

31st Annual West Virginia EMS Conference
Sutton, West Virginia, November 15th, 2008

Ambulance Transport Safety: Everything You Really Need to Know



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Research Director, EMS Safety Foundation
CEO, Objective Safety
New York, USA

▶ To quote Steve "Sid" Caesar – Director IHS ES

"We want everyone to get home safely each day"

Who am I?

- ▶ Emergency medicine physician
 - USA – Johns Hopkins to Harlem
 - Australia – Royal Melbourne to the Outback
- ▶ Public Health - Injury Research
- ▶ Ambulance Transport Safety
- ▶ Chair National Academies Transportation Research Board, EMS Safety Committee
- ▶ Recipient of International Society of Automotive Engineers, Women's Leadership Award



<http://www.objectivesafety.net>



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?

Firstly!

▶ ~~An accident ?~~

▶ or
a predictable and preventable event

A tragic emergency health care intervention outcome



Rollover Crash Kills Medical Technician

It does happen....

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
- ▶ BUT an EMS crash can kill all involved AND wipe out an EMS systems response capacity.....

Ambulance Transport Safety

- ▶ Emergency care, public health, 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

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

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

NEWS CENTER

Paramedic Killed in Turner Ambulance Crash

By Staff Writer
Published: 7/5/07 10:00 AM
Updated: 7/5/07 10:00 AM

TURNER (APR 2007) - The fatal crash paramedic was killed when the ambulance collided with a private truck in Turner at a Turnpike about 10:30 a.m. Thursday.

The ambulance, Turner County Department was the first to arrive at the scene of the crash, which occurred on the east side of the road.

The ambulance driver, 30-year-old Andrew McCougl, was killed. The paramedic, 31-year-old Allan Parson, was killed. The ambulance driver, 30-year-old Andrew McCougl, was killed. The paramedic, 31-year-old Allan Parson, was killed.

The paramedic was killed when the ambulance collided with a private truck in Turner at a Turnpike about 10:30 a.m. Thursday.

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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 4:58 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 6:19 PM (Suggest Removal)
to: madi, 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: K responder: why can't I proceed given that I'm not in a hurry and I want to know if the actions and situation surrounding this were worth this cost 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 hit 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 broadside 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 41-year-old Sammy Smith, 31-year-old Matt McCougl and 50-year-old Kelly Rager. The two paramedics were also killed. They were identified as 66-year-old Robert Wells and 40-year-old Amanda Wells of Hicksville.

Another emergency medical technician, Matt McCougl, and the truck driver, Gerald Chapman, 37, 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 wares and lights were turned on.

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

Live! News
July 22, 2007

By: **NEWS** 11/7

Antwerp, Ohio

Antwerp, Ohio



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 Shueck 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."

January 10, 2008



This is not a crashworthy environment



Jan 28th, 2008

Monday, January 28, 2008 10:14 am
 Top Story | Previous Top Stories | Our Picks | Today's Pick
 Posted at: 7:33 am (3 Comments)
1 dead, others injured in Sussex crash involving ambulance



Collision happened at the intersection of Beaver Dam and Indian Mission roads near Angola Launch »



April 14th, 2008

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

An emergency services 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 River to the Palisades Central mall.

Suzanne 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 Dreischer said. "She appeared to be seriously injured."

The paramedic van driver, 19-year-old Scott Thorne to Westchester Medical Center, said.



April 20, 2008...??

HERALD-EXAMINER
 State News
Child injured after being struck by ambulance

Friday, April 18, 2008 9:46 AM EDT

ANGERMUNSTER, N.J. (UPI) — An Allegheny County area 7-year-old boy died in a hospital with life-threatening injuries after being struck by an ambulance.

Police investigators are probing and the unidentified child was riding a bicycle about 9:30 a.m. Saturday when the ambulance struck him, according to the state.

After treatment at the scene, the child was taken into the ambulance and taken to St. Joseph Hospital, a hospital spokeswoman said. He was taken to the hospital in the ambulance's rear seat.

Springfield boy hit by ambulance dies

Friday, April 18, 2008 9:30 AM EDT

ANGERMUNSTER, N.J. (UPI) — An Allegheny County area 7-year-old boy died after being struck by an ambulance while riding his bike over the weekend.

