


September 11, 2013

How to Design Your Next Ambulance

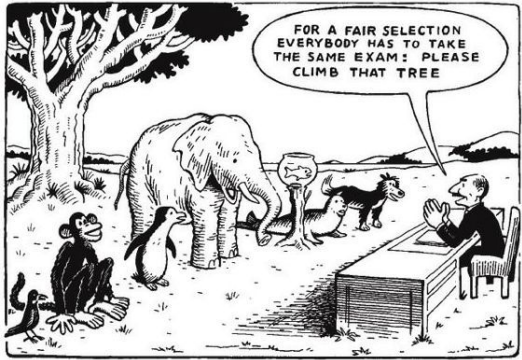
Nadine Levick, MD MPH
 Research Director, EMS Safety Foundation
 CEO, Objective Safety, New York, USA
 Chair, TRB, EMS Subcommittee, National Academies





What are we going to cover today?

- Design Approach
- Key principles of ambulance design
- Special Resources
- How to make your ambulance design safer right now
- Pitfalls and Opportunities



Your electronic Handout awaits you online at...

- www.objectivesafety.net

This WILL be FAST!!
No need to take any notes – all text slides will be awaiting you in your online Handout




Your electronic handout/resource link



Or if you are < 30 years




How do you use a QR code for the first time?

Get any Tag reader App on your smartphone (free from your App store)

- 1 open Tag App and scan the QR code
- 2
- 3






<http://www.objectivesafety.net>
Your Handout and Additional Resources



12 years ago today



Who am I?

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



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Expo 2012 – a booth



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Expo 2013 – INDEMO 1.0



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Ambulance Safety Innovation Design Module 1.0

See us @booth 567
or online
www.INDEMO.info

INDEMO 1.0
POWERED BY EMS SAFETY FOUNDATION



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Sept 9, 2013

September 10, 2013 Email Print Comment RSS

Texas EMS patient killed in collision with truck
 The force of the impact caused the patient and medics to be tossed around inside the ambulance.

The Houston Chronicle

HOUSTON, Texas — A man died after a pickup struck the ambulance taking him to the hospital, authorities said.

A Ford F-150 truck collided with a Houston Fire Department ambulance about 9:20 a.m. Monday along the 9800 block of Bissonnet, Houston police said.

The ambulance was flashing its lights and using the siren, police said.

A 45-year-old heart attack victim was being taken to an area hospital. The force of the impact caused the patient and attending HFD paramedics to be tossed around inside the ambulance, HFD officials said.

The patient stopped breathing after the collision and was pronounced dead at the scene. No other injuries were reported, police said.

The driver of the pickup truck was questioned at the scene. HPD later cited him for failing to yield the right of way to the ambulance.

Release of the man's identity was pending verification by Harris County medical examiners.

The investigation into the fatal crash is continuing, police said.

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September 7, 2013

Two injured in Wayne County ambulance crash

Monday, September 9, 2013
 Southeast Missourian

Two men suffered moderate injuries Saturday when an ambulance in which they were riding ran off the road and hit an embankment, the Missouri State Highway Patrol reported.

Michael D. Irions, 34, and Harry Shearrer, 73, both of Patterson, Mo., were passengers in a 2009 Ford E430 ambulance driven by David Ross, 27, of Piedmont, Mo., according to a crash report from the patrol.

The ambulance was traveling south about 6:05 p.m. Saturday on U.S. 67 two-tenths of a mile south of County Road 544 in Wayne County when it ran off the left side of the road, hit an embankment and came to rest in the median, the report stated.

Irions and Shearrer both suffered minor injuries in the crash, according to the report.

Irions was taken by air evac to Saint Francis Medical Center in Cape Girardeau, and Shearrer was taken by ambulance to Poplar Bluff Regional Medical Center in Poplar Bluff, Mo., the report said.

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Neonatal transport crash July 10, 2013

- Single vehicle collision, ran off the road
- Clear weather daytime
- No patient on board
- Non emergency
- All occupants wearing seat belts
- No intrusion
- Most other injuries minor
- Doctor killed with closed head injury

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Doctor Killed in Ambulance Crash Being Remembered

Updated: Jul 12, 2013 6:59 PM EDT

By Emily Matesic - email



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July 21, 2013

http://host.madison.com/ws/news/local/health_med_fit/meriter-ambulance-design-might-not-be-safest-some-ems-experts/article_3c50d6fc-ee1f-51af-be3a-78caa1c4ee81.html



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Other EMS officials say vans aren't big enough to carry specialized equipment and personnel, a key reason the box-style ambulances are much more widely used.

