Advanced First Responder Vehicle Design

THE PROCESS TO ENGINEER A CROSS-COLLABORATIVE FIRST RESPONDER VEHICLE OF THE FUTURE
Our Vision

After attending several trade shows and seeing the technology offered by multiple vendors, a common problem became evident: No two vendors ever collaborated on any technology item to showcase the integration or collaboration potential of their products.

For example, Chevrolet would debut an advanced computer mounting system manufactured by one of its technological partners, while Ford would highlight a new light bar, and at the same time, Tesla would showcase an all-electric “police car” for attendees to see.

Instead of viewing these advances in silos, we set out to evaluate the best technological achievements available, wipe the slate clean of what we knew a first responder car “should” do, take a fresh look at what it “needs” to do, and create a collaborative, all-inclusive product.

Many first responder agencies simply refresh their past orders when new cars arrive, updating equipment so it mounts properly in the newest edition of whichever vehicle they select. Often this is done out of necessary haste, because public sector money needs to be spent in a timely fashion. While we are not advocating a wholesale change to the system, we do want to encourage more critical thinking during the process. A public entity can still build out its vehicles however its standard business operations dictate; however, we hope to show that when time, budget, personnel and other factors allow, municipalities can change the way they see technology and leverage that new approach into creating more effective emergency response vehicles that maximize safety and economic efficiency.

—George Barlow Brown, Communications/IT Section Chief, New Orleans Office of Homeland Security and Emergency Preparedness

—Capt. Adam M. Brickeen, Tactical Paramedic, NOHSEP EMS Liaison, New Orleans EMS
**Departmental Collaboration**

As it would with an emergency operations center, the New Orleans Office of Homeland Security and Emergency Preparedness (NOHSEP) assigned liaisons from each of its first responder entities—police, fire and emergency medical services—to the vehicle initiative.

We focused on EMS for this project for a simple reason: EMS needs to transport the most “stuff.” An ambulance offers a massive body and transporting capability, so streamlining an ambulance was not our goal. Rather, New Orleans EMS has shift supervisors who respond in a “sprint” capacity, often arriving on scene first and beginning treatment before an ambulance arrives. We wanted to reinvent the vehicle these supervisors use to better accommodate their requirements.

A supervisor can carry upward of 10 items in a car. This equipment typically occupies space beyond the rear cargo area. Items include active shooter kits, cardiac monitors, paramedic bags, an O₂ tank, rapid diver kits and incident command kits. As you can imagine from the list, while many might look at a larger vehicle, we wanted to incorporate all of this into a package that was manageable, organized and, quite frankly, smaller. We believed this would save the thousands it would cost to get a bigger vehicle to accommodate our planned additions.

Each supervisor also has a vast amount of administrative duties to perform during each 12-hour shift. Minimizing clutter and congestion inside their mobile office was a key objective.

As we began to examine the role of the initial EMS responder, we saw cross-collaboration into the world of incident management, where that first-responding supervisor vehicle could relay information from a mass-casualty incident—information that could be vital to the treatment of patients and management of the incident. This scenario spawned new ways to think about vehicle lighting, camera placement and even the equipment that should be transported.

Our mission was to design a cross-collaborative first responder vehicle of the future—the kind of car that’s advanced today but in a few years will be the industry norm. We wanted to showcase that this future vehicle won’t need to wait 10 years—it can be done in a few months. This gave us goals, objectives and a direction to begin to outfit a vehicle so advanced, it came during our build process to be known as the “Batmobile.”

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**Why We Must Embrace Technology**

Technology can streamline workflow in many ways. It can help decrease response times and speed the transmission of data. Technology growth allows us to constantly upgrade the physical footprint it leaves behind, thereby constantly changing “normal.”

All around us technology influences our daily lives. Tesla Motors has an all-touchscreen display for a center console; Apple has a watch that’s paired with a phone; and computers have drastically changed shape and purpose in just the past 10 years.

