

2020 Research & Development Priority List (Combined)

Each year, the IAB membership prioritizes first responder research and development (R&D) items. The R&D items were assessed based on the following criteria: mission performance, life safety of first responders and civilians, strengthening response systems, and anticipation of purchase by communities in need.

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1. Indoor 3-D Tracking of Personnel
 Technology to track operating personnel in 3-D environment indoors, which is defined as urban type infrastructures such as high-rise buildings to include XYZ coordinates. These systems have two components: (1) transmitting device carrier by a first responder that allows an electronic signal to be located to within 3 feet on both a horizontal and vertical access, and (2) a computer that receives the signal and displays it, allowing an incident commander to observe in real-time the location of first responders operating within the incident.
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2. Real-Time Automatic Detection, Identification, and Translation of Non-English Texts-to-911
 Analytic software that will, in real-time, automatically detect, identify, and translate non-English texts-to-911 into English, as well as translate back the English responses in the texter's language.
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3. Low Cost, Thin Driver's Side Ballistic Window Glass
 A ballistic glass on the driver's side of the patrol vehicle to allow officers the benefit of ballistic protection while on patrol. Glass should be thin enough to allow the window to move up or down and light enough to not overly stress the motor. The window should be cost effective to allow departments to deploy across and entire fleet.
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4. Robotic X-Ray Integration
 An x-ray capability for existing bomb squad robots that incorporates key components of the system into the robot frame and communications system, so that when source and imager components are added, they attach and plug into the robot in a way that the x-ray system can be managed by the robot operator.
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5. Development of Performance Requirements & Test Methods for Ballistic-Resistant Body Armor for Women
 Appropriate performance metrics and test methods for construction and features of shaped body armor designed for females to validate test methods and revise existing body armor standards, addressing the unique needs and requirements of female law enforcement officers, soldiers, firefighters, and emergency medical service personnel.
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6. Use of Unmanned Aircraft Systems (UAS)
 UAS-related tools (thermal imaging cameras or two-way communication between operator and command post) and standards for use (standard operating procedures and maintenance) to help law enforcement agencies start and maintain an effective UAS program for use of UAS for aerial observation of incidents and interaction by law enforcement agencies when the use of aircraft is impractical or cost prohibitive.
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7. Responder / Receiver Mental Health and Wellness
 Responder / Receiver menu driven suite of mobile apps providing pre-event stress inoculation, post-event psychological first aid, and post-event self-assessment and referral for occupational stress exposures and the continuum of stress responses. Data would be available to supervisors to document training compliance. App would allow for customization based upon event type, discipline type, and role in the organization.
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8. HME Neutralization
 A method is needed for application to HME materials that will change them from an explosive material to inert material that is safe to transport and dispose of.
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9. Proximity or Robot-Based Chemical Detector
 Capability to allow operator to remotely sample and identify chemical hazards while minimizing the potential deleterious effects on the operator, such as time on target and time wearing PPE by offering remote access to samples. Chemical materials of interest include binary threat precursors materials (phosphide, sulfide, and cyanide salts); explosive precursors (peroxides, nitrates, etc.); drugs and drug precursors; chemical agent precursors (chlorine, ethylene, thiodiglycol, etc.); and toxic industrial chemicals.
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10. 3-D X-Ray
 Ability to take multiple x-rays of a package and develop into a 3-D image, preferably with only one trip downrange. Technology will require an apparatus to capture x-ray images from different angles within a single plane and then process those images in a computer to generate 3-D images that can be viewed from a computer screen.

-  **11. Proximity or Robot-Based Explosives Detector**
 Capability that allows for the operator to remotely sample and identify HME lab materials while minimizing the potential deleterious effects on the operator. Develop a proximity ([T] = 30 cm; [O] = 2 meter) detection and identification capability for the explosive materials present at visible/bulk levels (> 1 mg). Explosive materials of high interest include TATP, HMTD, MEKP, AN, Black Powder, Armstrong's Mixture, and others.
-  **12. Artificial Intelligence (AI) Capability to Supplement PSAP Call-Taker Overload**
 An AI system to answer 911 calls, collect information from the caller, and provide the information to the call-taker, in prioritized order, during periods of PSAP overload. The system would be able to ask specific questions, such as the caller's name and phone number, type and location of incident, etc., record and analyze the caller's responses, prioritize calls, transmit information, and forward the call to a call-taker when available.
-  **13. Near Real-Time Sharing of Video Feed**
 Ability to provide near real-time sharing of a video feed (from a smartphone, body-worn camera, UAS camera, etc.) with other first responders and emergency management to allow for viewing and analyzing video feeds independently of the primary user.
-  **14. Study of the Penetration of Firefighting PPE and Skin by Common Chemicals**
 An analysis on the penetration of turnout gear and human skin by increasingly more common chemicals to study the short- and long-term risk posed to the health of firefighters. Relevant chemicals include per- and poly-fluoroalkyl substances (PFOA and PFOS), polybrominated diphenyl ether (PDBE) fire retardants, organophosphate (OP)-based fire retardants, and lithium ion battery combustion products (such as propylene carbonate, lithium hexafluorophosphate, and hydrogen fluoride).
-  **15. Body Core Temperature Management System**
 A system that does not impair the body's natural mechanisms for heat dissipation while ensuring personal protective equipment keeps EOD and hazmat community safe from chemicals, pressure, and projectiles.
-  **16. Universal Suit Seal/Respirator-to-Suit Interface**
 A better interface in place of current mask-to-garment elastomeric interfaces that allows for fit with a variety of certified NIOSH respirators, including NFPA 1992, NFPA 1994, or NFPA 1999 ensembles.
-  **17. Interoperability Requirements for Incident Management Systems**
 A standardized, integrated incident management system that interfaces with and across platforms to third party technologies, such as accountability (company, unit, location), air management, biometrics, and environmental data. Cross platform integration/standardization is necessary for interoperability and the desire for a single incident management interface.
-  **18. Ability to Interface Multiple Databases & Services with Currently Utilized First Responder Communications**
 Software to allow first responders to interact with multiple databases, such as brand names/generic names/street names of medications and services, through currently used communication devices (LMR, smartphone) to access additional resources quickly and easily.
-  **19. Alternative Crowd Dispersal Device**
 A crowd dispersal device that can be deployed from a safe distance, prevents any contact between the public safety personnel and the public, and gets immediate compliance from individuals to disperse from the area. Device shall be chemical/toxic free and shall not contact or cause potential for injury to individuals it is deployed upon.
-  **20. Near Real-Time Sharing of Screen Display**
 The ability to provide near real-time sharing of a screen display (smart phone, laptop computer, etc.) with other first responders and emergency management to allow viewing and analyzing visual screen displays.
-  **21. Pedestrian Sensors on Patrol Cars**
 Pedestrian sensors on patrol vehicles to prevent officers from being a target for assault while parked in their patrol vehicles. People approaching their patrol vehicle on foot can move up and ambush the officer. The sensor would provide a 360-degree coverage around the vehicle to alert the driver when someone approaches their vehicle on foot.
-  **22. Effectiveness of Wipes as Skin Decontamination Aid at Fire Scene**
 Research on the use of different types of absorbent wipes and their effectiveness in removing fireground contamination from the skin of firefighters without exacerbating dermal exposure. This includes methods of evaluation and an understanding of the characteristics of wipe products that enable use-decisions for removing fireground contamination.

