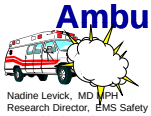
Maryland Volunteer Fireman's Association Annual Conference
Ocean City, Maryland
June 13, 2010

The Ride of Your Life – Ambulance Safety



Nadine Levick, MD, MPH
Research Director, EMS Safety Foundation
CEO, Objective Safety
New York, USA

EMSSafety FOUNDATION

Emergency Medical Service Transport

- What are the transport safety issues that pertain to this important public service and public safety industry?
- What do we know of the risks and hazards and how can we measure these ?
- How can the safety of this transport system be optimized?

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Outline

I. Review of data on ambulance crashes and safety standards and guidelines that exist for the ground EMS

II. Identification of ground EMS transport safety issues, hazards and areas of risk to patients, providers and public

III. Highlight unacceptable mythology and challenges to advancing EMS transport safety

IV. Profile innovation, new safety technologies and strategies and knowledge transfer to enhance safety and reduce risks of ground EMS and patient transport

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Things can go wrong –

but when there are sound safety technologies and policies in place, and the system is well prepared, you can minimize harm

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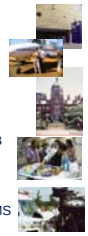
Who am I?

- Nadine Levick MD, MPH
- Emergency Medicine Physician and Public Health Academic, (USA-Hopkins, Harlem, Maimonidies, Brookdale & Australia – Royal Melbourne, Royal Childrens Hospitals, Royal Australian Flying Doctor Service)
- Chair, National Academies Subcommittee TRB EMS Transport Safety, USA
- Founder of EMS Safety Foundation
- Recipient, International Society of Automotive Engineers, Women's Leadership Award for EMS Safety



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http://www.objectivesafety.net

Very Important Principle

Ambulance transport safety is part of a SYSTEM, the overall balance of risk involves the safety of all occupants and the public

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Emergency Medical Services (EMS) An important and unique transport system

- Public safety, public health and emergency service
- Is there to save lives

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EMS Transport Safety

- 'patient safety'
  AND also
- 'provider' and 'public safety'

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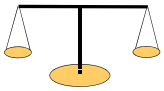
Ambulance transport a serious transport safety problem…

In the USA

- the most lethal vehicle on the road both per mile travelled and per vehicle
- is exempt from commercial fleet safety oversight from Federal Motor Carrier Safety Administration (FMCSA)
- 2/3 fatalities not in the ambulance
- Exempt from most FMVSS standards

Balance of concerns and risk during transport



- Response and transport time
- Clinical care provision
- Occupant safety/protection
- Public Safety

Some odd facts

- Ambulances are generally not built by the automotive industry
- Intelligent Transportation Systems (ITS), transportation safety engineering is not generally integrated into EMS systems
- Although all EMS systems have medical direction and oversight, it is rare for there to be transportation expertise oversight

Data…

- What is your transport safety record in your service?
- How can you improve if you don't have a meaningful measure of safety performance?
- Transport safety is not guesswork, it is a science

…and

- Is your ambulance crashworthy?
- Do you have a telematics feedback system?
- Enhanced Stability Control (ESC) – Does your ambulance have it??
  - An estimated >16% decrease in vehicle crashes
- and what is your loading height??
  - …is it less than 27 inches (68cm)??

Unique workplace

- In vehicles
- At roadside and other emergency scenes

The 'workplace' IS a vehicle

- EMT's often in vulnerable positions during transport.
  - Bench seat
  - Captains chair
  - Standing or kneeling

View of Ambulance interior from Rear

The 'workplace' is also a crash scene

Absence of USA standards and oversight

- Challenges in identifying best practice
- Myriad of unregulated commercial products
- No safety performance standards
- Absent national safety oversight

Canada - Corporate Manslaughter Corporate Homicide Act: 8th April, 2008

Corporate Manslaughter and Corporate Homicide Act 2007

An interhospital transport ? "Do no harm…."?

Pa. ambulance involved in crash; patient pronounced dead at scene

April 2010, Resuscitation – Going fast can hurt your patient clinically!

Resuscitation

Golden Hour – not so hot

- March 2010 Annals EM

Emergency Medical Services Intervals and Survival in Trauma: Assessment of the "Golden Hour" in a North American Prospective Cohort

Golden Hour Summary

- This study suggests that in our current out-of hospital and emergency care system time may be less crucial than once thought. Routine lights-and-sirens transport for trauma patients, with its inherent risks, may not be warranted. [Ann Emerg Med. 2010;55:247-248.]

May 13, 2010.. Last month

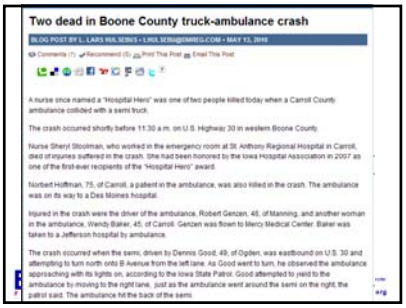
2 killed in Iowa ambulance crash

Mason City IOWA

Move to the Right

Move to the Right for Sirens and Lights or P-O-P (Pull over Please)

Two dead in Boone County truck-ambulance crash


A nurse once named a "Hospital Hero" was one of two people killed today when a Carroll County ambulance collided with a semi truck.

The crash occurred shortly before 11:30 a.m. on U.S. Highway 30 in western Boone County.

Nurse Sheryl Stoolman, who worked in the emergency room at St. Anthony Regional Hospital in Carroll, died of injuries suffered in the crash. She had been honored by the Iowa Hospital Association in 2007 as one of the first-ever recipients of the "Hospital Hero" award.

Norbert Hoffman, 75, of Carroll, a patient in the ambulance, was also killed in the crash. The ambulance was on its way to a Des Moines hospital.

Injured in the crash were the driver of the ambulance, Robert Genzen, 46, of Manning, and another woman in the ambulance, Wendy Baker, 45, of Carroll. Genzen was flown to Mercy Medical Center. Baker was taken to a Jefferson hospital by ambulance.

The crash occurred when the semi, driven by Dennis Good, 49, of Ogden, was eastbound on U.S. 30 and attempting to turn north onto B Avenue from the left lane. As Good went to turn, he observed the ambulance approaching with its lights on, according to the Iowa State Patrol. Good attempted to yield to the ambulance by moving to the right lane, just as the ambulance went around the semi on the right, the patrol said. The ambulance hit the back of the semi.

The Hartford Courant.

courant.com

Girl, medics injured in crash

Preventable…

- James Woodman
  - – is a paramedic who, on his first day as a paramedic, suffered a severe TBI when the ambulance he was riding in (in the back) was t-boned and rolled onto its side.
  - – He remains in a persistent vegetative state in an ECF in Colorado.
- It is assumed that when the ambulance rolled onto its side, the lifepack 10 struck James in the head.....

Predictable risks

- Fatal crashes more often at intersections, & with another vehicle ($p < 0.001$)*
- 70% of fatal crashes EMS crashes during Emergency Use*
- Most serious & fatal injuries occurred in rear (OR 2.7 vs front) & to improperly restrained occupants (OR 2.5 vs restrained)**
- 82% of fatally injured EMS rear occupants unrestrained**
- > 74% of EMT occupational fatalities are MVC related***
- Serious head injury in >65% of fatal occupant injuries#
- More likely to crash at an intersection with traffic lights (37% vs 18% p=0.001) & more people & injuries/crash than similar sized vehicles##

*Kahn CA, Pirralllo RG, Kuhn EM, Prehosp Emerg Care 2001 Jul-Sep;5(3):261-9
**Becker, Zaloshnja, Levick, Li, Miller, Acc Anal Prev 2003
***Maguire, Hunting, Smith, Levick, Annals Emerg Med Dec 2002
#NIOSH, 2003
##Ray AM, Kupas DF, Prehosp Emerg Care 2005 Dec; 9(4):415

EMS Transport General Concerns

- Consequences can be predictable & likely preventable
- Costs of these adverse events are high in loss of life, financial burden and negative impact on delivery of EMS care
- Other high speed vehicles (eg. racing cars) have a different safety paradigm
- Design of interventions to mitigate injury is predicated on a valid testing model
- Complex both engineering and public health issues

A tragic emergency health care intervention outcome

Rollover Crash Kills Medical Technician

It does happen….

Transport related aspects -

- dispatch of EMS/Medical transport vehicles
- transport policies and protocols
- vehicle fleets and vehicle design
- vehicle purchase standards
- Intelligent Transportation Systems (ITS) technology
- driver training
- driver performance monitoring
- roadside and road design
- integrated traffic safety technologies
- scene safety and visibility
- safety data capture
- safety oversight

- Transport Medicine

Key elements

- Impact Biomechanics
- Transport Ergonomics
- Fleet Safety

Impact biomechanics

- Crashworthiness
- Vehicle design
- Occupant protection

Transport Ergonomics

- Operational tasks
- Human factors analysis
- Range of reach
- Patient loading and unloading

Fleet safety

- Operational policies – dispatch, safety
- Fleet mix
- Vehicle selection – safety, ESC, loading height
- Driver performance and monitoring
- Scene safety
- Visibility and conspicuity
- Safety measurement and management

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Real world answers to real world questions -

- What features will enhance safety of my new vehicle purchase?
- What color scheme do I want on my vehicle to make it safest?
- What policies offer the safest system?
- How do I get my team to address safety issues?
- Do I need a helmet, and if so which one?
- What data should I collect when something goes wrong, and how to analyze it?

