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PROTECTION | PREVENTION | PREPAREDNESS | RESPONSE | RESILIENCE | RECOVERY



ARTIFICIAL INTELLIGENCE ETHICAL COMMAND DILEMMAS

Italian avalanche response; Public communications during London terrorist attack; IEDs in Iraq; Evolutions in medicine, a tactical medic's perspective; Virtual reality; Scanning risk landscape horizons; Role of lawyers in a crisis; Drones & robotics; Disaster epidemiology; Climate change & security; EENA & Waze pilot project

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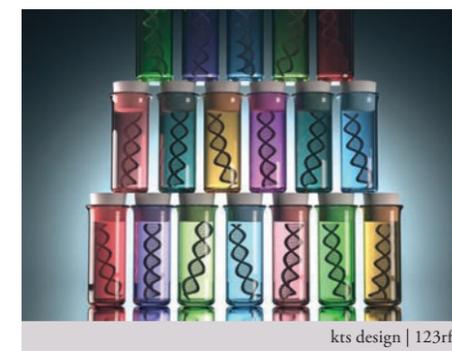
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WeRobotics

comment

Since the publication of our last issue in December 2016, exciting changes have taken place. I am delighted to be able to inform readers and subscribers that I am now one of the owners of CRJ.



Supported by new business partners and co-owners, David Stewart and Kirsty McKinlay-Stewart, CRJ is now part of a new parent company, Crisis Management Ltd. The new ownership of CRJ brings a fresh dynamism and outlook, ensuring that we maintain our position as the foremost international, multidisciplinary platform for practitioners, academics and all other individuals and organisations that are involved in crisis preparedness, planning and response. We have ambitious plans for the future and there will be constant updates on what we are doing via the CRJ website, Twitter feed, LinkedIn Group and our monthly e-newsletter.

In addition to publishing CRJ, Crisis Management Ltd provides a wide range of services across the crisis management and resilience arena, including consultancy and training services – bringing the talents of some of the finest and most respected experts across the globe to this endeavour.

The future for CRJ is a positive evolution rather than a dramatic change, and we want our community to help shape that change. We have started this process with a slight tweak in terms of the publication's format and size, which have been redesigned so that we can include even more information within our pages.

You will find the content and scope are as wide-ranging as ever – from reports on the avalanche tragedy in Italy (p12) and the London terrorist attack (p16), to horizon-scanning articles on the threat landscape (p48) and climate change and security (p44). We discuss technology innovations in the form of virtual reality (pages 30, 34 and 68) and look at resilience more generally with a host of other articles.

The most vital element of the CRJ remains its community – our global readers, advertisers, authors and Editorial Advisory Panel – and we are committed to making sure that the quality and relevance of our content are maintained and developed even further.

The new team has already been out and about at various shows and events around the world and hope to meet many, many more of you over the coming months.

Emily Hough

Night images improve disaster understanding

USA: scientists have released new global maps of Earth at night, providing the clearest yet views of the patterns of human settlements across our planet.

Now, a research team led by NASA Earth scientist Miguel Román, is working on removing the moonlight, fires and other natural sources of light and providing updated nighttime images on a daily basis, which could help in disaster response and planning.

Data from the satellite Suomi NPP uses the Visible Infrared Imaging Radiometer Suite (VIIRS)

to detect photons of light reflected from Earth's surface and atmosphere in 22 different wavelengths.

Armed with more accurate nighttime environmental products, the NASA team is automating the processing so that users will be able to view nighttime imagery within hours of acquisition. VIIRS detected power outages in the wake of Hurricane Matthew, a major storm that struck the north-eastern Caribbean and the south-eastern United States in September 2016.

In the future, NASA, FEMA and the Department of Energy hope

to produce power outage maps and integrate the information into recovery efforts by first responders.

The NASA team envisions many other potential uses for the images. For instance, daily nighttime imagery could contribute to efforts to track sea ice movements and concentrations.

A team at the United Nations has already used preliminary versions of the data to monitor the effects of war on electric power and the movement of displaced populations in war-torn Syria.

In a separate, long-term project,

Composite images showing the Earth at night could be useful for monitoring disasters such as conflict, storms, earthquakes and brownouts

NASA Earth Observatory images by Joshua Stevens, using Suomi NPP VIIRS data from Miguel Román, NASA's Goddard Space Flight Center

Román is working with colleagues from around the world to improve global and regional estimates of carbon dioxide emissions. The team at NASA's Global Modeling and Assimilation Office is combining night lights, urban land use data, and statistical and model projections of anthropogenic emissions in ways that should make estimates of sources much more precise.

"Thanks to VIIRS, we can now monitor short-term changes caused by disturbances in power delivery, such as conflict, storms, earthquakes, and brownouts," said Román. "We can also monitor gradual changes driven by urbanisation, out-migration, economic changes, and electrification."

■ To view and download the new images, and to read stories of night light science, visit earthobservatory.nasa.gov

Emergency services network fears

UK: A Public Accounts Committee (PAC) report has highlighted new and serious concerns about emergency service communications in Great Britain. The Government intends to replace the Airwave system currently used by police, fire and ambulance services with a new Emergency Services Network (ESN).

The Committee has warned that plans to take part of the existing communications system out of service early: "Strikes a major, potentially catastrophic blow to the ability of our emergency services to carry out their job and keep citizens safe."

It concluded the department concerned had not budgeted for delays, nor put in place detailed contingency plans to manage them. The Airwave contracts were being extended on a month-to-month

basis until the new system was up and running, but in January, it emerged that an important piece of infrastructure that Airwave requires to function will no longer be provided. This, said the Committee, raised the possibility that emergency services may not be able to communicate with each other after March 2020 until transition to ESN is complete in September 2020.

Meg Hillier MP, Chair of the PAC, said: "The potential consequences of a six-month gap in emergency service communications are unthinkable. Government needs to tackle this now or the result will be quite simply a tragedy in waiting."

The PAC added: "In addition it now seems inevitable that taxpayers will also be paying substantial additional sums, with no certainty of delivery."

Strategic use of apps in humanitarian ops

Geneva: It's estimated that more than 2.5 billion people around the world use messaging apps. That figure is expected to rise to 3.6 billion by 2018. In emergencies such as natural disasters or armed conflicts, people are increasingly relying on these platforms to keep in touch with their loved ones or to remain informed about the situation.

The International Committee of the Red Cross (ICRC), working with The Engine Room and Block Party, have released a report entitled, *Humanitarian Futures for Messaging Apps*, saying that messaging apps have become so widespread that they deserve to be considered 'strategically' for use in humanitarian operations.

According to the ICRC's director of communication and information management Charlotte Lindsey-

Curtet: "Humanitarian organisations are currently experimenting with messaging apps for two main purposes: to communicate with people affected by crisis or conflict, and to co-ordinate tasks and actions internally."

These new opportunities pose new challenges. "There are a number of issues such as security, data protection and privacy which need to be seriously considered," said the ICRC's head of data protection. "They can reproduce old inequalities and create new ones in the form of digital, age and gender divides."

The report was prepared with support from an advisory group that included the IFRC, the UNHCR, UNOCHA, and the World Food Programme.

■ To download the full report, visit: hop.icrc.org/messagingapps

Lives saved by drones

China: Drones have rescued at least 59 people from life-threatening conditions in 18 separate incidents around the globe, according to drone manufacturer, DJI.

More than one-third of the people rescued were saved by drones operated by civilian bystanders

and volunteers, indicating that the widespread adoption of personal drones offers a concrete benefit to public safety.

The company's report is based on a survey of media reports collected from around the world. As such, it says that it almost

certainly undercounts the number of lifesaving activities undertaken with drones. It includes rescues made on land, on water and in flooded areas, as drones found missing people, brought them water and supplies and, in several cases, brought them life jackets or rescue ropes.



USA: The George Washington Centre for Cyber and Homeland Security has published an insight into a global anti-cybercrime operation that targeted Avalanche – an international criminal business – in what has been called: "One of the most technically complex takedowns in the history of cybercrime."

The report, which was co-written by Rob Wainwright, Director of Europol, and Frank J Cilluffo, Director of the Centre for Cyber and Homeland Security, is titled *Responding to Cybercrime at Scale: Operation Avalanche – a Case Study*.

Operation Avalanche, in which an international coalition of law enforcement agencies and a private sector partners neutralised one of the most sophisticated criminal syndicates in history, says that this operation was one of the most impressive in a recent string of cross-border, law enforcement-led initiatives that has illustrated the importance of organising responses to vast cybercrime networks, based on the unique aspects of their business models.

The report provides background on the concept of crime-as-a-service (CaaS) and demonstrates

how law enforcement used its understanding of this framework to cripple the Avalanche platform. It draws upon lessons learnt to present a way forward for co-ordinated efforts seeking to take down cybercrime networks and deter cybercriminals in the first place.

In its analysis of CaaS, the authors explain that, as with legitimate economies, the cybercrime economy is driven by market forces and is: "Capable of matching the needs of products and consumers across the globe. The development of such an economy has allowed increasing numbers of criminals, including those with minimal technological savvy, to trade and utilise illicit digital services and tools." In a detailed examination of CaaS, the report highlights how the entrepreneurial behaviour of cybercriminals: "Mimics legitimate business practices, including customer service, online rating systems, advertisements and even special discounts."

Avalanche offered criminal infrastructure and services that its associates used to launch multiple cybercrime campaigns, ranging from banking Trojans, to ransomware,

phishing, and associated money laundering activities.

The operation involved more than 20 different firms, each representing one of the diverse malware families the network supported, and each providing core technical and financial services to its globally dispersed customers.

It also used a "technically complex" command and control infrastructure, which enhanced the criminal network's resilience to detection and takedown by the authorities.

Indeed, the dismantling of the Avalanche ring marked the largest ever use of 'sinkholing', a technique used to combat cybercriminal infrastructure by interrupting command and control channels. More than 800,000 domains were seized, sinkholed or blocked.

The authors add that the success of the operation, executed by the European Cybercrime Centre (EC3), together with partners from around the world, demonstrates how the axiom: "It takes a network to define a network," has never been more relevant.

■ The full report is available for download from: cchs.gwu.edu

in brief

Sri Lanka: At least 10 people were killed when a 91-metre-high garbage dump collapsed after catching fire in April. Firefighters rushed to the site in Meethotamulla and began digging through the rubbish to rescue those buried, as others fought to contain the blaze.

Mexico: A gas tanker collided with a bus near the Pacific coast and exploded in April. Twenty-nine people died in the incident.

Peru: Heavy rains, landslides and flooding led to the deaths of at least 85 people and damaged more than 145,000 houses across the country, with entire villages being destroyed or damaged. Hundreds of hospitals and more than a thousand schools were damaged.

Australia: Cyclone Debbie flooded vast tracts of land and killed at least four people after making landfall in Queensland. The main disaster zone spread across an area of more than 1,000km.

New Zealand: Floods and landslides blocked roads and closed schools, more than 1,000 homes were left without power and a state of emergency was declared in several districts as the tail end of Cyclone Debbie swept the country after causing massive flooding in Australia.

World: The World Health Organisation says that the RTS,S vaccine – the world's first vaccine against Malaria – will be introduced in three countries: Ghana, Kenya and Malawi, in 2018. The vaccine needs to be given four times, once a month for three months, followed by a fourth dose 18 months later.

Syria: The Syrian Civil Defence (SCD) centre in Kafr Zit was struck by bunker buster bombs. The bombs broke through the underground shelter, destroying it completely and killing all of the team who were sheltering inside. The SCD says the centre and its surrounding areas were targeted for hours after the initial attack. A paramedic and a civilian were killed in the same incident.

PEOPLE

New Editorial Advisory Panel Member



CRJ is delighted to welcome **Winston Chang** to its Editorial Advisory panel. Winston is Global Thematic Focal Point for the International Search and Rescue Advisory Group (Insarag) Secretariat.

He has previously served for over two decades in the Singapore Armed Forces and in various operational command and training

positions with the Singapore Civil Defence Force. His international experience in disaster management and response includes deployments as part of the United Nations Disaster Assessment and Co-ordination (UNDAC) team to sudden onset emergencies, including the Indian Ocean tsunami – Meulaboh, Indonesia, Pakistan Kashmir earthquake, Cyclone Nargis in Myanmar, the Solomon Islands tsunami, Typhoon Morakot in Taiwan and the Nepal Gorkha earthquake.

Currently, he is currently based in Geneva, Switzerland with the United Nations Office for the Co-ordination of Humanitarian Affairs (OCHA) and is the global International Search and Rescue Advisory Group (INSARAG) Secretariat Thematic Focal Point.

Winston's current portfolio includes engaging and working closely with disaster response management authorities from national governments, regional organisations, NGOs and a wide range of other relevant stakeholders on areas such as disaster preparedness and response at all levels, and in accordance with the UN General Assembly (GA) Resolution 57/150 on Strengthening the effectiveness and Co-ordination of international urban search and rescue assistance.

Winston Chang is also responsible for the Insarag external classification (IEC) system, with 49 global teams successfully classified to date.

Space weather risks

UK: Space weather is of rising importance, both as a scientific discipline in its own right (see *CRJ* 11:3) and as a severe source of risk that has been recognised by government agencies and corporations nationally and internationally.

Space weather describes the way in which the Sun, and conditions in space more generally, impact human activity and technology, both in space and on the ground.

A new report, *The Economic Impact of Space Weather: Where do We Stand?* has been published, examining the issue.

Funded by the UK Space Agency International Partnership Space Programme, the report says that although space weather is growing rapidly as a field, work rigorously assessing the overall economic cost of space weather appears to be in its infancy. The report provides an initial literature review to gather and assess the quality of any published assessments of space weather impacts and socioeconomic studies.

Generally speaking, there is a good volume of scientific peer-reviewed

literature detailing the likelihood and statistics of different types of space weather phenomena, say the authors. However, the literature on documented impacts is not as extensive, with many case studies, but few statistical studies. The literature on the economic impacts of space weather is rather sparse and not as well developed when compared to the other sections, most probably owing to the somewhat limited data that are available from end-users.

“The major risk is attached to power distribution systems and there is disagreement as to the severity of the technological footprint,” according to the authors, who call for urgent work to better quantify the risk of future space weather events.

■ *The report by JP Eastwood, E Biffis, MA Hapgood, L Green, MM Bisi, RD Bentley, R Wicks, L-A McKinnel, M Gibbs and C Burnett is published by Risk Analysis and can be viewed at <http://onlinelibrary.wiley.com/doi/10.1111/risa.12765/full>.*

■ CRJ will be examining the risks of space weather as well as space infrastructure within the context of crisis management and response in a future edition.

Gaps in SAR capability

Cayman Islands: A report released in February 2017 by the UK's Maritime Coastguard Agency (MCA) has revealed some major gaps in the islands' current search and rescue (SAR) capability, writes *Martin Boyle*.

The Cayman Islands Overseas Territory Search and Rescue (OTSAR) Capability Review was conducted at the request of the Governor's office by a team from the MCA, after an incident on March 6, 2016, which saw five persons – including two children – go missing during a boating trip around Grand Cayman.

This incident generated an independent review of the Royal Cayman Islands Police Service

(RCIPS) response, conducted by the MCA in April 2016, which found no fault with the SAR operation.

This report is the first in a series of SAR capability reviews of British Overseas Territories, and has exposed significant issues in the Cayman Islands, therefore the Governor's Office should be commended for its courage in calling for the review.

As more reviews are undertaken, a bigger picture may become apparent and opportunities for improvement and collaboration can only enhance the global SAR safety system.

■ *This news story is taken from CRJ's Search and Rescue blog; a full version of the article can be found online at www.crisis-response.com*



Land Rover and drone tested in Austria

Austria: Land Rover has donated 'Project Hero', a Discovery vehicle with a tailor-made communications drone and other specialist technology to the International Federation of Red Cross and Red Crescent Societies (IFRC). The vehicle is designed to enhance Red Cross and Red Crescent emergency response operations in the wake of disasters.

The bespoke vehicle and drone were designed in close collaboration with emergency experts from the Austrian Red Cross. The roof-mounted drone can take off and land while the vehicle is moving and is controlled by a tablet app. Once airborne, the drone feeds live footage to emergency response teams – allowing rescuers to investigate an emergency scene safely, and to rapidly assess

The Land Rover Discovery with tailor-made communications drone and other technology has been donated to the IFRC and will be tested in Austria

ICRC

damage, hazards and the condition of people who need help.

The vehicle functions as a fully-equipped mobile command unit, with storage for emergency supplies and an interior that can be reconfigured for a stretcher and other needs.

The vehicle and drone will be trialled for a year by Austrian Red Cross emergency response teams – in simulations and test runs, as well as real-time responses to accidents, landslides, avalanches, floods and other disasters that in Austria's mountainous Eisenerz region.



Fragility and conflict

USA: A key trigger common to nearly all conflicts is the element of fragility – fragility of states, of institutions, or of societies, said United Nations Secretary-General António Guterres in a call for increasing investment in preventative measures that address the problem of fragility before it turns into conflict.

“This means strengthening states, strengthening institutions, strengthening civil societies (and) combining the peace and security approach with the inclusive and sustainable development approach and with human rights,” explained Guterres, speaking at a World Bank-European Union event in Washington DC, where the Bank

Secretary General of the United Nations, (second from right) addresses the Financing for Peace event at the World Bank and the International Monetary Fund (IMF) Spring Meetings. At second left is the President of the World Bank, Jim Yong Kim

World Bank | Grant Ellis

and the International Monetary Fund (IMF) held their annual Spring Meetings in April.

