What's Changing in Ambulance Standards?

www.caas.org


EMERGENCY

Partnering with Industry to Build Safe EMS Work Environments

Jim Green (NIOSH)

CDC

NIOSH

Overarching Goals of this Research

- Provide patient compartment occupants with the same level of crash protection as is found in passenger vehicles
- Work with end users to ensure designs meet their needs
- Partner with manufacturers to ensure adoption of consensus standards in the absence of a regulatory requirement to do so
- Near Term: Develop 10 system specific test methods for publication to be referenced nationally or internationally - **Completed**
- Long Term: Incorporate new test methods into one or more bumper-to-bumper ambulance national standards - **Ongoing**

CDC

NIOSH

Building New Ambulance Test Methods: The Foundation is Crash Testing

Crash testing helps us understand how the vehicle reacts both internally and externally as crash energy is distributed.

Full Vehicle Crash Testing

An external view of the full vehicle crash testing performed

Structural Concerns with Existing Litter Retention Devices & Seating Systems

Production Cot – Successfully Meets SAE J3027 Recommend Practice Criteria

Occupant Excursion Issue: Existing Restraint Type and Location

Pre-crash event: standard cot, restraint and antler floor fastener

Mid-crash event: patient excursion exceeds 30 inches or 76 cm

SAE J3102 - Dynamic Test Option

(Video provided courtesy of American Emergency Vehicles (AEV) located in Jefferson, NC)

- This test also provided positive test results for SAE J3027 – patient cot for structural integrity and excursion.
- Met floor strength requirements in SAE J3102

Equipment Mount & Cabinet Integrity: Flying Equipment and Supplies are a Hazard

Prior to crash equipment and gurney either mounted or stowed in cabinets

Post crash (rollover) equipment and gurney positions drastically changed

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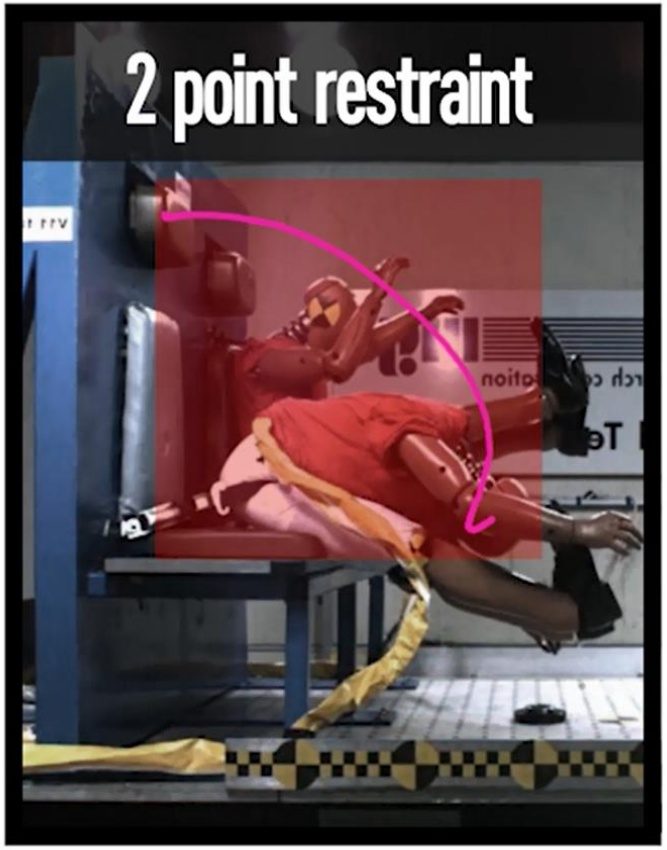
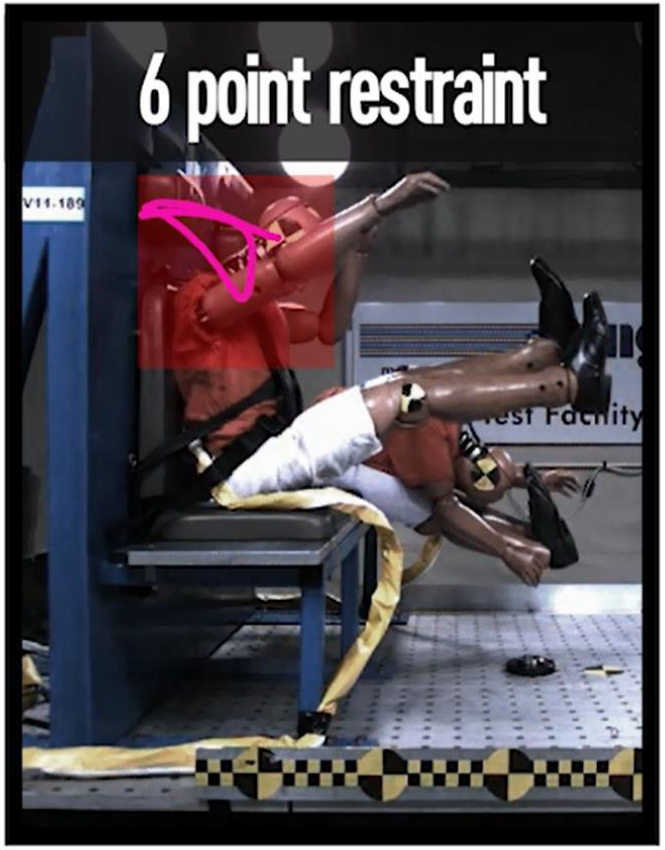
Demo: Frontal Impact, Forward, & Rear Facing Seating

SAE J3026 requires all seating to be tested in the orientation in which it is installed using a 171 lb. crash test dummy.

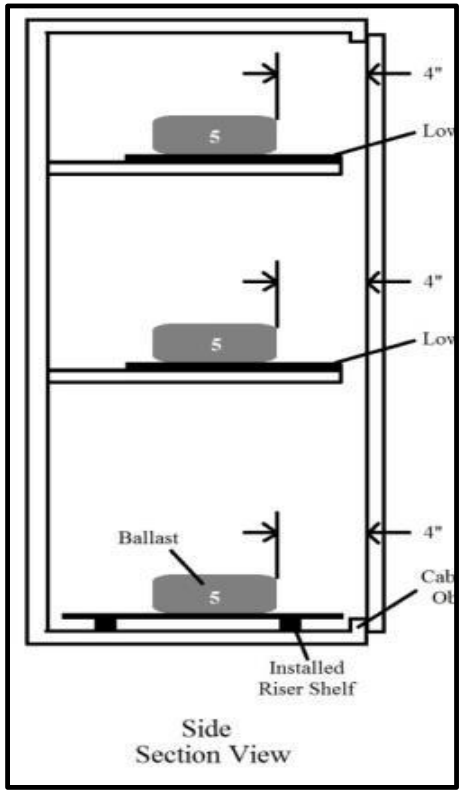
Head path comparison 2 pt lap belt versus 6 pt restraint

