



COCKPIT 2020: CARS, COMMUNICATIONS AND CRIME FIGHTING



AN INSIDE LOOK AT NEARLY TWO YEARS OF IN-DEPTH MOTOROLA RESEARCH FOCUSED ON DESIGNING THE COCKPIT OF THE FUTURE AND IMPROVING THE OVERALL LAW ENFORCEMENT EXPERIENCE FOR OFFICERS.

It's a mobile office. It's a crime-fighting tool. It saves more lives than any doctor's office. And it's crammed full of clutter. What is "it"? It's the cockpit of most police cruisers. The reality is that the amount of technology in today's patrol cars is exploding. There's not enough space to hold it all. In addition, almost every piece of technology in the cockpit has a different user interface – and thus operates differently. While that may not be a problem when officers are patrolling their beat, it presents a big problem during a high-speed chase.



“As a police officer once explained it to me, the reality of law enforcement is that one moment you’re drinking coffee, and the next moment your life is in danger,” says Bruce Claxton, senior director of innovation and design at Motorola. “That type of immediate stress affects your ability to make good decisions quickly.”

“Here in Motorola’s public safety group, we’re dedicated to finding ways to use technology to present material in a very clear manner – a manner that helps police officers make decisions quickly and clearly,” Claxton says. “We’re continually coming up with new ways to use technology to take the complex and make it simple.”

It’s just one of the many reasons that Motorola embarked on its revolutionary Cockpit 2020 research project several years ago. Motorola researchers set out to design the ultimate patrol car – one that would be second nature to operate, even in times of high stress.

“When you look inside a patrol car, you can quickly tell that no systems approach was used to design the cockpit,” says Mark Palmer, director of human factors and design research at Motorola. “Instead, there are multiple pieces of equipment – and multiple user interfaces. And when there are multiple user interfaces in a single environment, that creates problems for the end user – particularly when they’re under stress. So we decided it was time to take a different approach.”

The approach that Motorola researchers took started with this question: “If you were to design a system for police officers from the ground up, what would it be?”

The project quickly expanded into something bigger, and it is now called the Law Enforcement Experience program, or LEX. It involves researching and improving the whole day-to-day experience of police officers, both in the vehicle and outside of it.

Based on its research, Motorola has categorized the day-to-day experience of police officers into four different “phases”:

- Phase 1: The monitoring phase, which includes an officer’s patrol time – the time when he or she is continually monitoring the situation around him.
- Phase 2: The preparation phase, where patrol officers are getting ready to respond to a call and need access to as much critical information as they can process.
- Phase 3: The response phase, when first responders are actually traveling to an incident or taking control of a dangerous situation.
- Phase 4: The documentation phase, where officers must spend their time recording information, such as writing out citations or recording what took place during a previous incident.



“In each phase, we’re trying to imagine the ideal experience for the officer – and how technology can help create that ideal experience,” says Craig Siddoway, director of industrial design at Motorola. “Our goal is to make the technology invisible.” In the monitoring phase, “police officers spend much of their time just assessing their environment and looking for patterns that don’t make sense,” says Palmer. “So the question we looked at is: How can we use technology to improve that process? If you could use technology to extend an officer’s senses, how would you do that?”

PHASE 1: MONITORING

For instance, video technology could be used to improve an officer’s awareness – by using it to detect potentially dangerous activities. When an officer stops a vehicle, video analytics technology could allow a camera located in the patrol car to in effect extend that officer’s peripheral vision – and to sound an alarm if a car is approaching too closely when he is next to the highway writing a ticket. Or it could sound an alert if, for instance, it detected that the door was opening on the detained vehicle.

“In a sense, you’re augmenting the officer’s existing reality by giving him more information about his environment,” says Claxton. “You’re using technology to enhance an officer’s perception of the world around him.”

Technology already exists today that translates data into useful information and thus improves an officer’s awareness of the environment around him, Palmer says. For example, automatic license plate recognition (ALPR) systems automatically signal officers when the license plate check reveals that a vehicle might belong to a suspected criminal.