We always ask ourselves one question before every purchase: What is newest and coolest technology for our task? Through research, we compared the cost of new technologies to current purchasing and industry standards and discovered that, ironically, the newer technology is not always the most expensive.
Vehicle
We had to make a choice: Should we push the envelope and attempt to place newer technology in the current supervisor vehicles used by New Orleans EMS, or should we really think outside of the box and change the size of the vehicle?

EMS responders carry a lifesaving array of products, devices and items for patient care in their vehicles. They need these to do their jobs, but they also have to be comfortable. It would have been easy to stick with what New Orleans EMS was using, the Ford Expedition, but any large city is filled with narrow streets and traffic congestion, and bigger is not always better. So we scaled down in size, choosing the 2016 Ford Explorer Interceptor Edition for our prototype.

The Interceptor Edition is minimalist in design and built to accommodate additional technology, specifically in the center console area. In contrast, the Expedition comes as a standard vehicle, without much room for modification, an obstacle we’d have had to work around.

The choice had a benefit we hadn’t anticipated, and that was cost. We instantly saved thousands by choosing the smaller vehicle! We knew we had overages that could be applied to purchasing new technologies, but we were confident our initial vehicle choice and the savings associated would outweigh the small additions we were making.

EMERGENCY LIGHTING
Lighting a vehicle properly is vital for response times and avoiding accidents. Emergency lights have been shown to actually attract and create additional collisions with tired and drunk drivers. Red lights historically pull people because of their color, and blue lights can do the opposite.

Looking at the average emergency vehicle, it is easy to think, There are too many lights. Historically, an emergency light consisted of a bulb, a colored-lens housing and a mirror that circled the lit bulb, shining light 360 degrees so the vehicle could be seen from all directions. Just a decade ago, police cars still used this technology.

Modern LED lighting is a directional-based light. LEDs are incredibly bright and can change patterns easily, thus drawing attention. But this directional light works only in the direction it faces, which is why emergency vehicles need lights on all four sides. Consequently lights get mounted to the bumper, inside the current OEM lights and even in the grill.

The Value of Trade Shows
If you’re not attending trade shows, you’re doing yourself and your agency a disservice. Trade shows are the home of emerging technology, and shows like those hosted by the International Association of Chiefs of Police (IACP) and EMS World Expo target technology towards emergency responders. Public sector sales, especially for first responders, are about volume over changing the market. They know your vehicle product lines, they know the types of mounts you use, and this means they know they will sell 100 widgets when 100 new cars arrive.

Go to trade shows. Go see the emerging technology. Challenge the salespeople on what they sell, and find out why they’re not pushing the limits with their product lines to meet your needs.
If we were going to create a vehicle that could also serve at a mass-casualty incident, we needed a new type of lighting, one that would illuminate in all directions and not just create annoying patterns. Police cars have “take-down” lights that light up the forward portion of the vehicle. These are to illuminate the scene or suspect for officer safety. Why can’t this white light also be used for officer assistance? We knew we wanted 360-degree lighting and, through research, discovered a more effective light bar than what we were using, one that could provide 360 degrees of high-intensity LED lighting. We can now fully illuminate a mass-casualty incident, allowing us to provide better patient care.

This new advanced light bar allows us to create custom patterns and appropriate lighting for scenes, pursuits and even stationary situations, and avoid annoying the public with lights in their faces all the time. Moreover, this new light bar is narrower, brighter and more cost-effective than what our baseline vehicle originally featured. We added purposefully placed lights to increase visibility and responder safety.

**RADIO COMMUNICATION/INTERNAL SWITCHES**

Inside any first responder vehicle, you will find a bank of switches. These are carefully chosen and placed for reflex muscle memory. Responders do not want to have to look down and read labels on switches, certainly not while driving. Unfortunately, most products come with their own switch. Lights get a light bar panel, radios get their own interfaces, and sirens usually need their own as well. Sometimes the lights and siren get paired up, but even then one is left with a multitude of switches.