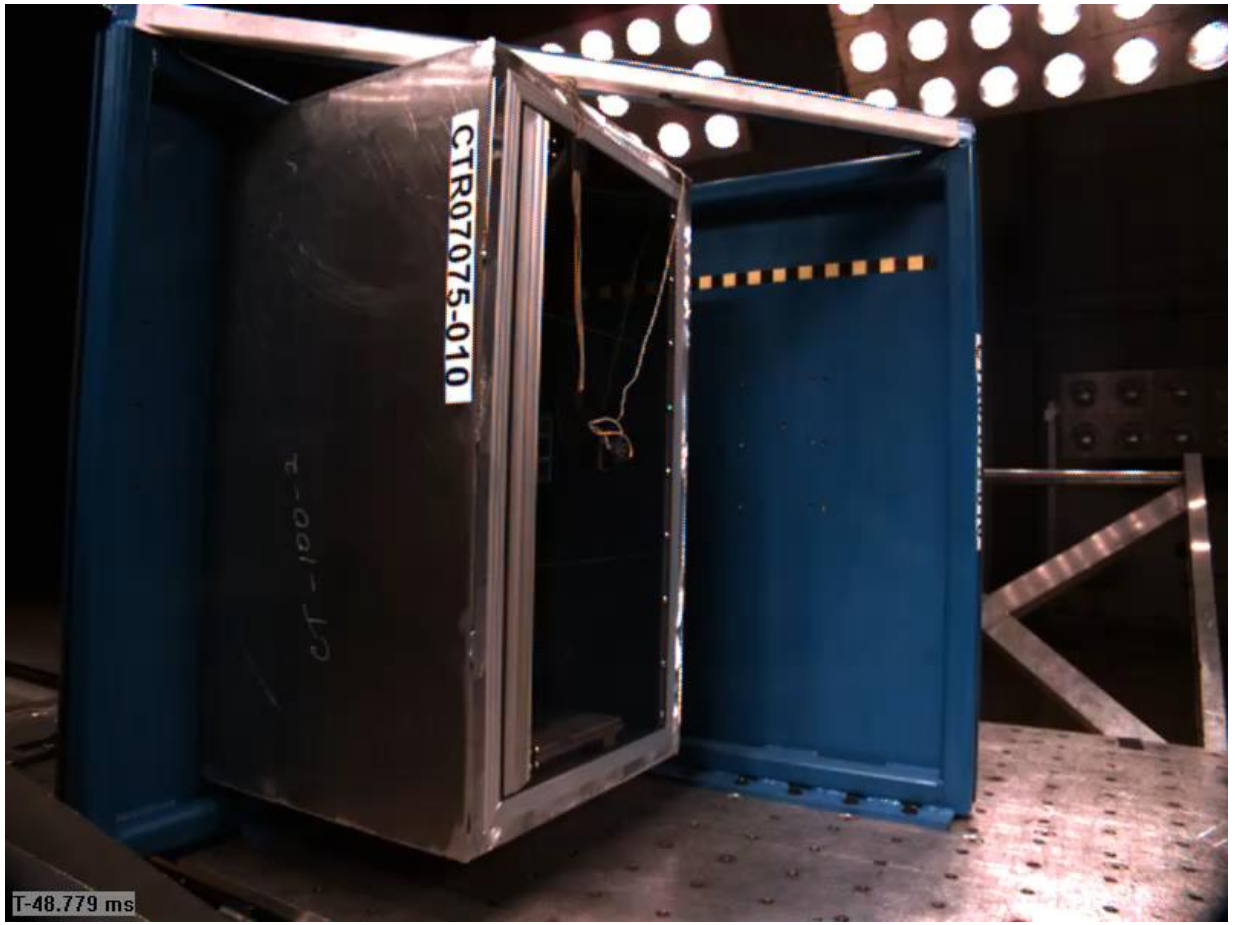




Upper torso restraints enhance occupant safety!

Cabinet Testing: Aluminum Cabinet - 20 lbs. in bags (Prototype Design)





Cabinets will be tested to a weight rating identified by the builder. Labeling will likely be required.

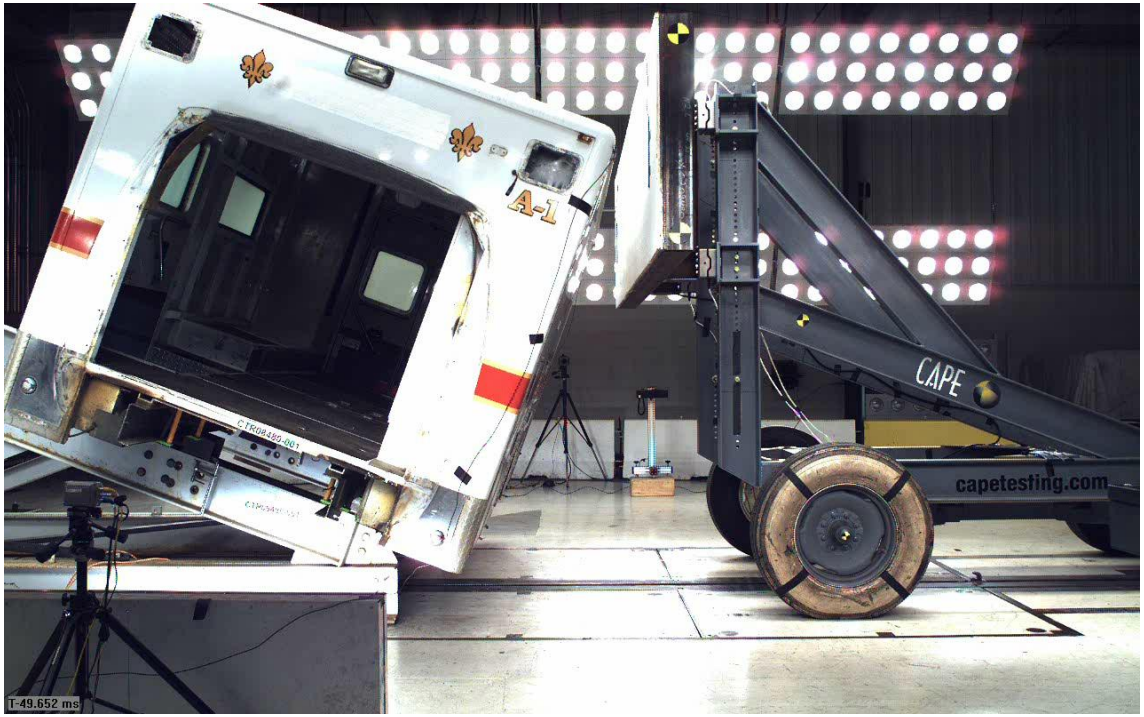
Patient Compartment Integrity – SAE J3057
Phase 1: Slowed Video Clip

Impact loading of 28,000 ft-lb – twice the requirement for the cab of large trucks

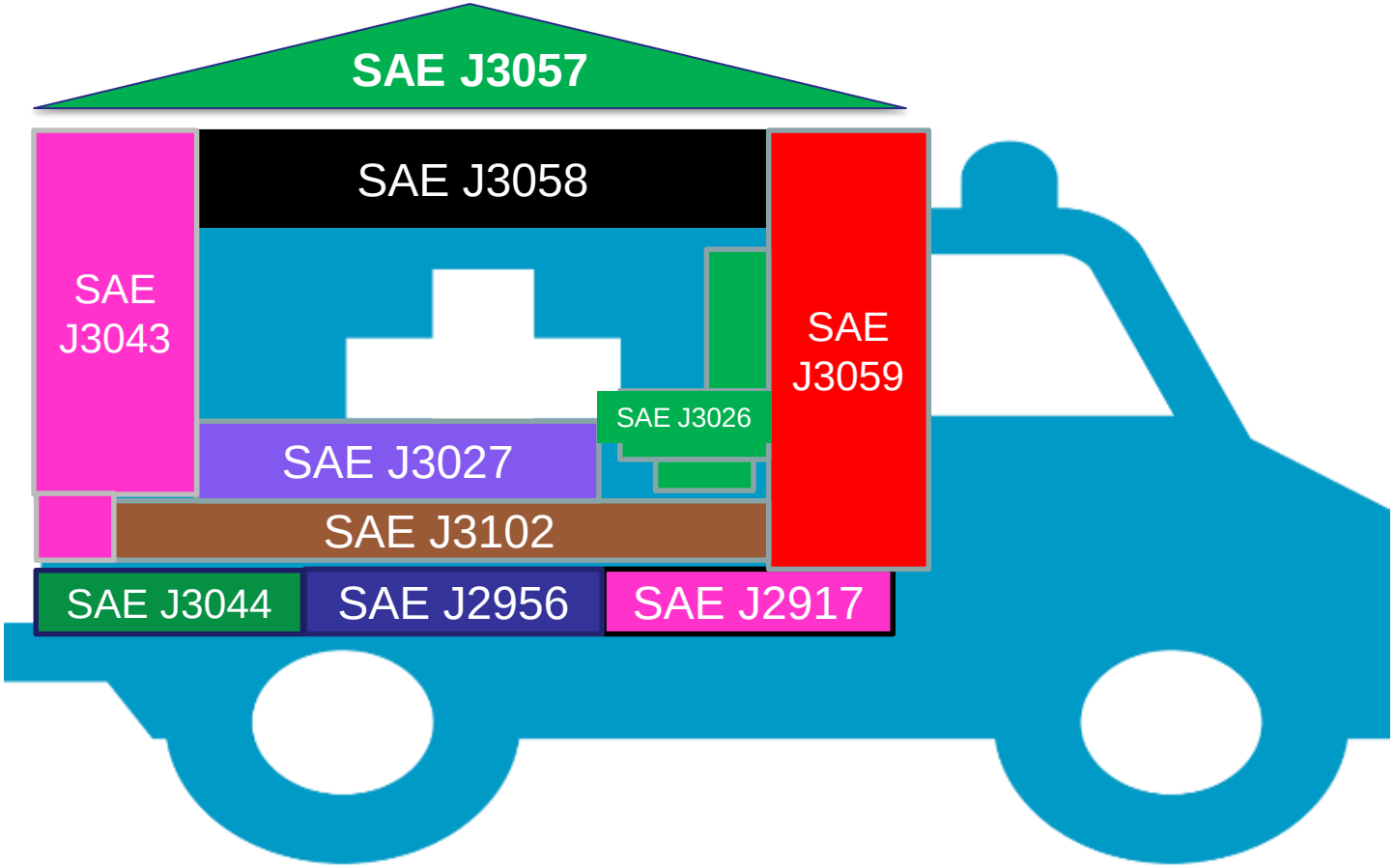
After roof edge impact, phase 2 of the test requires a vertical roof crush test

