Making the initial RNe response safer... and faster

All of us take things for granted. The light turns on when you click the switch, water comes out of your tap, you can check your social media account on your mobile phone day and night, the trains run on time (mostly) and the fire and rescue service will turn out if your home is on fire. Energy, utilities, communications, transport and the emergency services form part of what is collectively known as Critical National Infrastructure (CNI).

Rob Munro

TERRIFFIC
ACCELERATED CBRNE RESPONSE

With over 35 years' experience in marketing and communications, Rob Munro has focused on EU research projects in the security and crisis management sectors for the last 13 years. Working as a consultant to ARTTIC, part of the PNO Group, for the past 5 years, Rob is the communications and dissemination lead on the Terriffic project.

But a multi-agency exercise held within the European-funded Target project in 2018 showed very clearly that within 48–72 hours of a regional electrical grid being taken out of action, normal modern-day life as we know it would be very seriously impacted. Once electrical power had been lost, people ran out of food quickly – their fridges and freezers could not keep the food safe, the supermarkets had the same problems and customers panic-bought everything else in the stores. These days, mobile phones and cordless phones at home all need electricity to run, so these became useless and people had no way of contacting friends and family if they lived far away. The schools had to close without lights and heating and they had difficulty contacting some parents if the phones did not work.

Traffic lights stopped working, leading to multiple crashes on the roads. Petrol stations could not pump fuel, so even the emergency services were impacted and had to triage the calls they responded to. Hospitals had to rely on backup generators, which are required to have sufficient fuel for 96 hours. Power outages for longer than this clearly put patients on dialysis machines and in the intensive care units at very severe risk. And should this happen in the depths of a cold winter, the impact would be even more dramatic.

In the exercise in question, a cyberattack from a rogue actor was the cause, but the impact could be even greater if the cause was a dirty bomb activated by a terrorist organisation. The main threat from a dirty bomb is from the explosion itself, which can cause serious injuries and property damage. The radioactive materials used in a dirty bomb may not create enough radiation exposure to cause immediate serious illness, except to those people who are very close to the blast site. However, the radioactive dust and smoke spread farther away could be very dangerous to health if inhaled. An added danger is that you cannot see, smell, feel or taste radiation. For the first responders, there is also the risk of secondary devices.

▼ **For further details about the project, please visit www.terriffic.eu**

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It is impossible to underestimate the importance of a country's Critical National Infrastructure (CNI) – our everyday lives depend on the smooth, continuous and efficient function of the facilities, sites, systems, people and information that make up CNI. These national infrastructure sectors include Chemicals, Civil Nuclear, Communications, Defence, Emergency Services, Energy, Finance, Food, Government, Health, Space, Transport and Water. Of course, several of these also have clearly defined 'sub-sectors'; Emergency Services for example can be split into Police, Ambulance, Fire Services and Coastguard.

Fewer risks for the response team

The initial minutes and hours of a response to any chemical, biological, radiological, nuclear, explosive (CBRNe) incident are absolutely critical. Responders aim to contain the most severe consequences, stop the ongoing criminal or terrorist threat, save victims, manage the crime scene and organise an effective response. This is also the time when first responders are most at risk as the nature, extent and intensity of the contamination is still unknown and secondary devices or contaminated objects may still be present.

The Terriffic project, which has received funding from the European Union's Horizon 2020 research and innovation programme, is working to deliver a step change in the effectiveness of first responders during the first 30–60 minutes of a radiological, nuclear, explosive (RNe) incident. It will lead to reduced response times, fewer risks for the response team and less human intervention in the operation due to a higher number of automated processes and extended mobile detection capabilities.

Terriffic will enrich the broader European response to RNe events by developing a set of modular technology components in a comprehensive system. These will include new detectors, sensors, drones, robots and plume dispersion modelling with the data being fed into augmented-reality software and into an advanced information-management and decision-support system.

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The key components of the Terriffic System:

- Aeraccess' Hawker Q800X is a versatile UAV platform that can carry a wide range of different payloads up to 1kg, including the RNe sensors and cameras developed in the project. Designed to resist harsh weather conditions, it can be flown in winds of up to 70kph with gusts of 90kph and can still operate in heavy rain, snow, fog and desert conditions.
- The NERVA XX robot from Nexter Robotics is a light, robust and versatile UGV, which can be equipped with more than 20 different mission kits, delivering significant flexibility to users. It is used operationally for tasks as varied as CBRN recognition, IED control and victim assistance. Here it is being deployed with the world's smallest coded aperture gamma camera and the FPG detector.
- Arktis Radiation Detectors is expanding the functionality of its mobile radiation monitoring MODES van to 'house' the full Terriffic System, providing rapid deployment. It has also developed a SiPR detector and a Flat Panel Gamma (FPG) detector, which delivers the highest degree of *sensitivity at a specificity* sufficient to discern the type of radioactive source (medical, natural, nuclear, industrial).
- CEA List is developing the world's smallest coded aperture gamma camera, which visualises any contamination hotspots. Weighing only approximately 300g, it can be fitted to the UAV and the UGV and transmits the images back to the incident-management software. In training mode, it simulates the gamma camera behaviour without using any radioactive sources, offering further tangible benefits to practitioner organisations.
- The École Centrale de Lyon has developed the algorithms and software that are used not only to locate the radiation source but also to identify what the source is and how it will disperse into the area, depending on weather conditions and surrounding buildings. The measurements taken produce a plume model, which can be viewed in a 3D simulation of the contaminated area.
- The augmented-reality solution developed by Luxembourg Institute of Science and Technology will provide a never-before-seen set of information in near real-time to the incident commander, delivering essential data from inside the red zone. Commanders can visualise the incident, overlay various symbols and see the sensor readings incorporated into the visual graphics.
- Bruhn NewTech's CBRNe-Frontline incident-management system pulls all of the data from the System into one place, including from the radiation sensors and cameras that are mounted on the UAV and UGV and the results of the plume modelling forecasting. Offering full situational awareness, the real-time status and management of all sensors is coordinated through the embedded SCIM software hub. Supporting critical decision making, the System can communicate a CBRNe picture to command and control systems enabling the safeguarding of lives. CBRNe-Frontline is already in operational use by NATO forces, giving it proven credentials.

▲ **The Aeraccess Hawker Q800X drone with the Flat Panel Gamma (FPG) detector from Arktis Radiation Detectors mounted underneath.**

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◀ The NERVA XX robot from Nexter Robotics with the miniaturised gamma camera from CEA and the FPG detector from Arktis Radiation Detectors mounted.

▲ The MODES van from Arktis Radiation Detectors allows for rapid deployment of the complete Terriffic System.

The project will also provide detailed information on the applicability of some developments within a chemical and biological (CB) context, so although the focus is on RNe, the outcomes are intended to have a wider impact.

Dr Ulisse Gendotti, CTO of Arktis Radiation Detectors and project coordinator expanded: 'The impact of such a terrorist act is unthinkable, but of course we have to prepare for the worst possible scenario. In Terriffic, we are bringing innovative technologies together into a new system, which will make a huge difference to the initial response. More information about the actual threat being faced means the incident commander can make better-informed decisions and save lives.'

Police and fire services are trialling and evaluating the components

All aspects of the project are practitioner driven, with CBRNe experts from several European Member States contributing throughout the project to the final solution. Leading-edge technologies have been provided by the R&D partners, whereas key innovative components are being developed by SMEs already involved in the military or first responder markets. A number of practitioners have been heavily involved throughout the development process, assessing the various components, and they will trial the technology using live radiation sources in the Final Trial.

Chambéry, not far from the Lac du Bourget in France, was the venue in April 2019 for the first Terriffic trial – an initial assessment of the existing technologies in the system's components. This three-day training and assessment event, organised by TLA and hosted by SDIS73, the French fire service for the Savoie region, allowed the technical team to create a baseline from which future development and integration work could be taken forward. Several different radiation scenarios were utilised to challenge the components in both indoor and outdoor environments, providing a baseline to evaluate the effectiveness and the potential of the various technologies.

Lt Col. Denis Giordan of SDIS73 emphasised the aspirations of the project by saying: 'I hope that Terriffic will be able to help the safety of first responders and specialised responders and to improve the tactical situation analysis."

Terriffic components were also used during the eNotice trial in Gurcy, France in May 2019 to demonstrate the augmented value of drone and robot use for first responders. Run by SDIS77 at their training centre, this demonstration exercise involved 600 participants from the police and fire services, as well as representatives from the French Ministry of the Interior and the European Commission.

Following on from what was learnt during these trials, the technical team has continued to develop and evolve these technologies – both independently and as an integrated system. Remote and physical integration of the components was carried out in March and September 2020, meaning that the project has continued to make good progress despite the Covid-19 travel and meeting restrictions. There is a final integration meeting planned for once the lockdown measures have been relaxed, then TLA will organise a number of training sessions involving practitioners from several countries. Following these will be the Final Trial in France and a tabletop and field exercise in Slovakia, which will be monitored by project partner ISEMI. Both events will importantly involve numerous practitioners, who will be able to use the integrated system and independently assess how well it performs. This will help to ensure that Terriffic can really make a difference to first responders involved in the initial response to an RNe incident. Dates for these next phases will be published very soon.

To watch the video of the first trial or to get involved in Terriffic or to find out more about the project, please visit the project website.

For more information, go to www.terriffic.eu

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