But a Pittsburgh hospital and a Dallas-area ambulance service are among those that use a van to transport newborn patients, as Meriter's box-style vehicle did. Meriter will consider switching to a van, an administrator said.



Van ambulances are safer for patients, medical workers and other passengers because they're designed to absorb energy, equipped with stability controls and undergo extensive safety testing, Dr. Nadine Levick said.

Levick, of New York, is founder of the EMS Safety Foundation and chairwoman of the Transportation Research Board's EMS safety subcommittee, part of the National Academies that advise Congress.

Box models like the Meriter ambulance don't have such safety features, Levick said.

"You have a physician dying in a vehicle that was largely designed by health care providers, not automotive safety engineers," Levick said. "It's a big box stacked on a truck chassis."

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Allen Anderson/The Reporter Media
An ambulance overturns on Hwy 26 near Willow Road, in the Town of Waupun on Wednesday, July 10, 2013.

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Allen Anderson/The Reporter Media
An ambulance overturns on Hwy 26 near Willow Road, in the Town of Waupun on Wednesday, July 10, 2013.

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Ambulance flips over on Hwy 26, Town of Waupun
July 16, 2013

Photo Courtesy: The Reporter News
An ambulance overturns on Hwy 26 near White Road, in the Town of Waupun on Wednesday, July 10, 2013.

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April 2, 2013

April 02, 2013 Email Print Comment RSS

Patient ejected in Ga. ambulance crash
The patient in the back of the ambulance was thrown from the vehicle by the impact

By EMS1 Staff

CANTON, Ga. -- A patient and two medics were injured in an ambulance crash in Canton Sunday morning.

The Canton [Palm](#) reported the Jennifer Emergency Medical Services ambulance was traveling on the northbound side of the interstate when it left the roadway and crashed into trees.

The patient in the back of the ambulance was thrown from the vehicle by the impact; initial reports said the patient died 911, but a Cherokee County Fire and Emergency Services said one of the medics called for assistance.

Cherokee County Fire and Emergency Services transported the three to the hospital and their injuries were said not to be life-threatening.

An investigation is now under way into the cause. All photos Cherokee County Fire/EMS of the crash.

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Your work environment!!

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And yes, this meets KKK or NFPA

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August 27, 2012 - NYC

2 dead when ambulance and SUV collide on Staten Island's Hylan Boulevard

Published: Monday, August 27, 2012, 9:08 PM Updated: Tuesday, August 28, 2012, 6:22 AM

By John M. Annesse/Staten Island Advance

STATEN ISLAND, N.Y. -- A wild collision between an ambulance and an SUV has left two people dead, one of them a retired FDNY EMS lieutenant working as a paramedic for Staten Island University Hospital.

The crash happened on Hylan Boulevard shortly after 7 p.m. Monday, near the intersection of Seacrest Avenue in

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Paramedic David Restuccio killed



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Sept 16, 2010

SUV Rips Side Off Ambulance in Deadly Maryland Crash

EMS Crew Escapes Serious Injury, Three Civilians Killed

article comments photos videos

Recommended 275 people recommend this.

Twitter 7

SUSAN PHILLIPS, WUSA9 | Thursday, September 16, 2010

DISTRICT HEIGHTS, Md. (WUSA9) - A violent collision between an SUV and an ambulance has killed three people and sent two paramedics to the hospital.

Mark Brady, spokesperson for Prince George's County Fire and Rescue, says the crash happened shortly after midnight in the 6000 block of Marlboro Pike in District Heights. According to Brady, investigators believe ambulance 856 was traveling west on Marlboro Pike on its way to an overdose call on Tanov Place when it came upon a GMC Suburban traveling eastbound in the westbound lane at a high rate of speed.



