FUTURE TECHNOLOGY IN LAW ENFORCEMENT

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Abstract

This research project examines whether future technology might benefit or hinder the law enforcement profession. As with any “futures” issue, it is difficult to present hard data and fact-based research, because the future has yet to occur. However, this project examines literature detailing existing technology and technological advances currently under development. Technological research relevant to law enforcement is occurring in a number of areas. Weapons, communications, computers, brain wave communication, density scanners, vision enhancement, augmented reality, biometrics, and other technologies are all poised to advance considerably in the future. Many of the advancements will need corresponding legislation to make their use lawful.

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Chapter I: Introduction

Well-known inventor and entrepreneur Charles F. Kettering once said, “My interest is in the future because I am going to spend the rest of my life there.” He also said, “People are very open-minded about new things—as long as they’re exactly like the old ones,” (Kettering, n.d.). Both phrases summarize the human dilemma of embracing future changes. Some people are resistant. Some people are open-minded. In any case, understanding and discussing future issues helps people to grasp the concepts and make better use of new ideas.

Technological advances are moving forward at lighting speed. Read any works by futurists, think tankers, techno geeks, leaders, or those at the cutting edge of any field of endeavor and they say the same thing—stay current with technology or you will find yourself in the dark. The criminal justice field is no different. In fact, law enforcement has the need, at a minimum, to stay current with the tactics and techniques of criminals and should presumably be a step or two ahead. Get too far behind and you may be technologically outgunned. In the past two or three decades, technology has advanced more quickly compared to earlier times. Most people would agree technological changes have been advancing exponentially.

First, this paper examines new technology on the horizon. Next, it discusses the use of the technology in the field. Many of the advancements will need corresponding legislation to make their use lawful. They will need publicity, documentation, explanation, and success stories in order to gain public

acceptance. Funding is always an issue, particularly for local government agencies who tend to have lean and often under-funded budgets. This project includes a fictional story illustrating how a city police officer might go about his daily tasks using some of the emerging technology discussed in the paper.

Chapter II: Literature Review

Current Research

Technological research relevant to law enforcement is advancing in a number of areas. Weapons, communications, computers, brain wave sensors, density scanners, vision enhancement, augmented reality, biometrics, and many other technologies, are all poised to see considerable future advancements. The challenge is to adapt the technology into workable field equipment and anthropomorphic devices; those that enhance the effectiveness and/or the efficiency of law enforcement officers. The trick is to start with the end in mind.

Scientists at the President's Office of National Drug Control Policy, Counterdrug Technology Assessment Center (CTAC) are working in partnership with other federal agencies to develop several high-tech devices (Brandenstein, 2002). The mini-buster secret compartment detector is a handheld device that senses density in solid objects. When scanned over the body of a motor vehicle, it can locate hidden compartments used to smuggle contraband, terrorist devices, or other illegal items.

In the communication arena, scientists produced the Wireless Interoperability System, which connects the radio frequencies of various emergency first responders (federal, state, and local) who may need to coordinate activities at a large incident (Brandenstein, 2002). The system provides smooth, fast, accurate real-time communications for emergency

personnel. These interoperability systems are becoming available to state and local entities through the U.S. Department of Homeland Security.

Two projects are currently under way at the Counterdrug Technology Assessment Center which would help law enforcement with searches and evidence presentation (Brandenstein, 2002). Non-intrusive cargo inspection technology would reveal the presence of contraband in a sealed container and identify the contents (drugs, weapons, biological agents, explosives, or lawful cargo described on the manifest) without expending valuable time and resources searching by hand. The handheld device could prove invaluable for use on shipping containers and vehicles passing through seaports, truck inspection facilities, airports, ports of entry, and the like.

The other project is the creation of a Video Stabilization System that electronically converts useless, unstable surveillance video into clear, court-presentable evidence. CTAC also provides federal, state, and local law enforcement agencies with equipment such as third generation night vision and digital wiretap devices.

