affect emergency vehicle drivers.
- Compliance with all federal, state, and local laws and administrative rules as they relate to vehicle operations on public highways.
- Compliance with recognized standards for emergency vehicle drivers including, but not limited to, NFPA 1002, NFPA 1500 and Commission on Accreditation of Ambulance Services (CAAS).

3. Pre-planned and Agreed-upon Actions

Whether the organization is career, volunteer, or a combination organization, it is important that emergency response actions are understood by all. Remember:

- Personnel assignments, including emergency vehicle drivers, change regularly in all types of organizations. As a result it is not known which qualified emergency vehicle driver may be driving on any specific emergency incident.
- Emergency vehicle drivers have standard operating procedures for response and arrival.
- When events occur rapidly at an incident scene, the first-in officer(s) should not have to worry about the actions of emergency vehicle drivers.

4. Resource Document upon Which to Base Training

When procedures, responsibilities, and actions are predetermined, it allows for the emergency vehicle driver to train and practice in accordance with the SOGs. Specifically:

- Prospective emergency vehicle drivers can identify the training requirements necessary to qualify as an emergency vehicle driver on various types of vehicles.
- All emergency vehicle drivers can be informed and trained to identify which vehicles respond to the various types of incidents.
- Existing emergency vehicle drivers can identify the requirements for retaining certification and expanding certification to additional vehicles within the organization.

5. Required Anticipated Actions

It is easier and less stressful to brainstorm certain situations and their solutions in a quiet setting. This eliminates the confusion of responding to a complex incident. Examples include:

- Critical maintenance and inspection of vehicles and equipment can be identified and scheduled.
- Pre-trip, response, and post-trip responsibilities for all emergency vehicle drivers can be identified and detailed.
- Inappropriate driving actions and/or conflicting actions that might lead to emergency vehicle collisions can be eliminated, or at least minimized.

SOPs/SOGs Subject Areas

While SOPs/SOGs can and do vary widely from organization to organization, the general subject areas can be classified into five groups. They are:

1. Eligibility requirements for drivers.
 - Age, experience, and performance standards for new applicants.
 - Necessary steps to maintain emergency vehicle certification.
 - Procedure for expanding an existing certification to other vehicles.
 - Recertification procedures for existing drivers.
2. Training and proficiency testing requirements for drivers.
 - Classroom training and written examination.
 - Competency course training and testing.
 - Over-the-road training and testing.
 - Annual training and/or driving for cqualification.
3. Emergency response procedures and requirements.
 - Emergency vehicle responses per type of incident.
 - Traffic Incident Management (TIM) ³⁶
 - Emergency light usage
 - Application of state traffic laws to emergency incident response.
 - Response procedures for emergency incidents.
 - Emergency incident scene operations.
 - Off-road emergency vehicle operations.
 - Private and administrative vehicle response.
4. Customary and ordinary procedures.
 - Vehicle inspection and maintenance procedures.
 - Non-emergency travel.
 - High-hazard operational procedures.
5. Special situation procedures.

- Inclement weather operations.
- Night operations.
- Special location considerations.
- Collision reaction and reporting procedures.
- Collision investigation procedures.
- Vehicle malfunction procedures.



Organizational Input

In the evaluation of policy it is essential to obtain input from the organization's personnel. The following are questions to be asked regarding policy:

- Is it founded on sound judgment?
- Is it reasonably attainable?
- Is it within legal and/or regulatory boundaries?
- Is it unwisely in excess of or more stringent than existing law, for example, negating an existing defense or immunity?
- Is it definite, positive and clear?
- Does it need further definition or explanation to those affected?
- Is it applicable to all organizational units?
- Is it flexible?
- Should it be flexible?
- Does it reflect the general thinking and enforcement philosophy of all levels of personnel?

- Will or must it be supported by procedures, guidelines, and protocols, rules, and regulations?
- Can it be enforced?
- Will it be enforced?
- What if it is not enforced?
- Does it provide the intended results?

Administration, management, and operations personnel of an emergency service organization should be involved in the development of policies.

EXERCISE:

Review organization's SOPs/SOGs and protocols, rules and regulations associated with emergency vehicle driving.



Module V

LEGAL ASPECTS OF DRIVING EMERGENCY VEHICLES

Module V Goal

The goal is to provide the participant with an understanding of the legal ramifications of emergency vehicle operations. Review specific state laws pertaining to emergency vehicles and applicable standards.

Module V Objectives

Successful participants will be able to:

1. Explain the legal climate that exists and its impact upon emergency vehicle drivers and the associated emergency service organizations.
2. Identify the primary legal principles that affect drivers of emergency vehicles and recognize the implications for operating emergency vehicles.
3. Identify specific state driving laws.
4. Discuss the impact of individual state or local laws, standards, and requirements on emergency vehicle driver training and operations.

Module V – Glossary of Terms

The following term is used in this module and may also be referenced in subsequent modules.

Breach – The breaking or violating of a law, right, obligation, engagement, or duty, either by commission or omission.

Commercial Driver's License (CDL) – The license that is mandated by state and federal law to drive a commercial vehicle on the public highways.

Duty of Care – Having a duty to provide just, proper, and sufficient care, so far as the circumstances demand it; the absence of negligence. Having a duty to provide that care which an ordinary prudent person would have exercised under the same or similar circumstances.

A duty to use due care toward others in order to protect them from unnecessary risk of harm.

The obligation we all owe each other not to cause any unreasonable harm or risk of harm. The courts decide whether a duty of care is owed in specific cases by applying a reasonable person standard.

Joint and Several Liability – A liability is said to be joint and several when a party may sue one or more of the parties to such liability separately, or all of them together at its option. A legal status in which two or more persons are separately and together liable in tort for the same injury to person or property. "Liability that may be apportioned either among two or more parties or to only one or a few select members of the group, at the adversary's discretion."

Sovereign Immunity – A government's immunity from being sued in its own courts without its consent.

Legal Aspects of Driving Emergency Vehicles

Overview

Emergency service organizations and the drivers of emergency vehicles have an awesome responsibility, worthy of careful consideration and special recognition. While rendering aid in the event of an emergency, responders should recognize and then balance that responsibility against the duty to exercise care for the safety of others.

When the state grants people rights and privileges not given to everyone, they are expected to perform in keeping with special state standards while exercising such privileges. This particularly applies to emergency vehicle operation. Emergency vehicle drivers are often granted special privileges under state motor vehicle statutes. Some of these privileges include the qualified right to:

- **Proceed through a red traffic signal or stop sign** - but only with due regard for the welfare of others
- **Exceed the posted speed limit** - but only with due regard for the welfare of others
- **Travel against the normal flow of traffic** - but only with due regard for the welfare of others

It is important to note that these privileges are not without limitation and qualification. Understanding these privileges and the related state-specific requirements and qualifications is critical for emergency vehicle drivers.

The number of lawsuits and criminal allegations involving emergency vehicle operations continues to rise. Training emergency vehicle drivers regarding these legal responsibilities is imperative.

There are a variety of local, state, and national guidelines that impact emergency vehicle driver training and operation. These can be classified into five categories:

1. _____
2. _____
3. _____
4. _____
5. _____

Legal Climate

For decades many aspects of American society depended upon the concept of public kindness—if a person or organization undertook an action on behalf of someone else in the community, they were not, in most cases, sued when something went wrong. Unfortunately, the concept of public kindness has greatly diminished.

When something goes wrong, no matter what is being attempted, very often the injured party, rightly or wrongly, wants restitution and goes to the court system in an attempt to obtain satisfaction.

Another legal concept that has eroded in many areas of the country is sovereign immunity, reflected in the old adage of “the King can do no wrong.” In medieval times the courts were functions of the monarchy, run by the king. The population was therefore barred from using the court system to sue the king who created and ran the system. In America, local and state governments stood in the shoes of the king. Therefore, state laws essentially exempted from suit most governmental actions under sovereign immunity statutes. Ambulance organizations acting for local governments often were afforded the privilege of such immunity. As the years have passed and with the de-emphasis on the public kindness concept, exceptions to immunity have developed. In some states the entire sovereign immunity principle has been voided. In others, restrictions and conditions have been added.

Accordingly, the original concept of “the King can do no wrong” has now changed in many areas to mean, “the King shall do no wrong.” Lawsuits against emergency service organizations have increased significantly

in recent years. These suits often include all possibly relevant parties: the emergency service organization, the emergency vehicle operator, any officers or supervisors, and the chief executive of the emergency service organization.

Legal Principles and Terms

There are at least three principles of law specifically affecting emergency vehicle drivers. The principles that apply in almost every state and instance are:

- Emergency vehicle drivers are subject to all traffic laws unless a specific exemption is provided
- Exemptions for emergency vehicle drivers apply only when the emergency vehicle is involved in an emergency operation
- Emergency vehicle drivers can be found civilly liable and/or guilty of a crime if involved in an accident, even if they are operating under the provisions of an exemption



In addition to these principles, there are a number of legal terms that have a significant impact upon emergency vehicle operation. Knowledge and understanding of these terms and concepts affecting emergency vehicle operators are very important.

Match the following terms, by drawing a line, with their correct definitions:

Negligence

Legal liability placed on one person for the acts committed by another person.

Due Regard

Civil legal liability that results from a breach of a duty owed by one person to another, caused by failure to exercise that degree of care which a reasonably prudent person would exercise under similar circumstances, and where damages/harm are caused by that breach of duty owed. It is easier for a plaintiff to prove negligence against an emergency service organization (ESO) than to prove a violation of due regard.

Gross Negligence

The state of being legally obligated to another. In the context of emergency vehicle operation, it is the conclusion that one or more persons have been negligent to others. In a civil context, if liability exists, then money damages are owed. In a criminal context, if liability exists, then fines, penalties and/or incarceration are the result.

Vicarious Liability

Considered the most serious form of negligence and is defined as generally willful or wanton misconduct, meaning acts involving intentional wrongdoing or reckless indifference toward others (e.g., vehicular death when one is driving under the influence of alcohol or drugs). The precise definition of gross negligence can vary from state to state.

Liability

The safety of others means the manner in which a reasonably careful person performing similar duties and under similar circumstances would act.

It is important for drivers of emergency vehicles to recognize that, in the event of an accident involving bodily

injury or property damage, there is a strong possibility of a lawsuit being filed by the persons harmed. Whether damages are due and payable is determined by the legal system based on the facts and circumstances of the case. Concepts like due regard and reckless disregard for the safety of others are the types of issues evaluated in a court of law.

The fear of a lawsuit is not the principal reason for developing a quality driver training program and SOGs. Rather, the desire to build a first-rate organization that consistently demonstrates the skills needed to provide quality service to the community should be the major motivation in this regard. If an accident occurs, strong SOGs, enforcement and practice of those SOGs, a quality driver training program, and careful, responsible driving are the best defense.

It is important to note that relevant state laws can vary significantly from one jurisdiction to another. Therefore, understanding the detail of the law in your particular state is essential.

Emergency Vehicle Driving Laws

Traffic laws affecting emergency vehicle operation are usually based on state law and typically address four separate but interrelated issues:

1. The application of the federal CDL law as it applies to the drivers of emergency vehicles that are classified as commercial (greater than 26,000 lbs.) vehicles.
2. Exemptions which, under certain conditions and in certain states, are granted to emergency vehicle operators.
3. Rules governing members of the public and their actions when an emergency vehicle approaches.
4. Rules governing emergency service personnel operating privately owned vehicles (POVs) while responding to an emergency.

If emergency vehicle drivers are to understand the intricacies of driving under emergency conditions, they must know what qualifications, certification, and/or licensing they must have to operate an emergency vehicle within the state. They must also know the legal rights they have as the driver of an emergency vehicle, as well as limitations regarding such rights, and the requirements for members of the public. Finally, personnel who have cause to respond in their POVs should know and understand what rights, if any, they have as an emergency responder, as well as limitations and qualifications regarding such rights.

Other Requirements and Standards

As referenced previously, there are a number of requirements and standards that affect emergency vehicle drivers. Although these may vary from state to state, they typically include:

State laws and/or administrative regulations – All states have traffic laws that can affect emergency vehicle operation. These are of the greatest importance. Many states have either a state-mandated occupational safety and health program or have adopted the federal standard and associated regulations. In addition, many states have specific training requirements for ambulance operators or have adopted the requirements of the USDOT's National Standard Curriculum.

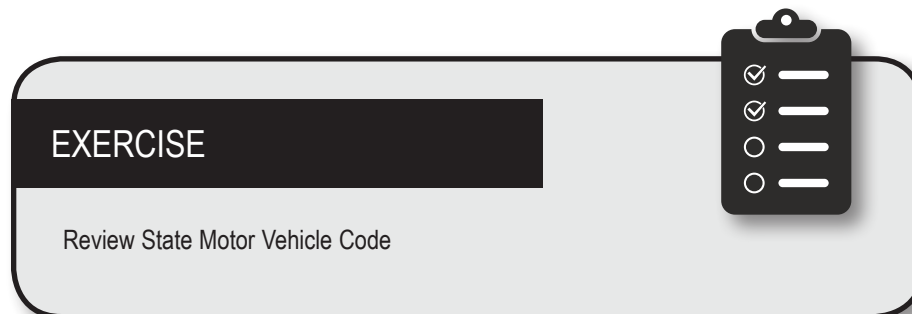
Local ordinances or statutes – Occasionally municipalities and counties adopt local ordinances that affect emergency vehicle operations. As an example some communities do not permit the use of high-beam headlights, and others impose speed limits on local streets. Any local ordinances that apply to emergency vehicle operations should be identified and incorporated into an ESO's driver training program, SOPs and SOGs, and their respective operations.

Organizational protocols, rules and regulations and standard operating procedures/guidelines (SOPs/ SOGs) – Many organizations have developed specific criteria, regulations, and guidelines for the operation of emergency vehicles. These range from driver selection, training, and certification to driver operations and recertification. They should be incorporated into the respective training and operational programs and activities of the organization.

The U.S. Department of Homeland Security *Research Study of Ambulance Operations and Best Practice Considerations for Emergency Medical Services Personnel* recommends, "When an EMS response vehicle

approaches a red light, stop sign, stopped school bus or a non-controlled railroad crossing, the vehicle should come to a complete stop.”⁶

To the extent possible, the VFIS program for emergency vehicle driver training has attempted to incorporate and/or be consistent with any of these recognized standards or regulations.



Limitation of Industry Standards – Industry standards for safe driving _____ the law in most states. Rather, state laws control most vehicle incidents and create the legal standard for intersection driving. Relevant industry standards are actually guidelines that go beyond the legal requirements of most state laws. In this regard, note the Notice of Limitations that NFPA itself provides:

Important Notice about NFPA

NFPA codes, standards, recommended practices, and guides are _____ standards development process approved by the American National Standards Institutes. This process brings together volunteers representing varied viewpoints and interests to achieve consensus on fire and other safety issues. While the NFPA administers the process and establishes rules to promote fairness in the development of consensus, it does not independently test, evaluate, or verify the accuracy of any information or the soundness of any judgments contained in its codes and standards.

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Relevant NFPA standards (Guidelines)

NFPA - 1451

Standard for a Fire Service Vehicle Operations Training Program

Chapter 7.1.3

Drivers/operators of emergency vehicles shall bring the vehicles to a complete stop and shall not proceed until it is confirmed that it is safe to do so in the following situations:

- At any “stop” signal (i.e., sign, light or traffic officer)
- At blind intersections
- At intersections where all lanes of traffic cannot be seen by operator
- If there is a stopped school bus

NFPA - 1500

Standard on Fire Department Occupational Safety and Health Programs

Chapter 6.2.8

During emergency response, drivers of emergency vehicles shall bring the vehicles to a complete stop under any of the following circumstances:

- When directed by a law enforcement officer
- At red traffic lights
- At stop signs
- At negative right-of-way intersections
- At blind intersections
- When the driver cannot account for all lanes of traffic
- When other intersection hazards are present
- When encountering a stopped school bus with flashing warning lights

NFPA standards provide positive recommendations to strive for when establishing safe driving practices. However, adopting them in their entirety or in part could raise the level of care required at intersections and therefore deprive you of the protections of reasonable discretion standards provided by state law. We suggest that if you are considering adopting sections of NFPA 1451 and/or NFPA 1500, you should:

- Consult with your legal advisor to ensure that your SOPs/SOGs do not reduce or eliminate any immunity or other available defense.
- Qualify the standard by stating that drivers will comply with these standards unless due regard dictates or state law permits otherwise.
- In any event, establish a peer review process to review every incident and to identify any situation that deviates from any SOPs/SOGs.

The Commission on Accreditation of Ambulance Services (CAAS)

CAAS is an organization which designs industry standards for ambulances and other forms of medical transportation.

Accreditation

Accreditation, as described by CAAS, “provides a template for making comprehensive organization changes that improve the overall performance of the organization.” The process to become a CAAS accredited agency requires an independent review which validates an organization meets or exceeds the standards. For more information on accreditation or the standards, visit the CAAS website at: www.caas.org.

Relevant CAAS Standards

CAAS 202- Comprehensive safety standards are required to assure that patients, employees, and the agency are protected from unnecessary risk.

202.01 Vehicle Safety
202.02 Employee Safety
202.03 Patient Safety
202.05 Incident Reporting
202.06 Loss Control

Section 202.01

The agency shall have a written policy/procedure for addressing driving standards.

At a minimum, shall include:

- Acceptable driving record criteria (including initial check; biennial check and employee responsibility to report all changes to driving record),
- All requirements to achieve and maintain driving privileges,
- Emergency and non-emergency vehicle operation standards including: speed – lights/siren use –

Safety restraint use – crew responsibilities – all applicable laws – driver training program and vehicle crashes.

Section 202.01.03

The agency shall have a driver training program applicable to all personnel with driving privileges.

At a minimum, this program shall include:

- Initial classroom training covering the safe operation of vehicles and all driving policies/procedures
- Initial hands-on training
- Initial evaluation process to authorize driving privileges
- Annual driver training review/update
- Procedures for remedial driver training as needs are identified

Section 202.01.04

The agency shall have a written policy/procedure addressing vehicle crashes.

At a minimum, the policy/procedure shall include procedures that employees are to follow in the event of a vehicle crash:

- Required reporting process for vehicle crashes,
- Process for investigating and follow-up of vehicle crashes, including but not limited to determining if preventable, any remediation and/or corrective action

Module VI

THE VEHICLE

Module VI Goal

The goal is to study various technologies and components of emergency vehicles.

Module VI Objectives

Successful participants will be able to:

1. Understand the differences between various vehicle types
2. Recognize how technology may assist drivers of emergency vehicles
3. Identify vehicle components and features

Module VI – Glossary of Terms

The following terms are used in this module and may also be referenced in subsequent modules.

Ballast – Anything that is not secured and may become a projectile.

Electronic Feedback/Driver Monitoring Systems – Systems that monitor various driving metrics, such as speed, G-forces, fuel consumption, brake usage, etc.

National Transportation Safety Board (NTSB) – A federal agency charged with investigating transportation incidents and collisions including, but not limited to, transportation via air, water, and land.

Roll Stability Control System (RSC) – Active vehicle safety systems that monitor and detect a vehicle's roll condition. If parameters are exceeded, the vehicle will automatically execute proper brake control and engine torque reduction without the driver's input.

Sterile Cab – Eliminating non-essential duties or activities, such as casual conversation, listening to music, eating, cell phone use and unnecessary conversation while the apparatus is responding in an emergency mode.

United States Fire administration (USFA) – A federal governmental entity of the Federal Emergency Management Agency (FEMA). The mission of the United States Fire Administration is to provide leadership, coordination, and support for the nation's fire prevention, control, and EMS activities.

The Vehicle

Overview

Driving any type of emergency vehicle will be a radical change for some people. For instance, an individual who has never driven a vehicle weighing over 3,000 pounds will have more to learn than just emergency vehicle operation. It's important to realize that a heavy and dynamic emergency vehicle cannot be driven like a passenger vehicle.

Different types of apparatus place the driver in unique seating positions in relation to the road (sit up high), the steering axle and their distance from the centerline of the vehicle, which can significantly challenge a driver's perspective and affect his/her judgment. For example, some ambulances have driver seats that are uniquely close to the center of the vehicle, which causes the driver to underestimate the location of the left side of the vehicles. These are just some of the things to consider when training emergency vehicle operators. More detailed information and examples are included in the following sections.

Type of Emergency Vehicle

The type of emergency vehicle can have a significant influence on the amount of training necessary to acquire proficiency. A new driver would require more time and training than a driver moving from one type of vehicle to another. It is essential that a driver receive individual training and be proficient in driving each emergency vehicle he/she is expected to operate.



Type I	a cab chassis furnished with a modular ambulance body	10,001 – 24,000
Type I – AD	Type I with increased GVWR, storage, and payload	14,001 or more
Type II	a long wheelbase van, with integral cab-body	9,201 – 14,000
Type III	a cutaway van with integrated modular ambulance body	10,001 – 14,000
Type III – AD	Type III with increased GVWR, storage, and payload	14,001 or more
Source: Federal Specification for the Star-of-Life Ambulance (2007)		

The Federal Specification for the Star-of-Life Ambulance³⁵, commonly referred to as the “K-Spec” or “KKK Spec”, sets minimum requirements for new ambulance built on a chassis which was originally intended to be used as an ambulance. The ambulance type is categorized based upon the cab-body design and gross vehicle weight rating (GVWR).

Sterile Cab

The U.S. Department of Homeland Security study⁶ recommends the securing of all items in the vehicle. NFPA 1917 requires all equipment weighing 3 pounds or more to be mounted and contained in an enclosed compartment capable of containing its contents through a 9 g force in the longitudinal axis or a 3 g force in any other direction.

Personal items such as keys, cell phones, and portable radios are often left unsecured in the cab of emergency vehicles and are a hazard to responders. These items are known as ballasts. The only thing that prevents these ballasts from becoming projectiles is inertia. For example, a 15-ounce can of beans produces 100 pounds of force at 35 mph. This is enough force to cause significant harm to a person who comes between it and its final resting place.

The aviation industry uses a concept called sterile cockpit. This concept was highly successful at curbing the number of incidents from distracted pilots and crew members in the aviation community. They prohibited crew members' performance of nonessential duties or activities, such as listening to music, eating and unnecessary conversation while the aircraft is involved in critical and high-risk maneuvering, including taxiing, takeoff, landing and all other flight operations.

It's important for ESOs to adopt a similar concept. The goals of a sterile cab would include but not be limited to:

- _____
- _____
- _____
- _____
- _____
- _____

Vehicle Components and Features

Advances in technology have led to the development of a number of systems that may assist drivers and have improved safety on the roads. These include:

- Autonomous Vehicle Technology
- GPS Monitoring Systems
- Forward Collision Warning Systems (CWS)
- Lane Departure Warning Systems (LDWS)
- Roll Stability Control Systems (RSC)
- Electronic Driver Monitoring/Feedback Systems
- Onboard Video Monitoring

The National Highway Traffic Safety Administration (NHTSA) has identified five levels of automobile automation. These include:

Level 0 - **No Automation** (no longer in production).

