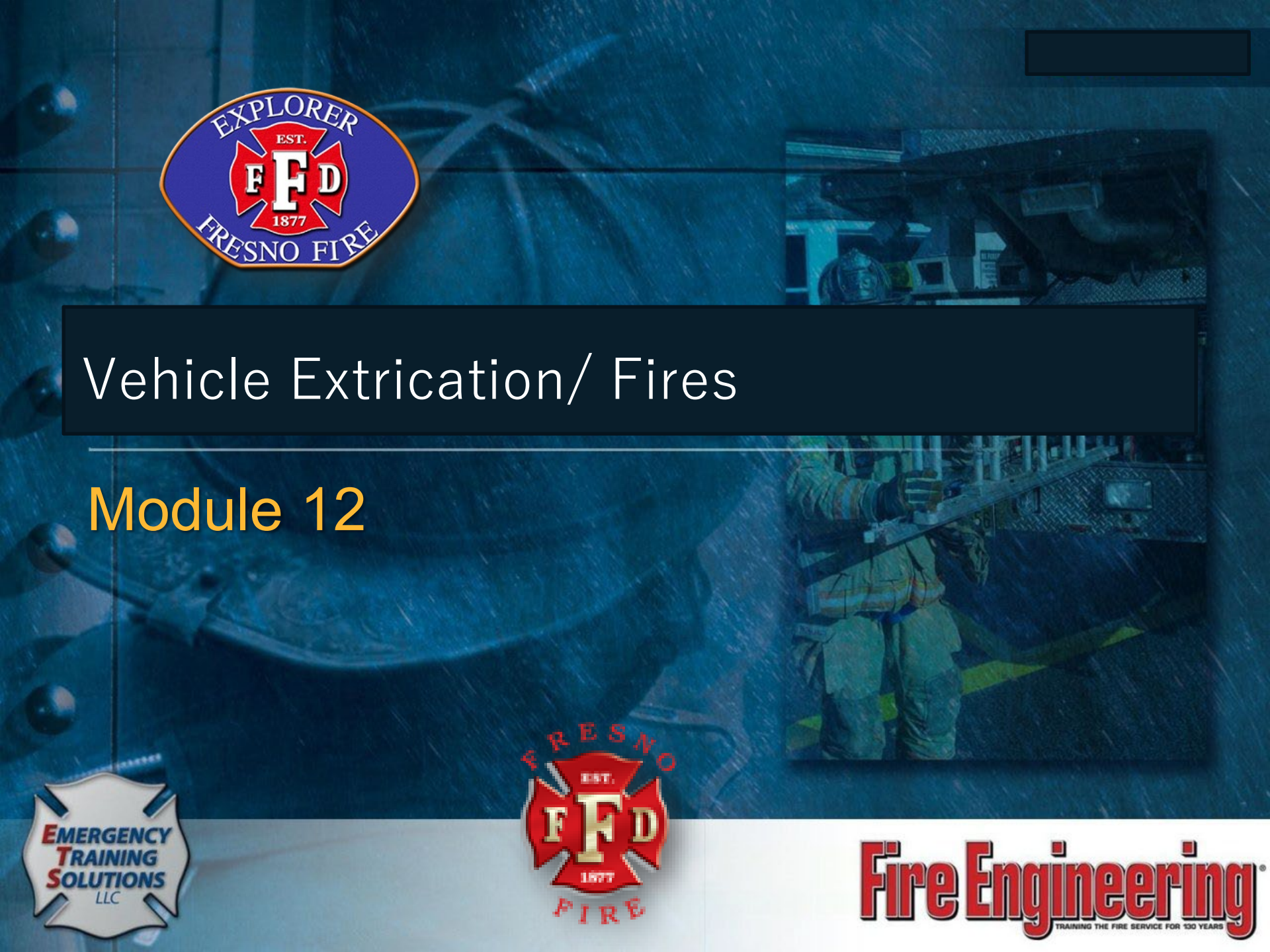
Vehicle Extrication/ Fires

Module 12



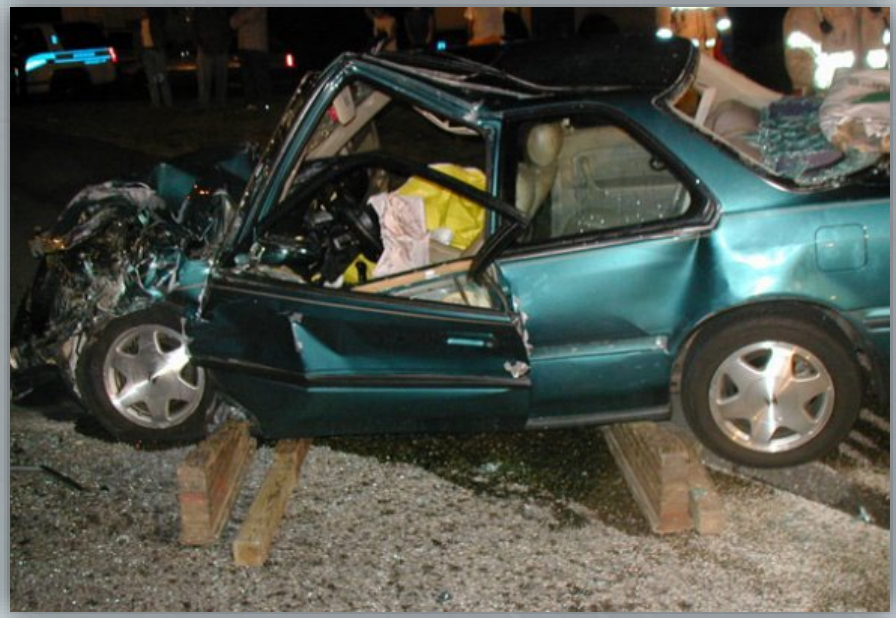
Vehicle extrication is a vital service provided by today's fire departments