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Creating a Safety Culture

within a company must start with upper management's commitment to safety

- Awareness
- Training
- Incentive

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Challenges to Optimizing EMS Transport Safety

- Disparate and fragmented safety infrastructure
- Lack of a centralized EMS Safety oversight or data
- A large number of small groups of end users, with a mix of volunteers and professionals
- Ambulances are non-standard vehicles, a truck chassis and an after market box or a modified van
- EMS vehicle safety is not integrated as a part of the transport safety industry

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Safety oversight of what and …. by whom

- Vehicle Safety
- Vehicle Design
- Transportation systems safety
- Safety Equipment Design
- Vehicle and Safety Equipment Testing and Standard development
- Safety policies

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In the USA AND Canada there are more safety standards for moving cattle than for moving patients

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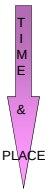
the EMS transport process

- communications/dispatch
- the patient
- restraining device/seat
- transporting device/gurney
- paramedics/transport nurses, doctors & family
- patient monitoring equipment
- clinical care & interventions
- protective equipment
- the vehicle
- the driver/driving skill
- other road users
- the road



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The Emergency Department (ED)

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An ambulance is <u>not</u> an ED /ICU on wheels

The laws of physics prevail…

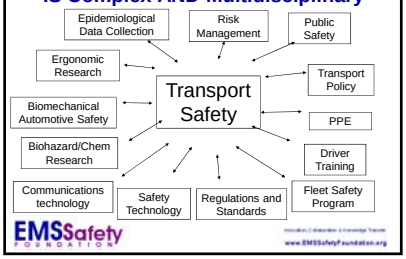
- and they don't care what your job title is or if you are a patient, a provider or a member of the public

Science behind Policy

- "For successful technology, reality must take precedence over public relations, for Nature cannot be fooled."

  Richard P. Feynman 1988

Ground Ambulance Transport Safety IS Complex AND Multidisciplinary



Do we ask vehicle builders to write cardiac arrest protocols…? Vehicle design and safety is not what we are trained to do!!!!

Are we designing vehicles that are difficult to see…?

What do we know now??

- Intersection crashes are the most lethal
- There are documented hazards, some which can be avoided
- Occupant restraint with standard belts is effective. (Over the shoulder belts for patients should be used, with the gurney in the upright position where medically feasible)
- All equipment should be locked down
- Some vehicle design features are beneficial - automotive grade padding in head strike areas, seats that can slide toward the patient
- Electronic Driver monitoring/feedback systems appear to be highly effective
- Head protection??

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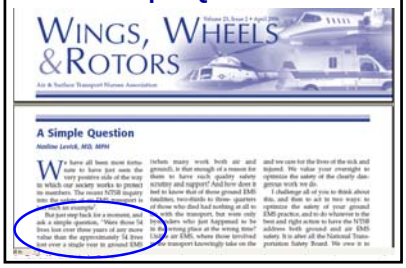
2008 - Air EMS on the NTSB's "Most Wanted List", where is ground EMS??

A Simple Question….



Safety is Good Business

June 2007

The inevitable bottom line…

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Accident Cost Table

REVENUE NECESSARY TO PAY FOR ACCIDENT LOSSES

THIS TABLE SHOWS THE DOLLARS OF REVENUE REQUIRED TO PAY FOR DIFFERENT AMOUNTS OF COSTS FOR ACCIDENTS

It is necessary for a motor carrier to generate an additional $1,250,000 revenue to pay the cost of a $25,000 accident, assuming an average profit of 2%. The amount of revenue required to pay for losses will vary with the profit margin.

YEARLY ACCIDENT COSTS	PROFIT MARGIN				
	1%	2%	3%	4%	5%
$1,000	100,000	50,000	33,000	25,000	20,000
5,000	500,000	250,000	167,000	125,000	100,000
10,000	1,000,000	500,000	333,000	250,000	200,000
25,000	2,500,000	1,250,000	833,000	625,000	500,000
50,000	5,000,000	2,500,000	1,667,000	1,250,000	1,000,000
100,000	10,000,000	5,000,000	3,333,000	2,500,000	2,000,000
150,000	15,000,000	7,500,000	5,000,000	3,750,000	3,000,000
200,000	20,000,000	10,000,000	6,666,000	5,000,000	4,000,000

REVENUE REQUIRED TO COVER LOSSES

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Safety saves time, lives AND money Canada, Nova Scotia

- Since 2000 working towards a goal of zero loss ratio with insurance provider
- 10 million kilometers per year
- 150 emergency response ambulance units
- Collision claim history measured in dollars per 100,000 kilometers traveled:
  - 2000/2001 $ 1725.00
  - 2001/2002 $ 1049.00
  - 2002/2003 $ 751.00
  - 2003/2004 $ 416.00
  - 2004/2005 $ 229.00

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Are you self insured???

Very Scary insurance data – the $10 million dollar EMT

Year	Payroll $million	Modified Premium $1,000	Incurred Indemnity $1,000	Incurred Medical $1,000	Total Claims #
2003	14.1	540	885	9,925	93
2002	12.6	547	266	255	78
2001	11.3	454	88	128	55
2000	10.6	420	63	194	89
1999	10.1	405	115	117	56
1998	9.6	411	13	30	51

Workers Compensation Rate increased by 26.5 %
Was $5.86/$100 payroll in 2005-2006
Now it is $7.41 for 2006-2007

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A problem

2007 Insurance data –

- 27 fold more likely to have a claim based on transport than related to medical care

2003 Insurance data –

- 10 fold more likely to have a claim based on transport than related to medical care

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EMS CANNOT Afford to keep paying out like this….

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- Transport Medicine

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Key Issues

- Mythology
  - That Emergency Medical Service personnel are safe
- Injury Hazards
  - Biohazard
  - Chemical/Radiation
  - Physical/Mechanical trauma – THE BIG PROBLEM
- Motor Vehicle Crashes are the highest cause of death at work – EMS has > 2X the mean national rate
- An R & D and Regulatory Gap
  - Occupational Health and Safety
    - the workplace is in a vehicle – exposure data are scant
  - Automotive Safety
    - a vehicle is the work place – 'exempt' from automotive research and regulation

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Ambulance design & transport safety initiatives timeline

- 1960's National Academies of Medicine – the Cadillac to the chassis and box truck, birth of the ambulance conversion industry (?? date of the FMVSS exemption)
- 1979 – NTSB report and birth of EVOC
- 1980 – Swedish barrier crash tests
- 1987 – JAMA paper - Paul Auerbach
- 1995 – First published text on Ambulance collisions - and by an optometrist
- 1998 – EMSC Pediatric Ambulance Transport Safety Grant
- 1999 – ASA and CEN ambulance safety standard in Australia and Europe
- 1999 - First ambulance rear compartment sled tests with instrumented dummies
- 2000 – First peer reviewed engineering publication on ambulance crashworthiness
- 2000 – First full vehicle ambulance crash tests
- 2001 – First SAE Emergency Vehicle Safety Symposium
- 2003 – Mobile Medical Transport Safety Task Force (MMTS) established
- 2004 – Morgantown program
- 2005 – First ambulance ergonomics paper
- 2006 – First NAEMSP ambulance safety keynote
- 2006 – First EMS Chiefs of Canada ambulance safety Keynote
- 2007 – Inaugural TRB Ambulance Transport Safety Seminar
- 2008 – First Ground EMS Transport Safety Summit –November 2008
- 2009 - Second TRB Ground EMS Transport Safety Summit – October 2009

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Challenges to Optimizing EMS Transport Safety

- Disparate and fragmented safety infrastructure
- Lack of a centralized EMS Safety oversight or data
- A large number of small groups of end users, with a mix of volunteers and professionals
- Ambulances are non-standard vehicles, a truck chassis and an after market box or a modified van
- EMS vehicle safety is not integrated as a part of the transport safety industry

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Challenges to Optimizing EMS Transport Safety

- Rear compartment exempt from FMVSS
- Complex automotive safety area bridging acute clinical care, public health, public safety and automotive safety
- Very recent history as a research issue
- Limited fiscal support for cross disciplinary EMS transport safety research

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Firstly!

- An accident ?
- or a predictable and preventable event

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A tragic emergency health care intervention outcome

Rollover Crash Kills Medical Technician

It does happen….

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A devastating tragedy…

- An ETT down the wrong hole may kill your patient and be a terrible burden for the pts family and for the medic involved

Negative impact on system performance…

- BUT an EMS crash can kill all those involved AND wipe out a rural EMS system AND negatively impact a regions response capacity……

Ambulance Transport Safety

- Emergency care, public heath, public safety, and patient transportation.
- Important Principle:
  Ambulance transport safety is part of a system, the overall balance of risk involves the safety of all occupants and the public
- All get home safely

Real world answers to real world questions -

- What features will enhance safety of my new vehicle purchase?
- What color scheme do I want on my vehicle to make it safest?
- Do I need a helmet, and if so which one?
- What policies offer the safest system?
- How do I get my team to address safety issues?
- What data should I collect when something goes wrong, and how to analyze it?