Department of Defense researchers at the U.S. Army Soldier Systems Center in Natick, Massachusetts are designing the Law Enforcement Advanced Protection System (LEAP) uniform. LEAP is a comprehensive, integrated, modular system approach to a tactical uniform offering ballistic, chemical, and biological protection for the special operations police officer - a combined hybrid uniform of soldiers, swat officers and hazardous materials specialists. Because it

is difficult for special operations officers to perform tactical operations while wearing existing large plastic hazmat suits, the U.S. Department of Homeland Security, Office of Science and Technology is sponsoring a multi-agency effort to integrate several technologies into an advanced law enforcement uniform.

The LEAP uniform employs an extra layer just above an officer's waist. This is actually the top part of the chemical-biological protective material connected to a non-permeable bottom. When needed, the officer doffs the load-carriage vest, slips into the rolled-out top half with built-in gloves and hood, and then dons a mask, helmet, and the vest again. Soft body armor covers the torso, shoulders, and upper arms. The vest can be configured to carry radios, extra ammunition, hydration pouches, and other items. The ergonomic load-bearing belt holds a pistol, magazines, handcuffs, flash bangs, and other equipment. In addition to protecting the head against ballistic trauma, the LEAP helmet incorporates a Global Positioning System, radio antenna, flashlight, drop-down visor with heads-up display, and a detachable mandible to cover the face and neck. The uniform includes boots, kneepads, elbow pads, and a waste management zipper.

Researchers at the United Kingdom Police Information Technology Organization (PITO) are using biometrics research to build a database of violent criminals and sex offenders (McCue, 2003). The technology uses facial and voice recognition systems to enhance automated fingerprint and palm print identification. Video cameras and microphones used in public or private

surveillance systems may recognize thousands of violent criminals and sex offenders just walking past.

The Pinellas County, Florida, Sheriff's Office uses facial recognition technology to identify prisoners booked into the county jail. A station in the booking area takes four facial images in less than five seconds. Along with the normal data collected during booking (name, address, physical descriptors, date of birth, etc.), the images are stored in a database. Deputies then print a temporary jail identification card, complete with color photo, used to identify inmates during their incarceration. Deputies may easily transfer the data and images, via email, to computer workstations for use by other personnel in records, investigations and patrol (Facial Recognition, 2004).

By using a system such as this, deputies throughout the county have better access to criminal histories that include multiple photographs of the defendant. Deputies conduct mobile searches through PC's and personal digital assistants (PDA's). Using a digital camera, deputies in the field can take images of a person and launch a database search by using a docking station inside of a patrol unit. Deputies search the database using a digitized image of a person from a still, video, or composite source.

The military's development of the Unmanned Aerial Vehicle (UAV) could significantly affect law enforcement. Noted police futurist Dr. Andreas M. Olligschlaeger, a member of the FBI Futures Working Group and President of TruNorth Data Systems, Inc., discussed the future of law enforcement UAV's in

his article *20/20 Vision* (Olligschlaeger, 2004). Using existing nanotechnology, police UAV's would be the size of a small bird and stay aloft quietly for hours. Using facial and voice recognition software, the devices would scan hundreds of yards omni-directionally, day or night, for known felons or wanted persons. One UAV could perform many of the same tasks as would several plain-clothed officers in unmarked vehicles.

The exoskeleton suit is another device discussed by Olligschlaeger. The suit is worn by an officer and uses nanotechnology and artificial muscles to allow the officer to run with minimal effort, over prolonged periods, at a speed of up to 20 mph. Top speed is 35 mph for shorter distances. The suit enables the officer to lift items up to four times his own weight. The applicable technology is being studied at several institutions.

The ultimate interface between humans and computers may be a neural link directly from the human brain to the computer. Scientists at the University of Technology Sydney have developed a revolutionary "Mind Switch". Labeled the Environmental Control Unit (ECU), the mind switch is activated by a burst in alpha brainwaves when a person closes their eyes and imagines the desired activity (Rice, 2004). A computer receives the signal and activates a home electronic device such as a radio, appliance, or television. Participants in the experiment were also able to adjust controls such as volume. In its latest testing, the switch was over 90% reliable when used by severely disabled persons with minimal training. The research opens a completely new world of

possibilities when humans and computers begin to communicate through the brain.

Another powerful new technology upon the horizon is augmented reality (AR). Most televised NFL football games now use a simple form of augmented reality to superimpose the yellow line across the television screen denoting the first down line marker. According to Cowper and Buerger (2003) of the FBI Futures Working Group, advanced AR virtually overlays computer-generated images onto a person's real world vision. "Situational awareness is greatly improved, theoretically allowing one person equipped with AR technology to do the same amount of work as three unequipped individuals (p. 3)."

