

SME RESEARCH BRIEF

Research Review – Innovation in Decision Supports for Responders

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Are we ready for advanced decision supports like artificial intelligence for first responders?

The use of artificial intelligence (AI) and other decision support technologies in front-line public safety is just getting a foothold. To what extent will emerging technologies solve remaining challenges for first responders? This brief provides a snapshot of research and technology development activities supported by the Centre for Security Science at Defence Research and Development Canada (DRDC CSS). This treatment touches on how science and technology (S&T) requirements can be effectively articulated by operators including police, fire and paramedics, with a view to informing federal investments intended to support innovation.

Incentivizing responder research and development

First responders, including members of the Canadian Tri-Services Emergency Management Committee (CTSEMC), have shown interest in how artificial intelligence and other advanced decision support (ADS) tools might improve individual and organizational effectiveness. Despite wider adoption of AI component technologies such as natural language processing (NLP) in society –SIRI for instance - the development and deployment of tools including AI and other innovative solutions for police, fire and paramedic responders is still quite nascent. A 2017 first responder capability assessment¹ undertaken by DRDC CSS took stock of selected police, fire and paramedic perceptions of crucial capabilities needed to respond to major incidents in Canada. The assessment cast light on the need to fortify capabilities such as command and control systems, operator situational awareness, and communications interoperability among agencies. The application of new technology supports, including AI, were thought to hold promise in strengthening these capabilities. Despite conventional misconceptions, artificial intelligence systems today are not really performing synthetic computer cognition operations that approach human thinking. The challenge then is to match remaining operational challenges with the maturity level of technologies of the day.

The intersection of capability maturity and operator readiness to leverage technology

Building innovative decision support tools to improve police, fire and paramedic operations involves a successful blending of a technology solution with a first responder's readiness to contribute throughout the technology development pathway. An example of AI-oriented collaboration is the decision support solution developed by the Jet Propulsion Laboratory (JPL), the '*Assistant for Understanding Data through Reasoning, Extraction and sYnthesis*' (AUDREY) human-like reasoning technology. The JPL team led by Dr. Ed Chow has, in partnership with Hastings-Quinte County Paramedic Service (HQPS), DRDC and Department of Homeland Security S&T, developed and demonstrated a decision support tool using AUDREY components to support front-line operators in responding to a 'STEMI' heart attack call for serviceⁱⁱ. The prototype AI solution was intended to explore, characterize and analyze complex operating environments and processes with a view to improving front-line paramedic decision making. The host responder agency HQPS brought a key 'operator readiness' characteristic in that this operating environment had a well-defined, commonly understood doctrine – such as the *Ontario Advanced Life Support Patient Care Standards* - to position the JPL development team to identify the opportunities for AUDREY to assist the work of paramedics through a difficult call for service. Application of AI for this problem focused on, among other things, the ability of the system to identify from myriad sources, those pieces of data or information that are relevant to the call for service. Similarly, in an AUDREY application for US firefighters, the importance of having solid data was emphasized by Dr. Chow.

Implications for First Responders and Solution Developers

A good question for police and other first responders to ask when considering a new technology application is: "*to what extent will this particular technology solve the operational problem under consideration?*". To name just a few, the following operational decision-making challenges could be considered for innovative technology supports such as AI:

- use of kinetic force
- police and citizen behaviour during large gatherings and public order events
- detection and mitigation of threats and hazards in the operating environment
- resource allocation of responders and partner agencies

Consider the challenge of reducing avoidable collisions for police vehicle operations. The characterization of the problem is complex in and of itself. Are the antecedent problems training, vehicle equipment and configuration, stimuli impairing officer attention, or perhaps cognitive overload under stress? The challenge will be to ascertain which parts of the 'problem' lend themselves to AI or other technology supports and where other improvements can be made.

Looking ahead, DRDC is positioned to leverage *Innovative Solutions Canada* (ISC) investments to incentivize the development of technology supports – using things like artificial intelligence - to improve responder safety as well as command and control of critical incidents.

Key references

ⁱ Royal, Michelle, H. Colbert and D. Gamble, "*Canadian Next-Generation First Responder Preliminary Capability Assessment*," Defence Research and Development Canada, Centre for Security Science, Ottawa, 2017.
https://cradpdf.drdc-rddc.gc.ca/PDFS/unc274/p805347_A1b.pdf

ⁱⁱ US Department of Homeland Science and Technology. News Release: *U.S. and Canada Kick off Joint Next Generation First Responder Initiative with Artificial Intelligence Field Experiment*. Release Date: July 6, 2018
<https://www.dhs.gov/science-and-technology/news/2018/07/06/news-release-us-canada-kick-artificial-intelligence> [Accessed January 31, 2020].