
Welcome to
FDIC 2008

"GIMME WATCHA GOT"

Modern Fire Apparatus and Emerging Technology

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The US Fire Apparatus Fleet

- NFPA estimates 40,000 in-service US fire apparatus were built prior to NFPA 1901 (1991) standard.
  - 10,000 are over 30 years old.
  - 17,000 are 20-29 years old.
  - 13,000 are 15-19 years old.

The US Fire Apparatus Fleet

- Of all US fire apparatus in-service today…
  - 13% are over 30 years old.
  - 21% are 20-29 years old.
  - 19% are 15-19 years old.

- THAT'S 50% OVER 15 YEARS OLD

The US Fire Apparatus Fleet

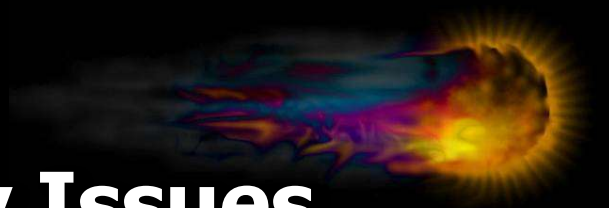
- 35% of US Fire Depts. Have a formal apparatus replacement program…
- …BUT 65% DO NOT !

Traditionally…. When Have We Retired/Replaced a Fire Truck?

- When it breaks or crashes ?
- When we get some money to buy a new one ?
- Maintenance costs skyrocket ?
- Engine/pump/aerial craps out ?
- When the fast talking salesman shows up ?

BETTER Reasons to Replace Aging Fire Apparatus!

- Obtain Benefits of Better Technology
- Greatly Improve Firefighter Safety
- Reduce Overall Maintenance Costs and Component Failures
- Increase Reliability
- Reduce Down-time
- Eliminate Parts Availability Issues



Some Safety Statistics…

- Responding/Returning is the 2nd leading cause of FF LODDs
- **15,000** apparatus collisions/year
- **25-30** FF deaths/yr
- **5000** FF injuries/yr
- **Cost $7-8 Billion/yr**

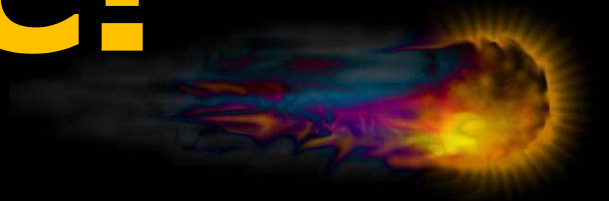
The Common Sense Solution

- Upgrade substandard equipment.
- Replace old obsolete equipment that can't be fully upgraded.
- Eliminate dangerous traditional practices.
- Put Safety First and ARRIVE ALIVE!!

Before 2003…

Where Could You Find Fire Apparatus Upgrade & Replacement Guidelines?

Nowhere!



What changed that?

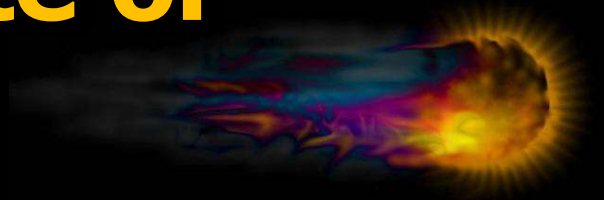
NFPA 1901 (2003) Annex "D"

NFPA 1901 (2003) -- "ANNEX D"

- New in the 2003 NFPA 1901 standard.
- Intent:
  - Gain maximum equipment utility.
  - Minimize risk of serious injuries.
  - Encourage fleet modernization.

What Does "Annex D" Cover?

- Minimum requirements for all **first line** fire apparatus.
- Minimum requirements for all **reserve** fire apparatus.
- Definition of **obsolete or unfit** fire apparatus.



NFPA Apparatus Safety Standards

- **Origin – NFPA Fire Engine Committee report in 1901.**
- **IAFC has been actively involved since 1912.**
- **First pumper standard adopted in 1916.**
- **Regular revisions ever since then.**

The Standard Writing Process

- Diverse committee composition.
- Subcommittees by topic or function.
- 5 year revision cycle.
- Ongoing review.
- Public comment.
- Published in writing.

Purpose of the Standards ?

- Define state-of-the-art equipment.
- Improve utility.
- Improve durability.
- Ease maintenance.
- Promote safety.