All doors must open after test completed

Intended to simulate side roll with roof line impacting ground



SAE Documents



How do SAE tests impact ambulances built to new test methods and standards?

- SAE J3026 requires all seating to be crash tested with a crash test dummy. This includes the bench seat.
- SAE J3027 requires the cot and floor fixture be crash tested. This requirement effectively eliminates the antler style cot mounting system and cot from future use.
- SAE J3043 requires equipment mounts to be tested.
- SAE J3058 requires all cabinets to be tested to a rated loading.
- SAE J3057 requires a new dynamic roof crush test be performed.
- SAE J3102 requires a test of the floor structure under the cot.

New Test Methods Published by the Society of Automotive Engineers

Last of 10 SAE Test Methods published in April 2017!

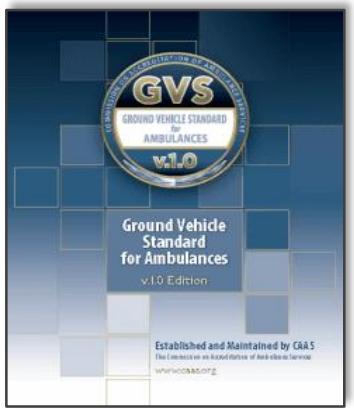
All available through SAE's website

Test Methods Referenced by National Standards

- 2016 Edition References first 6 SAE Test Methods
- 2017 Change Notice in draft references all 10 SAE Test Methods

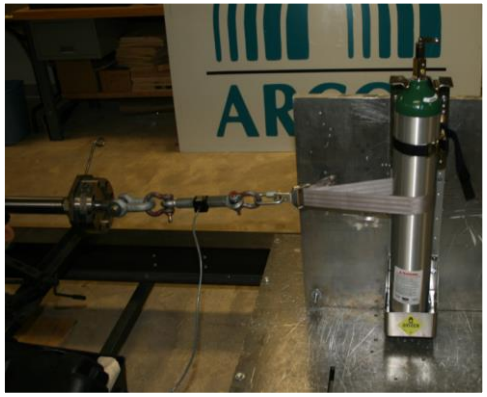
NFPA 1917
Standard for
Automotive
Ambulances
Effective 2016
2nd Edition

- 2016 Edition References first 6 SAE Test Methods
- 2019 Edition in draft references all 10 SAE Test Methods



- 2016 Edition References first 6 SAE Test Methods
- Awaiting information from CAAS regarding 2nd Edition

SAE Recommended Practices: NIOSH & Ambulance Builders Working Together



Using energy derived from full vehicle crash testing the team was able to design and test new crashworthy components for use in the ambulance

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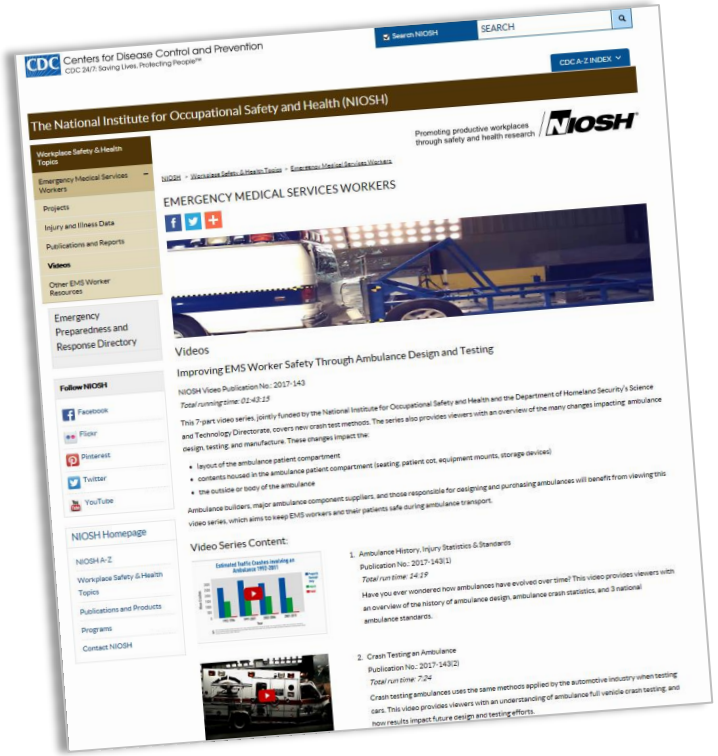
Informational Video Series



NIOSH partnered with Department of Homeland Security's Science and Technology Directorate as well as other federal agencies and the ambulance industry to develop a 7-part video series that covers new crash test methods.

Video series became available on the NIOSH EMS Workers webpage the week of May 22, 2017

www.cdc.gov/niosh/topics/ems/videos.htm

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"The findings and conclusions in this presentation are those of the author and do not necessarily represent the views of the National Institute for Occupational Safety and Health (NIOSH). Mention of company names or products does not imply endorsement by NIOSH."

Ambulance Patient Compartment Design Standards

Jennifer Marshall
Office of Special Programs
National Institute of Standards and Technology

