




S.P.E.A.R. –
Seminars for Professional Emergency Area Responders
Cleveland Clinic Regional Hospitals,
Ohio, May 21st, 2008

**EMS Safety and Wellness
Ambulance Transport Safety -
The Essentials**



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

**35th Annual EMS Week
May 18-24, 2008 –
EMS: Your Life is Our Mission**

► 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
Ambulance driver 57 and 58th Ave. Spring Hill, Tennessee, 47301

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**
November 8, 2007

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 crash 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 Clucas told the Journal News it appeared the ambulance was traveling in the wrong direction.

Carmel Fire Chief David Johnson says Lamb was taken off life support and pronounced dead on Thursday at the Westchester County Medical Center.

The ambulance crash fatality report was published in the Journal News on Thursday at the link below.

And Nov 10th's 2007 obituary....

N.Y. EMT killed in ambulance crash led to rest

By Michael Reppert
Special News
November 10, 2007
VALHALLA, N.Y. — "Remaining silent" was the final word placed on the Nov. 8, 2007, fatal crash of a 27-year-old paramedic (Matt Lamb) on a Putnam County ambulance. The ambulance was returning from an ambulance call when it went off the road and struck a tree, killing the paramedic.

The news reported that paramedics on scene and nearby ambulances were called to the scene at the 58th Ave. Spring Hill, Tennessee, 47301.

For a complete list of the names of the victims of the fatal crash, visit the website www.ambulancecrash.com.

It was there that paramedics and other EMS professionals gathered to pay tribute to Lamb and to share their thoughts and memories about Lamb, talking with him before the crash and the ambulance crash.

Johnson recalled Lamb's eagerness to serve, as a paramedic joining the EMTs in the ambulance, and his dedication to the job. Lamb was a member of the Putnam County Fire Department and the Putnam County Sheriff's Office. After coming on board at the Carmel Fire Department, Lamb joined the Carmel Ambulance Unit, the first ambulance unit in Putnam County.

"Matt's head and was distributed to every aspect of the emergency services, so it is no wonder he was so well respected and loved," said Johnson, who was on scene with the ambulance crash.

Lamb died Thursday, about a day after the fatal ambulance crash. Lamb was 27 years old and had been a paramedic for about a year. He was also a member of the Putnam County Fire Department and the Putnam County Sheriff's Office. The ambulance crash was the first fatal crash involving a paramedic in Putnam County.

<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?

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 Cimio, 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 Cimio.

Zappala said Cimio was traveling south on Route 19, transporting a patient with a do-not-resuscitate order to UPMC Pottsville, 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.

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

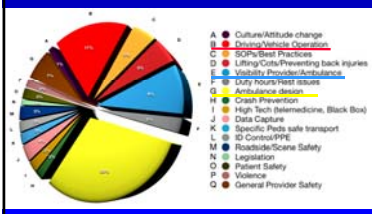
- ▶ Challenges in identifying best practice
- ▶ Myriad of unregulated commercial products
- ▶ No safety performance standards
- ▶ Absent national safety oversight

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

New paradigm - Integration of EMS

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

Key 5 Safety Priority areas of focus Here is what you sent in: n = 155



Relative Priority Issues

- ▶ Priority Number one
 - Vehicle ops - 29%
 - Ambulance design - 27%
- ▶ Priority Number two
 - Ambulance design - 35%
 - Vehicle ops - 29%

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



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

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

TIME
↓
&
PLACE





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

*NARS/ITS 2006-8

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##

*Watts CA, Pinsky RG, Kuhn EM. *Prehospital Emergency Care* 2007; Jul-Sep;5(3):281-4
 **Baker, Zelenko, Levin, Li. *Motor Acc. Anal Prev* 2002
 ***Maguire, Hunting, Smith, Levick. *Annals of Emergency Medicine* 2002
 ##Gordon 2003
 ##Maguire, Hunting, Smith, Levick. *Prehospital Emergency Care* 2005; Dec; 9:472-475

Occupational transportation fatalities..