Two Parts of the NFPA Standard

- **"MAIN BODY" = *"Shall"***
  - **Essential & mandatory requirements of the standard.**
- **"ANNEX" = *"Should"***
  - **Non-mandatory but important committee recommendations.**

Technological Evolution

- **Before 1991 revision: "*Reactive*" Standard**
  - **New ideas conceived & proven in field first.**
  - **Usually added to standard years later.**

- **After 1991 revision: "*Pro-active*" Standard**
  - **Embrace new useful emerging technology.**
  - **Focus on safety and improved capability.**

Technological Evolution

- **1991 Apparatus Standard brought**

BIG IMPORTANT CHANGES

- **Pumps & plumbing systems improved**
- **Cab & body improved**
- **Chassis improved**
- **Aerial devices improved**
- **Firefighter safety improved**

Technological Evolution

- **Pumps & Plumbing**
  - Pump min. cap. 750 gpm.
  - Tank min. cap. 500 gal.
  - "Slow close" valves.
  - Caps tested to 500 psi.
  - 30° sweep discharge elbows to prevent kinks.
  - Foam systems added.
  - Grouping of pump controls.
  - Intake relief valve added.

Technological Evolution

- **Cab & Body**
  - Fully enclosed cab.
  - Seats / belts for all crew.
  - Sirens & horns off roof.
  - "Door open" warning.
  - Back-up alarm.
  - Reduced noise levels.
  - Fail-safe door handles.
  - Reflective striping added.
  - Warning lights improved.

Technological Evolution

- **Chassis**
  - Automatic transmission.
  - ABS & auxiliary brakes.
  - Increased battery capacity for sure starts.
  - Line voltage electrical systems upgraded.
  - Electrical grounding.
  - New interlocks.
  - Axle & GVW weight standards.

Technological Evolution

- **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.
  - Aerial device movement interlocks.
  - 100% third-party testing required.

Technological Evolution

- **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

Technological Evolution

- **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**

Technological Evolution

- **The 2009 revision will bring more new technology and improvements.**
  - Third-party Test Certification
  - Vehicle Data Recorders
  - Rollover Stability Testing
  - Electronic Stability Control
  - Tire Pressure Monitor
  - Maximum Top Speed Limitation
  - New Cert. & Doct. Requirements
  - Statement of Exceptions
  - Flares, Cones & Vests Required
  - AED Required
  - Better Walk & Step Lighting
  - Seat Belt Warning Panel
  - Longer Seatbelt Webbing
  - In-Cab Helmet Restraints

Technological Evolution

- 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

That's a Pretty Impressive List of Improvements Just Since 1991!

Technological Evolution

So What...

- **Only apparatus less than 15 years old (1991 standard or later) should be allowed in front-line service -- *period*.**

Technological Evolution

So What...

- **Apparatus more than 25 years old should be *removed from service* - *active or reserve !!***

Technological Evolution

So What...

- ***All*** **apparatus, front-line or reserve, should be upgraded to a minimum equipment level:**
  - **Fully enclosed seating**
  - **Seat belts for all crew**
  - **Blocking warning lights**
  - **Reflective striping**
  - **Slip resistant walks**
  - **Non-slip handrails**
  - **Ground & step lights**
  - **Horns & sirens off roof**
  - **Loose gear secured**

Technological Evolution

So What...

- ***All*** **apparatus, front-line or reserve, should be regularly inspected & serviced for:**
  - **Engine belts, fuel lines & filters replacement**
  - **Brakes, brake lines & wheel seals replacement**
  - **Radial tires & springs service**
  - **Weight not over axle & GVW ratings**
  - **Fire pump meets original rating**
  - **Alternator output meets original rating**
  - **Water tank & baffles not corroded / distorted**
  - **All interlocks present & working**
  - **Radiator checked, coolant hose replacement**
  - **Generator & line voltage accessories tested**

Some Practical Considerations...

- **Sample Upgrade Costs**

Enclose cab:	**$20-30K**
New Radiator:	**$5K**
Jake Brake:	**$3K**
Telma Retarder:	**$8K**
New Water Tank:	**$7-10K**
New Cab/Glider Kit:	**$100K+**
Aerial Overhaul/Update:	**$50-125K**

Some Practical Considerations...