USA EMS

- EMS Systems - >15,000
- Personnel - ~1 million
  (~30% F/T professional & 70% volunteer)
- Vehicles - ~50,000
  (Type I, Type II, Type III, Freightliners, ?motorcycles)
- Transports - ~50 million
  (to Emergency Depts ~ 50%, < 1/3 emergent)
- Cost - ~$8 Billion annually
- Safety Oversight - ? Disparate

What is a survivable impact ?

12 mph (20 km/hr)?

What is a survivable impact?

$E = \frac{1}{2} mv^2$ $v^2 = 2as$

~ 30 mph - survivable

What is a survivable impact?

$E = \frac{1}{2} mv^2$ $v^2 = 2as$

~ 60 mph – not survivable

A survivable impact??

A serious problem…

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Tragedy you don't want to be involved in

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Thursday July 5th 2007…… Paramedic Allan Parson's killed

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"…I'd like to know what can be done so this never happens again…."

Posted By:Concerned at July 5, 2007 4:38 PM (Suggest Removal)
to all the people worried about how fast the emt was going. would it be fast enough if it was your loved one in there.....

| Add your comments

Posted By:Concerned at July 5, 2007 4:19 PM (Suggest Removal)
I'd mad. it would be too fast if they ran over my family member on their way to another's family member...

| Add your comments

Posted By:Concerned at July 5, 2007 4:58 PM (Suggest Removal)
To X responder: Why can't I second guess this? A man is dead and I want to know if the actions and situation surrounding this were worth this net loss. And I'd like to know what can be done so that this never happens again.

2 weeks later… Friday July 20th 2007 The worst ambulance crash in USA history

Five Killed in Crash of Ambulance and Semi

July 21, 2007 08:20 AM EDT

VAN WERT, OHIO (AP) -- The Ohio State Highway Patrol continues to investigate the crash of an ambulance that killed five people Friday night, including three emergency medical technicians. Troopers say the ambulance was broadsided by a semitrailer in Crane Township, about 65 miles southwest of Toledo.

The ambulance, with four Antwerp Emergency Medical Services workers aboard, was taking two victims from an earlier car crash to a hospital. Troopers say it was broadsided by a tractor-trailer at the intersection of County Road 176 and County Road 87. The ambulance then burst into flames.

The Highway Patrol says three EMS workers were killed. They were identified as 44-year-old Sammy Smith, 31-year-old Heidi McDougall and 25-year-old Kelly Rager. The two patients were also killed. They were identified as 64-year-old Robert Wells 60-year-old Amelda Wells of Hicksville.

Another emergency medical technician, Matt McDougall, and the truck driver, Gerald Chapman, Jr. of Indiana, were both taken to the hospital. It's not yet clear whether they suffered any injuries.

Authorities have not said who had the right of way at the rural intersection nor have they said if the ambulance's emergency siren and lights were turned on.

Antwerp fire chief says, 'They were doing what they loved...'

Emergency personnel throughout the region are also shocked and mourning their own.

"That's one of our worst scenarios when it's one of our own," said Con Shuherk of the Payne Fire Department.

"Everyone is a brotherhood," said Friend. "Everybody looks after everybody."

Randy Shaffer, director of Paulding County Emergency Management Agency, said the accident has had a deep impact.

"It has affected every emergency personnel in the county," he said. "We know it could happen at any time. We read about it in our newsletter. We just don't think it's going to happen to us."

Shaffer said when a call came in that an ambulance was involved in an accident Friday, "I think every squad in the county activated."

Jan 28th, 2008

EMS

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April 14th, 2008

Ambulance worker loses arm in accident - West Nyack, New York

An emergency service worker lost her right arm today after the ambulance in which she was a passenger crashed into a truck parked along Route 59 near the flyover to the Palisades Center mall.

Bonnie Ames, 20, was taken by helicopter to the Westchester Medical Center in Valhalla where she underwent surgery.

"She's out of danger, but she lost her arm," Raymond Florida, director of Rockland Paramedic Services said early this evening.

"We used multiple units from the jaws of life to extricate her," West Nyack Fire Chief George Drescher said. "She appeared to be seriously injured."

The paramedic van driver, 19-year-old Scot... there to Westchester Medical Center, said ...

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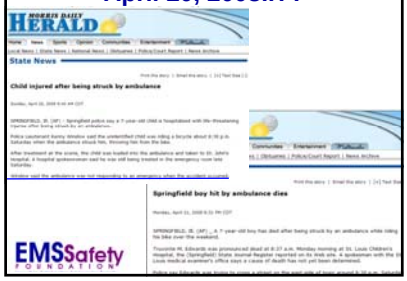
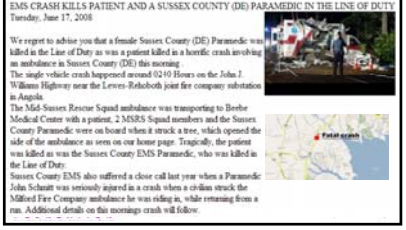
April 20, 2008..??



June 17th 2008
a paramedic and a patient killed



EMS CRASH KILLS PATIENT AND A SUSSEX COUNTY (DE) PARAMEDIC IN THE LINE OF DUTY
Tuesday, June 17, 2008

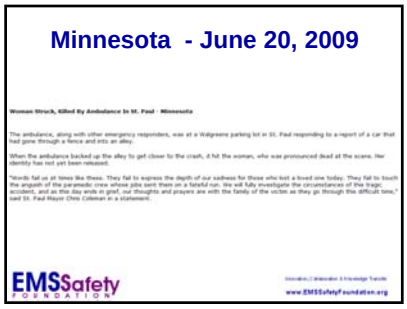
We regret to advise you that a female Sussex County (DE) Paramedic was killed in the Line of Duty as was a patient killed in a horrific crash involving an ambulance in Sussex County (DE) this morning.
The single vehicle crash happened around 0240 Hours on the John J. Williams Highway near the Lewes-Rehoboth joint fire company substation in Angola.
The Mid-Sussex Rescue Squad ambulance was transporting to Beebe Medical Center with a patient. 2 MSRS Squad members and the Sussex County Paramedic were on board when it struck a tree, which opened the side of the ambulance as seen on our home page. Tragically, the patient was killed as was the Sussex County EMS Paramedic, who was killed in the Line of Duty.
Sussex County EMS also suffered a close call last year when a Paramedic John Schmitt was seriously injured in a crash when a civilian struck the Milford Fire Company ambulance he was riding in, while returning from a run. Additional details on this mornings crash will follow.

In this vehicle…

October 31, 2008 - Kentucky

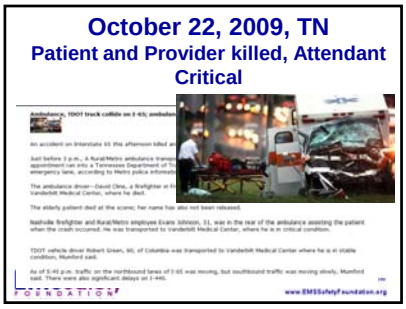
April 30, 2009 - Tennessee

Minnesota - June 20, 2009



August 2009 – Impaired…

October 22, 2009, TN
Patient and Provider killed, Attendant Critical



October 22, 2009
Provider and Patient Killed

Thursday, October 22, 2009 - Two people have been killed after an ambulance slammed into the back of a TDOT vehicle on Interstate 65 near Wedgewood Avenue.

Officials said the RuralMetro ambulance was travelling in the northbound lanes when it hit the truck.

The two fatalities are the driver of the ambulance and the patient being transported.

An off-duty Metro firefighter, Evans Johnson, was transported to Vanderbilt University Medical Center in critical condition. Johnson was tending to the patient in the ambulance.

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December 2009

EMSSafety FOUNDATION

January 14, 2010

EMS FOUNDATION

February 1, 2010

EM FOUNDATION

Is there an acceptable rate of morbidity and mortality for pre-hospital transport systems??

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USA EMS transport safety data estimates

- ~ 50,000 vehicles
- ~ 9,000 crashes a year
- ~ One fatality each week
  - ~ 2/3 pedestrians or occupants of other car
- ~10 serious injuries each day
- Cost estimates > $500 million annually

*FARS/BTS 2007

EMSSafety FOUNDATION

Is it your service's tragic year?

- ~ 50 fatalities a year
- 15,000 EMS services
- Each year one in 300 services experiences a fatality

EMSSafety FOUNDATION

So for EMS personnel…

- What's going to kill you?
- What's going to injure you?

EMSSafety FOUNDATION

and what is killing EMS ?

EMS personnel fatalities*

- 74% transportation related
  - 1/5 of ground transport fatalities were struck by moving vehicles
- 11% were cardiovascular
- 9% were homicide
- 4% needle sticks, electrocution, drowning and other

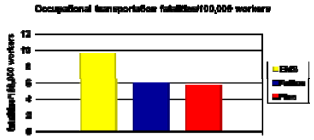
* Maguire, Hunting, Smith & Levick, *Occupational Fatalities in Emergency Medical Services: A Hidden Crisis, Annals of Emergency Medicine, Dec 2002*

EMSSafety FOUNDATION

So does it make sense ?

