

New Ambulance Design Aims to Improve Safety

By Susan E. Sagarra

A new ambulance is helping deliver emergency medical care in a manner that is intended to improve safety for patients as well as providers, increase efficiency during patient care, decrease supply costs and provide better communication with hospital staff.

The ambulance is a working proof of concept using a beta version of Ferno's new modular iN|Traxx component set. The ambulance was built for Pulaski County Ambulance District (PCAD) in Missouri through a collaboration between Ferno, Osage Ambulances and PCAD Deputy Chief Mike McCart.

The custom-designed ambulance was delivered to PCAD in late February. The ambulance is built on a 2014 Mercedes Sprinter chassis. The focus is on three main components: safety, efficiency and technological intelligence.

McCart wanted a better way to carry supplies, make the supplies more accessible and control inventory of supplies to cut costs.

"We have thrown out thousands of dollars of supplies because providers come back from a call and replace the supplies they used, throwing them into the cabinet in the front," says McCart. "The supplies don't get rotated and then they expire. We needed a way to reduce inventory and rotate the supplies more easily and efficiently."

McCart, who previously was in the military, had created his own version of a soft-sided supply kit. He approached Ferno to purchase its military track system, which he had seen in use with Ferno's military field medical equipment, to hang the bag. He didn't realize Ferno was at work commercializing its military system.

Ferno's new Ambulance Systems Division was working in cooperation with NIOSH and the AMD studying what happens to ambulances in a crash. The testing started with seat belts for providers but the industry ended up learning much more about the safety of the entire ambulance.

"Among other things, crash testing showed that at just 30 mph, providers and patients can be severely injured with existing layouts," says Tim Schroeder, director of ambulance systems for Ferno. "It reinforced that we needed to find a way to keep the medics safely belted and restrained, while having access to the patient, supplies and equipment. During a crash event, we need to

Smaller items, such as an IV bag, can be hung on clips and secured into the tracks that run along the ceiling of the ambulance.





Pulaski County requested a forward-facing seat instead of the typical side bench seating for more safety and better access to the patient and medical supplies.

keep equipment and supplies from becoming projectiles in the back of the ambulance. It's common in the industry to have devices and providers unrestrained (a study by Montana State showed that medics use seat belts just 2.6% of the time).¹

There are approximately 4,500 ambulance crashes reported in the U.S. each year,² but the number is likely higher because of the accidents that go unreported.

"While performing our field studies, we witnessed many types of calls. Critical patients often have lots of lines and leads going in different directions. Providers struggle to move around the ambulance to get their supplies without ripping 12-leads off patients' chests, oxygen, IV lines, etc. Monitors are often out of reach, so the 35-lb medical devices end up sitting loose on a bench," says Schroeder. "The interiors of some ambulances are so large, we are forcing providers to be unrestrained so they can access the patient, supplies and equipment."

"As an EMS equipment provider, we're taking a comprehensive approach to improve the back of the ambulance," Schroeder says. "Priority No. 1 is to improve patient and provider safety. The second priority is to increase efficiency with supplies and how they are arranged to improve patient care. The third priority is to provide meaningful decision support tools to aid the provider with the use of on-board electronics. This is the foundation of our Integrated Patient Transport System (IPTS)."

Schroeder says Ferno's IPTS consists of four major platforms: the patient (cot); provider (seating and restraints); environment (space around the patient and providers); and intelligence (communications, monitoring and reporting for all vehicle systems and equipment, and for the support of safe driving behaviors).

"Future ambulances will be designed to keep the provider safely seated and restrained while providing access to their patient, supplies and equipment. They will be modular so they can be quickly reconfigured and optimized for each mission. They will be crash-stable and more automated so that providers can remain focused on patient care," says Schroeder.