Cowper and Buerger suggest a number of possible law enforcement uses for AR, including:

> (1) Patrol car operator data and regional traffic management information on a heads-up display to make driving safer and more efficient, especially during pursuit and rapid response situations; (2) Identification Friend or Foe technology, worn by every police officer to reduce or eliminate friendly fire casualties by visually, audibly and/or haptically highlighting fellow police officers both on and off duty; (3) Display of officer location, activity and status information projected on a 3-dimensional map of the community; (4) The coordinated use of robots, UAV's and police officers managed through an AR network to enhance surveillance activities; (5) The

> use of realistic training scenarios to simulate dangerous police environments while blending real world equipment and fellow trainees into the scenario (p. 3-6).

Other technological advancements on the horizon include personal assistants, speech synthesis, wearable computers, data mining, liquid body armor, electronic clothing, artificial intelligence and crime forecasting (Olligschlaeger, 2004).

For some time now, computers have been able to process commands from human speech using voice interpretation software. The next natural step is voice interaction, similar to that of an interactive robot. Personal assistants are highly intelligent computers using a blend of emerging technologies: speech recognition, speech synthesis, and augmented reality. The potential is endless. Integrating the device to an unlimited number of public and private databases, employing data mining technology, and communicating with existing law enforcement communications systems (Computer Aided Dispatch, GPS guided locator systems, mobile data computers, etc.), could create a very powerful and efficient information management system. A police officer utilizing one in the field could accomplish many tasks simultaneously by simply conversing with the device and issuing verbal commands.

Legal Issues

Legal constraints associated with the use of a personal assistant present a significant hurdle to overcome. Law enforcement agencies continuously navigate

the information privacy laws. While the private sector has captured and exploited the confidential and personal data of U.S. citizens for years, most governmental agencies are generally prohibited from such activity. Due to rapidly changing technology, such proprietary information is widely available. The issue is rapidly becoming less about obtaining the information and more about how it is used and by whom. Once the legal system sorts out these issues, law enforcement's use of personal data may significantly enhance the efficiency of police officers and investigators (Carafano, 2005).

Funding Issues

Another significant barrier to technology innovation is funding resources. Many government agencies operate with fairly lean or under-funded budgets, particularly local agencies. Whereas many local agencies are involved in the business of service delivery, particularly local public safety agencies, most funding resources go toward personnel. Funding for equipment purchases usually go to the proven winners. Managers are reluctant to gamble with public funds on equipment, devices, or systems representing innovative technology because they may fail. Why purchase a digital camera when the silver halide film camera has worked well for decades?

Rapid Changes

The inability to stay current with and fund technological advances is a significant problem for state and local agencies according to the Rand Corporation (Schwabe, Davis, & Jackson, 2001). The following table (see next

page) illustrates just how far behind many state and local police agencies are when trying to make various technological resources available to their personnel. Just providing some basic items that other metropolitan agencies have had for years can be a difficult task. Local agencies increasingly rely upon federal agencies and the military to provide these items through grants and other assistance programs.

Technologies Not Available to Local Police

Technology	Not Available	Technology	Not Available
Detection and analysis of cyber-attacks	79%	Computers in patrol cars	58%
Blister/nerve agent protective clothing	79%	Electronic listening	57%
Video conferencing equipment	75%	Night vision devices	57%
Kinetic energy projectiles	75%	Vehicles—special purpose	45%
Chemical agent detection	71%	Crowd or riot control	44%
Long-range video monitoring	69%	Computer-based training	41%
Stun devices/projectiles	68%	Conference call equipment	36%
Radioactive agent detection	66%	Computer assisted dis-patching (CAD)	35%
Explosives detection	64%	Integrated data bases	34%
Polygraph equipment	64%	Protective gloves, helmets, and shields	34%
Fleeing vehicle interdiction equipment	63%	Audio-visual equipment to obtain evidence	30%
Concealed weapon detection devices	62%	Training equipment	28%
Bomb containment/ disablement equipment	60%		

SOURCE: LETS, 22, 25–29. Numbers are statistically adjusted percent of local departments reporting technology is not available.

