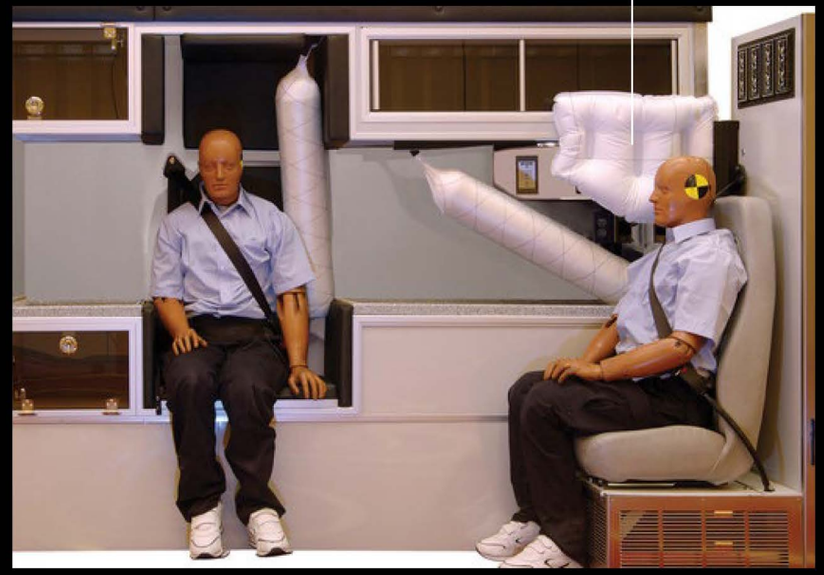
Currently Ambulances are not required to undergo crash tests; manufacturers cite prohibitive costs for why they don't do them voluntarily.

Some 3rd party organizations have conducted crash tests and found several dangerous areas around the patient compartment. Here we can see a medic in the side chair concussing against an overhead compartment.

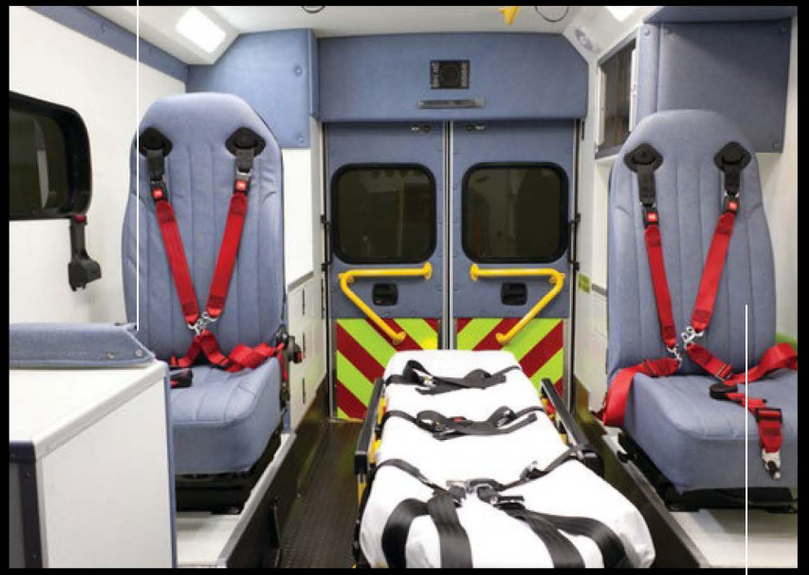
Medics in the standing position suffered neck, spine, and hip injuries from being flung across the patient compartment.

But, Incrementally, improvements are being made:

Some companies are incorporating airbags where common impaling injuries occur, particularly around overhead cabinets.



Elimination of overheard compartments reduces opportunities for head-strike injuries. More safe, front-facing "Captains chairs" are replacing standard benches, incorporating 4 and 5 point harnesses.



Medics opinions are mixed, but many still do not buckle up, nor do they like the reduced storage and workspace that the benches provided.

Blinkers and break lights visible from inside the box, to give EMS workers indication of the driver's intentions.

Small changes still following the "tacked on" method of improvement.

What degree of safety should be achieved?

Currently the seatbelts in the front of the ambulance are rated to withstand high forces

26,689 = 6000

Newtons (unit of force) — Pounds of force

Aiming for equivalent numbers could bring safety standards up to be on par with the rest of the unit.

How to achieve that level of protection?

Materials with breaking strength over 6000 lbs

Using proven existing methods and mechanisms

How to ensure medics will use it?