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June 17th 2008 a paramedic and a patient killed

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

We regret to advise you that a female Sussex County (DE) Paramedic was killed in the Line of Duty as was a patient killed in a horrific crash involving an ambulance in Sussex County (DE) this morning. The single vehicle crash happened around 0240 Hours on the John J. Williams Highway near the Lewes-Rehoboth joint fire company substation in Angola.

The Mid-Sussex Rescue Squad ambulance was transporting to Beebe Medical Center with a patient, 2 MSRS Squad members and the Sussex County Paramedic were on board when it struck a tree, which opened the side of the ambulance as seen on our home page. Tragically, the patient was killed as was the Sussex County EMS Paramedic, who was killed in the Line of Duty.

Sussex County EMS also suffered a close call last year when a Paramedic John Schmitt was seriously injured in a crash when a civilian struck the Milford Fire Company ambulance he was riding in, while returning from a run. Additional details on this morning's crash will follow.



In this vehicle...



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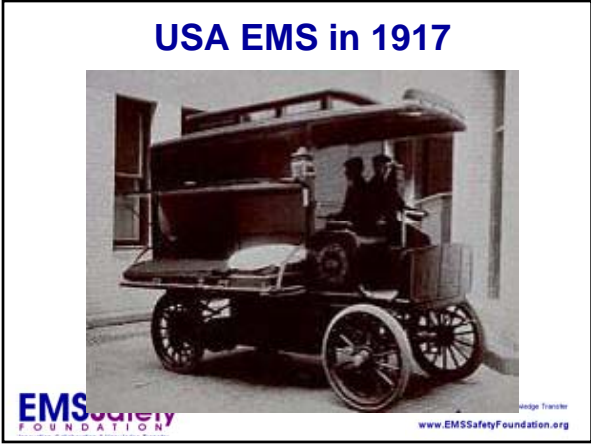
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April 30, 2009 - Tennessee



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USA 1980's Then....



And NOW!...



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USA 1980's Then....



And now...



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Equipment hard to reach



1960 to 2013



A passenger vehicle - sure



laundry or mail truck' - ??



A passenger vehicle



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But avoid repeating old mistakes!



Jump start
 A RoboRoo Series II kangaroo tests dummy is used in New South Wales, Australia, to help automobile designers study a unique Australian road safety issue — traffic accidents with kangaroos.

ASSOCIATED PRESS

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Very Important Principle

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

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You may not like all I have to say...

"The first commandment is: Thou shalt not shoot the messenger."

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Goals

- Cheaper
- Better
- Safer

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



Absence of standards and oversight

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

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



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adn.com
Anchorage Daily News
Alaska Newsreader
All Alaska in one click -- news, blogs, videos and more.
about the newsreader

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News Sports Outdoors Features Money Entertainment Opinion

Home | Alaska Newsreader | Editorial | Obituaries | Archives | Movies | Music | Restaurants | Submit an Event

Paramedic injured in crash is recovering

By Julia O'Malley
Anchorage Daily News
Published: December 28, 2006
Last Modified: December 28, 2006 at 05:07 PM

More anchorage stories »

- Coalition says Strawberry plans don't qualify for yes vote
- Bomb threat at elementary school leads to arrest of 4 eighth-graders
- City revises ads about smoking ban
- Suspect sought in death
- Alcohol seems a factor in tent death

An Anchorage Fire Department ambulance rushing a patient to the hospital was struck by a Dodge pickup this morning, injuring three paramedics, according to the Anchorage Police Department.

Story tools:

- E-mail a friend
- Print
- Dig this
- Send Newsline
- Send link via AIM
- Font size: | A | A | A

The Dodge broadsided the ambulance, which had lights flashing and sirens on, hitting it in the back around 8 a.m. as the medic vehicle was crossing the Glenn Highway at Airport Heights Drive. Onboard the ambulance were seriously injured patient Antonio Malavai, his wife, Gail Malavai, and four Anchorage Fire Department personnel: driver Eric Tuott, 31, EMT Jess Werner, 40, and paramedics Dave Wallace, 43, and Tony Brugiera, 36.

Brugiera, who was riding with Malavai in the back of the rig, was hospitalized with a head injury and is in stable but guarded condition. Werner and Wallace were treated for minor injuries and released. Clifton Tyler, 43, the driver of the pickup, and



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Important...