Source: The Rand Corporation, 2001.

Chapter III: Methodology

The research for this project began in March 2005 while I attended a National University course titled Current Issues in Criminal Justice. However, the bulk of the research I conducted while attending the Federal Bureau of Investigation, National Academy, in Quantico, Virginia, during the spring of 2005. The National Academy is an advanced course of study in the latest law enforcement tactics, theories, techniques, and technology, taught to command-level law enforcement personnel from local, state, federal, military, and international agencies.

Studying at the National Academy provided a unique opportunity to conduct research, assemble the results, and present the findings to approximately forty law enforcement professionals and two instructors. These individuals provided written comments and feedback about the nature of the project, the results, the quality of the presentation, etc. They also made suggestions of what they felt was missing from the project. This was an outstanding opportunity to receive peer review for this project by law enforcement commanders from around the nation and the world.

Upon returning to my studies at National University in July 2005, I incorporated many of the suggestions from this peer review into a significantly enhanced form of the project. In August 2005, I added additional research and changed the format.

The research consisted of literature review from internet databases, materials at the FBI National Academy Library, books in my home library, materials at the National University Library, law enforcement journals I subscribe to, newspaper articles, and discussions with various law enforcement professionals from around the nation.

Chapter IV: Results

Notwithstanding costs and legal constraints, officers may be more efficient and possibly more effective with the proper application of advanced technology. With some of the technology discussed above, how might the police officer of the future conduct field law enforcement? Borrowing from an idea in the article *20/20 Vision* by Olligschlaeger, the following fictional account examines how a city police officer might go about his daily tasks using some of the emerging technology discussed above.

Results Presented via Fictional, Future Scenario

Officer Sample starts his shift by leaving the station in his powerful, yet ultra-efficient hydrogen fueled patrol unit and begins to surveil the streets of Civil City. "Hey Holly, what's going on today?"

"Good day, Officer Sample," responds his personal assistant in a pleasant voice. "Your voice log-on imprint, password, and your system access level were confirmed. Let us review a summary of crime highlights for the past 24 hours in Civil City with a focus on your assigned district. This will be followed by brief accounts of regional, state, national, and international news which may impact your duties today." When issued his personal assistant, Sample was able to choose a name, voice, and body for the highly intelligent device. "Holly" is a 6-inch tall, animated hologram who looks like a famous actress. She "stands" on the passenger side dashboard and talks directly to Sample.

Holly has access to hundreds of public and private databases, executes any number of commands simultaneously, utilizes voice interaction software, and communicates with Sample through sensors in his helmet transmitting commands to her through use of a mind switch.

"What else do you have for me today?" asks Sample.

Holly responds immediately: "We detect a disproportionate amount of criminal activity at Pine and Century during the past 24 hours. Units were sent to two disturbances in the street, one vehicle was towed, and Officer Citem temporarily detained, but did not arrest, Ima Hype, a convicted drug dealer. Based upon historical data, the forecast is a 41% possibility of drug sales, prostitution activity, or a felony street crime occurring there within the next 48 hours."

"Send a UAV," Sample directs. "Have it scan two blocks in every direction from Pine and Century. Advise me if any known felons, prostitutes, or drug dealers are loitering in the area." Holly responds, "Executing now. The UAV is launching from the city corporation yard. ETA is 12 minutes."

Within 30 minutes, Holly advises Officer Sample of a wanted subject, Hugh Manatee, loitering near Pine and Century. The UAV has identified Manatee using facial and voice recognition technology. Holly explains how the investigators have an arrest warrant charging Manatee with rape and they have been looking for him for two weeks. The investigators had placed his biometric data into the wanted persons database when they entered the arrest warrant. Sheriff's

deputies collected Manatee's biometrics (fingerprints, palm prints, voice imprint, DNA code, facial images, and blood type) during his previous jail bookings. He is on parole for first-degree burglary. Sample drives to the area. Holly advises dispatch, Sample's field sergeant, the watch commander, and the case investigator of the activity simultaneously.