- Gloves and universal precautions?...
  … good biohazard protection BUT aren't going to give much protection in a ambulance crash

Occupational transportation fatalities..



- WE HAVE A BIG PROBLEM HERE

** Maguire, Hunting, Smith & Levick, Occupational Fatalities in Emergency Medical Services: A Hidden Crisis, Annals of Emergency Medicine, Dec 2002*

Predictable risks

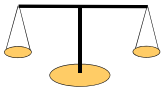
- Fatal crashes more often at intersections, & with another vehicle (p < 0.001)*
- 70% of fatal crashes EMS crashes during Emergency Use*
- Most serious & fatal injuries occurred in rear (OR 2.7 vs front) & to improperly restrained occupants (OR 2.5 vs restrained)**
- 82% of fatally injured EMS rear occupants unrestrained**
- > 74% of EMT occupational fatalities are MVC related***
- Serious head injury in >65% of fatal occupant injuries#
- More likely to crash at an intersection with traffic lights (37% vs 18% p=0.001) & more people & injuries/crash than similar sized vehicles##

**Kahn CA, Pirrallo RG, Kuhn EM, Prehosp Emerg Care 2001 Jul-Sep;5(3):261-9*
***Becker, Zaloshnja, Levick, Li, Miller, Acc Anal Prev 2003*
****Maguire, Hunting, Smith, Levick, Annals Emerg Med Dec 2002*
#NIOSH, 2003
##Ray AM, Kupas DF, Prehosp Emerg Care 2005 Dec; 9:412-415

Ambulance transport a serious USA transport safety problem…

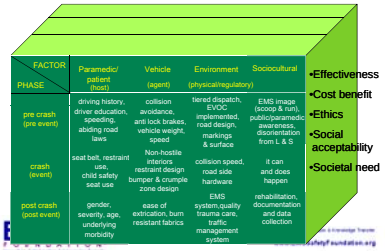
- the most lethal vehicle on the road both per mile travelled and per vehicle
- is exempt from federal commercial fleet safety oversight (FMCSA)
- 2/3 fatalities not in the ambulance
- Exempt from most FMVSS standards

Balance of concerns and risk during transport



- Response and transport time
- Clinical care provision
- Occupant safety/protection
- Public Safety

Haddon/Baker/Runyan Phase-Factor Matrix as applied to EMS Safety



Data…

- What is your transport safety record in your service?
- How can you improve if you don't have a meaningful measure of safety performance?
- Transport safety is not guesswork, it is a science

The laws of physics prevail…

- and they don't care what your job title is or if you are a patient, a provider or a member of the public

Science behind Policy

- "For successful technology, reality must take precedence over public relations, for Nature cannot be fooled."

  Richard P. Feynman 1988

Safety is a tool to save

- Lives
- Time
- Money

must be evidenced based

Firstly, the DANGER…

- The state of EMS transport safety research is an EMBARRASSMENT
- Lags at least 30 years behind general automotive and transportation safety research
- EMS Safety research is NOT EVEN ON THE PLAYING FIELD of state of the art automotive safety research
- 'Reinventing the wheel' – should be avoided at all costs

Then, The OPPORTUNITY

- This is vehicles, and this is transportation safety
- Vehicle and transportation safety technology and research infrastructure exists
- Ditto drivers, and driver/fleet safety technology
- Collaboration, and the multidisciplinary model is key
- Optimal use of very scarce resource

Current accepted safety design and transport system technologies are being ignored, and worse…

And…

This is in a setting where

- transport safety is the major and most costly adverse event in EMS
- And there have been all sorts of major technical and informational developments since Jan 2006

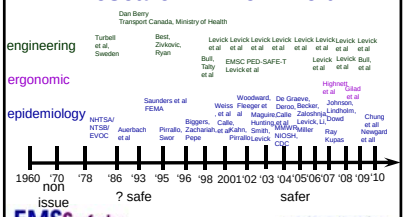
New Information/Technical Developments Jan 2006- Jan 2010

- SAFETEA-LU, 2006 – EMS identified as one of the 4 E's
  - (Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users)
- International Ergonomists Association (IEA) - publication June 2006
- Enhanced Safety of Vehicles (ESV) - publications June 2007, 2009
- American Society Safety Engineers (ASSE) - publications June 2006, 2007
- National Academies TRB – Inaugural EMS Safety address, Jan 2007
- NEMSAC established – April 2007
- AMD Engineering Public Comments, July 2007
- KKK-F, August 2007
- OSHA September 11, 2007 EMS safety in Federal Register
- State Strategic Highway Safety Plans, October 2007
- Sporadic State EMS Council Transport Safety Policies
- APHA EMS Safety technical abstracts - Nov 2007, 2008, 2009
- EMS Safety Foundation established – Dec 2007
- National Academies TRB – Inaugural EMS Safety Subcommittee meeting Jan 2008
- National Academies TRB– first EMS Safety Publication Jan 2008
- Transportation Safety Advancement Group (TSAG) – Feb 2008
- Society for Automotive Engineers (SAE) – publications Oct 2007, 2008, 2009
- Worker visibility Act - Nov 2008
- SAE Ambulance Standards development – April 2009
- NFPA Ambulance Standards Committee – June 2009
- National Academies TRB EMS Safety Summits – Nov 2008, Oct 2009

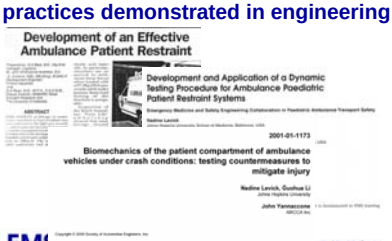
A challenge we know now…

- …is that there is a major problem with the present approach and what is being done currently
- and many practices are in conflict with, or not supported by, existing technical engineering science

Ambulance Safety Research: A New Field



We should use the best safety practices demonstrated in engineering



…in automotive safety engineering

CRASHWORTHINESS ANALYSIS OF THREE PROTOTYPE AMBULANCE VEHICLES

DEVELOPMENT OF PROPOSED CRASH TEST PROCEDURES FOR AMBULANCE VEHICLES

USA AMBULANCE CRASHWORTHINESS FRONTAL IMPACT TESTING

Protection for Infants Transported in Incubators

Ambulance Vehicle Crashworthiness and Passive Safety Design: A Comparative Evaluation

EMSSafety FOUNDATION

and in ergonomics

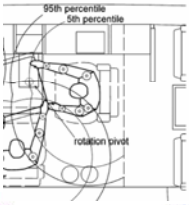
INDUSTRIAL ERGONOMICS

Ergonomics in the rescue service—Ergonomic evaluation of ambulance cots

Reviewing ambulance design for clinical efficiency and paramedic safety

EMSSafety FOUNDATION

Range of reach.. This is a well defined technical science



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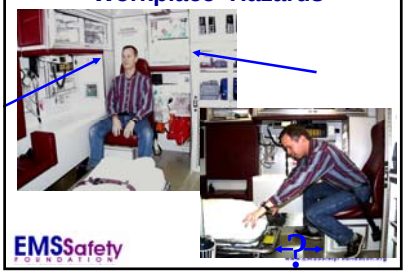
‘Workplace’ Hazards



EMSSafety FOUNDATION

EMSSafety FOUNDATION

Bigger is not necessarily better……

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Creating a Safety Culture

within a company must start with upper management’s commitment to safety

- Awareness
- Training
- Incentive

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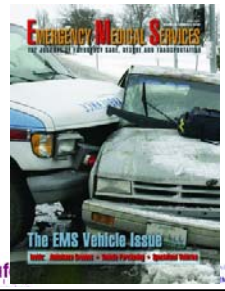


EMSSafety FOUNDATION

USA EMS in 1917

EMSSafety FOUNDATION

1960 to 2009

A passenger vehicle - sure

'Laundry or mail truck' - ??

A passenger vehicle - ??

Some recent adverse outcomes

UPS and Laundry trucks have very similar design and even more stringent safety requirements to EMS vehicles BUT very different cargo……

People are passengers and NOT packages or parcels

- "Ambulance transport has a death toll…."

Carl Craigle EMT-P, Chief Platte Valley Ambulance

'Real world' head-on post crash

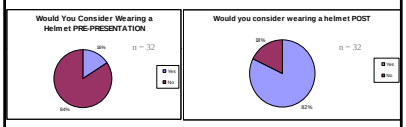
Rollover Crash Kills Medical Technician

Ambulance Runs Off I-66 and Rolls Over, Injuring Two Employees and a Patient

It does happen….

But what about head protection?

Attitudes to Head Protection in EMS

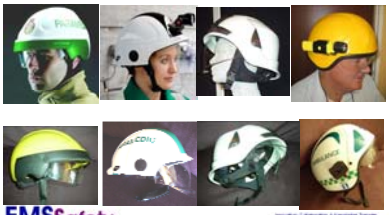


Levick NR, Garigan M, A Solution to Head Injury Protection for Emergency Medical Service Providers, International Association for Ergonomics (IAE).