Occupation	Fatalities/100,000 workers
EMS	~10.5
Police	~7.5
Fire	~5.5

▶ 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*

So for EMS personnel...

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

'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

* 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

Safety is Good Business

The screenshot shows a webpage from the Federal Motor Vehicle Safety Administration. The main heading is "Safety is Good Business - Crashes Hurt Your Bottom Line". Below the heading, there is a sub-heading "Crashes Hurt Your Bottom Line" and a paragraph explaining that while many people think of safety as just a cost, it is actually a business opportunity. The page lists several reasons why safety is good business, including:

- Lower Insurance Rates
- Lower Litigation Costs
- Lower Regulatory Costs
- Lower Maintenance Costs
- Lower Fuel Costs
- Lower Downtime Costs
- Lower Replacement Costs
- Lower Training Costs
- Lower Recruitment Costs
- Lower Publicity Costs
- Lower Reputation Costs
- Lower Customer Retention Costs
- Lower Employee Turnover Costs
- Lower Employee Absenteeism Costs
- Lower Employee Injury Costs
- Lower Employee Death Costs
- Lower Employee Disability Costs
- Lower Employee Litigation Costs
- Lower Employee Settlement Costs
- Lower Employee Lawsuit Costs
- Lower Employee Malpractice Costs
- Lower Employee Negligence Costs
- Lower Employee Liability Costs
- Lower Employee Insurance Costs
- Lower Employee Health Care Costs
- Lower Employee Disability Insurance Costs
- Lower Employee Life Insurance Costs
- Lower Employee Pension Costs
- Lower Employee 401(k) Costs
- Lower Employee 403(b) Costs
- Lower Employee 529 Plan Costs
- Lower Employee 528 Plan Costs
- Lower Employee 529a Plan Costs
- Lower Employee 529b Plan Costs
- Lower Employee 529c Plan Costs
- Lower Employee 529d Plan Costs
- Lower Employee 529e Plan Costs
- Lower Employee 529f Plan Costs
- Lower Employee 529g Plan Costs
- Lower Employee 529h Plan Costs
- Lower Employee 529i Plan Costs
- Lower Employee 529j Plan Costs
- Lower Employee 529k Plan Costs
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- Lower Employee 529u Plan Costs
- Lower Employee 529v Plan Costs
- Lower Employee 529w Plan Costs
- Lower Employee 529x Plan Costs
- Lower Employee 529y Plan Costs
- Lower Employee 529z Plan Costs

The image shows the cover of the June 2007 issue of EMS magazine. The main headline is "Crash Costs: Assessing the Hidden Damages of an Ambulance Accident". Other headlines include "An Ounce of Prevention" and "EMS Responders' Safety". The cover features a photograph of an ambulance involved in a crash.

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

'Real world' head-on post crash



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

State SHSP EMS Focus*

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

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

Integration and Collaboration

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



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

- EMERGENCY MEDICAL SERVICES DISPATCH SERVICES
- EMERGENCY MEDICAL SERVICES PARTNERSHIPS
 - Increase the participation and role of Regional EMS Councils in local and regional highway traffic safety boards and/or organizations
- PRE-HOSPITAL TRAINING PROGRAMS
 - Train EMS providers in the use of the new medical protocols; provide funds and/or other support to certified EMS Course Sponsors to train EMS providers in the use of these protocols; and collaborate with Regional EMS Councils and/or Regional Emergency Medical Advisory Committees (REMCO) on the development and implementation of training programs
- ROAD CONDITION AND INCIDENT RESPONSE
 - Provide a placeholder for regional and/or county EMS representatives in municipal DOT emergency management plan development and implementation