Looking at a current police car, for example, you typically see at least three sets of controls. Each of these is needed for a particular task, but moving your hand from one to the next and possibly to a third means less time with both hands on the wheel, and this takes away from safe driving.

We needed to make this process better and safer. A product actually exists that takes all of the switches and combines them into a single platform: the Motorola O9 Control Head. This product requires a third-party component to make all the connections for the lights, siren and radio work, but for the sake of streamlining, hiding another junction box under a seat is easy.

Choosing this product provided an array of communications advances that work with the new radio and also operate the lights and siren as well as any electronically controlled locking device. Coiled hand-held microphones are a thing of the past. This new control head allowed us to choose a specific radio that could pair a Bluetooth microphone and get a signal up to 300 feet from the vehicle. Just imagine a 300-foot coiled cable following someone around!

This choice gave us the ability to accommodate two forms of comms for any user. The radio on the hip is primary, and the secondary use could be retrofitted to anything a responder or officer may need: communication to the hospital, direct talk to the police department, or even to mutual aid resources. Suddenly our mass-casualty vehicle had critical communications abilities, and we didn’t even mean for it to happen!

The radio, Motorola’s APX 7500, solved all our communications needs. We primarily work on the Louisiana Wireless Information Network (LWIN) through our Motorola product line. We have a tier II Harris system for failover for all public safety, which is the primary system for all of our non-public safety agencies. Finally we
maintain connectivity as required by the state to the HEAR (Hospital Emergency and Administrative Radio) radio system via VHF.

We also discovered that by choosing the control head, we freed up real estate in the center console. We went from occupying 21 inches of switches to just needing 9 inches. With this newly free space, we decided to introduce a lock box for safekeeping narcotics. If you take off the EMS hat and put on a police one, that box can be a gun locker or compartment for holding evidence or anything else you need to keep secure.

**DECALING AND LOGOS**

We needed the vehicle to fit into the current New Orleans EMS fleet, so we did not want to stray too much regarding its visual appearance. Rather we sought to modernize how decaling plays a role in response safety.

The current NOEMS vehicles, as shown top left, have a Z shape on the door in reflective white striping, the EMS badge on the door and the caduceus on the back window. Unit numbering and further decaling existed, so we wanted to match. We wanted to make sure the car appeared to be the same at first glance, without a big difference in terms of the change in model. The biggest hurdle was space on the glass for decaling. We also wanted to create an alternative to rear-facing reflective chevrons.

In the 1990s the United Kingdom began to standardize reflective chevrons on vehicles to deter rear collisions. Years later in the United States, fire standardization called for the same chevrons, and by association EMS embraced them as well. Today chevrons are everywhere on vehicles, even nonemergency vehicles, based on the same idea of safety.

Essentially we wanted to improve on this idea without sacrificing the safety aspect of the chevrons. Once you put white chevrons on our car, which is blue, they arguably competed with the lettering. The current vehicle has the words but also a much larger space for lettering, allowing larger characters.

Ghost decaling is becoming more and more prevalent. This involves color-matching reflective decals to a vehicle so they are only visible when light reflects off them. This type of decaling enhances any words needed to be shown for daytime operation. It also clearly identifies the vehicle to the public. We feel this bridges the gap between the normal patterns associated with accident deterrence and overall vehicle appearance.

**COMPUTER/MOBILE DATA TERMINAL**

Current EMS ambulances and supervisor vehicles utilize two computers to do two separate jobs. In the ambulance there is one computer in the front for dispatch needs and a separate laptop for patient records and documentation. In supervisor vehicles there is also one PC up front and a tablet for patient records and documentation. However, this is either a ruggedized laptop on a permanently fixed stand—which takes up significant space and also can become a projectile in an accident—or a PC hard-mounted into the dashboard, which arguably removes many of the OEM functions of the vehicle.