In his remarks at the panel discussion, the UN chief noted that the traditional forms of development aid are not enough and said that new approaches that create the conditions for investments in building resilience of communities and addressing fragility are needed.

Tackling terrorist propaganda

The Netherlands: Terrorist groups, such as the so-called Islamic State (IS), largely owe their success to their well-planned and implemented strategy on the Internet. Their virtual footprint will remain on the Internet for the foreseeable future as a result of the massive production of slickly-edited content accumulated over the past years. Tackling this challenge remains at the forefront of the EU's counter-terrorism efforts and can only be achieved through a co-ordinated and systematic action bringing together law enforcement, public institutions and the private sector.

Recognising the need for such a multi-stakeholder approach, Europol's European Counter Terrorism Centre (ECTC) set up an Advisory Group on Online

Terrorist Propaganda in 2016, bringing its staff together with academics and practitioners with recognised expertise in the field of terrorist exploitation of online communications. The aim is to draw upon the group's expertise and technological solutions to keep pace with the way terrorists adapt their message and communications to changing environments and new technologies.

The results of this multi-stakeholder co-operation were presented at the Online Terrorist Propaganda at Europol's ECTC event, alongside topics ranging from solutions on big data analysis, mapping terrorist networks online, to insights into terrorists' online behaviour, tactics and communication.

Information platform for supply chains

World: In collaboration with partners and as a part of a global supply chain network, the United Nations emergency food relief agency has set about developing the first-ever information platform to better manage supply chains and efficiently match deliveries with demand in responding to large-scale health emergencies, such as pandemic outbreaks.

The end-to-end supply chain information system is being developed in collaboration between the World Food Programme (WFP) and the NEC Corporation, a Japanese multinational provider of information technology services and products. The Japanese Government has provided financial support that will be used as seed funding for the new platform.

The new system will bring

together supply chain and logistics information and enable end-to-end tracking of pandemic response items, such as protective clothing and medical equipment in a country facing an outbreak, helping ensure quick and appropriate delivery of supplies. It will also provide analysis on supply inefficiencies, promote timeliness and cost efficiency in continuous improvement to the supply chain network.

According to WFP, the system will help overcome challenges witnessed in the response to the West Africa Ebola outbreak, such as severe warehousing and distribution capacity constraints, limited visibility of the overall supply and demand of critical items, access constraints caused by border closures, and a lack of public-private sector co-ordination.

Toll of war on children

Syria: As the war reached its six-year milestone, Unicef said that verified instances of killing, maiming and recruitment of children increased sharply in 2016, in a drastic escalation of violence across the country.

This assessment came a few weeks after Dr Mohammad K Hamza, a neuropsychologist with the Syrian-American Medical Society (SAMS), told ATT that children in Syria affected by the war have experienced more trauma, physical and emotional pain than medical professionals have ever seen. He coined the phrase “Human Devastation Syndrome” to describe levels of trauma, which go beyond post traumatic stress, that many children are experiencing.

Unicef said that at least 652 children were killed last year, a 20 per cent increase from 2015, making it the worst year for Syria's children since the formal verification of child casualties began in 2014. Of these, 255 were killed in or near a school.

Unicef added that more than 850 children were recruited to fight in the conflict, more than

double the number recruited in 2015. “Children are being used and recruited to fight directly on the frontlines and are increasingly taking part in combat roles, including in extreme cases as executioners, suicide bombers or prison guards,” it said.

Challenges in access in several parts of Syria stand in the way of assessing the full scale of children's suffering and of urgently getting humanitarian assistance to the most vulnerable. Children are also dying from diseases that can otherwise be easily prevented. Access to medical care, lifesaving supplies and other basic services remains difficult – there were at least 338 attacks against hospitals and medical personnel in 2016.

Inside Syria and across its borders, coping mechanisms are eroding and families are taking extreme measures to survive, often pushing children into early marriage and child labour. In more than two thirds of households, children are working to support their families, some in extremely harsh conditions unfit even for adults, according to Unicef.

The ethics of AI command

Today, algorithms are used to make financial decisions, smart policing, and medical diagnosis and treatment decisions. **Eric J Russell** examines the implications of humans taking orders from machines within the emergency services

The Watson project from IBM is a system that cannot just think and learn, but can also take decisions.

As we speak, Watson is being used for cancer research and treatment thanks to its ability to analyse vast amounts of data and research findings extremely rapidly. It can achieve in seconds what teams of researchers need weeks to do. Here, we examine the ethical implications of Artificial Intelligence (AI) and thinking in algorithms regarding emergency response, specifically, the decisions surrounding life and death issues – orders and commands being issued completely devoid of human action or emotion.

As with other sectors, AI will soon be a part of the emergency services. The professions that embody a person's humanity shown outwardly to another will not be immune from this. Technological breakthroughs are being presented to the world every day. Advances in science and engineering are overwhelming. Innovation is now on a high-speed pathway where dreams become reality. Technological change is coming to the emergency services and it is unstoppable.

It is time for the emergency service professions to discuss the ethical implications of AI involving emergency response, especially command decisions that stem from AI and not from a chief officer, as this is soon to become one of the ethical controversies facing emergency service operations. At the centre of this ethical dilemma lies the crossroads of human experience and emotionally charged choices versus rational, emotionally absent data-driven decisions. In the near future, AI will be making – or at least playing a huge role – in operational command level decisions. Thus the ethical debate moves beyond simply relying on the systems to make judgments, to the more controversial ramifications of overriding that AI's decision. For instance, an on scene commander decides to ignore a decision made through AI and a responder is killed, what then? Current line-of-duty deaths are tragedies; however most of time they are simply that – tragedies void of negligence. Yet where does negligence, or for that part criminal negligence, come into play when the system

says one thing and the commander orders another?

AI is in its infancy. So are the systems that will use it. Aerospace and defence technology companies are developing new generations of drones (unmanned aerial systems) and robotics that will employ AI to function. The operating systems within these systems will continue to get smarter. They will be able to analyse and take decisions based upon data and observation. Soon they will be able to function flawlessly. These systems can talk to each other in nanoseconds, each one instantly improving and learning from the other.

Imagine a fire and rescue organisation that has been activated to respond to a residential structure fire with the possibility of occupants trapped. As the initial dispatch is occurring, an aerial drone self-dispatches to the address. The drone is on scene and surveying the situation before any emergency response vehicle is close. The drone itself activates a second drone capable of close-up surveillance using thermal imaging and infrared technology. The two drones speak to one another in nanosecond increments through their respective AI systems. The two systems are able to establish second-by-second command decisions without any involvement from response personnel. Using engineering and schematics data of similar structures, scientific models of burning and combustion, coupled with a complete operational picture, and real-time global information regarding response vehicle location and travel time, the

Because of these systems, could human mistakes or misjudgement, driven by emotion and a desire to serve, become criminal acts?

systems decide the battle plan for arriving companies.

The systems know the companies responding, the workload they have faced since coming on duty, the individual responders' health records, each responder's basic and advanced training, past emergency response experience and physical fitness abilities. They know how fast a specific responder can perform a search moving on their hands and knees. They know how fast each individual working with another individual can deploy and advance an attack line. The systems have access to everything and use this

information in the decision-making process. And they do so at a speed that is impossible for the human brain.

The initial dispatch has made it clear there is the possibility of trapped victims. These AI systems have already confirmed that occupants are trapped, identified their location within the structure

as being in the rear bathroom on the second floor, and have calculated their viability as seconds tick by. The systems identified that the fire originated in the basement and has spread throughout the home. The system also identified three large agitated dogs in the backyard, thus removing the possibility of a vent-enter-search ladder operation; it self-dispatches animal control to the scene to deal with the animals. As the first company arrives, they receive a 'do not enter' algorithm from the system. Based upon all of the intelligence it gathered, the system flashes a possible floor collapse, responder-loss, and zero survivability if rescue

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operations commence from any accessible entry. The systems call for the first company to begin suppression operations from the outside. The system has used data to decide the fate of the occupants, as well as the safety of the responders. The responders on scene can hear the victims calling for help.

The system displays where to begin the attack to the senior fire officer on scene. For this incident, two lines are called for; one through a basement window and the other through a first floor front left window, fighting the fire from the outside in. The company is fast, firefighters have water flowing from two lines into the structure within a minute of being on scene; they are knocking down the fire. As conditions change, the algorithm then shifts to an offensive interior attack. The system launches another fast-track robot from a compartment of the first arriving vehicle, which enters the structure ahead of the responders. It tells the firefighters that they need to use the front right window to advance into the building, which way they need to turn, and what direction to go. The robot has recognised and confirmed that the floor below the front entryway is about to collapse, which it duly does. In addition, the robot identifies stable flooring for the responders, showing them the pathway in the heads-up displays built into their SCBA masks. It is at this point the now interior fire attack company hears the final screams of the two burning occupants, and then silence.

Interior operations continue and the responders battle the fire while the second arriving company performs ventilation in the exact spot and in the exact way the system has told them to do. With the fire extinguished and the structure ventilated, the interior crew makes its way to the bodies of the trapped occupants.

The systems immediately switch operations to overhaul.

The fast-track robot that entered the

structure has already alerted the responding fire investigator as to the origin of the fire, whether accelerants are present and if arson is suspected. In addition, the systems have run records as to which insurance company to notify, the family members of the victims that need to be contacted by the Red Cross (which it has already dispatched), and has the medical examiner responding, as well as mortuary services. This is all within a span of minutes.

So let's take this from the ethical standpoint of life safety, ie risk a lot to save a lot. It is standard practice for many fire and rescue organisations to initiate search and rescue operations immediately when victims are trapped in a structure fire. This is usually performed simultaneously with suppression operations when there seems to be viability and the possibility of success. If the first arriving officer had overridden the orders of the AI and initiated a search and rescue operation, the responders – out of instinct and an inability to see the subfloor burning – would have fallen through the floor and possibly been killed.

What would have been the ramifications for the officer who decided to override the AI's orders? The responders are human; they heard the cries for help on arrival. However, if overriding the order led to the serious injury or death of responders, the question is: was the officer negligent? Are responders now beholden to the orders of an AI system? Because of these systems, do human mistakes or misjudgement, driven by emotion and a desire to serve, become criminal acts? Can human responders get to a point where they trust the algorithm over instinct; can they accept the fate of those not saved based upon AI decisions?

These are the ethical dilemmas of iCommand.

AI will soon be a part of the emergency services profession and thus discussion and further research is imperative.

C-RJ

Author

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Response to fatal Italian avalanche

Extremely heavy snowfall, coupled with four intense earthquakes in a mountainous area of central Italy, led to a fatal avalanche that engulfed a hotel, writes **Luigi D'Angelo**, as he describes search and rescue efforts

On January 18, 2017, a 'perfect storm' struck a small municipality in the centre of Italy. With a population of about 1,500 inhabitants, Farindola is located near the Gran Sasso Mountain, accessed through an area called Rigopiano.

Intense snowfall had been affecting the central part of Italy for nearly a week, with snow reaching levels not seen in years. Despite efforts by Farindola's local authorities to keep roads open during the week, on the early morning of January 18, snow heights of two metres meant the snowplough could not access the road to the Rigopiano hotel, about nine kilometres from the centre of the municipality.

Four intense earthquakes hit the area with a magnitude above 5.0 on the Richter scale that morning. The seismic sequence started at 10:25hrs, with the first 5.3 magnitude quake, followed very closely by two further earthquakes of 5.5 and 5.3 respectively at 11:14 and 11:25hrs.

The earthquakes were clearly felt by people at the Rigopiano Hotel, who were seeking to leave the hotel upon the snowplough's arrival. Unfortunately, a series of unexpected circumstances, including the snowplough breaking down, prevented the hotel from being evacuated.

Despite numerous attempts, the road was still blocked and the hotel left isolated when a fourth quake with a magnitude of 5.3 struck the area again at 14:33hrs. Around 17:30hrs a devastating avalanche completely submerged the hotel.

When the alarm reached the Pescara Prefecture's situation room, intervention teams from the local civil protection system were mobilised. A civil protection operations centre was established in a sports hall in Penne, close to Farindola, to co-ordinate emergency activities. A mixed team composed of experts in mountain rescue from the police along with firefighting and volunteer organisations, moved quickly trying to get to the hotel, which could only be reached by road as bad weather conditions precluded helicopters from flying to the site.

The first rescuers reached the hotel in the early morning of January 19, after several hours of demanding hiking through snow. Initially, it was difficult to identify the hotel



All images courtesy Italian Civil Protection Department
– Presidency of the Council of Ministers

building as it had been partially destroyed by the avalanche and was completely covered by snow. Two people were immediately rescued alive in the car park area outside the hotel. From the initial information collected, 40 people were said to have been in the hotel when the tragedy occurred.

A team from the national civil protection department was deployed to Penne to support prefecture and municipality representatives with co-ordination activities.

Search and rescue (SAR) activities were carried out by mountain rescue experts from the police and the national civil protection volunteer organisation, the National Corps of Mountain Rescue and Caving (CNSAS), which supported the activities of the national firefighting corps' urban search and rescue (USAR) teams. The latter were tasked with searching for people in the collapsed building. Other rescuers from different corps were constantly present in the area to support SAR activities.

The army was deployed to open roads, remove rubble and to handle heavy machinery, thus clearing the area around the hotel to facilitate access for the teams. The health service provided medical support to rescued survivors and arranged transport to the hospital in Pescara. Personnel from the police and the Carabinieri facilitated the transit of emergency vehicles and managed access at the area of operations, which was restricted solely to rescue activities.

The operations centre in Penne, where all the actors from the civil protection system were present, provided co-ordination activities to facilitate operations in the Rigopiano area. Co-ordination meetings were held every morning and afternoon and the centre took charge of transporting the responders to and from the scene, to allow adequate rotation of intervention teams, as well as co-ordinating air operations for the transport of food and equipment.

After the first two survivors had been rescued, SAR operations in the hotel area were fuelled by a variety of activities. Hotel workers provided information about the premises and which rooms guests could have been in when the disaster struck. Around 200 rescuers worked at the scene. The hotel was a three-storey reinforced concrete

Heavy snowfall and unusually harsh weather in mid-January left hundreds of thousands of homes without electricity, schools closed and roads unusable in the same Regions already affected by the earthquake on August 24, 2016 (CRJ 12:2) and by the following seismic swarm, including four shocks greater than, or equal to, magnitude 5 on January 18 alone. While 200 rescuers were dealing 24/7 with the SAR activities in Rigopiano, Italian Civil Protection deployed up to 11,000 units of personnel in a combined effort to deal with the consequences of the earthquake, ongoing snowfall, smaller avalanches and landslides. Opening roads to reach isolated mountain villages, restoring electricity and water supplies, bringing food and medication by foot or by helicopter to families trapped by the snow, while accommodating 5,000 more people who left their homes (on top of more than 10,000 who were still in temporary accommodation following the earthquakes in August and in October), required great co-ordination and a massive effort by armed forces, fire brigades, volunteers and police, by the national health system and energy companies, as well as by the affected regions' personnel

structure, with reception, bar and restaurant areas on the ground floor. A spa was on the basement level and bedrooms were on the first and second storeys. The fury of the avalanche had engulfed the entire structure; the first and second floors were destroyed and collapsed onto the ground floor, while the spa appeared intact.

Unfortunately, the hotel's occupants had all been on the ground floor waiting to leave the hotel once the road was passable. Before reaching the ground floor, rescuers had to dig through around three metres of snow, then through two collapsed storeys. Once they reached the ground floor, they faced a scenario in which rubble from the destroyed structure had mingled with mud, snow and debris carried downstream by the snow.

The complexity of operations required strong co-ordination and activities were driven, in the early stages, by the canine teams that led rescuers just above a room located on the ground floor where some of the missing people were finally found alive.

Excavation conditions were prohibitive, but all efforts were compensated with the discovery, after 48 hours, of seven people still alive in the billiard room, which remained intact after the avalanche. In the following hours feelings of hope fuelled SAR activities, but with each passing hour rescuers realised that the devastating power of the avalanche had left very little chance of finding survivable pockets inside the hotel.

After a week of extremely hard work, rescuers managed to reach and clear the entire ground floor. The remaining 29 missing people were found dead, mostly on the ground floor, including in the kitchens, reception and lounge bar. Of these, two bodies were found outside the hotel, in close proximity to the structure.

During the week, families of the missing persons were constantly informed regarding the development of search activities, both at the hospital and at the operation centre in Penne. Owing to the restricted access in the area of operations, constant provision of available information was ensured to the media at the operation centre in Penne. **CRJ**

Author



LUIGI D'ANGELO, is Head of International Relation Unit at Italian Civil Protection, who was at the co-ordination centre in Penne co-ordinating the activities during that week



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High-rise tragedy in Iran

As a firefighter there are few things worse and more moving than losing your fellow firefighters and colleagues while battling a blaze and rescuing people on the fireground, writes **Navid Bayat**

Tragedically and appallingly, the above scenario materialised in Tehran earlier this year during a high-rise building collapse incident.

The fire broke out in the early morning of January 19, 2017, on the tenth floor of one of the most important old-built commercial high-rise buildings in Tehran. The 17-storey Plasco Building was the hub of the wholesale clothing industry in Iran's capital.

