



## PDHonline Course G474 (2 PDH)

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# Introduction to Commercial Truck Fires

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**PDH Online | PDH Center**

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# Discussion Areas

- Expert Qualifications
- Why?
- Major Components of Trucks
- NFPA 921 Methodology
- Truck/Vehicle Fire Investigation Methodology
- Fire Involvement of Truck Components

# Expert Qualifications

- This course is informational and not designed to qualify attendees as experts for the purposes of litigation or litigation support.
- Completion of this course will not enable attendees to safely perform the duties of a fire investigator.
- For more information about how to become a Certified Fire and Explosion Investigator (CFEI) or Certified Vehicle Fire Investigator (CVFI), visit the National Association of Fire Investigators (NAFI) website at [www.nafi.org/certification](http://www.nafi.org/certification) .
- For more information about how to become a Certified Fire Investigator (CFI), visit the National Fire Protection Association website at <http://www.nfpa.org/training/certification-programs> .

# Why Investigate Truck Fires?

- Truck Fires typically result in a larger loss of economic value due to the inherent cost of the truck vs. an automobile.
- Truck Loads in trailers can have a phenomenally high value.
- Truck Fires can result in earning loss or production down-time or business interruption loss for an independent trucker.
- Trucks are typically parked close to each other resulting in a higher potential for fire spread damage vehicle to vehicle.
- Some trucks are parked indoors or adjacent to building structures again resulting in higher potential for fire spread damage to commercial structures (as opposed to residential structures).

# Major Vehicle Systems

Take the time to press control and click on each hyperlink below. Each link has a basic summary of the major vehicle systems.

- Powerplant: [Engine](#) and [Transmission](#) ([Transmission Video](#))
- Electrical System: Engine/Powerplant System, Safety Restraint Systems, FMVSS required Systems: lighting/horn/wipers/gages, Body Control Systems.
- [Suspension](#) and [Steering](#) (Fig 2-1 and 2-2)
- Body ([diagram](#))
- [Heating and Cooling](#)
- Brake System: [Primary](#), [Secondary](#), and [Trailer](#)



## Commercial Truck Extra Consideration

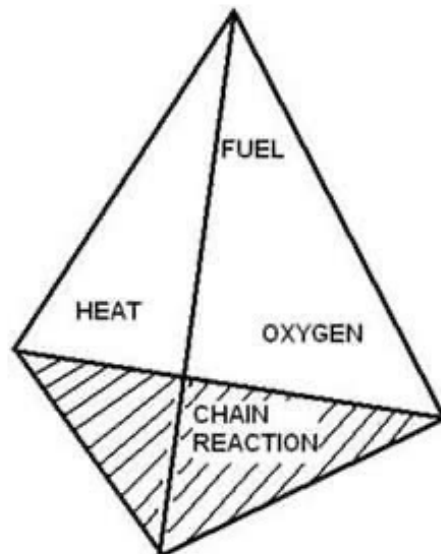
- Scalability of Components – i.e. larger size
- Trailer – chassis, structure, electrical, brake system, lift gates, heating or cooling system
- Contents of Trailer
- Specialized Loads and Configurations – i.e. Tankers, Construction Equipment, Motor Vehicle Carrier, Dumps, School Buses, Commercial Buses, Recreational Vehicles

# Exploded View of Basic Truck



# NFPA 921 Guidelines

- NFPA 921 Guidelines for Fire Investigation
- Investigate scene or evidence from least damage to most damage, from outside to inside.
- Attempt to locate the basic components of a fire: fuel, oxygenating agent, ignition/heat source, and ability to sustain combustion (uninhibited chemical reaction).
- Use the scientific method to prove or disprove theories of cause and or origin.