Investigators are probing the crash, which occurred Saturday at about 9:30 a.m. in Angermunster, N.J. The child was riding his bicycle on the road when he was struck by the ambulance.

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 Levers-Ruboboth joint fire company station in Angola.

The M4-Savers Rescue Squad ambulance was transporting to Berbe Medical Center with a patient, 2 MERS 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 M4-Savers Company ambulance he was riding in, while returning from a run. Additional details on this morning's crash will follow.

In this vehicle...



October 31, 2008, Kentucky



Fatalities and funerals

Funeral Services Held For Marble Falls Paramedic

Friday, October 31, 2008 11:00 AM EDT

Funeral services for a Marble Falls paramedic who died in a crash on Highway 79 were held Saturday.

Funeral and burial services for Hanson were held in Marble Falls, Texas.

To view an obituary for Hanson's family and for fellow emergency workers, but also to express our deepest sympathy and offering prayers for Hanson's wife and children, please visit the link below.

Hanson's wife and children are still in shock, saying he died peacefully and suddenly, leaving behind a young son and a young daughter.

Funeral services for Hanson's family and for fellow emergency workers, but also to express our deepest sympathy and offering prayers for Hanson's wife and children, please visit the link below.

Hanson's wife and children are still in shock, saying he died peacefully and suddenly, leaving behind a young son and a young daughter.




2 counts of vehicular homicide...
November 5, 2007 - PA

Drunken ambulance driver killed 2 in car crash - Pennsylvania

A 22-year-old ambulance driver drank before her shift and was impaired when she collided with a car in Marshall, killing two men instantly, Allegheny County District Attorney Stephen A. Zappala Jr. said today.

Shanea Leigh Climo, 22, of Evans City, is charged with two counts of homicide by vehicle and involuntary manslaughter, driving under the influence and several traffic offenses in the Sept. 23 collision at Perry Highway and South Creek Road. She was arrested this morning, arraigned and released on her own recognizance, authorities said.

Police said an on-board camera system in the ambulance helped them decide to file charges. The camera allegedly shows the face of the driver, Shanea Climo.

Zappala said Climo was traveling south on Route 19, transporting a patient with a do-not-resuscitate order to UPMC Passavant, when she ran a red light and hit a Chevrolet Cavalier driven by Douglas Stitt. Stitt and a passenger, Philip Bacon, were killed.

The patient later died, but his death was not believed to be related to the crash, Zappala said.

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

Published online Tuesday, January 25, 2011

01/24/2011 | [View the Article](#) | [Update the Article's content](#)



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

By [Teresa E. Ryan](#)

The [York Dispatch](#) (@newsyorkpa)

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A York Adams County ambulance en route to York Hospital collided with a car at the intersection of routes 20 and 15 in York Township Township at 5:40 this morning, and the patient was pronounced dead at the scene.

York County Emergency Center-Corle's Storey said the patient, a woman, was being transported from Gettysburg Hospital because she was suffering a "significant" heart condition.

He said EMS staff tried to determine if other vehicles were involved in the crash, or what vehicle it was, but it was not clear because of the crash. "Staying with the vehicle to help or support the ambulance's operation."

So

- ▶ What's important
- ▶ What's not important

- ▶ What's going to save your life
- ▶ What might take your life

- ▶ What's going to hurt you
- ▶ What's going to protect you

- ▶ What is factual
- ▶ What is garbage

- ▶ What is new
- ▶ What is not new

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

Unique workplace

- ▶ In vehicles
- ▶ At roadside and other emergency scenes

Absence of standards and oversight

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

▶ What we need to consider, where is the 'bang for buck' in ambulance transport safety:

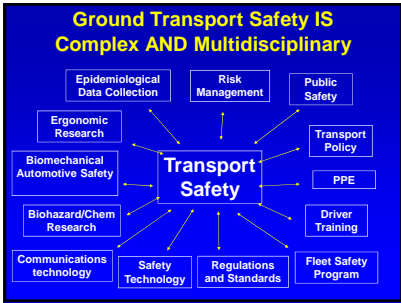


Some odd facts

- ▶ 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

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



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



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

TIME
↓
&
PLACE

The Emergency Department (ED)



