


The Loren Marshall Foundation and the Anchorage Fire Department  
**The Annual Resuscitation Conference**  
 Loren Marshall Foundation and Anchorage Fire Department  
 2nd Annual Anchorage Resuscitation Conference  
 Anchorage, Alaska, June 7-8th, 2008

**Ambulance Transport Safety -  
 The Essentials**



Nadine Levick, MA, MPH  
 Research Director, EMS Safety Foundation  
 CEO, Objective Safety  
 New York, NY

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

*"We want everyone to get home  
 safely each day"*

**A tragic emergency health care intervention  
 outcome**



**Rollover Crash Kills Medical Technician**  
Rescue team of Grand Falls, Oregon, firefighters arrived

**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.....

**... Nov 8th's Fatality**

**Putnam Co. paramedic dies in ambulance  
 crash**  
By The Associated Press

VALHALLA, N.Y. — A Putnam County paramedic returning from an ambulance call has died after the vehicle went off the road and struck a tree.

Authorities say Matthew Lamb of Carmel was riding in an **ambulance** vehicle at 5 a.m. Wednesday when it went off the road and struck a tree in Carmel.

Lamb suffered massive head trauma.

State police vehicle investigator Bruce Cuccinelli told the Journal News it appeared the ambulance was **driving slowly**.

Carmel Fire Chief David Johnson says Lamb was taken off the support vehicle and taken to the hospital Thursday at the Westchester County Medical Center.

The ambulance was driven by **Joseph Romano** of the Carmel Fire Department.

**Transport Science...**

**Science behind Policy**

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

Richard P. Feynman 1988

**EMS Transport Safety**

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

**A BIG Problem**

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

### Safety concepts out there now

- ▶ Fleet Safety Management
  - + Z-15
  - + Driver monitoring and feedback
- ▶ Enhanced ambulance vehicle design
- ▶ Intelligent Transport Technologies - ITS
- ▶ Visibility and Conspicuity
- ▶ New Safety Standards
- ▶ Independent resources and information



### 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?

### 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

### Thursday July 5<sup>th</sup> 2007.....

**NEWS CENTER**

**Paramedic Killed in Turner Ambulance Crash**

Turner, 31, was killed when the ambulance struck a tree while en route to a hospital. The crash occurred on a rural road near the intersection of State Route 126 and County Road 87. The ambulance was traveling southbound on the road at the time of the crash. The driver, who was not injured, was taken to the hospital. The ambulance was destroyed.

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

Posted by **ymad** 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.....

**Posted by concerned** at July 5, 2007 4:49 PM (Suggest Removal)

To mad: It would be too fast if they ran over my family member on their way to another's family member...

**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 sort loss. And I'd like to know what can be done so that this never happens again.

### Friday July 20<sup>th</sup> 2007... The worst ambulance crash in USA history

**Five Killed in Crash of Ambulance and Semi**

July 21, 2007 08:20 AM EDT

The Highway Patrol says three EMS workers were killed. They were identified as 44-year-old Robert Smith, 33-year-old Mark Hildreth and 23-year-old Kelly Rager. The two patients were also killed. They were identified as 46-year-old Robert Smith and 50-year-old Arnette Smith of Middletown.

Another emergency medical technician, Matt Hildreth, and the truck driver, Gerald Chalmers, 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 lights and siren were turned on.

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

Lisa Hixley  
July 23, 2007

By LISA HIXLEY  
l.hixley@timesherald.com

ANTWERP — They were heroes and the area's finest.

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 Shubert 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."

### April 20, 2008...??

**Child injured after being struck by ambulance**

By Lisa Hixley  
April 20, 2008 11:48 AM EDT

ANTWERP, Ga. (AP) — A 7-year-old boy was hurt after being struck by an ambulance while riding his bike near the ambulance.

Paulding County Emergency Management Agency said the ambulance was traveling about 40 to 45 mph when it struck the child. The child was taken to the hospital.

The ambulance driver, who was not injured, was taken to the hospital. The ambulance was destroyed.