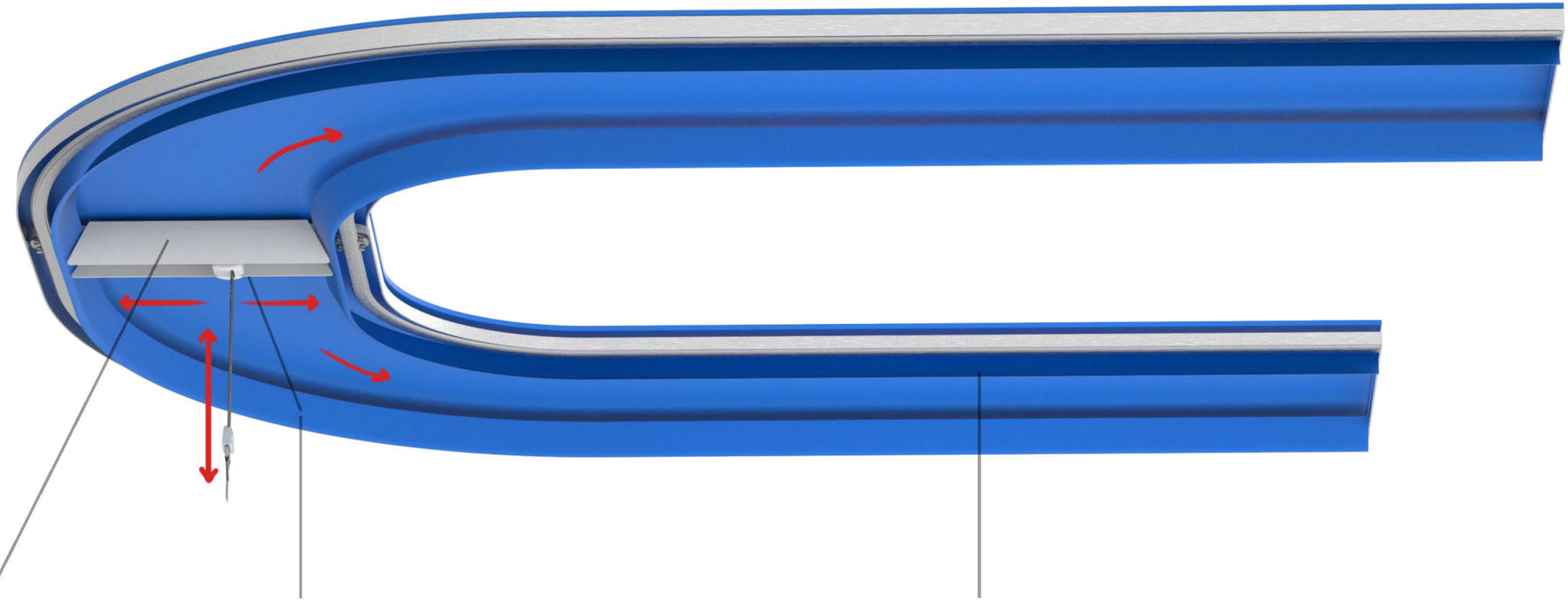
Constant checking in with the users and their values ensures that a collaborative design is achieved- a solution they help build will be more likely to fit their needs and be easily adopted.

Solution: A two-part harness + rail system

The Rail System

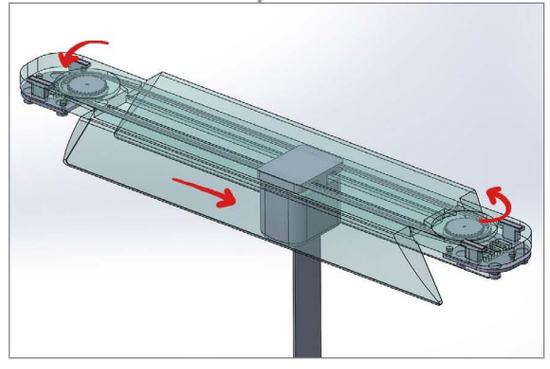
Movement

Movement of the rail system was very important: The system needed to glide with the user without too much resistance as they moved around the patient compartment to prevent accidental locking response and frustration on the medic's part.



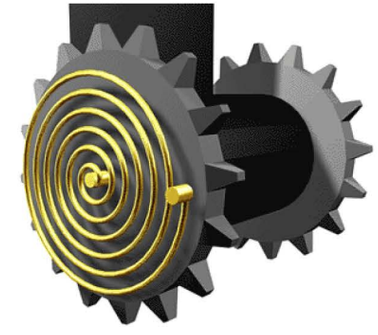
Linear sub-track

Un-tensioned gears and chain arranged as a pulley system, passively being pulled along with the medic's movements



Center spool

The extension and retraction of existing seatbelt mechanisms: a spool and a spring that controls the rotation force, or torque as the spring is deformed (Harris, 2002).