Just within the last two years, Tesla Motors has changed the interior of cars. In addition, many aftermarket companies make adapters to mount tablets into vehicles for personal use. Conversely, because of the historical hard mount or stand-mounted process in emergency vehicles, real estate is limited, and core functions of
the vehicle are often impeded. Why was it so far-fetched to think the former could be adapted to emergency vehicles? Tesla did it—why couldn’t we?

Our hurdle became the operating system. We needed a Windows OS PC, not a tablet, as our core applications are PC-based. This led us to look at the path of a remote, or wired, screen to mount in the dashboard. While just as logical as a third-party mounted tablet, it was not cost-effective.

Havis makes a product called the Integrated Control System (ICS). This product is an Android tablet by design, but software allows it to accept a video input. By simply pressing one button, the device displays the input the user chooses. The ICS side of the OS has software to allow you to use the basic features of your car: radio, air conditioning and even a backup camera. Fortunately for us, the center console is designed to work with the ICS and has a clean look. We now have full OEM features, our special needs are met, and we are not blocking any air conditioning vents with mounted equipment. Above all, occupant safety is preserved because nothing is mounted that could become a projectile in an incident. No modifications block the air bags!

With this solution, we decided to consider actual PC needs. We knew we needed a PC that was rugged because it would be in a car, but also because of our need to keep the cab clean. Mounting solutions in new locations allowed us to tone down the military standard ratings to which agencies traditionally adhere. PCs you can roll over with a car, drop from multiple stories and even subject to extreme temperature changes have become the industry norm. We challenged the need for this mil-spec rating. With the advent of solid-state drives, fanless PCs and tablets, was mil-spec still a standard we needed to adhere to? Tablet manufacturers even make mil-spec tablets. This makes sense, if the device is to be mounted in the front of the vehicle, for normal wear and tear, but why does this have to be the norm, especially if we are using the ICS?

We looked around the car and discovered the rear wheel fender housing inside the back of the car was largely empty and already had wiring passing through. By way of explanation, we could find no manufacturer that would allow the mounting of the tablet without interfacing that device, because the traditional assumption is that the tablet is the interface. We knew we wanted a tablet, but we did not need it exposed because we wanted to challenge the traditional use and setup of the PC system.

Through research and on-the-job experience, we found the Microsoft Surface Pro 4 to be one of the best devices on which to perform administrative
operations, as well as our necessary field work. We simply outfitted it with a ruggedized case enclosure to protect it. We were able to do so at a cost that was one-third that of the ruggedized PC. The end product not only accomplished the same workload, but also excelled in our specific office and administrative environment.

We took this PC, the ICS and the newly discovered location for mounting and had a custom mount created in the rear wheel fender housing. This allowed us quick access to the PC. The PC was strategically placed in the rear of the car for functional reasons as well. Imagine the paramedic responding to his or her call. They get dispatched, see the info on the ICS, arrive on scene and go to the rear of the car for the medical equipment. Based on its rear placement, the paramedic quickly detaches the PC, which now becomes the patient entry portal until the ambulance arrives. There’s no more returning to the car to read what’s on the screen, because the screen leaves the car with the paramedic!

This new configuration also enhances capabilities for daily administrative tasks. Each paramedic’s desktop computer, which is a tablet, is now the screen in the vehicle. Previously medics had to bring their laptop to their shift, as well as use what was mounted in the car. Imagine Outlook in your dash and not on your phone. People want to respond to e-mails, so by taking this urge away from the phone and presenting it full-screen, the paramedics can do office work while parked, increasing productivity through efficiency.

Havis supplied the keyboard mount and stand, which mounted in a low-profile design to the center console and positioned out of the way, thus posing no hazard to the occupants. The Microsoft Surface power brick, mounted below the PC in the rear of the car, accepts all of the necessary USB, video and networking inputs, and the single magnetic plug attaches to the Surface to make all devices connect.