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

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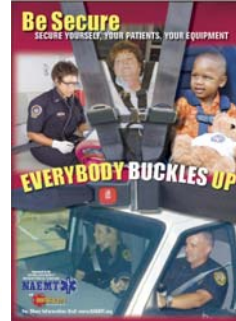
Why do we do this?



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



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EMS Safety timeline

- Didn't know it was an issue – 60's-70's
- Knew it was an issue – but didn't really know what to do – 80's-90's
- Safety technical data rolls out – past 10 years
- Change and adoption challenges – *we are here now*

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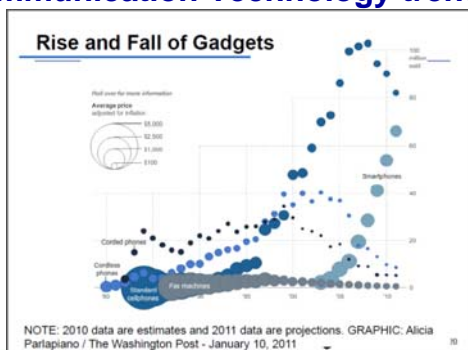
Generation - Y



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Communication Technology trends

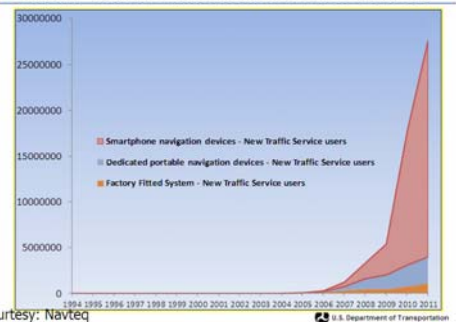


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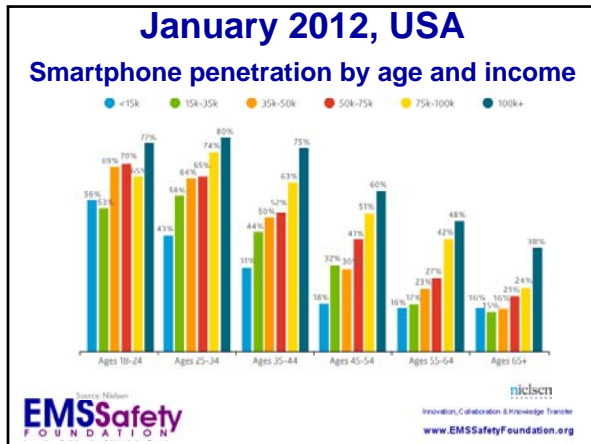
Smartphone navigation devices

US New Traffic Subscribers 1996 to 2011



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The new world of social media

A History of the Business of Social Media ...

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- ### Design Key Parameters
- Design concepts
 - Engagement
 - Operational needs
 - Technical Resources
 - Task Analysis
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Very Important Principle

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

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- ### Occupant Systems Safety
- Occupant Safety in EMS is driven by both operational and biomechanical systems.
 - Systems Safety integrating these two issues is key
 - There is interaction of occupants with the system, with each other and with available seating options and vehicle interior, equipment and operational tasks.
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Safety Performance

- Measurement
- Outcomes
- Technical expertise


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2012 EMS Safety Systems, Strategies and Solutions Summit

- One Day event, 30 presentations
- Held in Washington DC, Keck Center
- Simulcast Live to EMS Today
- Live Webinar Access - globally
- Over 100 participants live across 3 continents
- Greater than 10,000 downloads of handouts within the first week!!


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The 2012 TRB EMS Safety Summit

print this page & your smart phone will play the 8 sessions from the eTags! (even in B&W)

- Opening Address: A.J. Heightman
- Safety Developments Update – N. Levick
- Research needs assessment forms explained – E. Frazer

- 1: Data and Recent Initiatives
- 2: Transport, Human Factors - Bridging Diverse Disciplines
- 3: Testing and Standards
- 4: New systems safety technology solutions & telematics
- 5: Fleet management strategies
- 6: Innovative Vehicle Design
- 7: Operationalizing Safety
- 8: Panel: How to optimize the safety of your existing fleet
Wrap up – from Prof. Art Cooper