The fire was reported to the Tehran Fire Department's dispatch centre at 07:58hrs. The dispatch centre called on the nearest three fire stations simultaneously and the first fire trucks arrived at the scene at 08:02hrs, a very rapid response. Once the firefighters made it to the scene, they were divided into two firefighting and rescue teams.

The primary mode of operation was offensive, as

firefighters moved up the floors establishing 'bridgehead on eighth floor and committing two teams of search and rescue and firefighting to the affected tenth floor. Simultaneously, in order to help evacuate trapped building occupants and to perform extinguishment operation and prevent the fire from spreading to the upper floors externally, aerial hydraulic platforms deployed and operated in accessible areas around the building in an offensive operation mode.

Fire spread

Unfortunately, despite the best efforts of the firefighters, the fire developed and spread up to the upper floors mainly through the windows and the false ceilings of the tenth floor. As time elapsed and the incident became protracted, the intense heat caused the building structure and components to weaken and lose their integrity. As a consequence, extreme heat and weakened old-built structure components gave rise to an entire building to collapse while some of the firefighters were still inside performing operations. Some of the building's occupants were also still in the structure, trying to collect their valuables, despite firefighters' efforts to prevent them from re-entering the building.

All in all, there were 19 fire stations and almost 230 firefighters directly involved in the operation.

At the end of the day, the tragedy left 16 firefighters and five civilians dead.

CRJ

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Ensuring preparedness

Roger Gomm provides an overview of the terrorist attack in Westminster, London, outlining the importance of communities working together to protect the capital and to ensure preparedness

On Wednesday, March 22 2017, at approximately 14:40 a male drove a Hyundai four-wheel drive vehicle northbound over Westminster Bridge towards the Houses of Parliament. The driver mounted the pavement twice, targeting pedestrians, before mounting the pavement for a final time and crashing his vehicle into the eastern wall of New Palace Yard at the Houses of Parliament. He left the vehicle carrying two large knives and ran into the vehicle entrance gateway known as Carriage Gate at the northern perimeter fence of the Houses of Parliament. Using the knives, he attacked and killed a police officer in the grounds. He was then shot and killed by other officers. More than 50 people were hurt, with injuries ranging from cuts and bruises to: "extensive bone fractures." In addition to the police officer and the attacker, two members of the public died at the scene. Two other people were taken to hospital and later died from their injuries. The incident lasted 82 seconds; CCTV footage provided a "clear visual chronology" of the events. The attacker was formally identified as Khalid Masood, 52, from Birmingham.

Investigation

The Met examined a "large amount" of CCTV and footage taken by bystanders. Masood, also known as Adrian Russell Elms and Adrian Russell Ajao, was a classic 'lone actor' and his last criminal offence was in 2003. He was not a current 'subject of interest' to the intelligence community. The police asked anyone who knew Masood well, understood who his associates were or who could provide them with information about places he had recently visited to get in touch with them. Immediately following the incident the policing posture was reviewed to ensure that a proportionate level of reassurance and security was provided to the people, places and events in London. This included an ongoing uplift in visible policing in London, especially in crowded places, transport hubs and iconic sites and a review of protective security at key locations and events based on the intelligence picture.

The Met worked with businesses through its counter terrorism security advisors, event security co-ordinators and counter terrorism focus desks to review security plans, especially any requirement for hostile vehicle mitigation. Support from businesses in the area and throughout the UK was critical in responding to and investigating the attack. This ranged from providing reception centres for victims, places to interview witnesses and providing good quality CCTV images to enable the investigation to move forward quickly.

The police asked businesses to consider the following actions to help protect London from a further terrorist attack:

- Review security and identify vulnerabilities;
- Consider the installation of CCTV and hostile vehicle mitigation, (if appropriate);
- Ensure that CCTV is working correctly, that the images recorded are of a good quality and able to be provided to the police to assist a criminal investigation;
- Review, test and exercise response and recovery plans;
- Ensure they can respond and have a continuity plan;
- Ensure that staff know how and are encouraged to report suspicious activity; and
- Ensure security and front of house staff receive a counter terrorist awareness presentation.

The current threat to the UK from terrorism remains at 'severe'. The threat is extremely complex and ranges from lone actors carrying out crude attacks to sophisticated networks with ambitious and co-ordinated plans. The common aim is to inflict mass casualties and fatalities and to gain publicity. Common methodologies include the use of guns, vehicles, knives and explosives. All involve hostile reconnaissance.

The UK is fortunate in that traditionally, access to firearms has been limited by strong legislation in relation to firearms and explosives, although we cannot discount this methodology. **CRJ**

Author



ROGER GOMM is CRJ's Security, Crisis and Emergency Management Correspondent and a Member of CRJ's Editorial Advisory panel

Warning and informing: Tweeting pressures

Terrorist incidents and hostile events are accompanied by a unique set of pressures and variables. Media departments should be regarded as an indispensable part of the authorities' response strategy to such incidents and similar events, says **Brian Dillon**

In the First World War, aerial bombing brought civilians into the line of attack in a manner never experienced before. At that time, British authorities took the decision not to alert the populace about an impending air raid for fear of creating widespread panic. Despite this faltering start, by the Second World War policy had shifted and a public information campaign prepared people to head for shelter when the sirens started. Since then, the concept of warning and informing has become well established and applied in disasters, man-made or otherwise, as well as in cases of terrorism and violence.

After 9/11 the new terrorism threat presaged changes in many jurisdictions as governments wrestled with enhancing their resilience to withstand a significant terrorist attack. In 2004 the UK introduced statutory regulations directing public authorities to co-operate and issue relevant information to the public. In the same year the Federal Office of Civil Protection and Disaster Assistance was established in Germany with a remit that included warning and informing. In that era, the US Federal Emergency Management Agency's advice was centred on the need to use news media to communicate with the public. Perhaps understandably, bureaucrats did not predict the relatively recent advances in communication technology, but these have undoubtedly changed the landscape of communicating in crisis.

Although the first reported social network, Six Degrees, was created in 1997, by the turn of the century, social media was still in its infancy. It was only in 2003 that MySpace and Skype were devised, with Facebook coming online the following year. YouTube launched in 2005, Twitter in 2006 and Instagram in 2010.

It is estimated that by 2018 almost half the world's population will be using messaging apps, so it is little wonder that the emergency services

are also utilising them. This article focuses on Twitter as a means to warn the public in cases of terrorism and violence. It is not suggested this is the only method of communication, and clearly the traditional press briefing remains valid. Indeed, in the examples presented here, the use of a spokesperson featured in each scenario.

Today, public expectations are higher than ever before, with a low tolerance for perceived poor performance. Combined with rolling news channels and the instantaneous nature of social media, this presents challenges for the authorities in providing accurate information in a timely manner. Erroneous updates, out of date material or simply being judged as slow to respond can undermine confidence and fuel criticism.

In the *After Action Report for the Response to the 2013 Boston Marathon Bombings*, the reviewers commented: "The first public messaging did not come until the first press conference, which was nearly two hours after the bombing occurred." In this climate, even the most organised emergency service can seem leaden and behind the curve of an unfolding incident. News reporting, which works to its own agenda, can never replace factual information from the emergency services or government. In these case studies, each scenario featured its own unique difficulties and good performance with lessons that can be drawn to inform future practice.

San Bernardino, 2015: 14 people died and 22 were injured in the terrorist shooting at the Inland Regional Centre on December 2, 2015. The assailants were a married couple, one of whom was an employee and therefore legitimately at the venue with his co-workers. The incident started at 10:58hrs and continued until the terrorists eventually died in a gun battle with police some distance from the original venue.

The key locations were dispersed over a wide area that included both the Inland Regional



Dinendra Haria | REX | Shutterstock



More than 35 people were injured in the attack when Khalid Masood mounted the pavement on Westminster Bridge in a four-wheel drive vehicle, striking pedestrians

Adrian Hancu | 123rf

Centre and the intervention sites. Consequently, numerous law enforcement agencies were involved. At the Inland Regional Centre at least 70 reporters quickly congregated and initially swamped the sole information officer from the local police department, who then drew on reinforcements from the larger sheriff's department.

The police force issued its first tweet at 11:18hrs, warning of road closures and giving instructions to avoid the area. This was 14 minutes after the first officers had arrived; at 11:26hrs it confirmed that the incident was an active shooter situation. Over the course of the incident, 42 tweets were issued and the police co-ordinated messaging between the various US law enforcement bodies. Twitter was used to inform the public and ensure the news agencies had updates, which helped the police to avoid becoming consumed by responding to media demands. In the subsequent review, Twitter was reported as a critical factor in the police media operation.

A distinguishing feature of the San Bernardino operation was that the police communications team attended the police staging post and was explicitly included in the command team briefings. This enhanced co-ordination between the tactical operation and media response.

Munich, 2016: On July 22, 2016, nine people were shot dead in the vicinity of the Olympia shopping centre in Munich, Germany. Nearly all the victims were lured to the area on the pretext of a spurious offer by the killer. Although this was not categorised as a terrorist incident, the operational issues it presented are the same. The police faced a difficult task in locating the suspect as they received numerous conflicting reports, which indicated there was more than one assailant and they were at large across the city.

The police were first alerted to the incident at 17:52hrs and by 18:33hrs they published on

Twitter that a shooting had occurred with an update soon after that there was more than one casualty. As the incident continued, they issued successive tweets, which cautioned that they believed there was more than one shooter. As a result, they acted progressively to close down the city's public transportation system.

In this example, the Munich police acted quickly to turn around witness reports into warning messages for the public. Believing they were dealing with multiple shooters, their priority was to act to save life and thus communicate at speed, hence the significant decision to suspend the transport network. An impressive feature is that they tweeted in German, French, Turkish and English. They also swiftly arranged for a spokesperson to address television reporters to provide complementary updates.

London, 2017: The terrorist attack in Westminster, London on March 22, 2017 lasted a mere 82 seconds; in that time five people were murdered and another 50 injured. The killer was a British citizen who acted alone. The incident started at 14:40:08hrs and ended when the murderer had been shot by police. The first emergency call was made at 14:40:59 hrs. At 14:48hrs the Metropolitan Police tweeted it was aware of a situation on Westminster Bridge and at 14:52hrs it issued a warning that this was being treated as a firearms incident, with police on the scene.

As events continued other services and relevant organisations contributed, the public was informed with pertinent information, for example about paramedic activity and travel disruption. Significantly, other organisations acted on the police's information in order to warn their own Twitter followers, including the French and American embassies and the local business partnership.



Rick Findler | REX | Shutterstock

Although this situation was confined in geography and time, it took place at the centre of the government district at an iconic tourist location, with the Prime Minister and Parliament in attendance. It was notable how effectively the authorities issued information and co-ordinated their messaging so it was aligned with their core business and complementary of other agencies' activities.

In theory, these examples may convey an impression that providing the public with relevant updates should not be difficult to achieve. The reality, of course, is that delivering this efficiently is anything but simple. In London, the Metropolitan Police receives approximately seven emergency calls per minute, every hour, every day. On average, each call is answered within 11 seconds and the operator then has to make sense of the information and, if necessary, dispatch officers to the scene. Once officers arrive, they have to gain situational awareness and report their findings back to the operations

room. The next stage is for decisions to be made as to the wider implications of the incident and which organisational levers need to be pulled to draw in additional assets, including public messaging and co-ordination with partners.

Inevitably in a major incident, the volume of messaging and information increases. This requires discipline by the authorities to scythe through superfluous material and stay focused on their task, linking utterances on Twitter with the objectives of the operational commanders. Each tweet has to assist and not confound the responders at the scene and the public caught up in the scenario.

In the case studies cited here there are lessons that can be drawn that are applicable in a range of environments, from capital city to small town. The starting point is that incident management requires an integrated service from the operational front-line response and the media department. If applied effectively, media teams offer considerable scope to enhance the corporate response. This

includes providing reassurance and guidance, to potentially issuing life-saving information. In order to achieve this, media personnel must have a degree of tactical awareness so they appreciate the subtleties of some elements of operational practice, lest updates are issued which confound the frontline. In effect, they become another tactical option, contributing to the strategic objective of saving life, minimising casualties and controlling the situation with the aim of bringing the situation to a conclusion. Thus, it follows that media personnel must be proximate to the command function so they have an appreciation of what is taking place and are able to assist as and when required. Nevertheless, a degree of autonomy is required so decisions can be taken to distribute information expeditiously without clarification or sanction from high command. Media departments should also be fully interoperable with other relevant organisations so as to know the parameters of communication. Clear protocols are essential to avoid duplicating

information or issuing contradictory material.

Terrorist incidents and hostile events are accompanied by a unique set of pressures and variables. Media departments should be regarded as an indispensable part of the authorities' response strategy and, if used adeptly, Twitter with its speed, brevity and wide reach, is a viable tactical option. Nevertheless, the simplicity of Twitter should not belie the difficulty in using it wisely. Extensive planning, training and exercising are required to avoid breathing life into the First World War fear of causing panic and making a bad situation worse.

CRJ

Author



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Stepping up online crisis response

Tim Lloyd says that, although some frontline emergency services have made great strides to harness the world of digital communication, a wide gap in preparedness for crisis communications still exists across a wide cross-section of government departments and agencies

In the UK, BBC Radio 4's *Today* programme sets the agenda for the rest of the day. This is a mantra still heard in Whitehall in 2017. There are similar examples across the public sector: "The CEO really rates the *Oxdown Gazette*," or: "Can we get our Minister on the *Breakfast* sofa to respond?" Great store is still placed in column inches and airtime.

Frontline emergency services have made great strides to harness the digital communications world, helping them to meet core requirements of the UK's *Civil Contingencies Act*. The March attack in Westminster demonstrated how the Met Police and others can be quick to co-ordinate and respond online (see p17). But the news desks and customer service teams in other public sector organisations have been left exposed and vulnerable to online crisis for too long.

Social media commentary does not call the press office for a statement or to fact check. Opinion is presented as fact, republished, commented on and reinterpreted for a whole new audience in the time it takes a government press officer to understand who might be responsible for the policy, service or location that is at the centre of a crisis.

The author has worked in and around the UK Government for eight years, starting with a baptism of fire during the 2009 swine flu epidemic. In that time, government's ability to handle and use social media has improved enormously and the tools, people and experience are far greater than they used to be.

At least in 2017, no one is completely dismissive of the impact of social media on breaking news. However, among a wide cross-section of government departments and agencies, we still see the same gaps in preparedness for crisis communications. The valuable moments between something happening, it being reported online, the establishing of facts (and debunking of myths), are still being missed.

Debunking

Why is this? The answer is simple: internal culture and processes have not adapted.

Those tasked with managing online channels are rarely empowered to respond in real-time. Instead of being allowed to get on with adapting and illustrating official lines, facts and statements for social media, staff have to seek additional sign-off, losing valuable time and impact.

Untargeted rebuttal on public channels is often far too aggressive or assumes too much knowledge for it to be of any help to the public. And what remains are potentially powerful but one-way social media marketing channels, whose commentary on relevant

crisis issues is often notable by its absence.

There are some exceptions. For example, the Air Accident Investigation Branch used Twitter to ask those who witnessed the 2015 Shoreham Airshow crash to submit footage or images, to be used as part of the investigation (the incident involved a vintage aircraft crashing into a road close to Shoreham Airport in the South-East of England, killing 11 people and injuring 16 others).

Furthermore, there is a continued focus on direct comments and complaints. You will find most public sector organisations on Twitter and Facebook manning their own pages and sometimes responding to comments left by members of the public.

However, it is more difficult to find organisations that are tackling crisis communications in other places online – the places where their audience might spend most of their time.

It is easier to hope everyone will see the message on Twitter, and that may be true for the first 24 hours of a crisis. But where is the long tail of conversation? This is to be found in community forums, blogs and hyperlocal news.

Organisations such as the Environment Agency and Highways England should have a clear understanding of the places where local communities come together to share information and news online. One thing is for sure: these conversations will not all be sitting neatly under a couple of hashtags on Twitter.

Another point is that the status quo is being challenged by new ways of finding and interpreting data.

Corporate news desks in the public sector need to be more alive to the different sources of information that media, and the public, can draw upon. Mountains of data that have to be made public online are a feast for a new generation of reporters, who have swapped shorthand for training in advanced Excel. Difficult correlations between the performances of different organisations are now much easier to find.

A starker example of the challenge posed by public data is the tracking of flights and shipping. In the Westminster attacks (p16) people were quick to screenshot

Author



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the arrival of emergency helicopters, as seen through Flight Radar 24. In 2014, it was plane enthusiasts who were first to break news of a possible crash landing by a Virgin Atlantic flight at Gatwick Airport, UK.

Not everyone understands the structure of government organisations. The strikes on Southern Rail in 2017 (UK) are a good example of something where blame for a crisis was variously apportioned to a number of different organisations in a complex public-private structure. The bottom line is that most customers do not care about the structure. They expect publicly accountable bodies to explain and solve crises.

And if one organisation cannot solve a crisis, customers have the ability to analyse, discuss and criticise these structures with each other online. It is incumbent on all these implicated organisations to clearly explain their role and actions, using the wealth of online channels and tools at their disposal.