As the assistant feeds stabilized, real-time video images from the UAV to the heads- up display on the patrol unit windshield, Sample listens to the UAV's digitally enhanced audio feed in one earpiece of his LEAP uniform helmet. In the other ear, he listens to the radio communications of units responding to assist him. The UAV provides GPS coordinates on the windshield display in relation to the patrol unit, allowing Sample to drive right to the wanted parolee. The dispatcher, sergeant, and watch commander make quick adjustments to their monitors. They listen to and watch the same sequence.

As Officer Sample exits his patrol unit, Manatee takes off running. The UAV easily follows the wanted man, despite the disadvantage of darkness, which has just set upon Civil City. If he had wanted to bother with it, Sample could have continued to watch the video feed from the UAV on his wrist module. On this occasion, Sample lowers the facial visor on his helmet, automatically engaging the digitally enhanced night vision lenses that easily allow him to see Manatee in the darkness. His helmet provides his location to the others via the built-in GPS system. As he begins to run after the fleeing criminal, the sensors on his exoskeleton suit sense his exertion and provide the energy sufficient to propel

Sample at three times his normal running speed. He catches up to the man within ten seconds. Having been previously arrested by officers wearing the 'superman suits', Manatee submits, knowing further resistance is pointless.

After delivering the defendant to the investigators and completing some electronic forms on his mobile data computer, Officer Sample resumes his patrol duties. He thinks about a scheduled court appearance for the next morning. The assistant interrupts his thoughts and announces, "You are expected in court tomorrow at 0900 hours in department 8. The assigned deputy district attorney called earlier to confirm the case is moving forward. I routed a copy of the case report to your mailbox at the police department."

Holly changes the subject. "Dispatch forwarded your next assignment. It is a family disturbance at 1439 Shasta Street. Sarah Battery called nine minutes ago to report her husband, Joe Battery, was drunk and belligerent and she feared for her safety. He had just left the residence and was walking in the neighborhood. She feared he would return soon and hurt her."

Holly continues, "Joe Battery works at Shasta Tire Shop, 1955 Shasta Street. He is a 33-year-old white male, 6 foot, 190, brown and blue, has no outstanding warrants, and is not on parole or probation. Sarah Battery is unemployed and on probation for theft. They have been married two years and have no children. His driver's license photo and her recent booking photo are on screen. Records indicate a dog license for a two-year-old German shepherd and

a recent firearm purchase by Joe Battery for a .38 caliber handgun. I have house plans on file from the building department if you wish to see a floor plan?"

"No thanks, Holly. Just put Ms. Battery on screen." The audio-video recording of the call, which commenced upon the initial contact with dispatch, is played back to enable Officer Sample to get a feel for the situation. "We had a terrible argument and he just left for a walk. I am scared, please hurry....."

Chapter V: Discussion, Conclusions, and Recommendations

Discussion

Could this scenario be right around the corner? All of the technology mentioned previously currently exists or is in the development stage. Law enforcement may soon begin using some of the new devices in the field. At least one large U.S. metropolitan police agency is beginning to experiment with UAV's. Another is experimenting with facial recognition technology through cameras mounted in a public park known for frequent incidents of violent crime (*Los Angeles*..., 2005). Applying undeveloped technology products to the future market is largely dependent upon the needs of law enforcement and available funding. Legal issues and privacy concerns must also be resolved along the way.

Conclusions

Police officers are information brokers. The future of policing, amongst other things, depends upon the use of technology to provide officers with information. The use of computers to enhance human ability is a major goal. The seamless integration of computer systems is even more essential. The more information at the officer's disposal, the more effective the officer may be. It may also enhance the safety of the officer, the defendant, and the public. Future technology will most definitely benefit the law enforcement profession. Are police officers ready for the future? They should be, as they will spend the remainder of their careers there!

Recommendations

State and federal agencies typically provide grant funding for research as well as new products that are just emerging from the research and design phase. Cash-strapped law enforcement agencies should take every possible advantage of grants aimed at introducing new products and technology into the field.

Small and medium sized agencies may want to follow the lead of large metropolitan agencies, which typically have more resources (funding, personnel, political, administrative, etc.) to acquire, evaluate, and implement new technology. The smaller agencies should put together a committee of forward thinking individuals, sworn and non-sworn, who meet occasionally to assess new technology resources and make recommendations to the agency executive. Those recommendations should serve to guide the organization in a direction that embraces future technology compatible with existing systems.

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