Level 1 - **Function Specific** - One or more functions automated, but under human control.

Level 2 - **Combined Function** - More than one function is automated at a time, but the driver remains attentive (adaptive cruise control in combination with lane centering).

Level 3 - **Limited Automation** - Sufficiently automated to operate under certain traffic or environmental conditions with limited occasion for driver control.

Level 4 - **Full Automation** - Vehicle is self-driving for the entire trip (no human control required).

GPS Monitoring is being utilized by some ESOs to make more efficient use of available resources. These systems can help identify the location of available resources, which may improve response times to client needs. The use of a closest unit response not only helps to meet a client's needs, but also may reduce the potential exposure to loss from vehicle crashes. GPS monitoring can also help manage crew safety. A vehicle not in the intended area or that has stopped for an excessively long period of time could indicate that the crew or vehicle is in trouble, and the system can pinpoint the location for those coming to assist.

Roll Stability Control Systems are active vehicle safety systems that automatically intervene if a high rollover risk is detected while driving. If a rollover threat is occurring, the system intervenes and assists the driver in minimizing the rollover risk by automatically reducing vehicle speed. Frequently, activation takes place before the driver is aware of the need.

Electronic Driver Monitoring/Feedback Systems monitor various driving metrics such as speed, G-forces, fuel consumption, etc. Many organizations have implemented audible warning signals to give the driver feedback when pre-set parameters are exceeded (in addition to tracking the information). A video component is included in some of these systems, providing video for a set period of time from the onset of an "event."

Onboard Video Monitoring Systems provide continuous video monitoring of the vehicle interior and windshield

view. These systems are often installed along with monitoring driving metrics similar to electronic driver monitoring systems. They can be set up to provide audible warnings to the driver when pre-set parameters are exceeded in addition to tracking (and tagging to the video) the information. These systems typically provide continuous recording of the interior of the vehicle and road ahead through use of a windshield-mounted camera.

When these types of systems are implemented as a program with policy and standard procedures, they are proven to be effective safety programs. They allow ESOs the ability to review driving behavior (including compliance with policies) and can help identify what was being done just prior to an “event.” Videos can be an excellent tool for coaching and for training both the new and the experienced driver.

Automatic Transmissions

The majority of newer apparatus are equipped with automatic transmissions. Shifting can be accomplished by various means such as using a shift lever or a push button. Operate the shifting mechanism based on the type of mechanism provided on the vehicle.

Manual Transmissions

Operating a vehicle with a manual transmission requires more training and practice than operating a vehicle equipped with an automatic transmission.

Shifting techniques must be learned and applied to prevent unnecessary damage to the clutch and the transmission. Vehicles equipped with multi-gear transmissions with “splitters” require even more training and practice.

Special Vehicles

Certain types of vehicles require special driver training. Examples include high-profile ambulances, off-road operation of certain types of rural or off-road UTV/ATV, four or six-wheel drive units for off-road or inclement weather operation, vehicles with trailers, and units driving over unusual terrain. Additional training is available for many of these special vehicles at the VFIS website.

EMS Personnel Restraints within the Patient Compartment

The systems to restrain EMS personnel within the patient compartment continue to evolve. The nature of many treatments requires a certain level of mobility within the patient compartment as the vehicle is in motion. In a NHTSA study of ambulance crashes, _____ of EMS personnel within the patient compartment were unrestrained.²⁷ Many restraint options are now available and providers must focus on wearing the restraints provided in their units. If treatment requires removing restraints, the vehicle should be stopped prior to removal.

Patient Restraints within the Patient Compartment

In a NHTSA study of ambulance crashes, only 34% of patients were secured properly with shoulder and lap straps.²⁷ Patients should be secured in accordance with the manufacturer recommendations. The VFIS *Patient Handling Reducing Responder & Patient Injuries and Patient Handling Incidents* Program provides more detailed information regarding the proper handling and restraint of patients within the patient compartment.

Pediatric Patient Restraints within the Patient Compartment

The Emergency Medical Services for Children (EMSC) program is devoted to reducing child and youth mortality and morbidity resulting from severe illness or trauma. EMSC facilitates state partnerships, grants, and research focused upon pediatric emergency medical care.

Safe Transport of Children by EMS Guidance is a collection of best-practices for safely transporting children by ambulance. Created by The National Association of State EMS Officials Safe Transport of Children Ad Hoc Committee, this document establishes evidence-based standards with regard to transporting pediatric patients.

The VFIS *Patient Handling Program* provides more detailed information regarding the proper handling and restraint of pediatric patients within the patient compartment.

Module VII

VEHICLE DYNAMICS

Module VII Goal

The goal is to have the participant understand the physical forces that act upon vehicles and how both vehicle design and physical forces affect handling.

Module VII Objectives

Successful participants will be able to:

1. Understand the physical forces that affect vehicle handling
2. Recognize that vehicle characteristics influence the effect of physical forces on emergency vehicles

Module VII – Glossary of Terms

The following terms are used in this module and may also be referenced in subsequent modules.

Anti-Lock braking system (ABS) – A computer-controlled system for maximizing the braking of a vehicle without locking the wheels and causing it to lose traction with the roadway.

Center of gravity – The point in any solid where a single applied force could support it; the point where the mass of the object is equally balanced. Weight center or balance point of an object, such as a truck body. Calculated to help determine optimum placement of truck bodies on chassis.

Centrifugal force – The force that tends to make a rotating body move away from the center of rotation.

Friction – The force between two surfaces rubbing together. It is higher if the surfaces are dry and rough and it is lower if the surfaces are smooth and wet.

Gravity – (physics) The force of attraction between all masses in the universe, especially the attraction of the earth's mass for bodies near its surface.

Gross axle weight rating (GAWR) – GAWR is the chassis manufacturer's specified maximum load-carrying capacity of an axle system. It is a requirement of the *Federal Motor Vehicle Safety Standards* that the GAWR be shown on a label on the vehicle. The system includes, but is not limited to, the axle, tires, suspension, wheels, frame, brakes, and applied engine torque.

Gross vehicle weight rating (GVWR) – GVWR is the chassis manufacturer's specified maximum load-carrying capacity of a vehicle having two axle systems. (A multi-axle installation is one system.) It is a requirement of the Federal Motor Vehicle Safety Standards that the GVWR be shown on a label on the vehicle. It may be equal to or less than the sum of the front GAWR and the rear GAWR. The in-service weight or gross vehicle weight should always be equal to or less than the GVWR.

Gross combination weight rating (GCWR) – GCWR is the chassis manufacturer's specified maximum load-carrying capacity for tractor-trailer type vehicles having three or more axle systems. (A multi-axle installation is one system.) It is a requirement of the Federal Motor Vehicle Safety Standards that the GCWR be shown on a label on the vehicle. Where the trailer is detachable, the GCWR limits the axle system(s)' maximum load for any replacement trailer.

Inertia – Inertia is the property of an object that makes a body at rest tend to remain at rest, and a body in motion tend to remain in uniform motion along a straight line unless acted on by an unbalanced force.

Load, dynamic – Any moving load on a vehicle, such as people, water, or equipment not secured.

Load, static – Load that is exerted by the weight of the vehicle and the frame members, at rest.

Momentum – Momentum is the product of an object's mass (weight) and its velocity (speed). When an unbalanced force acts on an object, the object's movement will be accelerated. The acceleration will vary directly with the applied force and will be in the same direction as the applied force. It will vary inversely with the mass of the object.

Pitch – A vehicle is said to pitch when the front end rises while the rear end falls, or vice versa, such as in a fore-and-aft rocking motion. Nose-dive is an example of pitch.

Roll – Rotation of a vehicle about its longitudinal axis. An example of roll is body lean to the left or right during a cornering maneuver.

Secondary braking system – A supplemental device designed to assist the braking system of a vehicle in reducing the vehicle's speed and/or bringing it to a complete stop. Commonly referred to as retarders, secondary braking systems may consist of an exhaust brake, an engine (or compression) brake, a transmission retarder, or a driveline retarder.

Yaw – Rotation about the vertical axis. A vehicle spinning out in a turn is an example of extreme yaw motion.

Vehicle Dynamics

Overview

Physical forces and vehicle characteristics affect the amount of control that the driver has over the vehicle. When the limits of the physical forces are exceeded, the driver gives up control of the vehicle. There are a number of vehicle characteristics that can lead to this. These include:

- Driving too fast
- Accelerating too quickly
- Traction control
- Braking too hard
- Brake fade
- Changing direction
- Traveling through a curve

Physical Forces

Acceleration, deceleration, velocity, directional control, and tracking are governed by the laws of physics. Physical forces are always evident and affect the manageability of each response. Their impact on a vehicle and its movement can be identified, measured, and predicted. Physical forces affect the handling of a vehicle and are influenced by mechanical and environmental factors.

These factors include the condition of the vehicle's components, weather and road conditions, and the characteristics of the vehicle. The most important physical forces that affect emergency vehicle operations are:

- Friction
- Velocity
- Momentum and inertia
- Centrifugal force

Friction

Friction is the physical force that resists relative motion between two moving objects or surfaces that touch. Friction occurs whenever two surfaces rub together. Examples of friction are:

- Driver's hands on the steering wheel
- Engine belts on pulleys
- Brake shoes on drums or pads on discs
- Tires on the road surface

In controlling an emergency vehicle, the two most critical friction points are the tires on the road and the brake's shoes on drums or pads on discs.

Tire/road friction – Friction provides the vehicle with traction. The best traction is achieved when the vehicle is not moving. Good traction is achieved when the vehicle is moving at a safe speed consistent with environmental conditions.

Locking wheels create poor traction that can result in skids. The amount of friction between the tires and road is dependent upon a number of items. These include: tire size, tread, type, and inflation (follow manufacturer's recommendations), speed of the vehicle, weight of the vehicle, road surface, and weather conditions.

Brake friction – Whether drum or disc brakes, friction is the method used to slow or stop a vehicle. The energy created by this process is released in the form of heat, just as rubbing your hands or two sticks together emits heat. As heat increases, braking ability will decrease. Brake fade caused by excessive braking is one of the most serious consequences of heat build-up. Examples include dramatic increases in required pedal force or sudden brake disappearance.

Steering friction – Handling is affected by the following:

- Traction exhibited by the steering tires
- The number and spacing of drive axles (tires) exerting force in a straight line
- The weight distribution on the axles of the vehicle
- The ability of the driver to keep the steering wheels (tires) rolling

Tires must be rolling in order for the driver to change the vehicle's direction. For example, during a skid the brakes must be released and the steering frictional force between the tires and road re-established.

Velocity

Velocity is speed. Velocity is controlled through acceleration, deceleration, and directional control. The emergency vehicle driver has only two types of control. These are velocity control and directional control. Velocity control is usually expressed as either a constant velocity or a changing velocity. Smooth velocity control is an important ability for the emergency vehicle driver to acquire and apply. Directional control is the result of three factors. These are steering, turning, and tracking. Velocity control is usually defined in terms of:

- Acceleration is _____ in velocity
- Deceleration is _____ in velocity
- Braking is _____ in velocity

Momentum and Inertia

Momentum is measured as the product of the object's mass, or weight, times its velocity. Simply stated, the law of inertia is: An object at rest will remain at rest and an object in motion will remain in uniform motion along a straight line unless it is acted upon by an unbalanced force. Inertia is the force that keeps a moving object in motion in the same direction. As momentum increases, it is harder to overcome the effects of inertia. Larger emergency vehicles have a greater mass, hence, at the same speed, larger vehicles will have greater momentum than smaller vehicles.

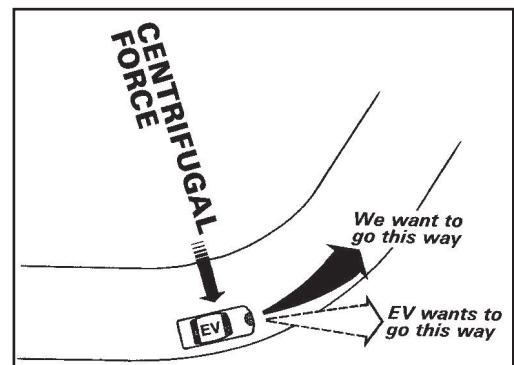
Both momentum and inertia affect velocity control. For example, increased momentum equals greater required stopping distance. The brakes work harder, friction is increased, and more heat is generated. With increased momentum, inertia is harder to overcome, and changing direction is more difficult. As a result, when momentum increases, the vehicle will follow a wider track around a curve.

Force is a product of momentum. The force of a vehicle is what the driver of the vehicle has to control. Using the engineering formula of force equals mass times acceleration, it helps show why it's important for a driver to keep both hands on the steering wheel at all times.

Centrifugal Force

Centrifugal force is the force, caused by inertia, that tends to make a rotating body move away from the center of rotation. Centrifugal force is caused by the tendency of all bodies to continue to move in the direction they began. It is the force that tends to push the vehicle traveling around a curve away from the center of the curve.

A driver of a vehicle can feel the centrifugal force when the vehicle negotiates a curve. It is the push from the inside of the curve outward. Higher speed equals higher centrifugal force, and the tighter the curve, the greater the effect of centrifugal force on the vehicle. A doubling of speed increases centrifugal force fourfold.



Vehicles in Motion

Let's start with sway — the motion of a vehicle rocking from side to side as it rounds a corner. Next, the term dive refers to a situation in which the nose of the vehicle dives toward the road when the driver slams on the brakes. Squat happens when the vehicle accelerates, the nose comes up and the suspension drops. An extreme squat is called a wheelie. Oversteer happens when a driver attempts to turn, but the rear wheels lose traction and the vehicle spins out. Understeer occurs when the driver turns the steering wheel, but the vehicle doesn't turn.

Oversteer, understeer and neutral steer describe the chassis reaction to steering wheel input. Neutral steer occurs when the vehicle tracks through a corner on the turning circle generated by the front wheels. Understeer happens when the vehicle tracks through a corner on a turning circle greater than the one generated by the front wheels. When the vehicle tracks through a corner on a turning circle less than the one generated by the front wheels, oversteer occurs.



Increasingly, aviation terminology is being used to describe automotive phenomena — how the tire rubber reacts to steering, braking and acceleration. Such aviation-derived terms include roll (replaces sway), pitch (replaces dive and squat), and yaw (replaces oversteer). Yaw can also be called sideslip.

Chassis in motion

All of the aforementioned situations occur because of the chassis. The chassis is on a set of axes. When facing the front of the vehicle, one can imagine the Z-roll axis as a line that passes through the roll center of the front suspension and rear suspension. This line (or axis) moves with the change in position of the front and rear suspension when the vehicle is cornering, accelerating, and braking.

The X-pitch axis passes through the center of gravity of the vehicle. A vehicle will move on this axis under acceleration and braking. The Y-axis (for yaw) is at the center of gravity and roll axis.

Cornering or lateral acceleration causes the chassis to roll. The faster the vehicle speed in the corner, the more the chassis will tend to roll.

The most weight is placed on the outside front wheel, and the weight on the inside front wheel is reduced. The weight on the outside rear wheel is also reduced. If the vehicle is braking while turning a corner, more weight is shifted to the outside front wheel. The inside rear wheel applies the least amount of weight to the road.

Controlling motion

The sway bar, anti-roll bar or stabilizer, is a mechanical device that controls the amount of chassis roll. It is attached to the chassis and lower control arms of the suspension. The change in position of the control arms will cause the bar to lift the chassis on one side and pull the chassis on the other, depending on the direction of the turn.

Acceleration and braking cause the vehicle to pitch. The location of the center of gravity and the wheelbase will effect the amount of the dive (or squat). The vehicle will react more when the center is higher and/or the wheelbase is shorter in the vehicle.

When the weight is transferred to the front wheels under braking, the rear wheels have a tendency to lock up. Proportioning valves and ABS can control this tendency.

Weight transfer

Under acceleration, the chassis will pitch up and transfer the weight to the rear wheels. The grip of the rear tires can cause the front wheels to lift off the road. In the case of a front-wheel-drive vehicle, acceleration can cause a loss of grip. The longer the wheelbase and the lower the center of gravity, the less pitch of the chassis.

Yaw, affected by both roll and pitch, is a lateral force caused by a vehicle turning a corner. As the center of gravity moves forward, back, and from side to side, yaw angle can change. The greatest yaw occurs when a vehicle brakes while turning a corner.

Roll causes the weight to shift to the outside front wheel, and braking transfers weight to the front wheels. This results in little or no weight on the rear tire contact patches and increases the slip angle to a point where the vehicle loses control and spins. Computer-controlled ABS and throttle provide electronic stability control by modulating the throttle and applying braking to the individual wheels, thus providing yaw control.

Vehicle Balance and Traction Concepts

Any motion of the vehicle causes changes in the balance and traction. The changes are caused by the shifting

of vehicle weight and can be felt by riders either in a sideways or front-to-back motion. Braking and acceleration affects the degree of imbalance and traction of the vehicle. Smooth steering, braking and acceleration keeps the vehicle more stable and will provide better traction.

Vehicle characteristics

The characteristics of the EMS vehicle influence the effects of the physical forces on the vehicle. Some of these characteristics include:

- Total weight and weight distribution (center of gravity)
- Suspension system
- Braking system(s)
- Rollover awareness

Total weight and weight distribution (center of gravity) of the emergency vehicle is a very important consideration in the vehicle's handling. There are a number of important factors that must be considered by the emergency vehicle driver. The total weight of the vehicle, with all equipment and personnel included, cannot exceed the carrying capacity of the vehicle as expressed through its GAWR or GVWR. In addition to the legal ramifications of an overweight vehicle, the overloaded condition has a direct impact upon the vehicle's braking capability.

The weight between the front and rear axles must be appropriately distributed. Vehicles should have approximately a 1/3 (front), 2/3 (rear) weight distribution in order for the vehicle to brake properly and handle safely. Additionally, the weight distribution from side to side should not be excessive, and a differential of 7% from side to side is considered a maximum. A poorly balanced vehicle results in steering difficulties and places undue strain on certain braking and suspension components of the vehicle.

A driver must recognize the potential of the vehicle to overturn. Each type of vehicle will have a different vertical center of gravity, depending upon its design. A Type I-AD vehicle with a high center of gravity is more susceptible to weight shifting and rolling.

The suspension system of an emergency vehicle can have a major influence on the handling characteristics of the vehicle. It affects the physical forces exerted on the vehicle when it is moving. The suspension system is defined as those elements that transmit the weight between the chassis of the vehicle and the ground. The system includes the axles, springs, wheels, and tires.

Axles of all emergency vehicles should have a weight rating to carry the fully loaded vehicle as distributed through the chassis. As in the case of all of the components of the suspension system, the weight rating of the springs must be sufficient to carry the associated weight when fully loaded. The wheels and tires are another important component of the suspension system. Both must have a weight rating that will accommodate the weight distributed through the axle and springs. The overall rating of the suspension system is based on the weakest link in any component in that system, including the wheels and tires.

The condition of tires, which includes inflation, tread design, and tread wear, has a major impact on vehicle handling. In certain vehicles, depending on their size, that impact is even greater. Each tire has about 8.5 x 11 inches or 40–93 square inches of contact with the road. It is imperative that both the inflation pressure and tread be in good to excellent condition. Many authorities recommend a minimum tread depth of 4/32" for tires on emergency vehicles. Individual manufacturer standards should be identified and followed.

All components of the suspension system must reflect the vehicle's weight rating. It is imperative that an adequate design combination not be compromised by the use of even one underrated component.

Braking Systems

The deceleration of vehicles is performed by the braking systems. There are three types of braking systems on most emergency vehicles. These include a standard or service, parking and auxiliary braking system.

Two types of standard or service brakes are currently in use. These are drum brakes and disc brakes. Drum brakes have brake shoes, which are wedge- or cam-operated, that press against the rotating drum assembly

on the axle, creating friction and slowing the axle's rotation. Disc brakes have pads that engage a rotating disc assembly on the axle with the same results. Braking systems were originally all hydraulically operated, then heavier vehicles went to air-operated brakes, and now electronically operated brakes are available.

Electronic brake systems are referred to as “brake by wire” or “stability control” since they work in conjunction with the ABS. The advantage of electronic braking is that it is much faster and increases vehicle stability by applying appropriate wheel braking while de-powering the engine to prevent loss of control. Emergency vehicles that have independent front suspension will also have increased braking capability. This is a result of larger front-wheel brakes that are incorporated into the system.



Antilock braking systems (ABS) are now found on nearly all personal and emergency services vehicles. ABS should not be confused with auxiliary braking systems. The purpose of ABS is to enable the driver to stop the vehicle in the shortest possible distance on a slippery surface while maintaining control and avoiding a skid. ABS prevents the wheels from locking, keeping the tires turning so there is friction with the road surface, allowing directional control. ABS essentially performs automatically and more effectively than what is accomplished by pumping hydraulic brakes. It allows steering, improves control, and enhances stability during braking on wet, icy, or loose gravel surfaces. One manufacturer's system works with auxiliary braking devices by also pulsing the devices.

It should be noted that an ABS is fully compatible with both types of air brake systems, drum and disc, and with all types of auxiliary or secondary braking devices. Automatic traction control (ATC) can also be integrated into an ABS. The ATC uses the signals from the wheel sensors to determine if the drive wheels are spinning because excessive power is being furnished. NFPA 1917, Standard for Automotive Ambulances, requires an all-wheel ABS if such a system is available from the chassis manufacturer. This should also apply to all emergency service vehicles, including EMS vehicles.

Auxiliary braking systems are an added feature that assists in stopping heavier vehicles and reduces brake wear and heat buildup that can cause brake fade. NFPA 1917 also requires an auxiliary braking system on all vehicles with a GVWR of 36,000 pounds or more. The standard also recommends their use on apparatus down to 31,000 pounds GVWR.

Type I-AD and III-AD ambulances should consider auxiliary braking. These systems are necessary because emergency service vehicles make repeated stops from high speeds that cause rapid brake lining wear and brake fade, which can lead to collisions. Auxiliary braking systems are also recommended for apparatus that respond on long or steep grades, in congested areas with repeated stops, or to a high number of incidents.

There are four types of auxiliary braking systems. These include:

1. Driveline retarders
2. Compression or engine brakes (for large displacement diesel engines)
3. Exhaust brakes (for smaller diesel engines)
4. Transmission retarders

Driveline retarders work by slowing the rotation of the driveshaft. They are generally electromagnetic devices that can be installed directly to the front of the rear axle or at a mid-driveline mounting. Hydraulic driveline retarders are also available.

Engine brakes or compression brakes work by altering valve timing under deceleration by opening the exhaust valves at top dead center of the stroke for an instant, releasing cylinder compression and eliminating the expansion stroke. In essence, the engine is converted to an air pump as each cylinder compresses and releases. The noise produced is simply that of the released compression pressure. Although there are other manufacturers, these are commonly referred to as “Jake Brakes.”