Biometric technology, such as electronic fingerprinting, is already being used by some officers to make the identity verification process much easier and faster. In the future, facial recognition technology could even be used to scan a crowd to look for a particular suspect, similar to how ALPR systems today are used to scan license plates.

“Already in the commercial arena, we’re seeing augmented reality applications emerging that allow you to take your cell phone, scan the landscape and receive information on a target object,” says Claxton. “That’s exactly what we’re talking about developing for public safety.”

PHASE 2: PREPARATION

In the preparation phase, it is important to present only the most critical information to officers – and to present it in such a way that the officers can process that information quickly and easily.

To enhance an officer's effectiveness in this phase, Motorola first set out to understand what information is most critical to officers – and in what context they need it. To gain this understanding, Motorola posed some in-depth questions to police officers, asking them what pieces of information are most critical to them when responding to calls.

Not surprisingly, researchers discovered that public safety officers responding to a call want to know answers to questions such as whether the suspect in question has a history of violence or any outstanding criminal warrants, whether the suspect might be carrying a weapon and the location of potential backup officers. Other key questions they would like answered in a criminal call would be whether children are involved, if people are injured and if there is any history of mental illness.

But how much information they want, need and can even process is largely dependent on what kind of situation they are facing at the time, particularly as officers move to response mode.

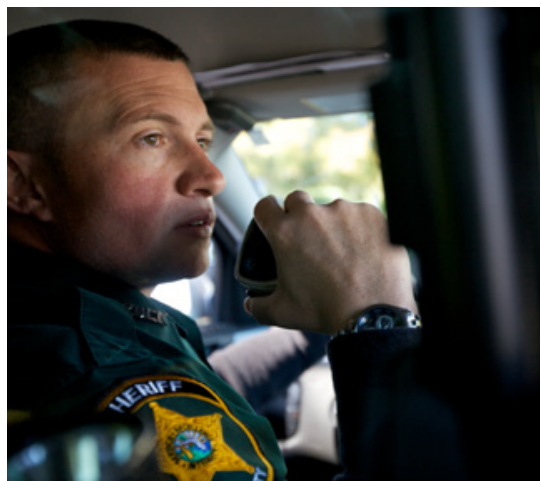
PHASE 3: RESPONSE

In the response phase, the high stress really kicks in. And that's when it's important to know the best way to design equipment so that officers can operate it during times of stress.

That's exactly the kind of thinking that went into Motorola's most recent cockpit product, the O9 Integrated Control Head for Motorola's APX™ 7500 Mobile Radios. The design of the APX 7500 O9 Integrated Control Head was a direct result of much of the law enforcement experience research done by Motorola's public safety design group.

As one example, the O9 combines several communication and warning functions into a single control head – thus providing safer, more intuitive operations while also reducing the amount of equipment required in the vehicle.

“Basically, the O9 takes away the traditional light and siren controls in a vehicle and incorporates it into a larger radio control head, which the police officer also uses to interact with the radio system,” Palmer says. “But when we set out to incorporate the various functions into one product, we talked with officers about the design – and we found that one aspect of the current design that the officers really liked was a lever that already integrated the lights and sirens together. They were able to easily access this control without looking and relied on motor memory to activate it in a single motion. We wanted to incorporate these usage behaviors into the O9 while also designing a more effective and reliable control.”



“It would have been tempting to create a light and siren control on the touch screen because it gives you more freedom as a designer. But the police officers we talked with stressed the need for the light and siren controls to be an integrated, ‘no-look’ control. They told us ‘Don’t mess with the lever,’” Palmer adds. “So we knew a touch screen was not the way to go, and we designed a product that used that same motor memory – but also supported other features and functions.”

Motorola's group of researchers and designers incorporated several other intuitive controls into the APX 09 Integrated Control Head as well. For instance, previous light bar controls had evenly spaced rows of buttons with various functions. Some controlled the pursuit lights while others controlled functions such as takedown lights, alley lights, siren modulations and the PA system. While the linear arrangement of the buttons might seem logical and efficient from an engineering perspective, it falls short in actual use – so Motorola redesigned it.