Right Mouse Click and open and read the following Link: [NFPA 921](#)

# NFPA 921: Scientific Method

- Recognize The Need – typically a fire, cause, and origin is needed to what may have caused the fire.
- Define The Problem – What caused the fire.
- Collect Data – scene and evidence inspection, photos, reports, destructive evidence examination/testing, and etc.
- Analyze Data
- Develop an Hypothesis
- Test Hypothesis
- Select Final Hypothesis – Final Cause determination

# NFPA Fire Cause and Origin Methodologies

- Fire Patterning – Establish area of origin based on degree of burn and V patterns
- Arc Mapping – Identifying and locating electrical arcs and attempting to establish origin based on distance from power source
- Analysis of Combustibility of Materials
- Fire Suppression Effects on Patterns
- Time Line Analysis – Witness statements, photos, and videos if available
- Computer Fire Modeling



# Truck/Vehicle Fire Methodology

- Same basics as regular Fire Cause and Origin Complicated by:
  - Lack of Remaining Evidence
  - Spoliation of Remaining Evidence During Transport and Storage
  - Close proximity of fuels and ignition sources
  - A plethora of different materials used in mfg. of truck
  - No standardization in components/design
  - Interaction w/ site
  - MVA



# Truck/Vehicle Fire Methodology, cont.

- Investigation Assisted by:
  - Large Size of Commercial Truck
  - Limited Number of Sources of Fuel and Possible Ignition Sources