Ambulance Patient Compartment Human Factors Design Guidebook

First Responders Group

February 2015

Homeland Security

Science and Technology

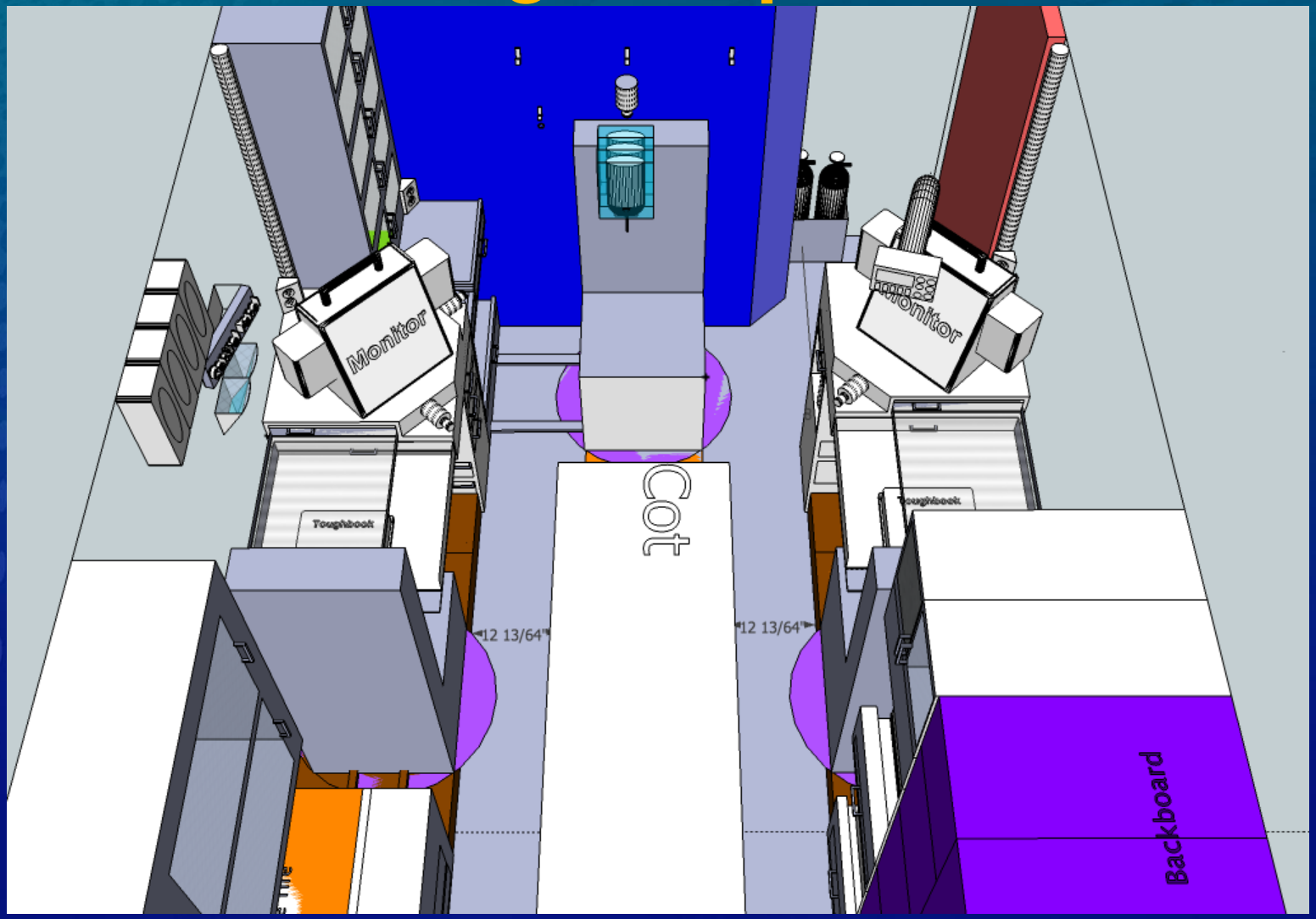
Design Assumptions

- Designs are based on requirements and criteria
- Design is not “standard” and only serves the purpose of visualizing optional layouts
- One patient on cot
- Curbside & roadside seats on track
- Cables, tubing, & leads are routed along wall/ceiling
- Design does not necessarily address crashworthiness
- CPR/intubation cannot be performed while seated
- IV bag will be hung prior to transit
- Curbside workstation is the primary medic seat
- Jump bags are the primary storage for immediate care items

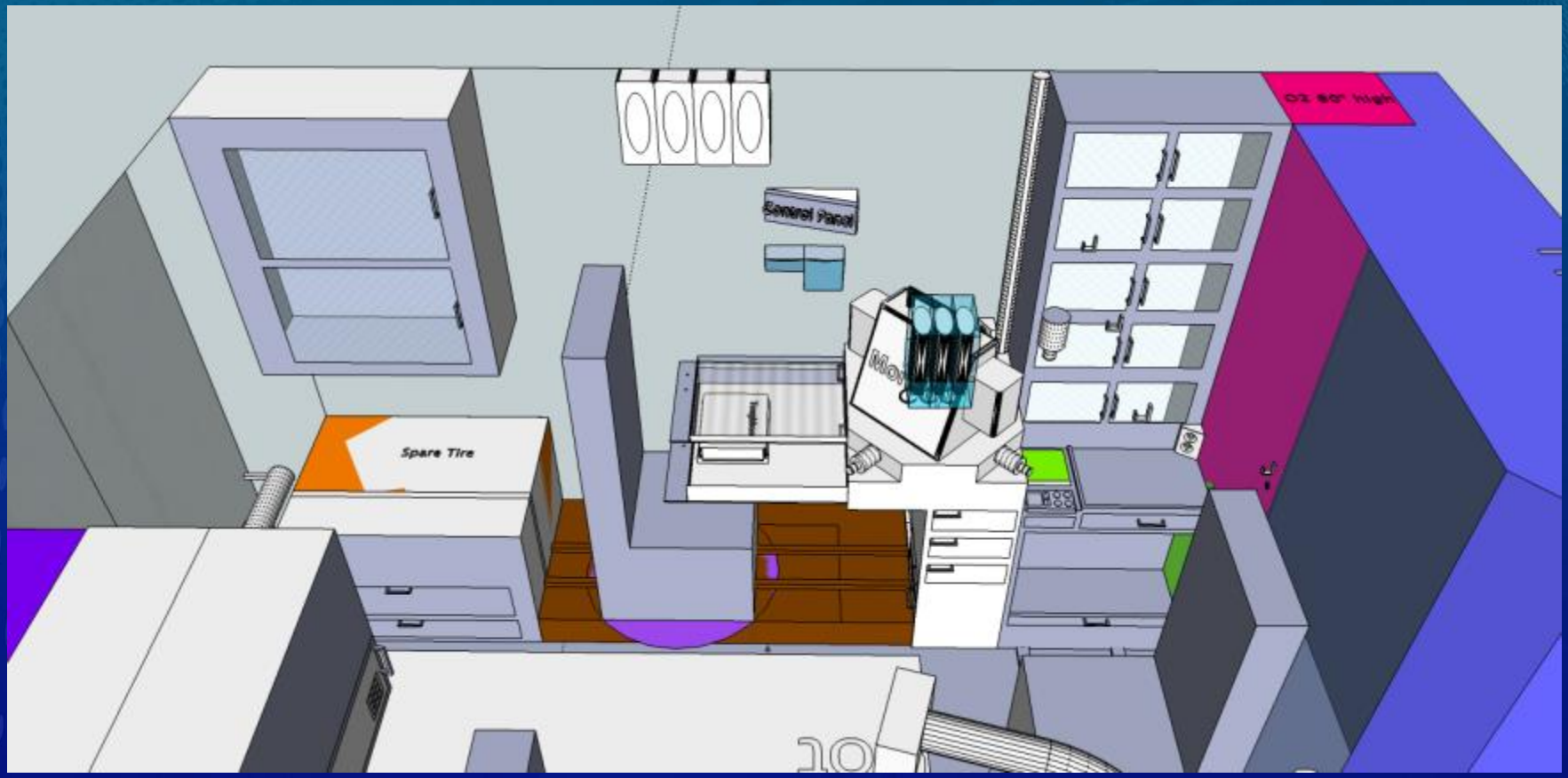
Key Human Performance Requirements

- **Use the human performance requirements to drive the design.**
- The EMS provider shall be able to reach the patient's body from head to knee while in a seated and restrained position.
- The EMS provider shall be able to reach common and critical equipment/supplies from a seated and restrained position.
- The EMS provider is able to face and interact with the patient while in a seated and restrained position.