Common Incidents

Introduction

Second to

EMS calls, motor vehicle crashes (MVC's) are the most common incidents



Systems

designed to protect occupants can slow our efforts and place rescuers in danger

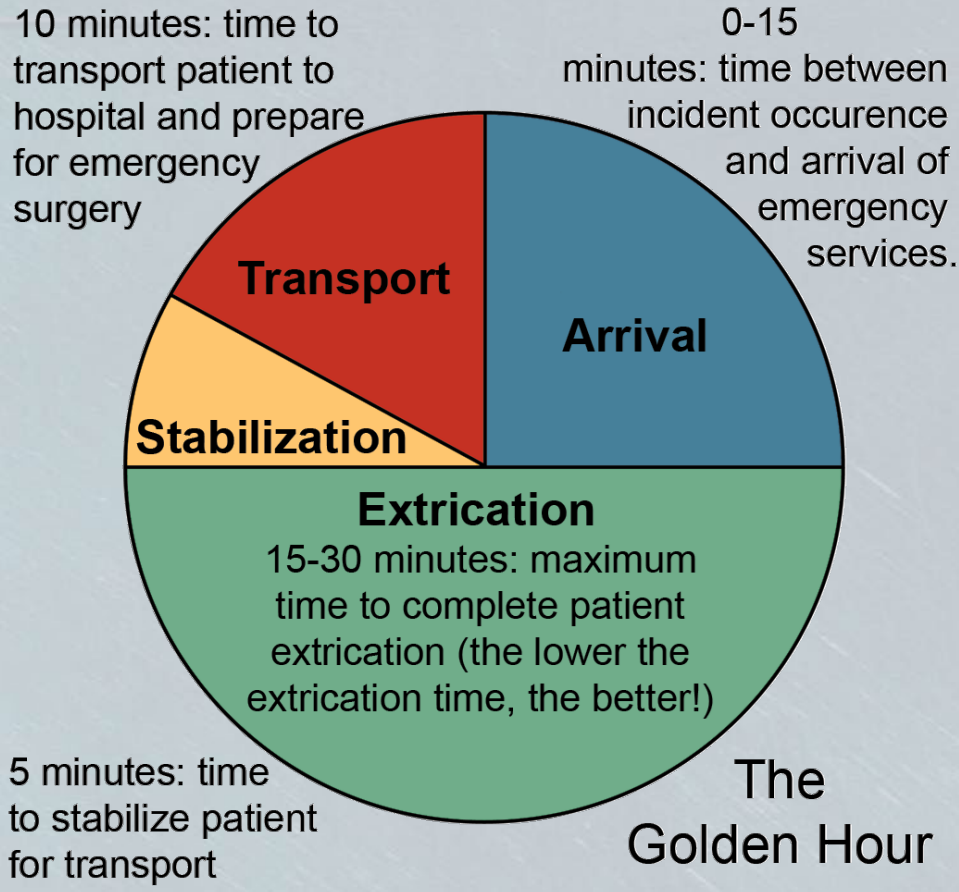
The Golden Hour

Elapsed Time

between the moment of the patient's injury and their arrival at a hospital

We Control

the 15-30 minute window from arrival through extrication operations

