Changes in Fire Apparatus Now and in the future

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Past President of FAMA – Year 2000

Overview

- The changing fire service
  - Industry Statistics / Trends
- Manufacturers are changing to meet your new needs
- NFPA / Safety Advancements
  - Cab & Chassis
    - Engine EPA 2010
  - Aerials
  - ARFF
- Other Technological advancement

Times have sure changed

What Changes do you see?

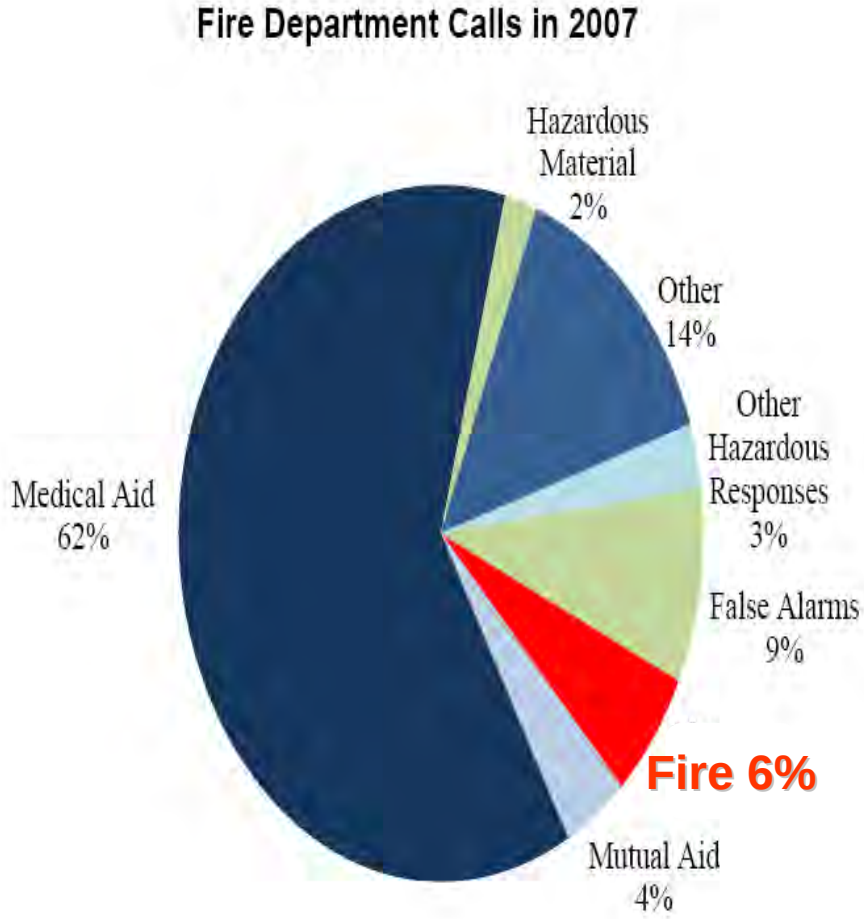
The Changing Fire Service

"While all the hats and shirts you own have the word "fire department" on them, let's face it, responding to fire is not what we do with the bulk of our response time…

Chief Jeff D. Johnson, April 2010

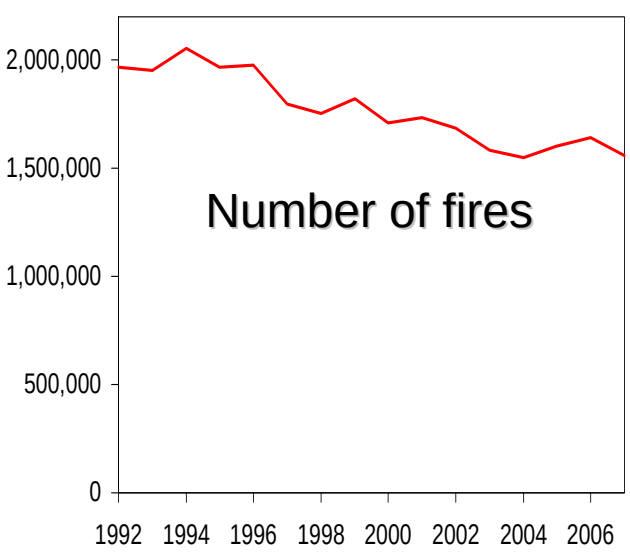
Industry Statistics/Trends

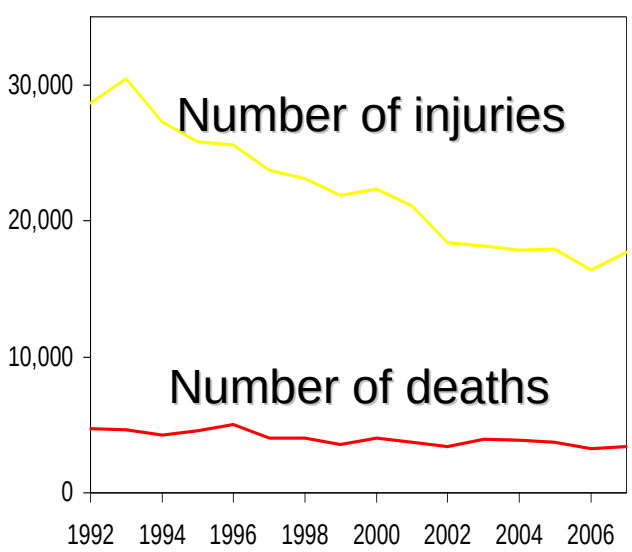
Fire Departments Calls
More EMS and Less Firefighting

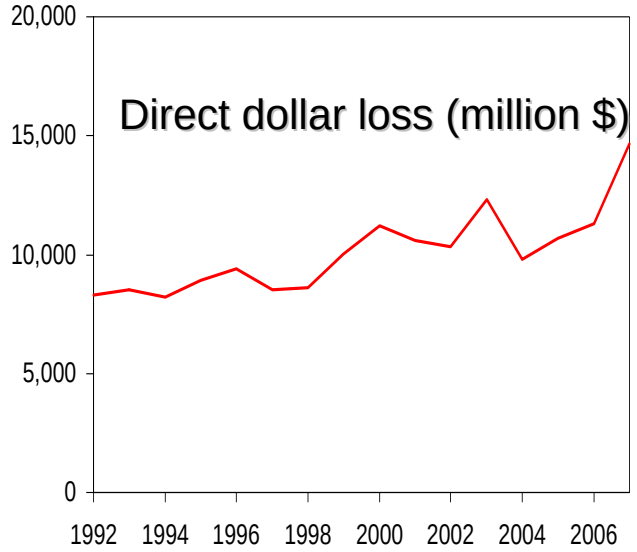


* NFPA Fire Analysis and Research

U.S. fire trends (1992 – 2007)





