Proactive Driving System
Course Slides

Montgomery County Fire & Rescue Service
December 2002
Overview

MCFRS Fleet Losses
Starting
In-Motion
Intersections
Arriving on Scene or
Stopping
Backing
1

MCFRS Loss Analysis

Insurance
Special Causes
Driving Tasks
At-Risk Behaviors
New Philosophy

Proactive Driving System
Insurance

Our collision loss experience is poor
Spending money for premium increases that could be spent for more worthwhile things
Pledged to the insurer that we would improve
Insightful loss study completed
We changed the way we understand collisions
Our driving is the loss source
Our drivers are the solution
Special Causes

These loss factors are *not* root causes of our fleet losses

<table>
<thead>
<tr>
<th>Apparatus Type</th>
<th>Assigned Station vs.</th>
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</thead>
<tbody>
<tr>
<td>Emergency vs. Non-Emergency Driving</td>
<td>Detail</td>
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<tr>
<td>Preventability (the other driver)</td>
<td>Location of Vehicle Damage</td>
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<td>Shifts</td>
<td>Driving Experience</td>
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<tr>
<td>Districts</td>
<td>Multiple Collisions</td>
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<tr>
<td>Stations</td>
<td>Time of Day</td>
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<td></td>
<td>Road Conditions</td>
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</table>
Five common driving tasks were related to DFRS collisions. Collision reduction will occur by mastering these driving tasks.
At-Risk Driving Behaviors

At-risk behaviors are simply actions that place the vehicle in harms way. The loss analysis revealed a distinct set of at-risk behaviors for each driving task. We have not made this connection in the past.

Collision reduction will occur as more operators master the driving behaviors.
New Philosophy

We drive our vehicles with the mindset that the other driver will make a mistake in the path of our vehicle.

Our operators will drive proactively by adjusting their driving to avoid collisions triggered by other drivers, traffic, and environmental conditions.
Proactive Driving Formula

Identify the hazard

Predict outcome

Decide action

Execute maneuver

This formula will help you avoid collisions
Starting

Daily Apparatus Check
Circle Check
Adjustments
Seat Belts
Visual Scan
Daily Apparatus Check

Preventive maintenance process
Occurs at shift change
Identifies defects
Treats small problems
Mirror & seat adjustments
Documentation
Mark of a professional operator
Cab Adjustments

- Passenger mirror
- Driver mirror
- Steering wheel height and angle
- Seat height
- Clean windshield
- Clean windows
- Clean mirrors
- Rear spot lights

Adjust mirrors so blind spot mirrors provide a view of the two blind spots.
Circle Check

*Rapid 360 degree vehicle scan*

**Sides**
- Compartments
- Ladders, tools, lights, and equipment

**Rear**
- LDH and hose
- Appliances and loose equipment

**Underneath**
- Obstructions or forgotten equipment
- Wheel chock

**Mark of a professional operator**
Visual Scan

Operator completes a visual scan of the field of vision before moving
  Forward
  Sides
  Rear
Remain parked until the overhead door is 100% open
Proceed slowly through the door opening and hazard zone

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Seat Belts

- All crew members seated and restrained
- Insurer’s hot button
- Patient care providers must use their judgment during patient transport
- EMS unit driver must adjust speed and space cushions when crew member is unrestrained
- Zero Tolerance. Consequences imposed for failing to wear a seat belt

Zero Tolerance
In-Motion

- Space Cushion
- Visual Lead Time
- Eye Movement
- Cover the Brake
- Safe Speed
- Railroad Crossings
- Hands Free
- Steering
- Signaling
- Traffic Signs & Signals

Proactive Driving System
Space Cushion

How the space cushion works:

- Provides adequate space for braking
- Provides space for offensive or aggressive drivers
Four Second Rule

- **Up to 40 mph**: 4 seconds
- **Each additional 10 mph**: +1 second
- **Poor Road Conditions**: +1 second

What is an adequate space cushion for 60 mph on wet pavement?

4 seconds + 2 seconds + 1 second = 7 seconds

Proactive Driving System
Proactive Driving System

Stopping Time

- Perception: $\frac{3}{8}$ to $\frac{3}{4}$ second
- Reaction: $\frac{3}{4}$ second
- Braking: 2$\frac{1}{2}$ seconds
- Stopping Time: 4 seconds

Based upon 40 mph on wet roads.
Stopping Distance

How much distance do you need to stop on a dry road?

