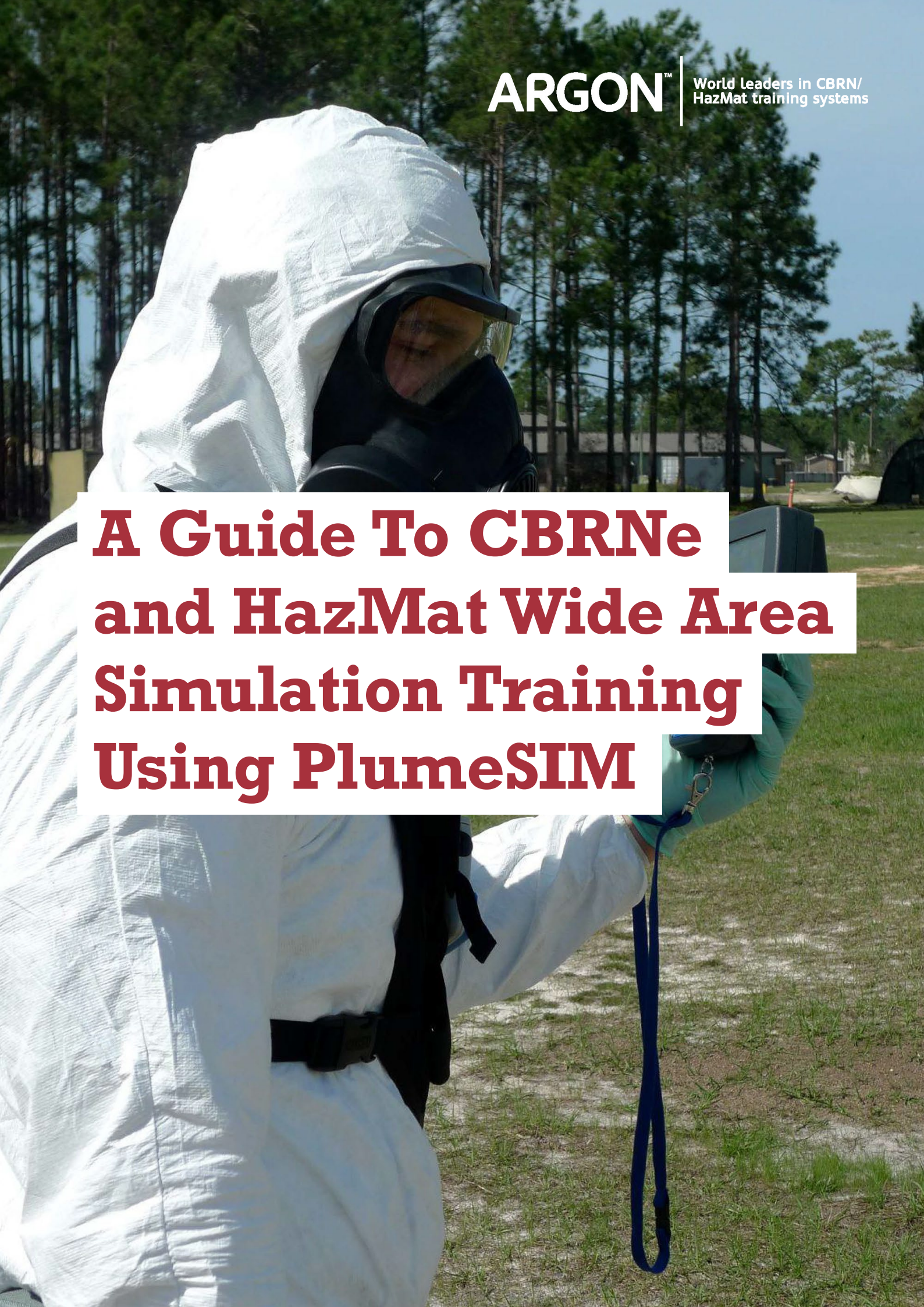


**ARGON™**

World Leaders in CBRN/  
HazMat training systems



**A Guide To CBRNe  
and HazMat Wide Area  
Simulation Training  
Using PlumeSIM**

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# Introduction

Delivering effective wide area CBRN/HazMat training with real tools while maintaining safety and following regulations can be a significant challenge. Even in the presumed safety of a training environment, the process of detecting, identifying, and monitoring certain hazardous and radioactive materials can pose a risk for emergency response teams.