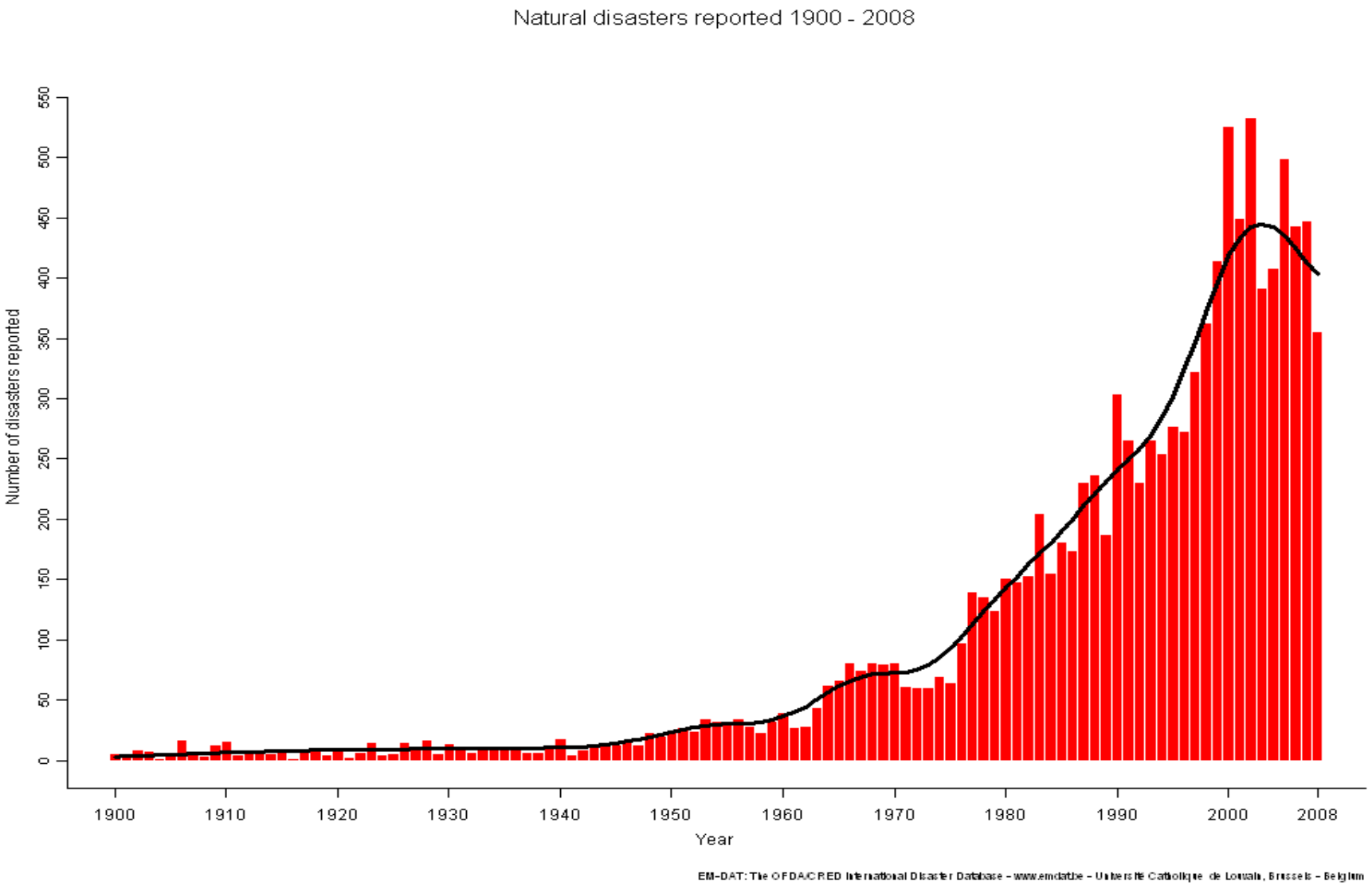


- Number of fires: 15% ↓
- Number of injures: 31% ↓
- Number of deaths: 20% ↓
- Direct dollar loss: 32% ↑

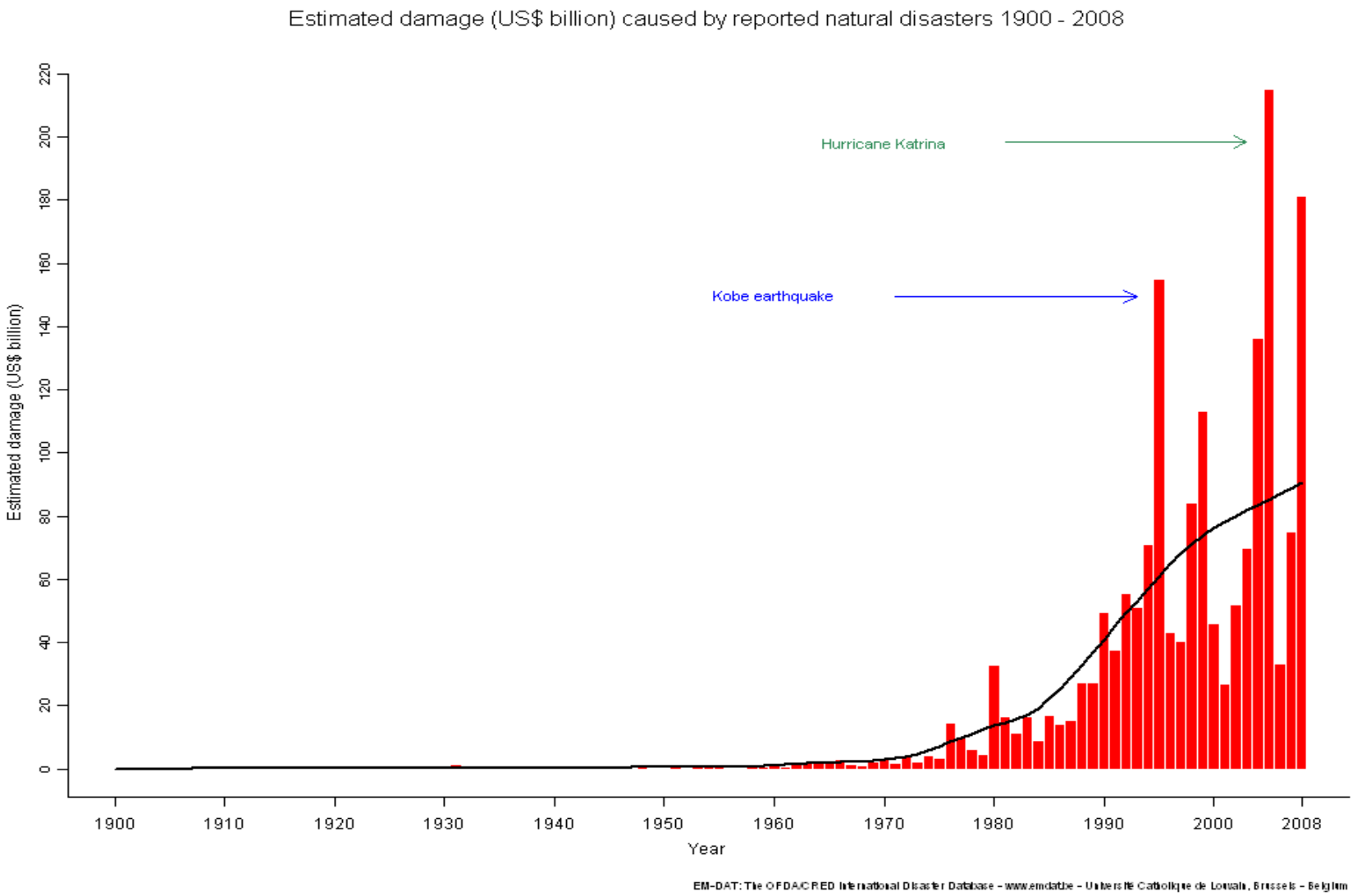
Conclusion -- Fewer Fires but those we are having are worse than even. Still need big water when needed.