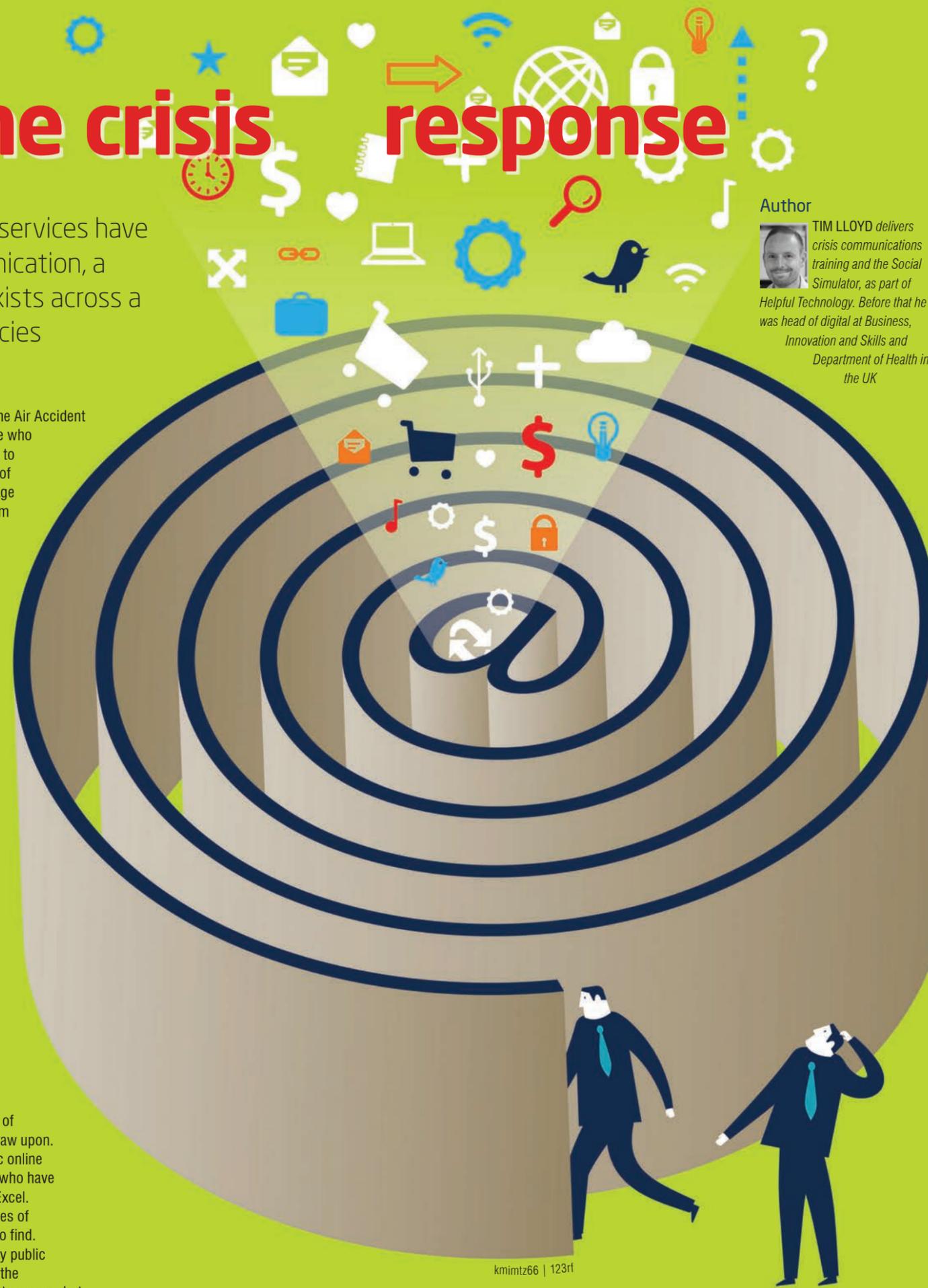
In addition, customer expectations have changed. Simply being on Twitter as part of a crisis response plan is no longer good enough. A social media channel cannot exist solely for convenient promotional purposes. Customers will expect to ask questions and read answers – quickly. For the most part, the police and, on an international scale the UK Foreign and Commonwealth Office (FCO), set a good example. If people in the UK contact their local police force or FCO on social media, they will probably receive a timely and helpful response. However, for many central government departments, agencies and frontline services, social media seems to be the preserve of back-office teams that are ill equipped to handle large volumes of incoming questions. For hard-pressed teams of public servants, surely the answer is to involve customer service teams and broaden their responsibilities to social media?

It is worth noting that crisis communication cannot be solved with software. The web is awash with fantastic analytical software that will monitor, alert and track mentions and conversations about your organisation, products and services, online.

Those responsible for monitoring and analytics software in an organisation need to be part of the crisis response plan. Too many organisations have invested in products like Brandwatch, without plugging this into the crisis response process. Even the more expensive software begins to struggle when asked to provide meaningful data about the most important, influential members of your audience online.

Staff need to be confident and empowered to make fast decisions about prioritising what to monitor and when to respond. Where is the crisis being discussed most and who are the key voices for us to respond to?

In public sector crisis communications the social media box was ticked a long time ago. But strategy and tactics have not developed from simply having a few channels for monitoring, and limited capacity to respond. Meanwhile, the expectations of the media and the person in the street are much greater. It is time for online crisis response in the public sector to really shine and be given the acknowledgement and status it deserves.



knimtz66 | 123rf



Mine clearance in Iraq

Nigel Ellway from the All Party Parliamentary Group on Explosive Weapons, UK, provides CRJ with some observations from a recent visit around Mosul, Northern Iraq

Sitting in the back of a car watching a man selling oranges from a barrow on the side of the road. I wondered, not for the first time, how I came to be there.

In the car with me was the Glaswegian veteran war correspondent David Pratt, our close protection officer Ollie, and Shahim our Iraqi driver. The car we were in was a nondescript Land Cruiser armoured by Streit Group and in the vehicle behind us was UK Member of Parliament (MP) Roger Mullin, vice chair of the All Party Parliamentary Group (APPG) on Explosive Weapons and Charlie Martell, Optima Group's country manager for Iraq.

The town was Mosul, and despite the raging war going on in the West of the city, people were already attempting to return to some form of normality in the Eastern sector.

Nearly every day for the previous few weeks the fighting between the Peshmerga and Iraqi army forces and the so-called Islamic State (IS) had been on the front pages and broadcast news around the world, but the story of the daily activity of people like Charlie and his team goes untold.

Optima's team of specialists is regularly called upon to clear Mosul's schools, hospitals and other critically important sites – such as power stations and water treatment plants – of the explosive remnants of war and, more terrifyingly, improvised explosive devices (IEDs) often left as booby traps in buildings.

One of Optima's team presented our group with a chilling introduction to IED detection and neutralisation – IS is now

getting so good at making IEDs that they come with their own quality control labels attached. "The day I made my first mistake," he said, "was the day I stopped being a cowboy."

We were with the Optima team because Roger Mullin had been invited as a Scottish National Party (SNP) parliamentarian to lead a delegation holding talks with the various Kurdish political groups organised by the Westminster Foundation for Democracy. This trip was ahead of the UK's Secretary of State for International Development's announcement of major funding for mine-action and counter-IED work, and Foreign and Commonwealth Office (FCO) Minister Tobias Ellwood's visit to Baghdad and Erbil.

IED booby traps

Over the last year, the APPG on Explosive Weapons has held an inquiry into the use of IEDs, which led to a report and recommendations to government.

Visiting Mosul threw up even more questions – especially around the fate of the internally displaced people, who are too scared to return to their homes because of the likelihood of IED booby traps.

On our first morning in Erbil we had a compelling introduction to the initial treatment of IED victims – medical charity Emergency UK (CRJ 12:1) runs a trauma hospital in the centre of Erbil in which 78 per cent of the patients are blast victims. Giacomo Menaldo, Humanitarian Response Programme Manager, showed us around.

In a ward full of children, Giacomo explained that because of local politics, a victim from Mosul would be taken in an Iraqi ambulance to a checkpoint between Mosul and Erbil where, regardless of the weather, they would be transferred to a Kurdish ambulance to be brought the remainder of the way to the already stretched Emergency hospital.

Giacomo's anger was evident as he described how many children were injured by explosive blasts – and how

entire families were torn apart by the violence just 50 miles down the road. "IS are complex," he fumed, "their weaponry is effective. They cause chaos. Civilians are used as a tool to slow down the military." Emergency's medical team works tirelessly to mend the broken bodies, but the longer term psychological affects are left to chance.

There was plenty of fuel in Giacomo's narrative for the APPG's second inquiry into the support for victims of IEDs, recently announced by the group's new Chairman, Dr Matthew Offord MP (CRJ 12:2), and the questions raised in Iraq will be a major element of that inquiry.

The APPG on Explosive Weapons was first created as the APPG on Landmines back in 2011, with the name being changed to recognise the increasing use and hazards of IEDs. In addition to having a highly engaged membership of MPs and Peers, we are the only APPG that enjoys personal support from the responsible ministers and their departmental policy teams. What we have to say is listened to and appreciated.

In April 2016 at the United Nations 19th meeting of Mine Action Directors in Geneva, Roger Mullin, then Group Chairman, called for parliamentarians across the world to commit to work together against the scourge of illegally used explosive weapons.

In Erbil, Roger was able to demonstrate this commitment himself by holding talks with each of the Kurdish political parties and the Kurdistan Regional Government itself, to discuss the impact of land mines and IEDs used by various groups in the Iraqi conflict. He emphasised the pressing need for co-operation across the political divide to combat these explosive hazards.

Using the report from the APPG inquiry, and the issues we had seen for ourselves in Mosul, Roger very easily convinced our Kurdish hosts of our credentials and opened avenues for future conversations and political action.

Roger's discussions with the four Kurdish factions are part of a project by the Westminster Foundation for Democracy SNP Division, to help bring a semblance of democracy to the Kurdish region. Jamie Brotherston, who set up our visit, was keen to include the mine-action/counter IED dimension in the agenda and it looks as if it will now be a central pillar for

future engagements. Until British Prime Minister Theresa May announced the snap general election on June 8, we were due to brief ministers personally on the outcome of the trip – we will now have to wait for the new parliament to be formed, but will be pushing the issues just as hard when it is.

Iraq is one of those countries cursed by years of cross border conflict, civil war and now the battle with IS.

Unexploded remnants of war, anti-personnel landmines and anti-vehicle landmines, and now improvised explosive weapons are numerous and widespread – particularly around Mosul.

A number of de-mining, explosive ordnance disposal and counter IED organisations operate in the country – mostly co-ordinated by United Nations Mine Action Service (UNMAS) and United Nations Development Programme (UNDP). Both NGOs and commercial operators are at work, each with a specialist remit.

Sadly, dealing with explosive weapons is a growth industry; it is also one where there is much competition for international funding and contracts. This has led to a degree of 'blurring the lines' in definition of the hazards being cleared.

Concerns have been raised that individuals trained in explosive ordnance disposal or mine clearance are also claiming to be experts in counter IED work, and the term 'improvised landmine' is creeping into the lexicon.

Mines, unexploded ordnance and IEDs may all go bang, but they are very different types of weapon, with very different motivations behind their manufacture and placement.

If an inadequately trained and qualified operator is used to clear an IED, there is a real danger that they will also become the victim of that device, and this has huge legal implications for the organisation hiring that individual, and even for the organisation or nation funding the clearance operation.

This is why the APPG in its recommendations from its inquiry stressed the real need for an internationally recognised set of standards for humanitarian counter IED work, and also why it makes sense to have sufficient and appropriate funding for such work.

Author

 NIGEL ELLWAY is a former international journalist and Whitehall media advisor who

created the APPG on Explosive Weapons in 2015 and now works with humanitarian de-mining and counter IED organisations to facilitate political awareness and understanding of the issues surrounding these disciplines. The author is grateful to the FCO, and particularly the team in the Embassy in Baghdad and the Consular team in Erbil, for their extremely helpful and practical assistance; and to Optima Group for arranging an informative and highly sobering day in Mosul, with superb explanations and in-depth analysis of the issues. He would also like to thank Jamie Brotherston for setting up the project on behalf of WFD; to Roger Mullin MP for allowing him to hijack some of his visit; and to David Pratt for being an invaluable source of background detail and incorrigible Glaswegian wit

■ Findings from the APPG's inquiry into the use of IEDs can be downloaded from appgexplosiveweapons.co.uk

CRJ



Member of Parliament Roger Mullin hands Hoshiyar Siwaili, Head of Foreign Relations Office of the Kurdistan Democratic Party a copy of the APPG Report on IEDs: Global Solutions for a Global Threat

David Pratt



Psychosocial preparedness: Soft skills in disasters

Belinda Ekornås and **Nils Petter Reinholdt** describe the features of their work in psychosocial preparedness, including a new learning portal and lessons learnt from the interdisciplinary collaboration involved

After the devastating terrorist acts in Oslo and Utoya in 2011, the Norwegian Parliament ordered a formal evaluation. The *Gjorv Report (NOU 2012)* revealed serious shortfalls in Norway's emergency preparedness and ability to avert threats, underlining the importance of psychosocial preparedness training in municipalities and police districts. The commission stated that care for those affected and their next of kin should be organised within the framework of an information and support centre. In order to implement this strategy, it recommended joint exercises with the participation of municipalities, police, hospitals and relevant first responders. This point was further emphasised by the evaluation

The aim of the project has been to embed psychosocial preparedness in a way that harnesses innovative technology, so as to help all those who might be affected by a crisis or disaster

RVTS East

report conducted by the Norwegian Directorate of Health, which said: "Emergency preparedness plans for the services must be more comprehensive in the psychosocial field, regularly practised, and include all those expected to play a role."

As a response to these reports, an extensive effort was launched to improve the quality of crisis intervention and prevention.

The Regional Centres – Violence, Trauma and Suicide Prevention (RVTS) were assigned to provide competence to personnel working with crises and disasters. *The National Health Emergency Plan (2014)* states that RVTS should contribute to integrated emergency services, as well as preparations for the prevention and management of health consequences from incidents, including accidents, emergencies and disasters.

This led RVTS East in Oslo to prioritise the psychosocial safeguarding of those affected by crises and disasters. This perspective is included in all of its educational activities, training and full-scale exercises. It has also embedded psychosocial preparedness in developing new methods that harness innovative technology, such as the development of a web-based educational portal.

Based on existing research and experience, Hobfoll

and colleagues (2007) proposed the following principles to prevent adverse psychological effects after disasters: Promote safety; calm and reduce physiological activation; increase belief in individual and collective efficacy (self-efficacy); promote social support and solidarity; and create hope and faith for the future.

These principles are essential in all psychosocial care and are integrated in RVTS East measures. Its work in psychosocial preparedness is further guided by the principle that affected people are displaying normal reactions to an extraordinary situation.

This line of thought brought about a need to move away from the tradition of symptom checklists and 'to do' lists. Instead, RVTS East chose to collaborate with a professional film company to increase and enrich the learning experience and show the importance of strategies that enhance resilience in crises through the dissemination of knowledge. This collaboration made it possible to present realistic scenarios and tell case stories relevant to professionals working in the field of psychosocial preparedness.

As an answer to the call from the Norwegian Department of Health, RVTS East took on the challenge of creating a learning tool that could be useful, practical and provide new insights in this field.

Our goal was not to make yet another list of what 'to do' or 'not to do' when terror or disaster strikes. Instead, the tool provides strategies to address psychosocial effects and useful interventions, rather than procedures.

Furthermore, we wanted to include all the areas of psychosocial preparedness and address organisational, family, and individual perspectives. RVTS East decided to meet these challenges by developing an interactive, practical web toolbox for psychosocial preparedness; this can be found at psbs.no.

The web toolbox covers: Crisis interventions and disaster preparedness; challenges before, during and after deployment for military personnel and humanitarian workers; along with terrorism and prevention of radicalisation and violent extremism. The web toolbox also includes a family and child perspective, as well as an organisational perspective, in all areas that the learning portal covers.

The portal's overall aim is to present updated knowledge in a practical and tool-based way that is applicable to a wide range of professionals working in this field, including professionals within the health sector, first responders – both civilian and military – municipalities and other target groups.

Our experience from the multidisciplinary work involved in creating learning films and exercises was that this heightens creativity by challenging implicit rigid ways of understanding knowledge dissemination.

Moreover, it has avoided the fear of some professionals that 'popularisation' of knowledge implies a loss of complexity. For example, when using the web toolbox in education and supervision, our experience is that straightforward and communicative texts and creative visual solutions evoke professionals' curiosity and eagerness to learn more. The films, photos, and animations allow complex issues to be visualised and make it easier to convey the subjective experiences of the helpers, those affected and their families.

Furthermore, the use of profiles, cases and storytelling combined with text, lends strength to the narrative. Including films that portray the experiences of first-hand

survivors or caregivers activates an emotional response, thus increasing identification and insight for users.

RVTS East's guiding principle for organising psychosocial preparedness in disasters is that mastering this subject on an individual level requires organisations to have plans, training and leadership directed towards crisis and disaster management.

Stress management is a central topic in psychosocial care and is included in all our education efforts and throughout the web toolbox. This is, of course, important for people affected by such incidents, as they need strategies to handle the stress brought on by the situation. Professionals also face an enormous strain, both directly from interacting with people in crisis, but also from the pressure to make decisions and take actions within limited timeframes and with sparse information.

Strategies

Our aim is to convey strategies that will help professionals go from 'fight and flight' mode to more emotional control and better decision-making.

For this purpose, RVTS East has translated and included the 'Highres' app in our education programmes, and in the web toolbox to enhance stress management (the app was developed by the Phoenix National Centre for Excellence in Post-traumatic Mental Health, for the Australian Defence).