An ambulance is not an ED /ICU on wheels



USA EMS data

In the USA*

- ▶ ~ 50,000 vehicles
- ▶ ~ 5,000 crashes a year
- ▶ One fatality each week
 - ~ 2/3 pedestrians or occupants of other car
 - Approximately 4 child fatalities per year
- ▶ ~10 serious injuries each day
- ▶ Cost estimates > \$500 million annually
- ▶ USA crash fatality rate/capita 35x higher than in Australia

*NHTSA 2006-6

Is it your service's tragic year?

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

So for EMS personnel...

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

This is not how you want to see your partner during a transport



'Workplace' Hazards



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

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

▶ "Ambulance transport has a death toll...."

Carl Craigle EMT-P, Chief Platte Valley Ambulance
Colorado Springs, April 2007



Clinical Care? Occupational Health and Safety.....?

- ▶ This IS a Transportation and Automotive Safety issue
- ▶ This is a Systems safety issue

Safety is Good Business



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

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



It does happen....

But what about head protection?



New EMS helmet prototypes for 2008



Problems

- ▶ No Standards
- ▶ Unique safety and hazard protection needs
- ▶ A number of less than appropriate devices out there



Dynamic vs. Static

Safety Testing

Dynamic Safety Testing

- ▶ requires sophisticated, expensive equipment
- ▶ measurably demonstrates forces generated during collision
- ▶ accepted international standard for vehicle restraint systems

The Crash Event - Crash Testing

- ▶ An introduction
- ▶ What one needs to know
- ▶ What do the tests really mean
- ▶ And, what tests are meaningful

Intrusion vs Deceleration

- ▶ Intrusion = vehicle to vehicle or vehicle to fixed narrow object
- ▶ Deceleration = sudden stop – ie. sled test

If we know this – and its published ...



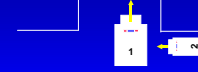
Levick NR, et al. Development and Application of a Dynamic Testing Procedure for Ambulance Pediatric Restraint Systems, SAE Australasia 1998;58:245-51

Why do we do this?



Full Vehicle Crash Testing

Test 1 – Right side impact



1 – Target vehicle
Type I ambulance
2 – Buffer vehicle
Type II ambulance
Closing speed 44 mph



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



NIOSH Ambulance Occupant Safety Crash Testing



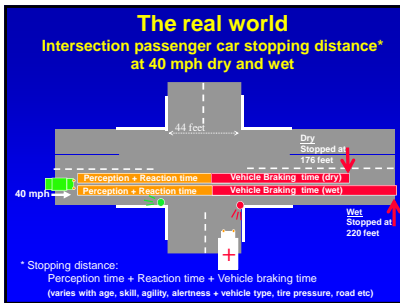
Impact Direction
25 MPH !

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.....



Ambulance Standards??

- ▶ KKK?
- ▶ AMD?
- ▶ FMVSS?
- ▶ NFPA?

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.mga.com/WorkArea/showcontent.aspx?id=1329

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.mga.com/WorkArea/showcontent.aspx?id=1329>



AMD – static 'safety testing'

- ▶ Inconsistent with automotive safety principles – and specifies that a 'successful test' is -
 - ▶ 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.



No 'a'... then NO 'F' !!!!!

▶ $F = ma$

where F – force
 m – mass
 a – acceleration

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

Unacceptable, and non-automotive AMD/KKK-F 'safety testing' practices and standards !!??

AMBULANCE TEST RECORD BROKEN

THAT WAS THEN **THIS IS NOW**

In 2000, shattered industry records by testing and certifying the modular body to more than double the 1500 lb curbside Federal Standard. In addition, they performed a body side test that had never been seen before. Now has broken that record with a 55,000 body test on the top and side of the module. The ambulance body is now certified to a 500% curb weight level. [▶ MORE INFO](#)

INDUSTRY LEADING SAFETY INNOVATION

USA Ambulances: FMVSS Exemption

**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 Restraint Protection**

§§ 1. Vehicles manufactured on or after September 1, 2002, and before September 1, 2003, are exempt from the requirements of this section insofar as they relate to the head restraint specified in § 571.572.1.2. The exemption does not apply to any target that cannot be used solely in the procedure of § 571.572.1.2. The exemption does not apply to any target that cannot be used solely in the procedure of § 571.572.1.2. The exemption does not apply to any target that cannot be used solely in the procedure of § 571.572.1.2.