* NFPA Fire Analysis and Research

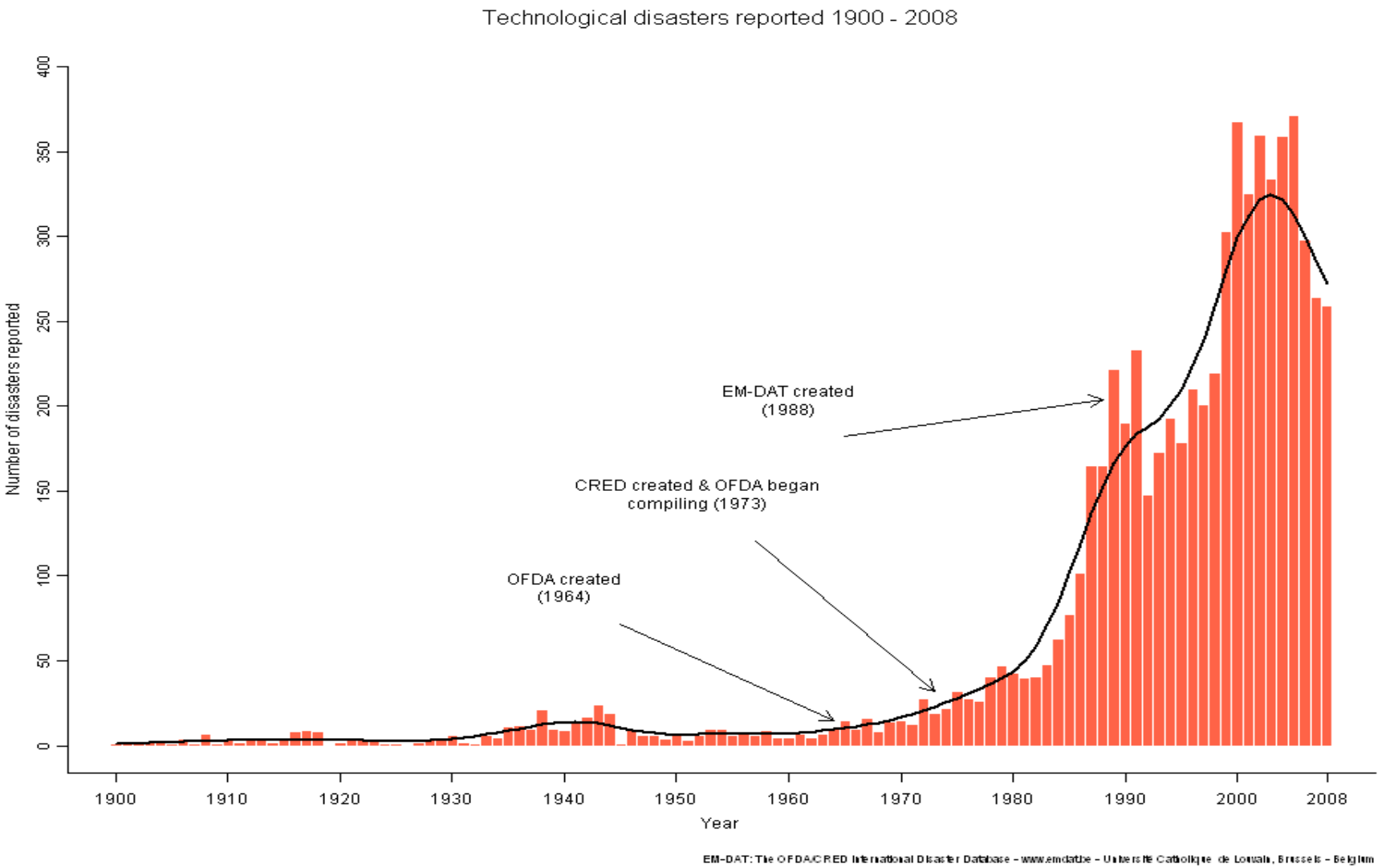
Natural Disasters on the Rise



Damages in Billions



Technological Disasters



Trends - Conclusion

- Number of calls has almost tripled in last 30 years
- More EMS Response
- Fewer Fires than ever before, but fires we are having are larger are causing more damage than ever
- Fire Service is most often the first responder for disasters (natural & technical) that are on the rise
- Fire Service moving toward multi-purpose vehicles that can do more
  - Need to carry additional equipment
  - Needs to be multifunctional and maneuverable
  - Still needs big water pumping capability
- Safety features are necessary, but adding cost
- Technological Advancements are being adapted faster than ever before
  - From use of Class A Foam, CAFS, body materials

USA Fire Apparatus Market

- **On average there are 5000 – 6000 fire apparatus purchased each year**
- **In 2010 – Estimate 3000 - 3500**
- **There are an estimated 70,000 fire apparatus in service in the USA**
- **NFPA estimates 40,000 in-service US fire apparatus were built prior to NFPA 1901 (1991) standard.**
  - **10,000 are over 30 years old. (13%)**
  - **17,000 are 20-29 years old. (21%)**
  - **13,000 are 15-19 years old. (19%)**
- **Over 50% of all apparatus are over 15 years old**
- **Trend - Fleets are aging and not being replaced**

Trends in Apparatus Sales
Pumper Sales

- **Most shipped of any fire apparatus**
  - Greater than 50% of total shipping
- **Declining sales trend**
- **Industry efforts to multi-task apparatus**
- **Mini pumpers experiencing a steady growth**
- **Group includes: Rescue, Mini-Tanker and all other Pumpers**

Walk-In Rescue

- **Declined steadily**
- **Switch to Non-Walk-In**

Non-Walk In Rescue

- **Increased growth steadily**
  - Shipping doubled in 10 years
- **Shifting from firefighting to emergency response**
- **Desire to separate crew and equipment**

Rectangular and Elliptical Tanker Sales

- **Increased growth**
- **Rectangular tankers have grown faster than elliptical**
  - Rectangular tankers have about twice as many sales
- **Converting former military and petroleum vehicles no longer common**
- **Rectangular can provide more capacity**

Aerial Sales

- **Slight increase in growth**

- **Group includes: Aerial Ladders, Tractor-Drawn Aerials, Aerial Platforms, and Water Tower Aerials**

Airport Rescue and Fire Fighting (ARFF) Sales

- **Declined steadily**
- **Limited size of market**

Major Refurbishment

- **Declined steadily**
- **Mid-1990's were strong**
  - Possible response to 1991 revisions to NFPA 1901
- **Major refurbishing includes**
  - Pumpers, aerials, tankers, ARFF, and foam trucks
- **Gaining Popularity in last 2 years**

Changes to Fire Apparatus as Result of Changing Needs

Engines are being used to perform more tasks

- Traffic Control

Engines are being used to perform more tasks

- Lighting

Engines are being used to perform more tasks

- SCBA Refilling

Engines are being used to perform more tasks

- Disaster Response – Hazmat MABAS

Engines are being used to perform more tasks

- Heavy Rescue – Carry more equipment

Conventional Pumper - Rescue

Trend toward Multi-Purpose Vehicles

Trend toward Multi-Purpose Vehicles

Trend toward Multi-Purpose Vehicles

Integrated Pump Systems

- Increased Compartments
- Improved Service Access
- Simplified Operations
- Easy Maintenance

Trend toward Multi-Purpose Vehicles

Trend toward Multi-Purpose Vehicles
Patient Transport with CAFS

Multi Purpose

CAFS
Patient Transport
Rescue
Water Purification

NFPA/Safety Advancements

NFPA 1901

- ***Safety*** of firefighters to and from the scene and ***Frontline Service Life*** of apparatus are primary factors in the purchase decision.