We believe we have managed to ruggedize components in order to ensure their longevity while also reducing the need for rugged equipment because of the chosen location for mounting. This unique overall solution is one Havis makes for several models of cars, and multiple companies make tablet mounts that can be mounted in the trunks of police cars for safekeeping. However, we needed one that was accessible and didn’t take up a significant amount of space, so we created our own with the help of Crescent City Decal, the same company that did our decaling.

**LTE-ADVANCED COMMUNICATION AND FIRSTNET BAND 14**

In regard to communications, our overall objective was simple: high-speed Internet, the ability to share our connection, and seamless and secure connectivity back to our internal city network for document access. Applying these needs to the mass-casualty incident from earlier, one can see how our vehicles now have the potential to be core in-field assets. Ensuring a constant, secure and high-speed virtual private network (VPN) connection back to the city of New Orleans’ network will essentially allow our employees to recreate their office environment and use all their normal applications from these enhanced scene-response vehicles.

While the market is saturated with proven mobile products, we wanted to push the limits of device capabilities to demonstrate our ability to deploy advanced, high-performance vehicle technologies to support our first
responders. We needed a ruggedized solution with advanced features that could handle our network demands.

While we will use only a single carrier network initially, we opted for a multinetwork, future-proof communications solution that will support FirstNet Band 14 for public safety. This got us ahead of the curve and in a position to simply add this capability when FirstNet rolls out.

Additionally, we needed advanced networking and the ability to remotely monitor our vehicles. Due to the vast amount of data being transmitted, we needed to separate that data into subnets. On the monitoring side we wanted to incorporate advanced asset tracking, as well as ambient temperature sensors throughout the vehicle because of the volume of narcotics stored onboard.

For these reasons, we selected the Sierra Wireless AirLink MG90 multinetwork vehicle router. This high-performance router is built for vehicles and supports multinetwork access both for wide and local area networks. It allows us to use a commercial carrier network today, add a Band 14 radio at a later date, and have long-range, dual-band Wi-Fi capabilities to create a high-capacity vehicle area network (VAN), enabling Wi-Fi offload at our stations for video and other applications. Furthermore, the MG90 integrates with the AirLink Connection Manager (ACM), an advanced mobile-optimized VPN server, to consolidate the security of all of our connected in-vehicle devices into a single centralized platform.

**REAR STORAGE**
Understandably, no one ever wants to have to call EMS, but if they do, they want EMS to arrive ready, able and equipped to handle whatever is presented. Oxygen,
defibrillators and medical supply kits are all essential items of EMS work and need to be at the ready. An ambulance can carry all of this plus a multiperson team to perform the lifesaving work. In addition to the ambulance, the supervisor and his or her response vehicle need to be able to arrive, respond and treat in a timely fashion, equipped with all the essential items to do the job. Because the Ford Expedition offers more in terms of space and storage, we needed to maximize the cargo area of the Explorer.

Setina offers a vast array of storage products. Moreover, it can customize its product to meet customer needs, and this extends to every aspect of being a first responder. We chose Setina because it has a product that bridges storage and technology.

The sacrifice to stay in a smaller vehicle came with hurdles. Technology needs a home. It also needs to be maintained for optimal performance—that means kept cool, free from moisture and, most of all, in a place free from impact by outside forces. Setina offered this as part of their spare tire cover. We removed the OEM floor in the back and replaced it with a rubber-coated steel floor, complete with a secondary tray for electronics. This allowed us a safe home for technology that met all our needs. Here we maintain all the technology that must be accessible, including the comms (both LTE and Motorola P25 radio) and the control head for the camera system.

Solutions for New Frontiers

SOLAR PANEL
When hosting this volume of technology, not to mention advanced lighting, we needed to ensure we would not drain the battery for any long-term single use. To that end we affixed an adhesive solar panel to the top of the vehicle to provide a sort of preventive measure to ensure the vehicle remains operational while also allowing us to keep its battery charged.