Role of a head protective device

- A simple, immediate and inexpensive adjunct – a protective device -
  - To protect occupants from hazardous interiors
  - As vehicle crashworthiness design advances
  - As driver training advances
  - For when equipment becomes unsecured
  - As EMS Safety Standards are developed, for both EMS vehicles and EMS occupational safety

New EMS helmet prototypes for 2006-2010



And very Predictable…

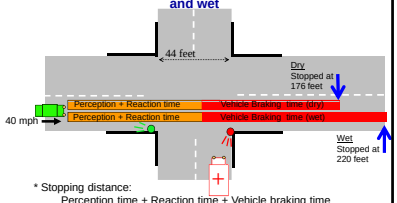
- Intersections are lethal environments

So.. The real world for an EMS vehicle approaching a red light

- You think they heard you…
- You know they must have seen you..
- And maybe they did
- ….. But..
- There is NO way humanly possible that they could stop…..

The real world

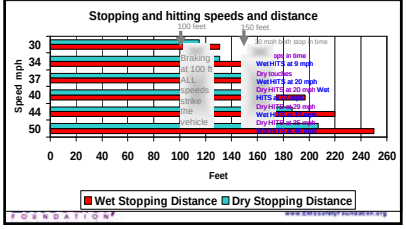
Intersection passenger car stopping distance* at 40 mph dry and wet



* Stopping distance:
Perception time + Reaction time + Vehicle braking time
(varies with age, skill, agility, alertness + vehicle type, tire pressure, road etc)

They CANT STOP IN TIME

Even at 30 mph & 100 feet away - dry and wet conditions-



What is known

- Ambulance transport is part of a system of integrated elements, as is an ambulance vehicle a microcosm safety system of interrelated occupant and safety issues
- The laws of physics prevail -

Would we….?

Seeing that we are health care providers – lets look at it this way –

- Would we use medical equipment that was built by folks who were not technically qualified or trained biomedical engineers and who just said – "this device is safe"?
- Or would we expect them to be qualified in this field and that their products were tested in a meaningful way to ensure that they were safe?

EMS Safety

- 'patient safety'
  AND also
- 'provider' and 'public safety'

Very Important Principle

Ambulance transport safety is part of a SYSTEM, the overall balance of risk involves the safety of all occupants and the public

- This IS a Transportation and Automotive Safety issue

Benefit of Safety

- Any cost of addressing these issues is dwarfed in contrast to the huge burden of not doing so - in financial costs let alone the personal, societal, ethical and litigation costs

Important…

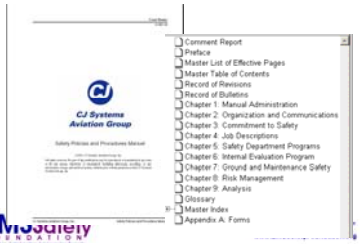
- Ergonomics and automotive safety issues are interrelated
- Crashworthiness priorities override the ergonomic issues

Air EMS is a role model for safety initiatives and focus

Air Safety Approach

- Safety Program Planning
- Evaluating
- Analysis of Safety Performance
- Analysis of Safety Information and Data
- Analysis of Risk Profiles and Plans

An Aviation Safety Plan



Duke Policies

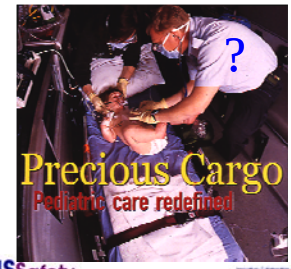
Duke Risk Assessment Approach

Integrating Risk Assessment and Operational Practice!!

- Green
- Blue
- Yellow
- Red

Goals

- Standards for safety
- Policy based on Science
- Databases to demonstrate outcome



1995- Deceleration Sled test

(upon impact) 24 G, 30mph

Levick NR, et al. Development and Application of a Dynamic Testing Procedure for Ambulance Pediatric Restraint Systems, SAE Australasia 1998;58:2:45-51

Immobilization board

Foldable

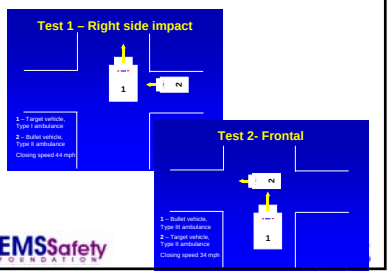
Choose the Best Option

Vehicle Crashworthiness testing

USA - 2000 research

Europe - 2007 to meet CEN

Full Vehicle Crash Tests



2000 Full Vehicle Crash Testing

Pre-impact CTD positioning

Preparation of test vehicles

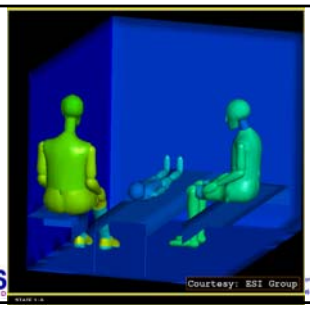
And this all takes place in 60 millisecs – the blink of an eye

Impact residue

During impact

CTD dynamics

Post impact



Which of these two vehicles would you want?

Sprinter v Ford Transit crash test

http://www.youtube.com/watch?v=C3kN6WF5vAA&feature=related

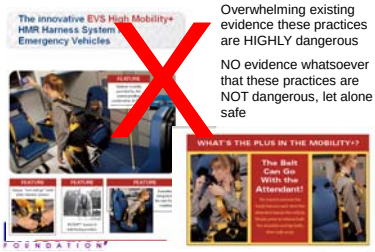
High speed crash, rolled and the occupants (patient and medics) had only minor scratches

'Safety' approaches being driven by manufacturers claims and sales rather than by science and data

Rash of "Safety Concept" vehicles….. Devoid of substantive automotive safety engineering input or testing

A few key words about restraint systems…

Systems safety failure AND dangerous



Overwhelming existing evidence these practices are HIGHLY dangerous

NO evidence whatsoever that these practices are NOT dangerous, let alone safe

NOT new technical data…

Richardson S.A., et al, Int. J. of Crash., 4:3, 239 – 259, 1999

Side facing 4-point harnesses demonstrated to be lethal, even at slow ground vehicle speeds

Side facing 4-point harnesses demonstrated to be lethal, even at slow ground vehicle speeds

Being seated IN an automotive seat is what will protect you

- Anything that allows or encourages you to get up out of your seat will also encourage you to be injured or killed – it is potentially lethal to be out of your seat in any fashion
- 4 or 5 point harnesses over both shoulders for sidefacing occupants are potentially lethal – and in NO WAY SUPPORTED BY ANY DATA OR INDEPENDENT AUTOMOTIVE SAFETY EXPERTISE

Yet another potentially lethal example marketed as a 'safety innovation' YET outside of automotive safety practice

Yes, the ride of your life….

- Sure… these vehicles all parade around the EMS and Fire shows
  BUT…
- NOT ONE of these vehicles has been to the automotive safety shows or scrutinized by the automotive safety industry

Ambulance Vehicle Standards??

- KKK?
- AMD?
- FMVSS?
- NFPA?
- SAE…?
- ASTM…?
- International
  - –ASA
  - –CEN

Global EMS Vehicle Safety Standards v Specifications and Guidelines

- EMS Safety and Performance Standards
  - – Australia & New Zealand 4535
  - – Common European Community (CEN) EN1789
- Non EMS Specific USA Standards
  - – [Aviation - FAA/CAA/JAA]
  - – [Fleet vehicles - ASSE/ANSI Z15]
- USA Other
  - – Purchase Specification: KKK
  - – "Standards" - NTEA – AMD, ASTM F 20
  - – Guideline: EMSC Dos and Donts, and (ASTNA, CAAS and CAMTS)

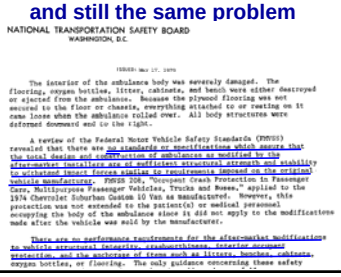
American National Standard ANSI/ASSE Z15.1-2006

Safe Practices for Fleet Motor Vehicle Operations

What Z15 encompasses

- Safety Program
- Safety Policy
- Responsibilities and Accountabilities
- Driver Recruitment, Selection and Assessment
- Organizational Safety Rules
- Orientation and Training
- Reporting Rates and Major Incidents to Executives
- Oversight

NTSB 1979… and 30 years later and still the same problem



NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

The interior of the ambulance body was severely damaged. The flooring, oxygen bottles, litter, cabinets, and bench were either destroyed or ejected from the ambulance. Because the plywood flooring was not secured to the floor or chassis, everything attached to or resting on it came loose when the ambulance rolled over. All body structures were deformed downward and to the right.

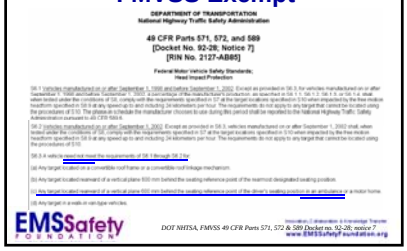
A review of the Federal Motor Vehicle Safety Standards (FMVSS) revealed that there are no standards or specifications which require that the total design and construction of ambulances as modified by the after-market installers are of sufficient structural strength and stability to withstand impact forces similar to requirements imposed on the original vehicle manufacturer. FMVSS 208, "Occupant Crash Protection in Passenger Cars, Multipurpose Passenger Vehicles, Trucks and Buses," applied to the 1974 Chevrolet Suburban Custom 10 Van as manufactured. However, this protection was not extended to the patient(s) or medical personnel occupying the body of the ambulance since it did not apply to the modifications made after the vehicle was sold by the manufacturer.