- **Other Upgrade Costs**

Re-painting:	**$8-12K**
Striping/lettering:	**$2-4K+**
New alternator:	**$2-3K**
New tires:	**$3-4K**
New LED light pkg:	**$5-8K**
New halogen light pkg:	**$3-4K**

Some Practical Considerations...

- **Added New Component Cost**

Foam systems:	**$8-20K**
CAFS system:	**$40-50K+**
Hydraulic generator:	**$18-20K**
Diesel generator:	**$12K**
Floodlight tower:	**$5-15K**
Equip. mounting pkg:	**$5-20K**
Electric cord reel:	**$2K**

Some Practical Considerations...

- **New 1500 GPM Pumper**
  - **Average cost in 2007**

Chassis	Low	Medium	High
Commercial	*$140-175K*	*$175-225K*	*$225-350K*
Custom	*$225-275K*	*$275-400K*	*$400K & up*

Some Practical Considerations...

Modern apparatus provide huge benefits in operating cost, utility, durability, performance, and safety.

Older trucks simply cannot be retrofitted to the same level of capability.

A new truck might just be a better deal all around.

Some Practical Considerations...

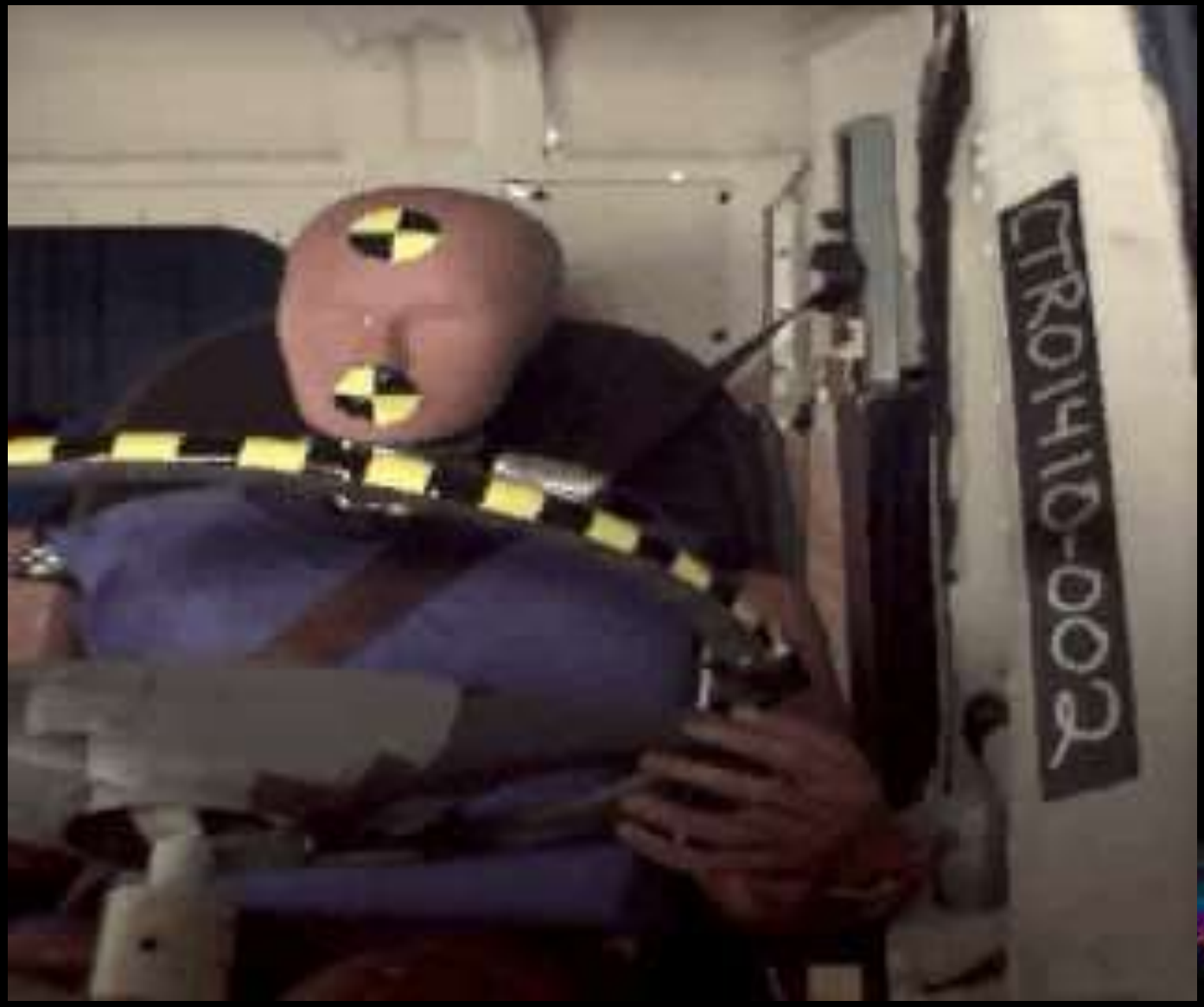
- **New equipment can also include emerging new technologies...**