This addition maintains a constant power flow to the battery and ensures it is fully charged on an hourly basis.

KEYLESS OPTIONS
In a rush, people forget basic things. First responders are no exception, but why not anticipate and correct for some of the more common and “fixable” mistakes? Locking your keys in your vehicle has happened to us all.

We wanted our vehicle to allow for rush, because patient care is paramount. Because of this we added a keypad lock to the vehicle. Ford is well known for selling these, but they do not come as part of the package we chose as our base model. Ford also sells a raised push-button keypad that can be added to the vehicle, but we wanted to maintain clean lines. Moreover, Ford commonly mounts its keypad above the driver door handle, but we had striping in that location.

Thus we discovered the BOYO keypad entry system. This pressure-sensitive keypad is mounted on the inside of any window that does not open. We placed it on the front windshield, just above the bottom on the driver’s-side edge.

The addition of this keypad does more than just help with mistake correction. Now you can intentionally leave your car running, with the AC on, when you step out by simply manually locking the door and then regaining access with the push of a few buttons.

We also placed a Kussmaul ignition bypass on the vehicle. This is commonly found in ambulances to allow them to
continue running with the keys removed. It prevents the car from being placed into gear and driven off.

360-DEGREE LIVE FEED
EMS ambulances in New Orleans have two cameras. There’s one in the rear to observe patient care, a front-facing camera, and an interior driver cab camera, both of which are purposed for DriveCam and accident documentation.

On a scene response vehicle, especially in a mass-casualty incident, video becomes vital for incident command and dissemination of information. The Mobotix system gave us the ability to stream this 360 degrees of footage back to our EOC, as well as to any necessary mobile device. As with the Verizon Networkfleet product, integrating this video back into our Common Operational Picture application was necessary, and we published the live feed within our application.

In addition, this 360-degree video system can better assist from an investigative standpoint for the various large-scale events that take place in New Orleans, as well as help with progression timelines for our own events. We have a multitude of mass events in New Orleans, including Mardi Gras, Super Bowls, NBA all-star games and multiple festivals and road races, all of which take place on the streets of our city. We can drive these routes a week before, a day before and the morning of any road-based event to document the entire route. In the event of an adverse incident, we will have investigative footage we can review to see what changed over time. We can also use this footage as part of any after-action report to highlight exactly what and where the specifics of the event occurred, as opposed to just hoping stakeholders will understand what the report is referencing.

CHARGE GUARD
For redundancy against our fear of battery drain, we placed a charge guard on the overall vehicle electronics. This device is essentially a preventative measure that ensures items are turned off if the battery drops below a certain voltage.

VEHICLE DIAGNOSTICS
Technology and its effective integration is how we solve problems. With regard to this project, we had a vehicle and we had technology. What we needed to ensure was that we had technology to keep us informed about our vehicle at all times, including its location, oil life, tire pressure, factory recalls and overall status. Simply stated, we have too much riding on this to allow fleet maintenance to be its downfall.

To that end, we found Verizon’s Networkfleet product does real-time diagnostics of the vehicle through the OBD2 port, and we worked with Verizon to publish the car’s GPS position into our own internal mapping solution. This internally made software lets us track incidents (EMS calls, crime and fires) in real time. We wanted this vehicle to integrate as fully as possible among all public safety agencies, and integrating it along with our internal Common Operational Picture software allowed us to do that.

STREAMLINED ANTENNA
Currently we have a light bar on the top of a vehicle that has a smaller roof than the Expedition. As previously described, we have also added a solar panel, which occupies even more space. As roof real estate became more and more of a problem, we had to solve for the vast antenna each of these technology components required for optimal functionality.

Panorama Antennas makes a product called the Sharkee that met all of our
requirements. This antenna replaced the OEM antenna that came on our vehicle, providing the clean look we desired. Acknowledging the concern regarding the housing of this much technology inside a single device (as it does essentially create a single point of failure), we ensured most critical communication, the day-to-day radio communication, was not included in this solution.