-  **23. Non-Pyrotechnic Diversionary Device**
An alternative device that can be deployed when Noise Flash Diversionary Devices (NFDD) or “flash bangs” cannot be used. The non-pyrotechnic dynamic entry device should have similar disabling characteristics as a NFDD or “flash bangs” with improved safety. The device cannot negatively affect tactical operations when deployed.
-  **24. Meta-Analysis of Preventable Causes of Death for Law Enforcement**
Research to identify a comprehensive meta-analysis of the preventable causes of death for law enforcement officers, including death by weapons and vehicles (i.e. lack of training, poor tactics, etc.). Study should include attributional factors and long-term effects of wellness issues, such as cardiac complications, health and wellness, depression, PTSD, environmental hazards, and cancer.
-  **25. Rapid Universal, Battery Charger for Portable In-Home Medical Devices**
A battery charger for portable in-home medical devices (infusion pumps, ventilators, apnea monitors, etc.) to rapidly charge the back-up batteries when electricity is unavailable in the home.
-  **26. Non-Burning Treatment System for Illegal Fireworks**
An EPA-approved tractor/trailer size mobile treatment unit that could travel to the point-of-storage of fireworks for on-site, safe reduction to a desensitized slurry that can be hauled away to a central processing plant for treatment, recycle/reuse, and destruction. Process would include converting materials, such as fireworks, explosives, and pyrotechnics, into a product that is safe for human health and the environment.
-  **27. PPE for Law Enforcement First On-Scene at Wildfires, Structure Fires, or other Fires**
Personal protective equipment (PPE) for law enforcement officers responding to or providing perimeter control at a structure fire or wildfires to increase the officer’s functional ability (survivability) and enable the officer to potentially save lives during fire events requiring evacuation or immediate rescue.
-  **28. Determine Threat of PFOA/PFOS in Turnout Gear**
An analysis of per- and poly-fluoroalkyl substances (PFOA and PFOS) presence in firefighters in the United States to include evaluation of operational impacts on turnout gear, if PFOA/PFOS water retardant materials are removed from turnout gear, total PFOS load in firefighters’ bodies versus the standard population, and a material standard confirming gear/materials do not contain high priority environmental hazards prior to firefighting use.
-  **29. Multi-Meter for Bomb Technicians**
A comprehensive multi-meter tool for use during manual entry scenarios requiring electronic detonator and switch diagnostics that measures (1) DC current (in-line and indirect current probe), (2) DC voltage, and (3) continuity for the purpose of detonator/switch diagnostics. Color-coded probes should be optimized for taking voltage and current measurements through the insulation of detonator leg wires.
-  **30. Small Unmanned Aerial System (sUAS) with Multi-Gas Metering for Operation in Flammable Gas Environments**
A sUAS weighing under 10 lbs. with a combination of sensors commonly found in 5-gas meters that first responders routinely employ. The device would take indoor/outdoor readings in flammable gas or vapor environments and send readings wirelessly to the person operating the sUAS.
-  **31. Receive-Only Mode for Communications Not Connected to Network to Reduce Power Consumption**
A system that allows users’ communication devices in areas that lack connectivity to enter a ‘receive-only’ mode to reduce power consumption, instead of continually ‘pinging’ to try and locate and connect to a network. The devices would be brought back into normal mode upon receipt of a signal from a network, which requires little or no power to detect.

2020 Research & Development Priority List (By Discipline)

COMMUNICATIONS

1. Real-Time Automatic Detection, Identification, and Translation of Non-English Texts-to-911

Analytic software that will, in real-time, automatically detect, identify, and translate non-English texts-to-911 into English, as well as translate back the English responses in the texter's language.

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EOD

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HAZMAT

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LAW ENFORCEMENT

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