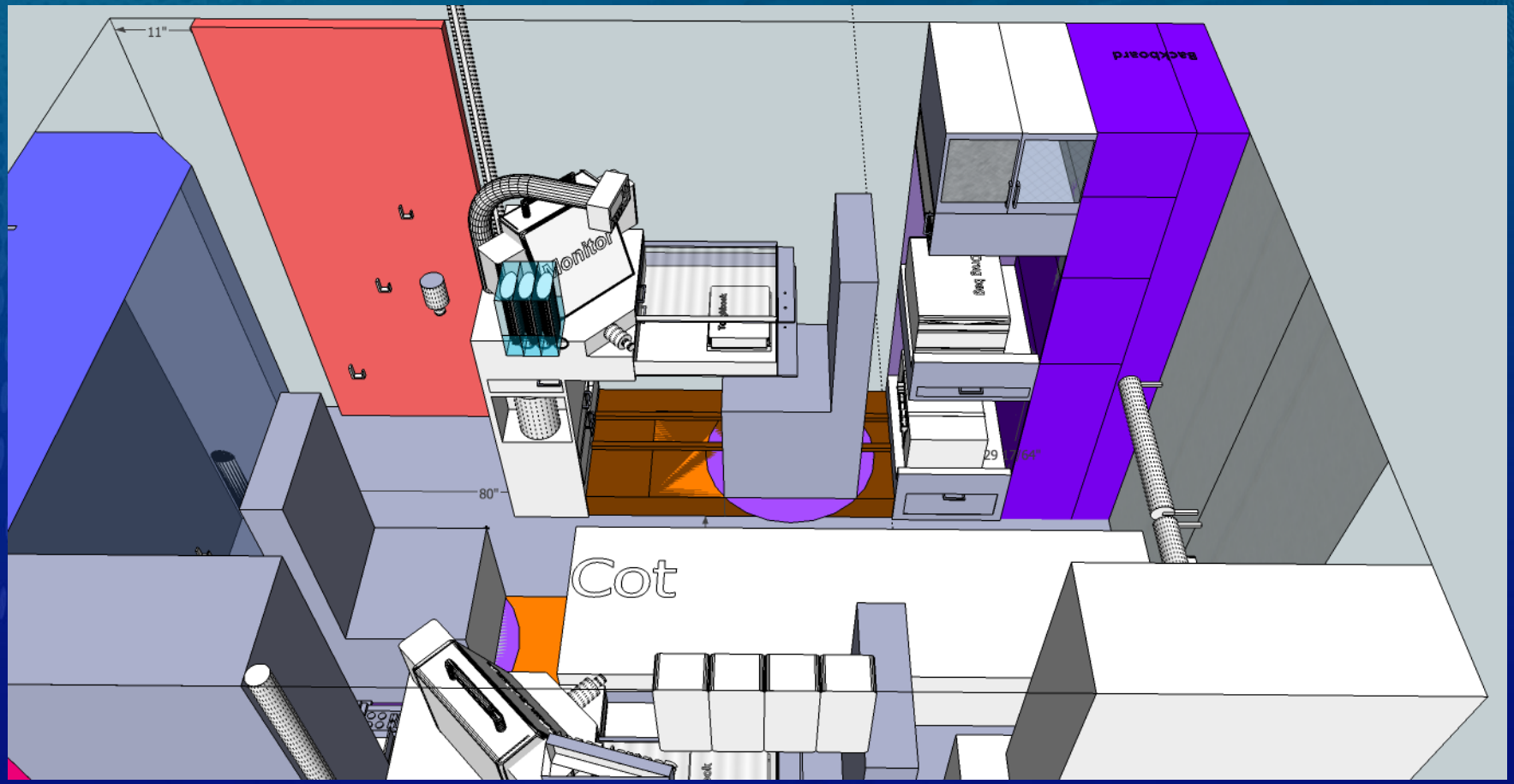
Conceptual Design – Helps to Validate Design Requirements



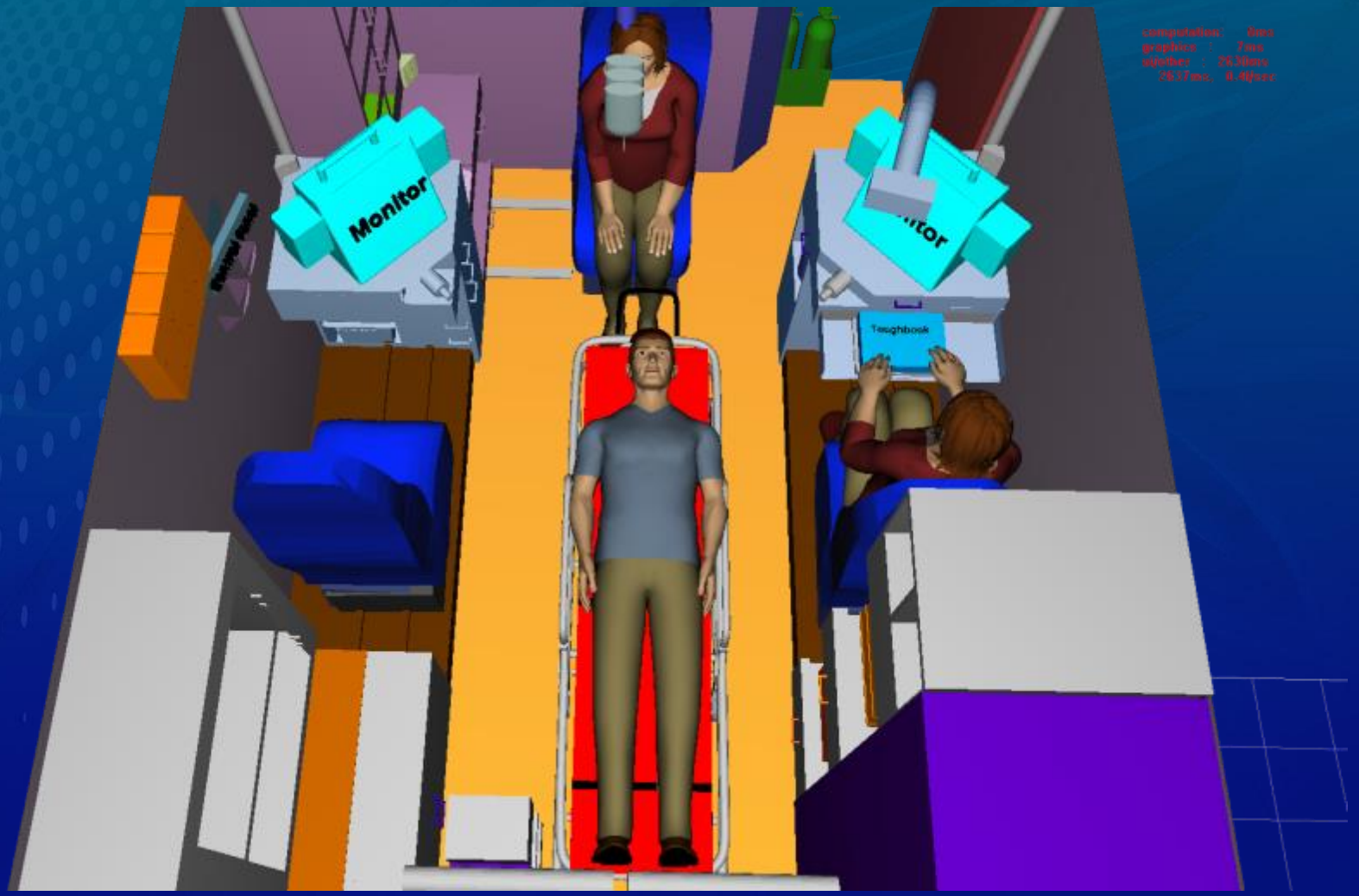
Roadside Seat



Curbside Seat



Modeling with Mannequins




Monitor
Toughbook

Guidebook

- Ambulance Design Guidebook covers best practices, recommendations, and ergonomics.
  - **Final, pending release by DHS**
  - Intended to be a practitioner guide and not a standard
  - Covers user-defined process, steps to take to develop design requirements and basic systems engineering
  - Also addresses some best practices or recommendations in the following areas:
    - Equipment layout and workflow
    - Lighting, noise, HVAC
    - Storage
    - Ingress/egress (patient and EMS worker)
    - Labeling
    - Communications and information technology
    - Restraints and seating
    - Surfaces and materials (incl. decontamination)