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<http://www.emssafetyfoundation.org/2012TRBSummitAgendawithLinks.pdf>


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Its out there NOW

- TRB 2012 Summit – addressed the key and interdisciplinary applied solutions issues, in one day – please seek that information out. www.objectivesafety.net/TRBSummit2012.htm
- There have been two prior TRB Summits held, 2008, 2009 and both with vehicle engineering and transportation systems technical expertise
- See www.trb.org, and for the Summit archives: www.objectivesafety.net/TRBSummit2008.htm www.objectivesafety.net/TRBSummit2009.htm


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Some new dimensions

- Vehicles – smarter, sleeker, safer – CHEAPER!
- Operations – new technology tools
- Interdisciplinary infrastructure – new global platforms

Safety of the...

- Provider
- Public
- Patient

Safety is a tool to save

- Lives
- Time
- Money

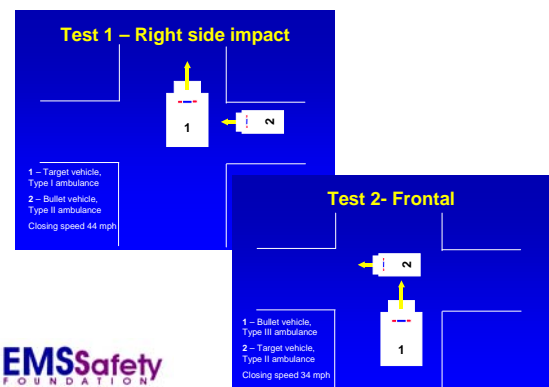
must be evidenced based

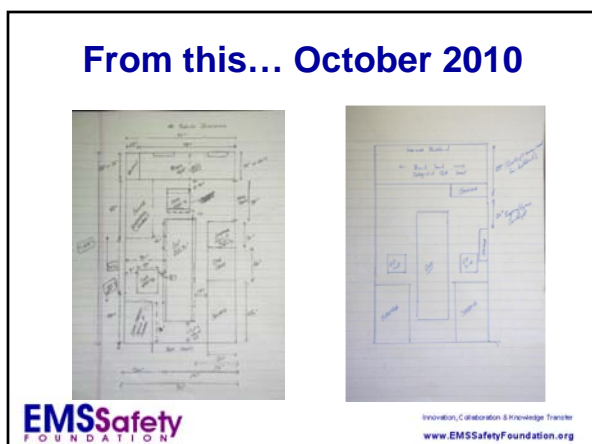
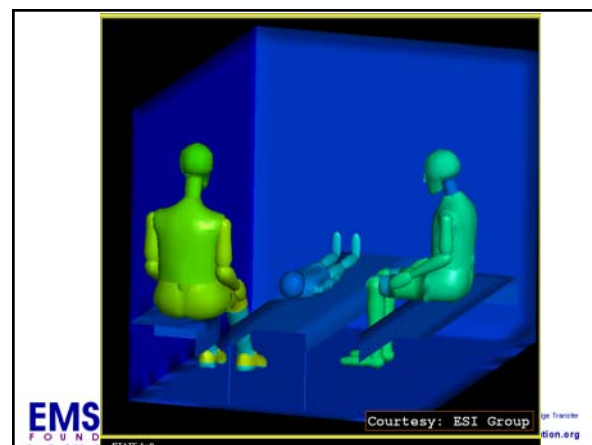
Flexibility to manage two patients



Design Concepts

Full Vehicle Crash Tests











User friendly

- All necessary equipment should be reach from the seats without losing the seat belt




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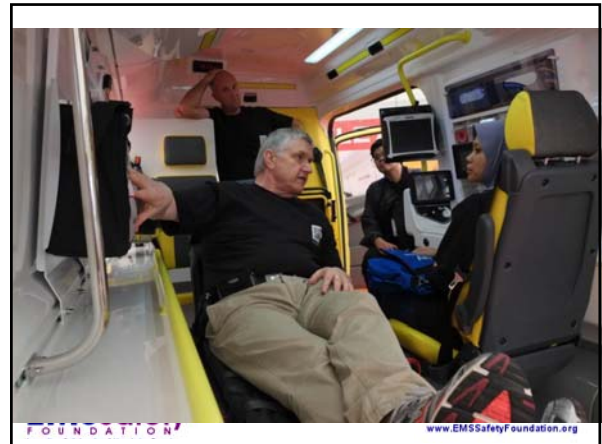
- The stretcher platform can be moved into 3 different positions





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Vehicle Occupant Safety design

European design
Safety technology
is a key focus

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The old and the new...