10 mph  30 feet

30 mph  113 feet

60 mph  315 feet
# Stopping Distance

## Actual stopping distance on dry road (COF=0.70)

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<thead>
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<th>Stopping Time (sec.)</th>
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### Stopping Distance

Actual stopping distance on wet road (COF=0.40)

<table>
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<th>Miles/Hour</th>
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<th>Actual Stopping Distance (ft.)</th>
</tr>
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Four Second Rule

- It should take the engine 4 seconds to pass the light pole
- Add 1 second for each 10 mph over 40 mph.
- Add extra 1 second for poor conditions
Eye Movement

**Eye Movement** means keeping your eyes moving to see the fields of vision. Scan the entire field every 10 seconds.

**Tunnel Vision** places your vehicle at-risk for a collision.

You need to monitor 3 fields of vision:
- **Front** – at least ¼ mile ahead and street sides
- **Sides** – lanes right and left next to vehicle
- **Rear** – lanes right and left behind vehicle
Visual Lead Time (Forward)

Scan the horizon and look over the vehicles in front of you
Scan ahead and scan street sides
Try to see what you will encounter 12 -15 seconds from now
Helps vehicle stay in a straight line
Identify hazards and still have time to react

Intersections, crosswalks, RR crossings
Playgrounds, schools, construction, parking lots, shopping centers

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Side Field of Vision

See what is happening to your sides
Use blind spot mirrors
Monitor left and side lanes
See what is about to enter your peripheral vision
See aggressive drivers before they cut in front you
Rear Field of Vision

Check your mirrors every 5 to 10 seconds
You may see a vehicle approaching too fast or following too close
You may still have time react
Check mirrors before slowing or changing your path
Mirrors

*Other times to check mirrors*

Check mirrors before slowing down, stopping, decelerating
Check mirrors on long or steep hills
Mirrors distort the real image
Objects appear to be smaller and farther away than they really are
Railroad Crossings

808 requires you to stop at unguarded crossings
Stop and look in both directions
Assume that guarded signals are not working
Trains travel in both directions
Wait a moment to proceed after a train passes
Assure the tracks are clear in both directions

Stop for all railroad crossings
Safe Speed

*Posted speed limits are for ideal conditions*

Do not go faster than the speed shown
Slow your speed for less than ideal conditions
Slow and smooth acceleration and stops
Maintain adequate space cushions
Your best defense is to SLOW DOWN
Steering

Hold steering wheel firmly
Two hand skill
Hands positioned at 3:00 and 9:00
At-Risk Behaviors to avoid
  One-handed steering
  360 heel turning
  Elbow steering
  Finger steering

Hands grip steering wheel at 3:00 and 9:00
Signaling

Signal before any change of direction
Signal early
3 blinks before lane change
Assure that your turn signal is off after the turn
Intersections

Cover the Brake
Eye Movement
Reduce Speed
Intersection Stop
Jumping
Clear Space
Cover the Brake

Cover the brake when you identify a probable hazard
Approaching, entering, or traversing intersections
Remove foot from accelerator and prepare to brake

Advantages
  - Immediately decreases speed
  - Braking distance decreases
  - Reduces reaction & braking times
  - Resume speed without losing momentum

Proactive Driving System
Eye Movement

Operator observes the entire intersection from right and left sides.
Reduce Speed

One of the best proactive driving tactics is to reduce speed
Reduces stopping distance needed
First gear or 10 mph no less than 100 feet before the intersection
Achieves stopping distance < space cushion

Reduce speed to 10 mph.
Intersection Stop

The Intersection Stop applies to emergency driving.
Must stop at a red light, stop sign, or other intersection when you are against the right of way.
Only proceed when you make eye contact with other drivers.
Avoid using the apparatus as a moving roadblock – this is aggressive driving.

You must stop at intersections against the right of way.
Jumping

Operator depresses the accelerator hard from stopped position
Vehicle jerks or jumps forward
Hard on the apparatus
At-risk for rear-end collision
Jumps before other vehicle moves forward is a common low speed, at-fault collision
Smooth starts
Clear Space

Space cushion left while stopped
Clear space equals one-half of your vehicle length
Helps prevent low speed rear-end collisions
Adequate room to change lanes

Too close. No room to maneuver right or left.

Perfect. Clear space left for maneuvering.
Traffic Lights

Pay attention to traffic lights

Stale green
Stop for yellow
Flashing yellow means proceed with caution
Flashing red means stop before proceeding
Zone of Confusion

Created by two or more emergency vehicles responding together
Civilian driver sees one emergency vehicle, but hears a different one at the same time
Civilian driver thinks the coast is clear but pulls into your path
Elderly and teenagers
High-risk situation
Anticipate other vehicles to make mistakes

Confused driver sees the Engine and hears the Truck. Driver’s mind thinks there is only one emergency vehicle so driver pulls into the path of the trailing vehicle.
Zone of Confusion

Anticipate other drivers to make mistakes

Demonstrate care for other vehicles

Driving tactics for procession style response:

Travel single file. A larger vehicle leads. Leading vehicle creates a path.

Increase space cushions. NEVER travel nose to tail.

Each vehicle must traverse intersections alone and make eye contact with other drivers. Trailing vehicles NEVER bust the intersection.