- Initial price may carry “sticker shock” for apparatus built with all available safety features and “heavy-duty” components, but over time = savings when high run departments have fewer traffic injuries and 15+ years of front line service

NFPA Changes in 1999 Standard

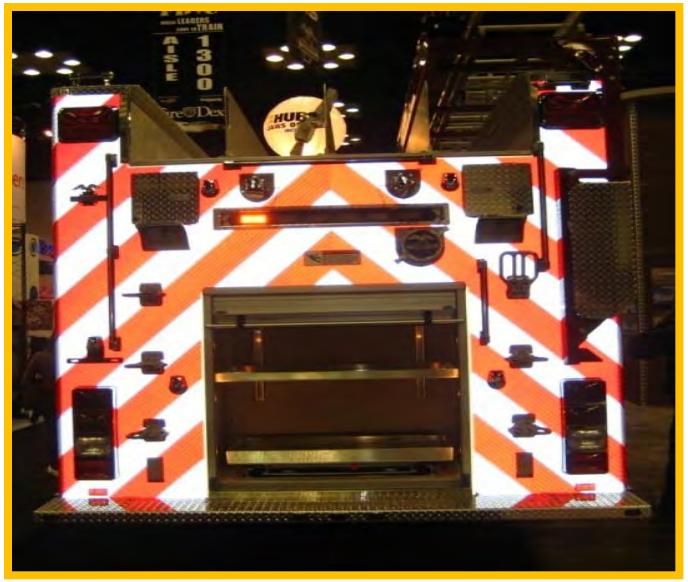
- 1996 & 1999 revisions brought more technology and improvements.
  - CAFS systems
  - Air systems
  - Quint standards
  - Communications
  - Scene lighting
  - Winches
  - Slip resistance
  - Equipment mounts
  - Air-pack fill stations
  - Load managers
  - Pre-delivery testing

NFPA Changes in 2003

- More improvements mandated in 2003 revision.
  - 3rd Party Generator Testing.
  - Standardized Equipment Weight Table in “Annex C”.
  - Inlet relief valve
  - Positive-lock SCBA mounts
  - Ember separator specs
  - Reflective striping on inside of open cab doors
  - Large-capacity pumps
  - Hi-viz red crew seatbelts

NFPA 1901 – 2009 Standard

- More 2009 safety improvements…
  - Reflective Striping on All Doors
  - Cab Structural Integrity Tests
  - Driver Adjustable Mirrors
  - Min. Clearance for Access Ladders
  - Better Handrails & Handholds
  - 50% Rear Reflective Striping
  - Ground Ladder Heat Shielding
  - Winch/Rope Anchor Requirements
  - Intake/Outlet Caps Secured to Truck
  - Aerial – Electronic Envelope Control
  - Aerial – Short-jacking Control
  - Safer Line Voltage Grounding
  - Breathing Air Quality Monitor
  - Winch Free-Spooling Clutch Required
  - Trailer Safety Standards Added



NFPA 1901 2009 Revision Requirements

- Electronic Fluid checks.
- Data Recorders
- Roll Stability requirements

(System or Tilt Table Certification)

- Seat Belt warning indicators.
- Tire Pressure monitors.
- Apparatus Weight vs. Top Speed limitations.
- Secured cab interior equipment mounting guidelines.
- No Helmets worn in response. (Various storage provisions)
- Changes in weight estimations. (Personnel weight figured at 250# per person in place of old 225# per person. Could affect axle rating)

- Future? Who knows? Safety will be prevailing factor…

Cab & Chassis Advancements

Safety Systems

- Traffic deaths are the second leading cause of firefighter death.
  - 5,000 accidents in 2008 responding to or returning from a fire
  - 25-30 Deaths
- Frontal Airbags
- Side Roll Airbags
- Electronic Stability Control ESC

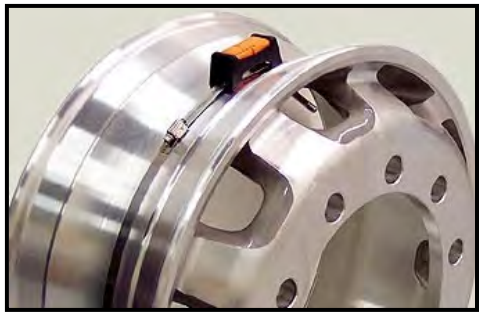
Safety Systems

- Independent Front Suspension
- Improved Ride Quality by 340%
  - Improves Handling
  - Enhances Vehicle Control
- Introduced 17” Brakes
  - 23% Shorter Stopping
  - Longer Brake Life

Safety Systems

- Tire Protection Systems
  - Monitor Pressure
  - Keep Tire on Rim

- Caps That Vent Pressure
  - An Extra Layer of Safety
  - Releases Trapped Residual Pressure.



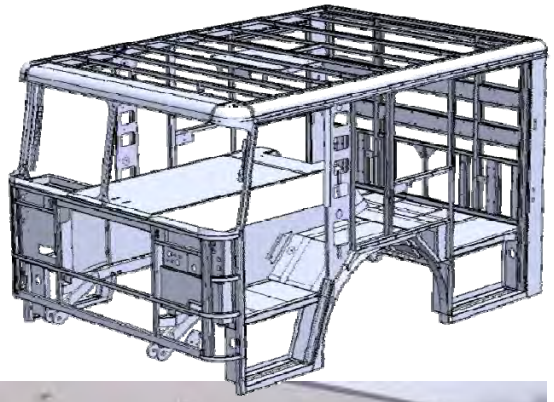
SCBA Brackets

- Inertia Activated
  - No Latches or Straps
  - Walk-Away Design
- Electric
  - Released w/Parking Brake
  - Walk-Away Design
- Pull Release
  - Cable Actuated

Example of Helmet Storage Brackets

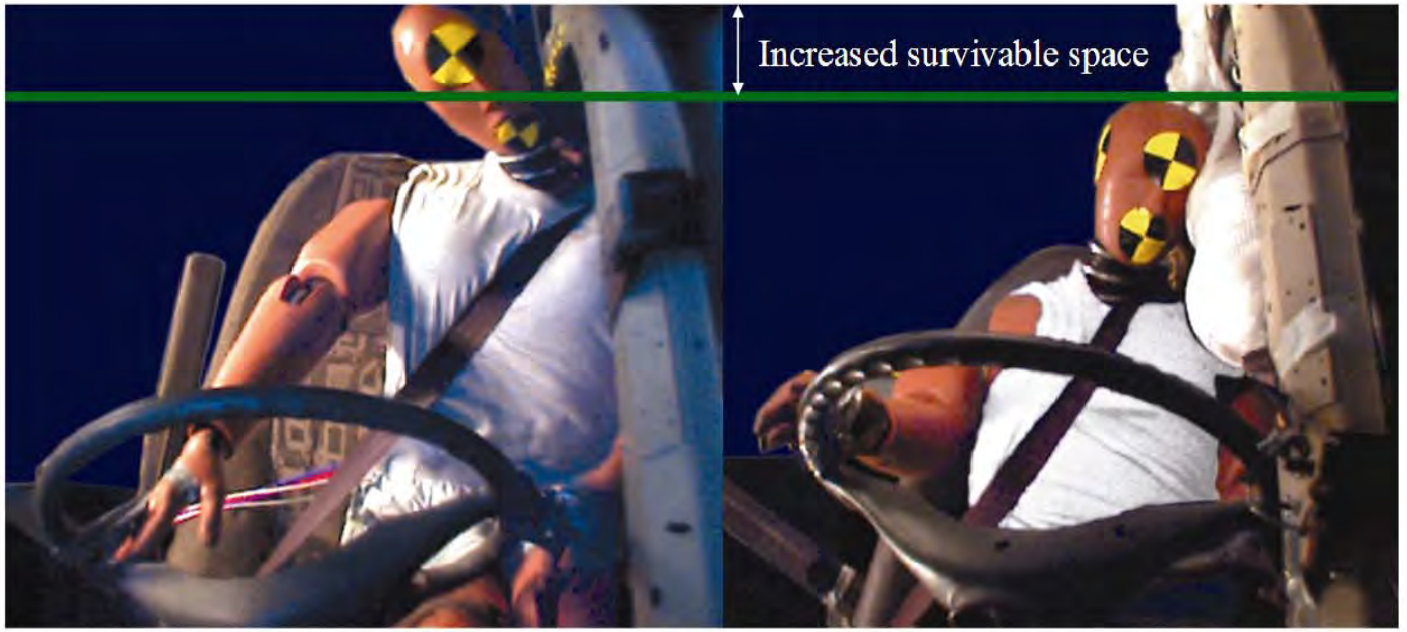
Cab Safety

- OEMs are investing more than ever in Cab/Chassis Strength & Safety
  - Exceeded SAE and ECE-R29 crash test requirements with a single test cab
  - Roll Stability system testing
  - Seat belt anchor testing
  - Roof & Pillar overload testing