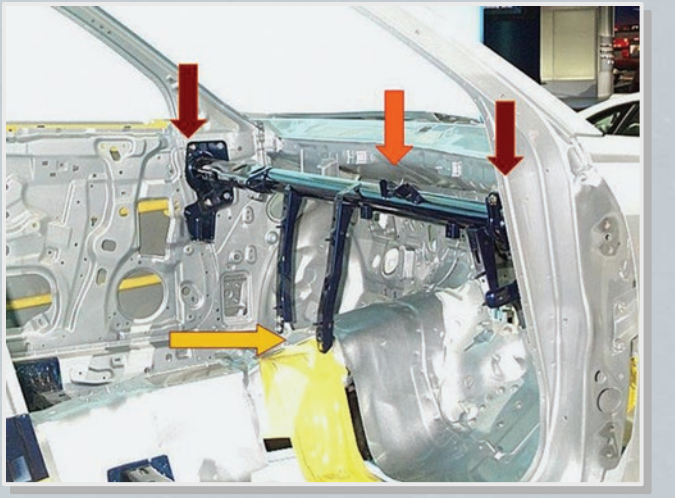


Energy Absorption Areas

Vehicle Design & Technologies

Crumple zones

- Absorb energy (crush) during a crash
- Nose of the vehicle compresses

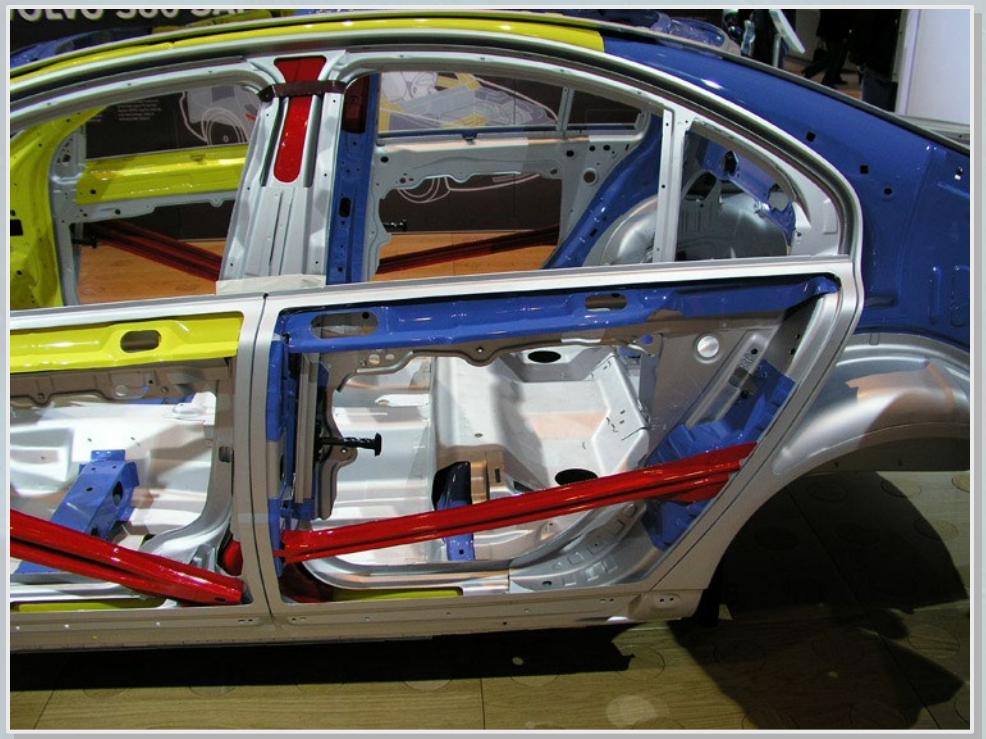


Structural reinforcement

- Ties the sides, floor, and firewall together
- Relief cuts sever the crush zone

High-Strength

steels and alloys are used to reinforce lighter weight vehicles



Boron