Exhaust brakes consist of a butterfly valve that closes, restricting the flow of exhaust gasses and creating a back pressure on the engine, slowing the engine's revolutions per minute (rpms). Some brands are not effective at speeds of less than 20 miles per hour. Exhaust brakes are lighter and less expensive than engine brakes, but not as effective.

Transmission retarders are an integral part of the automatic transmission. Transmission retarders may be of two types, the input type that operates at the input section of the transmission (between the torque converter housing and the main housing), or the output retarder that operates at the tail shaft of the transmission. The output retarder is the most prevalent on emergency vehicles. These systems work by using the transmission fluid to power an opposing direction wheel on the drive shaft within the transmission.

Auxiliary braking systems can increase the brake lining life by as much as three to five times the normal service period, depending upon the specific design application and use. This can result in considerable savings, paying for the expense of installing the system. In addition to increasing brake life, these systems reduce other wear factors such as heat damage to brake drums and discs and tire wear. Automatic transmission and driveline retarders are especially effective. Some auxiliary braking devices should be shut off when the apparatus is responding on slippery surfaces. Follow the manufacturer's recommendations for proper operation.

The physical forces of momentum and inertia cause all vehicle weight to shift whenever the driver accelerates, brakes, or turns the vehicle. The shift of weight becomes a dynamic movement. The weight shifting can easily result in the loss of vehicle control.

Rollover Awareness

Emergency vehicles of all types have increased in height. Six- and eight-person cabs, with room to stand in, dramatically increase vehicle height proportionately. Now, more tools, equipment and additional compartments are being added all the way to the top of the vehicles. Many vehicles now require ladders to reach equipment or mechanical devices just to reach equipment in compartments. With their greater size and weight, and 400-plus horsepower engines to move them, the propensity for rollover dramatically increases. No matter how skilled a driver is, how well the road has been designed or how clear the weather is at the time, basic physics either keep a vehicle under control or send it careening out of control.

For each inch in added height, the vehicle's center of gravity moves up as well. The center of gravity for a vehicle is the middle point from the ground up to where the weight is the same above and below that line. The higher the center of gravity, the greater the chance the unit will experience rollover, and this condition worsens when the unit's design includes a higher water tank.

Increased weight and poor weight distribution are contributing factors that can cause additional problems on the road. Even light vehicles are likely to be running at their gross vehicle weight and many are overweight on a regular basis. This is known as the static weight. However, when vehicles are moving, the dynamic weight moving from side to side and back and forth from braking complicates the problems of weight distribution even further. This shift in weight from the rear to the right front corner could cause the left rear tires to lose all traction, and cause the vehicle to fishtail.

Rollover Prevention

Emergency vehicle rollovers are an all too frequent cause of vehicle damage, serious injury and fatalities. However, these incidents are of a highly preventable nature. All emergency vehicles are subject to rollovers, but tankers/tenders, aerial apparatus and ambulances are particularly vulnerable because of their high center of gravity.

Roll stability control systems (RSCs) may help prevent some rollovers; however, many rollovers occur on flat stretches of highway where the driver turns the wheel sharply one way and then over-corrects in the opposite direction, causing the vehicle to go out of control and roll. RSC systems will not likely prevent these types of rollovers.

One scenario where rollover can happen is 1) when the vehicle drifts off the pavement onto the soft shoulder; 2) the driver quickly turns the wheel sharply left and the vehicle shoots across the road; and 3) the driver over-

corrects, and the vehicle flips. In this situation, the driver should decelerate, steer straight ahead and, as the vehicle slows, turn the wheel gradually to ease the unit back on the road.

Drivers need to be aware of common circumstances that contribute to rollover situations. The most common conditions involve speed and soft shoulder drop-off. When the vehicle goes onto a soft shoulder, the driver may overcorrect, attempting to get back on the roadway. By doing this maneuver, the vehicle tends to do a body roll, increasing the risk of a rollover.

In another scenario, a driver may attempt an evasive maneuver. If the driver turns the wheel sharply left, then sharply right to get back in the lane, the slosh of tank water starts the vehicle into an uncontrollable pitch from side to side. In this situation, excessive speed is usually a contributing factor.

No matter what the condition of the vehicle or the weather, all drivers must be well-trained and qualified, and must have experience behind the wheel of that specific piece of apparatus. They must be in good physical and mental condition before driving any vehicle during emergency situations.

Finally whether operating in the emergency or non-emergency mode, the driver and ALL passengers must be wearing seat belts. This will not only help with safety, but wearing a shoulder belt will also keep the driver in the proper upright position to maintain control of the vehicle.

Even the most experienced driver cannot defy the principles of physics. Rollovers are likely as the weight shifts and the center of gravity changes. Only by driving at safe speeds can the mission be properly accomplished.

Wear your seat belts, and slow down!

Module VIII

EMERGENCY VEHICLE OPERATIONS/SAFETY

Module VIII Goal

The goal is to have the participant appreciate the necessity of being prepared to drive emergency vehicles. Understanding the need to be mentally and physically prepared to avoid situations that may adversely affect emergency vehicle operations, implement best practices in safety, and develop defensive driving techniques to avoid or reduce the consequences of vehicle collisions.

Module VIII Objectives

Successful participants will be able to:

1. Describe both the physical and mental effects of motivation.
2. Explain the link between motivation and positive changes in individual behavior.
3. Outline the actions that must be completed prior to operating an emergency vehicle.
4. Recognize that emergency response driving is a complex process involving many factors, tasks, and maneuvers.

I

Module VIII – Glossary of Terms

The following terms are used in this module and may also be referenced in subsequent modules.

Buffeting – To knock against or about. This may occur when a crosswind interferes with normal aerodynamics, which can cause a vehicle to move abruptly.

The Manual on Uniform Traffic Control Devices (MUTCD) – This handbook defines the standards used by road managers nationwide to install and maintain traffic control devices on all streets and highways. The MUTCD is published by the Federal Highway Administration (FHWA) under CFR 23, Part 655, Subpart F.

Emergency Vehicle Operations/Safety

Motivational Exercises

It is suggested that these motivational exercises be undertaken immediately following the review of the module objectives.

Physical Motivational Exercise

Nearly everyone has physically felt the effects of a vehicle collision. The exercise, developed by the National Academy of Professional Drivers¹⁴ is designed to increase awareness that everyone is subject to having a vehicle collision. No one is immune.



Request everyone to stand up. Have everyone stand and stretch for about a minute and then ask the following questions.

1. Would everyone who has experienced a vehicle collision in the last year please sit down.
2. Everyone who has had a collision within the last two (2) years, please sit down.
3. Everyone who has had a collision within the last five (5) years, please sit down.
4. Everyone who has ever had a collision, either as a driver or a passenger, please sit down. At this time, everyone should be seated; but, if someone is still standing ask:
5. Everyone who has had a member of your family involved in a collision, please sit down.

Mental Motivational Exercise

The following exercise illustrates how we become conditioned to act in a certain way or get in a “rut,” i.e., a mind-set is easily established, and an emergency vehicle driver must be cautious to avoid getting in a mind-set that has a negative impact.

To prove the mental need for motivation a series of questions will be asked, each of which requires a quick, one-word response stated out loud.

1. If you were fishing on a body of water, what would be the device or vehicle called that you would fish from?
Boat!
2. What do you call a funny story?
Joke!
3. What do you call the white stuff that goes up the chimney?
Smoke!
4. What do you call the thing around the neck of an ox?
Yoke!
5. What do you call the white of an egg?
Yolk!
Wrong. The yolk of an egg is yellow, not white. The white is albumen.

Motivation

Motivation is one of the forces that shapes and affects our actions and behavior. Motivation can be physical, mental or a combination of both. Studies have shown that motivation is affected by both internal forces (i.e., the individual creates the impetus to undertake certain acts) and external forces (how people view themselves within their sphere of influence).

Everyone has the potential to be involved in a vehicle collision. For an emergency vehicle driver, recognizing this possibility is important. It is also important for emergency vehicle drivers to understand that individuals will tend to act in certain ways when they face particular conditions or situations. Recognition of the condition and situations that cause us to act in certain ways is the first step to understanding mental motivation. The concept is referred to as psychological set. One type of psychological set is a mental rut. Because almost everyone drives on a daily basis, it becomes habit or second nature. The opportunity to fall into a psychological set or mental rut when driving is a very real danger.

An individual's motive, whether driven by physical or mental considerations, results in traits acquired over years of performance. These traits are the result of routine, comfort, and confidence. The following are examples of each:

Routine – “We’ve always done it this way,” or “There was never any SOP. The way I was doing it was never questioned or corrected, so I continued to do it that way.”

Comfort – “This is the easiest manner to accomplish what has to be done in the least amount of time.”

Confidence – “I know the way I’m doing it may not be the safest, but I know I can get it accomplished this way. When all else fails, I will use the methods that have never failed me before.”

Defensive Driving Goals

Defensive driving training is designed to illustrate that a driver's routine, comfort, and confidence can be used to arrive at a safer way of driving emergency vehicles. An open-minded individual with the correct attitude recognizes that there is nothing wrong with developing and implementing new methods. This can be done while retaining a sense of routine, comfort, and confidence, yet implementing the new methods because they are safer and they work. The goal of each emergency vehicle driver must be to:

Maintain the highest level of safety possible.

Each driver is responsible for the safety and lives of the client and other citizens. A driver must also be fully dedicated to the safety of his/her fellow responders.

Be prepared for unexpected situations and conditions that can adversely affect emergency vehicle operation.

Dynamic forces influence emergency vehicle driving. These include adverse weather, terrain, road conditions, and mechanical malfunction. Emergency vehicle drivers must attempt, through learned responses, to limit the possible negative outcomes by controlling their reactions to these outside forces.

Avoid, through effective training and applied practice, unnecessary legal consequences occurring as a result of emergency vehicle operations.

The legal consequences of a collision may extend to individuals, the organization and any associated governmental unit. Consequently, legal outcomes can socially and economically ruin the lives of emergency service personnel as well as discredit the organization and the profession. A typical governmental reaction to an adverse legal outcome is to create restrictive protocols, rules and regulations affecting the type of activity involved.

Motivating emergency drivers, both physically and mentally, to adopt new and safer habits is a way of extending their routine, comfort zone, and confidence level. One positive approach to this motivation is to learn and apply the principles of defensive driving when operating an emergency vehicle.

Preparing to Drive

Driving emergency vehicles under emergency response conditions requires careful planning and consideration of a number of important factors. These include route planning, driver readiness, and effective start-up procedures.

Route planning – An item that should be addressed prior to an actual emergency incident is the planning of typical routes to various locations within the response area. Safety is the number one priority in route selection. The other notable objectives of route planning are to:

- Maximize response efficiency
- Minimize collision exposures
- Enable the emergency vehicle driver to focus on actual driving tasks
- Avoid environmental and construction hazards

When planning a route, thought should be given to both the geographic and local conditions. Route planning, whether urban, suburban, or rural, requires careful consideration. Entrances and exits to major facilities, special events, times affecting traffic flows, and environmental conditions are all factors to be

considered. These factors include facilities such as schools, shopping centers, stadiums, etc., and known high-hazard areas where bicyclists, joggers, or pedestrians often congregate. Route planning in rural areas requires that some additional items be considered. These include poor street markings, dirt or gravel roads, bridges, weight limits, and longer travel distances.

Driver readiness – An emergency vehicle driver's effectiveness is determined by a number of factors. These include fatigue, health and personal problems. Both mental and physical fatigue can influence the ability of an emergency vehicle driver. Some examples include a lack of sleep, or a sudden awakening from a sound sleep. Maintenance of consistently good health is vital for all emergency vehicle drivers. Sufficient rest and nutrition, physical fitness, and freedom from controlled substances, including over-the-counter and prescribed medications, are essential health requirements. In addition, a driver's personal problems can significantly affect his or her capability to function as an effective driver. Problems can range from family conflicts and financial difficulties to employment problems and grief.

Effective start-up procedures – Prior to driving any emergency vehicle, effective start-up procedures should be followed. These include four specific actions. First, conduct a circle of safety inspection. Always circle the emergency vehicle prior to starting and moving it for any reason. The driver has sufficient time to undertake this activity while other personnel are making their way to the vehicle or obtaining additional incident information. Adjusting the cab features is the second action. Upon entering the cab, ensure that the vehicle features such as the driver's seat are properly adjusted, mirrors are positioned, and controls are in the proper operating position. The third action is the securing of the seat belt. Not only must the driver have his or her seat belt secured, but must also ensure that all crew personnel are secure. This can be done during the circle of safety. The vehicle should not be moved unless all occupants are secured. The fourth and final action is receiving the signal. The driver should receive a positive signal either from the officer or designated personnel prior to moving the vehicle. Personnel should use an audible buzzer if they are not directly visible by either the officer or the driver.

Right of way – The emergency vehicle driver must understand that being given the right-of-way and having the right-of-way are two entirely different situations. This principle must be reinforced each time an emergency incident response is undertaken. Right-of-way cannot be forced or assumed. It can only be given by other drivers.

While emergency vehicle drivers encounter civilian drivers on each response, civilian drivers rarely encounter emergency vehicles during routine driving. Many states now have "Move Over Laws." These laws are specific instructions for all users of our highways to respect and accommodate the movements of emergency vehicles responding in an emergency mode.

There is a common misconception shared by many emergency vehicle drivers: they can rely solely on the fact that there are laws governing emergency vehicle response to ensure a safe response. To hold this belief is shortsighted. Emergency vehicle drivers must understand that they only request the right-of-way.

Emergency Response Driving

Whenever a driver operates an emergency vehicle on the highway, he/she must adhere to the principles of defensive driving. These include predicting the predictable, expecting the unexpected, and handling unexpected problems. One method for addressing the principles of defensive driving is to apply the SIPDE system (Search/ Scan, Identify, Predict, Decide, and Execute).

Search/Scan: A key component for identifying is to scan ahead. See the big picture and detect relevant occurrences.

Identify: By the search and scan, identify potential problems or existing hazards to be avoided.

Predict: Make judgments of space and time relationships relative to other highway users and travel features. Then project these judgments into possible future options.



Decide: After using the identification and prediction process, decide on the appropriate course of action.

Execute: Using approved techniques, execute the necessary maneuvers.

Visual habits

The visual habits of emergency vehicle drivers significantly affect their ability to drive defensively. There are five visual habits that improve defensive driving:

1. _____
2. _____
3. _____
4. _____
5. _____

Identify distracted drivers

Driving is a task that requires a great deal of technical skill and attention. The roadways are full of motorists who, for various reasons, do not pay attention to the driving task. When a driver's attention is taken away from the act of driving, they are known as inattentive drivers. These inattentive (also known as distracted) drivers may drift over the lane divider or weave in their own lane. They may be distracted by being preoccupied with maps, eating, drinking or using a cell phone. If they are involved in chatter with other occupants, distraction can also occur. Be vigilant and watch for signs that a distracted driver may be in your driving space.

Use of emergency lights and siren

As a driver you have a responsibility to ensure that the lights and/or siren on an emergency vehicle are utilized properly when it is responding to an emergency incident. If you expect to legally use one or more traffic law exemptions, you must adhere to the requirements for allowing the exemption. While there are no guarantees that members of the public will yield, operation of the lights and siren are crucial to informing other drivers of the emergency vehicle's presence. Remember, emergency lights are simply safety devices for increasing visibility, not an authorization to violate safety practices. Emergency warning equipment provides two basic signals to other drivers. They are notified that an approaching emergency vehicle is operating in an emergency mode (perception of presence), and that they are being asked to yield the right-of-way in accordance with state and/or local law.

Emergency vehicle drivers should be aware of some information regarding emergency lights. Essentially, effectiveness is dependent upon their intensity, color, and flash rate. Most state traffic laws require at least one warning light to be displayed in the direction of approaching traffic when the emergency vehicle is blocking a moving traffic lane. Light color recognition and reaction are based on a number of items, involving more than just emergency vehicles. A summary follows:

Red – Red may attract drivers who are fatigued or under the influence of drugs or alcohol.

Blue – Blue offers good visibility day or night.

Amber – Many experts view amber as the best warning light, especially for the rear of emergency vehicles. It provides improved visibility in fog or other hazy conditions. However, it should not be used as an emergency light on the front of the vehicle.

Clear – Clear directional lights, such as MARS, Wig Wag or headlights, provide good visibility, but clear lights should be capable of being turned off at scenes, and they should not be used on the rear of the vehicle.

Colors of lights vary from state to state and among emergency service organizations.

Lighting – There are a number of limitations to emergency vehicle lighting. Emergency vehicle drivers should be aware of these limitations. For example, low sun or glare can greatly reduce the effectiveness. Experience also shows that lights mounted on high emergency vehicles may be above motorists' field of view if the emergency vehicle is closer than it should be to the rear of a passenger car.

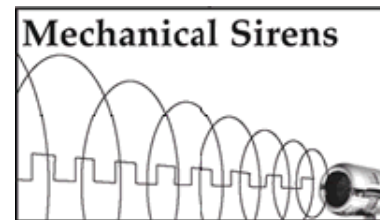
Vehicles are typically visible at 2,500 feet during the daytime on the open road. With their headlights on they become visible at 4,700 feet under similar conditions. Based on this fact, it is advantageous to consider a policy requiring all emergency vehicles to operate with headlights on during daylight hours. Many vehicles come with daytime running lights.

When parking emergency vehicles on the highway, remember that too many emergency lights on stationary vehicles create a carnival effect and cause confusion. This procedure is now addressed in the Manual of Uniformed Traffic Control Devices (MUTCD). Within this context, park your emergency vehicle safely at emergency scenes with most of the emergency warning lights off. In addition, create a safe work zone through proper placement of the vehicles, advanced warning signs, cones, flares and other warning devices.

Sirens – Many emergency vehicle drivers rely too heavily on the use of sirens to alert drivers in the path of the emergency vehicle. Therefore, while changing the mode may increase the ability to attract attention, it does little to impact reaction.

A variety of studies indicate that the effective distance of sirens range from thirty (30) feet to one hundred-fifty (150) feet. In some urban locations, the effective distance can be as little as fifteen (15) feet.

A mechanical siren produces a spiraling square wave, thus offering a very strong and focused pattern.



Electronic sirens are notorious for having dead spots and creating noise pollution without direct sound penetration, making them less effective.

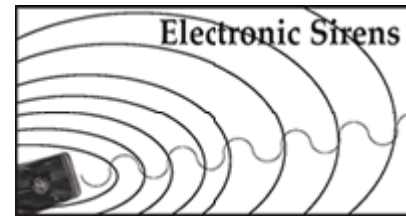


Image: Timberwolf Sirens

Vehicles with electronic sirens tend to outrun their sound waves at approximately 55 mph. This phenomenon is so common in the industry, they call it sirencide. Vehicles equipped with mechanical sirens do not outrun their sound waves. The air or shock wave is accelerated to more than 120 mph, minimizing the vehicle's speed as a concern.

As emergency vehicle drivers, you should still follow several basic procedures when using a siren:

- Utilize the siren whenever responding to an emergency.
- Change the mode of the siren from wail to yelp at least two hundred (200) feet before entering an intersection. Studies have indicated that the high-low mode is the least effective siren mode.
- Use another audible device, if so equipped, to alert vehicles or otherwise clear traffic that fails to hear the siren. If using an air horn, use short, repetitive blasts.

Automated Traffic Control Systems

Many organizations are using automated traffic control systems, also known as pre-emption devices or priority systems. These systems allow the driver to activate a special light that sends a signal to a receiving device attached to the stoplight control box. Once the signal is received, the stoplight gives priority to the approaching emergency vehicle, changing the signal in their direction to green. This assists the driver of an emergency

vehicle in clearing out traffic in congested intersections. Drivers should use caution when using these devices and should not assume that the light will turn green.

According to NFPA 1451, ESOs should ensure that operators that use automated traffic control systems should be provided with initial and annual refresher training on the system's operating features and limitations.

Emergency Dispatch Protocol

Emergency Communication Centers use an Emergency Fire and Medical Dispatch Protocol System. Each protocol is carefully standardized, containing consistently partitioned information, which separates sections for key questions, dispatch determinants, response codes, additional information, and post-dispatch instructions. Each dispatcher is trained to follow the protocols.

Emergency vehicle operations are classified as either emergency or non-emergency. During non-emergency operations, emergency vehicles comply with all of the traffic laws and rules of the road that apply to other vehicles. The specific exceptions to traffic laws that apply to emergency vehicles only apply during authorized emergency operations.

Emergency response creates an increased risk to responders and to other users of the roadways. It's important to balance this increased risk against the potential benefits of faster response in situations where lives and/or property are at risk. Limit emergency response to situations where prompt response may reduce the risk of death, serious injury or disability or preventable damage to property.

Consider developing programs using a risk-benefit analysis to prioritize emergency vehicle response. For example; not all calls are expected to be handled with an emergency response. Upon verifying that a call is of an emergency nature, the dispatcher will gather all pertinent information necessary to establish the correct medical response. The dispatcher then selects the most appropriate level of response based on the answers provided by the caller during the first series of questions and local jurisdiction protocols. The information-gathering process takes a few seconds and an alarm is generated. The dispatcher then alerts the designated unit(s) via an alerting system. The call is then dispatched. In potentially life-threatening situations, the dispatcher may provide pre-arrival medical or fire instructions until the first unit arrives on the scene. These are in-depth, advanced-level instructions given in time-critical situations, where correct evaluation, verification, and advice are essential.

Agencies usually have defined response guidelines for the emergency vehicle operator to follow. These may include light and siren usage, response speeds, number of vehicles, and other locally specific policies. Review your agencies policies on light and siren use.

Space Management

Establish a cushion of safety on all sides of an emergency vehicle, which is essential to safe operation. Following distance, rate of vehicle closure, blind spots, and traffic closure on an emergency vehicle are major areas of concern in maintaining this cushion.

1. Following Distance

You need space ahead in case you must suddenly stop. According to collision reports, the vehicle that fire trucks and ambulances most often run into is the one in front of them. The most frequent cause is following too closely. Remember, if the vehicle ahead of you is smaller than yours, it can probably stop faster than you can. You may collide if you are following too closely.

Total stopping distance is determined by perception time, reaction time, and braking time. Most authorities recommend a four-second rule as an acceptable following distance at speeds of 40 miles per hour or less and five seconds or greater for speeds over 40 mph. One rule of thumb for calculating following distance (seconds of safety cushion) is to note a fixed point that the vehicle ahead passes, and then count 1,000 one, 1,000 two, etc. until your vehicle passes the same point. If you do not get to 1,000 four, your following distance must be increased to ensure safety. A comparison of the safety cushions and total stopping distances at 40 mph and 55 mph are summarized for reference in the following table.

Speed	Safety Cushion	Distance Traveled	Distance Required To Stop*
40 mph	4 seconds	240 feet	210 feet
55 mph	4 seconds	320 feet	340 feet**
55 mph	5 seconds	400 feet	340 feet

* These stopping distances do not include perception distance.