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

- EMS RESPONDER CRASH PREVENTION
 - Undertake a systematic review of other state actions and protocols on ambulance traffic safety measures to identify and prioritize those appropriate for the New York State pre-hospital system
 - Increase education and involvement of EMS providers in principles of appropriate traffic safety techniques
 - Develop and implement ambulance traffic safety protocols at state, regional and service level
 - Review treatment modalities and protocols to identify those that may contribute to injuries resulting from the impact of ambulance crashes
 - Identify methods to provide incentives for adoption by EMS services of protocols that enhance traffic safety
 - Partner with organizations that provide public driver awareness and education campaigns to improve driver awareness of driver responsibility and appropriate response to approaching emergency vehicles

Pennsylvania Code

Part VII Emergency Medical Services

§ 101.1. Decision report and quality reporting. The ambulance service shall report to the appropriate regional EMS council, or a state or regional council, if applicable, by the Department, an ambulance vehicle accident that is reportable under 75 Pa.C.S. and an accident or injury to an individual that results in the loss of life of the ambulance service from results in a fatality, or medical treatment at a facility. The report shall be made within 72 hours after the accident or injury. The report or notice shall be made within 30 days after the fatality.

Policy makes a difference...

Organizational policy and other factors associated with emergency medical technicians' case study

Jonathan R. Nussack, Amy Forlanski

Abstract: The purpose of this study was to determine how organizational policy and other factors associated with emergency medical technicians' case study...

"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 Operations

EMS

WEMSA - October 2007

- Emergency Vehicle Operations Policy
- Vehicle operations training and evaluation
- A program of graduated driver responsibility
- Drivers only age 25 and over
- Complete stop at an intersection
- Restricted use of Red Lights and Sirens
- 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?

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	150,000	200,000	250,000	300,000
5,000	500,000	750,000	1,000,000	1,250,000	1,500,000
10,000	1,000,000	1,500,000	2,000,000	2,500,000	3,000,000
20,000	2,000,000	3,000,000	4,000,000	5,000,000	6,000,000
50,000	5,000,000	7,500,000	10,000,000	12,500,000	15,000,000
100,000	10,000,000	15,000,000	20,000,000	25,000,000	30,000,000
200,000	20,000,000	30,000,000	40,000,000	50,000,000	60,000,000

REVENUE REQUIRED TO COVER LOSSES

Rollover Crash Kills Medical Technician
 Ambulance driver killed and both crew injured after rollover on I-95

It does happen....

New EMS helmet prototypes for 2008

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's Operator's Gender and Performance: Medical Technician Age

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 experience 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. Levick, MD, MPH
 Maimonides Medical Center

REAL WORLD APPLICATIONS OF AN AFTERMARKET DRIVER HUMAN FACTORS REAL-TIME ALIBI MONITORING AND FEEDBACK DEVICE: AN EMERGENCY SERVICE PERSPECTIVE

Nadine Levick
 Objective Safety LLC
 United States of America
 Larry Wieruck
 Michael C. Nagel
 Citrusville Ambulance
 United States of America
 Paper Number 07-0229

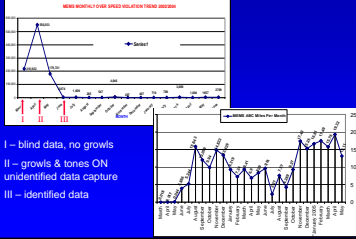
Purpose of 'Feedback box' Program

- ▶ 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

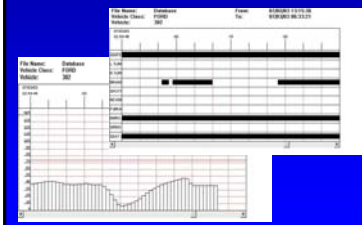
Demonstrated Effectiveness



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.

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

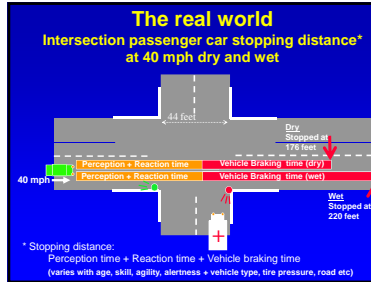
- ▶ Opticon
- ▶ Simulators

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

If we know this – and its published....