and other steel alloys are extremely difficult to cut

Windows

Vehicle Design & Technologies

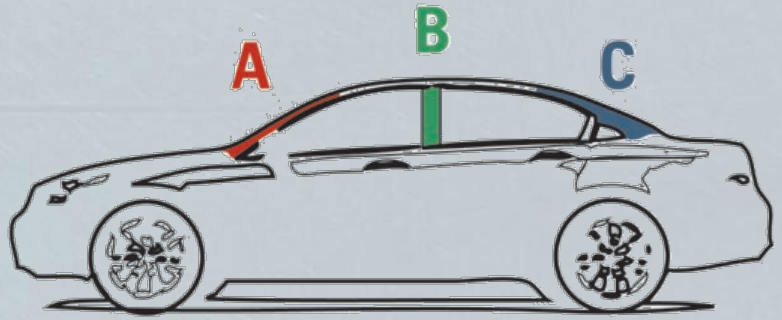
Two types of glass are widely used

- Laminated glass
- Tempered safety glass
- New Enhanced Protective Glass (EPG) uses a polycarbonate glazing

Vehicle Posts

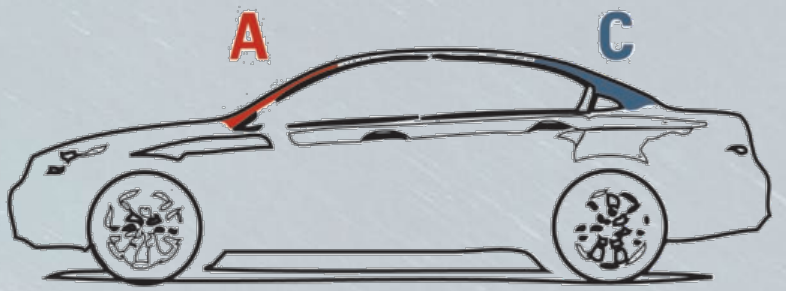
Seat Belt

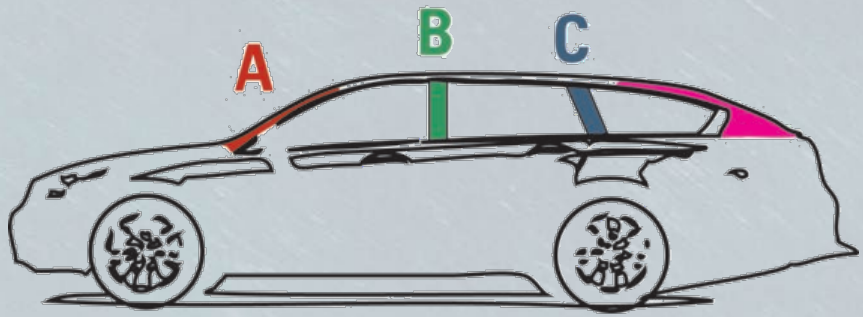
attachments in the roof posts can add difficulty to cutting