** As illustrated, a four-second safety cushion is not sufficient.



2. Rate of Vehicle Closure

As an emergency vehicle driver, you should be aware of your rate of closure on other vehicles and pedestrians at all times. This is essential to maintaining a safe following distance.

There are many reasons why people may not yield to emergency vehicles even when all warning devices are operating. One major reason is that the emergency vehicle's rate of closure is too fast and does not allow the civilian driver to perceive the presence of the emergency vehicle and react appropriately. Other reasons include:

- Emergency vehicle speed outruns siren's effectiveness
- Blocked field of view
- Misinterpretation of direction of siren sound
- Hearing-impaired drivers
- Inattentive drivers
- Drivers distracted by loud music, cellular phone, kids, stress, and aggressive drivers

3. Blind Spots

Because of the size and configuration of most emergency vehicles, blind spots along both sides are normal and to be expected. Be aware and recognize that side-view mirrors often will not allow full visibility of these areas. Other personnel can help you view these difficult areas.

4. Overhead Clearance

Hitting overhead objects is a danger. Make sure you always have overhead clearance. Know the height of your vehicle. Have it prominently displayed on the dashboard.

Do not assume that the heights posted at bridges and overpasses are correct. Re-paving or packed snow may have reduced the clearances since the heights were posted.

If you doubt you have safe space to pass under an object, go slowly. If you aren't sure you can make it, take another route. Warnings are often posted on low bridges or underpasses, but sometimes they are not.

Some roads can cause a vehicle to tilt. There can be a problem clearing objects along the edge of the road, such as signs, trees, or bridge supports. Where this is a problem, drive a little closer to the center of the road if traffic conditions allow. When in doubt—stop.

Before you back into an area, use a spotter or get out and check for overhanging objects such as trees, branches, or electric wires. It is easy to miss seeing them while you are backing; check for other hazards at the same time.

5. Ground Clearance

Many drivers forget about the space under their vehicles. That space can be very small when a vehicle is heavily loaded or has a long wheelbase. This is often a problem on dirt roads and in off road situations. Do not take a chance on getting hung up. Drainage channels across roads can cause the ends of some vehicles to drag. Cross such depressions carefully and at an angle.

6. Elevation Angle Limitations

Vehicle characteristics can be located in the operator manual. Knowledge of vehicle angles is necessary to maneuver over or through obstacles, prevent undercarriage damage or becoming stuck.

Off Road Capacity Example (2013 Ford F350)

Approach angle: 18 deg
Departure angle: 17 deg
Ground clearance (min): 216mm (8.5")
Ramp break-over angle: 17 deg



7. Bridges

Many rural and urban areas of our country have public and private bridges that were built many years ago. The structural load-bearing capacity, age, and condition may render them unable to bear the weight of our modern emergency vehicles. Know the Gross Vehicle Weight of your vehicle and preplan for locations in your response areas that represent potential danger.

Bridges will freeze before the road surface when the temperature drops. Be especially careful when the temperature is close to 32 degrees Fahrenheit. Total loss of control can occur once a bridge has frozen over.

Strong winds can cause “buffeting” while crossing a long bridge. These wind gusts and blasts can cause total loss of control of the vehicle. Do the following if you encounter strong winds:

- Reduce speed
- Check for oncoming traffic
- Adjust lane position
- Do not over steer when affected by strong wind
- Prepare to counter steer if necessary
- Stay off the brake



Special attention should be given to weight limit signs for bridges. These signs are posted to prevent excessive weight vehicles from crossing bridges that may not be capable of sustaining the weight of the vehicle. If a weight restriction sign on a bridge reads max. weight 10 tons and your vehicle weighs 15 tons, do not attempt to cross the bridge, even in emergency response mode.

Underpasses present a hazard for overhead clearance. Drivers should know the height of their vehicle and be cautious when approaching an underpass to make certain the vehicle will fit. Remember that not all underpasses are marked for overhead clearance.

8. Traffic Closure

Another technique for effective and safe space management is to regularly observe the vehicles behind the emergency vehicle. Often curious family members will follow the ambulance to the hospital and other drivers will follow the emergency vehicle to break traffic in an effort to move more quickly down the street or highway. In either case, be aware of the presence of any vehicles and keep them under observation and increase your following distance to allow for a larger cushion of safety. Signaling any intent to turn, pass, or stop is extremely important to keep civilian drivers from following too closely or colliding with your emergency vehicle. Be aware of these vehicles, but don't lose focus to the front.



Speed Management

It is essential that, when driving an emergency vehicle, the driver does not yield control due to excessive speed. There are four primary rules regarding speed management (Best Practices):

1. _____

Within urban areas, average response speed is less than 35 miles per hour. If speeds are increased to 45 mph and the average response distance is one mile, a total of only about 23 seconds is saved. If speeds are increased from 55 miles per hour to 65 mph in rural areas, a total of only about 51 seconds is saved in a five-mile response. It's just not worth the additional risk.

2. _____

Cautionary speeds such as limitations on hills, curves, or ramps are designed for passenger cars. Emergency vehicles are typically heavier overall and more top-heavy than cars. Thus posted cautionary speeds are even more important to obey for emergency vehicles.

3. _____

Care must be taken when transporting others. For example, the nature of injury or illness of a patient does not always necessitate faster transport. Undue speed or erratic driving may actually decrease the attendant's ability to treat the patient. Several states have implemented clear SOPs or protocols to guide the mode of transport decision making. Be mindful of sudden turns, hard starts and stops, and always use the provided occupant restraints for responders, patient(s) and other occupants of the vehicle.

4. _____

Drivers should adjust driving speed to both geographic and environmental conditions. Speed should match conditions such as curves, long downhill grades and steep grades. Remember that frequent use of the service brakes causes them to get very hot, which will reduce their ability to stop the vehicle. Weather is an important element to also consider when making speed adjustments. Slippery roads are a definite reason to slow down.

Basic Maneuvers

Competent emergency vehicle drivers understand and properly complete all of the basic driving maneuvers necessary to operate the emergency vehicle they are certified to drive.

1. Steering

Steering an emergency vehicle, whether driving non-emergency, responding to an emergency, or making an evasive maneuver, requires certain habits. The most basic habit is to place both hands on the steering wheel, and maintain a "three and nine" hand position on the wheel. You should not engage in other activities such as drinking, eating, or smoking. Exceptions include operating another device on the vehicle, such as shifting or turning on the windshield wipers.

2. Braking and stopping

Effective braking is essential to safe operation of an emergency vehicle. Your goal is to stop the vehicle in as short a distance as possible without losing control. In a vehicle with hydraulic brakes, you should firmly pump the brake pedal and release it before your wheels lock up. For air brakes, apply firm and steady pressure without pumping. For vehicles equipped with an anti-lock braking system (ABS), whether installed in conjunction with a hydraulic or air system, proper procedures for braking must be followed to prevent undesired vehicle reactions.

On vehicles equipped with air brakes, you should firmly press the brake pedal initially. Then ease up as the braking continues, and ease the pressure on the brake pedal just before stopping to avoid a jerking action. If the vehicle's wheels lock, immediately release the brake pedal, then reapply the brakes. It is important to recognize that continuous braking over a period of time builds up a tremendous amount of heat.

On vehicles equipped with a secondary braking system, apply the system in accordance with the directions of the manufacturer. Recognize that some applications of secondary braking systems can reduce tire traction. In areas where there is a high probability of braking, such as approaching and passing through an intersection or traveling against traffic, place your foot over (cover) the brake pedal. This will reduce your reaction time.

CAUTION!

Do not use retarders/engine brakes during inclement weather or when road surfaces are wet and slippery. Using these systems could result in losing control of the vehicle.

Total Stopping Distance

The total stopping distance for a vehicle consists of four basic components: perception/time distance; reaction/time distance; vehicle reaction time/distance; and vehicle braking distance. With air brakes, there is an added delay, or brake-lag. This is the time required for the brakes to work after the brake pedal is pushed. With hydraulic brakes (used on cars and light/medium trucks), the brakes work instantly.

_____ **/time distance** is the distance traveled from the time you observe a hazard until you decide on a course of action.

_____ **/time distance** is the distance traveled from the time it takes to move your foot from the accelerator to the brake pedal. Normal reaction time is $\frac{3}{4}$ of a second.

_____ **time/distance** (also known as brake-lag distance) is the distance traveled from the time the brake is applied until the brake actually activates.

_____ **distance** is the distance traveled until the vehicle comes to a complete stop.

There are many variables to consider for total stopping distance. Variables include driver's reaction time, weather, road conditions, road surfaces, vehicle weight, brake type, brake and tire condition and speed.

Using Air Brakes

Push the brake pedal down. Control the pressure so the vehicle comes to a smooth, safe stop. Remember that air brakes have the added delay called brake-lag. Unlike hydraulic brakes, which activate instantly, air brakes can take a half-second or more for the air to flow through the lines to activate the brake shoes or pads.

Emergency Stops

If an unanticipated emergency stop is necessary, apply the brakes as firmly as you can without locking the wheels. Keep steering wheel movements very small while braking. If larger steering adjustments are needed or if the wheels lock, release the brakes and reapply the brakes as soon as you can to maintain control. If the wheels are allowed to lock, you will lose the ability to control the vehicle's direction.

Brake Fade or Failure

Excessive use of the service brakes results in overheating and leads to brake fade. Brake fade results from excessive heat causing chemical changes in the brake lining, which reduces friction and also causes expansion of the brake drums.

Snub Braking

The use of brakes on a long and/or steep downgrade is only a supplement to the braking effect of the engine. Once the vehicle is in the proper low gear, the following proper braking technique should be used:

1. Apply the brakes just hard enough to feel a definite slowdown.
2. When your speed has been reduced to approximately five mph below your "safe" speed, release the brakes. (This brake application should last about three seconds.)
3. When your speed has increased to your "safe" speed, repeat steps one and two.

For example, if your “safe” speed is 40 mph, you would not apply the brakes until your speed reaches 40 mph. You now apply the brakes hard enough to gradually reduce your speed to 35 mph and then release the brakes. Repeat this as often as necessary until you have reached the end of the downgrade.

3. Backing up

While backing usually occurs at slow speeds, it accounts for a disproportionate number of minor, low-speed collisions, and has the potential for serious consequences. Some guidelines for backing an emergency vehicle include:

Park so as to minimize the need for backing if the incident allows.

If you think ahead to how your vehicle will have to leave its location, a simple adjustment in the final placement can minimize or even eliminate the need for backing.

Give audible notice that backing will occur.

If the vehicle is equipped with a back-up alarm, shift the vehicle to reverse while applying the brakes. This will initiate most back-up alarms. If the vehicle is not equipped with a back-up alarm, touch the horn lightly three times before beginning the back-up maneuver.

Use a spotter located at the left rear of the vehicle whenever backing.

You must be able to see the spotter through the mirror and vice versa and make mutual eye contact. If the spotter disappears from the mirror, the driver must immediately stop. A portable radio is of course of great benefit to a spotter. If a spotter is not available, conduct a walk-around of the vehicle before backing.

Understand hand signals and audible signals.

Standard hand signals are illustrated in the appendix. Be sure that all drivers and spotters have been trained in the meaning of the signals being used. When using an audible signal (buzzer), one means stop immediately, two means go forward, and three means back up. Radio communication is preferred.

Use side mirrors whenever backing.

You should not attempt to lean out the window or turn around to see. Regularly check the right side mirror for objects in the path of the vehicle.

Check the front corners of the vehicle.

This is especially important if the vehicle is turning while backing. Either the right or left front of the vehicle may swing around and strike a fixed object that did not initially appear to be a potential problem.

Maintain speed control.

Back up at an extremely slow speed. It is imperative to maintain your control of the speed of the emergency vehicle.

Use of rear-view cameras requires orientation and practice.

Many apparatus are now outfitted with rear-view cameras. Use of these devices requires practice and should not be used instead of a spotter.



4. Lane changing

Lane changing on multi-lane roads can usually be accomplished with little difficulty provided some basic rules are followed. Plan ahead, signal your intentions to change lanes, check mirrors, and then make the lane change smoothly. In areas that have blind spots and limited visibility, practice appropriate space management. Follow these procedures when merging onto or exiting a highway.

5. Turning

There are basic procedures that need to be followed when executing a turn. Often these procedures are ignored or violated. It is essential that you always signal before turning. Do not operate an emergency vehicle with its four-way flashers working. This prohibits you from properly signaling a turn. Whenever possible, turn from one proper lane into another proper lane. If turning left, position the emergency vehicle in

the left turn lane or in the left lane. Avoid crossing lanes in order to execute the turn. Position the emergency vehicle into the proper lane after making the turn. This is especially important on multi-lane streets.

6. Passing

Often it is necessary for you to pass other vehicles during an emergency response. At highway speeds (40 to 60 mph), a safe pass can be completed in about 10 seconds. For example, the emergency vehicle will travel about 1/6 of a mile (825 feet) at 55 mph during that 10-second period. A rule of thumb for passing and visibility distances is:

Starting Speed	Passing Distance	Visibility Distance
30 mph	450 ft.	900 ft.
35 mph	525 ft.	1,050 ft.
45 mph	675 ft.	1,350 ft.
55 mph	825 ft.	1,650 ft.
60 mph	900 ft.	1,800 ft.

Other considerations when passing vehicles include the speed of the traffic and visibility limits. Common visibility limitations include crests of hills, blind curves, and environmental limitations. Passing should include the following steps:

- Check traffic both ahead and behind.
- Be alert for vehicles planning to move into the passing lane.
- Check sides and double-check blind spots.
- Signal before initiating the pass.
- Accelerate while changing lanes.
- Signal before returning to the driving lane.
- Check mirror before returning to the driving lane.
- Cancel directional signal and resume speed.

Passing on the right is extremely dangerous and should be avoided whenever possible. If passing on the right is absolutely necessary, extreme caution should be taken and always have an out, anticipating sudden reaction from the other drivers.



7. Negotiating intersections

Intersections are the locations responsible for the largest percentage of major accidents involving emergency vehicles¹². Even with the use of warning devices, intersections pose a serious threat to the safety of both emergency service personnel as well as the general public. It's important for emergency service organizations to adopt and practice intersection operating guidelines during emergency responses. Review the following best practices and compare them to the organization's SOGs, state statutes and applicable standards. Careful consideration should be given to establishing policies for addressing both controlled and uncontrolled intersections.

A controlled intersection is any intersection controlled by a stop sign, yield sign, yellow traffic light or a red traffic light, and requires prudent action by the emergency vehicle driver. An uncontrolled intersection is any intersection that does not offer a control device (stop sign, yield or traffic signal) in the direction of travel of the emergency vehicle. Traffic pre-emption devices change a light to green, but are by no means a guarantee of right-of-way or safe passage. Do not assume that pre-emption devices will change the light.

It's important for emergency vehicle drivers to be prepared to slow or bring their vehicle to a stop. If another vehicle operator fails to yield the right of way to an emergency vehicle, the emergency vehicle driver cannot force the right-of-way, nor can they assume the right-of-way; therefore the emergency driver does not have the right-of-way until the other vehicle yields.

Uncontrolled Intersections

- Scan the intersection for possible hazards (right turns on red, pedestrians, vehicles traveling fast, etc.). Observe traffic in all four directions (left, right, front, rear).
- Slow down if any potential hazards are detected and cover the brake pedal with the driver's foot.

- Change the siren cadence not less than 200 feet from intersection.
- Avoid using the opposing lane of traffic if at all possible.
-

Controlled Intersections

- Do not rely on _____ to clear traffic.
- Scan the intersection for possible hazards (right turns on red, pedestrians, vehicles traveling fast, etc.) and driver options.
- Begin to slow down well before reaching the intersection and cover the brake pedal with the driver's foot; continue to scan in four directions (left, right, front, back).
- When approaching a traffic signal, be aware of "stale" green lights or yellow caution lights; begin to slow and prepare to stop, as these will be turning red.
- Change the siren cadence not less than 200 feet from intersection.
- Scan intersection for possible passing options (pass on right, left, wait, etc.); avoid using the opposing lane of traffic if at all possible.
- According to NFPA 1500, during emergency response, bring the vehicle to a complete stop for any of the following:^{13, 36}
 - When directed by a law enforcement officer
 - Red traffic lights
 - Stop signs
 - Negative right-of-way intersections
 - When the driver cannot account for visible traffic in the lanes of traffic in an intersection
 - When other intersection hazards are present
 - When encountering a stopped school bus with flashing warning lights
- Establish eye contact with other vehicle drivers; have partner communicate all is clear; reconfirm all visible traffic is stopped.
- Account for traffic one lane at a time, treating each lane of traffic as a separate intersection.

8. Operating under adverse conditions

Civilian drivers usually choose when and under which conditions they drive. Unfortunately, the emergency vehicle driver must operate whenever an incident occurs. Many times this involves adverse conditions. Typically, adverse conditions can be classified in terms of traction, vision, and adverse handling implications. If these adverse conditions cannot be adequately handled or if other unexpected situations occur, you may need to initiate crash avoidance procedures.

9. Traction implications

The traction of an emergency vehicle is adversely affected by a variety of environmental conditions. Whenever conditions reduce traction, you must reduce your speed and steer, accelerate, or brake smoothly and evenly. Environmental conditions include the occurrence of rain, snow, ice, and/or leaves on the roadway.

Rain

In addition to oil build-up, water forms a layer that builds between the tires and the roadway. As little as 1/16 inch of water can cause hydroplaning of a vehicle. Standing water may also impact steering, braking, and general vehicle operation. Do not drive through moving water.

Snow and ice

Snow and ice form an extremely slippery road condition resulting in reduced traction for a vehicle's tires. Also, certain structures such as bridges may accumulate snow or ice prior to other portions of a roadway doing so.

Leaves

In many areas of the country during certain periods of the year, large amounts of leaves accumulate on the roadway. When wet they can result in slippery conditions equal to rain, ice, and snow.

Excessive heat

Many roadways can be affected by extremes in temperature that change the coefficient of friction affecting traction.



Loose gravel, sand, and stones

Loose gravel, sand, and stones also change the coefficient of friction affecting traction.

Skid avoidance

Skid avoidance is having the ability to maintain control of the vehicle using defensive driving skills and vehicle controls. By demonstrating good handling skills the driver is capable of detecting, preventing and taking corrective action that prevents a crash.

Some actions that may result in lost control are:

- Driving too fast for weather, road or tire conditions
- Accelerating too hard
- Braking inappropriately
- Changing direction too abruptly
- Taking a curve at a high rate of speed

Identifying slippery surfaces

Slippery surfaces can sometimes be very difficult to detect. Depending on time of day and weather conditions, you may be driving on a slippery surface and not realize it until the vehicle begins to slide. There are clues that will help identify slippery or possible slippery surfaces. These clues include:

- Shaded areas
- Bridges
- Melting ice
- Black ice
- Just after a rain begins

In some weather, water or slush accumulates on the roadway, causing the tires to lose contact with the road surface, limiting traction. This condition can cause the vehicle to hydroplane. Hydroplaning can occur on wet road surfaces at speeds as low as 30 mph.



10. Vision implications

Conditions that affect your ability to see potential hazards include night driving, precipitation, distractions, the type of vehicle, and the condition of the driver's eyesight.

Night driving

Driving at night increases the potential for problems because of factors such as hidden hazards, increased difficulty in judging the speed and distance of other vehicles, limited highway lighting, and glare from roadside lights. Even with these limitations and possibly impaired vision, a few simple procedures can help you compensate:

- Dim dash and cab lights
- Reduce speed
- Keep headlights and windshield clean
- Watch the area beyond the headlights
- Keep your eyes moving, scanning continuously

Precipitation

Remember that rain, fog, and snow reduce visibility. In addition, rain and fog increase glare both during the day and at night. It is imperative that you keep the vehicle under strict speed control.

11. Adverse handling implications

Preparing for the unexpected is a difficult task. Other factors that may restrict the driver's ability to maintain control of vehicle include: features and condition of vehicle's components, high winds resulting in buffeting, and the driver's acquired skill-set. Drivers must be prepared to handle sudden condition or operational changes that may result from human error, natural/environmental factors or from mechanical failure.

The vehicle

Many features of the vehicle can either assist or restrict your ability to reduce the impact of adverse conditions. All emergency vehicles should be equipped with minimum features in good condition. These features include the windshield and windshield wipers, visors, headlights, and rear-view mirrors. Forward-mounted rearview mirrors at the front corners of the vehicle are particularly important. Other features such as Roll Stability Control Systems (RSC), traction control, and anti-lock brakes are also beneficial in reducing the effects of adverse handling implications.

High winds

Emergency vehicles typically provide a large area that high winds can impact. While high winds do not reduce traction, these winds are often accompanied by other adverse weather conditions. Sudden wind gusts or blasts, either caused by natural occurrence or by passing another object, result in a problem called buffeting, are also a concern as they can cause total loss of vehicle control.

The driver

You can help reduce the effects of adverse driving factors through a number of actions. These include:

- Preparing adequately through driver training
- Using low beams and wipers
- Watching for slowed and/or stopped vehicles
- Checking rear-view mirrors regularly
- Practicing both space and speed management while increasing the safety cushion

12. Railroad Crossing Safety

Railroad crossings present real danger if not navigated in a safe manner. It's important for drivers to use extreme caution and follow applicable state laws anytime a railroad crossing is part of a response route. It is wise for drivers to be familiar with the location of railroad crossings in their response area and to have an idea of frequency of train movement through the area. The presence of a train may prohibit or delay the response of resources.

There are two basic types of railroad crossings: passive and active. A passive crossing is one that does not have any type of traffic control device. These crossings are usually indicated only by signs and/or pavement markings that alert a driver of a crossing ahead. The second type of crossing is an active crossing. This type of crossing has a traffic control device installed at the crossing to regulate traffic. These active devices include flashing red lights, with or without bells and/or gates, and flashing red lights on gates.



Best practices for safe driving at railroad crossings include:

- Do not race a train to a crossing
- Reduce speed and be prepared to stop when approaching any railroad crossing
- Do not proceed between activated crossbars
- Do not expect to hear a train while driving; similar to emergency vehicle warning devices, a train horn may not be heard until the train is dangerously close
- Do not rely on signals to warn of an approaching train; slow down and look before proceeding through any rail crossing
- Multiple tracks should be approached independently; if a train passes, ensure that all other tracks are clear before crossing
- Follow all applicable state laws with regard to traversing railroad crossings
- If a stop is required, silence the cab, open a window, look both ways and listen for an approaching train before crossing
- Do not pass another vehicle within 100 feet of a crossing
- Watch for other vehicles that must stop at crossings
- NEVER park the vehicle on a crossing without first getting clearance from the railroad
- If an emergency scene is located near or on tracks, contact the railroad
- Make sure the vehicle will not "hang up" on the crossing (Breakover Angle and Angle of Departure)
- Don't be fooled by the illusion of the speed of the train

Collision Avoidance

Despite the best training and precautions, sometimes a collision may be unavoidable. If such an occurrence is seen as inevitable, following are several things you could do.