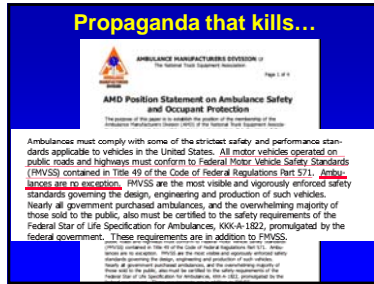
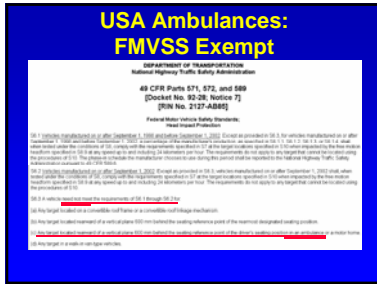
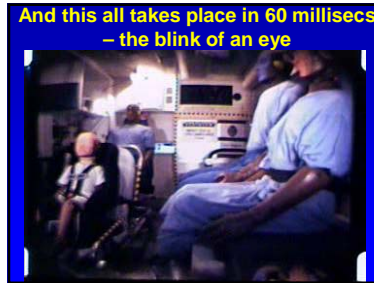
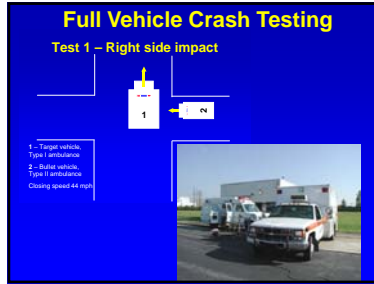


Leviak NR, et al. Development and Application of a Dynamic Testing Procedure for Ambulance Pediatric Restraint Systems, SAE Australasia 1998;58:2-45-51

Why do we do this?




Choose the Best Option



USA ambulance purchase specifications

GSA:KKK-A-1822F, Aug 2007

- ▶ Static Pull test
- ▶ 2200 Lbs. (8G's) in Longitudinal and Lateral
- ▶ No dynamic test
- ▶ No definition to manikin mass
- ▶ No restraint for equipment
- ▶ Voluntary



KKK/AMD – 'safety testing'

- ▶ Ignorant of 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.

Unacceptable, and ridiculous current 2007 USA ambulance 'safety testing' practices !!??

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 150% curb weight 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

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://www.kipedia.org/wiki/Newton's_laws_of_motion

KKK certified and FMVSS exempt..?

2 dead in Michigan ambulance crash

The Associated Press
SKANDIA Township, Mich along an Upper Peninsula member, state police said.

The truck was stopped in Township waiting for traffic General Hospital near road.

Investigators found no evidence.

Amulance patient Carrie Cornell, died at the scene member, Ryan Peterson, 2



FMVSS exempt.....



Its not magic... what is safe is known and understood



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

The Ride of Your Life....

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

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

Ambulance Transport Safety Task Force (ATS) and the National Transportation safety Board (NTSB)

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 alignment
 - Ground Ambulance Safety Issues and Directions
- ▶ Recorded presentations and handouts available at 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

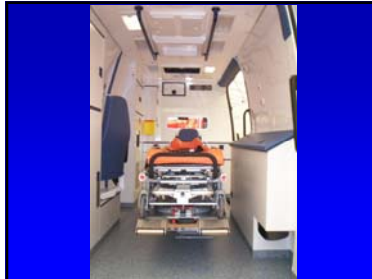
TRB
Jan.
16th
2008



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/>



Australia, Melbourne



NSW Australian vehicles



Flexibility to manage two patients



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



Norway initiatives



Sweden initiatives



Other successful models



Ergonomic layout and equipment



Securing equipment



Safety concepts out there now

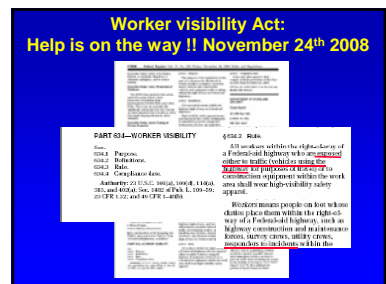
- ▶ Fleet Safety Management
 - Z-15
 - Driver monitoring and feedback
- ▶ Enhanced ambulance vehicle design
- ▶ Intelligent Transport Technologies - ITS
- ▶ Visibility and Conspicuity
- ▶ New Safety Standards
- ▶ Life Safety Initiatives
- ▶ Resources and information



- ### 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



- ### 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???