This is why having access to the right equipment is integral to effective training. The equipment should ideally be as similar as possible to the real tools used in the field. This helps responders better understand the capabilities, applications, and limitations of every detection tool that they may be called upon to use, especially in what can often be hazardous, challenging and high-pressure environments.

In this book, you will learn:

- Four important principles of wide area training
- How to research wide area simulated training systems
- Details about how our PlumeSIM system enables you to deliver effective real experience wide area training



# 4 Principles of Wide Area Simulated Training

Wide area chemical and radiological simulator systems deliver safe, authentic and engaging CBRN and HazMat real experience training scenarios. In this chapter, we will highlight 5 important principles of wide area simulated training to keep in mind when planning your scenario.

## 1. Safety

This is the most important consideration for any HazMat or CBRNe training exercise. Keeping both personnel and the environment safe, however, can pose a significant challenge when utilising real devices and chemical or radiological sources.

Location is one of the main challenges, especially for training involving potentially harmful materials.

Teams who need to learn key response tactics in government buildings, for example, will have to ensure that they are adhering to strict safety protocols that can potentially limit the scope and realism of their training.

Additionally, outdoor training needs to be carefully monitored and controlled. Instructors must consider everything from the time of day it is conducted to the appropriate weather conditions, the type of radiological source used, and/or the quantity of chemical agent or chemical agent simulant that can be released. In these scenarios, wide area training systems and their associated simulation detectors offer an authentic real experience training scenario with no risk to people and significantly reduced, if not zero environmental impact.

## 2. Realism

Studies indicate that realistic training scenarios are integral for achieving a successful learning outcome. One [meta analysis](#) of simulation training in higher education found that simulations are the most effective way to facilitate learning of complex skills across domains (such as CBRN/HazMat). This analysis highlighted the importance of realistic practice opportunities which include authentic problems related to the professional field.

Stakes are higher when this professional field involves CBRN and HazMat response. Adequate realism is necessary for teams to develop the skills and muscle memory needed to respond in highly stressful emergency situations.

Authenticity is especially important in the creation of radiation safety scenarios where the invisible threat of radiation fails to trigger an immediate response from the student. The key lies in creating realistic scenarios that replicate the instrument readings and responses that participants will experience in real-life incidents. Wide area simulation training systems provide an infrastructure for these scenarios.



### 3. Ease of Use

In addition to providing realism for successful learning outcomes, wide area training exercises should be frequent and repeatable. They should also be easy to implement within the time frame and environment of your choice. As we have explained, however, safety considerations pose a significant challenge.

These exercise implementation challenges can have an adverse effect on the success of your training. Additionally, CBRNe or HazMat scenarios which are limited by unavoidable delays in the resetting of equipment, essential decontamination procedures, special permissions, regulatory administration, or the clean-up time between exercises can make it difficult – if not in some circumstances impossible – to deliver a frequent and repeatable realistic training experience.

Wide area training simulator systems allow for unlimited scenarios that can be carried out in any setting. They are suitable for individual or group use, without the administrative and regulatory “red tape” involved with traditional chemical simulants and radiological sources.

### 4. After Action Review (AAR)

One of the most important steps in any training scenario is completing an after action review (AAR). This not only tracks how successful the learning experience was, but also helps instructors and students pinpoint where things have not gone to plan, and why.

Research has indicated that these AARs can significantly improve learning outcomes. In a systematic review of findings from 46 studies that reported on the impacts of AARs on “quantifiable aspects of performance” (such as simulators, personnel records, and performance appraisal ratings), it was found that AARs improved effectiveness over control groups by approximately 25%.

Additionally, obtaining this feedback is critical to ensure that the right protocols are being followed, including correct detector use, measurement taking, and flag planting.

If a crucial step has been missed, the simulator training system will record any errors to create an AAR and exercise recording can also prove a valuable means to demonstrate the operational readiness and effectiveness of response teams to third parties.



# What is PlumeSIM?

Utilising the correct wide area training system can have a profound impact on the safety, realism, and overall outcome of the learning scenario.

