



# Invisible hazmat

Hazmat training in confined spaces is about to go the next level of realism thanks to technology making its way from the chemical warfare training sector.

Directives, but with so much emphasis on prevention, how can operators prepare for the possibility of a hazmat release such as a gas plume?

Such training aids are on offer and under constant development by Argon Electronics, a hazmat/CBRNE specialist that provides simulator training technology for military and emergency response sectors worldwide.

Argon Electronics first became involved in hazmat simulators in the late 80s, when the UK fire service was looking for ways of moving away from radiation training involving live sources. The use of real radioactive materials was not only becoming regulatory burdensome but, in addition, it was found that their use also distracted students from additional aims set out in the exercises.

**I**n September this year a new device will be unveiled that can simulate specific levels of different gases' concentrations and interact accordingly with handheld gas detection simulators to provide better training realism in confined-space scenarios.

There may be a plethora of regulations governing the operation of hazardous industrial and process facilities, which range from Seveso III and COMAH to DSEAR and Atex



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A field or table-top exercise can be planned easily using a map or images of an industrial site.

The company subsequently developed training simulators that helped students focus on their own radiation exposure without taking attention away from other aims of the exercise, such as victim rescue. Steven Pike, founder and managing director of Argon, explains more: "With radiation simulators they were able to go into an area and their meters would alarm; if the victim was trapped in a vehicle with a radioactive source, it could be that the rescuer could not walk directly to the vehicle 30m away and keep below safe levels of exposure. However, a survey might reveal that walking around the back would expose them to a tenth of the radiation that they would receive otherwise, and they could translate that to spending ten times more time with the victim to try to get them out. This aspect was always difficult to exercise without using some form of radioactivity simulation."

The simulation technology was further developed in the

context of chemical warfare and toxic materials, which led in 2008 to Plume Sim, a simulator package that works with either replica gas or radiation monitoring equipment for field and table-top exercises.

In summary, the system enables the instructor to plan a field or table-top exercise on a laptop by using a map or images of an industrial installation. Parameters are selected for the activation of the simulation instruments in the field, which include the type of substance; whether from a single or multiple sources; plus a range of environmental conditions such as variation of wind direction and speed. If students are deployed in the field with GPS-enabled simulation detector units, the instructor can monitor their locations and the levels of agent being displayed in their handheld simulators, in real time. The entire exercise is recorded for assessment and validation of contingency plans.

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Multigas Sim turns mobile devices into gas detectors for the duration of an exercise.

Since the release of Plume Sim the equipment has been enthusiastically taken up by military forces around the world, the latest contract being with the US Marine Corp, which took delivery of the Plume Sim in early 2018.

In 2016 the company developed a new version of Plume Sim that was more targeted at the training budgets of high-hazard industrial organisations and municipal responders: Plume Sim Smart.

Plume Sim Smart offers similar capabilities to Plume Sim, but replaces simulator devices in the field with mobile phones. Plume Sim Smart's app turns a mobile phone into a lookalike gas detector for the duration of an exercise. In table-top mode, the top half of the screen is the simulated detector, the bottom half is the game pack controller. "The instructor has a laptop that is typically hooked to a projector, so the students can see a map of the area," explains Pike. "The instructor can disable the view of the plumes, and can just reveal the wind direction and pattern. The students then manoeuvre themselves around the area, or the commander instructs them where or how to deploy. If they happen to be in the area with a release, they will get the appropriate readings on their phones." Following the exercise, the instructor can show the nature of the plume, its direction, and any sensitive buildings in its path such as hospitals. "You can save the exercise so that if any questions arose about training for this type of event, it is just a question of getting the file out."

Using mobile phones has some unexpected benefits in that it enables field exercises to take place truly offsite, in the middle of a city, without causing alarm. "If you are looking to practice reporting back and checking readings in towns, it would not go down well to have people walking down the street in PPE carrying a meter of some description. With Plume Sim Smart it's just people walking down the street looking at their mobile phones – same as half the population."

The natural progression in this type of training is to

transition from table-top mode, which allows people to experience how the system functions, to field exercise mode with full PPE. "If there is a training environment it is logical to dress up people in PPE, when all the stresses associated with PPE can come into play, such as using the actual radio comms system. In many countries bands have been squeezed to fit more radio traffic, which has led to less bandwidth available for speech. If you are in PPE and stressed, with ambient noise, there is more scope for unclear communications. People come under psychological stress and they may misinterpret or forget processes. This type of exercising is valuable because it allows people to fail, and then hopefully there is more chance of everything working out when the real incident happens," says Pike.

A new multigas simulator that works with Plume Sim Smart is currently in development for use in confined spaces and multi-level buildings. The threat could be gas escape or a number of dangerous devices secreted somewhere in a building. The hardware is the same as currently available both for chemical warfare training and the toxic industrial response training. "The instruments can be set to emit a signal that represents either a specific substance or set to present a low level of oxygen or an explosive atmosphere in a confined space. As responders enter into that environment, the readings on the display will vary accordingly; for example if limits are breached alarms are activated in their PID detectors."

The new multigas simulator is designed to overcome the constraints posed by interference to communications inside a building, where GPS technology is limited, explains Pike. The new technology will also be highly configurable so that instructors can decide whether single or multigas sensors are used.

The multigas simulator is expected to be in the market later this year.

## MIXED CONNECTION – TOXIC RESULT

The Chemical Safety Board has released a new safety video detailing key lessons from the 2016 chemical release at MGPI Processing Facility in Atchison, Kansas.

The toxic release resulted in over 140 reported injuries, and approximately 11,000 members of the public forced to evacuate or shelter in place.

The release occurred on 21 October during a routine delivery of sulphuric acid: the delivery driver was escorted to a loading area and an operator unlocked the sulphuric acid fill line for the driver to connect with the truck's hose. The sodium hypochlorite line was also unlocked and the two lines, which were close together, looked similar and were not clearly marked; the driver inadvertently hooked the sulphuric acid hose to the sodium hypochlorite fill line. As a result of the incorrect connection, thousands of litres of sulphuric acid from the tanker truck entered the facility's sodium hypochlorite tank. The resulting mixture created a dense green cloud that travelled northeast of the facility until the wind shifted the cloud northwest towards a more densely populated area of town.

The CSB's newly released safety video, *Mixed connection: toxic result*, includes a 3D animation of the incident, as well as interviews with a CSB investigator and CSB chair Vanessa Allen Sutherland.

In the video, Chairperson Sutherland says: "Delivery and



unloading operations may be perceived as simple compared to other processes at chemical facilities, but because these activities can involve large quantities of chemicals, the consequences of an incident can be severe. Our case study on the MGPI incident stresses that facilities must pay careful attention to the design and operation of chemical transfer equipment to prevent similar events." The CSB video notes that chemical distribution takes place on a massive scale in the US. According to a study by the National Association of Chemical Distributors, more than 39.9 million tonnes of product were delivered to customers every 8.4 seconds in 2016 – resulting in many opportunities for incidents like the one at MGPI to occur. The video can be viewed on the CSB's website and Youtube.