Alternative

techniques may be needed to defeat these reinforcements





High Voltage

systems cause concerns

Alternative

fueled vehicles have ERG's available from the US DOT

Disconnecting

the battery helps prevent deployment

Be Careful

where you place your body and tools during door and side operations

Photo Courtesy of Delphi

Vehicle Stabilization

MVC Rescue Operational Cycle

Create

a solid foundation to work from

Deflate

the tires to transfer the weight to the cribbing

Remove

the glass to prevent it from exploding during extrication

Cribbing

Tools & Equipment

First tool for stabilization

- Wood or composite
- Step chocks
- Manufactured versions

Photo Courtesy of PowerHawk

Tension Buttress Systems

Tools & Equipment

Stabilize

vehicles not on their wheels

Struts

are placed at a 45° angle against the vehicle

Ratchet

straps tension the brace against the vehicle

Lifting Bags

Tools & Equipment

Compressed

air inflates the bag to lift or spread objects

Capacity

varies with surface area and inflation pressure

Tool Functions

Tools & Equipment

SEVER	DISTORT	DISPLACE	DISASSEMBLE
			
Divide into two or more parts	Change an object's shape without severing	Moving an object from its original position	Reducing objects to their basic parts

Hand Tools

Common extrication hand tools

Hacksaw	Tin snips	Center punch
Razor knife	Crowbar	Bolt cutters
Hammer	Screwdrivers	Mechanic tools
Chisel	Wire cutters	Come-a-long

Power Hydraulic Tools

Tools & Equipment

Cutters

Spreader

Ram

Combination Tool

Photos Courtesy of Holmatro USA

Power Hydraulic Tools

Supplied

by a power unit

Hydraulic

pump driven by a gasoline, diesel, electric, or compressed gas motor

Pressures

between 3,000 and 10,500 psi

Amkus Power Unit

T&E Manual 306.001

- The Amkus power unit consists of a two-stage axial piston hydraulic pump powered by a 5- to 6.5-horsepower, 4-cycle gasoline engine. The hydraulic pump has a maximum operating pressure of 10,500 psi and delivers a constant flow of a mineral-based hydraulic fluid to the rescue tools through a control valve.

- Amkus tools are carried on FFD trucks.

Amkus Power Unit

T&E Manual 306.001

- The control valve(s) direct hydraulic fluid to the hose lines. The valve(s) are labeled “pump” and “release” and are of the 90-degree operational type (parallel with hose charges the line).
- The two-way valve should be in the neutral release position before starting the engine. The valve should also be in the neutral position when connecting or disconnecting the hydraulic hoses to the rescue tools.

Amkus Spreader

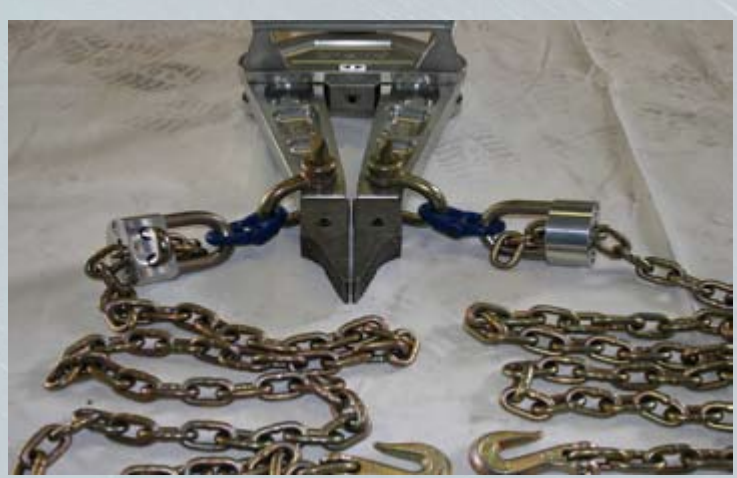
T&E Manual 306.001

- The Amkus spreader weighs 47 pounds and will produce up to 17,000 pounds of spreading force.