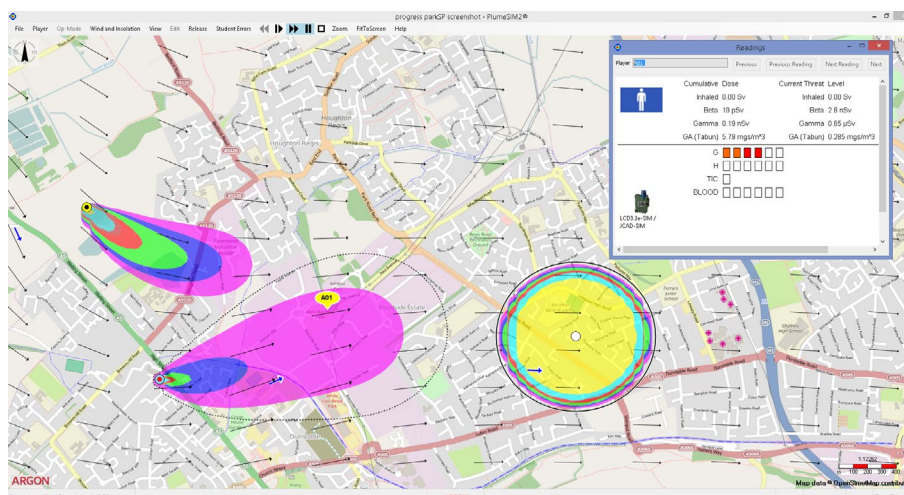
With this in mind, Argon Electronics developed PlumeSIM®. This wide-area instrumented training system provides management of chemical and radiological simulators that respond to a wide variety of user defined threat scenarios. It's perfect for CBRN counter terrorism, petrochemical or industrial toxic release scenarios and nuclear emergency exercises.

This real time training system includes powerful after action review to ensure effective learning outcomes. It enables training of multiple personnel, and even separate teams. The system also enables those responsible for incident management to practice their decision making processes.

PlumeSIM is completely portable and can be set up on a PC or laptop without extra system hardware. Instructors simply select the parameters for the scenario to influence the activation of simulation instruments. For teams looking to use app-based technology, rather than simulation devices, [PlumeSIM Smart](#) can be a powerful option (learn more in an upcoming chapter).

One of the most significant benefits of PlumeSIM is the great number of parameters available. Instructors can set up the type of threat, such as plumes, depositions, and hot spots, and release single and multiple sources. They can also select plume size and height, both of which can significantly affect student response to the exercise.

PlumeSIM offers a full range of environmental conditions, such as wind direction and velocity. Importantly, these can also be changed in real-time to give students the opportunity to respond to new conditions, such as plume variation due to a change in wind direction. Instructors can then record the actions of trainees from a single location.



# How Does PlumeSIM Work?

PlumeSIM incorporates four important aspects of training: Planning, Tabletop, Field, and After Action Review.

## Planning Mode

The PlumeSIM system's innovative design allows for the use of common file format map images. Instructors can even incorporate "home-made" sketches of the training area.

To add to the realism, instructors can also superimpose the actual satellite image of the area from Google Earth™ onto the training map.

Once the map is set, instructors can quickly and easily set and adjust the source type(s), quantity, location and nature of the release source. They can also set the desired environmental conditions.

Instructors can also define a plume or hotspot based on a variety of hazardous substances, CW agents, radionuclides, or compounds. They can then implement different release characteristics, such as duration, direction, persistence and deposition.

Multiple exercises can be set up, and all of their parameters can be saved for repeating scenarios as many times as needed in the future.

## Tabletop Mode

This classroom mode is ideal for pre-exercise familiarisation.

In this mode, students use gamepad controllers to move through a designated exercise location on the map.

Their simulator detectors are wirelessly connected to a tabletop controller that communicates scenario information to the devices. This allows students to see accurate real-time readings based on where they are located on the map. If a student is approaching a hot spot, for example, the readings on their instruments will begin to increase.

Students can then report readings and plant flags in key activity zones on the map. Each player can use up to six simulator detectors at a time.