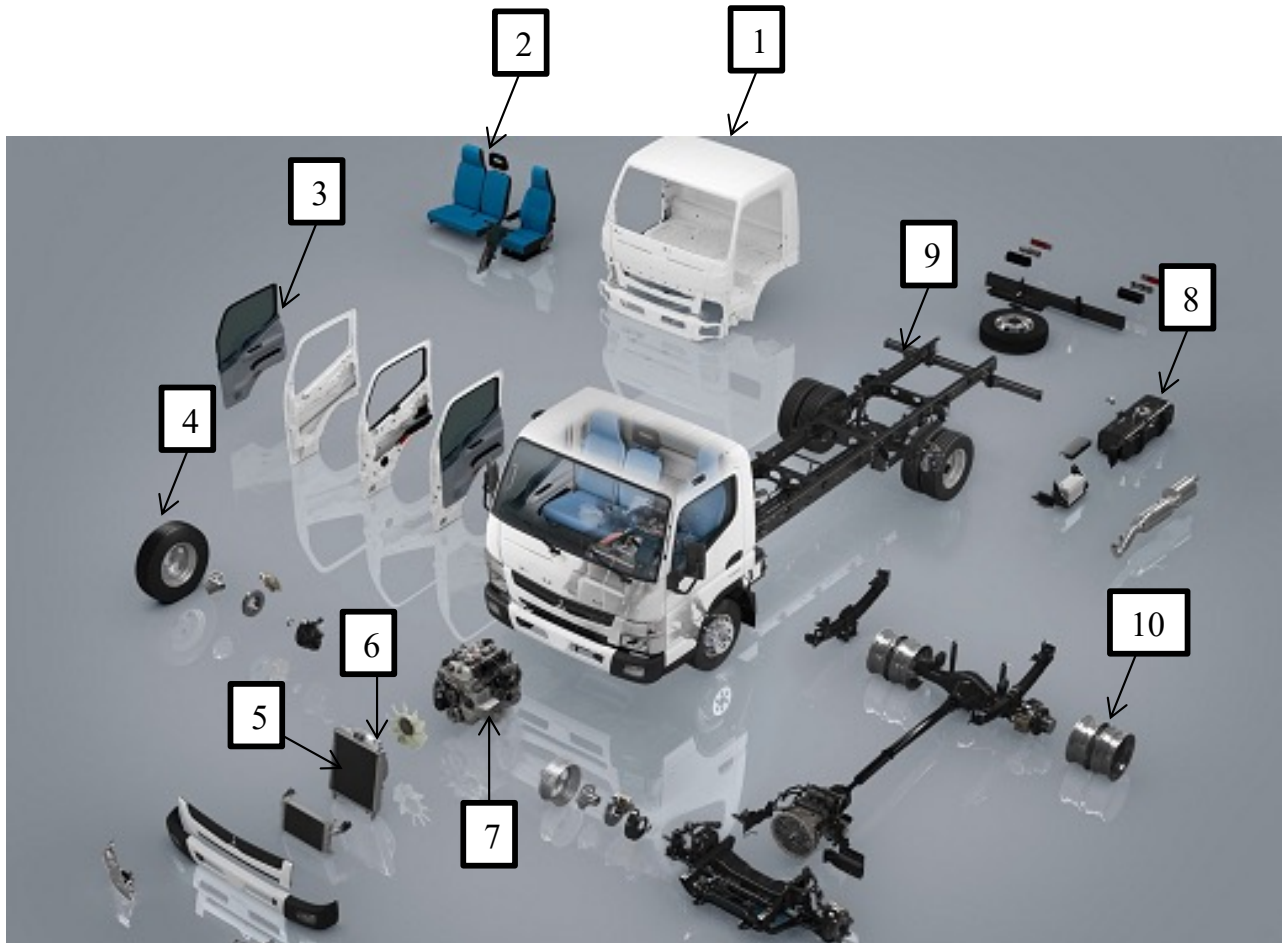


# Fire Investigation Data Gathering

- Preserve Evidence
- Preserve Site or Scene (if possible)
- Get Configuration/Construction History of Truck
- Log books/Use History
- Maintenance History



# Component Involvement in Fire: Fuel Sources and Materials



1) Cab: Fiberglass  
Ignition T = 1040 F

2) Seats: Polystyrene  
Ignition T = 655 to 689 F

3) Interior Trim: Plastic  
Melt T = 428 to 510 F  
Ignition T = 775 to 932 F

4) Tires: Rubber  
Melt T = 260 F  
Ignition T = 650-700 F

5) Radiator: Aluminum  
Melting T = 1050-1200 F

6) Coolant  
Ignition T = 748-770 F

7) Engine: Engine Oil  
Ignition T = 644-680 F

8) Fuel Tank: Diesel or Gasoline  
Ignition T = 489 F or 660 F, min  
respectively

9) Frame: Steel  
Melt T = 2600 F

10) Wheel Rims: Steel or Aluminum

11) Auto Transmission Fluid  
Ignition T = 626 to 716 F

Note: Temperatures are from multiple references including  
NFPA 921 2017 and Investigation of Vehicle Fires by Lee S.

# Plastics in Fire Involvement

How does plastic burn (Lee S. Cole)