Amkus Chains

T&E Manual 306.001

- Amkus spreader chains can be used without removing the spreader tips. The U-bolt assembly attached to the chains allows the chains to be connected to the spreader arms without removing the spreader tips.



Amkus Cutter

T&E Manual 306.001

- The Amkus cutter weighs 30 pounds and produces a cutting force in excess of 60,000 pounds.
- The maximum cutter opening at center is five inches. The maximum cutter opening at the tip is four inches.

Amkus Ram

T&E Manual 306.001

- The Amkus ram can produce a maximum of 30,650 pounds of pushing force to a maximum of 40 inches. The maximum pulling force, if equipped with an eyelet at each end, is 14,400 pounds.
- The ram is also equipped with one extension bar. The extension bar length is ten inches.

Amkus Back-Up Hand Pump

T&E Manual 306.001

- Designed to provide enough power to operate any of the rescue tools at their maximum rated capacities.

Hurst High-Pressure Rescue Systems

T&E Manual 306.001

- The Hurst Centaur Mini Mate Simo compact-power unit (Figure 12) consists of a lightweight, 3-horsepower, 4-cycle gasoline engine and hydraulic pump capable of a normal operating pressure of 9140 psi.

- Hurst High-Pressure Rescue Systems are typically carried on NCFD apparatus.

Hurst Spreader

T&E Manual 306.001

- The Hurst spreader weighs 43 pounds and will produce up to 51,700 pounds of spreading force and 24,700 pounds of squeezing force. The maximum spread distance is 32 inches

Hurst Chains

T&E Manual 306.001

- Hurst spreader chains can be used without removing the spreader tips.

Hurst Cutter

T&E Manual 306.001

- The Hurst cutter weighs 42 pounds and produces a cutting force of 152,900 pounds. The maximum cutter opening at center is 7 inches

Hurst Ram

T&E Manual 306.001

- The Hurst telescoping ram weighs 46 pounds and can produce a maximum of 53,950 pounds of pushing force through the first piston, and 26,980 pounds through piston two. The ram is 25 inches closed and extends to a maximum of 59 inches.

Hurst Compact Power Unit

T&E Manual 306.001

- The Hurst compact power unit consists of a lightweight 2.5-horsepower, 4-cycle gasoline engine, and hydraulic pump capable of a normal operating pressure of 9140 psi and delivers a constant flow of a mineral-based hydraulic fluid to the rescue tool through a single outlet.
- Used on FFD engine companies.

Hurst Compact Power Unit

T&E Manual 306.001

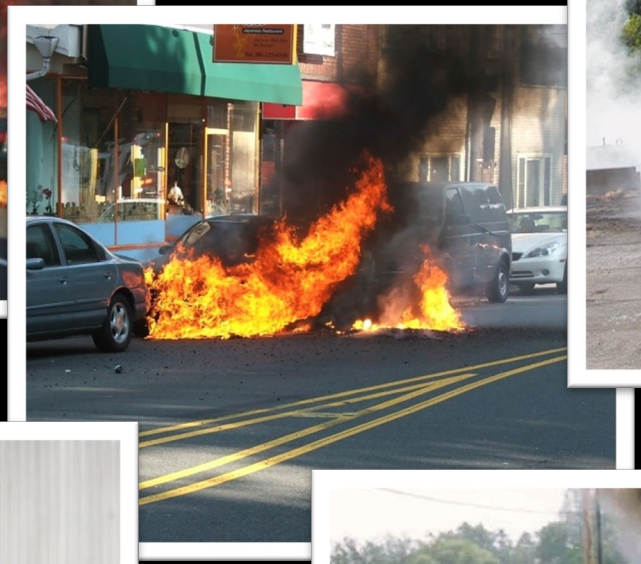
- The outlet has a dump valve to relieve hydraulic pressure to the tool. The valve is labeled “1” and “0” with 1 being closed for “pressure” 0 being open for “dump”