We combined GPS, Wi-Fi, cellular, Bluetooth, and Band 14 into one antenna mount and used the existing OEM mounting location. We utilized a second Sharkee for our 700/800 MHz needs with dual band to support VHF as well as an additional GPS antenna for our radio systems.

**VEHICLE ELIMINATIONS**
We wanted to ensure that we matched, as closely as possible, the equipment and purpose from our concept to the current solution. We only found one line-item we felt could be removed, and that was the front-mounted push bumper. It is not within the EMS supervisor’s role to utilize this piece of equipment during the course of duty. Additionally we discovered that some low-level crash impacts can be exaggerated because of this device. Some cosmetic and light

**Cost Comparison Table:** For full transparency and to help get a better understanding of the cost breakdown, we want to offer the following comparison. The first vehicle is the common EMS Expedition, and the breakdown of equipment prices to outfit a new one. By comparison, our EMS vehicle is on the right.

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<th>2016 Ford Explorer Police Interceptor</th>
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Note: All warranty cost(s) were not listed. All necessary wiring/components costs are listed with each specific item.
damage has occurred when the push bumper curled backward and physically pushed into the car.

**Unforeseen Hurdles**
With any project, hurdles will arise, and managing ours to ensure our goals were met was a challenge. None of these hurdles were monumental, and all were all solved with either ingenuity or spending on the smallest scale possible.

The Havis center console we chose was a low-profile one, for keeping clutter to a minimum. We added the lock box, but discovered its depth prevented mounting anywhere except the rearmost portion of the console. When we bench-tested this, it fit perfectly. Once we installed the console, the OEM mounting hardware that connects the console to the car required a crossbar for stability. This crossbar directly prevented the lock box from being fully dropped into place. We measured twice and cut once, removing about one inch of metal from the bottom front portion of the box using a plasma cutter and some assistance by qualified personnel. We then welded a piece back onto the box to close up our opening, and the box dropped perfectly into place, looking as though it was designed to fit there.

The Havis ICS system has integration for video, specifically the backup camera. However, the Havis product does not work with the OEM Ford camera, and we knew this going in. We did not want to waste a feature of the ICS but knew the camera would not work easily. We removed the camera housing and discovered if we replaced the lens and wiring with a camera that would work with the ICS, we would have a working system. Fortunately our vehicle was gutted, and this installation was cheap and quick. It plugged in perfectly to the ICS, and we did not lose a feature of our car or the ICS.

Some of our emergency lighting presented practical hurdles as well. We placed lighting under the vehicle doors, where running boards normally are mounted. This was done as part of our advanced lighting, but they are normally mounted farther forward on the body than we liked. We noticed as they were mounted more flush to the door panel, they were visible from above and could potentially distract or annoy someone standing next to the vehicle, so we moved them farther back onto the body of the car so they were not easily seen up close.

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**With any project, hurdles will arise, and managing ours to ensure our goals were met was a challenge.**

We had a speaker for our communications system that normally would be placed under a seat or out of the way. We did not want to hide this feature, but it would have been obvious it was out of place. The ICS comes with a single USB adapter we felt we did not need, as we were going to install a bank of USB connectors. Consequently we fabricated a custom mount inside the ICS (where this USB should have gone) to fit the speaker, then covered it with a mesh cover. The result looks like it was designed to be there. This speaker has crisp, clear sound that can be heard easily by all passengers.

Another loss from the Expedition came to our siren and howler speaker system.
The howler comes with two cone speakers that are quite powerful, and can penetrate car noise-muffling ability. The Expedition can easily mount both of these for optimal sound, but we were limited. We installed one in front of the driver wheel well, but the other did not fit on the other side, as the windshield washer fluid reservoir was located there. We decided one installation was enough but discovered if the other one was needed, we could relocate the reservoir inside the engine compartment and mount the speaker normally.