There are no performance requirements for the after-market modifications to vehicle structural integrity, crashworthiness, interior occupant protection, and the anchorage of items such as litters, benches, cabinets, oxygen bottles, or flooring. The only guidance concerning these safety

October 2008 JEMS Article "Rig Safety – 911"

What KKK-A-1822F, AMD and FMVSS state and don't state…

USA Ambulances: FMVSS Exempt


DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration

49 CFR Parts 571, 572, and 589
[Docket No. 92-28; Notice 7]
[RIN No. 2127-AB85]

Federal Motor Vehicle Safety Standards;
Head Impact Protection

DOT NHTSA, FMVSS 49 CFR Parts 571, 572 & 589 Docket no. 92-28, notice 7

USA KKK ambulance purchase specifications GSA:KKK-A-1822F, Aug 2007

- Specifications for the purchase of a Star of Life Ambulance
- Static Pull test
- 2200 Lbs. static stretcher test in longitudinal, lateral & vertical
- No dynamic test for vehicle, occupants or equipment
- No automotive test manikin
- Voluntary

www.ntea.com/WorkArea/downloadasset.aspx?id=1352

USA Ambulance Manufacturing Division (AMD) Ambulance Standards – August 2007

- No dynamic or impact test
- No automotive test manikin
- Mandates NO 'crumple zone'
- No impact tested anchorages for occupant restraint or equipment
- Internal, not independent

http://www.ntea.com/WorkArea/showcontent.aspx?id=1350

Occupant protection……?? July 2007

Mav 13. 2010.. Last month

May 13, 2010

Email Print Comment Register Bookmark RSS What's This

2 killed in Iowa ambulance crash

2 dead and 3 injured in collision Thursday

(CC) com

IOONE, Iowa -- A paramedic with significant injuries ought to save her patient and an ambulance driver in Thursday following a crash in Boone County.

Rescue crews arriving on the scene said the paramedic, Wendy Baker, told them her co-worker n the back of the ambulance was dead. Baker then ontinued to move back and forth treating the atient in the back of the ambulance as well as the river.

'She was working so hard I had to physically emove her from the ambulance scene because she didn't want to give up her patients," said Boone County Deputy Brian Pontius. "I don't even know er name."

KKK/AMD – static 'safety testing'

- Ignorant of automotive safety principles – and specifies -
  - No structural damage to any load bearing or supporting members, i.e., torn or broken material, broken welds, popped or sheared body rivets, bolts, and/or fasteners, shall be evident during the application of the force and after the release of the force.

KKK Specification and AMD Standards both default to the FMVSS for safety – however..

- FMVSS has a specific exemption for ambulance vehicles once you are 600mm or 2 feet positioned rearward of the driver
- KKK require a **'national test lab'** to conduct AMD 'tests' BUT NOT an automotive test lab!
- No dynamic impact tests AT ALL
- No crashworthiness tests

Ridiculous current 2009 USA ambulance '*safety testing*' !?!? – Is NOT consistent with accepted automotive safety practice…

No 'a'… then NO 'F' !!!!!

- $F = ma$

where F – force
m – mass
a – acceleration

Sir Isaac Newton (1642-1727), Philosophiae Naturalis Principia Mathematica (Mathematical Principles of Natural Philosophy), published in 1687. http://en.wikipedia.org/wiki/Newton's_laws_of_motion

FMVSS exempt……

Standards Development Update

- NFPA – developing enhanced KKK
- SAE – x2 standards underdevelopment
  - General vehicle crashworthiness and occupant safety standard
  - Specific equipment and occupant restraint standard
- ISO - ISO/AWI 39001 - Road-traffic Safety management system

What are the solutions?

- Training?
- Practice Policy?
- Transportation Systems Engineering?
- Automotive Engineering?
- Education of other road users???

Visibility and lighting issues

Hmm…

So why is it…

- That the EMS providers -
  - Were wearing navy blue – one of the most difficult colors to see at night
  - Had no head protection, when all other emergency personnel at the scene did
  - Had no protective clothing, when other emergency personnel at the scene did???

It isn't like this outside of the USA

News we don't want to see

Jan 22, 2007 6:39 am US/Eastern

Caught On Video: EMT Struck By Car

Lou Young
Reporting

(CBS) BRONX The car hit 46 year-old Capt. Steven Quirindongo so violently it smashed the vehicle's windshield and sent him flying through the air.

Quirindongo, a 19-year veteran of the city's emergency medical services, was on the scene of a fire on Riverdale Avenue in the Bronx Sunday afternoon when a civilian car moved past police barricades and caught him from behind. Chief Wayne McPartland was on the scene as the damaged health food store where his men had successfully put out the flames.

"We had two firefighter minor injuries," he told us, "and they were taking care of our men and when he (Quirindongo) was walking back to the ambulance he was struck by the civilian vehicle.

Worker visibility Act: November 24th 2008

PART 634—WORKER VISIBILITY

§ 634.3 Rule.

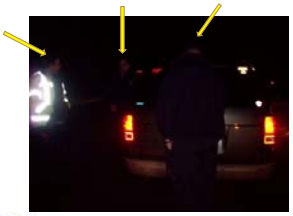
All workers within the right-of-way of a Federal-aid highway who are exposed either to traffic (vehicles using the highway for purposes of travel) or to construction equipment within the work area shall wear high-visibility safety apparel.

Workers must provide on foot whose duties place them within the right-of-way of a Federal-aid highway, such as highway construction and maintenance forces, survey crews, utility crews, responders to incidents within the

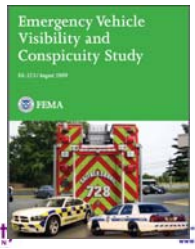
Day visibility

Night visibility

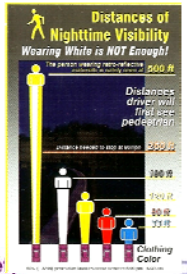
Here's the real world at 6 ft…



August 2009 – Visibility review

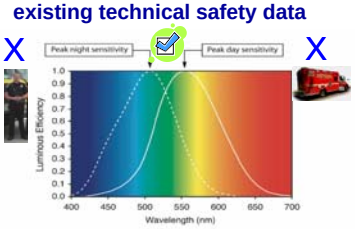


Distances of Nighttime Visibility



Policy and practice ignorant of existing technical safety data

X X



This addresses some very real risks, very creatively – and currently ONLY available in London Ontario!

Color-blindness affects 10% of the population

- As seen with normal vision

- As seen with color blind vision

Emergency Vehicles – Viewer Awareness

For a timely, appropriate and safe response

- Location
- Size
- Shape
- Speed
- Intended path

- Having access to that technical knowledge supports changes to improve safety practice

Muskoka EMS - Canada

Old design

New design

Muskoka EMS - Canada

But whatever color …. If you run a red light someone will be killed

Driver issues

Conclusions: When controlling for call volume and ambulance time, the odds of having been in an ambulance accident within the past year were significantly higher for younger EMTs. Future studies should investigate the effects of various interventions such as increased field supervision or driver safety training programs on the driving performance of younger EMTs.

Invehicle technologies to enhance transport safety

- Aftermarket in vehicle electronic e-safety devices with monitoring and feedback

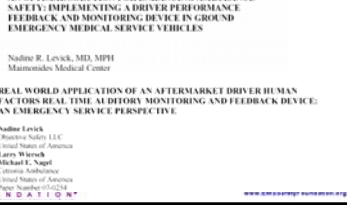
[November 02, 2009]

BusinessWire

inthinc Delivers tiwi Driving Safety and Fleet Management Solution

SALT LAKE CITY --(Business Wire)-- inthinc Technology Solutions (News - Alert), Inc. (www.inthinc.com), a developer and manufacturer of tiwi-branded solutions to improve driving safety, today announced its tiwi driving safety system is in full production for light commercial fleets as well as heavy duty and special purpose applications. With tiwi, companies get the only comprehensive system that changes driving behavior in real time to improve safety and fleet efficiency.

What about changing driver behavior in the real world??