The guiding principle for the app is resilience, which includes the ability to adapt to change, maintain a level of performance under stress, and to use flexible coping styles and adaptive behaviours. In order to be resilient in adverse circumstances it is important to learn to test, adjust and optimise:

- Test – are your reactions the best under the circumstances?
- Adjust – identify what is possible to change in the current situation, and then change it. Accept the things that you cannot change, and focus your attention towards what you can change.
- Optimise – this is done through training, which involves learning better ways to manage your responses by training and learning new strategies. In order to take emotional control in a crisis you need to stop, breathe, think, and then do.

Our aim is to combine communication, technology and knowledge to interact and inspire each other. We developed the web toolbox, not only to answer the call for improving evidence-based crisis and disaster management, but as a stand-alone creative and novel product, which challenges the tradition and predictability of the professional discourse.



■ The portal is now available in English; go to the website psbs.no

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Authors

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Emily Hough speaks to Dr Matthieu Langlois, a medic with France's elite national counter-terrorist tactical unit, about his recently published book that traces the 2015 terrorist events in Paris

What exactly happened after the savage killing of 89 people by terrorist gunmen at the Bataclan theatre in Paris on the night of November 13, 2015? How do you operate within such a terrorist attack scenarios? Few people know, fewer understand, others try to imagine what it must be like... And some tell lies about it by reporting and spreading false information.

These are the introductory words to *Médecin du RAID, Vivre en état d'urgence (RAID Medic, living in a state of emergency)*, by Matthieu Langlois, MD.

As part of France's elite national counter-terrorist tactical unit – Research, Assistance, Intervention, Deterrence (RAID) – whose personnel include tactical emergency medics, Langlois and his colleagues are no strangers to the pages of the *CRJ*, having assisted with many articles and reports.

One of the motivations in writing this book was to reflect upon the new operational universe opened up by today's evolution in mass terrorism, Langlois tells me, as well as to give victims and their families a truthful account of what really happened amid a maelstrom of inaccurate reports, rumours and misconceptions.

"I wanted to bear witness, to provide my analysis. The outstanding aspect of this crisis is driving us to rethink cross-functionally between and among the police forces and rescue teams. The strategic control of such operations is critical and the key to avoiding any loss of the rescue team members without waiting to provide any care. It does require work, co-ordination and shared experience not heroism, and this is the underlying motivation of all RAID members, as well as my own," he says.

Indeed, Langlois highlights that, without explanation of how the events at the Bataclan unfolded, a lack of understanding arose as to why, for example, firefighters did not enter the theatre where the terrorists were still entrenched. "Faced with the threat of weapons and explosives, any rescue will be rendered less effective if it involves the death of a rescuer or a medic. That's the fundamental rule of the job: you can't tend to an injured person when the shooter is likely to target you." It is for this reason, he emphasises, that one of the most vital messages of his book is that the Paris Fire Brigade and the French Emergency Medical Service, SAMU must be prohibited from entering the exclusion zone, before police Special Forces have neutralised all threats.

The book takes the reader through the incidents of November 2015 in chronological order, layered with reflections, anecdotes and explanations; it is these personal observations that illuminate the



Evolutions in terrorism: A tactical medic's perspective

The author, Dr Matthieu Langlois, together with colleagues from France's elite national counter-terrorist tactical unit
author photo

narrative, bringing the events to life while clarifying operational decisions, and describing organisational structures and co-ordination between agencies.

So, what were the most critical surprises that Langlois and his team faced? He replies: “The number and severity of wounds we encountered were by far beyond our immediate capabilities. So the immediate response required flexibility and adaptability to implement the simple processes that we already knew by heart. The first that comes to mind was for fast triage to ensure fluidity of evacuation.”

He continues: “A tactical medical triage system was implemented to ensure the fastest possible extraction from danger and to secure the victims. So the first action was to ask people if they were able to leave the danger zone under police cover.

“The difficulty lay in the psychological approach needed to convince the victims to trust us at that stage.”

Indeed, communication with the hostages was one of the most challenging parameters: “Despite the fear and pain they were experiencing, we had to convince them to follow us in just a few seconds. We achieved this through human interaction and empathy, a simple glance, a comforting word...”

This is where the RAID team’s experience as medics is evident; its members work in operating theatres or emergency rooms, so they already have finely honed skills to communicate with patients experiencing pain or major psychological distress. And the satisfaction when this trust was successfully established was immense, notes Langlois.

We turn to tactics, with Langlois emphasising that one of the most vital messages in his book is to organise a flexible, adaptive and co-ordinated evacuation path at an incident. In other words, France’s doctrine is to deploy specialist medics into the hot zone at the same time as the responding specialist law and order forces in order to accelerate extraction of the injured, with minimal delay.

“While the police forces deal with the threat, the rescue mission could – and should – begin. However, dealing with the threat remains the priority,” he explains. “To implement this, tactical medics are integrated within the counter-terrorist and law enforcement units. As they combine expertise and experience, these personnel are the key decision-makers when it comes to organising the evacuation of victims within a secure area in the red zone.

“In a mass terror situation with significant penetrating trauma, such as an active shooter incident, the medical literature has established that efficient management of the time between the wound and reaching the operating theatre is the key factor that will save lives,” he tells me.

The need for co-ordination between services at such scenes is imperative and the solution is training: “Every time we train together, we learn lessons, especially when such exercises include other units, so we can rehearse extractions and inter-unit co-ordination.”

Langlois emphasises that such close collaboration between police and rescue units requires: “Perfect co-ordination, humility and a shared culture.

“Transparency is essential for constructive sharing. We need to avoid corporate agency posturing and present the same narrative through our communication and images.

“To achieve this, I believe that a Rapid Reflection Taskforce, as conceived by Dr Patrick Lagadec on crisis management (see previous issues of *CRJ*) must be created at a national level and it is important that this be



“We had to convince the hostages to follow us in just a few seconds. We achieved this through human interaction and empathy, a simple glance, a comforting word...”



“Close collaboration between police and rescue units requires perfect co-ordination, humility and a shared culture,” according to Dr Langlois

politically independent. Such a taskforce would gather senior level analysts and practitioners, among others, to analyse situations and trends and make assessments, based on facts, to leverage improvements in response.”

When asked about the importance of standard operational procedures and plans, versus the ability to exercise one’s own judgment in a rapidly unfolding crisis scenario, again, training is the key. “It is vital to be constantly preparing and rehearsing, to be able to adapt during a crisis and to accept the unknown.

“We have observed that simplicity is much more readily adaptable and adhere to the Keep it Simple, Stupid (KISS) concept. All operating procedures and techniques require a significant amount of training and preparation. However, they should not exclude judgment capabilities and decision-making skills,” he notes, continuing: “By definition, the next crisis is still unknown, so it is critical that all units – including the police, fire brigade, and so on – maintain a high capacity for adaptation during an emergency. We train on scenarios that factor in contemporary issues, threats, analysis and outputs from previous terrorist attacks.

“It is crucial to keep a taste for the unknown, which is too often alien to conventional drills and simulation exercises.”

To conclude, Langlois tells me that readers of the *CRJ* should consider certain vital questions when it comes to preparedness for situations similar to the Bataclan theatre siege, such as whether their organisations have adaptive standard procedures.

He also highlights the ongoing discussions revolving

around the delineation of roles within the hot zone, namely whether police officers should act as rescue experts in the red exclusion zone and, vice versa, whether firefighters should be trained alongside police and the military to operate in such zones.

This is another reason for Langlois writing the book – not only does he want to share information on how RAID works with the public and relatives of those affected by such incidents, but also to provide clarity to the media and colleagues around the world. With regard to the media, he explains that it is vital to: “Explain how we work so if they should become caught up in a scenario, they don’t put us and the hostages at risk by revealing critical information. We need to help them become responsible, active stakeholders following ethical rules of behaviour.”

Langlois adds that this terrible event, which caused immense suffering, fear and pain for those affected, and their families and loved ones, was a unique experience for all the responders involved, including his unit.

This is why it is so important for the lessons learnt to be shared, he says.

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Médecin du RAID, *Vivre en état d’urgence*, by Matthieu Langlois (ISBN 978-2-226-39188-9) is published in French by Albin Michel. There are plans for an English translation; CRJ will announce this upon publication

Virtual reality for first responders



Laurence Marzell presents an immersive virtual and mixed reality platform that trains personnel to respond to physical threats and cyberattacks on critical infrastructure and crowded places

In July 2015, IEEE, the world's largest technical professional organisation dedicated to advancing technology for the benefit of humanity, published an article on the use of virtual reality (VR) for the training of first responders. The article, drawing upon a study from the University of Virginia, stated that firefighters, bomb disposal officers, and others responding to emergencies need hands-on training that is safe and inexpensive and that VR simulators could be the answer to this.

Technological advances in this field are likely to reduce training costs, while simulated scenarios can provide a safe environment for first responders and security personnel to practise in.

With terrorism, natural disasters and, on occasion, man-made accidents continuing to be a major threat to life and infrastructure across Europe and beyond, it is becoming increasingly difficult for first responders to predict, prepare for and respond to attacks or disasters. Training has, in the past, used traditional live scenarios through full-scale exercises. However, such exercises are costly, time consuming and limited in the types of scenario that they are able to replicate. VR and mixed reality (MR) training could significantly reduce the major cost and time resources of these traditional methods, while at the same time increasing the frequency and availability of training opportunities.

In early 2015, as part of its Horizon 2020 programme, the European Commission awarded AUtomated serious Game

scenario Generator for MixED reality training (Auggmed) project funding of approximately €5.5 (\$5.84) million to develop its serious games platform for first responder training. Now, less than a year before the end of the project, Auggmed is well on the path to showing how VR and MR training of first responders can be applied at a practical level.

In March of this year, Auggmed successfully conducted a pilot of its prototype virtual-reality training system at a Barcelona rail station.

This pilot, the second of three, supports the development of a serious game platform to train police, security personnel, first responders and counter-terrorism units in different VR scenarios within real infrastructure environments using MR techniques. Auggmed's first pilot in May 2016 involved firearms officers from a UK police force responding to a scenario of a mixed physical and cyber-based attack at an international airport.

The 2015 study by the University of Virginia (see references) highlighted that designing a VR system requires an enormous amount of detail and data, which makes it difficult to translate into simple user interfaces. The researchers noted that the virtual systems seen today may look like programs that can be applied to training, but they are created by visual artists and hence do not provide the specific details first responders need. As a result, the researchers concluded that the game development platform Unity would be ideal to create a training VR system,

Author



LAURENCE MARZELL
leads the Serco participation in the Auggmed project; auggmed-project.eu

Auggmed Project – Horizon2020

Under the co-ordination of BMT Group Ltd, Auggmed is a consortium of 14 project partners from six EU countries. Partners include: Serco; University of Greenwich; Piraeus Port Authority; Ferrocarrils de la Generalitat de Catalunya; University of Birmingham; Geomobile; Sistema D'Emergencies Mediques; Police and Crime Commissioner for West Yorkshire; CENTRIC – Sheffield Hallam University; Israteam; Konstantinos Kardaras (Integration Power); Ministry of Citizens Protection; and Universidad Politécnica de Madrid www.auggmed-project.eu

because it is adaptable and enables user-controlled changes. This is why Unity was chosen as the game development platform on which the Auggmed system is based.

It is linked up with the state-of-the-art evacuation and circulation simulation software tool Exodus, which models crowd behaviour based on the best available data. This novel approach and integration increase the perceived realism and hence the system's immersiveness.

The developed system allows end users to assume a variety of roles within the simulation and to interact with the simulated crowd. In addition, Auggmed implements mathematical models that describe the effects of fire hazards and explosions on people and infrastructure. The fire modelling is carried out using the Smartfire CFD simulation software.

Both the Exodus and Smartfire simulation models are cutting-edge engineering simulation tools used in the design and certification of buildings around the world.

Numerous statistics based on physical and medical research have been compiled, describing potential effects on the human body, as well as the structural elements of buildings. Also included were the number of casualties, severely wounded, moderate and lightly wounded, as well as potential traumatic stress disorder of victims. Thus the scenarios played out are not based on an artist's impression of reality, but use the best available data and models, bringing training as close to reality as possible. These developments solve some of the main drawbacks exhibited by traditional live exercises, such as safety and expense.

Learning objectives

The Auggmed prototype allows trainers to set learning objectives for individual trainees and/or teams of trainees from a single or multiple organisations. They can define scenarios, monitor the progress of the training session, alter scenario parameters during the training session, provide real time feedback and assess the trainee's performance.

This multimodal VR and MR platform will be able to be used anywhere, via a variety of devices and technologies from smartphones and tablets to high-end PCs with multiple monitors and head mounted displays.

Bespoke scenarios will be possible, automatically generated to suit the needs of the individual, and accessible by a trainee at a time and place of their choosing. This will allow training to take place as often as required, in scenarios involving arbitrary population sizes, with users interacting with this crowd and trainers able to initiate a remote, unplanned session to test the readiness levels of individual team members.

The Auggmed prototype allows end users to assume a variety of roles within the simulation and to interact with the simulated crowd. The scenarios are not based on an artist's impression of reality, but on the best available data and models, bringing training as close to reality as possible

Auggmed

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AUGG**MED**

THE SERIOUS GAME PLATFORM

MULTI-AGENT COUNTER TERRORIST TRAINING IN MIXED REALITY ENVIRONMENTS WITH AUTOMATED SERIOUS GAME SCENARIO GENERATOR



AUGGMED is developing a serious game platform for single and team based training of end-users with different levels of expertise from different organisations responding to terrorist and organised crime threats.

The platform will automatically generate non-linear scenarios tailored to suit the needs of individual trainees with learning

outcomes that support improved emotional management, analytical thinking, problem solving and decision making skills.

The game scenarios will include advanced simulations of operational environments, agents, tele-communications and threats through virtual reality (VR) and mixed reality (MR) environments with multimodal interfaces.

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Partners



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Gamifying cybersecurity training

Training police officers how to handle digital devices when dealing with cybercrime is crucial, but can be time consuming and expensive. Here, the developers of a prototype that aims to transform training in this area by harnessing serious games technology, outline a possible solution

Many of the crimes reported to the police involve some aspect of digital technology. Cybercrime is no longer limited to describing criminal events where a computer or digital device is the target or tool, such as hacking or identity theft.

Indeed, technology can play a key part in virtually any criminal investigation. For example, police officers responding to reports of a murder may need to investigate a victim's mobile phone to establish which route they took to their destination, and the browsing history of the perpetrator could be used to establish intent.

Consequently, crime scenes in the 21st Century can contain a number of different digital devices, all of which may contain crucial evidence. First responders (police officers who are the first ones on the scene when dealing with an incident) may be tasked with identifying and seizing

Crime scenes in the 21st century can contain a number of different digital devices, all of which may contain crucial evidence. Police officers may be tasked with identifying and seizing those devices and, owing to the volatile nature of digital evidence, how they interact with those devices can affect the availability and integrity of evidence

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those devices and, owing to the volatile nature of digital evidence, how they interact with those devices can affect the availability and integrity of that evidence. Training police officers in the appropriate handling of digital devices is therefore crucial. Although classroom-based training can be an effective mechanism for delivering cybercrime training, it is expensive and time consuming. There is a clear need to explore alternatives to traditional classroom-based training.

Computer games afford visually rich, interactive and immersive environments that allow the exploration of complex problem spaces, both for entertainment and in serious contexts. Research has shown that games can be engaging for a variety of different users and are an effective mechanism for encouraging participation in activities. Games enable users to interact with an environment that replicates the real world and they have a positive impact

on motivation, enjoyment, positive feelings and happiness, which can encourage learning and retention of knowledge.

Ensuring timely and cost-effective cybersecurity training to police officers is a key priority for many law enforcement agencies. The use of serious games is one method that can deliver engaging and measurable training in a relatively cheap manner. This pilot project is the result of collaboration between academia, industry and law enforcement and aims to demonstrate that serious games can provide continually updated training in a way that is engaging for the user, which doesn't take officers off the streets for days at a time to sit in a classroom, and can be delivered at a fraction of the cost of traditional training. The First Responder's Guide is a novel fusion of cybersecurity and computer games technology.

The first stage was to create the virtual environment containing three different crime scenarios and this involved three activities: Game jam; prototype development; and initial evaluation. A game jam, popular in the gaming community, is an event where software developers, artists and game designers meet in a physical location to create one or more games over a short period of time (typically one to two days). These game jams provide an excellent opportunity to focus participants' efforts on developing games around a particular theme and challenge them to develop rapid prototypes that can be presented to peers and industry.

Our game jam was delivered over a two-day period for the first stage and students from across our digital degree courses were invited to take part. We used the event to identify a broad range of game ideas and designs that could be utilised in a serious games environment to train police officers responding to cybersecurity incidents.

At the beginning of the game jam, we provided the students with a project brief, which outlined the challenges involved in the seizure, acquisition and analysis of digital devices. The students formed teams to produce their proposed game (or 'asset'). At the end of the two days, each team presented to a team of judges and was scored according to proposed design, computer graphics, modularity and adaptability. The winning team was invited to participate in the next stage of the project, namely prototype development.

This involved developing the winning asset from the game jam into a prototype. The student team worked with representatives from Police Scotland to develop the scenarios; these were designed to simulate the types of crimes involving a digital element that Police Scotland typically encounters and can be classified as: A planned operation involving indecent images of children; a reactive enquiry in which a complainant received threatening messages via social media; and a spontaneous enquiry involving an attempted fraud of a business via spear phishing.