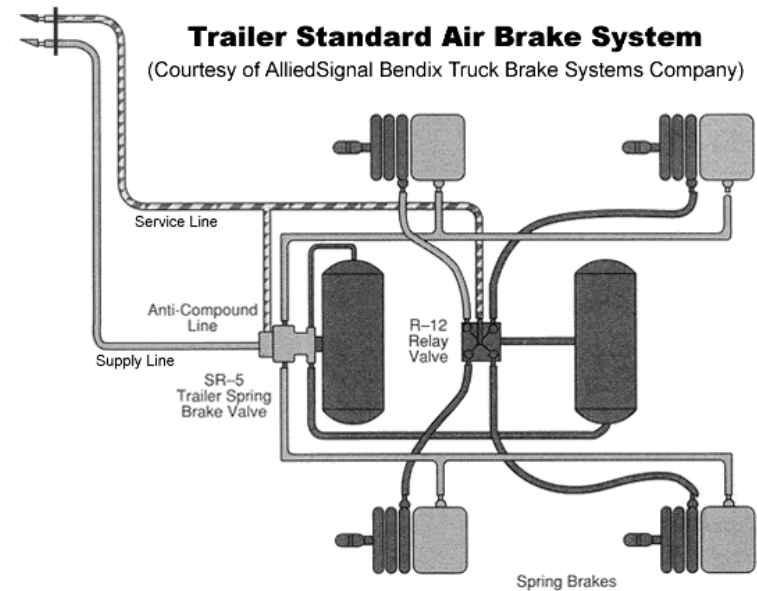
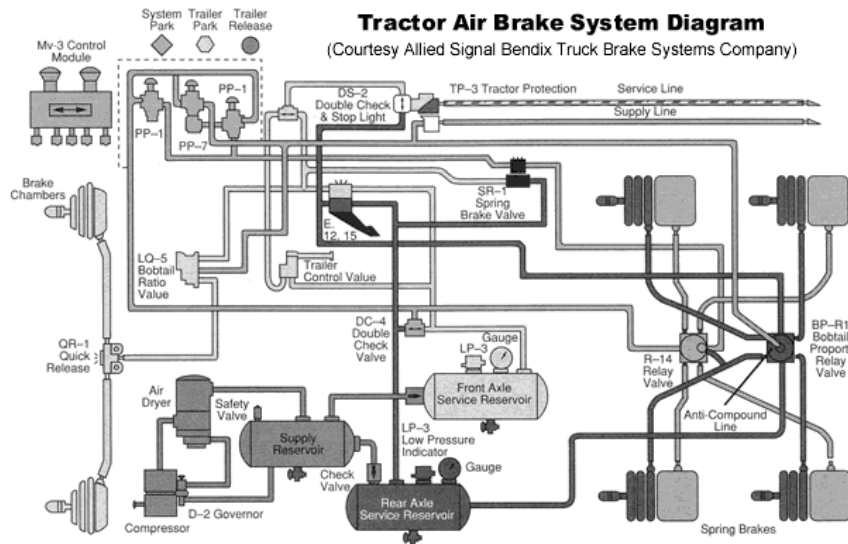
1. Heating
2. Decomposition
3. Ignition
4. Combustion

How to use?

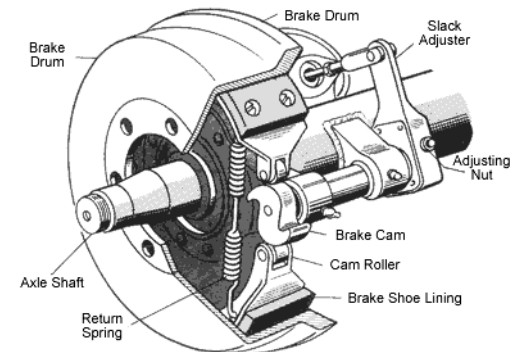
- Fire Patterning (V- Patterns)
- Determining Fire Spread and Direction of Fire
- Determine if fire started from interior of compartment to outside or vice versa

# Component Fire Involvement

## Least Likely: Brake System



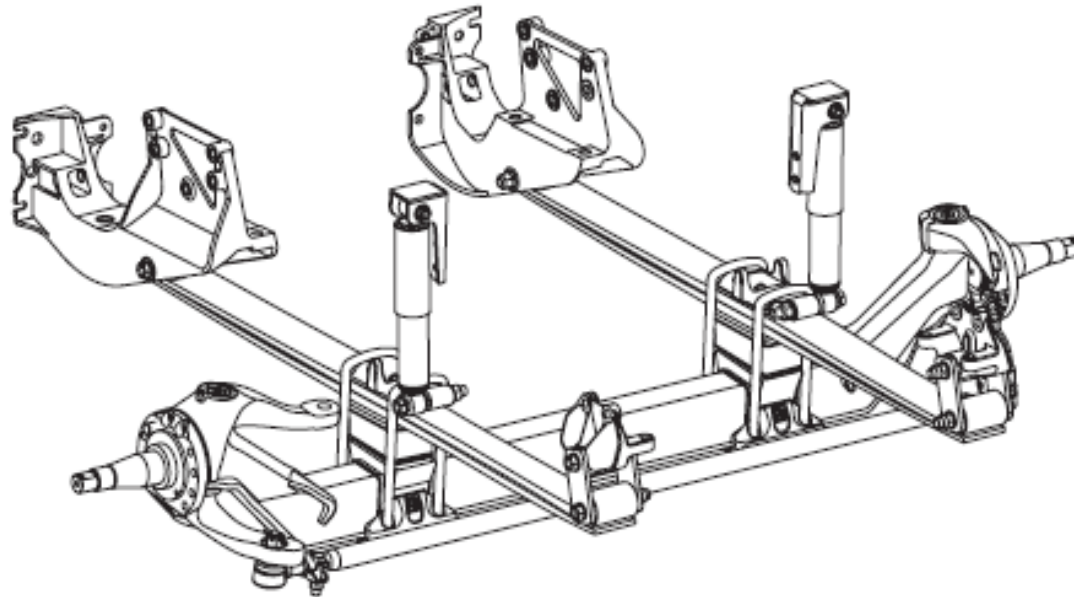
- Usually Air System
- Rubberized Air Hoses and Lines are good source of fuel
- Exception: MVA related or failed brake line locking of brakes