Rapidly and game changing technology

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EMS Safety Foundation's Interview with Dlouhy's Arne Schauer and AJ

<https://vimeo.com/68321134>

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Safer, flexible and cost efficient storage

- Roll out wall packs
- Smart go bags

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Emergency Vehicles – Viewer Awareness

- Location
- Size
- Shape
- Speed
- Intended path

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Policy and practice ignorant of existing technical safety data

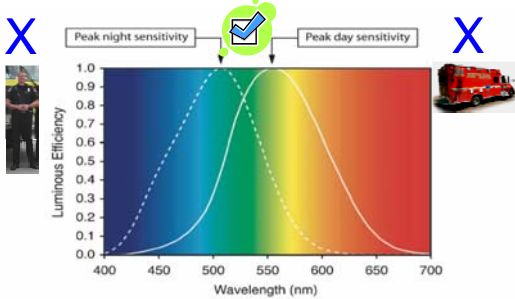


Figure 1. The scotopic (dashed line) and photopic (solid line) luminous efficiency functions, describing the spectral sensitivities of night and day vision, respectively.

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



Two Baltimore City Fire Department whistles were suspended after their ladder truck hit a sport utility vehicle, killing the three occupants of the SUV. (Ulrich Markel Photography)



Pages from JEMS

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Taking It to the Streets
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So however you wish to layout your rig

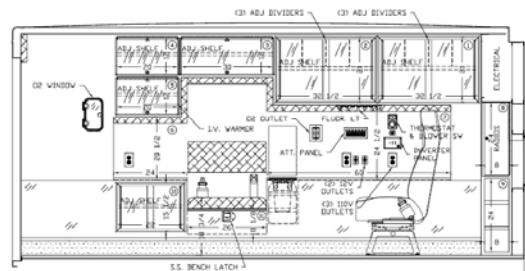
You must consider

- Occupant protection
- Range of reach & task analysis

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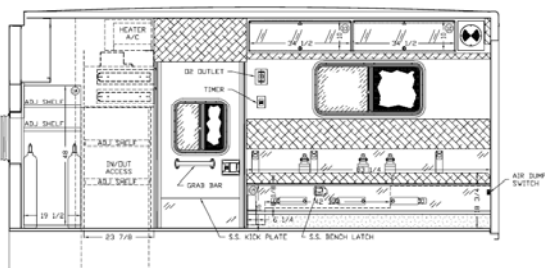
Are there head injury hazards? Can you reach the cabinets without being at risk?



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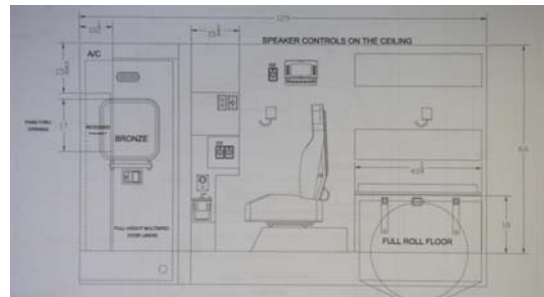
A squad bench is both an ergonomic and automotive disaster



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Forward and rear facing seating provides for both better ergonomics and better automotive occupant protection



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Specs should itemize key safety features

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As where you position a sharps container can have major impact on the safety of the occupants trying to reach it

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Simple sketches can be a helpful initial step ..