Each scenario is built around a virtual environment, which the player can explore using either 2d or 3d navigation mode. Depending on the scenario, various different objects are included within the environment, such as laptops, mobile phones, credit cards, smart televisions and so on. The user can inspect the objects and is presented with different options for interacting with them. For example, he or she can choose to switch off a mobile phone, place it in a Faraday Cage or seize it for further investigation. For each level of game play, the user is presented with a description of the particular scenario prior to entering the virtual property. After inspecting the virtual crime scene, the user can choose to leave the property and is presented with their

scores and feedback as to the appropriate course of action.

A short, qualitative evaluation was conducted with a small group of ten police officers to gather feedback on the appropriateness of the prototype, so as to establish current knowledge of cybercrime and incident response and the officers' attitude towards using games for training. Each officer was interviewed using hypothetical scenarios before playing. Individual scores were recorded during play, before participants were asked to complete a questionnaire on game play and usability.

Although all participants had received some form of training in cybersecurity before playing the game, there was some disparity between the interview answers and game play answers. Analysis of the questionnaire responses indicated that some participants found the wording of the questions vague. The navigation controls were also challenging for some. This feedback will be invaluable for the next stage of development, which will focus on refining the scenarios and in-game text, and removing the joystick navigation option so that the controls are more typical of a normal smartphone application.

Overall, participants were overwhelmingly positive about using games for training purposes.

Harnessing interactivity

To conclude, it is clear that cybersecurity is a rapidly developing field with increasing effects on society and which attracts the challenges of large and complex datasets on networked computing devices. This is reflected in crime patterns: most of the crimes that Police Scotland investigates now involve computer technology to some extent, making training in this area imperative. Typical classroom-based training can be expensive and time consuming, so using serious games to train police officers in cybersecurity is a viable option.

The prototype developed as part of our project is a fusion of cybersecurity and computer game technology, which provides a new training tool that harnesses the interactivity of serious games. Importantly, this tool has demonstrated the potential for more effective training to be delivered to more staff, at a significantly reduced cost, and without the need for classroom-based sessions.

Improving the cybersecurity skills of law enforcement personnel will lead to improved response to cybercrime and better preservation of digital evidence. 

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CBRN strategy in Austria

In these times of heightened security tensions, especially in Europe, planning to manage the consequences of a CBRN incident has become ever more vital, explains **Christian Resch**

Austria and Europe as a whole are facing major challenges. The sustained refugee crisis, simmering conflicts at the gates of Europe and the expanding international terrorist threat require a comprehensive approach to prevention and protection at a national level.

According to the current Austrian security-political analysis, the trend scenario for 2017 is characterised by an intensification of conflicts in the European neighbourhood, with far-reaching effects on internal security, societal cohesion and the resilience of the EU and its member states – through migration, terrorism and cyberattacks in particular.

Furthermore, the impacts of the new Trump administration on Europe are still not in full sight. Despite a European-wide stabilisation of – and upwards trend in – defence and security budgets, the EU is still not capable of carrying out its own larger operations to protect vital societal security interests.

Countries with developed industrial and service economies are the drivers of complex globalisation processes, and their societal resilience goes hand in hand with their economies. Despite Austria's economic performance being very stable in terms of traffic, telecommunication, energy, finance and healthcare, the protection of its critical infrastructure is vital. Natural or human-induced catastrophes, including terrorist incidents, can affect the whole of society and critical infrastructure plays a key role within this.

Chemical, biological, radiological and nuclear (CBRN) consequence management encompasses the actions required to maintain or restore the essential services that a society needs to function, as well as the management and mitigation of disasters triggered by CBRN hazards. It requires symbiosis between military and civil defence assets, especially after terrorist attacks.

The Austrian Constitution segregates these tasks between its defence and interior forces, with national legislation and political strategy ensuring close interoperability in consequence management scenarios. The Austrian Ministry of Interior takes the lead in virtually all major emergencies, with the only exception being incidents involving warfare agents, in which army forces assume command. As in disaster relief operations protocols, in the event of a CBRN disaster, the Ministry of Interior can draw upon military support through the Military Civil Defence Assets (MCDA) approach.

When there is a strong need for manpower, specialists and high value assets, the armed forces can assist. They can also provide the most important capability – that of force protection – when it comes to suspected terrorist attacks. Yet it is only now that civil protection first responders and large cities are taking this need into consideration.

In Austria's major cities the first responder concept is based on a combination of voluntary and professional civil protection services, including rescue organisations and firefighting units. These are key players in a response, but without efficient protective and hazard warning equipment, terrorist incidents can easily become a serious trap for civil emergency organisations. A significant issue within first response organisations

and authorities is that of raising awareness about secondary hazards such as CBRN or terrorist threats.

Civil protection and disaster relief authorities are responsible for first response in Austria. The system is based on federal principles, meaning that each federal state ("Bundesland") is responsible for its own response and preparedness plans, as well as hazard mitigation measures. National strategies merely define the legal framework – services and measures such as CBRN consequence management have therefore been developed in different ways.

If we take the chemical industry as an example, critical infrastructure operators such as Seveso enterprises must comply with strict national and international laws and guidelines, as do local authorities in terms of spatial planning. But response measures vary between Austria's nine individual states; some authorities have established official CBRN first responder teams with civil servants working as experts and team members. In other states, such

capacity is non-existent. Local rescue organisations on the other hand, mainly fulfil this need through awareness training. And not all states have established casualty decontamination teams or hot zone extraction procedures.

Professional firefighting units, which operate

in Austria's larger cities, cover the full spectrum of CBRN response, such as detection and analysis or decontamination. However, most of the country's other fire services are organised following a voluntary structure and CBRN bases have only been established where the relevant knowledge and interest are available.

Although federalism is undoubtedly a useful system of governance, in the case of consequence management, it has led to a variety of different mechanisms and obstacles, especially with regard to CBRN hazards, where cross-border co-ordination is so often needed.

National forces such as police and army meet the required holistic CBRN approach, but they are not categorised as first responders. A strategy to solve this issue and to provide proper and timely response and support is now being developed.

Police forces have officers who are trained and equipped in radiation protection in every unit. Vehicle accidents or property search operations may need a quick reaction as soon as secondary hazards are identified. If circumstances demand, CBRN investigation teams can act as first responders and can carry out detection and forensics, working in close collaboration with explosive ordnance disposal teams and military CBRN experts. CBRN response capacity such as special equipment and manpower, as well as experts and research and development, represent the strength of the military forces and fill the ensuing gaps.

Incidents where a release of chemical warfare agents (CWA) or toxic industrial materials (TIM) are suspected require a reach-back capacity with CBRN experts. On-site identification, sampling, sample packing and transportation are necessary, as is a large decontamination capacity. Situational awareness for CBRN consequence management is an integral part of the armed forces,

Stakeholders are heading in the same direction when it comes to common strategic development

and is based on three main concepts, as follows:

CBRN defence individual protection: This includes basic knowledge of hazards and handling of individual protective equipment for every soldier and employee (including civilians) and is essential to minimise the potential damage that CBRN agents or TIM could cause, especially those that endanger life and health and impair the operational readiness of essential equipment. It is crucial that this equipment provides survivability from CBRN agents or the release of TIM for a minimum of six hours and, if necessary, permits personnel to fulfil missions under CBRN conditions. To increase the level of individual protection to 96 hours, CBRN collective protection (ColPro) – involving deployable stationary or mobile systems – is an important element that has been integrated. ColPro can be set up as an improvised protection measure or as a technical construction to minimise the level of individual protection that is necessary during an incident, as well as reducing the physical and physiological impact of wearing PPE.

CBRN defence all arms: These soldiers embedded into all military units are trained and equipped for detection, identification and decontamination support within their units. These personnel provide early warning and reporting, fortification, local observation of meteorological conditions, implementation of dosimetry and evaluation of radiation exposure.

CBRN defence branch: These are units at company level tasked with CBRN reconnaissance (including detection, sampling, identification and analysis), decontamination (of personnel, vehicles and equipment, terrain and infrastructure), CBRN urban search and rescue (USAR), including heavy lifting and firefighting tasks under CBRN conditions, and water purification (from contamination). Five operational units cover the country, with one being maintained in a state of high readiness for deployment abroad. The units are reinforced by a team of experts in radiological, chemical, biological and veterinary issues; unit members can conduct CBRN forensics and a remote controlled, automotive survey on site as well as field laboratory analysis.

Unconventional incidents, such as terrorist attacks or the release of warfare agents, demand a much shorter reaction time than for disaster relief operations or for providing assistance within Austria. Intelligence information could lead to setting a 'notice to move' to shorten the reaction time, but a high percentage of incidents still require rapid reaction and deployment on site.

This is why a further concept has been developed for rapid deployment in Austria's urban conurbations. Protection assets, special operation forces, explosive ordnance disposal (EOD), military police and CBRN defence units form part of a brigade-sized first responder body called 'Kommando Schnelle Einsätze' (Rapid Operations Command).

Recent incidents have highlighted the need for rapid and efficient consequence management – CBRN response plays a crucial part in this, in Austria, across Europe and globally, so these forces are also trained in conducting joint missions in contaminated areas.

After a year of successful testing, a military CBRN first responder concept is being developed. Not every incident where CBRN is suspected calls for the full-scale deployment of a brigade-sized rapid reaction force. On some occasions it is more appropriate to send a small, specialised team of experts to support civil authorities in assessing the

situation or, in more robust scenarios, to replace them.

The CBRN hazards investigation team (HIT) capability is on call 24 hours a day, and is available to civil authorities or emergency organisations, as well as to critical infrastructure enterprises. The team can evaluate the situation, advise on risk analysis and countermeasures, and send experts to the site. Its deployment must be legally based, whether as support to civil authorities or interior forces.

Depending on the state of readiness, the duty officer can also send a hazards investigation team and these are deployed from one of the CBRN defence units closest to the area of interest.

CBRN HIT has established three stages of alert. Under normal circumstances the threat level is low, which means the teams go about their daily duty routines. During suspected threats or during high visibility events, the level is set to medium. The state of high alert is only triggered in confirmed terrorist threats or during incidents that are in already in progress.

The duty officer has staff reinforcements to provide all necessary support, such as logistics or contact to civil

Previous page: Joint mission briefing for police and military services. Below: High value asset for contaminated casualties; Below right: Live agent training in the Czech Republic; Bottom: CBRN forensics and sampling

C Resch and Hohenbalken



authorities, laboratories, legal advice, etc. Staffing can be scaled up to a full CBRN operations command that ensures a full mission documentation and a reach-back capability with subject matter experts from different fields such as CBRNe, static evaluation or special medical support.

CBRN HIT is an integrated part of the military first responder concept and ensures a rapid on site response for situation evaluation, saving reaction time and speeding up information gathering while the response units prepare for deployment.

The HIT is mission-specific and has capabilities to detect and identify contamination, as well as taking samples for lab testing and decontamination. Forensic analysis or explosive device disposal can be added to increase capability where there are more specific needs. Force enablers such as military police, EOD-teams, special operation forces or a field lab can expand the complement further.

This comprehensive approach is crucial for the mission to succeed in recovering a safe and secure environment through the deployment of hot zone extraction teams, medical and decontamination units.

CBRN consequence management in Austria has paid off in terms of shorter reaction times, a legal base providing more qualitative support to external stakeholders and the establishment of a communication and information platform. The strategy is now being implemented in all other emergency operations. It ensures a sharing of capabilities and capacities and avoids duplication. Furthermore, it facilitates a comprehensive training approach as police special forces, professional firefighting units and military forces, as well as rescue organisations, can now conduct counter-terrorism scenarios together. They share the same situational awareness of CBRNe threats and are improving protective equipment and increasing interoperability.

There are a few more steps to take, but all stakeholders are heading in the same direction when it comes to common strategic development, at least in terms of CBRN consequence management. Joint standard operational procedures and training, equipment and communication interoperability and compatibility will become the key to success in order to meet future challenges and to strengthen Austria's resilience.

Author



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The consequences of piracy

Piracy, which decreased significantly around 2012, has once again been making the news this year, says **Christoph Schroth**. What are the wider consequences of piracy and what is being done on an international level to protect this important transportation sector?

Areas known for growing piracy activities include Africa (Somalia being the most commonly known area), Indonesia, Malaysia, the Philippines, Yemen and Venezuela, but what does this mean for the maritime cargo industry? What are the potential consequences and what is still to come?

The International Maritime Bureau (IMB) defines piracy and armed robbery as: “An act of boarding or attempting to board any ship with the apparent intent to commit theft or any other crime and with the apparent attempt or capability to use force in the furtherance of that act.” Holding the vessel and crew for ransom is common practice as the attacks on ships are generally carried out with small boats (skiffs), making it impossible to remove cargo from the vessel itself.

Piracy is an asymmetric style of warfare that has created an entirely new challenge to the cargo industry. The vessels targeted by pirates primarily tend to be slow, have no fortification and provide easy access via a low stern (back of the ship) and via the freeboard (the sides of the vessel that tend to be close to the waterline when fully laden).

A typical pirate attack could look something like this:

- Skiffs approach the vessel, normally from the rear where radar coverage and field of view are limited;
- Shots are fired at the bridge with an assault rifle and/or rocket propelled grenade (RPG) to coerce the captain to slow down or stop;
- At the same time other skiffs come alongside or to the rear and try to board via boarding ladders they carry;
- The plan is to take over the bridge as quickly as possible, while rounding up the crew in a communal area to keep them contained; and
- Once in control, the pirates slow down to hook their mother ship and skiffs to the vessel and tow them along while proceeding to a holding area or utilising it as a mother ship (floating base) to commit further piracy attempts on other vessels.

Demands are generally issued next, and while a few years ago lower amounts were demanded, multiple millions of US dollars in cash tend to be the norm more recently. “Factors such as cargo and crew determine ransom demands,” Reuters reported in 2011, adding that: “Ransom demands have risen steadily in recent years. According to one study, the average ransom stood at

\$5.4 million in 2010, up from \$150,000 in 2005, helping Somali pirates rake in nearly \$240 million,” in 2010.

McNicholas states: “More than half of all pirate attacks reported (...) take place while the vessel is at anchorage.” An interview published by Yale Insights in 2011 estimated around 100 ships and crew to be held hostage at the time, which equated to less than one per cent of the world’s shipping fleet.

Reliable statistics on piracy are not easy to obtain as over or under reporting are a common problem. Also, it can sometimes be impossible to differentiate whether these acts are committed by pirates with criminal intent, or by fishermen who happened to cross the vessel’s way. The NATO Shipping Centre (2013) categorises piracy activities into five categories, namely: Suspicious activity; approach; attack; pirated/hijacked vessel; and disruption. The IMB reported that 92 per cent of all ship seizures had been off the coast of Somalia in 2010, totalling 49 vessels and 1,016 people being taken hostage; 28 vessels and 638 hostages were still being held for ransom at the end of that year.

Oceans Beyond Piracy has published reports summarising the *Economic Cost of Somali Piracy* for 2010 and 2011. Total costs for the international economy were shown to be between \$7 and \$12 billion per year. “The International Maritime Organisation (IMO), a global maritime watchdog, estimated that in 2011, West African countries lost nearly over \$1 billion in oil due to piracy,” states Christopher (2009). “Piracy and organised crime on cargo vessels and bulk carriers, both at sea and anchorages, cost over \$450 million per year.” Over and above the value of vessels: “Millions of dollars in ransom payments are paid to pirates. It is believed that these payments are divided between the pirates, their leaders and those who finance them. Intelligence indicates that part of the money is reinvested abroad through Somali emigrants.”

While other modes of transportation are available: “The main advantage of maritime transportation is obviously its economies of scale, making it the cheapest per unit of all transport modes.” It is, however, an expensive endeavour to enter this market sector, with a purchase price of \$75 million and daily operating costs of around \$50,000 for an average container ship.

Blue economy

“The EU’s blue economy employs roughly 5.6 million people and accounts for a gross value added of almost €500 billion euros. Seventy-five per cent of our external trade is waterborne,” Maria Damanaki, the European Commissioner for Maritime Affairs and Fisheries said in a speech in 2013. The most commonly used sizes of containers used in the shipping industry are 20 and 40 foot; these have given rise to the industry standard that measures cargo volume and vessel capacity – the Twenty Foot Equivalent Unit (TEU) and the Forty Foot Equivalent Unit (FEU). Between 2003 and the middle of 2009 total container cargo, including dry freight, insulated and tank containers, rose from about 16.6 million to 26.3 million TEU, with 32.9 million TEU in 2012.

The increased risk of piracy attacks on their vessels in above-mentioned regions has made it necessary for ship operators to take action. Multiple options can be explored, the first of which is avoiding the danger area entirely. However, while sounding simple this is not so easy to accomplish, either because of extended travel times for reasons of cost, or owing to a lack of alternative routes or ports. The route from the Mediterranean Sea to India and Australia lead through the Somali basin, a major piracy area. The only alternative to this route is around southern Africa, extending the journey time and cost significantly.

Another solution is that of using faster vessels to outrun the pirate skiffs, which generally cannot keep up with speeds above 20 knots. This helps operators to avoid problems during transit, but not while vessels are at anchor.

Maintaining awareness is one further measure that can be taken in the form of posting continuous lookout personnel on the bridge – the more people the better – 24 hours per day. Radar monitoring should be maintained and set up to include the rear of the vessel, the most common direction of approach.