Pretensioners & Side Airbags

RollTek Side Roll Protection



Without RollTek

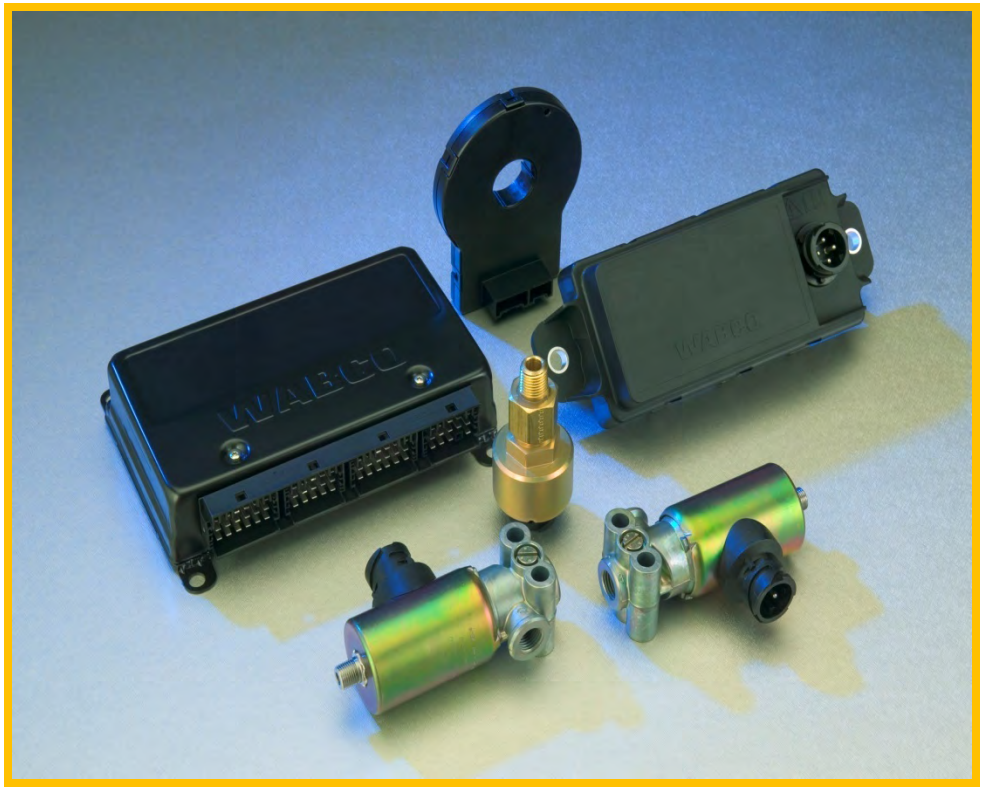
With RollTek

Static Stability Testing

Lateral Acceleration Indicator

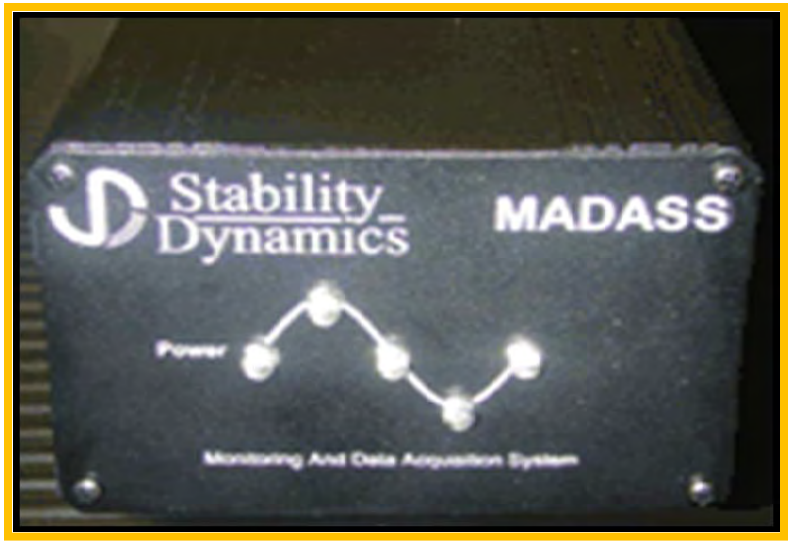
Roll Stability Control

Electronic Stability Control



Event Data Recorders

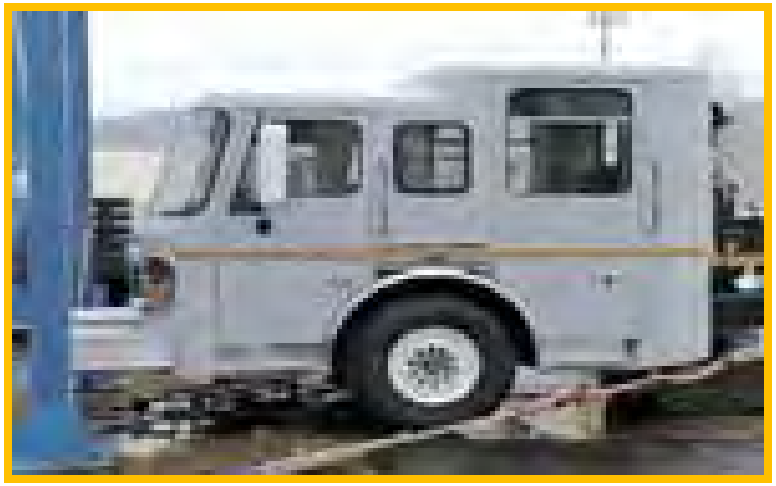
Vehicle speed (MPH)
Acceleration (MPH/sec)
Deceleration (MPH/sec)
Engine speed (RPM)
Engine throttle position
ABS event
Seat occupied status
Seat belt status
Master optical warning switch position
Time
Date