There are grants to assist you..

Federally-Mandated Worker Visibility Regulation Summary

The Department of Transportation (DOT) has issued a final rule that requires all new commercial motor vehicles (CMVs) to be equipped with reflective safety markings. This rule is part of a broader effort to improve the visibility of CMVs, particularly at night and in low-visibility conditions. The rule applies to all new CMVs manufactured after September 8, 2006, and to all CMVs that are replaced or modified after that date. The rule requires that CMVs be equipped with reflective safety markings that meet the requirements of Federal Motor Vehicle Safety Standard (FMVSS) 103. The rule also requires that CMVs be equipped with reflective safety markings that are visible from all angles. The rule is intended to reduce the number of CMV-related fatalities and injuries. The rule is effective as of September 8, 2006.

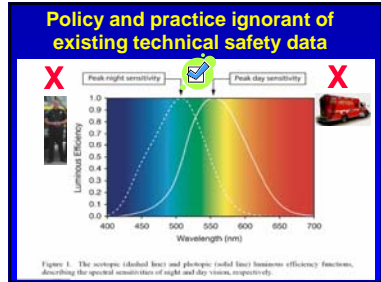



Science not, next best guess

UMTRI TRANSPORTATION RESEARCH INSTITUTE


Research on Modelling Emergency Vehicle Warning Lighting Systems

The University of Michigan Transportation Research Institute (UMTRI) is conducting research on modeling emergency vehicle warning lighting systems. The research is part of the Human Factors - Industry Affiliation Program (HFIAP). The research is intended to improve the design of emergency vehicle warning lighting systems. The research is being conducted by a team of researchers at UMTRI. The research is being funded by the National Highway Traffic Safety Administration (NHTSA). The research is being conducted in the field and in the laboratory. The research is being conducted in the area of emergency vehicle warning lighting systems. The research is being conducted in the area of human factors and ergonomics. The research is being conducted in the area of transportation safety. The research is being conducted in the area of emergency vehicle warning lighting systems. The research is being conducted in the area of human factors and ergonomics. The research is being conducted in the area of transportation safety. The research is being conducted in the area of emergency vehicle warning lighting systems. The research is being conducted in the area of human factors and ergonomics. The research is being conducted in the area of transportation safety.



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

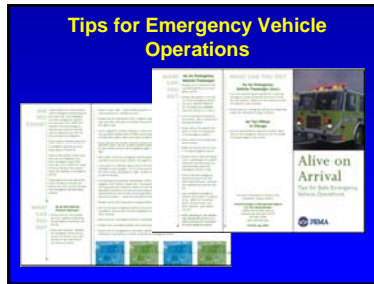
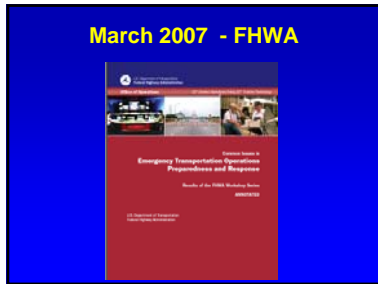


**R & D
“Ripoff and Duplicate”**

▶ Avoid reinventing the wheel at all costs

▶ Where are the best practices that we need to transfer knowledge from





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

The image shows the cover of a report titled "TRAFFIC INCIDENT MANAGEMENT SYSTEMS" published by FEMA in 2007. The cover features a photograph of a white emergency vehicle on a road.

- 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