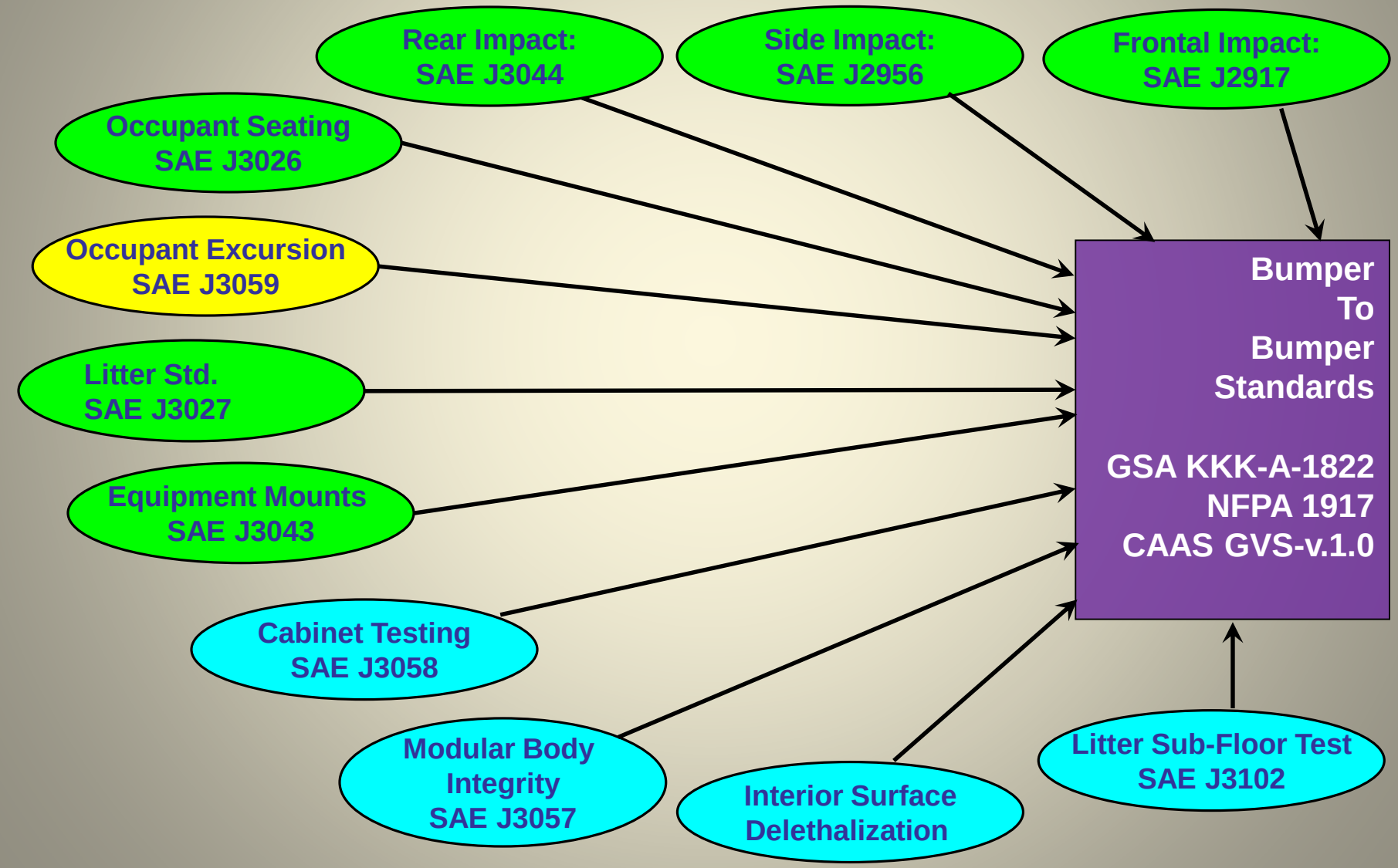
Standards vs Standards

- **Testing Standards** for Specific Safety Criteria
  a. AMD
  b. NIOSH = SAE

- Bumper to Bumper **Vehicle Standards**
  a. KKK-A-1822F
  b. CAAS GVS v.1.0
  c. NFPA 1917

Standards vs. Standards

Standards Landscape Today



KKK-A-1822F

NFPA 1917

CAAS GVS

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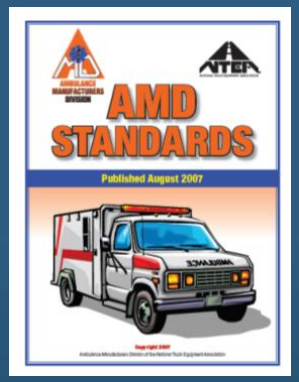

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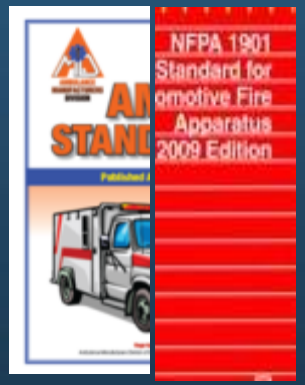

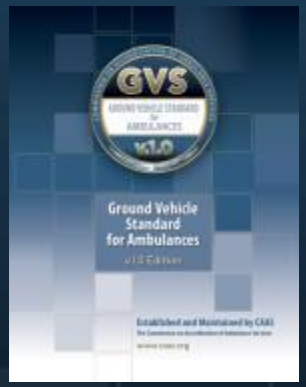

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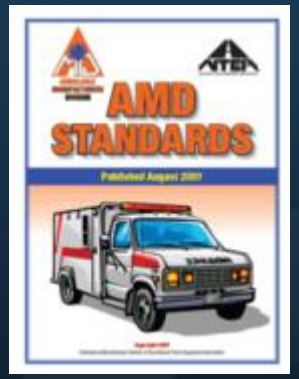

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National Association of State EMS Officials
201 Park Washington Ct • Falls Church, VA 22046 • www.nasemso.org
703-538-1799 • fax 703-241-5603 • info@nasemso.org