Seat Status Indicator

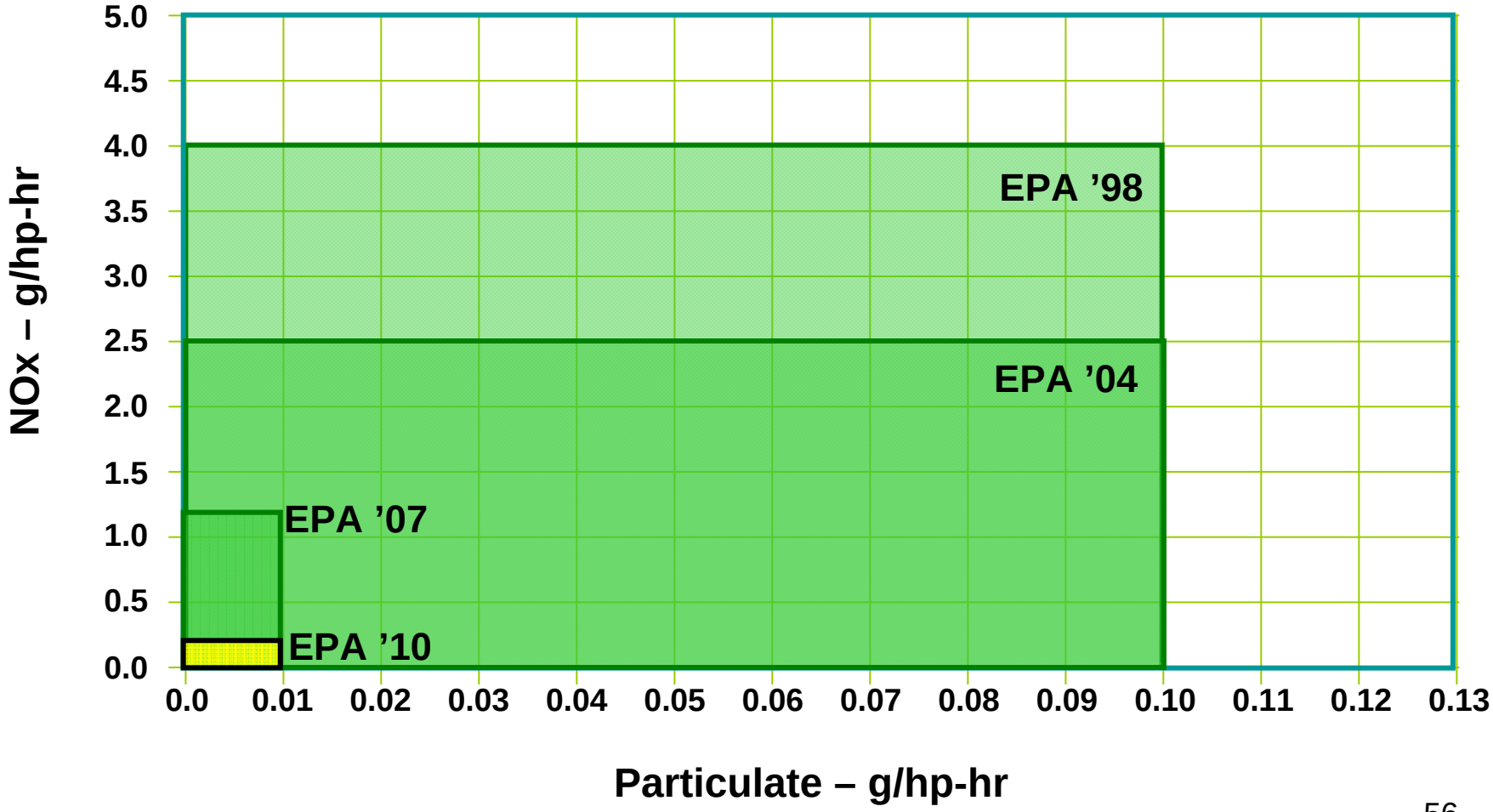
Structural Integrity Testing

Crashworthiness Testing



Engine & Transmission Advancements 2010 Emissions

North America On-Highway Standards – 2010 Emission Standards



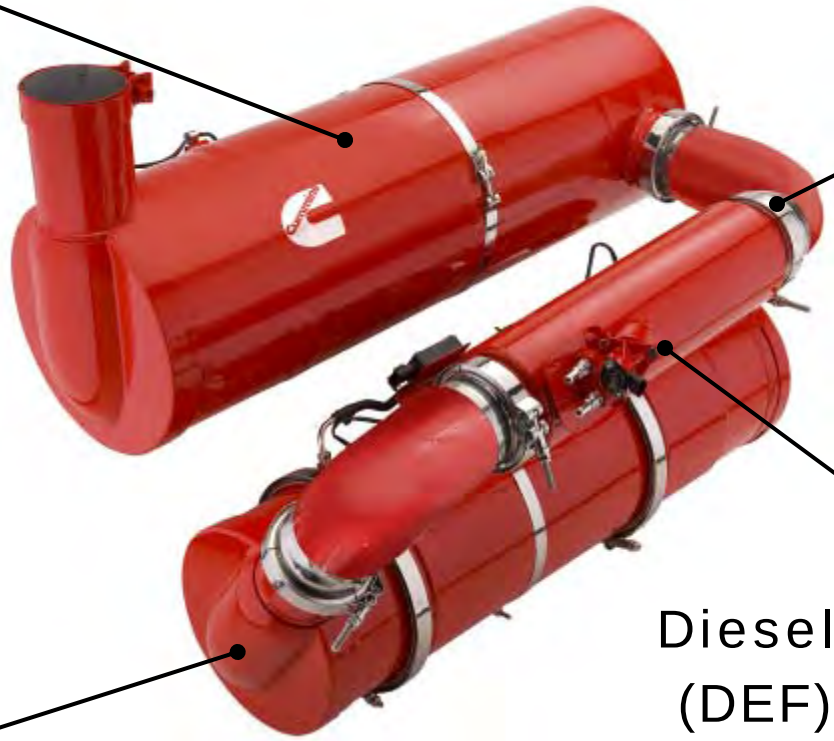
2010 Engine Emissions – Radical Changes - New Vocabulary

- **DEF**…**D**iesel **E**xhaust **F**luid (Urea)
- **SCR**…**S**elective **C**atalytic **R**eduction
- **DPF**…**D**iesel **P**articulate **F**ilter
- **ECU**…**E**lectronic **C**ontrol **U**nit
- **ECM**…**E**lectronic **C**ontrol **M**odule
- **EGR**…**E**xhaust **G**as **R**ecirculation
- **CO2**…**C**arbon **D**ioxide

New Vocabulary

- **OBD**…**O**n **B**oard **D**iagnostics
- **NOx**…**N**itrogen **O**xide
- **ESC**…**E**lectronic **S**tability **C**ontrol
- **RSC**…**R**oll **S**tability **C**ontrol
- **VGT**…**V**ariable **G**eometry **T**urbo
- **EMI/RFI**… **E**lectro**M**agnetic **I**nterference
  Radio **F**requency **I**nterference
- **SCAAN**... **S**ystem for **C**omputerized
  Application **AN**alysis

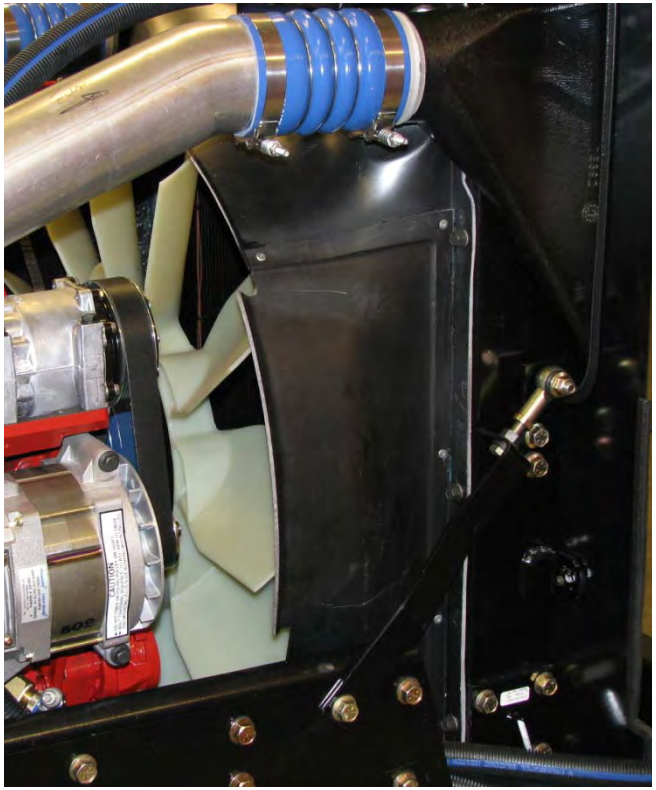
Cummins After treatment System (switchback configuration)