With regard to hardening vessel structures (with barbed wire, security gates or similar items), the same concepts as in home security can be employed. Securing windows, doors and minimising access points will slow attackers down.

Another measure is creating a piracy attack plan. The crew needs to be aware of what to do during an attack and



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how they will be alerted. This should be practised, same as all other drills aboard, such as fire drills, for example.

Some operators opt to place unarmed or armed security personnel on board during high-risk transits. Numerous companies worldwide offer these services and have successfully fought off or prevented attacks entirely. While armed personnel are often more effective in these tasks, thanks to their weaponry, they are only of benefit in the event of a gunfight; up to that point their skills are identical to unarmed personnel, focusing on avoidance, observation and documentation.

Many vessels have created citadels or safe rooms on board. These tend to be large enough for the entire crew, as well as the security team, and are to be occupied during an attack. The security team will generally join the crew if the pirates have successfully boarded the vessel and can no longer be stopped from taking control. Water, food, medical supplies, independent vessel controls and communication equipment are stored and installed and the room will only be unlocked once the navy or other security teams have boarded and taken control of the vessel back from the pirates.

So, what can the global community do about piracy? Owing to the large ocean areas involved and global financial impacts of piracy, many countries have taken action to prevent such activities off their coast and in their region. NATO formed an anti-piracy initiative in 2009 named Operation Ocean Shield. Its mission was to contribute to international efforts to counter maritime piracy, while participating in capacity building efforts with regional governments. Operation Ocean Shield co-operated closely with other naval forces, including US-led maritime forces, EU naval forces and national actors operating against the threat of piracy in the region. NATO's highest decision-making body, the North Atlantic Council provides political guidance for the operation. The area covered was greater than two million square miles, approximately the size of Western Europe. Its vessels had the permissions and responsibilities listed below:

- Conduct intelligence, surveillance and reconnaissance missions;
- Monitor and escort commercial vessels crossing the area;
- Log and share pirate attacks and activities via the NATO Shipping Centre;
- Board suspected pirate vessels with/ without the use of force; and
- Arrest suspects and hand over to designated law enforcement agencies.

Unfortunately, Operation Ocean Shield officially ended on December 15, 2016.

A set of guidelines on dealing with piracy incidents in the Somali basin has also been created. Known as *BMP4*, (*Best Management Practices for Protection against Somali Based Piracy – Version 4*), this provides guidance and advice for ship owners and security personnel alike. Additionally, there is an internationally recognised High Risk Area (HRA) bounded by Suez and the Strait of Hormuz to the North, 10°S and 78°E.

The UK Maritime Trade Operations Office (UKMTO) in Dubai acts as the primary point of contact for merchant vessels and liaison with military forces in the region. UKMTO Dubai also administers the voluntary reporting scheme, under which merchant vessels are encouraged to send regular reports, providing their position/course/speed and ETA at their next port while



transiting the HRA. UKMTO Dubai subsequently tracks vessels and the positional information is passed to Combined Maritime Forces and the EU Maritime Security Centre in the Horn of Africa (MSCHOA).

The centre co-ordinates emergency response and NATO or other organisation will be dispatched to assist. Interpol has also joined the fight against piracy and focuses on three areas: Improving evidence collection; facilitation data exchange; and building regional capabilities.

Prosecution of captured pirates is a point of concern, as jurisdictions are not always clearly defined. The various nations of navy vessels adhere to their countries' rules and regulations, as well as to international maritime law.

Vessel operations incur various costs in their daily operations including mortgages, fuel, oil and staff salaries. Security measures need to be factored into this calculation, although their impact is not always significant, especially if compared to ransom, loss of life, loss of the vessel for days to months, or loss of cargo. Insurance providers often stipulate the need for a security team aboard a vessel crossing the HRA, the costs of which have to be covered by the vessel operator, and consequently the client.

Piracy has become an integral part of safety concerns in the shipping industry, even if incidences were on the decline and limited to certain regions. But actions by ship operators and governments can either lead to seizing of piracy or create a shift of piracy towards new regions around the globe if not carried out in an efficient manner. Either way, the financial consequences of piracy are significant and private maritime cargo companies cannot handle this problem without the support of various governmental and international organisations such as NATO.

Regional governments need to be enabled to protect their own territorial waters without dependence on international assistance, as once these initiatives end, a return to the previous state of piracy could be the consequence, making the entire project's achievements appear minor as they were only temporary.

Jurisdictions and the legal foundations need to be in place and clearly defined on an international scale to provide consequences that span across all regions, without the need for courts to rule on a case-by-case basis every time. 

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Members of a visit, board, search and seizure team from USS San Jacinto investigate a suspicious dhow, as part of a deployment in support of maritime security operations

Petty Officer 1st Class
Brandon Raile | US Navy
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Climate change and security

Caitlin E Werrell and Francesco Femia highlight just how seriously the threat that climate change poses to national security communities is being taken, given that it acts as a threat multiplier within the geostrategic environment

In March 2017, US Secretary of Defense James Mattis, in his response to questions posed by members of the Senate Armed Services Committee, stated: “I agree that the effects of a changing climate – such as increased maritime access to the Arctic, rising sea levels, desertification, among others – impact our security situation. I will ensure that the department continues to be prepared to conduct operations today and in the future, and that we are prepared to address the effects of a changing climate on our threat assessments, resources, and readiness.”

Why would the Secretary of Defense, with so many other pressing national security issues on his plate, be concerned about what has been traditionally considered a manageable environmental issue?

The simple answer is that the national security establishment in the US, including the military and intelligence communities, has long understood the national security risks posed by climate change, as well as the responsibility to prepare for them. This is down to the nature of climate change as a threat multiplier, which exacerbates existing and prospective risks in the security landscape.

The security community has been planning for these risks since the first term of the George W Bush Administration. This includes the integration of climate change risks into close to 70 unclassified defence, intelligence and homeland security assessments, strategies and plans since 2003. Today, the assessment of climate change as a security threat enjoys strong bipartisan support in the broader US national security community, both inside and outside government. In 2016, for example, a group of senior retired US military and national security leaders convened by the Center for Climate and Security (CCS), many of whom served under both Bush Administrations and the Reagan Administration, determined that climate change presents a ‘strategically-significant risk’ to national security, and requires a commensurate level of response.

The US national security community is not alone, however. One study found that about 70 per cent of nations have included climate change in their national security policies in one form or another. The truth is that for national security thinkers, planners and implementers, changes in



Milosh Kojadinovich | 123rf

The threat to critical infrastructure and entire populations is direct, overwhelming and potentially existential



US Marines unload food and supplies in support of the flood relief effort in Pano Aqil, Pakistan. The effects of climate change could limit or complicate the ability of militaries to respond internationally to increasing demands, whether they are interventions in conflicts, or humanitarian assistance and disaster relief missions

US Army photo by Sgt Jason Bushong

the climate present problems worthy of attention by those whose primary job it is to protect their nation from harm.

While there is no single accepted definition of a national security threat, national security communities generally consider threats as either direct or indirect. In this context, many national security communities consider climate change a threat multiplier – a term first coined by CNA's Military Advisory Board and now broadly used by the US Department of Defense (DoD) – or an accelerator of instability, as characterised in the *FY2010 Quadrennial Defense Review* conducted by the DoD. This means that climate change exacerbates or heightens other threats, both directly and indirectly. Indeed, the cumulative impact of a changing climate alters the security landscape itself. It does so in two main ways: multiplying threats to critical infrastructure, and acting as a threat multiplier in the geostrategic environment.

Numerous climate change projections highlight a future of increased extreme weather events, such as droughts, floods, storms, and sea level rise, which could devastate communities in some areas of the world. This puts critical infrastructure in these places at significant risk, including military installations and the civilian infrastructure and logistical chains that support them. As such, climate-related threats have become a major concern for many national security planners and militaries, including the DoD.

For example, the DoD has determined that drought, dust storms, forest fires, and rising temperatures are physically affecting military bases and training ranges across the American Southwest. The DoD has also examined the impact of sea level rise on its numerous coastal military installations (including the highly vulnerable

Hampton Roads region, which includes 29 military sites that are critical for overall US military readiness), concluding that these risks are real and increasing.

An independent review by a Military Expert Panel convened by the Center for Climate and Security corroborated this assessment, concluding that sea level rise presents: "Serious risks to military readiness, operations and strategy," based on existing and projected impacts of sea level rise and storm surge on critical military and civilian support infrastructure, including access roads and energy grids.

Internationally, the picture is also stark. A 2016 DoD Strategic Environmental Research and Development Program report ran sea level rise scenarios for 1,774 coastal US military bases worldwide, and found significant risks at all times scales examined (2035, 2065, and 2100). This includes critical low-lying coastal installations, such as Diego Garcia, which is shared by US and UK military forces. Overall, these conditions limit or complicate the ability of militaries to respond internationally to increasing demands, whether they are interventions in conflicts, or humanitarian assistance and disaster relief missions.

Certain low-lying nations, such as Bangladesh and the Maldives, face the possibility of large percentages of their landmass being submerged by a rising sea. In such cases, the threat to critical infrastructure and entire populations is direct, overwhelming and potentially existential.

Much of the national security community's concern about climate change revolves around its capacity to multiply threats, particularly in regions of the world seen as key, strategic environments.

For example, climate change could indirectly upset the balance of competing interests in the South China Sea, an

area of critical geostrategic importance where ships carry \$1.2 billion in US trade annually. On top of this, sovereignty over parts of this sea is contested; the US, China and other nations of the region have perennially competed over its control, with the US viewing Chinese expansionism in the sea as a threat to freedom of navigation, national security, and the security of key allies. As the ocean warms and fish stocks move northward, tensions between the fishing fleets of China and other nations in the region are likely to increase, potentially heightening the possibility of conflict.

During his tour of duty as the Commander of US Pacific Command, Admiral Samuel J Locklear III identified climate change as potentially the most disruptive long-term security threat facing the Asia-Pacific region. As Admiral Locklear stated, in reference to the climate change threat to growing coastal populations in the Asia-Pacific region: "If it goes bad, you could have hundreds of thousands or millions of people displaced and then security will start to crumble pretty quickly." A security breakdown in such a strategically significant part of the world would have a considerable effect on regional and global security.

Climate change may also place stresses on food security by increasing the severity, frequency and variability of crop-damaging events like droughts and floods. Owing to the nature of the global food market, this can sometimes result in spikes in world food prices, increasing the likelihood of instability in places that depend on affordable imported food, such as most of the Middle East and North Africa. There is also high confidence that this region will continue to get drier, losing more and more of its winter precipitation, placing additional stress on a region plagued by conflict.

This is part of a larger phenomenon Dr Troy Sternberg calls: "The globalisation of hazards," where natural hazards in one region can have a significant impact on regions halfway across the globe. In the case of countries such as Egypt, that are of such strategic significance to the US and the region, such chronic instability – due in part to severe food insecurity – can fundamentally change the global security architecture.

There is also high confidence that the Arctic will continue to melt at a rate and a magnitude that is unprecedented in human history (see article by Lina Kolesnikova in *CRJ* 9:1). Dramatic changes to Arctic sea ice cover, driven in large part by climate change, may have a significant impact on resource disputes, particularly given a petroleum-rich sea bed and hazy territorial boundaries. The expected increase in commercial activities in the Arctic may also lead to security complications – as nations attempt to manage large stretches of open ocean that were previously inaccessible.

Lastly, climate change can exacerbate the social, economic and environmental stresses that plague fragile states, thus heightening the probability of massive population displacements and chronic instability.

The wicked problems that already exist in fragile states will have to contend with the new risks of a changing climate, which will complicate post-conflict reconstruction even further. Take the example of Syria. A severe drought from 2006-2011, coupled with natural resource mismanagement by the Assad regime and other stresses, led to the displacement of around 1.5 million farmers and herders. As noted in a CCS report, *The Arab Spring and Climate Change*, this drought was part of a pattern of increased drying in the Mediterranean and Middle East that began in 1973 and which was

strongly associated with climate change in a 2011 NOAA report. Though it would be folly to argue that climate change 'caused' the Syrian civil war, it is clear that the region's plummeting winter precipitation levels were one of the drivers of massive population displacements in Syria, and that the inadequacy of the government's response to that displacement contributed to popular dissatisfaction with the Assad regime. In short, climate change threatens to make fragile states even more fragile or chronically unstable, which can present serious national, regional and international security challenges.

Do these security threats warrant serious attention in light of the plethora of other transnational security threats, such as the proliferation of nuclear weapons and materials? From a national security perspective, the answer is yes – not least because climate stresses on food, water and energy systems can make other security threats worse, particularly in fragile and climate vulnerable regions, such as the Middle East and North Africa, Central and South Asia. In this context, it is not useful to separate climate risks from other risks, or to attempt to rank it against other threats. It is, as mentioned previously, a threat multiplier. Furthermore, climate change is what risk analysts would call a high probability, high impact risk, meaning that effects associated with it are very likely to occur (between 90 and 97 per cent), and will have a very large and widespread impact on security (for example, the *2014 Global Risks Report* ranked climate change highest, next to fiscal crises; see p48 for 2017 report).

Nuclear risk

It is useful to compare climate change to another transnational risk – the proliferation of nuclear weapons. A study commissioned in 2005 by US Senator Richard Lugar produced a median response of a 10 per cent likelihood of: "An attack involving a nuclear explosion," in five years and a 20 per cent likelihood in 10 years. Of course, in the case of a nuclear detonation, the price of that 10 or 20 per cent likelihood materialising is devastating and unacceptable, so preventing it is considered a vital priority. The same goes for a changing climate, given the high degree of certainty about its occurrence, and the likely scale of its impact over time.

The national security community does not have the luxury of waiting for 100 per cent certainty about the scope, scale or causation of climate change before addressing the associated risks, any more than it can wait for such certainty with any other national security risk. There is already a sufficiently high degree of certainty that climate change is, and has the capacity to be, a multiplier of direct and indirect threats to nations, and that steps to address that risk are warranted. That is why national security planners in the US have put time, personnel and resources into addressing its effects, and have done so across both Republican and Democratic administrations.

As US Secretary of Defense James Mattis stated in his written testimony to the Senate: "...climate change is a challenge that requires a broader, whole-of government response." In this context, national security communities have an obligation to be prepared for (and work to shape) the geostrategic security environment, and cannot afford blind spots in that picture. That is what grounds the: 'responsibility to prepare' for climate change risks enshrined in Secretary Mattis's statements, the actions of his predecessors, and the approaches of national security communities across the world.

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The risk landscape for 2017

Roger Gomm discusses the World Economic Forum's 'Global Risks Report' for 2017, which focuses attention on the evolution of global risks and the deep interconnections between them, finding that environment-related risks figure highly on the risk landscape

The *Global Risks Report 2017* was presented at the World Economic Forum (WEF) annual meeting earlier this year as part of its commitment for: "Improving the state of the world." It features perspectives from 750 experts on the perceived impact and likelihood of 30 prevalent global risks, as well as 13 underlying trends that could amplify them or alter the interconnections between them over a 10-year timeframe.

One of the key inputs to the analysis of *The Global Risks Report* is the Global Risks Perception Survey (GRPS), which brings together diverse perspectives from various age groups, countries and sectors: business, academia, civil society and government.

The 12th edition of the report is published at a time when deep-rooted social and economic trends are manifesting themselves increasingly disruptively across the world. Persistent inequality, particularly in the context of comparative global economic weakness, risks undermining the legitimacy of market capitalism, say the report's authors. At the same time, deepening social and cultural polarisation risks are impairing national decision-making processes and obstructing vital global collaboration.

Further challenges requiring global co-operation are to be found in the environmental category. Over the course of the past decade, a cluster of environment-related risks – notably extreme weather events and failure of climate change mitigation and adaptation, as well as water crises – has emerged as a consistently central feature of the risk landscape. This is strongly interconnected with many other risks, such as conflict and migration. This year, environmental concerns are more prominent than ever, according to the report, with all five risks in this category assessed as being above average for both impact and likelihood.

Technological change another important area examined and the report's authors find that: "Society

is not keeping pace with technological change." They say that, of the 12 emerging technologies examined, experts found that artificial intelligence and robotics to have the greatest potential benefits, but also the greatest potential negative effects and the greatest need for better governance.

This year's findings identify key challenges that the world now faces:

- Rising income and wealth disparity;
- Increasing polarisation and intensifying national sentiment (political); and
- The need to protect and strengthen our systems of global co-operation.

The first two are in the economic category, in line with the fact that rising income and wealth disparity are rated by respondents as the most important trend in determining global developments over the next 10 years. This points to the need for reviving economic growth, but the growing mood of anti-establishment populism suggests that the world may have passed the stage where this alone would remedy fractures in society: reforming market capitalism must also be added to the agenda, according to the report.

The report has also highlighted the potential of persistent, long-term trends such as inequality and deepening social and political polarisation to exacerbate risks associated with, for example, the weakness of the economic recovery and the speed of technological change. These trends came into sharp focus during 2016, with rising political discontent and disaffection evident in countries across the world. The obvious signs of disruption have come in Western countries, with the United Kingdom's vote to leave the European Union and Donald Trump's victory in the US presidential election. But there is also evidence of a growing backlash against elements of the domestic and international status quo in other parts of the world.

With the electoral surprises of 2016 and the rise of once-fringe parties stressing national sovereignty and traditional values across Europe and beyond, the societal trends of increasing polarisation and intensifying national sentiment are ranked among the top five trends.