SUMMARY: On August 15, 1992, NHTSA published a final rule amending Standard No. 201, "Occupant Protection in Motor Vehicle Crashes," to require passenger air and tractor, bus, and multipurpose passenger vehicles with a gross vehicle weight rating (GVWR) of 10,000 pounds or less to provide protection when a crash's head restraint exposure components, including the side- and rear-ward, and the roof, during a crash, in response to problems for

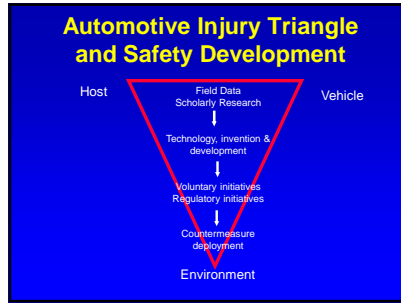
§ 1.2. Vehicles manufactured on or after September 1, 2002, and before September 1, 2003, are exempt from the requirements of this section insofar as they relate to the head restraint specified in § 571.572.1.2. The exemption does not apply to any target that cannot be used solely in the procedure of § 571.572.1.2.

§ 1.3. A vehicle need not meet the requirements of § 571.572.1.2 if:

- (a) Any target located on a convertible roof frame or a convertible roof linkage mechanism;
- (b) Any target located rearward of a vertical plane 500 mm behind the seating reference point of the rearmost designated seating position;
- (c) Any target located rearward of a vertical plane 500 mm behind the seating reference point of the front-most designated seating position; or
- (d) Any target located rearward of a vertical plane 500 mm behind the seating reference point of the front-most designated seating position; or
- (e) Any target located rearward of a vertical plane 500 mm behind the seating reference point of the front-most designated seating position; or
- (f) Any target located rearward of a vertical plane 500 mm behind the seating reference point of the front-most designated seating position; or
- (g) Any target located rearward of a vertical plane 500 mm behind the seating reference point of the front-most designated seating position; or
- (h) Any target located rearward of a vertical plane 500 mm behind the seating reference point of the front-most designated seating position; or
- (i) Any target located rearward of a vertical plane 500 mm behind the seating reference point of the front-most designated seating position; or
- (j) Any target located rearward of a vertical plane 500 mm behind the seating reference point of the front-most designated seating position; or
- (k) Any target located rearward of a vertical plane 500 mm behind the seating reference point of the front-most designated seating position; or
- (l) Any target located rearward of a vertical plane 500 mm behind the seating reference point of the front-most designated seating position; or
- (m) Any target located rearward of a vertical plane 500 mm behind the seating reference point of the front-most designated seating position; or
- (n) Any target located rearward of a vertical plane 500 mm behind the seating reference point of the front-most designated seating position; or
- (o) Any target located rearward of a vertical plane 500 mm behind the seating reference point of the front-most designated seating position; or
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- (q) Any target located rearward of a vertical plane 500 mm behind the seating reference point of the front-most designated seating position; or
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- (u) Any target located rearward of a vertical plane 500 mm behind the seating reference point of the front-most designated seating position; or
- (v) Any target located rearward of a vertical plane 500 mm behind the seating reference point of the front-most designated seating position; or
- (w) Any target located rearward of a vertical plane 500 mm behind the seating reference point of the front-most designated seating position; or
- (x) Any target located rearward of a vertical plane 500 mm behind the seating reference point of the front-most designated seating position; or
- (y) Any target located rearward of a vertical plane 500 mm behind the seating reference point of the front-most designated seating position; or
- (z) Any target located rearward of a vertical plane 500 mm behind the seating reference point of the front-most designated seating position; or