Courtesy of Allied Bendix Truck Brake Systems Company

# Component Fire Involvement

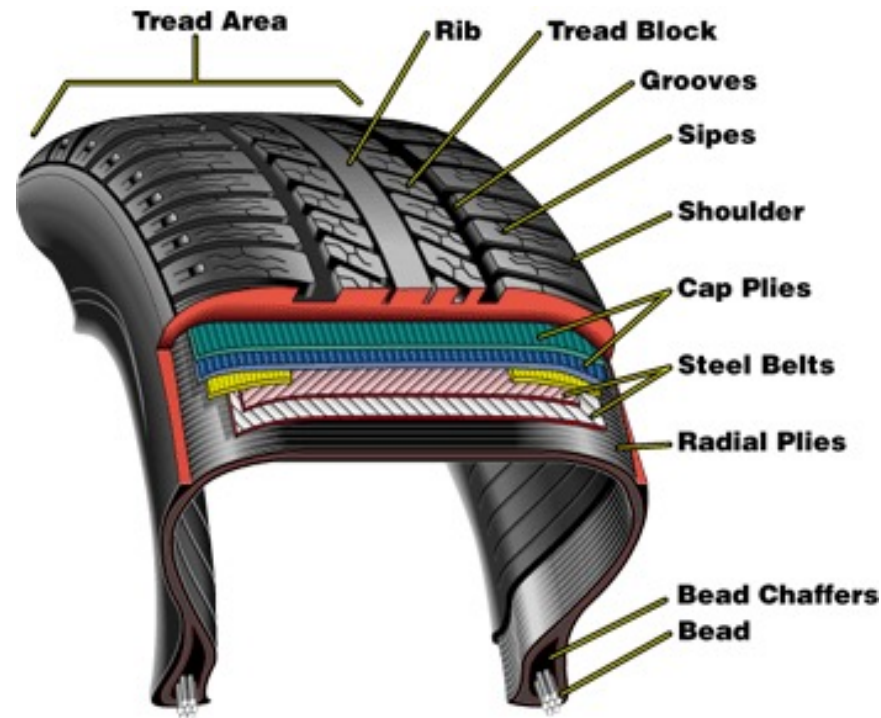
Least Likely: Chassis & Steering



- Constructed Largely of Non Combustible Materials
- Rubber Isolator Burns Useful for Burn Patterning

# Component Fire Involvement

More Likely: Tires



- Burns Easy and Likely to Be Consumed
- Not likely Cause and Origin Because of Design
- Exception: MVA related high speed braking or failed brake system locking of brakes. Friction can result in a fire.