Identify escape route(s).

Scan ahead along the roadway, shoulders and/or median to identify any potential escape routes that can safely be used to avoid a collision. Certain areas such as the crest of a hill or a curve can minimize identifying potential escape routes.

Brake smoothly and firmly.

If there is enough room to stop or no escape route is available, using emergency braking may be the only way to avoid a collision or minimize its consequences. The goal of emergency braking is to produce the shortest possible stopping distance without locking the wheels or losing control. With hydraulic brakes, if the vehicle does not have ABS, apply hard pressure to the pedal without locking the wheels, followed by quick, firm jabs that are short and result in steady pressure.

Air brakes should be applied with a steady pressure at the beginning and then eased off as the vehicle slows. Ease your foot pressure just before the vehicle stops in order to avoid a jerk and rebound. Air brakes should not be pumped. Finally, in vehicles with anti-lock braking systems (ABS), apply the brakes as hard as possible, and hold them down until the vehicle stops. Firm steady pressure allows the ABS system to function properly.

Accelerate smoothly and rapidly.

Evasive acceleration is accomplished with a quick burst of speed. Use this maneuver to avoid a collision with side-approaching vehicles, merging vehicles, or quickly closing vehicles. Evasive acceleration may also assist in regaining friction by providing downward thrust to re-establish friction and/or limit bounce.

Steer to avoid a head-on impact.

If at all possible the driver should avoid impact with the occupied portion of the vehicle. When you are sure that a collision is unavoidable, if you have the option, always choose the course least likely to result in a serious collision. Head-on collisions are the most damaging. Attempt to sideswipe or brush another unoccupied object. Impact-absorbing objects are better to choose than large, immobile items, which will not yield. Examples of impact-absorbing objects are unoccupied parked cars, bushes and shrubs, and small signs.

Privately Owned Vehicle (POV) Response

Most volunteer emergency service organizations rely heavily on the ability of their personnel to respond to calls, either to the scene or the station, in their personal vehicles. While this is essential to the organization's ability to react to emergencies in a timely manner, there are also inherent risks.

While motor vehicle laws vary from state to state, personal vehicles are typically not considered emergency vehicles under the motor vehicle code and are typically not permitted exemptions to motor vehicle laws.

Some motor vehicle codes address the use of blue or red "courtesy lights." Basically, these are a visual request asking other drivers to allow you to pass them upon your approach. They are not a demand for right of way, nor do they permit the driver to illegally pass or speed up to overtake any vehicle.

Many organizations have chosen to reduce or eliminate the risks associated with personnel responding in their personal vehicles by looking at alternative ways of getting personnel to where they are needed. For example, the creation and use of regular duty crews (personnel staffing predetermined shifts) would eliminate the need to have large numbers of volunteers responding to every call. A duty crew could staff at least a full first unit response, which can usually handle most calls.

Responders must understand that first and foremost, they must arrive at the emergency scene or the station safely in order to be of any help to the public.

Placement of Vehicles at Emergency Incidents

Every emergency service organization should have standard operating guidelines (SOGs) for placing emergency vehicles at emergency incidents. For highway incidents these guidelines should be in accordance with MUTCD-Section 6I.05, Use of Emergency Vehicle Lighting.

The use of emergency vehicle lighting (such as high-intensity rotating, flashing, oscillating, or strobe lights) is essential, especially in the initial stages of a highway incident, for the safety of emergency responders and persons involved in the traffic incident, as well as road users approaching the incident. Emergency-vehicle lighting, however, provides warning only and provides no effective traffic control. It is often confusing to road users, especially at night. Road users approaching the highway incident are often distracted by emergency-vehicle lighting and slow their vehicles to look at the traffic incident. This often leads to secondary incidents.

The use of emergency-vehicle lighting can be reduced if good traffic control has been established at a highway incident scene. This is especially true for major incidents that might involve a number of emergency vehicles. If good traffic control is established through placement of advance warning signs and traffic control devices to divert or detour traffic, then public safety agencies can perform their tasks on the scene with minimal emergency vehicle lighting.



Placement of Vehicles at Highway Incidents

Emergency response to traffic incidents is rising¹⁴ and remains a challenge to safely manage those incidents to protect not only the emergency responders but also the victims of the initial incident and the motorists who are trying to pass by the scene. The secondary challenge is how to quickly clear the scene and resume normal traffic flow.

Statistics have shown that many serious and sometimes fatal accidents have occurred involving emergency vehicles parked at highway emergency scenes¹⁵. It's important for drivers to be trained to properly position vehicles at highway incidents and to properly protect the scene and all personnel working the scene. This training should include, at a minimum:

1. Organizations Roadway Incident Response Procedures (SOPs/SOGs)
2. Terminology & Communications
 - Lane designations and numbering
 - Upstream/downstream
 - Block right/block left
 - Unit designations
 - Radio procedures
 - Zero buffer
 - Lane plus one
 - Early warning
 - Safe, quick clearance
 - Interoperable communication
3. Incident Command (NIMS & ICS)
4. Proper PPE
 - ANSI-approved high-visibility vest
5. Vehicle Placement
 - Proper blocking procedures
 - Large fire apparatus parked at an angle upstream of the incident work area
 - Front wheels turned away from incident scene and units properly chocked when parked
 - Proper buffer area left between blocking vehicle and the scene
 - Safe positioning
 - Ambulances positioned downstream with the loading area doors angled away from moving traffic whenever possible
 - All emergency equipment parked on one side of the road

6. Operations specific to different roadway environments

- Hills
- Curves
- Country roads
- Highways/interstates
 - High-speed
 - Limited access
 - o Bridges
 - o Tunnels

7. Temporary Traffic Control Zones

- Proper deployment tactics
- Proper buffers between elements
- Effective placement of police cars for advance warning, traffic control and scene safety

The Manual on Uniform Traffic Control Devices (MUTCD) provides detailed guidelines for establishing safe work zones at incidents on streets and highways. Major areas covered in the manual include defining classes of incident scenes by time spent on scene, temporary traffic control (TTC) devices such as cones, signs, etc., and information on the wearing of highly visible safety vests.

For more training on responding to and managing highway incidents, drivers are encouraged to take the *VFIS Traffic Incident Management (TIM) for Emergency Services* ³⁶ training program.

Off-Road Operations

Extreme care must be exercised to ensure the safety of all passengers as well as protection of the vehicle. These best practices for off-road driving should be followed:

Use the Proper Vehicle – Vehicles that were not designed by the manufacturer to operate off road should not be operated off of improved surfaces.

Speed – Speed should be as slow as possible and as fast as necessary. Operating off-road requires careful control of the speed of your vehicle. Loose gravel, soft soil, gullies, and ditches, and hidden obstacles require slow and deliberate travel, while mud, deep sand and similar loose materials require a steady pace so as not to lose momentum.

Handling Characteristics – The vehicle will handle differently when operating off-road (tire traction, soft surfaces, narrow paths, rocks and other objects).

Hand Position – Due to the potential for extreme terrain affecting the handling of the vehicle, it is important that the driver maintain control of steering. Maintain both hands on the wheel at the 9 o'clock and 3 o'clock position at all times.

Four-Wheel Drive – When a vehicle becomes stuck or bogged down it is often too late to shift into four-wheel or all-wheel drive. As soon as the vehicle goes off the paved road surface, the driver should stop and place the vehicle in four-wheel or all-wheel drive (if available).

Choose Existing Roads or Trails – Do not cut new roads unless there is no other way to traverse the area.

Know Your Terrain – Off-road operations range widely based on the geographic area. Pre-planning your response area will help identify the best accesses as well as special hazards and limitations. Special consideration should be given to ditches, gullies, hills and shallow water. Never cross moving water, and if traversing standing water is unavoidable, do not exceed manufacturer's maximum operational depth. CAUTION: wet brakes are not as effective and require longer stopping distances.

Read the Vegetation – The type of vegetation may provide a clue as to the type of ground that is present.

Vision – Sometimes it is difficult for the driver to see, either directly or via mirrors. When in doubt, get out and observe the terrain before proceeding.

Use a Scout – Spotters should be used when traversing unknown territory or if the ground is obscured

by heavy vegetation or water. The spotter makes the driver aware of obstacles and must carry a reliable hand light during night operation, wear highly visible clothing, and stay within the drivers' field of view at all times. Driver and spotter should use common hand signals for maneuvers such as turning, stopping, and reversing.

Hills – Always traverse a hill straight up or straight down to eliminate the potential to overturn and lose control. Do not exceed the manufacturer's maximum slope rating for your vehicle. The maximum slope for most over-the-road vehicles is 40%. When going up a hill, and the driver realize they can't make it, they should back straight down it. DO NOT try to turn around on the hill. If the vehicle starts to slide, steer the wheels into the slide when going downhill.

Module IX

VEHICLE INSPECTIONS AND MAINTENANCE

Module IX Goal

The goal is to have participants understand and perform routine maintenance of their emergency vehicles and to understand their role and responsibility in the process.

Module IX Objectives

Successful participants will be able to:

1. Explain the value and importance of regular vehicle inspections.
2. Identify the major component systems of an emergency vehicle.
3. Describe how to perform pre- and post-trip inspections.
4. List the three types of preventive maintenance.
5. Explain the role of the emergency vehicle driver in performing certain vehicle inspection and maintenance functions.
6. Describe the importance of keeping accurate and complete records.

Module IX – Glossary of Terms

The following terms are used in this module and may also be referenced in subsequent modules.

CAAS 203: Standard for Ambulance & Medical Transportation Equipment & Facilities

Emergency traffic mover (ETM) – An electrical device designed to operate a vehicle's headlights in an alternating sequence.

Pre-trip Inspection – The purpose of the pre-trip inspection is to see whether the vehicle is safe to drive. Typically, ESOs have designated frequency for the inspection (e.g., shift change, designated date, etc.). Various forms and records are used to document the inspection.

Post-trip Inspection – Usually performed when an emergency vehicle is in the service station after a response. Includes checking essential equipment, replacing supplies, fuel, etc., as determined by the ESO.

NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications.*

NFPA 1401, *Recommended Practice for Fire Service Training Reports and Records.*

NFPA 1451, *Standard for a Fire Service Vehicle Operations Training Program.*

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program.*

NFPA 1901, *Standard for Automotive Fire Apparatus.*

NFPA 1911, *Standard for Service Tests of Fire Pump Systems on Fire Apparatus.*

NFPA 1914, *Standard for Testing Fire Department Aerial Devices.*

NFPA 1917, *Standard for Automotive Ambulances.*

Vehicle Inspections and Maintenance

Important to Safe Operation

The proper maintenance of any piece of sophisticated equipment, including emergency vehicles, ensures safer operation and increases its anticipated life expectancy. In some cases emergency vehicle collisions are attributable to vehicle malfunctions resulting from poor maintenance. Inspection of emergency vehicles and proper maintenance are obviously important steps toward safe vehicle operation.

Many emergency vehicle collisions caused by poor maintenance or vehicle malfunctions are preventable. Routine physical and visual inspections must be conducted on a regular basis. In the final analysis, it is the organization's responsibility to confirm that inspection and maintenance are properly performed. The driver must verify that maintenance has been completed and the vehicle is in proper operating condition. The operational readiness of an emergency vehicle is the responsibility of the driver and the organization. This cannot be overstated. If it is not right, don't drive it!

Emergency Vehicle Components

Competent emergency vehicle drivers can recognize and identify the major components of their vehicles. These drivers know the functions of the major systems of the emergency vehicle, and they inspect these components and systems to ensure they are operational. Essentially all emergency vehicles are designed around four major components or systems. These include the chassis, the body, the primary function component(s) (task or mission), and the auxiliary systems.

Chassis

The chassis of the emergency vehicle is critical to ensure the safe operation of the vehicle on public highways. The typical components of a vehicle chassis include the:

Frame

The frame of a vehicle consists of continuous design frame rails with attached cross members. Most frames are constructed of heat-treated steel and should not be heated, welded, punched or drilled, especially in the flanges of the rails. Typically, the frame of the vehicle is structurally sound and stable, and it should not normally require any special maintenance but must be inspected regularly.

Suspension system

The suspension system of the vehicle consists of the vehicle's axles, springs, shock absorbers, wheels, and tires. An emergency vehicle's suspension system should be designed in accordance with the total weight of the vehicle and the weight distribution between or among the axles of the vehicle.

Steering and braking systems

The steering system of the vehicle includes the steering wheel, the steering box, the pitman arm, tie rods, and power steering pump and reservoir.

The braking system includes the service brakes, parking brake, and any auxiliary braking system installed on the vehicle.

Power train components

The power train components of the emergency vehicle consist of the engine, clutch and/or transmission, driveline, and differential.

The engine may be either gasoline- or diesel- powered. The subsystems of the engine include lubrication, cooling, fuel, electrical, exhaust, and air intake. The vehicle's transmission will be either automatic or manual. If equipped with a manual transmission, the vehicle will also be equipped with a clutch. The driveline will include the vehicle's drive shaft, universal joints and, if so equipped, either a power take-off or power transfer case to power other equipment on the vehicle. The differential or rear-end of the vehicle may be supplemented by a second unit, if the vehicle is equipped with four-wheel drive or multiple drive axles.

Body

All emergency vehicles have a mounting system for attaching the various body components of the vehicle to the frame and chassis. The mounting system insulates the body from both noise and vibration, and secures the body compartments to the vehicle.

The body mounting system is usually not readily visible to the driver. However, the driver must remain alert for telltale signs of problems such as excessive movement, shifting, or body tilting. These signs are usually most noticeable when the vehicle is in motion. If a problem is suspected, it is advisable to have another driver or crew view the emergency vehicle as it travels down the street. If a problem is still suspected and no other signs are noted, the vehicle should be inspected by a qualified vehicle technician.

Primary Function Components

Typically, emergency vehicle drivers are trained to inspect and perform routine maintenance on the primary function components of the vehicle. Such components include the compartments, body, and doors, or the patient compartment of an ambulance. While these components of the emergency vehicle are very important, they are only referenced here and left for the specific functional training appropriate for each type of emergency vehicle.

Emergency vehicle drivers should be trained regarding the inspection, performance of routine maintenance, and operation of these primary components. It is not, however, within the scope of this program to extend beyond acknowledging the importance of these components and the driver's responsibility. For more information, reference NFPA 1002, NFPA 1451, CAAS 203.01, and CAAS 203.02.

Auxiliary Systems

Each emergency vehicle dedicated to a primary function such as an ambulance has one or more very important auxiliary systems. Specialized training in the inspection and performance of routine maintenance is usually conducted as a part of regular emergency service training. Some of these auxiliary systems include:

- Line voltage electrical systems
- Internal and external communication systems
- Bio-waste disposal systems
- Auxiliary pump systems

Inspections

Regular inspection of an emergency vehicle is an essential step in ensuring its condition and safe operation under emergency conditions. Two types of vehicle inspections should be conducted on a regular basis. These include pre-trip and post-trip inspections. Pre-trip inspections, depending upon the extent of use, the type of organization, and local policy, should be conducted on either a daily or weekly basis. Post-trip inspections should occur after every use and should include, as a minimum, the following items:

- _____
- _____
- _____
- _____
- _____

While many procedures for inspecting emergency vehicles have been developed and proposed by a variety of individuals and organizations, the following seven-step procedure is a direct adaptation of the pre-trip inspection process for commercial vehicles, as contained in the CDL requirements. Additionally, there are three additional recommendations when conducting either a pre-trip or post-trip inspection. These are:

- Conducting the inspection the same way each time and using a written checklist
- Report in writing any deficiencies
- Driving the vehicle on a weekly basis

Inspection checklist

The following pre-trip inspection checklist is recommended when conducting regular inspections of emergency vehicles.

1. Vehicle overview

As you approach the vehicle, look at its general condition. Check the windshield to make sure that it is clean and undamaged. Look for damage and whether the vehicle is leaning. Check under the vehicle for fresh oil, coolant, grease, or fuel leaks. Review the vehicle log. Verify that any discrepancies noted have been addressed.

2. Check the engine compartment

First, verify that the parking brake is engaged. Ensure, if appropriate, that the wheels are chocked, and secure any loose items in the cab. Access the engine compartment. Check the following:

- Engine oil level
- Coolant level and condition of hoses
- Power steering fluid level
- Windshield washer fluid level (if so equipped)
- Belts for tightness and wear (learn characteristics of belts on vehicle)
- Any leaks in engine compartment
- Battery fluid level and connections (may be located in another area)
- Automatic transmission fluid level (engine must be running)

3. Check gauges, warning lights, indicator lights and common cab features

It is good practice to refer to the vehicle manufacturer's manual to learn more about the operating systems, gauges and controls found on your vehicle. Become familiar with the layout of instrument gauges found on the dash of the vehicle so quick glances at the gauges will let you know when systems are performing correctly. The best time to check your operating gauges is when you are stopped at an intersection. By doing this, you will not be taking your eyes off the road while driving.



Along with the various clusters of gauges found on the dash, there is also a series of normally hidden icons that only illuminate when a problem is detected in one of the operating systems of the vehicle. The icons light up when the ignition is turned on and should go out when the vehicle is started. On some vehicles equipped with computer diagnostics, the icons will light in sequence as the computer does a system check of the vehicle's operating systems.

While checking the cab interior, do a check of all the features commonly found inside the cab. Check the master light and warning device console, the mirror controls (if equipped) and all other controls such as wiper controls and non-emergency light switches.

4. Start engine and check inside cab

While in the cab, check to ensure the parking brake is engaged and the automatic transmission is in "Park." Start the engine and listen for any strange or unusual noises. Look at all gauges to verify that they are registering within normal ranges. Generally these will include:

- Oil pressure
- Ammeter/voltmeter
- Coolant temperature
- Engine oil temperature
- Warning lights and/or buzzers
- Fuel level
- Diesel exhaust fluid (DEF) level (if applicable)

Note: Use caution when handling DEF fluid. This fluid is corrosive and could cause problems if not handled appropriately. Make sure that the fluid is dispensed into the correct tank, as mixing with fuel may cause serious damage to the engine.

After checking all of the vehicles gauges, check the operation of all vehicle controls. Generally these controls will include:

- Steering wheel
- Accelerator
- Brakes (parking, service, secondary braking system)
- Transmission
- Horn(s)
- Windshield wipers/washer
- Light switches and indicators
- Mirrors

5. Check headlights, signal lights, perimeter lights, and audible warning devices

After completing the interior cab check, inspect the audio devices of the vehicle (air horn, electronic horn, siren). Emergency vehicles can also have a number of independent lighting systems. Each system must be individually inspected. These lighting systems include the following:

- Running, parking, and brake lights
- Turn signals and four-way flashers
- Headlights (low and high beam), and emergency traffic movers (ETMs or WigWags), if so equipped
- Box/patient compartment, scene light or other work area lights
- Emergency strobe light system (intersection, side, and other)
- Emergency flashing light system (front and rear), roof light bar

6. Conduct walk-around inspection

After you have turned off all of the lights, a thorough walk-around inspection should be conducted. Begin at the left front of the vehicle. The inspection can proceed around the vehicle in a clockwise direction (left front, front, right front, right side, etc.). During this inspection the following items should be checked:

- Left front wheel and tire for condition, tread, and inflation, and the left front suspension
- Windshield, wipers, washers (if so equipped), front bumper, appearance and cleanliness of audio devices, lamps and reflectors
- Right front wheel and tire for condition, tread, and inflation, and the right front suspension
- Cab doors and closure, vehicle body, special provisions such as; patient compartment door, equipment and storage compartments and compartment doors
- Right rear wheels and tires for condition, tread, and inflation and the right rear suspension
- Rear patient compartment doors, other body features, lamps and reflectors
- Left rear wheels and tires for condition, tread, and inflation, the left rear suspension, and the fuel fill
- All compartments and cab doors, all closures, vehicle body

7. Check brake system (air brakes)

Get in the vehicle and start the engine. Thoroughly inspect the braking system of the vehicle by completing each of the following steps (if the vehicle is equipped with **hydraulic brakes**, move directly to steps E and F):

A. Test the low-pressure warning signal.

Build up enough air pressure to turn off the low-pressure warning signal. Shut off the engine, but leave the electrical system on. Depress and release (pump) the brake pedal to reduce air pressure. The low air pressure warning system must come on as the pressure drops below 60 psi.

B. Check to ensure that the spring brakes come on automatically.

Chock the wheels of the vehicle, release the parking brake, and shut off the engine. Depress and release (pump) the brake pedal to reduce air pressure. The parking brake knob must pop out when the air pressure falls to the manufacturer's specification. This is usually in the range of 20 psi to 40 psi. The spring brakes should then come on.

C. Check the rate of air pressure buildup.

With the engine off, depress and release (pump) the brakes down to a zero pressure. Start the engine and measure the time it takes for the air brake system to build sufficient pressure so that the emergency vehicle can be moved without brake drag.

A time of more than 30 seconds indicates an unacceptable time frame for a quick buildup system as defined by NFPA.

D. Test the air leakage rate.

With the engine off and a fully charged air system, conduct the following two tests for air leakage:

1. Without the service brakes applied, a loss in one minute of more than 2 psi for single vehicles and 3 psi for combination vehicles indicates an unacceptable rate of leakage.
2. With the service brakes fully applied, a loss in one minute of more than 3 psi for single vehicles and 4 psi for combination vehicles indicates an unacceptable rate of leakage.

Either condition indicates the need for immediate service.

E. Test the parking brake.

Check to ensure that everyone is off the vehicle and that no one is in front of or preparing to get on or under the vehicle. Apply the parking brake and put the vehicle in low gear. Gently apply the accelerator to pull against the parking brake. Make note and report if the parking brake fails to firmly hold the vehicle in place or allows the vehicle to creep.

F. Test the service brakes.

Check to ensure that everyone is off the vehicle and that no one is in front of or preparing to get on or under the vehicle. Wait for normal air pressure to build up, then release the parking brake. Move the vehicle forward slowly (about 5 mph). Firmly apply the brakes. Make note and report if the vehicle pulls, has an unusual feel, or has a delayed stopping action.

G. Check the air brake tank drain(s) (if applicable).

Compressed air may have water and/or compressor oil in it, which may freeze in cold weather and cause brake failure. The water and oil collect in the bottom of the air tank. Moisture in these tanks should be drained using the drain valve found on the bottom of each tank (number and size of tanks vary among vehicles). There are two types:

- **Manually operated** - Turn drain valve one quarter turn or pull cable if equipped.
- **Automatic** - Water and oil are automatically expelled. These tanks may be equipped for manual draining also.

8. Fixed Equipment and Systems

Check all fixed equipment and systems on the vehicle. Types of equipment that need to be checked include:

- Oxygen cylinder lifts
- Radio equipment
- Other pieces of equipment permanently affixed to the vehicle
- Stretchers

All equipment should be operated to make certain it is in a ready state. Any fixed systems such as hydraulic systems need to be checked for operability.