**Summary**
Be logical. Be pragmatic. Be attentive to needs, not just purpose. Be fiscally responsible. Of course, none of this is easy. This idea started at the IACP conference in October 2015, and here we are a year later, and we are proud of how far we have come.

We believe the technology you see inside our vehicle will be common within a few years.

To be sure, safety is, was and always will be paramount with this design. This is visible everywhere, in the multitude of lights, the storage of equipment, the placement of electronics to reduce items inside the seating area, and the placement of the air bags. Safety is featured in our technology as well: 360-degree camera feeds for patient safety, vehicle diagnostics and alerts in real time, and even the consolidation of switches, reducing the need to fumble.

Selling safety is easy! Safety has no price tag. No one passes on buying something that can clearly save lives, but disregarding cost for safety was as counterproductive to our process as choosing a more expensive car just because it was easier.

It really comes down to an assessment of needs. Police, fire, EMS—each requires different things, and we feel this vehicle meets the needs of New Orleans EMS without sacrificing operational capabilities or the ability to effectively respond. At the same time, all that needs to be done to transform the vehicle into a police car is to change some decals and install a prisoner partition. Similarly, swapping more logos and providing a larger storage system effectively allows the vehicle to be used as a fire response unit.

We present to you the 2016 Ford Explorer Interceptor, built out for New Orleans EMS for the role of field supervisor. We feel our vehicle has emerging technology, products and a purpose not found in a modern first responder vehicle, all while maintaining the ability to transport five seat-belted people safely. We believe the technology you see inside our vehicle will be common within a few years.

We called this project the “Batmobile” for the single reason that most people can relate to what the Batmobile has represented since first appearing in 1966, and we hope we have created something with which even Bruce Wayne would be impressed enough to want.
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DISCLAIMER
This vehicle is a new concept cross-agency vehicle. In no way did we set out to replace the purpose of the EMS supervisor vehicle or any public safety vehicle. This vehicle is a concept of a new type of emergency responder vehicle conceived by both the authors of this white paper.

The current EMS supervisor vehicle is built for a specific purpose, of which this car was built only to satisfy a small portion. We set out to split a first responder role with that of a Homeland Security liaison. This role is somewhat unique to New Orleans, as the liaison to our office is also that of a supervisor.

This written work is solely the opinion of the authors following field experience and research. Before implementing any of the foregoing into emergency operations, the City of New Orleans suggests that proper agency/municipality specific research and feasibility studies be conducted to ensure that any work is in compliance with any and all applicable laws, rules, guidelines, ordinances and/or policies.

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PRODUCT REFERENCE

2016 Ford Explorer  
www.ford.com/fordpoliceinterceptor/

Havis ICS  

Havis Center Console  

Microsoft Surface Pro 4  

Whelen Light Bar  
www.whelen.com/auto/product?head_id=4&cat_id=147&prod_id=617

Motorola APX Radio w/Bluetooth (O9 Control Head) (Siren / Light Interface Module)  
www.whelen.com/auto/product?head_id=4&cat_id=147&prod_id=617

Setina Easy-Lift Cargo Deck  
setina.com/cargo-solutions/trunk-tray-suv/easy-lift-cargo_suv-cargo/

Verizon’s Networkfleet Product  
www.networkfleet.com

Sharkee  
www.sharkeenow.com

Mobotix Cameras  
www.mobotix.com/other/Products/Outdoor-Cameras/FlexMount-S15

Sierra Wireless  
www.sierrawireless.com/

Crescent City Decal  
www.crescentdecal.com

Tomba Communications  
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BOYO Keypad Entry System  
visiontechamerica.com/site/portfolio/a-pass-touch/

Charge Guard  

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Whelen CenCom Sapphire  
www.whelen.com/auto/product?head_id=9&cat_id=68&prod_id=515

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