Combination Spreader/Cutter

T&E Manual 306.001

- The Hurst combination tool weighs 32 pounds and will produce up to 25,400 pounds of spreading force, 10,228 pounds of pulling force, and 85,430 pounds of cutting force. The maximum spread distance is 14.1 inches

Vehicle fires are a frequent type of response and must be handled with due care to ensure firefighter safety



Photos courtesy of West Hartford FD (CT), Robert Young, Brett Dzadik

Vehicle Fires

Introduction

Roadway fires

- Are most common
- Trucks, busses, and cars

Considerations of size-up

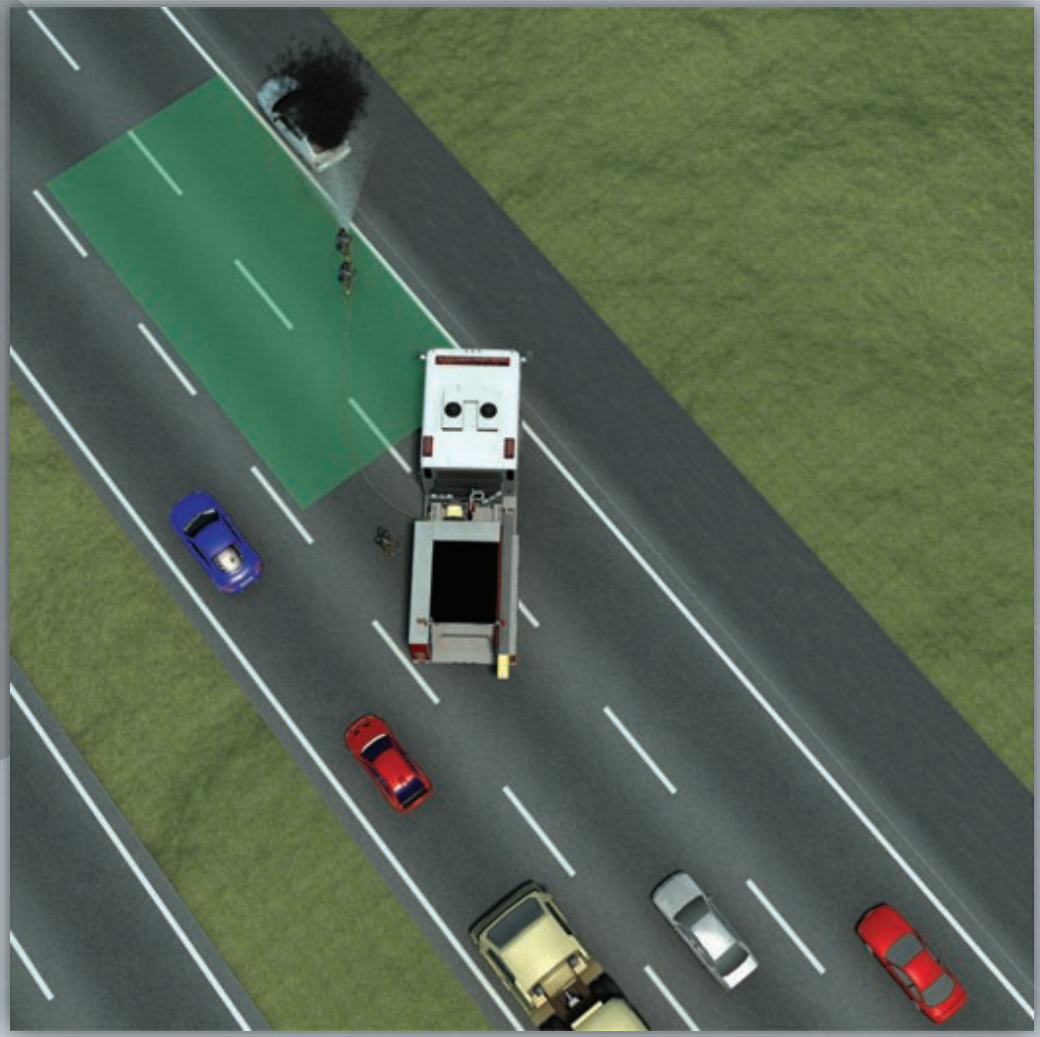
- Hazardous materials may be involved
- Vehicle fuel may be leaking or spilled
- Overhead or downed power lines
- Visibility of approach
- Location of vehicle in the roadway
- Vehicle stabilization