NFPA Ambulance Standard Development

- ▶ NFPA Ambulance Standard Development Public Comment
- ▶ The Public Comment period for the development of the new NFPA Ambulance Standard – is open until October 15, 2008
- ▶ http://www.emssafetyfoundation.org/NFPA_Ambulance0001.pdf



Protective devices/concepts

To prevent a crash

- ▶ Driver feedback
- ▶ Driver monitoring
- ▶ Driver training
- ▶ Vehicle Intelligent Transportation System (ITS) technologies
- ▶ Tiered dispatch
- ▶ Appropriate policies

In the event of a crash

- ▶ Vehicle crashworthiness
- ▶ Seat/seat belt systems
- ▶ Equipment lock downs
- ▶ Padding
- ▶ Head protection

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

A few key words about restraint systems...

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

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 for sidefacing occupants are potentially lethal – and is in **NO WAY SUPPORTED BY ANY DATA OR AUTOMOTIVE SAFETY EXPERTISE**

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

Innovation

Safety concepts out there now

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

Safety Policy



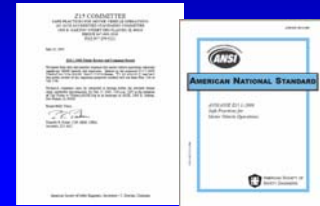
WEMSA – October 2007

1. Emergency Vehicle Operations Policy
2. Vehicle operations training and evaluation
3. A program of graduated driver responsibility
Drivers only age 25 and over
5. Complete stop at an intersection
6. Restricted use of Red Lights and Sirens
7. Monitoring of emergency vehicle operations

WEMSA covered some key and important policies and procedures But....

- ▶ What about hours of service?
- ▶ What about visibility at the scene? For providers and the vehicles...?
- ▶ What about protective equipment?
- ▶ What about ambulance design safety?
- ▶ What about reporting of adverse events?

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

Use proven safety tools



Patients must be in the over the shoulder harness, medics restrained in seat belts, equipment secured



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
Optivox Safety LLC
United States of America
Loren Wierock
Michael E. Nagel
California Ambulance
United States of America
Paper Number 040234

Purpose of 'Feedback box' Program

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

How the Device Works

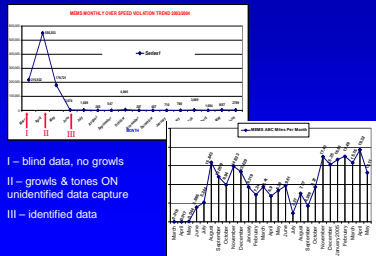
- ▶ Computerized monitoring device installed on each vehicle to measure parameters
- ▶ Each driver has individual key "fob"
- ▶ Data collected every second
 - including: vehicle speed and performance, driver behaviors and emergency mode
- ▶ Auditory feedback of warning 'growls', and penalty tones
- ▶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



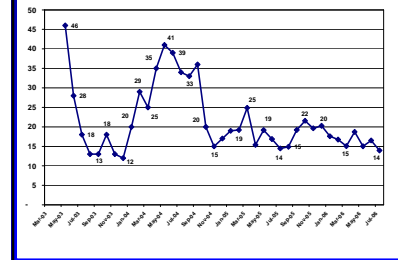
Over speed - accelerating

- ▶ Listen for growl – 15 sec warning begins
- ▶ Growl frequency increases near end of warning
- ▶ Tone on – penalty points awarded
- ▶ Slow down – tone stops
- ▶ Accelerate again - growl on – slow down – growl stops - no points

Demonstrated Effectiveness



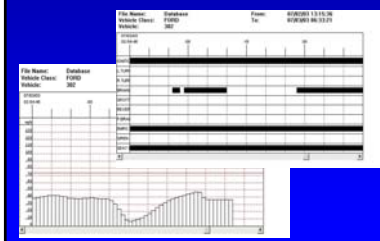
MEMS - Percent of Drivers Below Standard



And when a rare crash happens....



Unit 302 Accident



A key to safe ambulance transport



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.

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

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

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??