One important benefit of tabletop mode is its ability to mask the plumes, hotspots, and depositions the instructor has laid out. The instructor can opt to hide these events and make them only available to key operators, which incentivises students “in the field” to depend on their device readings.

## Field Mode

Thanks to its portability, PlumeSIM can also be used when students are ready to train out in the field.

The simulator detectors are wirelessly connected to the PlumeSIM system via a field base station and a wearable player pack that incorporates a GPS to keep track of student locations.

This detector connection can be maintained with up to five repeaters, for up to six kilometres, allowing for maximum movement and large area training with real-time instrument usage reporting.

Field mode works similarly to tabletop mode, with measurements which reflect the exact location of the plume, hotspot, or deposition. Instructors can also make changes to the parameters in real time.

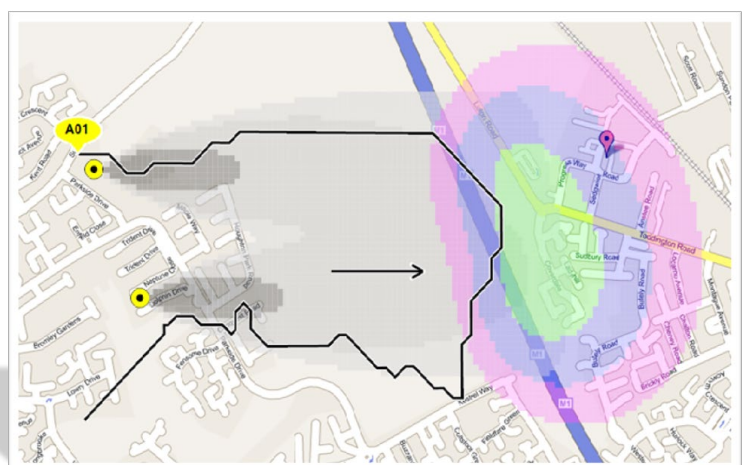
## After Action Review (AAR)

Both tabletop and field modes incorporate an after action review (AAR) capability. This details all of the students’ movements, including when and where they took measurements.

The AAR’s recording incorporates detailed feedback that tracks the students’ paths and device measurements throughout the exercise. If a student moved through a plume without noticing, for example, instructors can replay the scenario and show them exactly where they were when they missed the measurement.

This level of AAR detail allows students to see exactly where they succeeded, and importantly, where they need to make improvements.

Exercise results can be forwarded to an independent moderator for response capability measurements and validation of contingency plans.





# Incorporating PlumeSIM Into Other Training Systems

As we have demonstrated, PlumeSIM delivers safe, real experience training in a multitude of conditions. The PlumeSIM system is highly effective on its own for various exercises, team sizes, and training goals, but another benefit is its ability to incorporate other training systems.

Two key examples of this include the SAAB CBRN [Combined Arms Training System](#) and the [Steel Beasts Training System](#).

## SAAB's Gamer and Argon's PlumeSIM



Argon Electronics integrated SAAB's Gamer with PlumeSIM to create a state-of-the-art CBRN Live Training system. This enhanced system was first introduced in 2015 at the tenth international live training symposium, Levels of Fidelity, which was held at the Army Training Centre (AZA) in Walenstadt, Switzerland.