Emerging Technology

- **These advanced technologies are available on new fire apparatus today!**
  - **Side Air Bags**
  - **Pretensioning Seatbelts**
  - **Pretensioning Seats**
  - **Electronic Stability Control**
  - **Lateral Acceleration Indicators**
  - **Electronic Data Recorders**
  - **Seating Status Indicators**
  - **Structural Integrity Testing**
  - **Improved Crashworthiness**

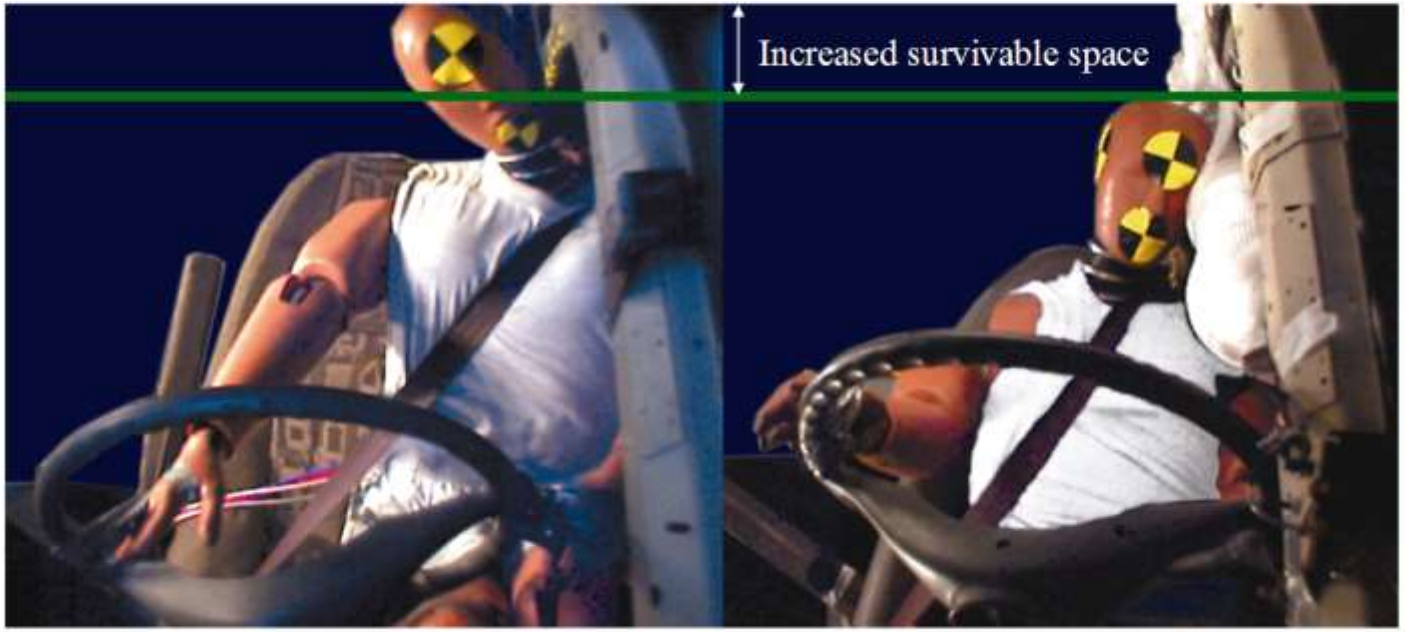
Seat & Seatbelt Pretensioners

Pretensioners & Side Airbags