**Springfield boy hit by ambulance dies**

By Lisa Hixley  
April 20, 2008 11:48 AM EDT

SPRINGFIELD, Mo. (AP) — A 7-year-old boy has died after being struck by an ambulance while riding his bike near the ambulance.

Springfield Police Department said the ambulance was traveling about 40 to 45 mph when it struck the child. The child was taken to the hospital.

The ambulance driver, who was not injured, was taken to the hospital. The ambulance was destroyed.



Can no longer say –  
“I didn’t know....”

### 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

### New paradigm - Integration of EMS

- ▶ Public health departments
- ▶ Social service agencies
- ▶ Community outreach
- ▶ Hospitals
- ▶ Health care networks / Insurers
- ▶ Industry

### 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 hybrid 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

### 1960 to 2007



A passenger vehicle - yes



### Some recent adverse outcomes



### 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

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

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

### 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



### The Emergency Department (ED)



### An ambulance is not an ED /ICU on wheels



### National 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

\*FARS873 2008-8

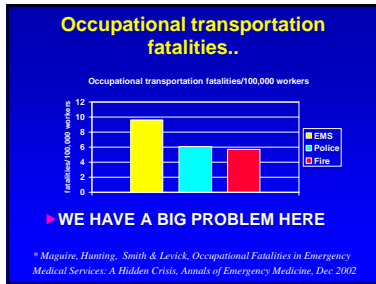
### Is it your service's tragic year?

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

### 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##

\*Niles CA, Pivetti RD, Kishi DS. Prehosp Emerg Care 2007 Jun-Sep;15(3):261-9  
\*\*Mileski Z, Zolotorova L, Linnik JJ, Miller AT. Acc Anal Prev 2003  
\*\*\*Bosque, Manning, Smith, Levick. Annals Emerg Med Dec 2002  
##OSHA 2003  
##Roy AM, Kupiec DT. Prehosp Emerg Care 2005 Dec; 9:412-415



- ### 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

- ### What do ambulance crashes really cost ?
- ▶ Loss of life and injury
  - ▶ Negative impact on EMS system
  - ▶ Collisions are the largest liability cost and exceeds malpractice or negligence
  - ▶ Besides the direct financial costs of replacing a damaged ambulance and equipment, there are additional hidden costs incurred:
    - investigating the ambulance collision
    - litigation/settlement/lawsuit
    - medical/disability costs of injured EMTs
    - hiring of new employees to replace injured personnel
    - retraining and psychological counseling of personnel involved and others
    - increased insurance rates



### A problem

2007 Insurance data –

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

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

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

### Nascar Safety Expert

- ▶ On ambulance patient compartment  
"It is a death vault"

Tom Gideon,  
Head of Safety, GM Nascar

### Policy makes a difference...

**Organizational policy and other factors associated with emergency medical technician seat belt use**  
Jonathan R. Stueck<sup>1,2\*</sup>, Amy Felwick<sup>3</sup>  
<sup>1</sup> School of Public Health, University of Pennsylvania, Philadelphia, PA, USA; <sup>2</sup> Center for Transportation Research, University of Pennsylvania, Philadelphia, PA, USA; <sup>3</sup> School of Nursing, University of Pennsylvania, Philadelphia, PA, USA

### "Are our policies killing people?"

- ▶ 1991-2000, 302,969 Emergency vehicles were involved in MVCs - 1,565 involving fatalities\*
- ▶ In PA 1997-2001, ambulances were more likely than similar sized vehicles to be involved in\*:
  - 4 way intersection crashes (43% vs 23%, p=0.001)
  - Collisions at traffic signals (37% vs 18%, p=0.001)
  - MVCs with more people injured (76% vs 61%, p=0.001)

*\*Comparison of Crashes Involving Ambulances with those of similar sized vehicles - Adam Ray, Douglas Kupas, PEC Dec 2005; 9-412-415*

### Vehicle Operations Position Statement

**Emergency Vehicle Operation**  
Position Statement

### WEMSA – October 2007

1. Emergency Vehicle Operations Policy
2. Vehicle operations training and evaluation
3. A program of graduated driver responsibility
4. 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?

