AccuRad PRD Simulator.

HIGH ALARM

HIGH ALARM visible
without removal from belt.

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Responding
to the end user

**Steven Pike and Julien Spruytte create the perfect training
simulator for emergency responders – by emergency responders**

Radiation detection and measurement equipment is evolving rapidly. Here we share the story of how Argon and Mirion Technologies collaborated to produce a simulator that captures the features of a truly customer-driven detector training capability – without requiring any active sources

There are many different views on what constitutes an acceptable simulator. Ultimately, simulation is always a compromise – but the art is to reduce that compromise as much as possible, while maximising the overall training benefits and providing an immersive and realistic experience for the student.

Focus on the end user

A powerful approach applied to both detector and simulator was needed. When Mirion initiated the development of the AccuRad, it started with the end user as the focus. Initially, an ethnographic survey looked at how radiation detection and protection instruments are used – identifying the pains and requested gains.

Customers were then involved in the co-development effort (design thinking) right from the start. They were invited to define the form factor (Mr Potato Head exercise) incorporating the aspects and key features they desired and felt were lacking in currently available products.

These exercises enabled the stakeholders to design a device they wanted rather than be given a device they were told they needed.

Beyond meeting full compliance to International and US standards (IEC 62401:2017 and ANSI N42.32-2016), examples of subsequently incorporated features included:

Hands-free operations

Radiation detection is only one of the duties of the users, and they expressed the need to operate the device hands-free. This is impossible with some of the most commonly used prior devices.

This requirement led to a top display allowing quick-glance readings of the dose rate and alarm level. There was also a need for a good fit on the first responder's utility belt or on ballistic vests.

Law enforcement

Law enforcement users had discrete requirements, which led to a black and matte device and to a discrete mode without backlight, sounds or flashing LEDs.

Directionality was the most wanted innovation. Most of the time, with traditional digits or histogram-based search modes, users could not locate the source of radiation in a wide environment or a crowd.

This was because the methods were taking too long – and they needed to focus on the screen instead of looking at their environment to identify suspicious persons, objects, or immediate life-threatening hazards. This led to the large front display, including the radar search mode and large and unambiguous readings.

False alarms are also a major problem with current PRDs (personal radiation detectors). They should be avoided – especially for natural background variations. The AccuRad alarms only for real threats and minimises nuisance alarms.

Remote situational awareness

Also required by responders is remote situational awareness. This led to the AccuRad App to enable Reachback by various means – including SMS, emails, RadResponder/CBRNResponder, and SpirVIEW Mobile – with easy and robust pairing of the Smartphone with the PRD.

Mirion then executed the results of this customer engagement and during the design process, revisited this panel of users to confirm that their needs had been correctly interpreted and incorporated.

Argon's journey to develop their current groundbreaking Gamma simulation technology followed a similar path. Both military and non-military CBRN instructors were engaged to ensure their detailed training needs were understood.

Argon was especially fortunate that one agency, having ➤

TRAINER REQUIREMENTS

Repeatability and consistency of readings
If an instructor configured a scenario for students to experience specific dose and dose rate readings at specific locations, this was to be repeatable across a number of different simulated instruments.

Shielding simulation
As close as possible response to Cs-137, including shielding effects. This was a particularly tall order and one that the agency concerned very kindly carried out extensive and repeated characterisation testing against both Cs-137 and Co-60 sources with real detectors – to help optimise and verify performance of the simulator.

Time distance
Very accurate inverse square law response to teach this critical aspect of radiological awareness.

Easy to use
Quick and easy to set up and use – no fancy software required for general local field exercises.

Flexibility
Ability to use in virtually any environment – including those sensitive to certain types of commonly used radio communications. Integration with PlumeSIM and an ability to incorporate spectroscopic simulation.

Radar mode indicating
simulation source location.

TREND mode simulation.

Simulated DANGER message
based on dose rate.

purchased a competing product that failed to meet requirements, was particularly keen to help us meet their needs.

Fusion of skills

Given the shared customer-focused development of Mirion's AccuRad and Argon's simulation technology, the marriage of the resulting simulation technology and detection product seemed ideal to create the perfect customer-first training solution.

After a joint US-French review of Argon's simulation technology, a collaborative engineering team was set up between Mirion's French Lamanon facility and Argon UK. The entire project was completed within four months and without a single physical meeting. This was a superb example demonstrating the use of collaborative tools, videos, and interface control documents from both teams!

Following a number of very successful internal field trials, Mirion and Argon brought our combined package to Mirion Connect 2021 and provided 'real-world' training scenarios with actual users.

The user response was universal. The training was realistic, immersive, and allowed full results to be incorporated back through CBRNResponder – so that team members could perform all aspects required in a real response.

The radar search mode is an especially innovative and impressive feature of the AccuRad. It is fair to say that there were

reservations as to how well this aspect would be simulated. But in the trials and at Mirion Connect, it worked out just fine – and represented an important achievement for simulated training.

Indeed, training for such scenarios, like preventive detection of radioactive materials in a crowd, involves relatively high-activity sources. These come with hazards and a regulatory and administrative burden that can be completely avoided with our simulator.

Full user capability

Key for training, the full user capability of the AccuRad has been maintained within the simulator – including wireless integration with the Mirion App and RadResponder/CBRNResponder.

The simulator makes it extremely easy to help users understand how to interpret the different display options; use the most appropriate search modes for the context (radar or trend); and in particular, practice their decision making.

It also enables users to refine their operational procedures in complete safety – without the need to use an ionizing radiation source and the associated logistical and regulatory trauma.

In addition to the standard series of simulation gamma sources, the AccuRad-SIM also responds to Argon's PlumeSIM system to facilitate wide-area instrumented training exercises, such as offsite release scenarios. The beauty of PlumeSIM is that these simulations can be carried out as both table top exercises and field exercises. AccuRad-SIM is also compatible with the additional wide range of training simulators produced by Argon – enabling a comprehensive suite of instruments to be used in the same exercise. ❚❚

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