The jury is out on

- ▶ Opticon
- ▶ Simulators

The EMS Safety Foundation

Intro and Logistics Webinars from December 11th 2007 & Jan 8th 2008
EMS Safety Foundation tab at www.objectivesafety.net

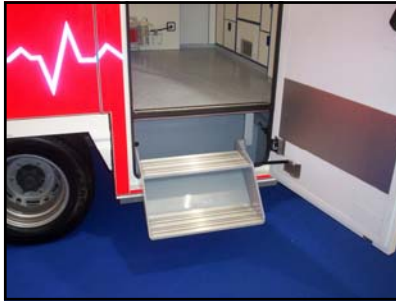


International approaches

- ▶ 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.

RETTmobil – 'Mobile Rescue'
Major European event for EMS innovation
Fulda, Germany May 2008
<http://www.rettmobil.com/>





One patient or Two patients
and you can reach both AND
your equipment...

a fleet based initiative



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



Ergonomic layout and equipment



So....

- ▶ Which vehicle do you want to be in ?
- ▶ Which vehicle is the best for efficient, and effective patient care?
- ▶ Which vehicle provides optimal risk management ?
- ▶ What is the optimal fleet mix?

Were we safer in the Cadillac???



Other successful models



Hmm...



So why is it...

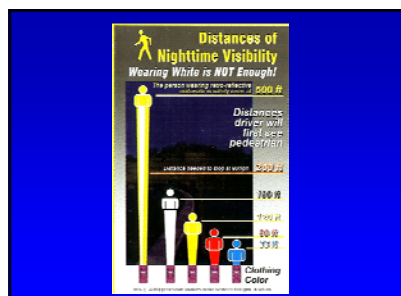
- ▶ That the EMS providers -
 - Were wearing navy blue – one of the most difficult colors to see at night
 - Had no head protection, when all other emergency personnel at the scene did
 - Had no protective clothing, when other emergency personnel at the scene did???

Worker visibility Act: Help is on the way !! November 24th 2008

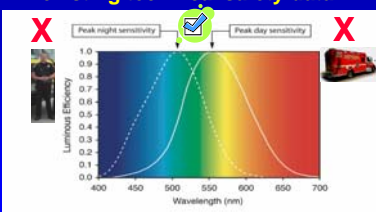
PART 634—WORKER VISIBILITY

§ 634.2 Rule. All workers within the right-of-way of a Federal-aid highway who are engaged either in traffic control or other work for purposes of visibility in construction equipment within the work area shall wear high-visibility safety apparel.

Workers means people on foot who no longer place them within the right-of-way of Federal-aid highways, such as highway construction and maintenance crews, survey crews, utility crews, and any other personnel working in the right-of-way of Federal-aid highways.



Policy and practice ignorant of existing technical safety data

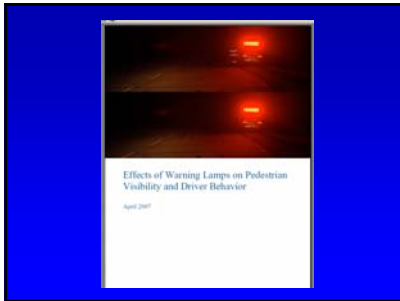


Visibility and Conspicuity ...?



Visibility and lighting issues





Under Way... Emergency Vehicle Visibility and Conspicuity Study

- ▶ Funded by the USFA, conducted by IFSTA
- ▶ Looking at the effectiveness of reflective markings used on emergency vehicles
- ▶ Doing best practice research and working with manufacturers



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

▶ Operating in an environment where many aspects of safety are still devoid of safety standards – requires technical knowledge and understanding

But whatever color If you run a red light some will be killed

Article: Don't Play Russian Roulette at Intersections
A.J. Pappalardo, Editor, JEMS, Editor at Large, 2008
The Editor of a National Fire Department magazine wrote an interesting article on the topic of a red light camera. The article was published in the March 2008 issue of JEMS. The article was titled 'Don't Play Russian Roulette at Intersections'.