Table 1: Comparison overview of KKK/NFPA/CAAS ambulance vehicle standards

Requirement	KKK-A-1822F	NFPA 1917, 2016	CAAS GVS v.1.0
AMD testing to verify compliance	AMD Tests #1, #4-26 required	AMD tests 1, 4-6, 8, 10-12, 15-16, 18, 21, 24-25, 27 required	AMD Tests #1, #4-26 required
Payload requirement	Type II 1,500 pounds before options; Type I/III 1,750 pounds before options; Type I/II AD 2,250 pounds before options	Finished vehicle weight plus permanently mounted equipment. Loose equipment as specified by purchaser Type I, 750 lbs.; Type I-AD, 1,250 lbs.; Type II, 500 lbs.; Type III, 750 lbs.; Type III-AD, 1,250 lbs. 171 lbs. times number of seat-belted positions, 171 lbs. patient, cot 100 lbs. or Power cot 250 lbs. plus 200 lbs. spare.	All Types 1,300 pounds minimum, payload after all options
Vehicle type certification	Proof of compliance and complete certification testing by ISO-approved laboratory is required for each type	Third party testing required for some parts of standard	Proof of compliance and complete certification testing by ISO-approved laboratory is required for each type
Occupant payload calculations	Weight calculated at 175 lbs./person	Weight calculated at 171 lbs./person	Weight calculated at 171 lbs./person
Vehicle cold start	AMD 022 or chassis manufacturer certification	Requires own test	AMD 022 or chassis manufacturer certification
Engine hourmeter	Optional	Required	Optional
Suspension clearance angles	Approach: 20 degrees; Breakover: 10 degrees; Departure: 10 degrees	Approach: 10 degrees; Breakover: 10 degrees; Departure: 10 degrees	Approach: 20 degrees; Breakover: 10 degrees; Departure: 10 degrees
Tire pressure monitor	Optional	Visual indicator or monitor required	Optional
CO monitor	Testing per AMD 007 required	Monitor required	Testing per AMD 007 required
Bulkhead/Partition	Bulkhead with latchable door (Type III only)	Bulkhead with window	Bulkhead with window required and sliding door optional (Type III only)
Floor loading height	Maximum is 34"	Maximum suggested load height 34"	Maximum is 34"
Access handrails	Grab handle on inside of each door or adjacent body structure	Interior or exterior grab handles on cab and patient compartment at each step location	Grab handle on inside of each door and recessed overhead grab rail required
Required door openings	Two doors required—minimum dimensions provided	Two means of escape required—minimum size 30" x 46"	Rear and side doors required—minimum dimensions provided
Floor testing requirements	AMD 20 floor deflection test required to prove floor load capacity	ASTM E661 compliance required	AMD 20 floor deflection test required to prove floor load capacity
Equipment stowage criteria	Minimum 35 cubic feet of interior storage; all devices to be fastened to manufacturers' req.	All equipment 3 lbs. or more to be mounted or stored in enclosure or bracket	Purchaser to specify stowage requirements
Cabinet storage load	Not specified, pending SAE requirements	Each cabinet to be labeled with max load	Not specified, pending SAE requirements
Equipment mounting and retention	Per equipment manufacturer's recommendation	SAE J3043 required	Oxygen mounts and fire extinguishers shall meet SAE J3043
Communication devices	Optional	Communication devices installed in patient compartment shall be within reach of EMSPs while seated and restrained	No requirement
Seat belt requirements	Seat belts must meet all FMVSS, AMD and SAE J3026 requirements	Meet all required FMVSS and requires special length type I or type II seat belts for vehicles with a GVWR of 19,500 or more	Seat belts must meet all FMVSS requirements
Access to patient	Primary attendant seat min 25" from head of cot	Seat to cot dimension provided to allow multiple cot positions	Primary attendant seat min 25" from head of cot
Seat belt warning	"Fasten Seat Belt" label required	Seat belt monitoring system required with visual and audible alarms in cab and pt compartment	"Fasten Seat Belt" label required
Main electrical printed circuit board	Certified to "Class 3 life support" standard	Non life-saving systems certified to Class 2 commercial/industrial assy. std. Life-saving systems certified to Class 3 life support std.	Certified to "Class 3 life support" standard
Wire harness protective loom	300 degree F maximum rated	194 degree F minimum continuous rated	300 degree F maximum rated
Warning lights	KKK, SAE or NFPA configuration acceptable	NFPA zone lighting or KKK acceptable	Purchaser to specify
Ground lighting under vehicle	Step wells to be illuminated	Under-body lighting required at all step/access points	Step wells to be illuminated
Exterior compartment lighting	Requires exterior compartments to be lighted	Each exterior compartment greater than 4 ft³ or opening greater than 144 in.² shall have minimum of 1 fc at any location	Requires exterior compartments to be lighted
Warning indicators	"DOOR NOT CLOSED" light	"DO NOT MOVE" light attached to open door, equipment rack not stowed, or attached device open or deployed	"DOOR NOT CLOSED" light
Generator requirements	Not specified	Detailed requirements for generators under 11 hp	Not specified
Reflective striping	6"–14" orange reflective stripe around body or equivalent	Min 6" reflective stripe or combination design on 25% length of cab and 75% length of body	Purchaser to specify
Chevrons	Optional	50% of rear (excluding glass) reflective with any design; chevrons optional	Purchaser to specify

DISCLAIMER: This document is not a comprehensive comparison and has not been independently verified. Regulatory and purchasing decisions should be made solely upon a comprehensive review of the contents of the most recent versions of these documents and the rules of the state in which the ambulance is intended to be licensed. Questions should be directed to the standards document caretaker and your state EMS office. For more information please see www.SafeAmbulances.org.

April 14, 2016

Ground Vehicle Standard for Ambulances

v.1.0 Edition

Established and Maintained by CAAS

The Commission on Accreditation of Ambulance Services

www.caas.org

Who is CAAS?

Commission on Accreditation of Ambulance Services - Accreditation Standards:

- Standards for enhancing quality and performance for licensed ambulance service providers
- Established in 1990
- “Gold Standard”- exceeds state EMS licensure requirements
- Voluntary, or as required by state/county or local ordinance
- When met- the ambulance service/organization is granted accreditation
- www.caas.org

CAAS Involvement

The Commission on Accreditation of Ambulance Services (CAAS) was asked by several National Organizations to develop an Ambulance Standard to replace the KKK specification.

CAAS represents the complete EMS spectrum, not just one specific sector of EMS.

The CAAS Board of Directors representation is multi-faceted, representing the broad industry.

CAAS GVS

GVS Ground Vehicle Standard v.1.0:

- **Standard for the design of new ambulances**
- **Establishes minimum standards, performance parameters and essential criteria for the design of ambulances**
- **Provides a practical degree of standardization**
- **Effective July 2016**
- **When built to the GVS standard- the vehicle will bear the GVS logo**
- **Does not require or imply CAAS accreditation which is a separate program**
- **www.groundvehiclestandard.org**

Specification

- GVS foundation is KKK
- Applicable to new production vehicles only
- Accommodates current chassis offerings
- Maintains certain important quality criteria
- Includes new NIOSH/SAE Safety Standards
- Allows purchaser flexibility with consideration for local requirements

It does include

- Purchaser ability to define emergency lighting configuration
- Purchaser ability to define exterior graphics design and colors
- Continuity of KKK enhanced electrical system requirements- “Class 3 Life Support”
- Continuity of KKK enhanced floor structure and loading requirement (AMD 20)
- New defined minimum payload requirement of 1,300 pounds for every vehicle *including options*

It does include

- Ability for purchaser to deviate from standard as allowed by state, exceptions to be defined by FSAM
- Additional enhancements are suggested, not required
- Required compliance for all AMD testing standards #01-25.
- FSAM required to provide Type Testing and Certification for each ambulance model from certified independent testing facility.

Required Safety Features

GVS V1.0 includes new SAE safety requirements that are researched by NIOSH:

- **SAE J3026 Patient Compartment Seating**
- **SAE J3027 Litter Fasteners and Anchorage**
- **SAE J3043 Ambulance Equipment Mounting and Retention**

To be included in V1.1 in 2017:

- **SAE J3057 Modular Body Integrity**
- **SAE J3058 Cabinet Testing**
- **SAE J3059 Occupant Excursion**
- **SAE J3102 Litter Sub Floor Test**

EMS Insider
News and Winning Strategies for EMS Leaders

RETHINKING REMOUNTS

Developing a national standard for ambulance remounts

By Laura Aguirre

The Commission on Accreditation of Ambulance Services (CAAS) initially published its Ground Vehicle Standard (GVS) for new ambulances (GVS V1.0) in July 2016. The GVS standard has already been officially accepted by two states (Texas and Alabama), and regulatory approval is pending in many others.

As part of the development plan for the GVS V2.0 revision due in July 2019, CAAS GVS has started a process to create a standard for ambulance remounts that will be an integral part of the second version of GVS.

"We created and published the CAAS Ground Vehicle Standard at the request of numerous industry associations who were seeking an ambulance standard for the broad spectrum of EMS," says Mark Van Arnam, administrator of the CAAS GVS standard. "These same stakeholders have convinced us that there is a need for a standard for remounted ambulances."

"The concept of remounting modular ambulance [illegible] is not new, but has been around since the 1970s," Van Arnam said. "[illegible] conditions have caused exponential growth in the [illegible] in the last 5–10 years."

Although the process of producing new ambulances contains numerous regulations, requirements and standards that must be met by a first stage ambulance manufacturer, there are few to no standards required for an ambulance [illegible] remounted ambulance.

"A [illegible] ambulance is a hybrid product," says Fred Schimmel of the Ambulance Manufacturer's Division (AMD) technical committee. "It consists of a used patient compartment that has outlived its original chassis platform, and has been mounted on a new chassis for a renewed life cycle. A new remounted ambulance is exempt from the KKK-A-1822, CAAS GVS and NFPA ambulance standards."

PROJECT KICKOFF

On June 7, CAAS GVS kicked off its project to develop a new remount standard by convening an Ambulance Remount Forum in Charlotte, N.C. "No one really knew how large the remount business was," says Van Arnam.

"We decided to get everyone in the same room and have [illegible] conversations about the industry." GVS sent out invitations to final stage manufacturers, remounters, EMS providers, regulators and equipment vendors.

"Registration for the meeting grew so fast we had to find a bigger venue," said Van Arnam. "We wound up with over 175 people who had interest in the remount process and attended the meeting."