# Component Fire Involvement

- More Likely: Engine/Hydraulic Units/PTOs



- Check NHTSA and Web for Recalls or Complaints
- If Engine was Cause and Origin, Check Maintenance and Use History
- Integrity of fuel, oil, or hydraulic lines should be checked
- Line fittings, routings, and clearances should be checked
- Reservoir levels need to be checked

# Component Fire Involvement

- More Likely: Main Powerplant Electrical System

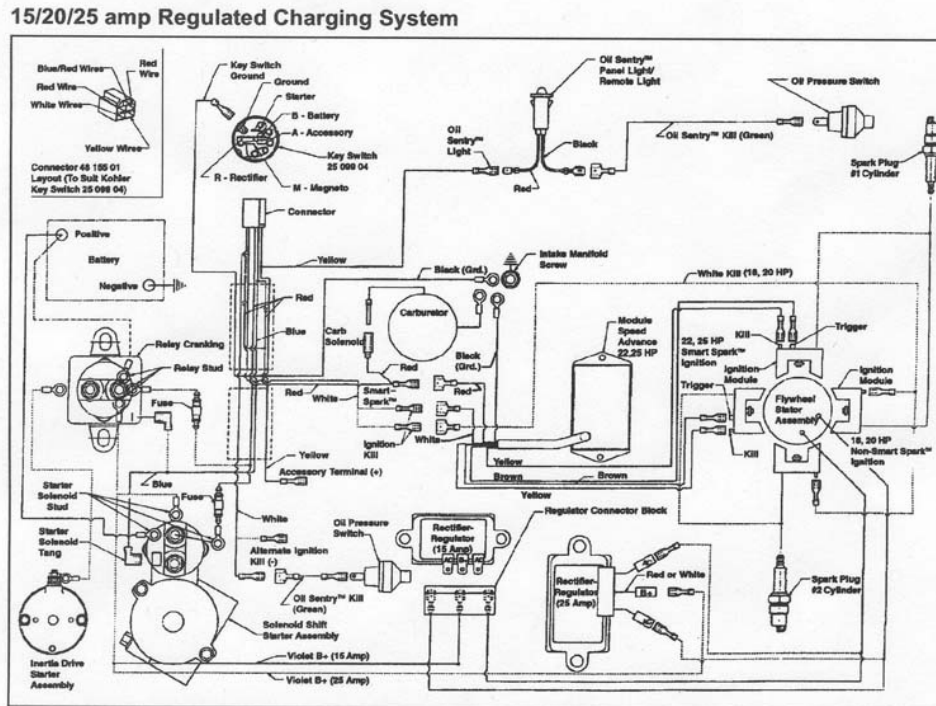


Figure 8-14. Wiring Diagram - 15/20/25 amp Regulated Battery Charging System.

- Prime candidate if fire started while vehicle was not in operation.
- Battery-Alternator-Fuse Box Circuit has highest load potential.