AN OPTIMAL SOLUTION FOR ENHANCING AMBULANCE SAFETY: IMPLEMENTING A DRIVER PERFORMANCE FEEDBACK AND MONITORING DEVICE IN GROUND EMERGENCY MEDICAL SERVICE VEHICLES

Nadine R. Levick, MD, MPH
Maimonides Medical Center

REAL WORLD APPLICATION OF AN AFTERMARKET DRIVER HUMAN FACTORS REAL TIME AUDITORY MONITORING AND FEEDBACK DEVICE: AN EMERGENCY SERVICE PERSPECTIVE

Nadine Levick
Objective Safety LLC
United States of America
Larry Wiersch
Michael E. Nagel
Catronia Ambulance
United States of America
Paper Number 05-0234

The "Feedback Box" - A transportation safety monitoring and feedback device

This technology is conceptually like a vehicle safety 'pulse oximeter' – that with auditory feedback - can save your life, your coworkers life, your patients life, and others on the road

Purpose of 'Feedback box' Program

- Enhance Safety
- Improve Driver Performance
- Save Maintenance Dollars
- Aid Accident / Incident Investigation

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How the Device Works

- Computerized monitoring device installed on each vehicle to measure parameters
- Each driver has individual key "fob"
- Data collected every second
  - including: vehicle speed and performance, driver behaviors and emergency mode
- Auditory feedback of warning 'growls', and penalty tones
- Data downloaded automatically every day

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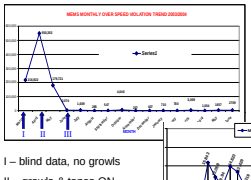
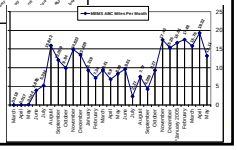
Demonstrated Effectiveness



I – blind data, no growls

II – growls & tones ON unidentified data capture

III – identified data



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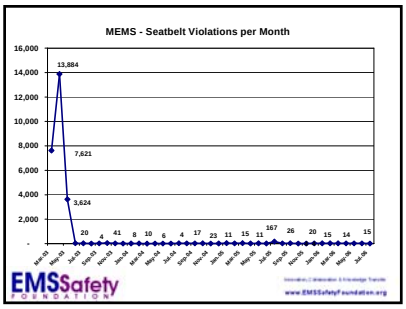

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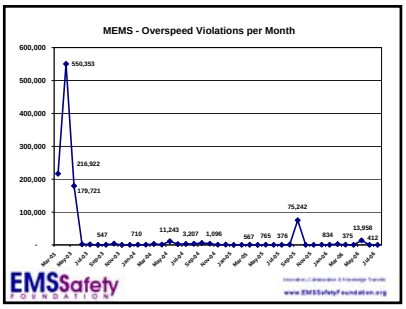

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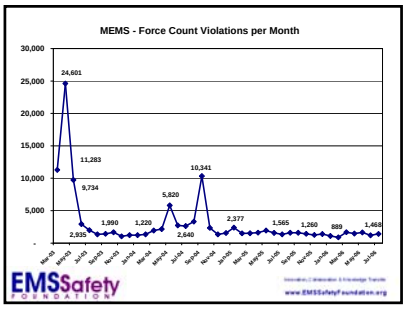

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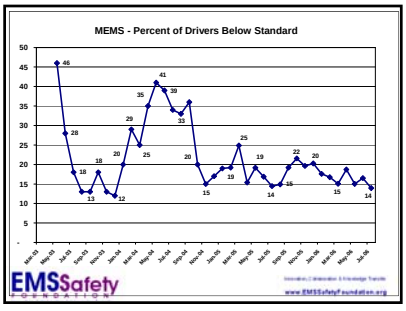

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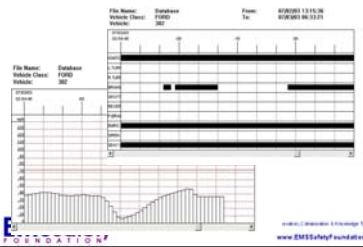
And when a rare crash happens….

Unit 302 Accident



Monitoring and feedback devices

- Implementation well received by the providers.
- 20% cost saving in vehicle maintenance within 6 months.
- No increase in response times
- Fewer crashes and less severe crashes
- Sustained improvement in safety proxies, with no inservice or retraining after the initial introduction period.

Feedback box Summary

- The system works
- Objectively improved performance
- No increase in response times
- At fault accidents reduced
- Accepted into the culture

However:

- The system requires monitoring
- Must be reinforced by management
- Must be incentives for good performance
- Must be consequences for poor performance

A key to safe ambulance transport

Extensive Indirect cost savings

- Fewer out of service vehicles
- Improved transport times
- Decreased administrative lost in managing unsafe behaviors
- Decreased legal burden
- Automatic system wide data
- Insurance benefits

Other monitoring devices

- Primarily to record events during and immediately preceding a crash
- Give no driver crash prevention feedback
- Administratively burdensome
- Intrusive
- Not demonstrated to be as effective in improving vehicle maintenance costs or as effective in modifying driver behavior long term

You want a system that works!!

- Does the system really work
- Is it going to be a major burden on your staff to implement
- What are the real costs
- Are you going to have video of your company vehicle on you tube??

- Do you want graphic images of the crashes your investment DID NOT HELP YOU AVOID???

The jury is out on

- Opticon
- Simulators

Resource availability and allocation technologies

EMS Transport Safety

- 'patient safety'
  AND also
- 'provider' and 'public safety'

Innovation

What's new

- New automotive safety technologies
  - crashworthiness
  - EVS
  - ITS
  - Monitoring and feedback enhancements
- New expertise
  - EMS Safety Foundation
  - TRB
  - ASSE
  - SAE
  - UTRC
  - Ergonomics
  - Industrial Design

Safety concepts out there now

- Driver feedback technologies
- Tiered dispatch
- Enhanced ambulance vehicle design
- Intelligent Transport Technologies - ITS
- New Safety Standards

What the independent technically expert occupant protection and automotive safety engineers say about our current ambulances and 'safety' approaches:

- "The rear compartment Death Vault"
- "The Kitchen Design must go"
- "The Kill, Kill, Kill (KKK) spec"
- "The organ donor harness system"

Independent Technical Expertise

- The "kitchen design" is completely unacceptable and a failure in health care delivery, occupant protection and ergonomics.
- Independent technical expertise must be here and involved

TRB TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

National Academies Transportation Research Board

Ambulance Transport Safety Summit –

- Bridging the gap between what we do and what is known
- Enhancing ambulance transport safety through shared knowledge of technical data
- Open access, all EMS related organizations notified and invited, and beamed to EMS Expo!

October 29, 2009

- This is where the technical experts were, operational EMS providers and the government agencies too

What could you learn from the National Academies – right NOW and gratis

- The realm of burden and benefit
  - measuring the safety of the system
  - determining the economic, ethical and risk benefit challenges
- Transport System Management
  - fleet safety and oversight technologies and policies
  - operations management – dispatch, congestion routing, deployment of resources, benchmarking
- Vehicle safety
  - occupant protection design and testing
  - Vehicle performance safety
  - vehicle and personnel human factors issues
- Dissemination and Policy
  - Knowledge transfer
  - Standards, specifications and policy

TRB TRANSPORTATION RESEARCH BOARD OF THE NATIONAL ACADEMIES

October 29, 2009 TRB Summit

2009 TRB Summit Participants

http://www.objectivesafety.net/TRBSummit2009.htm

- Technical experts
  - Automotive safety engineering, occupant protection
  - Automotive and EMS operational ergonomics and human factors
  - Transportation systems safety engineering
- Government agencies
  - National Highway Traffic Safety Administration (NHTSA)
  - Department of Transportation ITS (DOT)
  - National Transportation Safety Board (NTSB)
  - Federal Highways Administration (FHWA)
  - Federal Motor Carrier Safety Administration (FMCSA)
  - Bureau of Labor and Statistics (BLS),
  - Department of Homeland Security (DHS)
- EMS State Directors
- EMS Services
  - private and municipal from across North America
  - Fire/EMS
  - Volunteer EMS
- Industry partners
  - EMS Equipment
  - Vehicles, both OEM and aftermarket
- Academics

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TRB TRANSPORTATION RESEARCH BOARD OF THE NATIONAL ACADEMIES

Please do go and access this information, it comes from technical and operational experts and it is gratis

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Its out there NOW

- TRB 2009 Summit – addressed the key and interdisciplinary issues, in one day – please seek that information out.
- There have been two TRB Summits held, 2008, 2009 and both with vehicle engineering and transportation systems technical expertise
- See www.trb.org, and for the Summit archives: www.objectivesafety.net/TRBSummit2008.htm www.objectivesafety.net/TRBSummit2009.htm

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International approaches

- The state of the art non-USA vehicles have NO squad bench nor the after market structural vehicle modifications that can potentially decrease crashworthiness integrity that were seen in study vehicles.

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The EMS Safety Foundation: A practical and functional model

Interdisciplinary and Operational

- Innovation
- Collaboration
- Knowledge transfer

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The EMS Safety Foundation

November 2009 Webinar for Public Access

www.EMSSafetyFoundation.org and www.objectivesafety.net

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Background:

- EMS Safety Foundation has been established to fill a gap in
  - technical knowledge transfer
  - practical interdisciplinary R & D
  - evaluation and implementation of system safety enhancements for EMS and Medical Transport
- It is a not-for-profit institute

EMSSafety FOUNDATION www.EMSSafetyFoundation.org

Mission

- This is a team of like minded innovators across EMS Medical Transport and a number of technical disciplines, who share the common mission of enhancing the safety of EMS delivery for all involved.