As part of the registration for the meeting, CAAS GVS polled the remounters on the number of annual ambulance remounts they were doing annually, Van Arnam says. "We were [illegible] surprised to find that the number of remounts performed annually was approximately equal to 25% of the total number of new ambulances manufactured in a given year. One state regulator who attended the meeting stated that 7% of the new ambulance registrations in his state last year were remounts. This is clearly a high growth segment of the market."

FEDERAL STANDARDS & PERSPECTIVES

As federal partners in the CAAS GVS project, representatives from the National Highway Traffic Safety Administration (NHTSA) and the Department of Homeland Security (DHS) attended the forum.

Through the course of the presentations, it became very clear that there are, in fact, numerous and detailed requirements mandated on a federal level for both remounters and remounted ambulances.

Coleman Sachs, chief of the Import and Certification Division of NHTSA, discussed the [illegible] requirements of the Federal Motor Vehicle Safety Standards (FMVSS) and specifically how they apply to ambulance remounters.

"An ambulance body remounter is a final stage manufacturer," stated Sachs. "When a new cab is used in assembly of a truck, the truck will be considered newly manufactured for purposes of FMVSS."

Sachs went on to say, "As a final-stage manufacturer, a remounter has the legal responsibility for all certification-related duties and liabilities under the Vehicle Safety Act."

Many of the requirements were outlined, including the fact that the ambulance body remounter must be registered with NHTSA and comply with all applicable provisions of the federal standards. The remounter is required to affix a certification label to every vehicle that states that the vehicle complies with all applicable FMVSS regulations on the date of manufacture, and provides detailed information about the vehicle.

The remounter is also responsible for any safety-related defect or noncompliance with FMVSS in the components or equipment it adds to or introduces into the vehicle as a result of the work it performs.

Over the course of the meeting, it became apparent that although final stage ambulance manufacturers attending the meeting were familiar with the FMVSS requirements, some of the remounters weren't familiar with them.

Jim Green of the National Institute of Occupational Safety and Health (NIOSH), a familiar face among EMS circles, provided an update of the new test methods for ambulances published by the Society of Automotive Engineers.

Steve Spata of the Association for the Work Truck Industry, and Alex Iowa, of Ford Motor Company's Qualified Vehicle Modifier certification program, provided attendees with details on many of the requirements for multi-stage vehicles as applies to ambulance remounts.

Mike Berg of Virginia's EMS Standards [illegible] the position of both the commonwealth of Virginia as well as the National Association of State EMS Officials on ambulance remounts. Berg and Ken Holland from the National Fire Protection Association (NFPA) also presented a status report on their remount standard project.

John McDonald, a representative from the General Services Administration as custodian of the KKK Federal Specification for the Star of Life Ambulance, shared several details on ambulance compliance requirements with respect to the KKK spec. He noted that the KKK ambulance review [illegible] and often includes changes from year to year. He made it clear that [illegible] ambulance has [illegible] chassis change and the VIN number is no longer the same, the original Star of Life certification that may have been on the vehicle is no longer valid.

CREDENTIALS, PROCESS & PRODUCT

There are scores of issues that the GVS group will have to take on in order to develop an effective remount standard, including:

- >> Determining how to deal with chassis model year related provisions of FMVSS that apply to the patient compartment (door latches, seat and belt [illegible]) on a patient compartment that [illegible] has been [illegible] new model chassis [illegible] FMVSS 206 door [illegible] changed in 2007, and [illegible] 207/210 [illegible] changed in 2008.)
- >> Customer requests for changes in seat configuration from the original design and how to meet rigorous FMVSS requirements for installation of new seating positions.
- >> Requests for the addition of new SAE safety features in older generation patient compartments.
- >> How to relate KKK/AMD/GVS-type certification requirements to an individual remounted ambulance. These certifications all require original testing, which includes some destructive testing, for product line certification and is performed by a third-party lab.

In addition, it appears that the GVS remount standard project may have to address some issues never before addressed by a new vehicle standard. Builder credentials, such as product liability insurance coverage, process issues such as engineering analysis and standards compliance, as well as specific testing criteria of the [illegible] and product may all be [illegible] in order to put together the pieces of a comprehensive and effective remount standard.

> 'The ambulance remount business & process is complex, with numerous moving parts.'

MANY MOVING PARTS

"The ambulance remount business and process is complex, with numerous moving parts," says Van Arnam. "In my opinion, the development of remount standards will be more difficult than our GVS V1.0 standard project for the new vehicles."

JEMS Editor-in-Chief A.J. Heightman says that committee members he has spoken to are aware that the new standards will require some modifications to the existing patient compartments and that the safety of the crews and patients must be [illegible] in the [illegible] requirements.

"We believe that all parties have agreed that changes are warranted or needed and some of these changes that relate to crew and patient safety will likely be incorporated into the new remount requirements," Heightman says.

As the next step in their project, GVS announced the formation of an Ambulance Remount Work Group. This group will have the assignment of developing recommendations for remount standards and submitting them to the CAAS GVS committee within the next 12 months for consideration in the V.2.0 version of the CAAS GVS, currently scheduled for July 2019.

Those interested in participating in the CAAS GVS Remount Work Group are invited to submit their information on the GVS website at www.groundvehiclestandard.org. EMS

Coleman Sachs of NHTSA addresses group on federal requirements for remounters. Photo courtesy Mark Van Arnam

Remounts

- Remounting of ambulances has grown exponentially in last 5-10 years
- Estimated to be 3 times more Remounters than new ambulance manufacturers
- Estimated number of remounts is equal to 25% of total new ambulance production
- No regulations for Remounters or remounted ambulances

Remounts

- Remounted ambulances are currently exempt from KKK, GVS and NFPA standards
- ALL FEDERAL MOTOR VEHICLE SAFETY STANDARDS (FMVSS) THAT ARE APPLICABLE TO NEW PRODUCTION AMBULANCES ALSO APPLY TO REMOUNTS
- NHTSA and FMVSS require Remounters to comply with same standards as new vehicle manufacturers
- A remounted ambulance is considered a new vehicle

Challenges of a Remount Standard

The KKK certification of the original vehicle is not transferable once the VIN of the chassis has changed, and the sticker is no longer valid.

- How do you relate KKK/AMD/GVS type testing certification requirements to an individual used ambulance?

Challenges of a Remount Standard

Some of the FMVSS requirements do apply to the patient compartment and are model year related.

- FMVSS standards for door hardware/retention and seats/seat bases in the patient compartment do change periodically, and are based on the model year of the vehicle (chassis).

Challenges of a Remount Standard

All patient compartment seat locations must meet rigorous FMVSS testing and certification requirements.

- How could a Remounter comply with a customer request for changes in seat/seat belt configurations from the original design?

Challenges of a Remount Standard

How can a Remounter meet potential requirements for addition of some of the new SAE safety features in an older generation patient compartment?

- Some of these features could possibly be add-ons, while others likely not. Integration into an existing body could require extensive engineering, design and rework.

Challenges of a Remount Standard

What type of credentials should be required of a Remounter?

- FSAMs are required to meet significant regulations, requirements and standards. They generally have significant product liability coverage, engineering resources and testing protocol.

Remount Work Group

- Will meet three times in next 9-12 months to prepare recommendations for CAAS GVS Committee to consider for remount standard inclusion in GVS V2.0.
- Meeting dates and locations will be posted on www.groundvehiclestandard.org.

CAAS GVS endorsements

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GROUND VEHICLE STANDARD for AMBULANCES

Future plans for CAAS-GVS

- V1.1 to include latest SAE test methods – late 2017
- V2.0 revision July 2019
- V2.0 to include standards for Remounts
- Pediatric standards for patients and passengers to be considered as they are developed

2015	2016	2017	2019
• **KKK CN#8** • *Cot/mount* • *Seats*	• **KKK CN#9** • *Eq. Restraint*	• **KKK CN#10** • *Cabinets* • *Body* • *Floor* • *Excursion*	• Remounts • V2.0

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Ground Vehicle Standard for Ambulances

v.1.0 Edition

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