### 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 1<sup>st</sup> 2007
- ▶ Focus is the 4 'E's'
  - Engineering
  - Education
  - Enforcement
  - Emergency Medical Services
- ▶ EMS is a core theme

### State SHSP EMS Focus\*

STATE SHSP	AREA of EMS FOCUS
<b>New York</b> EMS Section 6 of 43 pages	<ol style="list-style-type: none"> <li>1. Emergency Medical Services Dispatch Services</li> <li>2. Emergency Medical Services Partnerships</li> <li>3. Pre-hospital Training Programs</li> <li>4. Road Condition and Incident Response</li> <li>5. EMS Responder Crash Prevention</li> </ol>
<b>Massachusetts</b> EMS Section 4 of 36 pages	<ol style="list-style-type: none"> <li>1. Establish EMS Legislation and Regulation</li> <li>2. Provide EMS Funding</li> <li>3. Enhance Capabilities for Medical Response to Disaster</li> <li>4. Expand EMS Human Resources</li> <li>5. Enhance EMS Education System</li> <li>6. Expand EMS Services</li> <li>7. Facilitate EMS Communications</li> <li>8. Conduct EMS Public Education and Information Programs</li> <li>9. Conduct Injury Prevention Public Awareness Efforts</li> <li>10. Enhance Medical Direction</li> <li>11. Provide Enhanced Trauma System and Facilities</li> <li>12. Establish an EMS Information System</li> <li>13. Evaluate and Monitor EMS Programs</li> </ol>
<b>Arizona</b> EMS Section 8 of 47 pages	<ol style="list-style-type: none"> <li>1. Identify and Analyze Performance Data</li> <li>2. First Responders</li> <li>3. Identify Crash Location</li> <li>4. Statewide Assessment and Plan</li> <li>5. Improve EMS Rural Access</li> </ol>

\*Craig H. Lovick, N. Strategic Highway Safety Plan - "What is EMS?", Jun 2008

### Pennsylvania Code

Department of Transportation  
**Pennsylvania Code**  
Title 22, Subchapter B, Chapter 100

**PART VII. EMERGENCY MEDICAL SERVICES**

Chapter 100

100.01. [Emergency Medical Services - General Provisions](#)

100.02. [Emergency Medical Services - Dispatch Services](#)

100.03. [Emergency Medical Services - Partnerships](#)

100.04. [Emergency Medical Services - Prehospital Training Programs](#)

100.05. [Emergency Medical Services - Road Condition and Incident Response](#)

100.06. [Emergency Medical Services - Responder Crash Prevention](#)

100.07. [Emergency Medical Services - Trauma System and Facilities](#)

100.08. [Emergency Medical Services - Information System](#)

100.09. [Emergency Medical Services - Evaluation and Monitoring](#)

100.10. [Emergency Medical Services - Public Education and Information Programs](#)

100.11. [Emergency Medical Services - Injury Prevention Public Awareness Efforts](#)

100.12. [Emergency Medical Services - Enhanced Trauma System and Facilities](#)

100.13. [Emergency Medical Services - Statewide Assessment and Plan](#)

100.14. [Emergency Medical Services - Rural Access](#)

100.15. [Emergency Medical Services - Other](#)

## NAEMT July 2006 Position statement



**National Association of Emergency Medical Technicians**  
**Statement on Safety Restraint Use in Emergency Medical Services**

**Statement**

The National Association of Emergency Medical Technicians (NAEMT) strongly advocates the use of available safety restraint systems for patient care in EMS, for patients, publicly, and all on-point at an emergency response vehicle.

**Background**

Emergency Medical Services (EMS) throughout the United States have been advised to be a dangerous profession. Although there is no single factor solely cited for the increase in occupational fatalities, EMS is consistently ranked as one of the most dangerous professions in the United States. Each year there are an average of 4000 fatalities and an average number of 100,000 injuries in EMS.