Pretensioners & Side Airbags

RollTek Side Roll Protection



Without RollTek

With RollTek

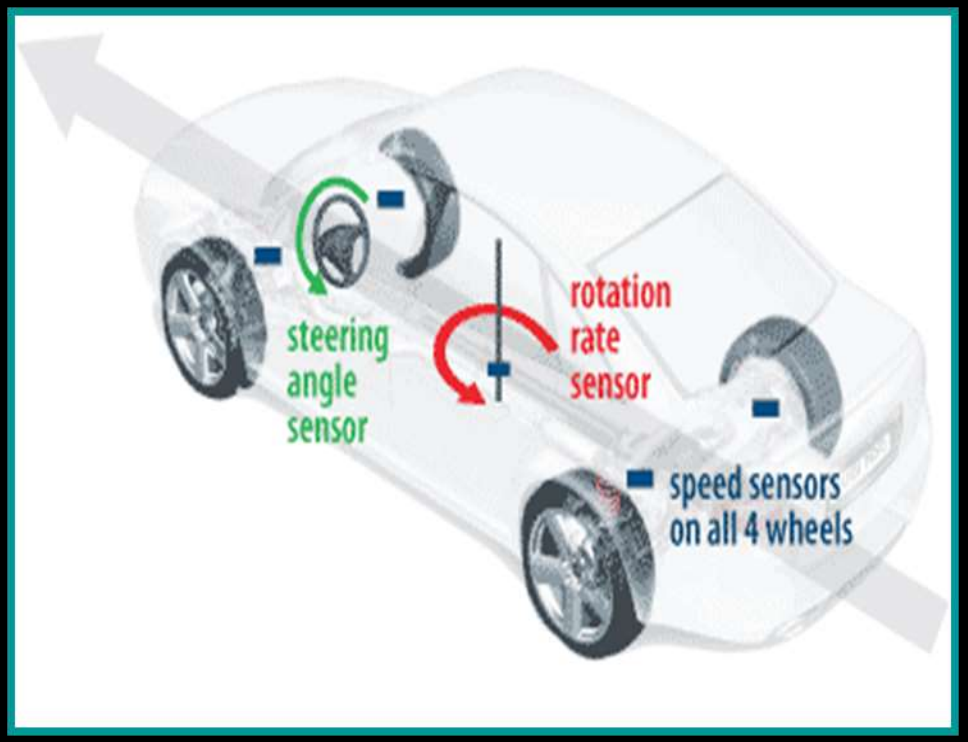
Static Stability Testing

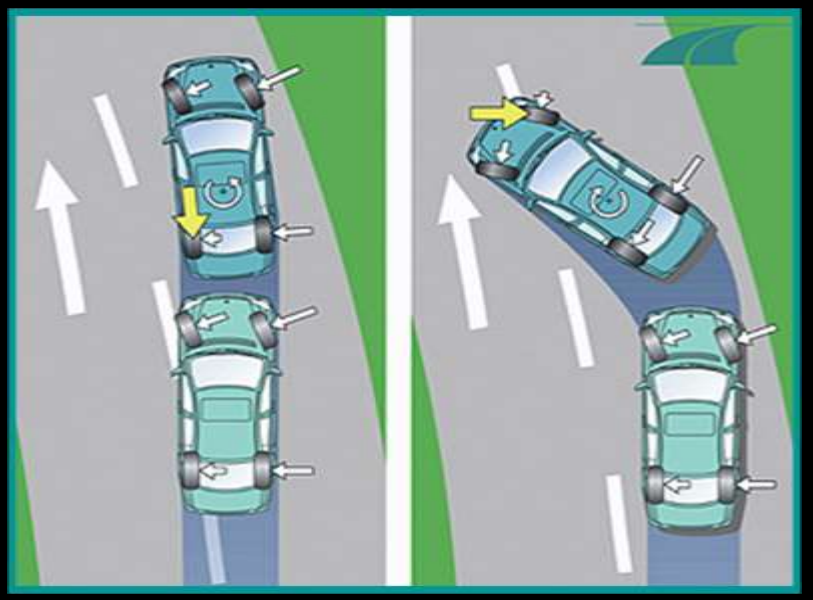
Lateral Acceleration Indicator

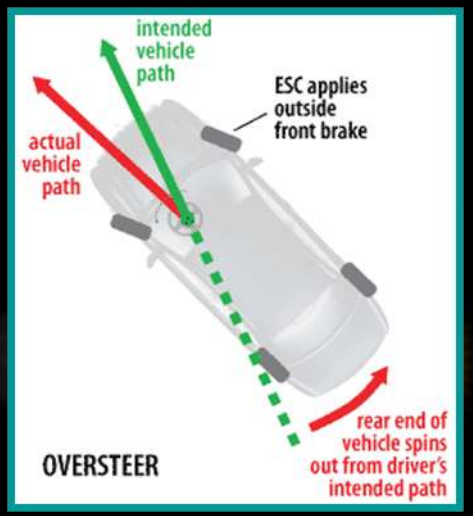
Roll Stability Control

Electronic Stability Control

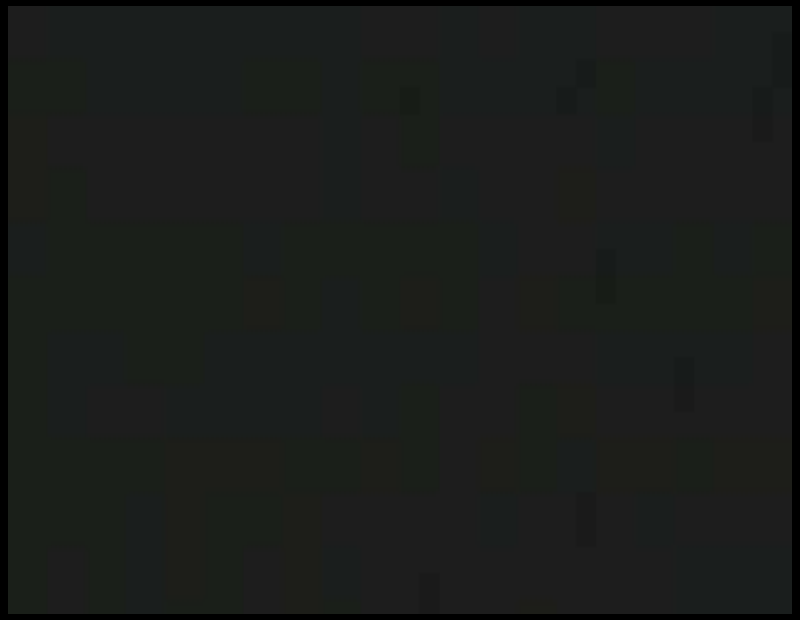
Electronic Stability Control





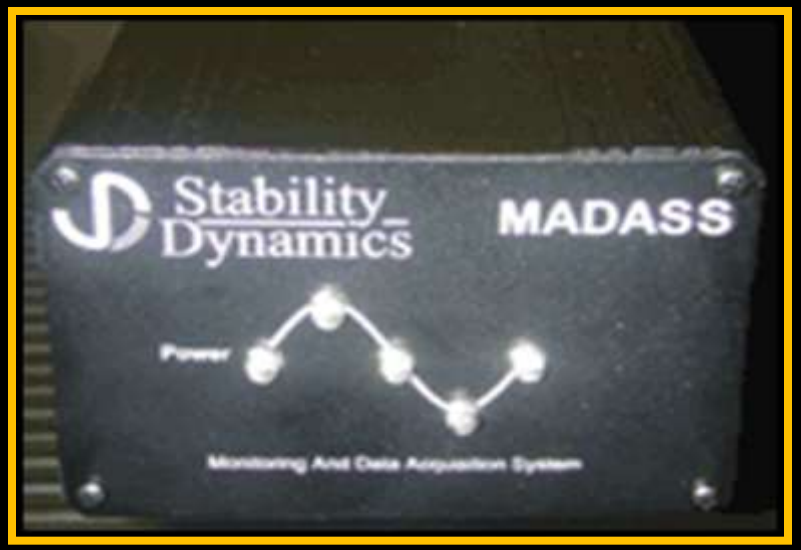


Electronic Stability Control



Event Data Recorders

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

ThE Bottom Line

- **Many recent changes to the NFPA standard can be linked to a specific incident that resulted in damage, injury or death.**

- **Older, non-compliant fire apparatus place the firefighter and the public at much greater risk !**

ThE Bottom Line

- **After the fact…**
- **…when the lawyer asks you if the tragedy could have been prevented…**
- **…you don't want to testify that safer equipment was not in the budget !**

QUESTIONS ?

COMMENTS ?

DISCUSSION ?