EXERCISE

Have students operate all fixed systems and equipment on the vehicle according to manufacturer's specifications and organizational policies and procedures.



Preventive Maintenance

A preventive maintenance (PM) program for emergency vehicles must be clearly defined and understood. As established in this training course, this is defined as a comprehensive program of regular inspection, adjustment, and/or replenishment. Any vehicle and/or major equipment within an emergency service organization not passing inspection must be repaired or removed from service.

There are numerous benefits associated with a preventive maintenance program for emergency vehicles. Most of these benefits can be grouped into the five primary benefit areas listed below:

- Safety
- Costs
- Operational effectiveness
- Legal liability
- Basis for purchasing decisions

A preventive maintenance program for emergency vehicles is typically divided into three levels of maintenance:

1. _____
2. _____
3. _____

Routine maintenance – Routine maintenance is usually identified as the primary maintenance level for ensuring that emergency vehicles are properly serviced and cared for. It is a very important part of preserving the safety of emergency vehicles. This maintenance should include daily, weekly, and monthly inspections. These inspections should include fluid level, wheels and tires, the electrical systems and devices. The organization should maintain checklists for these inspections. Drivers of the vehicles must be responsible for conducting routine maintenance and completing the applicable documentation. Deficiencies should be repaired or reported in writing to the individual responsible for routine maintenance. The organization should maintain a supply of adequate parts and hand tools to conduct minor repairs related to routine maintenance. A more extensive description of the role of the emergency vehicle driver is addressed later in this section.

Scheduled maintenance – Whether it is completed by operational personnel, including emergency vehicle drivers, or by trained vehicle technicians, scheduled maintenance must be based on a number of variables. These include the manufacturer's recommended schedule, the amount of use the vehicle receives, organizational policy, and current professional standards.

A scheduled maintenance interval should be developed and adopted for each emergency vehicle. However, many agencies group similar type vehicles into one scheduled interval. Most important, a regular schedule must be developed and followed for all emergency vehicles.

How the scheduled interval is selected can be accomplished in a number of ways, and a combination of methods should be considered. These include the hours of operation, mileage, and fuel consumption.

An example of this interval can be found with vehicles that require engine re-generation.

Diesel engines generally build after 2007 have a diesel particulate filter (DPF). This filter is designed to capture the unburned hydrocarbons from the diesel exhaust. These systems may be located in various areas depending upon the manufacturer; however they typically resemble a canister similar to a typical muffler.

As particulate matter (PM) accumulates in the DPF, back pressure begins to increase on the engine. Eventually, it becomes necessary to clear out the accumulated PM to maintain an acceptable level of backpressure. Regeneration is the process of clearing out the built up hydrocarbons from the filter. Refer to your vehicle operator's manual for the regeneration requirements. This process will likely include either an automatic regeneration or stationary regeneration. The basic process is to increase the exhaust temperature enough to burn off the accumulated PM.

Since emergency apparatus rarely run at significant enough loads and/or speeds to achieve the necessary temperatures long enough to clear out the DPF through automatic regeneration, stationary regeneration will likely be necessary on random intervals depending upon the use of the vehicle. A typical stationary regeneration process takes 20 to 45 minutes to complete but may be interrupted if necessary.

A series of lights in the cab of the vehicle will indicate when regeneration is necessary giving the driver adequate warning for when to perform regeneration. The first indication a driver will receive is a solid amber DPF lamp. This indicator is typically set to come on when the DPF reaches its minimum saturation level for regeneration and stationary regeneration should be performed at the earliest opportunity. If the engine is operated further without regeneration, the next phase of warning is a flashing amber DPF lamp, followed by the check-engine lamp, and finally the stop-engine lamp. If the lamps are ignored, regeneration by the operator will not be possible and the engine performance will decrease or even fail. These warning phases occur during the course of several hours and will vary slightly from one engine manufacturer to another.

CAUTION: exhaust is extremely hot during the regeneration process. ESOs should adopt SOP's/SOG's for the regeneration process which should include securing the area around the exhaust with traffic cones or some other warning device during stationary regeneration.

Crisis maintenance – Also referred to as repair, corrective maintenance must occur even with the most aggressive preventive maintenance program in place. An effective maintenance program identifies corrective maintenance by a variety of categories. A grouping preferred by many emergency service organizations involves scheduling corrective maintenance by the classification of the item requiring repair. There are three common classifications of corrective maintenance:

1. Classification "A" (immediate)

This category of corrective maintenance includes all items that require removing the vehicle from service immediately, such as a wheel showing signs of lubricant being thrown. Following organizational guidelines this classification typically includes safety items, items that incapacitate the vehicle, or items to be added to the vehicle to expand its potential services.

2. Classification "B" (as soon as possible)

This category of corrective maintenance includes items that are important and require prompt attention. However, they do not require removing the vehicle from service. A vehicle requiring a move up in its scheduled preventive maintenance because of operating in severe environments such as excessive dust or high water would also require prompt attention.

Another consideration in classifying corrective maintenance is repair delays. If a repair is left unattended for any significant time (more than one or two days), it will or can cause more extensive damage to the vehicle or one of its major systems.

3. Classification "C" (with next PM)

This category includes items that should be corrected, but can be addressed at the next regularly scheduled

PM. It is also the classification that seems to most often fall through the cracks. It is essential that an accurate recording system be maintained so that a vehicle log accompanies each vehicle to its next scheduled PM. Examples of this maintenance classification might include the repetitive replacement of a light bulb, which may indicate a short. Upholstery tears or rips, a burned-out rocker switch light, and the minor dripping of fluid from a vehicle component are other classification C examples.

Role of the Emergency Vehicle Driver

The emergency service organization must identify the role of the driver in the inspection and preventive maintenance program. While most operational crews are not trained nor equipped to undertake major work, most organizations assign some maintenance responsibilities to the driver. The organization should maintain checklists for these types of inspections and routine maintenance functions. Deficiencies should be repaired or reported in writing to the individual responsible for routine maintenance.

As this relates to the preventive maintenance function, NFPA specifically states that the driver/operator shall be able to “perform routine tests, inspections, and servicing functions on the specified systems and components ... so that the operational status of the vehicle is verified.”

List the systems and components identified in NFPA 1002 below along with specific items for consideration:

- Battery(s)
 - correct fluid level
 - connections tight/clean
 - battery box/compartment clean and secure
- Braking system
 - pressure prior to starting engine (air)
 - build-up time, if appropriate (air)
- ABS verification (dash light)
 - braking operation (during runs as well as at inspection time)
 - brake pedal (hydraulic)
 - moisture in system
- Coolant system
 - incorrect level
 - hoses and/or connections wear/leaks
- Electrical system
 - all lights and audio devices operating
 - voltmeter reading
- Fuel
 - correct level
 - check any power equipment levels (if applicable)
- Hydraulic fluid
 - verify number and location of check points for systems on vehicle
 - leaks (check floor under vehicle and areas around hoses and connections)
 - correct levels
 - cleanliness
- Lubrication
 - leaks (check floor under vehicle)
 - grease thrown (engine compartment, undercarriage, wheels and tires)
- Oil (Engine)
 - leaks (check floor under vehicle)
 - correct level
 - cleanliness
- Tires
 - condition (sidewalls, rims, tread, road hazards)
 - correct inflation pressure
- Steering system
 - ease of operation (power okay, no extra play)

- correct level of fluid
- power equipment starts easily and runs properly
- Belts
 - tightness
 - appearance and feel (wear)
- Tools, appliances, and equipment
 - inventory on vehicle
 - critical equipment checked for operational integrity
 - power equipment starts easily and runs properly

CAAS 203.02.01 lists the following as systems and components, in addition to manufacturer recommending as a daily inspection.

- Fluid Levels
- Brakes
- Lights
- Tires

In addition to the inspection and performance of routine maintenance as described in the organizational policy, the emergency vehicle driver is responsible for three other very important vehicle maintenance functions.

1. Documenting the need for maintenance on the assigned vehicle
2. Verifying that the requested and needed maintenance was performed and documented
3. Following established organizational guidelines for taking the vehicle out of service

Out-of-Service Criteria

NFPA 1911 addresses all conditions that would qualify for putting a vehicle out-of-service along with means of identifying what condition has met the criteria for being put out-of-service.

To place a vehicle out of service, post a sign outside the driver's door and place a special bag over the steering wheel. Any components that are put out of service should be noted by a distinctive colored sign located on the inside of the driver's door identifying which component is out of service.

All areas of the vehicle should be checked for any condition that warrants putting the vehicle out of service. Areas to pay particular attention to are:

- Driving and crew area
- Chassis, suspension driveline, wheels and axles
- Engine systems
- Engine cooling systems
- Transmission and clutch
- Electrical systems
- Braking systems

Recordkeeping

Because the potential for lawsuits and other legal actions is great, maintaining detailed and current emergency vehicle records is essential. There are two primary sets of records that should be maintained for emergency vehicles. They are maintenance records and operational records.

1. Maintenance records – All inspections and preventive maintenance efforts (including repairs and malfunctions) should be documented and a permanent record kept during the life of the vehicle. The record should consist of two components, a vehicle log and a maintenance file. Another type of record that should also be utilized by the organization is a work order or work request form. Emergency vehicle drivers should ensure that they complete each work order form thoroughly and completely.

The maintenance file should be very detailed and identify exactly what work was performed and which parts were repaired and or replaced. Statements such as “repaired brakes” or “checked and corrected hydraulic system” should not be used. They are too general and give no indication of the extent and nature

of the problem or the work accomplished. In the event that the vehicle is the subject of an investigation or a lawsuit due to a malfunction or a collision, both the vehicle log and the permanent maintenance file become extremely valuable records for both the emergency vehicle driver and the organization.

2. Operational records – The vehicle log, which may either be a paper or electronic document, should accompany the emergency vehicle and be readily accessible at all times. It is not the type of record that is documented at the time of maintenance or maintained by administration. The vehicle log should be maintained by the vehicle driver(s). Every routine maintenance action, regardless of how simple or complex, routine or unusual, and all preventive maintenance activity should be carefully recorded and maintained. Essentially, the vehicle log is a vehicle diary. It becomes a very important communication record between drivers of the same vehicle, and between drivers and vehicle technicians performing maintenance on the vehicle.

EXERCISE:

1. Instructor should demonstrate how a pre-trip inspection should be done.
2. Hand out vehicle checklists, and have participants each demonstrate a pre-trip inspection. If the organization does not have a pre-trip inspection checklist, the form included in the resources folder on the thumbdrive may be printed and used. Follow the organization's policy on documenting needed maintenance and out-of-service procedures.



Module X

EMERGENCY VEHICLE COMPETENCY COURSE

Module X Goal

The goal is to provide emergency vehicle operators with the skills to safely and efficiently operate emergency vehicles.

Module X Objectives

Successful participants will be able to:

1. Discuss the purpose of successfully completing a competency course as a component of a program for training emergency vehicle drivers.
2. List the specific skills associated with the competency course and their relationship to operating an emergency vehicle.
3. Describe the importance of safe operations by way of specific safety precautions when participating in a competency course as part of training for emergency vehicle drivers.
4. Explain the method used to evaluate an emergency vehicle driver's performance on the competency course and over the road.

Emergency Vehicle Competency Course

Purpose of Course

The competency course is designed to fulfill several purposes. The course is designed and intended to:

- Assist in the training of a candidate driver
- Qualify a candidate for street and highway driving
- Verify the competency of an existing driver
- Examine the proficiency of an existing driver

By establishing and maintaining a permanent record, the training officials of an organization can chart the progress of an individual over a period of time and/or verify the proficiency of an experienced driver. A candidate should undertake the competency course after successfully completing the written test, following classroom instruction and prior to any street and highway driving.

The course measures a driver's skill, knowledge, and judgment. It can also identify the limitations of an emergency vehicle while negotiating specific exercises or stations. The course, as included in this program, exceeds the driving tests described in the NFPA 1002 standard entitled Fire Department Vehicle Driver/Operator Professional Qualifications.

Driving the course requires completing each station under ideal conditions in a controlled environment. Actual driving conditions represent less than ideal conditions because of constantly changing situations. Specific performance criteria that are critical to achieving proficiency while completing the competency course include:

- Comfortable seating position
- Ease and convenience for reaching all essential vehicle controls
- Proper hand position on the steering wheel
- Careful vehicle control
- Precise steering adjustments
- Consistent vehicle speed
- Proper adjustment and effective use of vehicle mirrors

It should be emphasized that more is required than just successful completion of the competency course. It must be supplemented by other exercises including supervised/observed street and highway driving to fully comply with either NFPA 1002 recommended provisions or with NHTSA's National Standard Curriculum for Emergency Vehicles – Ambulance (Module C - Ambulance Operator Internship). A copy of the candidate's successful written test and competency course score sheet should be placed in his/her training file.

Emphasis on Safety

The competency course is a low-speed, behind-the-wheel, practical exercise that must be successfully completed by an emergency vehicle driver candidate prior to undertaking any over-the-road driving. Even with the use of low speeds, extreme caution should be exercised to ensure that there are no injuries to either the drivers or personnel operating the course. Specific safety recommendations for operating the competency course include the following:

1. One individual should be assigned exclusively to be the course safety officer. This individual should not be assigned any other duties and should devote his/her full attention to maintaining a safe course for all participants. The safety officer should also be watching for intrusion by unauthorized individuals if the training area cannot be secured from civilians.
2. A driver briefing should be held prior to a course walk-through to cover all driver rules.
3. All authorized personnel on the course should be clearly identified and visible. It is recommended that all personnel wear reflective traffic or command vests.

4. Only those personnel with a specific assignment should be permitted on the course when it is in operation. This would include the primary instructor, the course safety officer, and any designated spotters or scorers.
5. The instructor(s), primary scorers, and the designated safety officer(s) shall have radio communications with all vehicles on the course, preferably on a non-emergency frequency (training zone, etc.). An emergency "Stop-Stop-Stop" or similar code should be developed. If this signal is given, all vehicles must immediately stop until the intrusion or problem has been resolved.
6. The instructor or the safety officer can designate a vehicle as unsafe and deny such vehicle the right to travel the course.
7. Any vehicular or equipment malfunctions must be reported promptly to the course safety officer. A pre-trip safety inspection should be done prior to moving vehicles.
8. Only one vehicle should utilize the course at any time.
9. A second person must accompany the driver in the cab of the emergency vehicle. The purpose of the second individual is to act as another pair of eyes and ears for the driver and to serve as an on-board safety officer and radio operator, as well as observe the candidate.
10. All personnel in the vehicle shall be seated in an approved occupant seat and wear seat belts while on the course.
11. Eating, drinking and smoking are not permitted by any vehicle occupant while on the course.
12. The maximum speed on the course at any time is 15 mph.
13. All emergency vehicles on the course must operate with their headlights on.
14. No vehicle should begin the course until given the signal to proceed by the course safety officer.

Completion and Scoring of Competency Course Performance

The competency course consists of eight stations or exercises. They are designed to familiarize the driver with general vehicle maneuvering techniques and the specific characteristics of the vehicle. It is recommended that any candidate complete the classroom and written examination portions of the Emergency Medical Services Vehicle Operations Program prior to attempting to complete the competency course. Each driver must provide a valid driver's license prior to beginning the course.

Successful completion of the competency course may require multiple attempts by a driver operating a familiar vehicle. New candidates who have never operated large vehicles or any emergency vehicles may require considerably more practice prior to successfully completing the course. Successful completion of the course requires a driver to negotiate each exercise or station as directed without striking any cones or crossing any lines on the course.

Though speed should not be encouraged through the course, it is suggested that the course be completed within the stated time as follows:

Wheelbase	Suggested time to complete competency course
Vehicles < 170"	8 minutes
Vehicles 170" – 220"	9 minutes
Vehicles > 220"	10 minutes

Failure to make the allotted time shows the lack of proficiency in the vehicle, and remedial training is recommended.

Scoring is based on a point system. Brushing or knocking over a cone, crossing a control line, parking too far from the curb, and failing to stop within the prescribed measured distance at certain stations all result in penalty points for the driver. To successfully complete the competency course, a driver must travel the course within a reasonable time frame and receive no penalty points. The penalty point schedule is summarized on the following table:

Violation	Penalty points awarded
Each cone brushed, moved, or overturned	10 points
Crossing any line, each time crossed	3 points
Parking 12" or more from the curb (offset backing/parallel parking)	3 points
Stopping 18" or more from, or going past, the measured point	10 points

Over-the-Road Evaluation

An over the road evaluation should be performed after the driver has completed the classroom session, testing, shown proficiency on the competency course, and completed the observed street and highway driving as required by the AHJ.

There are specific maneuvers that must be mastered as part of the over-the-road driving portion of an Emergency Medical Services Vehicle Operations Program. This over-the-road portion should also include certain features, and it should be accomplished along a predetermined route on public roadways. The following maneuvers and features should be included:

1. Four left turns and four right turns
2. A straight section of urban business street or a two-lane rural road at least 1.6 km (1 mile) in length
3. One through-intersection and two intersections where a stop has to be made
4. One railroad crossing
5. One curve, either left or right
6. A section of limited-access highway that includes a conventional ramp entrance and exit and a section of road long enough to allow two lane changes
7. A downgrade steep enough and long enough to require down-shifting and braking
8. An upgrade steep enough and long enough to require gear changing to maintain speed
9. One underpass or a low clearance or bridge
10. Any other unusual or unique roadways or features that present special consideration in the operation of the emergency vehicle.

The street and highway portion of the Emergency Medical Services Vehicle Operations Program should include, at a minimum, ten hours of actual supervised/observed operation of the vehicle. The candidate must demonstrate proficiency in all aspects of the street and highway driving activities. Each session should be documented using a standard form (one such form is available on the VFIS website) and should be added to the candidate's training file. An evaluation drive (final drive) may be conducted, and a street and highway driving evaluation form should be placed in his/her training file. Sample forms are available in Appendix Four and in the instructor's resource kit.

Annual driver training shall include hands-on exercises, (excluding virtual reality driver training simulators), using an actual emergency vehicle.

Appendix One

Instructors' Supplement

COMMUNICATIONS AND THE EMERGENCY VEHICLE OPERATOR

Objectives

Successful participants will be able to:

1. Explain the emergency vehicle operator's roles and responsibilities involving communications.
2. Identify the emergency vehicle operator's role in receiving messages.
3. Identify the emergency vehicle operator's role in transmitting messages.
4. Demonstrate the proper communications used by emergency vehicle operators, including hand signals and radio etiquette.

Communications

Importance of Communications

How many times have we heard communication is the most important thing we do? Communications related to effectively operating an emergency vehicle are no exception. When you communicate you are allowing others to know where you are, what you are doing, and what they can expect from you. We are all too quick to blame others for misunderstandings or confusion, when in fact we may not have communicated our desire or intent efficiently and effectively.

The roles and functions associated with emergency services are closely tied to effective communications. That communication begins with an event that warrants a request for service. In the mind of the individual requesting service, that event is an emergency. The call is received by a dispatch center. The center screens the call according to protocols, then dispatches the appropriate equipment to the incident.

As anyone with experience in the emergency service field knows, service providers do not always receive completely accurate information. Often wrong address or inaccurate portrayals of emergency situations are received in initial dispatches. Although misinformation can waste valuable time, it is important for the emergency responder to understand that a dispatcher can only transmit information received from the caller.

Communication Responsibilities

The entire crew is responsible for communications involving their vehicle, and individual specific responsibilities. Teamwork is essential. For personnel, understanding each others' expectations is vital in responding successfully to a call. Emergency responders must be able to communicate effectively.

There are various points of any response during which reporting is a normal requirement. They include:

- Pre-response
- When dispatched on a response
- Enroute to destination
- Upon arrival
- At patient/incident scene
- Incident coordination
- Arrival at destination
- Available/in-service

Pre-Response

Prior to any response it is imperative that you assure that the equipment is checked and ready for use. Assess the on-board equipment as part of the routine daily vehicle check, examine the portable radios for battery power, and document all findings. Relay this information to the dispatch center so they know the status of your vehicle.

Dispatched on a Response

Critical Information:

- Address (location)
- Nature of call

Prior to leaving the station or starting point, be sure of the address and the safest route to reach the incident. If necessary, the passenger in the cab should be checking the location in a map book of the area. The map or grid book is an important resource for all organizations to have on their vehicles. This individual should also be operating the radio. Dispatch should also notify the crew of any route problems that may be encountered on the way to the call destination. For example, the emergency response crew should be made aware of major construction activities, parades, or other potential route interruptions. Such awareness is essential for a safe response. In turn, communication of any findings encountered en route to the call is imperative, especially if there are additional vehicles that may be responding via the same route.

The dispatch center should acknowledge pre-arrival instructions and response mode advised as per the local protocol. Any information regarding hazards should be relayed to the vehicles responding. For example the emergency response crew should be made aware of a domestic situation where vehicles and personnel need to stage until law enforcement secures the scene, a vehicle accident involving hazardous materials, or a vehicle accident involving multiple vehicles and patients.

Upon Arrival

When arriving at the incident, provide dispatch with a prompt eyewitness assessment of the scene. This will aid incoming vehicles in preparing prior to arrival. If you are the first arriving vehicle, give as much information as quickly as possible. The following are two example of such assessments:

“Ambulance four-two is on scene; car versus pickup truck. There is heavy damage; occupants still in vehicles, ambulance four-two investigating.”

These examples give an accurate picture of the incident, equipment on the scene, and what is being done. It is important for agencies to establish written SOPs/SOGs for labeling of building sides, how incident command is to be established, and what your agency wants established as an incident size-up.

At Patient/Incident Scene There are a number of times that you may arrive at a medical call scene, yet the patient is on the fifth floor of a high-rise or on the other side of a 200,000-square-foot factory. The on-scene time does not adequately reflect the time when aid reaches the patient. The “at-patient” time is noted when the patient is reached.

Incident Coordination

During the time spent at an incident, accurate and concise communication is essential. This will help other responders and dispatch personnel to gain an understanding of what the crew is encountering. It is important that incident command be established whether it is a small incident or major incident. The small incidents will allow practice of the incident command structure for when a major event occurs.

Enroute to Destination

Notify dispatch upon departure for the incident scene, medical facility or destination. Dispatch should also notify the crew of any medical facilities not accepting patients.

Arrival at Destination

When arriving at the destination, notify dispatch that you have successfully arrived at the intended destination.

Available/In-Service

As soon as possible after completion of the call, prepare your vehicle for the next response and notify dispatch when it is available.

Personnel

There are various personnel who are involved in a successful safe response. These include:

- Crew chief/officer
- Dispatcher
- Receiving facility
- Driver/operator
- Medical director

Crew Chief/Officer

The crew chief's/officer's responsibility is overall incident control. This is also the person responsible for radio communications. The crew chief/officer can be an additional set of eyes and ears for the driver/operator. The driver/operator may not see or hear a hazardous condition during the response or operation of the vehicle. The crew chief/officer must not assume that the driver/operator sees or hears everything, and must warn of what he/she sees and hears.