Positioning Apparatus

Scene Safety

Protect the scene

- Position at least 100’ away
- If possible park uphill and upwind
- Place apparatus diagonally to block lane, adjacent lane, and to protect the pump operator



Compartment Hazards

Extinguishment Operations

Engine compartment

- Hood pistons
- Bumper pistons
- Battery acid

Compartment Hazards

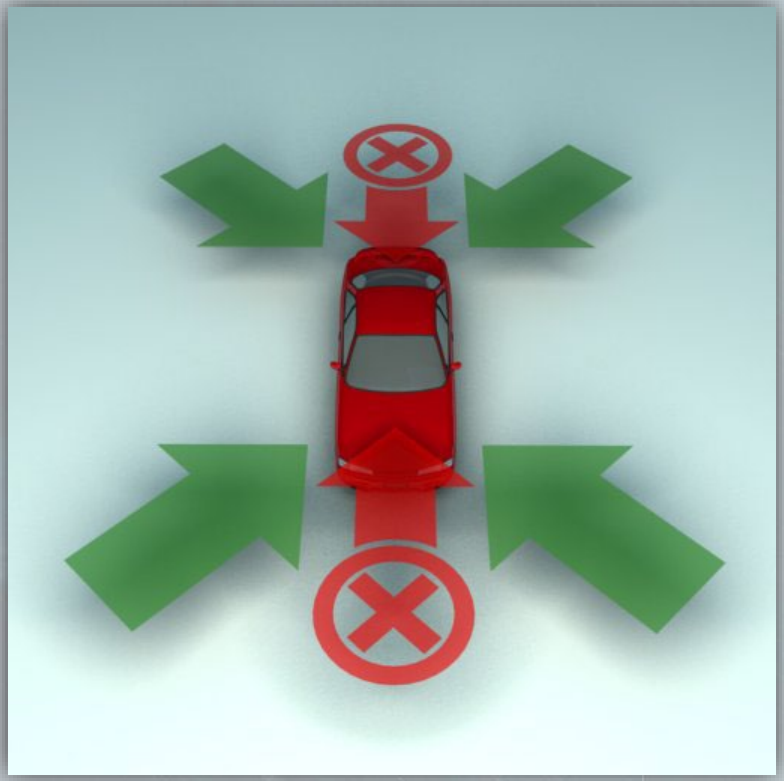
Extinguishment Operations

Passenger compartment

- Air bags
- Passenger restraint systems

Hoselines

should be advanced from the corners of the vehicle, not the front, rear, or sides



Shock Absorbing

bumpers can be dangerous

Advance cautiously

- Advance to the corners at a 45 degree angle
- Use a fog pattern to assist with smoke dispersion
- Sweep all surfaces to cool and extinguish
- Gauge success by watching the fire

Safety Concerns

Extinguishment Operations

- Tires
- Air bags and inflators
- Seatbelt pretensioners
- Steering and A/C components
- Struts
- Fuel lines

Magnesium Components

Extinguishment Operations

Currently used in

- Engines
- Steering
- Seats
- Instrument panels

Future uses

- More engine blocks
- Transmissions
- Manifolds and water pumps
- Oil pans

Also used in

- 1970's model Volkswagons, Porsches
- Late model BMWs and Corvettes