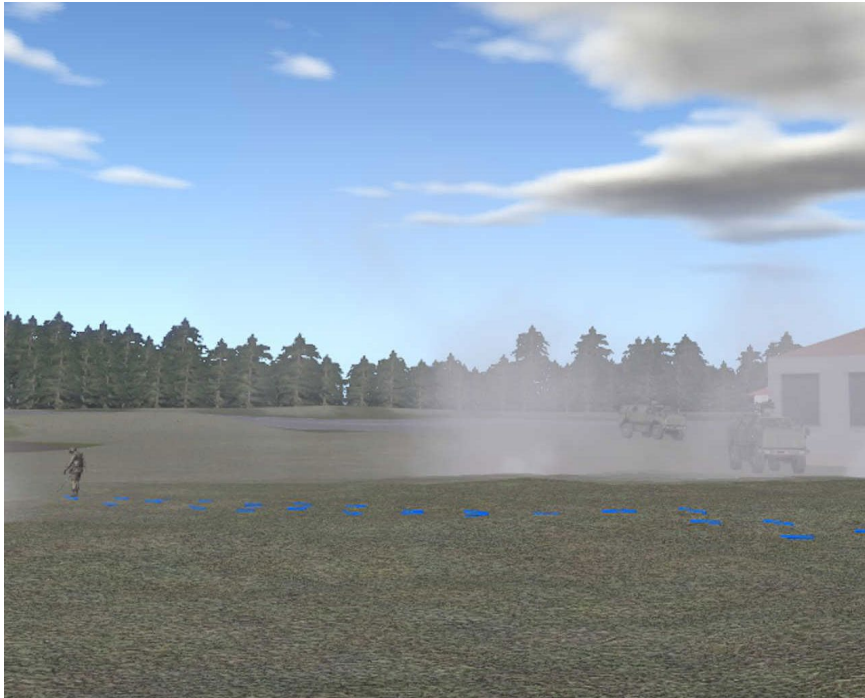
Argon Electronics and SAAB jointly staged a live scenario at the event, in which a hijacked military vehicle was weaponized with a simulated CWA.

The vehicle was driven towards a base guard post, and as the guards approached the vehicle, a simulated CWA was released. This triggered their chemical detectors (in this case, simulators of Smiths Detection [M4JCADs](#) / [LCD3.2e](#)), which prompted them to put on their respirators.

Once appropriately protected, the guards were then able to continue their response using Gamer's simulated Live Firing capability.

The demonstration attracted a huge amount of interest and positive feedback.

## Steel Beasts Pro Training System

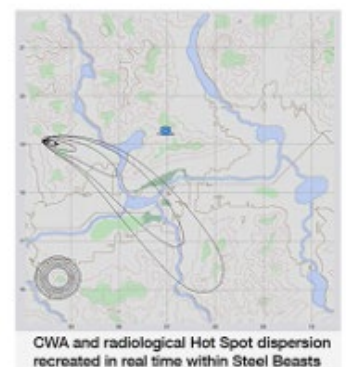
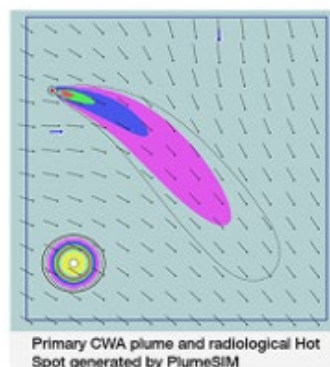


Argon's PlumeSIM Application Programme Interface (API) is a direct response to a request from an existing Steel Beasts Pro user who wanted to incorporate PlumeSIM's CBRN capability within its tactical simulation exercises.

Argon Electronics partnered with Steel Beasts Pro developer eSim Games to create a seamless integration between the two systems. Argon achieved this by adapting its PlumeSIM technology to enable the training system to be interfaced to a third party, Live and Virtual simulation system, and to import and display CBRN plumes (and their associated threat data) in real time.

The Steel Beasts Pro system uses the information obtained through each PlumeSIM exercise, such as participant location and exposure, to apply a relevant Damaged/Disabled status and to display an animated response within the simulation.

This allows users of Steel Beasts Pro to further develop their skills in recognising and responding to CBRN hazards. All information is presented in a compatible and seamless format within the trainee's own in-service simulation system. Steel Beasts Pro integration is a user-customised solution. Presently a concept demonstrator, interest in further development and application from Steel Beasts users is invited.





# Evaluating PlumeSIM's Total Cost of Ownership

When considering any new system, it's important to determine your long-term training goals and estimate your potential return on investment.

PlumeSIM offers a constantly evolving training solution that allows for a wide array of training exercises over a potentially endless period of time. The system itself is a single purchase, with the potential to scale up with add-ons whenever needed.

This system saves time and resources by allowing teams to set up training exercises when, where, and how they want. Instructors don't need to source and pay for chemicals, gases, or radioactive sources, or budget for their associated regulatory control and administrative costs.

They also don't need to find exercise locations which will allow these substances to be used. This opens up more options for exercise locations (and potentially lower rental rates).