Driver/Operator

The driver/operator should not be responsible for radio communications, especially when the vehicle is in motion. The driver's/operator's main concern is to get from point 'A' to point 'B' in a safe manner. The driver/operator cannot maintain two hands on the steering wheel as advocated in this program if he/she is using one hand to operate a microphone.

Dispatcher

Dispatchers have one of the more important roles in the whole communications aspect of a response. They are intimately involved from the beginning to the end. They initially need to obtain the appropriate information from the caller, send the proper vehicles to the proper location, and monitor the call until it is complete. They will need to assist crews in making contacts to other services and agencies as requested. This may include utility companies or medical receiving facilities. The dispatcher is the hub that keeps the communications wheel turning. Accurate information from him/her may often lead to a reduced response level.

Medical Director Many systems require their EMS personnel to establish communications with the medical director for additional medication or advanced orders. In these situations radio operators need to paint a vivid picture of what they are seeing, feeling, hearing, and smelling with regard to the patient.

Receiving Facility

The medical facility needs to be alerted that a patient is en route to its facility. In most instances, facility personnel are only interested in the overall summary of the patient. With staff cuts and patient loads increasing, they are not interested in a long explanation of the patient findings. The following is an example of such an overall summary:

“This is Ambulance 456 en route to your location with a 56-year-old male with a possible fractured ankle; vitals are stable, leg is splinted, and ETA is 5 minutes.”

Wait for the receiving facility to acknowledge before clearing the channel, and remember that local protocol governs the actions of the crew and needs to be followed.

Radio Communications

Radio Frequencies

Agencies use a variety of frequencies to communicate. It is essential to know the frequencies of agencies in your community and surrounding communities. You need to know the frequencies in your radio, their designations, and protocols for their use. If you respond to an area for which you do not have the designated frequency, you will need to rely on your dispatch center to relay the information. This is not always the best method. Relays add to the normal call volume for dispatch, and direct communication is always best to avoid miscommunications.

Headsets

Protecting crews from loss of hearing has become a priority for safety. There are a number of regulations and standards, including NFPA 1500, that recommend that personnel wear hearing protection when responding with sirens. Headsets protect crews from hearing loss, and they allow personnel to communicate in the vehicle. There are some restrictions on the use of these devices in different states. The driver of the vehicle may be most affected by these rules. You need to check on your state's laws governing the use of headsets while operating a motor vehicle.

Mobile versus Portable Radios

It is important to remember the capabilities of your device when transmitting. A mobile device can transmit over a longer distance than a portable radio. Most systems have placed fixed repeaters throughout their service area, but there are areas where communication may be impossible due to dead spots. Dead spots are areas where radio signals cannot be transmitted. Typically, dead spots are related to certain buildings or geographical locations. A repeater may be of value in these situations. A repeater is a device that receives a transmission from a low-power portable or mobile radio on one frequency and re-transmits it at a higher power on another frequency.

Other Communication Devices

There are a variety of other communication devices utilized in the emergency services industry. Mobile Data Terminals (MDT's) and various computer/tablet software systems allow responders to access CAD data directly to and from the dispatch center. This allows minimal verbal radio communications. Smart phones have become very popular and may be used by agencies. You still need to use caution when using these devices, and by no means should the driver of the vehicle be utilizing the cellular phone while the vehicle is in motion.

Radio Etiquette

Most radio communications can be heard by anyone who has a radio with that frequency. An SOG needs to be in place governing radio communications. Confidentiality is essential for patients. Off-the-wall comments are not appropriate at any time, and when transmitted across the radio, everyone with a radio could hear the comment. Restrict conversations to that which is necessary and professional. Think about what you are going to say before you say it. Remember to identify your unit designation and who you are calling. Keep your transmissions brief and to the point. Use plain English and speak distinctly and clearly. The following table shows a listing of plain English used in radio communications.

Use	Instead of
Affirmative	Yes or yea
Negative	No or nay
Four-two	Forty-two
One-four	Fourteen

Always confirm by repeating the message back to the person sending the message, especially if there is any doubt as to what they are trying to say. When spelling words, use the phonetic alphabet.

A- Alpha	N- November
B- Bravo	O- Oscar
C- Charlie	P- Papa
D- Delta	Q- Quebec
E- Echo	R- Romeo
F- Foxtrot	S- Sierra
G- Golf	T- Tango
H- Hotel	U- Uniform
I- India	V- Victor
J- Juliet	W- Whiskey
K- Kilo	X- X-ray
L- Lima	Y- Yankee
M- Mike	Z- Zulu

Some organizations like to use ten-code or a special collection of codes to communicate. Many organizations are trying to get away from the ten-codes and limit the number of special codes used. Many have changed to plain text. Codes can be difficult to remember, and the wrong code could be transmitted, resulting in the wrong response. Examples of some codes may include:

Signal 7	Death
Code H	Crew in Trouble
Code B	Bomb Threat

How to Use the Radio Equipment

There are some standard rules you should use when speaking on the radio.

- Listen to the channel before transmitting to assure that it is not in use.
- Press the transmit button for one second before speaking.
- Speak at close range, approximately two inches, directly into, or across the face, of the microphone.
- Speak slowly and clearly. Pronounce each word distinctly, avoiding words that are difficult to understand.
- Speak in a normal pitch, keeping your voice free of emotion.
- Be brief; do not waste airtime with unnecessary information.
- Know what you are going to say before you press the transmit button.

Hand Signals

The hand signals as illustrated in Appendix Two are drawn from Appendix B, "Interpreting Hand Signals," of the Emergency Vehicle Operator Course - AMBULANCE as published by the NHTSA of the U.S. Department of Transportation. These hand signals are generally accepted as standard in the United States and most foreign countries for both ground and air transportation employees. A set of hand signals should be adopted by your agency.

Summary

Your first priority as an emergency vehicle operator is to operate the vehicle in a safe manner. The crew chief/officer in the passenger seat should be using the radio when you are driving. The dispatcher is the hub that keeps the communications wheel turning. Spend a day in the communications center to understand their side of the communications process. It is imperative to know the address of the call and have pre-planned a safe route to respond prior to leaving the station. Limit your radio transmission to what is necessary and professional. You do not know who may be listening.

Appendix Two

INTERPRETING HAND SIGNALS

Objectives

Successful participants will be able to:

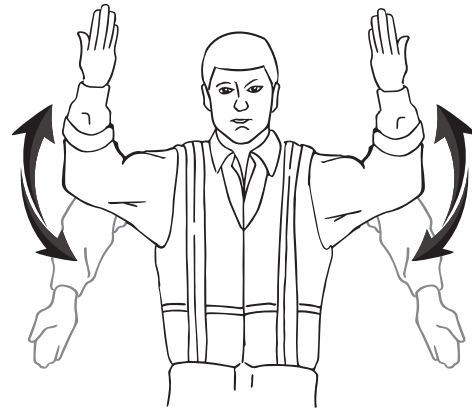
1. Identify the hand signals used during day and night operations.
2. Demonstrate the proper hand positions for each hand signal.

Signal One: Proceed Slowly Backing



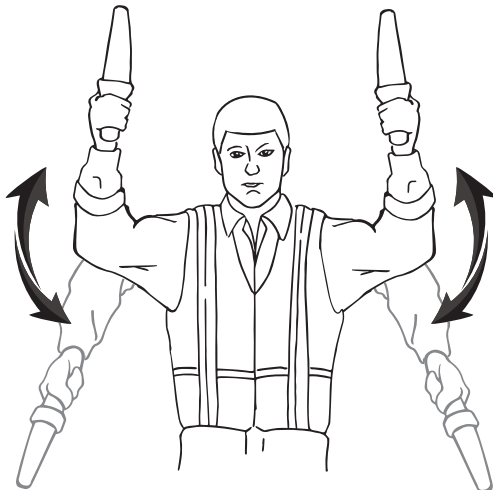
Day

Palms facing the directions of desired travel, bend both arms repeatedly toward the head and above the chest, and then extend.



Night

When using conventional flashlights, repeatedly direct lights forward and then back toward the head and above the chest.



Signal Two: Turn Right



Day

Facing the vehicle, raise left arm to side, bending at the elbow. Face palm outward and move hand to right.



Night

When using conventional flashlights, direct light in right hand in the direction of desired travel.



Signal Three: Turn Left



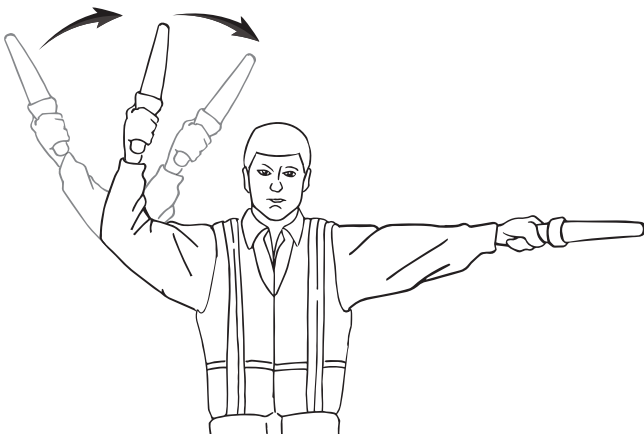
Day

Facing the vehicle, raise right arm to side, bending at the elbow. Face palm outward and move hand to left.



Night

When using conventional flashlights, direct light in left hand in the direction of desired travel.

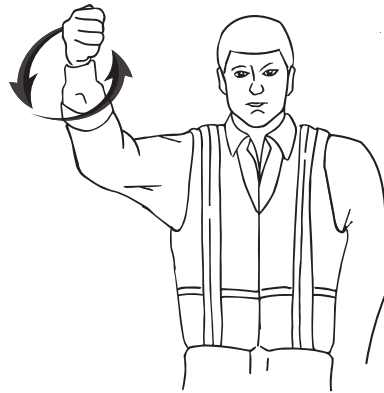


Signal Four: Increase Speed



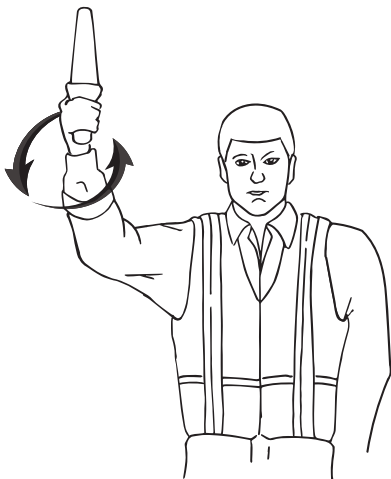
Day

Extend right arm above with a closed fist, palm forward. Move wrist in circular motion in front of body.



Night

When using conventional flashlights, direct light in right hand in a small circular motion at the wrist.

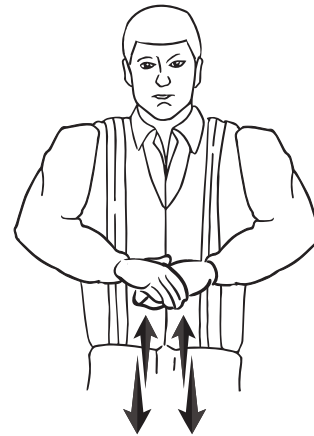


Signal Five: Slow Down



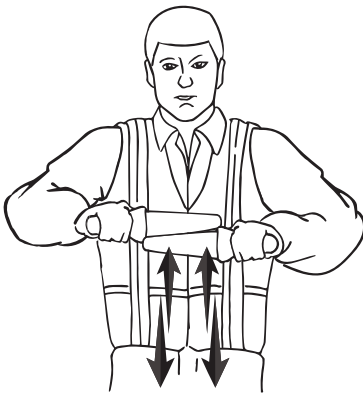
Day

Turn palms facing downward with thumbs toward body at waist level. Move hands down and up.



Night

When using conventional flashlights, direct lights down and up at waist level.

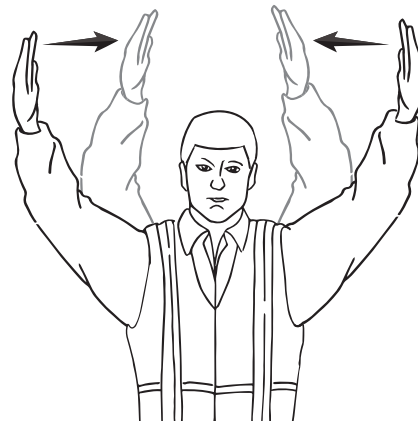


Signal Six: Distance to Stop



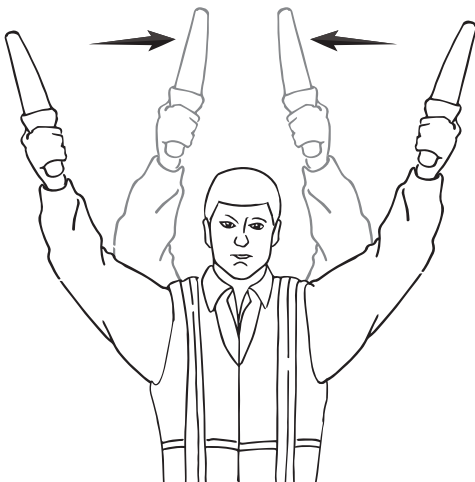
Day

Begin with arms stretched out palms facing each other. Turn elbows forward and bring hands together above your head as the driver gets closer to the stop.



Night

Begin with lights stretched apart above head. Bring lights together as the driver gets closer to the stop.



Signal Seven: Stop or Halt



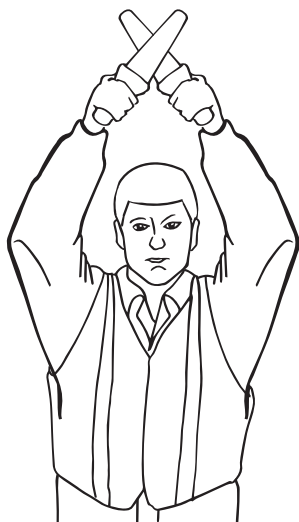
Day

Extend arms above head,
cross hands at the wrists.



Night

Extend lights above head, cross
cones or lamps and hold.

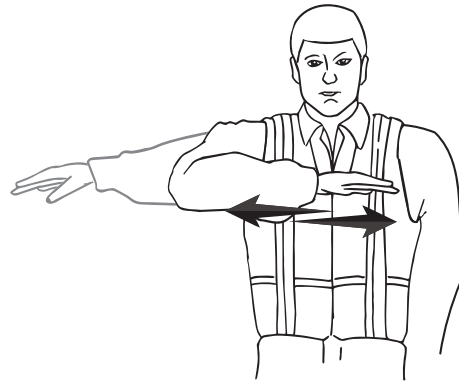


Signal Eight: Turn Off Engine



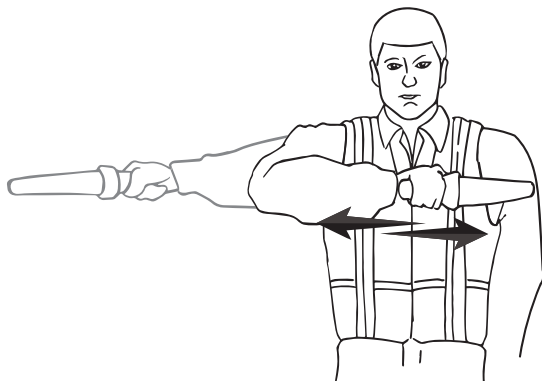
Day

Place right hand above chest level, with elbow at side, and palm facing downward. Move hand from right to left.



Night

When using conventional flashlights, direct light in right hand forward.



Appendix Three

COMPETENCY COURSE REQUIREMENTS

Objectives

Successful participants will be able to:

1. Recognize the importance of safety and specific safety precautions during the set up and operation of the course.
2. Verify drivers proficiency through successful completion of the competency course requirements to qualify them to move to the next phase: street and highway driving.
3. Verify that the student meets the requirements established by the Authority Having Jurisdiction (AHJ).
4. Instructor's shall demonstrate proficiency in the set-up and operation of the competency course.

Competency Course Requirements

While the optimum layout involves an open paved area approximately 300 feet by 300 feet, a variety of course layouts may be used. In addition to having a level paved area without obstructions and of sufficient size and shape for course layout, the following materials (or usable substitutes) are required to deliver this phase of the program:

1. **Clipboard and Scoring Sheets** - Supply a sufficient number of scoring sheets (minimum of one per participant). A clipboard or other portable writing surface is also required.
2. **Stopwatch** - A stopwatch is used to monitor each vehicle's time. A wristwatch with a second hand or digital second display may be substituted in lieu of a stopwatch.
3. **Reflective Vests** - At least three (3) vests shall be available: one for the instructor/grader; and one for each of the station/course spotters. Everyone on the course shall wear a reflective vest. A minimum of two spotters is recommended. If personnel and vests are available, one spotter per two stations - a total of four (4) spotters (in addition to the instructor/grader) is optimal.
4. **Tape Measure** - A 20' or 25' foot tape measure is required. It is utilized to measure each vehicle's wheelbase and length. This is to ensure that the course is set appropriately for each vehicle. Portions of the course also require additional measuring.
5. **Measuring Wheel** - A measuring wheel (or a 100' foot tape measure) is necessary to properly lay out the course and individual stations.
6. **Chalk or Carpenter's Crayon** - Several pieces of surveyor's chalk are needed. One of the many uses includes marking the location of the traffic cones at each station. The course layout may be permanently marked with spray paint, if the location is one that will be used repeatedly.
7. **Ball of String** - A ball of string of at least one hundred feet (100') (200' is more appropriate) shall be available for properly aligning the cones along many of the stations.
8. **Traffic Cones** - If the course follows the layout on the diagram in this manual, a total of 120 cones is optimally needed: 100 red or orange; and, 20 yellow or another contrasting color. If absolutely necessary the course may be constructed with a minimum of 80 cones. However, the layout is more effective if 100 to 120 cones are utilized. If you do not have contrasting cones, designate all entrances and exits by double cones or another method.

Competency Course Scoring

A copy of the competency course scoresheet is provided on the following pages. It can be copied and used to record the scores of the participants as they complete the exercises. It is noted that scoring for up to six "runs" is provided on each individual scoresheet. It is again emphasized that time on the course is not critical except that a driver traversing the course should keep the vehicle moving at an appropriate speed. Instructors should not use time to measure a driver's competency.

Competency Course Arrangement

One option is a linear arrangement along "normal" residential or commercial streets if this can be safely arranged. It must be emphasized that any arrangement is acceptable if it allows each of the stations to be set up as described and the overall course requirements are achieved. Since there is no specific timing requirement, the individual stations of the course may be dispersed as necessary.

If the vehicle being used is longer or wider than the width of a station, the station should be adjusted for the vehicle in order to achieve the intended learning objective for that station.

COMPETENCY COURSE SCORESHEET

The competency course is designed to measure driver proficiency in handling emergency vehicles. It is one portion of a four-part comprehensive Emergency Medical Services Vehicle Operations Program and should be utilized with the overall program. Through its use, the progress of each emergency vehicle driver can be measured over a period of time. The competency course is designed to duplicate eight situations in which the driver's skill, judgment, and knowledge of the limitations of the emergency vehicle are required for effective maneuvering. This course is based on Appendix A of the NFPA #1002 publication entitled *Fire Department Vehicle Driver/Operator Professional Qualifications*. See other side for course layout schematic.

Driver: _____ Vehicle: _____

Wheelbase: _____ Overall Vehicle Length: _____

Date: _____

Instructor: _____ Safety Officer: _____

Scoring of Competency Course

Time is only applied as acceptable or unacceptable (too slow). There should be no time comparisons between drivers, and it is recommended that actual times be recorded by the instructor only for the purpose of measuring a driver's individual improvement. Penalty points are awarded as follows:

Penalty Point Schedule		
Station	Error	Penalty
No. 1 - 8	All	Each cone brushed, moved or overturned..... 10 points
		Cross any line, each time crossed 3 points
No. 3 and 8	Alley Dock and Stop Exercise	Stopping 18" or more from, or go past, the measured point..... 10 points
No. 6	Offset Backing/ Parallel Park	Parking 12" or more from the curb 3 points

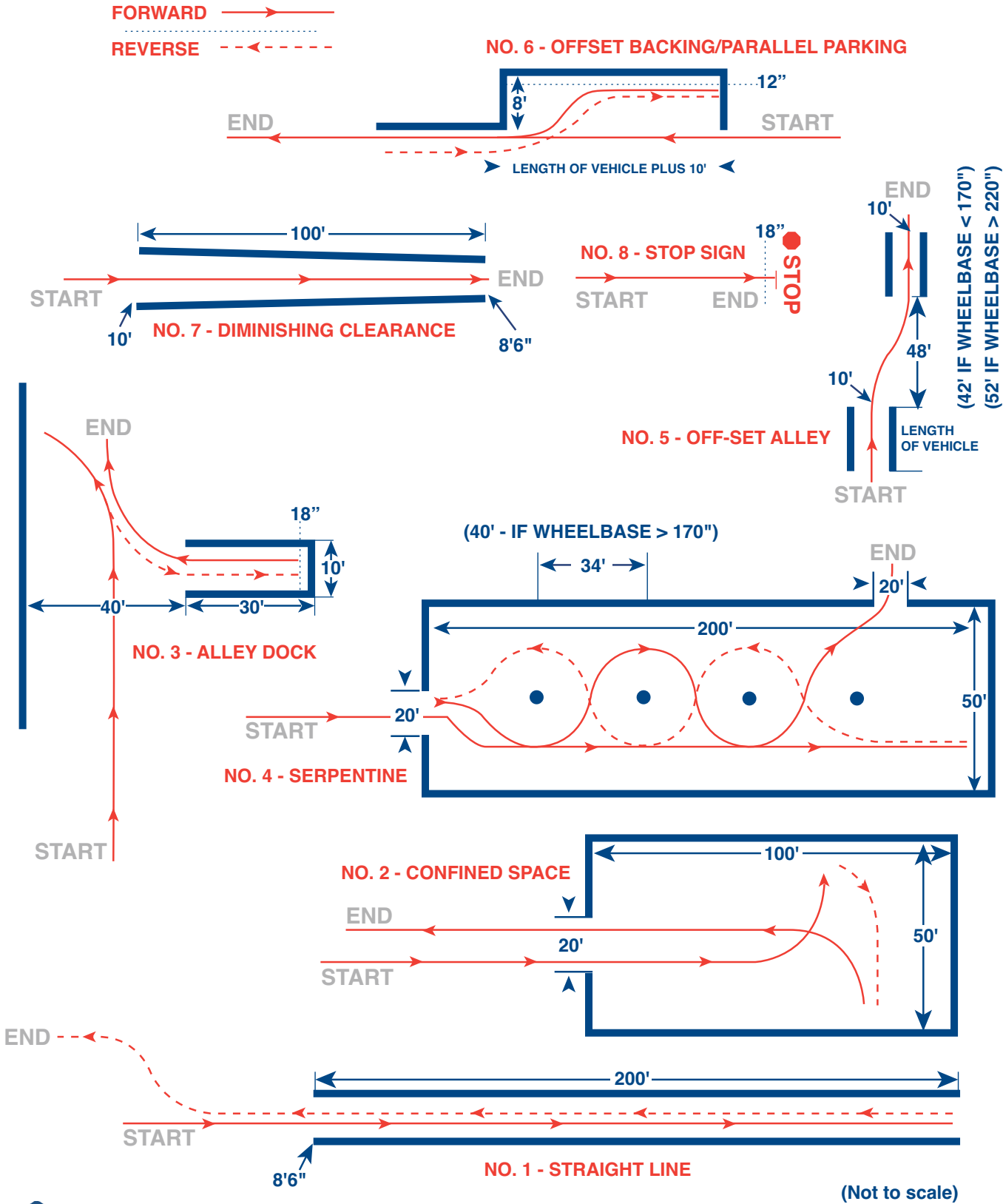
Completion and Scoring Record - Competency Course

Driving Time	Course Station #								Total Penalty Pts	Scorekeeper's Initials
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8		
Run 1										
Run 2										
Run 3										
Run 4										
Run 5										
Run 6										

Remarks: _____

WHEEL BASE	MAXIMUM TIME TO COMPLETE COMPETENCY COURSE
Vehicles < 170"	8 Minutes
Vehicles 170" - 220"	9 Minutes
Vehicles > 220"	10 Minutes

Competency Course



For more information, see instructor's guide and video.