U shaped track

Rail and V-ball bearing system that can navigate both curved and linear paths: female v bearings positioned on opposing sides of a middle track.

The Integrated Harness

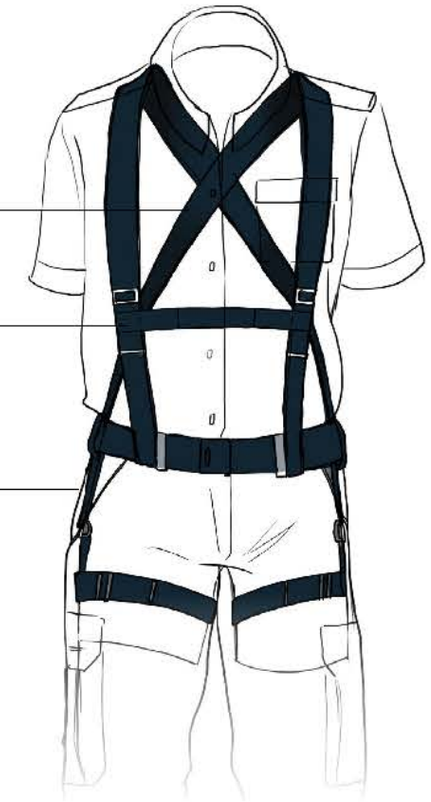
An on-person harness built into the medics' uniform that buckles into an overhead rail system and secondary clip. The advantages are that it is not something "extra" the medic must put on in the morning, and the rail system is out of the way while allowing a greater degree of freedom than conventional seatbelts.

It needed to be integrated into both a shirt and pants element for easy donning, while still being secure as a single unit to dispel force in the event of a crash.

Thinner padding to reduce bulk of shirt

Less bulky adjustment and connection points

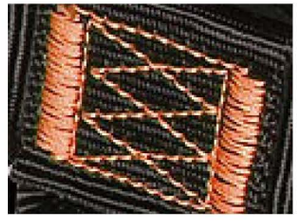
Not a onesie; not something else that the medics need to remember to put on.