Use contrasting siren tones. Switch to electronic siren with alternating or pulsing tone.
5 Arriving on Scene or Stopping

Deceleration
Pass the Address
Spotting
Parking Brake
Wheel Chock

Proactive Driving System
Deceleration

Important skill for heavy apparatus and EMS unit operators

Hard stops
  Harsh on apparatus, equipment, crew, patient
  Indicates operator was not scanning ahead

Smooth deceleration stops
  Plan ahead
  Good visual lead time – ¼ mile ahead
  Pick your stopping point on horizon
  Decelerate early
Stop at the Address

Common at-risk driving behavior is passing the address
   U-Turns in traffic
   Backing against traffic
   Operator gets frustrated
Preplan & teamwork
Know block numbers
Know the cross street before the target block
Reduce speed on the target block
Use spot lights
Stop and read the map book
Spotting

Consider these good habits when positioning or parking

- Approach the final spot slowly
- Spot for tactical advantage
- Leave clear space around vehicle
  - Compartment doors
  - Walking paths
  - Outriggers
- Drive out instead of back out
- Leave access for incoming companies
Parking Brake

Set the parking brake before personnel dismount the vehicle.

It is good practice to set the parking brake when the vehicle is stopped for 10 seconds or longer in a non-driving situation.
Wheel Chock

Redundant parking brake
Downgrade side
Required for parked vehicles
either attended and unattended
Light vehicles can use parking brake
Turn wheels toward curb
Mark of a professional operator

Chock a wheel
6 Backing

Safe Spotting
Hand Signals
Circle Check

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Backing Policy Changes

- Fire Administrator wants backing collisions eliminated
- Zero tolerance
- Minimum - Unit officer must dismount & spot
- Driver must complete circle check if alone
- EMS units must use spotters when patient care is not compromised
Safe Spotting

Spotters position themselves outside the rear hazard zone. The operator should stop the vehicle if the spotters are not visible or lack eye contact with the mirror.
Hand Signals

Stop

Turn

Diminishing Clearance

These standard hand signals should be used to communicate with the driver.

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Circle Check

360 degree inspection around the vehicle
Observe the rear blind spot
Observe the vehicle sides
Note object positions
Check overhead clearance
Check underneath the vehicle
Remember....

The easiest way to prevent a backing collision is to back with a spotter.

If a spotter is unavailable, then complete a circle check.
Case Studies

Proactive Driving System
Case Study 1

*Tanker crash kills two firefighters*

Tanker descending a hill at 47 mph on wet, rural road. Traffic light turns red when tanker is half-way down hill. Tanker brakes, slides, rear wheels leave road, and rolls over.

Driving task?
At-risk driving behaviors?
Proactive driving skills?
Preventable?

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Case Study 2

Truck company crashes into occupied building

Truck company traveling at 30 mph on city street. Operator experiences brake failure 30 seconds before collision. Truck avoids car, tries to swerve left, but crashes into building.

Driving task?
Worst case scenario?
At-risk driving behaviors?
proactive driving skills?
Liability?
Preventable?

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Case Study 3

Captain killed in engine crash

Engine company enters intersection against a red light. Other vehicle with green light collides with the engine. Engine then strikes a concrete bridge column. Unrestrained captain is ejected onto the road and dies. Crew struck by flying equipment.

Preventable?
Driving task?
At-risk driving behaviors?
Proactive driving skills?
Case Study 4

Lieutenant killed in truck company collision

Truck company with broken officer’s door approaches intersection with a four-way stop. Operator’s view is slightly obstructed to the right. Truck proceeds despite seeing pickup approaching fast to the right. Pickup runs stop sign and collides with truck. Lieutenant ejected out the broken door and killed. Lieutenant’s seat belt was not working.

Preventable?
Driving task?
At-risk driving behaviors?
Proactive driving skills?
Liability?

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Case Study 5

Tanker operator killed in crash with train

A tanker was traveling 10-15 mph and accelerating as it approached an unguarded railroad crossing. The tanker crossed the path of a freight train and was struck. The unrestrained operator was ejected and killed.

Preventable?
Driving task?
At-risk driving behaviors?
Proactive driving skills?
Case Study 6

EMS Unit rear-ends automobile

EMS Unit responding via the left lane of an interstate highway. EMS Unit is tailgating other vehicles to bully them out of the lane. A car six to seven ahead made a sudden hard stop, causing a chain reaction stop. The EMS Unit has a delayed reaction and rear-ends car in front. This collision causes three other collisions totaling four collisions.

Preventable?
Driving task?
At-risk driving behaviors?
Proactive driving skills?
Peer Observations

We will be instituting a monitoring system of peer evaluations
Choose a partner
Complete two driving observations
Coach each other to better driving practices
Teach inexperienced operators