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But they must be done to scale



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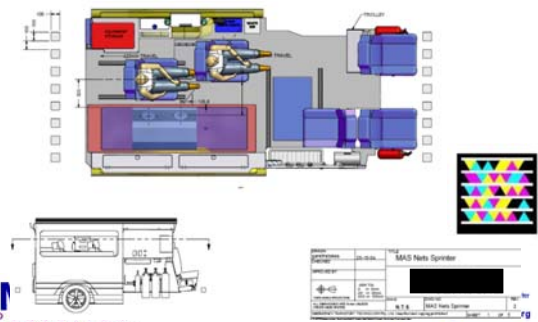
Specialty Ambulances

- Newborn Emergency Transport Service (NETS)
 - work realm - retrieval of sick newborn babies
 - collaborative design approach, new layout
 - define task needs
 - pushed design parameters to accommodate task needs
 - introduced dynamic seating (with restrictions)
 - rear seat - nurse conducting observations
 - forward seat - doctor, can engage to treatment position only once vehicle stops

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Melbourne, Australia Neonatal Ambulance – in transit mode



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Very Important Principle

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



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Occupant Systems Safety

- Occupant Safety in EMS is driven by both operational and biomechanical systems.
- Systems Safety integrating these two issues is key
- There is interaction of occupants with the system, with each other and with available seating options and vehicle interior, equipment and operational tasks.



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1980's Then....



And 2009...



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Now...



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Innovative vehicles

<http://www.emssafetyfoundation.org/NAEMSP2012poster.pdf>



Interdisciplinary and International Collaboration/Integration

Swedish industrial designer meets
North American Ambulance builder

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the result of the frequency analysis, green dots mark equipment used every time the ambulance is driven, orange



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No longer are the manufacturers left holding the baby – there is now active interdisciplinary collaboration



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Change and Innovation

- Improved data systems for injury
- Enhanced data on denominator
- New technologies
- New policies/standards
- Interdisciplinary collaboration

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June 17th 2008 a paramedic and a patient killed

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

We regret to advise you that a female Sussex County (DE) Paramedic was killed in the Line of Duty as was a patient killed in a horrific crash involving an ambulance in Sussex County (DE) this morning.

The single vehicle crash happened around 0240 Hours on the John J. Williams Highway near the Lewes-Rehoboth joint fire company substation in Angola.

The Mid-Sussex Rescue Squad ambulance was transporting to Beebe Medical Center with a patient, 2 MSRS Squad members and the Sussex County Paramedic were on board when it struck a tree, which opened the side of the ambulance as seen on our home page. Tragically, the patient was killed as was the Sussex County EMS Paramedic, who was killed in the Line of Duty.

Sussex County EMS also suffered a close call last year when a Paramedic John Schmitt was seriously injured in a crash when a civilian struck the Milford Fire Company ambulance he was riding in, while returning from a run. Additional details on this mornings crash will follow.



In this vehicle...



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April 30, 2009 - Tennessee



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Caution!!!

- Just because it has been 'Tested' does not necessarily mean it has been crash tested – nor that it is crashworthy and/or going to protect you
- Even if it has been 'Crash tested' – it depends upon to which standard, whether or not it is actually safe under real world crash conditions
- Appropriate technical expertise is key!!

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Technical Collaboration is key

- We are NOT the experts in this science
- We cannot afford to play the silo game here, it is costing lives, time and money
- We MUST have a meaningful evidenced based approach to design, operations and policy
- We must be outcomes driven

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this vehicle is safety crash tested by automotive experts



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Unlike this vehicle



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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?

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Fleet Mix ?



What do we know works...

- Tiered dispatch
- Vehicle Operations Safety Policies
- Ideally, forward and rear facing seating
- If not, use squad bench lap seat belts
- Patient over the shoulder belts
- Securing equipment
- Fleet management electronic technical devices
- Safety awareness
- Cultural change

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Risk/Hazards

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

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Goals

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

Very Important Principle

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Future directions

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

Key future focus

- Data and Recent Initiatives
- Transport Technical science
- Human Factors
- Bridging Diverse Disciplines
- Testing and Standards
- New systems safety technology solutions
- Fleet management strategies
- Innovative Vehicle Design
- Operationalizing Safety

- Innovation
- Collaboration
- Knowledge transfer

Conclusion

- EMS transport has serious hazards and safety issues
- Major advances in EMS safety research, infrastructure and practice over the past 5 years
- Design must integrate occupant protection and ergonomic principles
- Multidisciplinary safety issue that EMS cannot solve internally
- Failure to transfer knowledge from transportation and automotive safety and ergonomics is unacceptable and dangerous
- EMS is still way behind the state of the art in vehicle, transportation and occupational safety