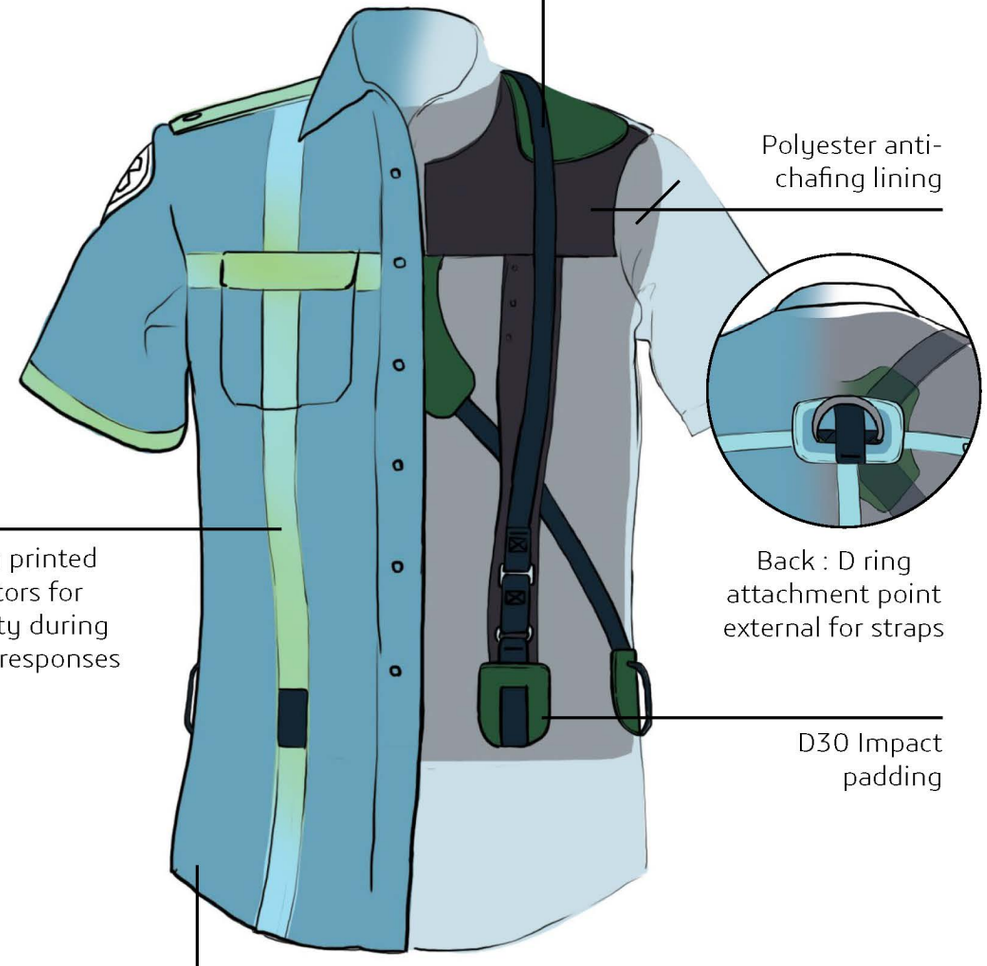


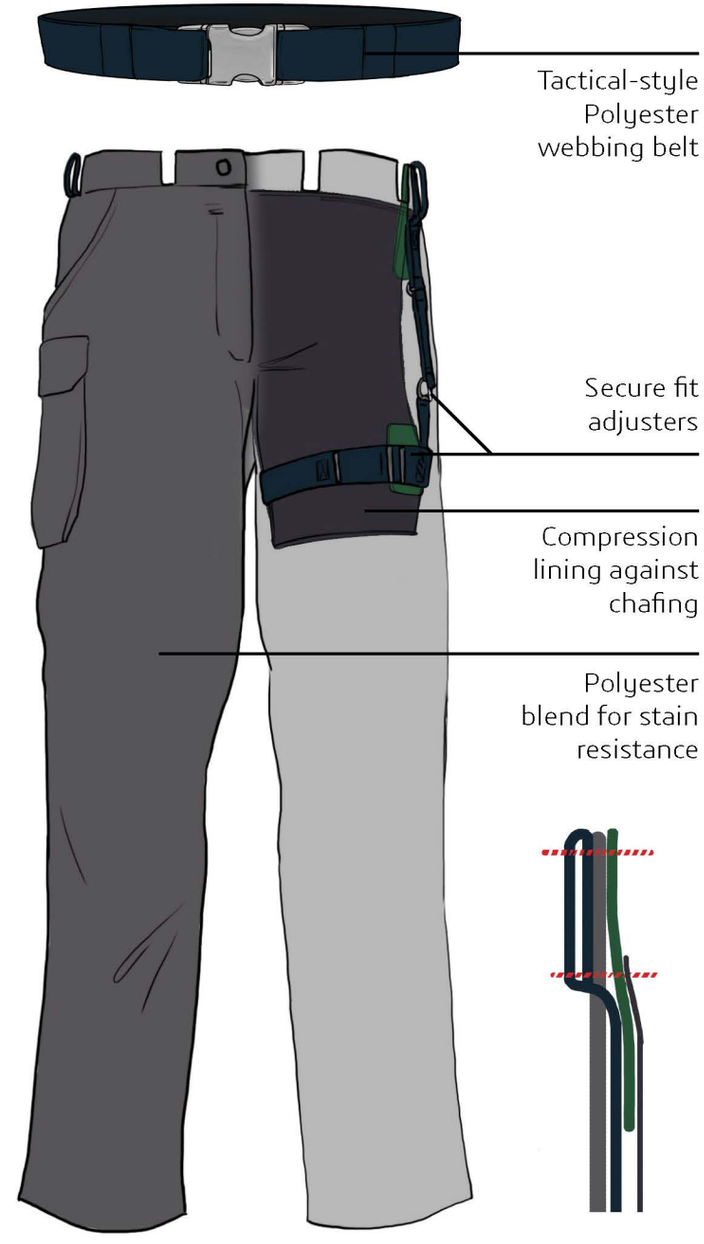
Uniform Construction

The layers of the uniform were carefully considered based on what needed to fit snugly to the body, and what the users preferred to stay loose. Careful consideration of materials and taking into account users' aesthetic preferences were important as well.

Inspiration was taken from parachuting, climbing, and fall harnesses: using tried and true methods of stitching and construction that have been proven to withstand equivalent forces.







Storage must be moved to make room for the rail system, but that also eliminates the possibility for head strike.

The cardiac monitor is in a position where it can be seen at any angle within the compartment, and is now mounted to prevent becoming a projectile in the event of a crash.

More seating-level drawers means less instances where the medic must stand to retrieve supplies.

Additional Patient Compartment Considerations