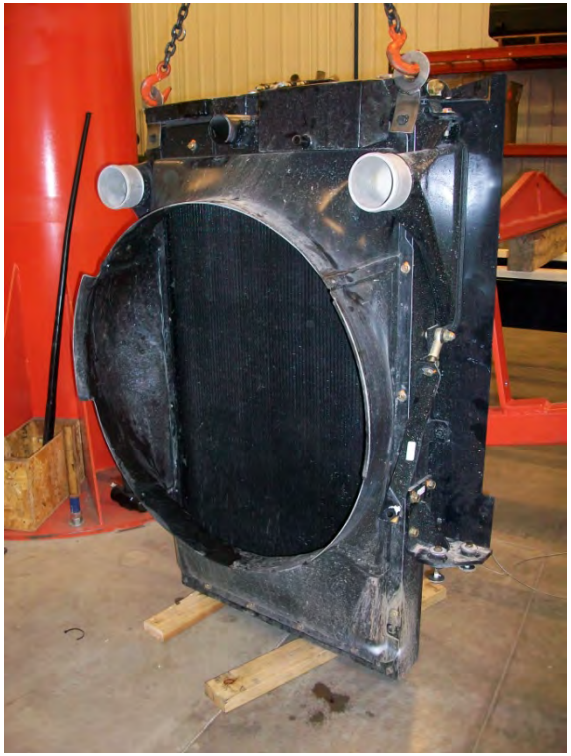


Actual View of Inline After treatment System

- DEF Fill Port with Integrated Drain
- Distance from engine controlled by engine manufacturer

- **Improved but larger cooling systems for higher engine temps**
  - Larger cores
  - Fan & shroud optimized
  - Improved seals and baffles





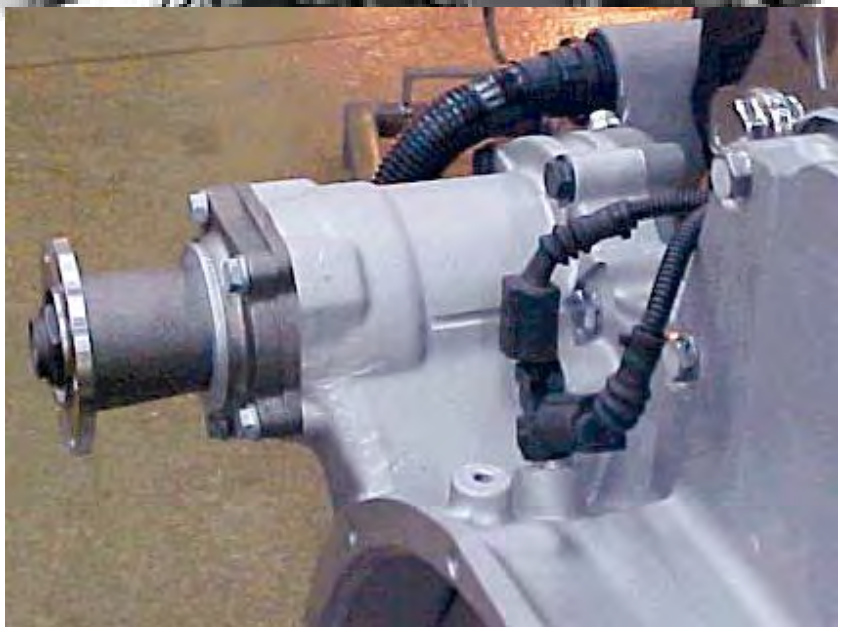
Advanced EGR Emission

No Urea Necessary

Transmission Advancements

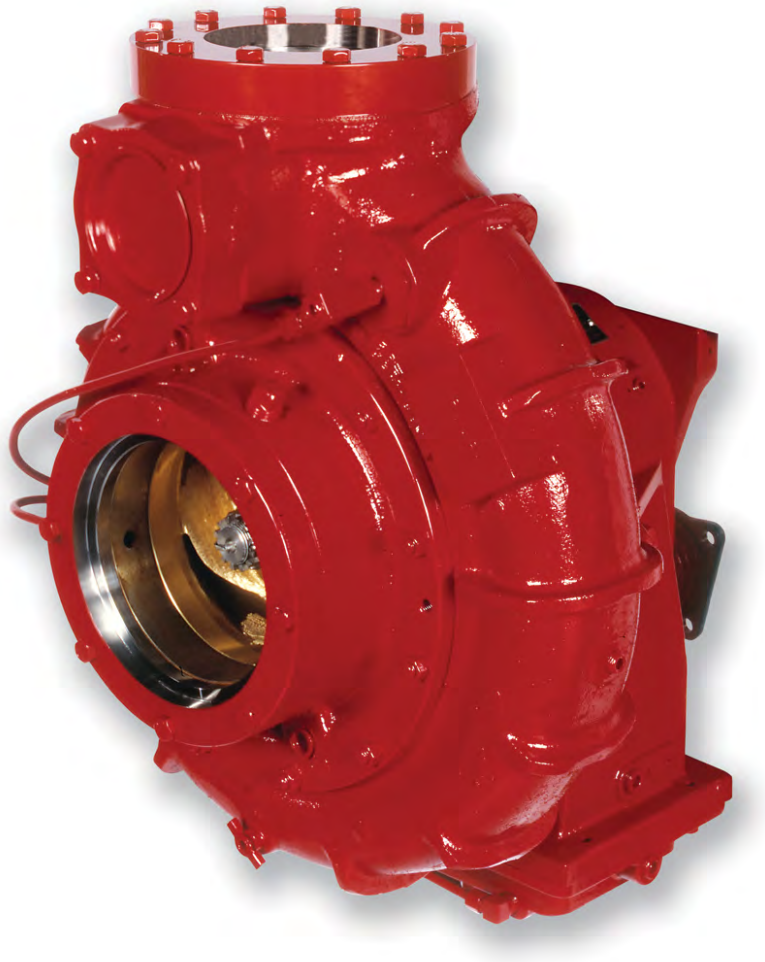
- Allison EVS 3000
  - Full engine Horsepower through the PTO

- REPTO Transmission
  - Rear Engine PTO
  - Constant Drive



Transmissions
Driving Large Pumps

- Most new multipurpose fire apparatus have pumps being driven by PTO
  - PTO Pumps to 1500
  - Compact
  - Easy to maintain
  - Compact – leaves room
  - Gets around emission component issues



Aerials

Technological Advancements – Aerials

- **Aerial Devices**
  - **250# min. ladder tip load – 750# for platforms.**
  - **Controls & breathing air in platform.**
  - **Water curtain cooling systems.**
  - **Static load support of 1.5x rated cap.**
  - **Stabilizer movement alarm & striping.**

Elevated Master Streams

- Aerials are utilized 90% of the time for elevated master streams and 10% of the time for rescue.
- Incorporating elevated master streams on pumper apparatus is a cost effective and efficient alternative.
- Light weight water towers allow for more equipment, water and foam to be carried on standard pumper apparatus.

Elevated Master Streams

Elevated Master Streams Residential Obstacles

- Residential areas are being developed and reconfigured to create a “small town” atmosphere including more “green zones”.
  - Tree lined streets make it difficult to utilize master streams for structural fire fighting.
  - Narrow streets and cul-de-sacs make it difficult to maneuver aerial apparatus or set-up outriggers.
  - Tree lined streets make large aerial devices tree trimming vehicles.

Quints have become popular

75 Aerial Ladder

100 Aerial LADDER

100 Aerial Platform

Aerial Command Seat

Crash Trucks

Radical Changes

HIGH TECH CAB INTERIOR

Mission Control Style Cab Environment

- Function Specific, Purpose Driven Controls

IMPROVED CAB VISIBILITY

Increased Visibility with 84 square ft of glass

RAPID INTERVENTION VEHICLE

WATER/FOAM, CAFS, DRY CHEMICAL, AND HALOTRON DELIVERED FROM A SINGLE QUAD-AGENT HANDLINE OR BUMPER TURRET

ULTRA HIGH PRESSURE (UHP) WATER/FOAM DELIVERY

Technological Advancement

Polypropylene Bodies & Trays

- Poly Bodies are made from the same tough, durable, impact-resistant polypropylene that are used for 99% of water tanks.