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In a nutshell

- EMS Safety Foundation is a not-for-profit multidisciplinary virtual think – tank and test bed for safety innovation and knowledge transfer
- It is a virtual network integrating the end users and the technical experts
- A tool to enhance the safety of delivery of EMS services

R & D
"Ripoff and Duplicate"

- Avoid reinventing the wheel at all costs
- Where are the best practices that we need to transfer knowledge from

Ambulance Vehicle & Ergonomics Workshop, October 2009

Automotive engineers addressing EMS Safety Foundation Workshop

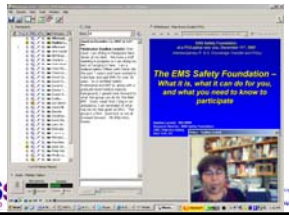
RETTmobil is -

- A major European Emergency Rescue Congress, Trade show and Symposium
- Held in Fulda, Germany
- Established in 2001
- Attended by ~ 20,000 attendees
- Brainchild of Prof Peter Sefrin

The EMS Safety Foundation

www.EMSSafetyFoundation.org

brings this presentation to you



Day 1:

http://www.emsresponder.com/web/online/Safety/Live-From-RETTmobil/25$13137

Day 2:
http://emsresponder.com/web/online/Safety/Life-From-RETTmobil--Day-2/25$13150

Day 3:
http://www.emsresponder.com/web/online/Safety/Live-From-RETTmobil--Day-3/25$13186

Day 4:
http://www.emsresponder.com/features/article.jsp?id=13197&siteSection=25

EMS Safety Foundation Delegation bringing International Innovation to you!

Vehicle Occupant Safety design

European design

Safety technology is a key focus

Safe and Ergonomic design

Patient Transferring Slides

Ergonomic layout and equipment

Flexibility to manage two patients

Collaboration and Outcomes

- Interdisciplinary Collaboration is what is key – not orthopedic folks talking to cardiologists – BUT collaboration between the health care folks appropriate automotive and occupant protection engineers and transportation system design and industry standards that make sense – and
- Meaningful measures of outcome and performance

Texas' Careflite's new vehicles

Careflite's new vehicle

Careflite's new vehicle

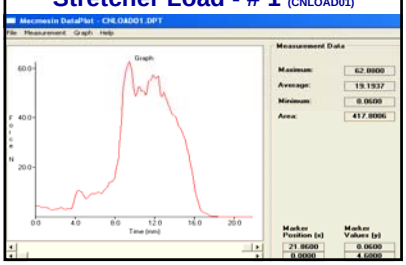
IRHA selected to test new ambulance

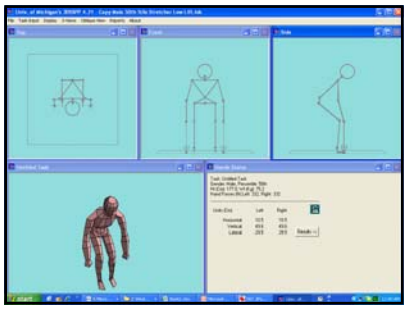
New design smaller, more cost efficient, say health officials

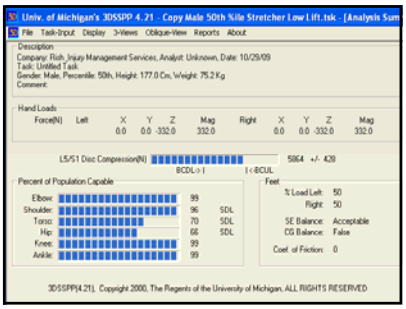
Manitoba's new fleet

Stretcher lifting & loading

Stretcher Load - # 1 (CNLOAD01)






Univ. of Michigan's 3DSSPP 4.21 - Copy Male 50th %ile Stretcher Low Lift.tsk - [Analysis Sum
File Task-Input Display 3-Views Oblique-View Reports About
Description
Company: Rish_Injury Management Services, Analyst: Unknown, Date: 10/29/09
Task: Untitled Task
Gender: Male, Percentile: 50th, Height: 177.0 Cm, Weight: 75.2 Kg
Comment:
Hand Loads
Force(N) Left X 0.0 Y 0.0 Z -332.0 Mag 332.0 Right X 0.0 Y 0.0 Z -332.0 Mag 332.0
L5/S1 Disc Compression(N) 5864 +/- 428
BCDL-> | | <-BCUL
Percent of Population Capable
Elbow: 99
Shoulder: 96 SDL
Torso: 70 SDL
Hip: 68 SDL
Knee: 99
Ankle: 99
Feet
% Load Left: 50
Right: 50
SE Balance: Acceptable
CG Balance: False
Coef. of Friction: 0
3DSSPP(4.21), Copyright 2000, The Regents of the University of Michigan, ALL RIGHTS RESERVED

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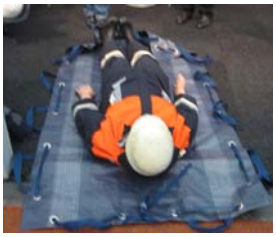
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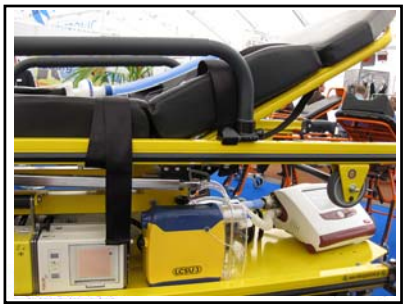


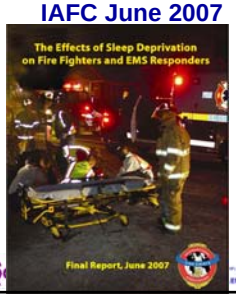
Small AED

Science behind Policy

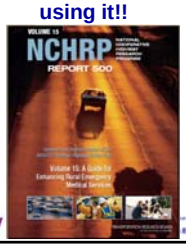
- "For successful technology, reality must take precedence over public relations, for Nature cannot be fooled."

  Richard P. Feynman 1988

IAFC June 2007



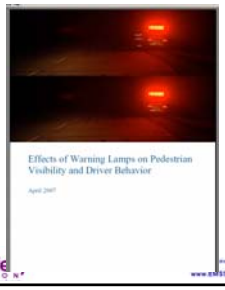
Transportation Research Board is an excellent resource… we should be using it!!



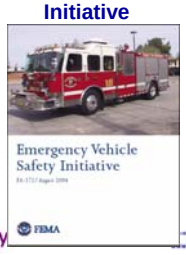
Tips for Emergency Vehicle Operations

An excellent model

http://www.EveryoneGoesHome.com



USFA Emergency Vehicle Safety Initiative



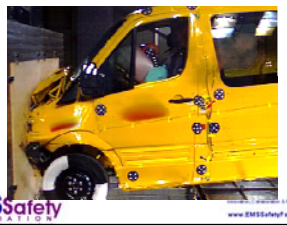
Traffic Incident Management Systems (TIMS)

- Released April 2008
- FEMA, USFA, IFSTA
- Covers setting up safe roadway incident work areas and using unified command at these incidents

Technical Collaboration is key

- We are NOT the experts in this science
- We cannot afford to play the silo game here, it is costing lives, time and money
- We MUST have a meaningful evidenced based approach to operations and policy
- We must be outcomes driven
- We MUST cease to be a fiefdom in a discipline we have no technical background or expertise in

this vehicle is safety crash tested by automotive experts



Unlike this vehicle

Is this acceptable…?

- There are ambulances rolling out of the show room on a daily basis – as we speak – being designed by health care providers and built by after market retrofitters, who are not at all governed as are other passenger vehicle manufacturers by the standards set by the society for automotive engineers

So what do we need to do ??

- Reach out to the appropriate experts – they sure do want to help us
- STOP being philistines and be the scientists we are trained to be and at least seek a scientific approach
- Get your heads out of the sand – there is plenty of valid technical information – FMCSA, TRB, SAE
- Make policy and purchase decisions on technically sound data, not a marketing brochure
- HAVE MEANINGFUL AND TRANSLATABLE OUTCOME MEASURES FOR YOUR SERVICES SAFETY PERFORMANCE

Future Directions

- Rational use of limited resource
- Avoid reinventing the wheel
- Formal safety research agenda
- Framework bridging key research and infrastructure
  - Society of Automotive Engineers
  - Involvement with ESV activities
  - EMS safety research funding
  - Foster evidence based initiatives

Goals

- Standards for safety
- Policy based on Science
- Databases to demonstrate outcome

Were we safer in the Cadillac???

Creating a Safety Culture

within a company must start with upper management's commitment to safety

- Awareness
- Training
- Incentive

Safety Management

- A Safety Culture
- Protective Policies
- Protective Devices
  - In the event of a crash
  - To prevent a crash
- Continuous Education and Evaluation

Very Important Principle

Ambulance transport safety is part of a SYSTEM, the overall balance of risk involves the safety of all occupants and the public

Future

- Meaningful Goals
- New policies
- New practices
- New standards
- New vehicles
- New technologies

Conclusion

- EMS transport has serious hazards and safety issues
- Major advances in EMS safety research, infrastructure and practice over the past 5 years
- Development of substantive EMS safety standards is a necessity and a reality
- Multidisciplinary safety issue that EMS cannot solve internally
- Failure to transfer knowledge from transportation and automotive safety is unacceptable and dangerous
- EMS is still way behind the state of the art in vehicle, transportation and occupational safety

And….

- It is no longer acceptable for EMS to be functioning outside of transportation, automotive and PPE safety standards for prevention of and protection of EMS providers and the public from injury and death

Thank you!

Any Questions??

Electronic handout available online

http://www.objectivesafety.net