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



**Be Secure**  
**EVERYBODY BUCKLES UP**

## Use proven safety tools



**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.

REVENUE 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

## 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

## Very Scary insurance data

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

## Benefit of Safety

- ▶ Safe practices save lives, time and money

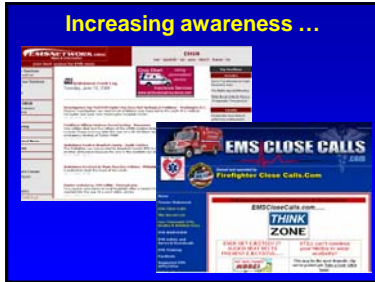
- ## This is about you and your safety
- ▶ What safety practices do you use??
    - Seat belts ?
    - EVOC training ?
    - Equipment lock down ?
    - Helmets ?
    - Driver Feedback technology ?
    - Tiered dispatch ?

## Balance of concerns and risk during transport

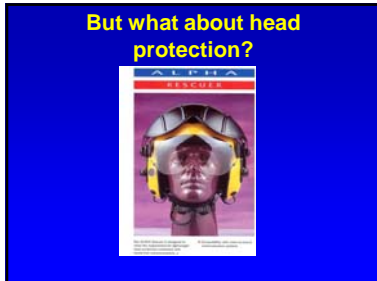


- ▶ Response and transport time
- ▶ Clinical care provision
- ▶ Occupant safety/protection
- ▶ Public Safety





- ### Risk/Hazards
- ▶ Predictable risks
  - ▶ Predictable fatal injuries
  - ▶ Serious occupational hazard
  - ▶ Public safety hazards



## What are the solutions?

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

## The Driver

- ▶ Driver selection
- ▶ Driver monitoring and feedback
- ▶ Driver Impairment
- ▶ Driver training

## Driver issues

**The Relationship Between Ambulance Crashes and Emergency Medical Technician Age**  
 Authors: R. Lovick, M.D., MPH  
 Department of Emergency Medicine, University of Michigan Medical Center, 300 Zeeb Road, Ann Arbor, Michigan 48106-0616  
 © 2008, JGIM

**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.

## Which is best, how many hours...??



## 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. Lovick, MD, MPH  
 Munroton Medical Center

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

Nadine Lovick  
 Executive Safety LLC  
 United States of America  
 Larry Wierock  
 Michael E. Nagel  
 Caltrans Institute  
 United States of America  
 Paper Number 07-0224

## Purpose of 'Feedback box' Program

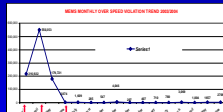
- ▶ Enhance Safety
- ▶ Improve Driver Performance
- ▶ Save Maintenance Dollars
- ▶ Aid Accident / Incident Investigation

## How the Device Works

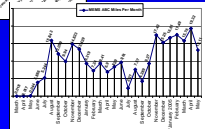
- ▶ Computerized monitoring device installed on each vehicle to measure parameters
- ▶ Each driver has individual key "fob"
- ▶ Data collected every second
  - including: vehicle speed and performance, driver behaviors and emergency mode
- ▶ Auditory feedback of warning 'growls', and penalty tones
-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



## Demonstrated Effectiveness



I – blind data, no growls  
 II – growls & tones ON  
 unidentified data capture  
 III – identified data



## 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.

### 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

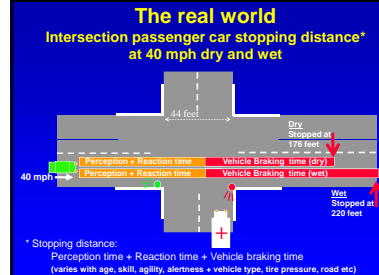
- ▶ Opticon
- ▶ Simulators

### 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.....



### Dynamic vs. Static

### Safety Testing

### Dynamic Safety Testing

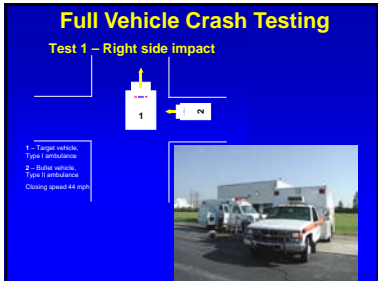
- ▶ requires sophisticated, expensive equipment
- ▶ measurably demonstrates forces generated during collision
- ▶ accepted international standard for vehicle restraint systems