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Competency Course Description (8 stations)

Station One - Straight Line Exercise

The purposes of the straight line exercise are to:

1. Familiarize the emergency vehicle driver with operating the vehicle within close quarters both in forward and reverse directions at a steady speed.
2. Enable the driver to adjust the mirrors for proper viewing, make minor adjustments in steering, and gain confidence in traversing a restricted area.

This exercise is typically the first station on the competency course. It is eight feet, six inches (8'-6") in width, measured from inside edge of cone to inside edge of cone. It is two hundred feet (200') in length. If space for the course is critical, the length of the station may be shortened to one hundred feet (100'). Intermediate cones along the sides of the exercise are usually set at intervals of twenty feet (20'). However, the space may be extended to twenty-five feet (25').

The exercise begins upon entering the straight line at the entrance. The driver travels through the exercise by "hugging" the left side, stopping at the end of the station, and backing out of the line without brushing or knocking over any cones.

Station Two - Confined Space Turnaround Exercise

The purposes of the confined space turnaround exercise are:

1. To allow the driver to become familiar with the turning radius of the vehicle.
2. To permit the driver to interpret depth perception involving the placement of the rear of the vehicle as seen through the vehicle's mirrors.

Setting up this station requires an area fifty feet (50') wide by approximately one hundred feet (100') long, with the width being the critical dimension. Often one side of the exercise is placed directly against the straight line station reducing the number of cones required. Again, intermediate cones are spaced at twenty-five foot (25') intervals with the entrance being centered on the fifty feet (50') side of the station. If space is limited the width of the station, may be reduced; however, the width should not be less than the length of the largest vehicle plus ten feet (10').

The driver begins the station by entering and proceeding diagonally toward one corner of the confined space. The vehicle is then maneuvered back and forward without projecting outside of the area's boundaries until it can be driven out the entrance in a forward direction. It should be emphasized that the confined space turnaround is not a three-point turn around. In fact, it may require up to six (6), seven (7), or even eight (8) turns for larger vehicles to accomplish the one-hundred-eighty-degree (180°) maneuver.

Station Three - Alley Dock Exercise

The purposes of the alley docking exercise are to:

1. Familiarize the driver with positioning the emergency vehicle to back into a confined space.
2. Judge depth perception and distance using the vehicle's mirrors to position the rear of the vehicle at or close to a fixed point.

The layout of this station is exactly ten feet (10') wide, measured from inside of cone to inside of cone, by thirty feet (30') long. It is not necessary to have the emergency vehicle completely in the dock area, so the thirty feet (30') can be used for all sizes of vehicles.

A simulated wall may be set up perpendicular to and at a distance of forty feet (40') from the entrance of the dock. The length of this wall should be a minimum of twice the length of the vehicle (LOV). This wall creates the alley for this exercise.

The intent of the exercise is for the vehicle to be backed into the simulated dock or stall, and stop within eighteen inches (18") of the back of the dock.

Station Four - Serpentine Exercise

The purposes of the serpentine exercise are to:

1. Familiarize the driver with the location of the corners of the vehicle for maneuverability purposes.
2. Familiarize the driver with the turning radius of the vehicle while proceeding forward and backward.
3. Require the driver to utilize both mirrors of the vehicle during one continuous exercise.
4. Increase the driver's confidence in the use of mirrors for vehicle maneuvering.

Setting up the serpentine station requires an area fifty feet (50') wide by two hundred feet (200') long. It is within the center of this overall area where the serpentine is set with four cones located forty feet (40') apart, measured center to center. For vehicles with a wheelbase of less than one hundred seventy inches (170"), the distance between the center cones is reduced to thirty-four feet (34'). The entrance to the exercise is centered along the fifty foot (50') side. The optimum location for the exit is along the side of the station between cones three and four. However, it can be located elsewhere if the site arrangement so dictates. If space is limited the width of the station may be reduced and the length shortened to one hundred sixty feet (160').

Upon entering the station the vehicle should be driven along the right side of the center cones. After passing the 3rd cone the vehicle should be "cocked" at a slight angle so as to position the rear of the vehicle between the 3rd and 4th cones. The driver then backs the vehicle between them, passing to the left of the third cone and to the right of the second cone. Then the driver should pass to the left of the first cone and back through the entrance. After backing through and stopping at the entrance the driver travels through the serpentine in a forward position. The vehicle should pass to the right of the first cone, left of the second cone, right of the third cone and then out the exit of the station.

Station Five - Off-Set Alley Exercise

The purposes of the off-set alley exercise are:

1. Allow the driver to become aware of the front and rear tracking of the vehicle.
2. Familiarize the driver with depth perception through the vehicle's mirrors, especially recognizing the location of the right rear wheel.

In setting up the offset alley station, each alley measures ten feet (10') wide by the length of vehicle (LOV) long, forty-two feet (42') for ambulances, it should be emphasized that the distance between the alleys is forty-eight feet (48') for engines and fifty-two feet (52') for aerials. It must be carefully measured edge of cone to edge of cone. It is necessary for the station spotter to adjust this difference for each type of vehicle. An extended front bumper or other projections of the vehicle must not extend outside the alleys. In other words, treat the alley edges as if they are building walls or parked vehicles.

When traversing the station the driver should proceed forward through the first alley and exit it. The driver should change the track of the vehicle and enter the second alley without rubbing or knocking down any of the cones. Typical problems involve changing the track of the vehicle too quickly or not straightening the vehicle's track sufficiently before entering the second alley.

Station Six - Offset Backing/Parallel Park Exercise

The purposes of the offset backing/parallel park exercise are to:

1. Allow the driver to understand the importance of vehicle positioning prior to starting a movement that requires an exact right side placement.
2. Familiarize the driver with the turning radius of the vehicle as it impacts restricted space placement.
3. Enable the driver to locate the position of the right front extremity of the vehicle while completing a maneuver.
4. Enable the driver to place the right side of the vehicle at a specific point utilizing the vehicle's mirrors.

Setting up the offset backing/parallel park exercise requires that the station be adjusted for the specific emergency vehicle traveling the course. The length of the parking space should be adjusted to equal the length of the vehicle plus ten feet (10'). As an example, if the vehicle is twenty-eight feet (28'), the space should be twenty-eight feet (28') plus ten feet (10') for a total of thirty-eight feet (38'). The depth of the parking space shall measure eight feet (8'). The distance of twelve inches (12") from the curb should be clearly marked.

The procedure for this station is to have the driver pull the emergency vehicle past the parking space and proceed to parallel park the vehicle in the designated space. The right side of the vehicle must be placed within twelve inches (12") of the curb. The most common mistake at this station is placing the right side of the vehicle either too close or too far from the curb. Crossing over the curb, parking too far from the curb, or knocking down cones that mark the parking space will result in penalty points being added to the driver's score in accordance with the scoring schedule.

Station Seven - Diminishing Clearance Exercise

The purposes of the diminishing clearance exercise are to:

1. Familiarize the driver with the importance of properly aligning a vehicle when entering a very confined asymmetrical area.
2. Familiarize the driver with traveling through a continually more confining restricted area.

The seventh station on the course is the diminishing clearance exercise. Approximately one hundred feet (100') in length, the entrance to the station is ten feet (10') wide, inside edge of cone to inside edge of cone. The concluding part of the exercise measures eight feet, six inches (8' 6"), edge to edge. Extreme care must be taken in measuring the width of the station because of the very close tolerances of the vehicles that will travel the station. Federal motor vehicle regulations limit the width of vehicles to one hundred two inches (102"). For vehicles that exceed eight feet (8'), the exit may be adjusted to the width of the vehicle plus six inches (6").

All vehicles must travel the station without touching any of the cones even though the clearance is very minimal. The purpose of this exercise is for the driver to maneuver the vehicle through the station without brushing or knocking over any cones.

Two of the most common mistakes involve speed fluctuations through the exercise and misalignment of the vehicle's track upon entering the station.

Station Eight - Stopping Exercise

The purposes of the stopping exercise are to:

1. Familiarize the driver with the position of the front of the vehicle.
2. Require the driver to brake smoothly and precisely while bringing the vehicle to a stop at a specified point.

Approximately forty feet (40') to sixty feet (60') beyond the end of the diminishing clearance station, three cones should be set parallel to each other and in the line of travel of the course vehicle. A mark at eighteen inches (18") from the cones must be made. The objective of the exercise is to bring the vehicle to a stop. The front bumper must not be more than eighteen inches (18") from the edge of the cones and not extend past the cones.

Stopping more than eighteen inches (18") from the edge of the cones or extending past their edge will result in penalty points being added to the driver's score in accordance with the scoring schedule.

The vehicle stop, which is the eighth station, completes the competency course.

If space is limited, this exercise may be added to the stopping end of the straightline exercise.

Appendix Four

STREET & HIGHWAY DRIVING EVALUATION GUIDELINE

Note: This guideline can be used for evaluating both emergency and non-emergency driving.

Separate evaluation forms are provided for each driving assessment.

Goal

Provide the emergency services organization (ESO) and the student with a process for evaluating actual (hands-on) emergency and non-emergency driving.

Evaluation & Documentation

The evaluator should utilize the appropriate evaluation form

VFIS Non-Emergency Street & Highway Driving Evaluation

Non-Emergency driving time can include any time the vehicle is driven: non-emergency call response and normal driving of any manner as approved by the authority having jurisdiction (AHJ)

VFIS Emergency Street & Highway Driving Evaluation

Emergency driving should only be permitted following qualification by the AHJ on the non-emergency evaluation. A probationary period should be considered by the AHJ for emergency driving to include a defined time period and supervision such as a qualified driver or officer during the probationary period. The emergency driving evaluation should be updated following the run by the officer or as determined by the AHJ.

Objectives

- Understand ESO driving-related policies and procedures and state laws for emergency vehicle (EV) operations
- Identify and understand pre-response activities
- While driving the EV, complete various driving situations satisfactorily
- During emergency response, the goal should be efficient response. Evaluation can be accomplished during or after the event, depending on ESO policy/guideline, and not all areas may be accomplished/evaluated
- Identify proper and improper reactions to driving situations

Review of ESO Driving Policies and Procedures and Applicable State Emergency Vehicle Driving Laws

1. Instructor should review and be familiar with all applicable ESO driving-related policies and procedures
2. Instructor should review state EV laws
3. A copy of the ESO policies and state motor vehicle driving laws should be available during review

Orientation to VFIS Driving Evaluation Form*

Instructor should review forms with person being evaluated. This review should include:

- Pre-response
- Non-emergency driving
- Emergency response driving
- Proper judgment and driving tactics being evaluated
- Time for immediate feedback/improvement

Because a review of the emergency evaluation form is not possible immediately prior to an emergency response, a comprehensive understanding of the emergency response evaluation will be required of the instructor.

Evaluation and Coaching

- Instructor should evaluate the student (during driving) and provide feedback and coaching. Evaluation items should include:
 - Maintaining a positive attitude regarding safety
 - Demonstrating proper judgment and decision making skills
 - Recognizing hazards

Non-emergency driving - referencing proper form for specific driving scenarios

Emergency driving - referencing proper driving evaluation form for specific driving scenarios

- Demonstrating proper driving based on ESO policies and State EV laws

Review and Discussion

Instructor and student(s) are to review learning objectives and discuss various situations and questions.



Street & Highway Driving Evaluation – Emergency Call Response

The Emergency Service Organization (ESO) should reference the state emergency vehicle laws and ESO policies and procedures. ***Emergency Mode can only be utilized during response to an actual emergency event.***

Driver / Vehicle Information

Driver's name:		Date of evaluation:
Evaluator's name:		Number of miles driven:
Vehicle number:	License number:	
Start time:	Finish time:	
Weather conditions:	Road surface:	
Driver's license number:	Expiration date:	Restrictions:
Type of evaluation: _____ Pre-Response _____ Emergency Call Response		

S – Satisfactory

NI – Needs Improvement

U – Unsatisfactory

N/A – Not Applicable

Pre-Response

	S	NI	U	N/A
Conduct pre-response inspection (according to ESO guidelines)				
Conduct walk-around (Circle of Safety)				
Adjust cab features				
Mirrors, seat, seat belt				
Secure seat belt - driver				
Assure seat belt(s) are in place – crew				
Start engine properly (according to ESO guidelines)				
Check braking systems				
Test service and parking				
Build full pressure in air tanks (if applicable)				
Check instruments for normal readings				
Receive signal before moving				
Start unit moving smoothly				
Proper gear				
Use clutch properly (if applicable)				

Recommendations

Emergency Call Response

	S	NI	U	N/A
Lights and sirens used correctly (according to ESO guidelines and state motor vehicle code)				
Speed according to posted limits or reduced at the following:				
Intersections				
Congested highways				
Schools				
Weather conditions				
Passing other vehicles				
Cautionary areas				
Maintain a safe following distance				
4 second rule-under 40 mph				
Intersections – Control Device (Red Light or Stop Sign) In Direction of Travel				
Do not rely on warning devices to clear traffic				
Scan the intersection for possible hazards				
Hazards may include right turns on red, pedestrians, vehicles traveling fast, etc.				
Observe traffic in all 4 directions (left, right, front, rear)				
Slow down if any potential hazards are detected and cover brake pedal with foot				
Change the siren cadence not less than 200' from intersection				
Scan for possible passing options (pass on right, left, wait, etc.)				
Avoid using the opposing lane of traffic if possible				
Bring vehicle to a complete stop or slow down as necessary for safe operations				
<i>Reference state emergency vehicle driving laws and ESO policies/procedures</i>				
Establish eye contact with other vehicle drivers				
Have partner communicate all is clear (if applicable)				
Reconfirm all visible traffic is stopped				
Account for one traffic lane at a time, treating each lane as a separate intersection				
Intersections – No Control Device In Direction of Travel				
Scan the intersection for possible hazards				
Hazards such as right turns on red, pedestrians, vehicles traveling fast, etc.				
Observe traffic in all 4 directions (left, right, front, rear)				
Slow down if any potential hazards are detected and cover brake pedal with foot				
Change the siren cadence not less than 200' from intersection				
Avoid using the opposing lane of traffic if at all possible				
Guarded Railroad Crossings				
Follow rules of the road				
Unguarded Railroad Crossings				
Slow down and cover the brake				
Bring vehicle to a complete stop				
Turn off siren and other noise producing items				
Operate motor at idle				
Open the window and listen for train whistle or train noise				
Proceed through with caution				

	S	NI	U	N/A
Vehicle placement				
Position vehicle to protect personnel and scene (according to ESO guidelines)				
Shut down excessive emergency response lights				
Place safety cones for traffic flow				
All staff operating in/near moving traffic wear appropriate high-visibility safety apparel				
Backing				
Position vehicle to avoid backing if possible				
Give audible notice				
Spotter used (stop vehicle if spotter is not visible)				
If no spotter, conduct Circle of Safety				
Check front corners				
Maintain speed control				
Parking				
Spotter used (stop vehicle if spotter is not visible)				
Park without hitting objects or vehicles				
Park correct distance from curb				
Secure unit (according to ESO guidelines)				
Departing Scene				
Conduct walk-around				
Secure seat belt – self and crew				
Secure patient (if applicable)				
Carefully enter traffic from parking position				
General Driving				
Braking				
Apply ABS and air brakes properly (do not pump brakes)				
Reduce speed and brake/downshift before curves				
Appropriate Rate of Closure and Safe Following Distance				
Shifting				
Downshift and change gears properly				
Proper Hand Position (10 and 2) (9 and 3 with air bags)				
Adverse Conditions / Night Driving				
Reduce speed				
Driver Awareness				
Alert and aware				
Take most efficient route to destination				

Recommendations



Street & Highway Driving Evaluation - Non-Emergency

Note: The Emergency Service Organization (ESO) should reference the state emergency vehicle laws and ESO policies and procedures. Non-Emergency driving time can include any time the vehicle is driven: non-emergency call response and normal driving of any manner as approved by authority having jurisdiction (AHJ).

Driver / Vehicle Information

Driver's name:		Date of evaluation:	
Evaluator's name:		Number of miles driven:	
Vehicle number:	License number:		
Start time:	Finish time:		
Weather conditions:	Road surface:		
Driver's license number:	Expiration date:	Restrictions:	
Type of evaluation: ☐ Pre-Response ☐ Non-Emergency			

S – Satisfactory

NI – Needs Improvement

U – Unsatisfactory

N/A – Not Applicable

Pre-Response

	S	NI	U	N/A
Conduct pre-response inspection (according to ESO guidelines)				
Complete documentation (according to ESO guidelines)				
Conduct walk-around (Circle of Safety)				
Adjust cab features				
Mirrors, seat, seat belt				
Secure seat belt - driver				
Assure seat belt(s) are in place – crew				
Start engine properly (according to ESO guidelines)				
Check braking systems				
Test service and parking				
Build full pressure in air tanks (if applicable)				
Check instruments for normal readings				
Receive signal before moving				
Start unit moving smoothly				
Proper gear				
Use clutch properly (if applicable)				

Recommendations

Non-Emergency Driving

Complete the following:	S	NI	U	N/A
Four left and four right-hand turns				
Straight section of urban business street or a two-lane rural road at least 1 mile (1.6 km)				
One through intersection and two intersections where a stop has to be made				
One railroad crossing				
One curve, either left or right				
Section of a limited highway that includes a conventional ramp entrance and exit				
Section of road long enough to allow two lane changes				
Downgrade steep enough and long enough to require down-shifting and braking				
Upgrade steep enough and long enough to require gear changing to maintain speed				
One underpass or low clearance or bridge				
Back a vehicle into a predetermined location				
Proper speed maintained				
According to posted limits				
Weather conditions / Night driving				
Retarder adjusted for road conditions (according to ESO guidelines)				
Cautionary areas				
Highway/road conditions				
Pedestrian traffic				
Proper following distance maintained				
Under 40 mph – 4 second rule				
Lane change				
Signal correctly				
Use mirrors				
Pause before change to check blind spots				
Accelerate into lane change				
Intersection – No Control Device in Direction of Travel				
Follows rules of the road				
Scan the intersection for possible hazards				
Observe traffic in all 4 directions (left, right, front, rear)				
Slow down if any potential hazards are detected and cover brake pedal with foot				
Intersection – Control Device (red light or stop sign) In Direction of Travel				
Decelerate and cover the brake				
Slow down and bring vehicle to a complete stop				
Confirm other vehicles have stopped (stop sign controlled intersection)				
Follow rules of the road				
Backing				
Position vehicle to avoid backing if possible				
Give audible notice				
Spotter used (stop vehicle if spotter is not visible)				
If no spotter, conduct Circle of Safety				
Check front corners				
Maintain speed control				

Non-Emergency Driving continued

	S	NI	U	N/A
Parking				
Spotter used (stop vehicle if spotter is not visible)				
Park without hitting objects or vehicles				
Park correct distance from curb				
Secure unit (according to ESO guidelines)				
Guarded Railroad Crossings				
Follow rules of the road				
Unguarded Railroad Crossings				
Slow down and cover the brake				
Bring vehicle to a complete stop				
Turn off noise producing items				
Operate motor at idle				
Open the window and listen for train whistle or train noise				
Proceed through with caution				
Departing Scene				
Conduct walk-around				
Secure seat belt – self and crew				
Secure patient (if applicable)				
Carefully enter traffic from parking position				
Night Driving				
Do not exceed speed limit				
General Driving				
Rate of closure and safe following distance				
Braking				
Apply ABS and air brakes properly (do not pump brakes)				
Reduce speed and brake/downshift before curves				
Shifting				
Downshift and change gears properly				
Proper Hand Position (10 and 2) (9 and 3 with air bags)				
Adverse Conditions				
Reduce speed				
Driver Awareness				
Alert and aware				
Take most efficient route to destination				

Recommendations



Off Road Driving Evaluation

Driver / Vehicle Information

Driver's name:		Date of evaluation: / /	
Instructor/Evaluator:		Number of miles driven:	
Vehicle number:	License number:		
Classroom Completed: Yes / No		Date: / /	# of Hours:

S – Satisfactory

NI – Needs Improvement

U – Unsatisfactory

N/A – Not Applicable

Pre-Response

	S	NI	U	N/A
Conducted pre-trip inspection				
Checked braking systems (service and parking)				
Checked instruments for normal readings				
Adjusted cab features prior to moving vehicle				
Secured seat belt – driver				
Verified seat belt use by all passengers				
Started engine properly				

Competency Course

	S	NI	U	N/A
Appropriate Speed maintained in course				
Straight Line Exercise				
Alley Dock Exercise				
Serpentine Exercise				
Off-set Alley Exercise				

Off Road Driving Exercise

	S	NI	U	N/A
Used Spotter when backing?				
Place vehicle into all-wheel drive before going off-road (if available)				
Selected proper gear for off road driving?				
Recognized hazards and terrain changes?				
Proper hand placement (thumbs <u>outside</u>)				
Appropriate speed used				
Drove straight up hill				
Proceeded at angle to avoid "bottoming out"				
Set emergency brake if vehicle stalled				
Conducted "Circle of Safety" (damage inspection) when returning to hard surface road				
Completed Off-Road Exercise				

Comments / Explanation of Deficiencies

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NOTES

EDUCATION | TRAINING | CONSULTING



Driving an ambulance or client transportation vehicle is a privilege and a position of tremendous responsibility in which proper training is critical. Participants in this course will have the opportunity to gain and/or verify a broad range of competencies associated with emergency and client transportation vehicles. These competencies include; the basic understanding of emergency response, vehicle dynamics and operations as well as the skills necessary for practical application.

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