“By applying good ergonomic design principles, such as functional grouping, shape coding and proximal separation in the 09 controls, we allow users to more easily access and use the controls without distracting attention from their primary tasks,” Palmer says.

PHASE 4: DOCUMENTATION

Documenting an incident is the least favorite part of the job for many officers. And while the levels of stress in this phase do not match those in the response phase, technology can still be a great tool to help officers do their jobs more effectively.

In fact, in its LEX project, Motorola is developing many new ideas on how to simplify the documentation process for officers – ideas that go way behind just redesigning forms.



“When it comes to the documentation phase, Motorola’s goal is to design a system that is intelligent enough to flag and capture the relevant information for the officer,” says Siddoway. “So when an officer reaches the documentation phase, he’s just organizing the information that’s already been captured.”

For instance, instead of writing down the description of an incident in text form, the officer could simply attach a video recording of the incident to the file. Global Positioning System (GPS) technology could be used to confirm location. And basic information like name and vehicle information could be entered using simple scans of license plates or driver’s licenses.

This is already happening today. With scanners that support automatic data capture, officers are simply scanning driver’s licenses to obtain information about a detained individual instead of typing it into the system.

“In the future, we’ll be taking this kind of automated data capture to a whole new level,” says Palmer. “Our goal is to eliminate most of the manual documentation required today.”

A VERY DIFFERENT RESEARCH APPROACH

One of the greatest challenges of enhancing an officer's day-to-day experience is discovering what officers might need in the future – instead of just determining what they think they need today.

“We do a lot of observational research, but that only takes you so far,” says Palmer. “You can only observe current behaviors. It's hard to figure out ideal behaviors based on what an officer is doing now.”

“We have so many modes in which we can now receive information. It's no longer just voice but also text, video, visual images such as maps and many others,” adds Claxton. “So what mode is the right one? We don't know yet. But we do know that in the public safety world, we need to present the information in a meaningful manner. We need to present it in the format that is easiest for the brain to process – and that actually augments our physical and cognitive abilities instead of limiting them.”

It's why Motorola approached its Cockpit 2020 project by focusing on the ideal cockpit of the future – instead of simply taking its current public safety roadmap and trying to make it better.

“The idea behind any creative thinking is to spike as high as you can as quickly as you can – and that's your innovative moment,” Claxton says. “As soon as you move from the creative to the design phase, then your vision moves closer to reality.”

“If you don't shoot for the moon, your vision flattens. Once you have the vision, you can then map that back, bridge it to today's roadmaps and create a very compelling vision,” Claxton says. “But you can't simply take the existing roadmap and try to push it forward 10 years. It's not going to get you there. It will be a linear process instead of this divergent process that's more creative.”

So what will the ideal cockpit and the ideal law enforcement experience really look like in 2020? Stay tuned ...

NEXT GENERATION PUBLIC SAFETY

At the heart of every mission is the ability to communicate in an instant to coordinate response and protect lives. Today, Motorola is putting real-time information in the hands of mission critical users to provide better outcomes. Our powerful combination of next generation technologies is transforming public safety operations by strengthening the mission critical core with broadband connections, rich-media applications, collaborative devices and robust services. It's Technology That's Second Nature. To find out more, visit motorola.com/nextgen.

“Cockpit 2020: Cars, Communications and Crime-Fighting” was originally published in the Motorola eZine for Government professionals, a quarterly online magazine that helps eZine subscribers stay up to date with market, industry and technology trends, as well as provides timely news, analysis and information.

Go to <http://ezine.motorola.com/government> to read current and past issues. Click on “Contact Us / Subscribe” at the bottom of the eZine page to subscribe to the online magazine.

Motorola, Inc. 1301 E. Algonquin Road, Schaumburg, Illinois 60196 U.S.A. motorola.com/nextgen

MOTOROLA and the Stylized M Logo are trademarks or registered trademarks of Motorola Trademark Holdings, LLC and are used under license. All other trademarks are the property of their respective owners. © 2010 Motorola, Inc. All rights reserved.