### 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







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



**NO automotive safety engineer**  
**NO crashworthiness engineer**  
**NO ergonomist**  
**NO reference to ANY existing or relevant automotive safety or crashworthiness technical publications....**  
**yet multiple occupant fatalities and injuries annually....**

**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

## Innovation

## Safety concepts out there now

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

## The EMS Safety Foundation

Intro and Logistics Webinars from December 11th 2007 & Jan 8th 2008

EMS Safety Foundation tab at [www.objectivesafety.net](http://www.objectivesafety.net)



## National Academies Transportation Research Board's (TRB) And Your New EMS Transport Safety Subcommittee



## TRB EMS Safety Update

- ▶ Brought together NHTSA, FHWA, TRB, National Academies, DOT, CAMTS & EMS
- ▶ 3 presentations
  - TRB and EMS
  - Safety air/ground
  - Ground Ambulance Safety Issues and Directions
- ▶ Recorded presentations and handouts available at [www.objectivesafety.net](http://www.objectivesafety.net)
- ▶ Potential for EMS safety research funding
- ▶ Next TRB meeting January 11-15, 2009 – all are welcome

## Ambulance Transportation Safety Task Force January 25th 2008



## 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 event for EMS innovation Fulda, Germany <http://www.rettmobil.com/>







### Science not, next best guess

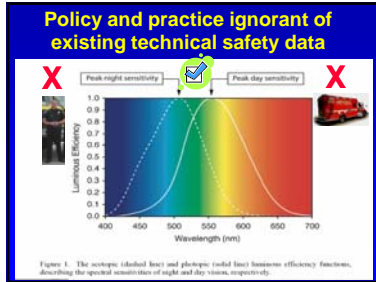
UMTRI Transportation Research Institute  
 Research on Modulating Emergency Vehicle Warning Lighting Systems

### Recent Visibility Webinar

[www.GlobalEMSForum.org](http://www.GlobalEMSForum.org)

Study of Emergency Vehicle Visibility and Conspicuity - Partnering with the International Fire Service Training Association (IFSTA)

Daylight color sensitivity is very different, especially for blues and reds, at the ends of the spectrum



### 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



**R & D  
“Ripoff and Duplicate”**

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



### Tips for Emergency Vehicle Operations

Alive on Arrival  
Tips for Safe Emergency Vehicle Operations

Emergency Vehicle Operations

FEMA

### USFA Emergency Vehicle Safety Initiative

Emergency Vehicle Safety Initiative  
10-11-12-13-14-15

FEMA

### UPS: The 'Big Brown'

- ▶ No left turns – instead make three rights
- ▶ Don't back up
- ▶ Don't employ any drivers under 25 years of age
- ▶ Don't employ anyone with a history of driving convictions

### Coming Soon! Traffic Incident Management Systems (TIMS)

- ▶ USFA report to be released any day
- ▶ Research and writing by IFSTA
- ▶ Covers setting up safe roadway incident work areas and using unified command at these incidents
- ▶ Will be available in a downloadable format

TRAFFIC INCIDENT MANAGEMENT SYSTEMS  
10-11-12-13-14-15

FEMA

### 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

### 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?

### Risk/Hazards

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

### Creating a Safety Culture

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

- ▶ Awareness
- ▶ Training
- ▶ Incentive

### Some simple and available solutions out there now

- ▶ Intersection Policy
- ▶ PPE
- ▶ 'Feedback' boxes

### 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

### Be ready for..

- ▶ New Infrastructure
- ▶ New information
- ▶ New collaborations
- ▶ New events
- ▶ Innovation in safety technologies, strategies and policy
- ▶ Knowledge transfer
- ▶ Unacceptable mythology
- ▶ Challenges to advancing EMS transport safety

### 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>