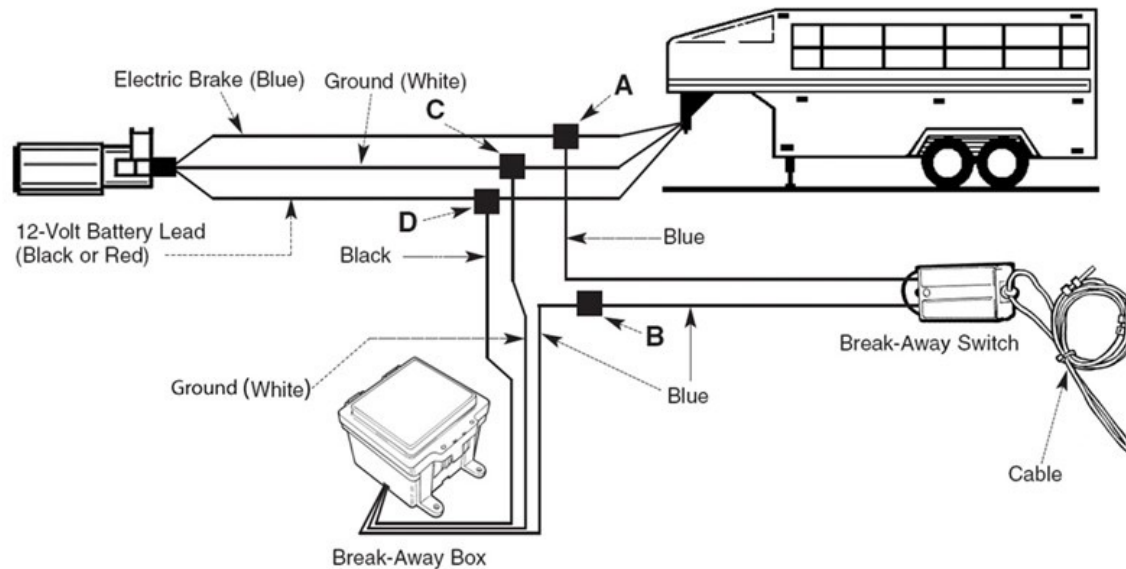
# Component Fire Involvement

## Possibility: Accessory System

- Seat Heaters
- Aftermarket and standard entertainment systems: stereo, video, or audio
- Plug in devices such as chargers and phones
- Trailer hook ups and connections
- Recording devices or backup cameras
- Living or comfort devices for sleeper cabs or RV's
- Cooking devices
- Refrigeration or cooler devices
- Lighters and other smoking accessories
- Trailer hitch or towing devices
- Plowing devices
- Dump Bed

# Component Fire Involvement

- Possibility: Accessory System



## Example 1: Area of Origin?



## Example 1: Cab Fire



- Fire Pattern suggests a cab fire.
- Preferentially on the driver's side.
- Area of origin: sleeper



## Example 1: Cab Fire



Better Shot of the Sleeper

## Example 2: Area of Origin?



## Example 2: Electrical



- Fire Pattern suggests a cab fire.
- Engine hood was damaged but present (left in cab).
- Front tires have no fire or heat damage
- Closer examination reveals a blowout (arcing) over the battery.
- Area of origin: Battery



## Example 3: Area of Origin?



## Example 3: Cab Interior



- Fire Pattern suggests a cab or engine fire.
- Aluminum radiator and tires have low resistance to fire and heat.
- Cab is entirely gutted, whereas radiator is still present and tires aren't consumed
- Area of origin: Cab interior

## Example 4: Area of Origin?



## Example 4: Content Fire



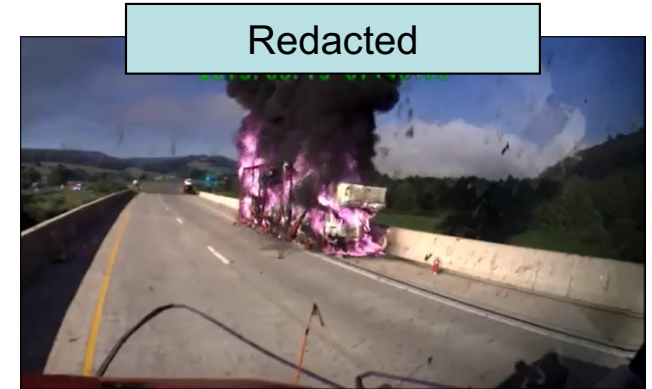
- Fire Pattern suggests a fire occurred in the transport portion of the truck.
- Only superficial fire and heat damage to cab, and engine underneath looks clear.
- Area of origin: Content

## Example 5: Locked Brake Skid Induced Tire Fire - alleged



- Locked Brake on right side of trailer alleged to have caused fire

## Example 5: Locked Brake Skid Induced Tire Fire - alleged



- Fire Dept. Photos revealed even braking and skid pattern up to the car hauler trailer.
- The difference in burn pattern was because FD could attack and put out fire on left side before the right side.
- Right side was on fire in videos/photos much longer than left side.

## Example 5: Locked Brake Skid Induced Tire Fire - alleged



- Pattern actually indicated fire originated with one of the cars being hauled.