R & D "Ripoff and Duplicate"

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

Air EMS is a role model for safety initiatives and focus



Integration and Collaboration

EMS Transport Safety Strategies - 2006-2007 New York State Strategic Highway Safety Plan



State Strategic Highway Safety Plans

- ▶ Required as part of the SAFETEA-LU legislation
 - (Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users)
- ▶ Effective October 1st 2007
- ▶ Focus is the 4 'E's'
 - Engineering
 - Education
 - Enforcement
 - Emergency Medical Services
- ▶ EMS is a core theme

Ambulance Safety Summit November 7th, 2008

- ▶ EMS Transportation Safety Subcommittee of the National Academies Transportation Research Board (TRB)
- ▶ Onsite panel of invited technical experts, in addition to policy makers and EMS leaders:
 - Safety data capture
 - Transport /fleet management, EMS vehicle operations
 - Automotive safety and occupant protection
 - Ergonomics and human factors
 - Standards
- ▶ Will be beamed live via Webinar and recorded electronically and TRB e-circular produced
- ▶ Access to live participation requires pre-registration
- ▶ Pre-registration info disseminated in early October

TRB Jan 2009 EMS Subcommittee Meeting and Seminar

- ▶ The Subcommittee on EMS Transportation Safety of the National Academies Transportation Research Board winter subcommittee meeting and seminar is in DC during the 2009 January TRB symposium
- ▶ Your input and participation (onsite or online) is valued
- ▶ You can submit your suggestions/input for the TRB EMS Subcommittee meeting online -
 - <http://www.emssafetyfoundation.org/TRBpriority.htm>

New NHTSA EMS info link

- ▶ There is a new Federal link to EMS info – a great resource!
- ▶ www.EMS.gov

www.GlobalEMSForum.org "Running Hot or Not", "Being Seen at the Scene" and "Ambulance Standards" Webinars



No need to reinvent the wheel...



March 2007 - FHWA



Tips for Emergency Vehicle Operations

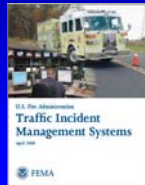


USFA Emergency Vehicle Safety Initiative



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



Risk/Hazards

- ▶ Predictable risks
- ▶ Predictable fatal injuries
- ▶ Serious occupational hazard
- ▶ Public safety hazards

What do we know now??

- ▶ Intersection crashes are the most lethal
- ▶ There are documented hazards, some which can be avoided
- ▶ Occupant and equipment restraint with standard belts is effective. (Over the shoulder harnesses for patients should be used, with the gurney in the upright position where medically feasible)
- ▶ 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??

Safety Management

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

What do we know works...

- ▶ Vehicle Operations Safety Policies
- ▶ Squad bench lap seat belts
- ▶ Patient over the shoulder harnesses
- ▶ Securing equipment
- ▶ Forward and rear facing seating
- ▶ Some electronic technical devices
- ▶ Safety awareness
- ▶ Cultural change

What you can do now

- ▶ Have a written and implemented 'safety program'
- ▶ Secure all equipment
- ▶ Secure occupants with standard belts
- ▶ Don't drive through red lights/stop signs
- ▶ Use properly implemented "Feedback Boxes"
- ▶ Monitor crash events with common denominators (ie. per 100,000 miles and per trip)

Important Principles !

1. A culture of safety
2. Drive cautiously
3. Wear your belts & restrain all occupants
4. Secure all equipment
5. Integrate scientific data into your policies and procedures

- Unrestrained occupants and equipment are a potential injury risk to all occupants

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

small changes can make a BIG DIFFERENCE

- ▶ **PREPARE – TEACH – REACH – RESPOND**
 - ♦ **Look** at your own safety record
 - ♦ **Teach** safety and hazard awareness
 - ♦ **Reach** out with safety information to all your EMS providers
 - ♦ **Respond** with the best safety practices

**PREDICTABLE
PREVENTABLE
and
NO ACCIDENT**

Conclusion

- ▶ EMS transport has serious hazards and safety issues
- ▶ Major advances in EMS safety research, infrastructure and practice over the past 5 years
- ▶ New technologies for vehicle design, occupant PPE and equipment restraint and driver performance are now available
- ▶ Development of substantive EMS safety standards is a necessity and a reality
- ▶ 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 safety and occupant protection

And....

- ▶ It is no longer acceptable for EMS to be functioning outside of automotive safety 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>