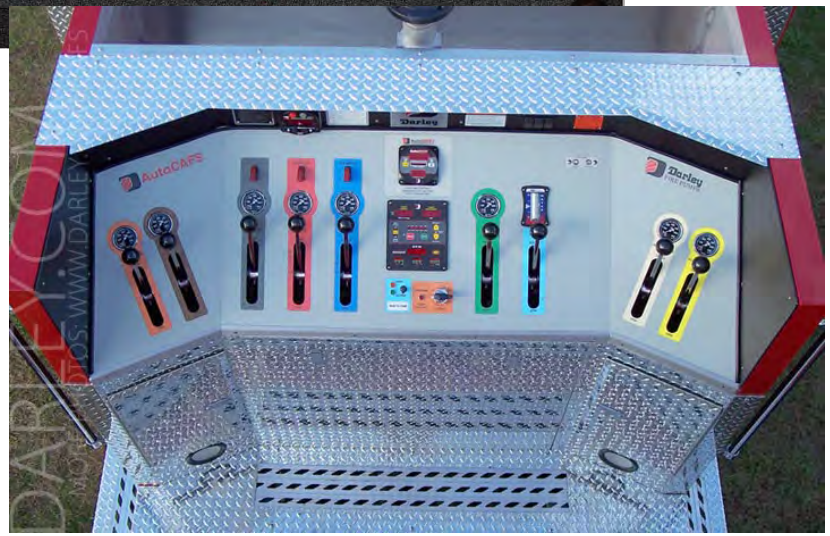
Polypropylene Bodies

- They will not rust or corrode
- Very Durable can resist day-to-day dings and dents
- Lighter weight than conventional steel or fiberglass bodies.
- PODS

Alternative Construction Materials

Glass-fibre Reinforced Polyester-
GRP

High Tech Control Panels
Relief Valves are becoming extinct



Multiplexed Electrical Controls

Ultra-High Pressure Systems

DRY CHEMICAL DELIVERED “DRY”
OVER 90’ WITH PULSE DELIVERY TECHNOLOGY

Radio Remote Controls

Water Purification Incorporated into the Pump Module

Hurricanes

Tornados

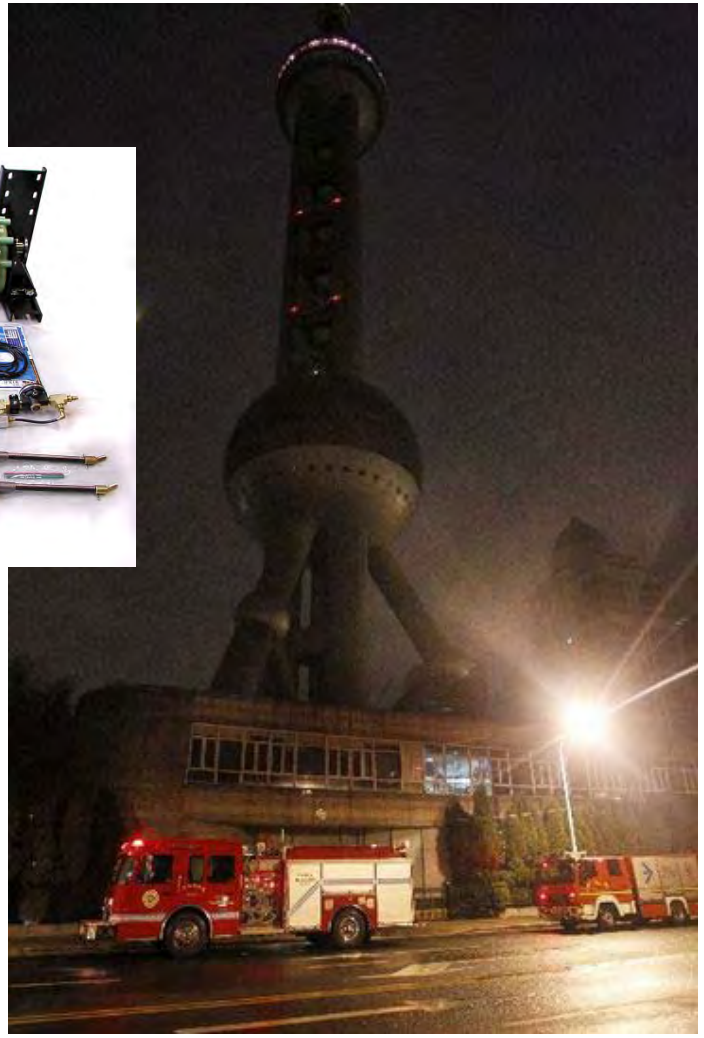
Floods

Decon Clean Up

CAFS for High Rise Applications

- Class A Foam & CAFS have been growing in popularity
  - Much simpler to operate and maintain
  - Reliable
  - Can be retrofitted

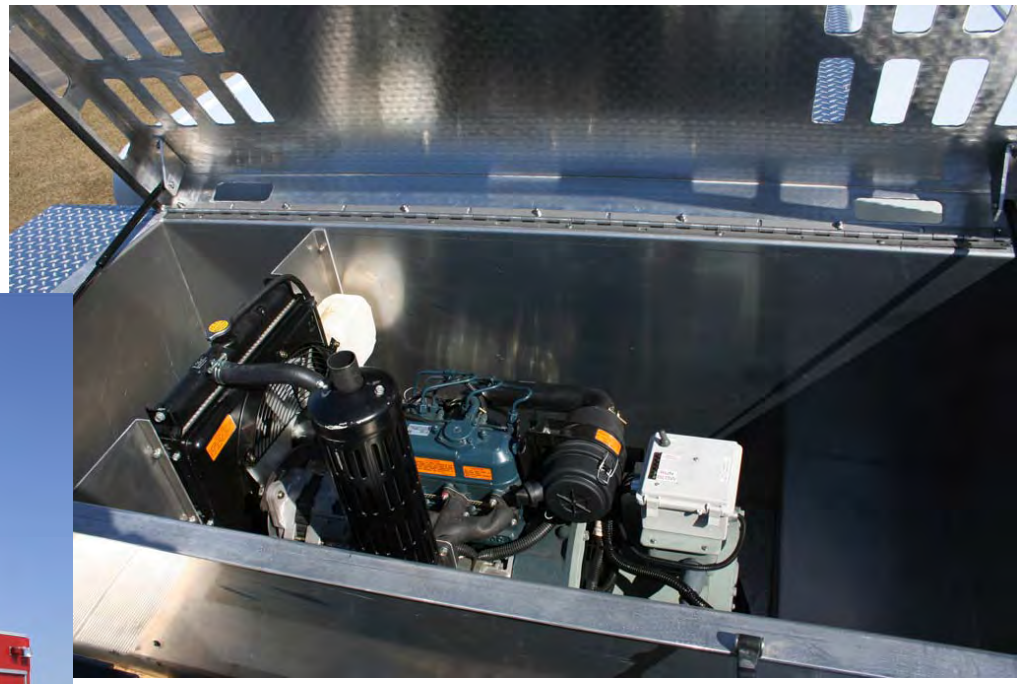
- High Rise Applications
  - Very Little Friction loss



Going Green

– Idle Reduction

- Natural Gas



www.fama.org

- FAMA Fire Apparatus Improvement White paper – report on technical changes
- Fire Apparatus Equipment Weight and Cube Calculator
- NFPA, Engine Standards Presentations
- famafemsagac.org – firegrantdata.com and other general information

Common Purpose

- Safety of the firefighter and those you service
- Manufacturers are changing to meet your changing needs
- Customer Service – Most manufacturer's "get it"
  - What is your customer's "Pain"?
- "The most important thing we can do for our industry is demonstrate that we "get it" – that we understand that this is an unprecedented economic storm and that it's not business as usual. The second thing we can do is understand what our customers need and strive to fulfill it." Chief Jeff D. Johnson, April 2010

Thank you