One of the most important considerations is the actual lifetime cost of ownership of not only the system, but also each associated device. As PlumeSIM operates with simulator detectors, it's important to consider the direct and indirect costs involved in acquiring and operating these products over their lifetime.

With this in mind, here's a breakdown comparison of actual detectors and simulator detectors:

## **Actual Detectors**

Deploying actual detectors in training scenarios requires a budget for the acquiring, transportation and handling of any sources that are vital to the operation of those detectors. These are subject to significant regulatory control with associated administrative cost.

Many real detectors also require the purchase of replaceable consumables. This can include hydrogen cylinders, filters or sieve packs. If they're incorrectly fitted during training, the detector concerned may need expensive repairs. In some cases, incorrect use by trainees can even mean needing to purchase new detectors.

Another budgetary consideration is the ongoing maintenance, decontamination and servicing of your detector equipment to ensure operational readiness.

## **Simulator Detectors**

Simulator detectors are generally more expensive at the outset, but their whole life cost is much lower than actual detectors. This is because simulators don't require many consumables (aside from the replacement of batteries), and they don't need regular calibration or preventative maintenance.

A well-designed simulator can also replicate consumables, which allows students to safely practice replacing them. Simulator detectors also allow trainees to experience the effects of contamination of their equipment, but without the need to use a substance which could potentially harm the device.

Perhaps most crucially of all, using simulator detectors during training safeguards the operational readiness of actual detectors. This ensures that safety-critical equipment is available when required.

## **PlumeSIM-SMART and App-Based Simulators**

[PlumeSIM-SMART](#), a derivative of PlumeSIM, is perfect for teams looking to take advantage of PlumeSIM's powerful capabilities – including planning, tabletop and field modes, and after action review – without purchasing the associated simulator equipment.

Whereas PlumeSIM is paired with simulator detectors to more deeply facilitate real experience training, PlumeSIM-SMART employs App based simulators providing a training solution that can be used discretely within urban areas while providing extended training areas due to the use of cellular radio infrastructure.

PlumeSIM-SMART comes as a comprehensive subscription scheme which enables organisations to immediately benefit with minimal investment.

This subscription also includes pay-as-you-go exercises. Additionally, Commanders who wish to include training in response to chemical warfare agents (CWAs) can subscribe to a chemical warfare simulation capability that focuses on the use of the LCD3.3 and AP4C detectors.



For smaller organisations in particular, the cost-saving, subscription-based approach of PlumeSIM-SMART offers team leaders a practical and affordable simulation training solution that requires no additional purchase of equipment.



## Conclusion

PlumeSIM and PlumeSIM-SMART are revolutionary training systems that provide HazMat and CBRNe professionals the opportunity to immerse themselves in increasingly realistic training environments.

This training system offers training providers and their students safety, environmental sustainability, and real experience training. Its low total cost of ownership when compared to using real detectors and simulant sources frees up budget and time for teams to scale up their processes. Instructors can ensure the delivery of consistent, verifiable and measurable CBRNe and HazMat training outcomes.

With its flexibility and infinite scalability, the PlumeSIM systems can be a powerful addition to any CBRN and HazMat organisation looking to implement real experience training.

## See PlumeSIM in Action

To learn more about PlumeSIM, PlumeSIM-SMART, and any of our simulator detectors, sign up for a free, online product demonstration with one of our team members.

We will walk you through PlumeSIM and any simulators you're interested in, including chemical and radiological detector simulators. During the live demo, you can ask our experts any questions you might have.

Simply click the button below to see how real experience training can enhance your HazMat and CBRNe exercises.

### Contact us

Telephone: +44 (0)1582 491616

USA: 571 210 1258 (7am to 5pm EST)

Email: [argon@argonelectronics.com](mailto:argon@argonelectronics.com)

## Request Argon's online product demo



**Retired Army Sergeant Major  
Bryan Sommers**

If you're interested in Argon's simulators consider signing up for a free, online product demonstration with one of the members of our team.

We will walk you through the details of any simulators you're interested in, including chemical and radiological detectors simulators, as well as exercise training solutions. This will be your opportunity to ask our experts any questions about our simulators.

Discover how Real Experience Training can enhance your HazMat and CBRNe training today!

**SCHEDULE A LIVE DEMO**