For PCAD, soft-sided iNTraxx SafePak movable supply bags have replaced hard, fixed cabinets. The supply bags, along with monitors, oxygen equipment, IV tools, laptops, stretchers and work trays, are hung on a tiered iNTraxx track system along the interior sides of the ambulance. All of the equipment is secured in iNTraxx equipment mounts and can be rearranged within moments, depending on the needs of individual calls. For example, PCAD

Oxygen tanks are easily accessible for the medic who is seated behind the patient's head when airway treatment is required. All of the airway equipment is stored in the same area of the ambulance.

Several soft-sided supply bags and monitors are easily moved around the ambulance on the tracks, based on the needs of each call.



PCAD Vehicle Features

Specifications on the ambulances can be altered to meet the needs of each agency. The following are some highlights of the PCAD vehicle.

- Each pouch in the SafePak supply bags is removable and interchangeable with other bags. The pouches are clear, making it easy for the providers to see what is inside. The pouches shut with a self-closing magnet. The pouches also are easy to wipe down. Additionally, the pouches help cut down on having too much inventory in the ambulance.
- The supply pouches can be hooked onto the iNjX cot.
- Large items such as monitors, suction and IV pumps can be secured into the track with equipment mounts. The mounts also have a quick-release feature so they can be easily taken on-scene.
- PCAD is waiting for delivery of two of Ferno's new iNjX iNtegrated Patient Transport & Loading System that can load into and out of the ambulances without lifting. The cot also can crawl onto porches and climb over obstacles such as highway Jersey walls.
- The iNjTraxx system has been designed to meet the new SAE requirements for ambulance litters and equipment. This includes the fastener for the Ferno iNjX and other Ferno cots.



The view from the back of the ambulance of the patient cot and the seat used for a paramedic performing airway treatment.

has a pediatric-specific supply bag that can be pulled into place when needed.

The bench seat has been replaced with a forward-facing seat adjacent to the patient cot. The seat can be built to face forward or sideways, but for maximum safety McCart wanted it to face forward. Pulaski providers are required to be restrained in the seat, which can be moved forward or backward as needed, and the patient and all supplies are within arm's reach. McCart says the best feature is that the attending provider can have direct eye contact with the patient during treatment on the way to the hospital.

"Current ambulances have squad benches, and the 'box' on the chassis is so big that medics can't do their jobs if they are properly restrained," Schroeder says. "But if they get up and are moving around in a speeding vehicle, going through intersections and potentially having an accident, they are vulnerable to injury or worse. With this system, supplies can be relocated within reach of the provider and safety is improved because equipment and supplies are crash-stable to SAE J3043 when locked into place. The supplies and monitors are secure, the medics are secure and the patient is secure. In the event of an accident, heavy objects won't go flying, and providers won't hit their heads on cabinets."

McCart says the comprehensive approach to the ambulance is ideal for his agency, which is in a rural setting.

"My crews are used to having to work in the back of the ambulance," McCart says. "The closest hospital



Pulaski County Ambulance officials requested a storage cabinet in the back of the ambulance. Items such as the military-style stretcher can be stored here until they are needed and swapped

out with other supplies in the working section of the ambulance. The military-style stretcher can be added to the side-tracking system when it is necessary to transport two patients. Also shown are the track and the movable devices into which supply bags, monitors and the stretcher can be hooked and locked.

for us is 30 minutes away (Pulaski County does not have a hospital). I want the time that my providers are standing in the back of the truck minimized. This is the de-lethalization of the back of the ambulance."

Schroeder says Ferno plans to deploy at least three more vehicles this summer. The United Kingdom will receive Vehicle No. 2 while Canada will receive the third and France will receive the fourth. Schroeder says that services in numerous other countries have expressed interest in the IPTS as well.

"(PCAD's) is the first vehicle of its kind in the world and it's still in the development and testing stage," Schroeder says. "We're working with Mike and his staff to see what needs to be adjusted or changed before it gets to market, hopefully this fall. It's the perfect place to do the testing. Pulaski County has been great to work with and Mike is a passionate, innovative guy. He's leading the way and he really cares about safety. We have a good rapport and we all are learning a lot. And others will benefit from this innovative approach." 🌟

References

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