Hence the next challenge which, according to the report, is facing up to the importance of identity and community. Rapid changes of attitudes in areas such as gender, sexual orientation, race, multiculturalism, environmental protection

and international co-operation have led many voters – particularly the older and less-educated – to feel left behind in their own countries. The resulting cultural schisms are testing social and political cohesion and may amplify many other risks if not resolved.

Although anti-establishment politics tends to blame globalisation for deteriorating domestic job prospects, evidence suggests that managing technological change is a more important challenge for labour markets, the report stresses. While innovation has historically created new kinds of jobs as well as destroying old kinds, this process may be slowing. It is no coincidence that challenges to social cohesion and policymakers' legitimacy are coinciding with a highly disruptive phase of technological change.

Another key challenge is to protect and strengthen global co-operation systems as many states seek to withdraw from various international co-operation mechanisms. A lasting shift in the global system from an outward-looking to a more inward-looking stance would be a highly disruptive development, says the WEF, which adds: "In numerous areas – not least the ongoing crisis in Syria and the migration flows it has created – it is ever clearer how important global co-operation is on the interconnections that shape the risk landscape."

The report also explores the relationship between global risks and the emerging technologies of the Fourth Industrial Revolution (4IR). The world faces a pressing governance challenge if it is to construct the rules, norms, standards, incentives, institutions and other mechanisms that are needed to shape the development and deployment of these technologies. How to govern fast-developing technologies is a complex question: regulating too

heavily too quickly can hold back progress, but a lack of governance can exacerbate risks as well as creating unhelpful uncertainty for potential investors and innovators.

Currently, the governance of emerging technologies is patchy, the report finds. Some are regulated heavily, others hardly at all because they do not fit under the remit of any existing regulatory body. Respondents to the GRPS saw two emerging technologies as being most in need of better governance: biotechnologies – which tend to be highly regulated, but in a slow-moving way – and artificial intelligence (AI) and robotics, a space that remains only lightly governed.

A chapter focusing on the risks associated with AI considers the potential risks associated with letting greater decision-making powers move from humans to AI programmes (see comment p8), as well as the debate about whether and how to prepare for the possible development of machines with greater general intelligence than humans.

Technology continues to offer humanity the hope of solutions to many of the problems it faces. But the report recognises that the pace of technological change is also having unsettling effects: these range from disrupting labour markets through automation, to exacerbating political divisions by encouraging the creation of rigid communities of like-minded citizens. "We need to become better at managing technological change, and we need to do it quickly," it says.

The report seeks support for efforts to protect and strengthen systems of global collaboration: "Nowhere is this more urgent than in relation to the environment, where important strides have been made in the past year but where much more remains to be done."

We face important risks, but also opportunities to take stock and to work together to find new solutions to our shared problems. More than ever, this is a time for all stakeholders to recognise the role they can play by exercising responsible and responsive leadership on global risks. 

■ The full report is available at the WEF website: www3.weforum.org

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"A cluster of environment-related risks has emerged as a consistently central feature of the risk landscape"

The challenging role of lawyers in crisis response

Companies – and their legal teams – need to understand that societal and community issues are as important as technical, legal, economic or engineering issues – these can be vital to reputation management in a crisis, says **Keith Ruddock**

Lawyers face a difficult dilemma when responding to crisis situations. Adopting too legalistic an approach may lead to response paralysis and increase negative reputational impact. Yet too light a touch may create major future legal exposures. Nonetheless, I believe that lawyers need to focus pragmatically, rather than legally, on what is required in the short term to minimise long-term exposure.

If a lawyer takes his or her role of protecting the company from any legal exposure in a crisis situation too far, they may (eventually) win the legal case, but could well have already lost the reputational argument. Most companies can withstand a major financial impact, but a reputational disaster will take years to recover from. Usually, addressing the legal issues can follow once the immediate crisis has been dealt with, provided that no major hostages to fortune on exposure to legal liability have been created in doing so.

During my 24 years in-house with Shell and the Weir Group, I have been involved in a wide range of crisis situations, which has prompted me to reflect on the role of a lawyer in crisis response. My comments in this article mostly relate to the role of in-house lawyers (recognising that slightly different factors apply for external lawyers). I am not seeking to embarrass or second-guess anyone in this article. Rather I am trying to stimulate reflection on the optimum approach to adopt on legal issues in a crisis situation.

Lawyers are generally trained to avoid, or at least minimise, legal risks and exposure to the greatest extent possible and typically tend to look to long-term consequences. However, in a crisis situation, adopting a legalistic approach may only serve to worsen the outcome.

All parties, including the lawyer, also need to recognise that lawyers typically have a wide range of skills to contribute beyond the purely legal. Yet the lawyer is often viewed as an adviser rather than as an integrated team member, even when in-house. Especially when new to the profession, the easy option for a lawyer

is often simply to say “no,” which can lead to major frustration for the business. Equally, however, no lawyer ever wants to hear someone say, “Why didn’t you stop me?” after the event.

Formal legal responsibility in a crisis usually involves developing a legal strategy, both in response to the event and to oversee business protection measures. This includes: Advising on the immediate legal liabilities, risks and issues; the notification of regulatory authorities; signing off on all documents for internal and external communications; establishing protocols to manage confidential or privileged documents/information; and having overall responsibility for the audit trail to include a record of decisions made (and the rationale for them) and records of all documents shared with external stakeholders.

However, while it is necessary to clarify formal roles and responsibilities, there is a danger of putting the legal contribution into a box. I strongly believe that lawyers bring other valuable skills beyond the purely legal. In particular, lawyers generally take a rounded view of matters; they are often used to professional conflict; they typically adopt an analytic, proportionate view; and are used to multi-functional team working. In addition, they usually do not have a personal exposure arising from the subject matter, which means that they can be objective in their contribution. Lawyers are usually articulate and can be a useful partner to the internal communications team (provided they do not become tied up – and thereby tongue tied – in trying to control the legal exposure unduly).

Crisis response is an area where time spent in preparation and training is invaluable. It is helpful for the legal, communications and commercial teams to reach prior agreement on legal liability, plans for potential crisis scenarios, whether to try to maintain legal professional privilege, how to handle approval of both internal and external communications, and the tone to take on communications generally.

The relationship between the legal team and the communications department in particular is a critical one. It is highly valuable for legal and communications teams to establish common ground on reputational objectives and roles, which will often go beyond the strict functional remits. Legal needs to develop the confidence and trust in communications to give it the comfort to be flexible, while communications also needs to earn the trust of legal by demonstrating a thoughtful and strategic approach. Social media has significantly changed the situation in this area. It is no longer possible to control or review what will enter the public domain (although you can rehearse in advance what you want to communicate – see p17). Creative tension between the legal and communications team is healthy – recognising the need to respond quickly but not in a way that will foreclose any other options in the future.

Working with external lawyers in crisis situations may sometimes be necessary to address specific issues such as privilege, dealing with regulators (eg dawn raids), provide



David Grigg | 12311

specialist legal advice or extra resources, or where there is no in-house legal team. My experience is that where external lawyers are involved, it is best to do so as fully as possible to optimise their input rather than keeping them detached. It is important to recognise that external lawyers, for reasons of protecting their professional exposure, will generally not be able to be as flexible as in-house lawyers. However, their contribution can be hugely valuable.

The tragic case of Christianne and Robert Shepherd is already widely known but is a salutary one in the context of a company, or perhaps its insurers, arguably being viewed as having adopted too legalistic a crisis response. Christianne (Christi, age seven) and Robert (Bobby age, six) Shepherd were brother and sister who died of carbon monoxide poisoning while on a Thomas Cook holiday in Corfu in October 2006. The cause of death was found to be a faulty gas boiler. In a criminal case brought in Greece, Thomas Cook was cleared of any responsibility. However, the jury at the UK inquest into the children's deaths in 2015 returned

a verdict of unlawful killing and concluded that Thomas Cook had: "Breached its duty of care."

Thomas Cook's CEO had told the inquest: "I feel so thoroughly, from the deepest of my heart, sorry, but there's no need to apologise because there was no wrongdoing by Thomas Cook." A confidential financial settlement between Thomas Cook and the family is understood to have followed.

In November 2015, the results of an independent review of Thomas Cook's crisis management procedures and the company's customer health and safety strategy were published. Written by Justin King, former chief executive of Sainsbury's, the review was critical of the way that Thomas Cook had dealt with the children's family, saying that its responses had been: "Intermittent, sometimes ill-timed and often ill-judged (...). Decisions were often not taken in the thoughtful and caring way you would expect from a company such as Thomas Cook."

Thomas Cook responded by saying that Justin King's report made for: "Uncomfortable reading in parts," and that it aimed to implement its recommendations within 18 months. Chief Executive Peter Fankhauser said: "It took us nine years to correct the mistakes of the past and to do what everyone would have expected of us; treat the family with the respect and empathy they deserve. We had to learn from this tragedy and do things differently, and this remains our commitment."

Analysing King's report, the BBC's business editor, Kamal Ahmed, noted: "In an era when there is considerable suspicion about the motivation of businesses, the ability of a company to react to a crisis in a way that reveals it to be run by human beings rather than faceless chief executives is of paramount importance. Every company chief executive should read Justin King's report and reflect on now many of the problems he has identified are also true of the businesses they run."

This is a very powerful challenge to any company responding to a crisis situation where reputational factors are as central, as was the case here. I genuinely do not seek to second-guess the decisions made by Thomas Cook and its advisers. However, the case is one that I think we should all reflect on and learn from, as

Crisis response is an area where time spent in preparation and training is invaluable

Thomas Cook itself has indicated it is seeking to do.

A more proactive response to a crisis was exhibited by BHP Billiton when, on November 5, 2015, an iron ore tailings dam at a mine in Bento Rodrigues, Brazil, suffered a catastrophic failure, killing at least 17 people and destroying at least 200 homes. It caused extensive flooding and environmental contamination. The dam is the property of – and is operated by – Samarco, a standalone 50/50 joint venture between Vale and BHP Billiton.

To date, very substantial fines and criminal proceedings against companies and individuals have been instigated by the Brazilian Government in addition to ongoing containment, remediation and community compensation costs.

What I found striking in BHP Billiton's response was that even when faced by such a major crisis, it chose from the outset to adopt a 'Do The Right Thing' approach which it appears to have sustained throughout, irrespective of the legal structure or potential exposure. The company could have maintained that Samarco was a standalone, self-operated, joint venture.

However, it chose not to seek to distance itself from the tragedy in this way, recognising that the expectation of the public was that both BHP Billiton and Vale, as co-owners, would stand behind the venture. BHP Billiton is still likely to be involved in ongoing litigation and regulatory investigations for some time, but its approach of seemingly not being too concerned in its response over whether it might weaken its future legal defences deserves to be recognised.

I had no involvement with either the Thomas Cook or BHP Billiton situations described above. However, I did have some involvement with the Corrib Project in Ireland where, in April 2005, Shell was granted an interlocutory injunction to prevent obstruction of work on an onshore pipeline. The protestors refused to obey the injunction and five men (who became known as the 'Rossport 5') were jailed for contempt of court. The decision to pursue a legal route with the RosSPORT Five greatly increased the level of opposition, locally, nationally and internationally, to the project.

Shell had to suspend all work on the Corrib project and in September 2005, applied to the Court to have the interlocutory injunction discharged; and the five men were eventually released from jail. However, the damage to the project, which had already been facing significant challenges, was huge and it took another 10 years before it was finally completed.

Shell was legally entitled to enforce its rights, but doing so was pivotal in mobilising opposition to the project. Corrib highlights how pursuing a legal course can lead to a very adverse outcome.

Many of the reputational crises I have been involved with could arguably have been foreseen or anticipated if a holistic approach had been adopted when assessing risks. One difficulty in the context of a project is that the team can often adopt a very goal orientated, schedule-driven, approach that may make it difficult to ensure wider social issues are taken into account. Companies need to understand that societal and community issues are as important as technical, legal, economic or engineering issues – these are what increasingly can kill or delay a project. For example, it will be crucial for the success of any company seeking to undertake fracking in



the UK that these issues are properly addressed or else it will be very difficult for them to obtain a social licence to operate.

It is a truism, but one learnt through hard experience, that it is usually too late to try to build trust once problems have arisen. Equally, building trust does not mean simply persuading the other party of the rightness of your case. It means establishing a basis on which a genuine, and respectful, dialogue can take place. You may not agree, but at least you will have the basis for engagement. One good – albeit not very scientific – test to apply is to consider how you would approach this situation if your grandmother lived in this community, or was affected by the project (I am assuming you like your grandmother).

It is essential to try to understand the concerns of the community with which you are dealing and to take the time to map out all the stakeholders involved and assess their respective positions and motivations. You will almost certainly not be able to address everyone's concerns, but at least you should be respected for seeking to understand the issues and addressing those you can.

Do not over rely on data to make your case. Access to the Internet has changed the dynamics here enormously.

For every 'fact' that you may put forward, you can be sure that your opponents will be able to find their own 'facts' to counter them. This is why establishing trust is so much more important than winning the argument.

It is critically important not to overlook what can be the blindingly obvious and to ensure that everyone in your team is empowered to state their concerns. Groupthink must be avoided at all costs. This is critical in a crisis situation, especially where emotions and frustrations (and exhaustion) may be running high. However, this can be where a lawyer may be able to provide a helpful level of challenge and input. Remember, just because you believe that what you are trying to do is legally, logically and technically right – does not mean that you are! This is where recognising the high level of emotional intelligence often exhibited by lawyers is so important, especially where operating in a very technically focussed organisation.

It is still important if at all possible to avoid accepting legal liability outright. However, society expects companies to take responsibility for what happens on their watch even if legal liability is far from clear-cut. In that context, a purely legal response is rarely the optimum one to adopt.



Keeping your reputation intact while navigating your way through a crisis can be challenging; a legal team can help to mitigate potential risks

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article is based on a presentation he made at the Crisis Management Conference organised by Steelhenge

Natural partners in city resilience

A brand new, urbanised world requires a new approach to sustainability – insurers and cities must work more closely together, according to **Butch Bacani** and **Evgenia Mitroliou**

Today's urban areas are home to over half of the world's population – an estimated four billion people – generate 80 per cent of global GDP, consume two-thirds of the world's energy, and produce over 70 per cent of global greenhouse gas emissions (UN-Habitat, 2016).

As hubs of economic activity and human development, cities concentrate both opportunities and risks for their inhabitants. This holds especially true in relation to disaster risk and climate change. For example, the World Bank estimates that without significant investment in urban resilience, natural disasters and climate change could cost our cities \$314 billion each year and push 77 million urban dwellers into poverty by 2030.

Persistent urban issues

Thus, appropriate local disaster risk management and climate mitigation and adaptation strategies could drive global change. However, persistent urban issues such as growing informality, insecurity and inequality, slow down this impetus and obstruct the path toward safer, more inclusive, resilient and sustainable cities as outlined in the UN's *Sustainable Development Goal 11 (SDG 11)*. Progress requires significant changes in the way cities are planned, designed and constructed, and the way urban communities manage risk.

In this context, cities and insurers should be natural partners in the pursuit of sound disaster prevention measures that protect development gains. However, uncertainty on how to work together has stymied collaboration. The insurance industry sees local governments as challenging 'clients' owing to systemic institutional obstacles that can limit long-term private-public partnerships. Conversely, insurance is perceived as an expensive solution, especially for cities in the Global

South. The first step towards building a mutually beneficial partnership between cities and insurers is understanding each other's function, purpose and limitations.

In the context of urban resilience and sustainability, the insurance industry has long been viewed from the narrow perspective of cashing out insurance policies in the event of a disaster. Now, in the face of more frequent, intense disaster events, the industry is increasingly accepted as an important stakeholder owing to its extensive expertise in managing risk.

Indeed it is the insurers' job to know risk. They are experts in identifying, analysing, and pricing risk through advanced risk modelling, data and technological innovations that are typically unavailable to city planners and managers. Insurers often openly declare: "Cities don't know their own risk." Hence, financial risk transfer in the form of insurance pay-outs is just one service that could be provided by the insurance industry. In fact, the industry's role as an advisor on risk management and investments is much more valuable

Cities stand to benefit by involving insurance partners in urban resilience planning from the onset and not after disaster has struck. Why? Insurance considerations – such as when to allot municipal budget reserves for disaster events, buy insurance policies, or encourage micro-insurance and social safety nets – need to be integrated into comprehensive risk management strategies.

More practically, risk assessments and insurance premiums are directly correlated: the premium is the price tag of a given asset's risk according to the insurer's very specific and extensive assessment.

Any independent assessment by the municipality runs the danger of diverging from the insurance company's assessment and could be consequently branded as flawed for the purposes of insurance premiums.

This is often why cities find insuring their public assets to be an expensive resilience measure that could be viewed as a luxury. Arguably, this gives insurers substantial control over the price of public assets – which becomes a

contentious issue when it comes to assets that have cultural value; for example, how do you price damages of a temple that lies at a risk zone?

Inviting the insurance sector to participate in co-designing resilient strategies and projects could help cities escape the disaster-reconstruction-disaster cycle and focus energy on urban growth and development. It could also help dilute the insurance

industry's one-sided control on pricing the invaluable. As the sector is becoming an active stakeholder it begins to understand what is valuable to the community, and why.

As risk managers, risk carriers and investors, the insurance industry is uniquely positioned to promote economic, social and environmental sustainability – in other words, sustainable development.

As risk managers, insurers help communities understand, prevent and reduce risk through research and analytics, catastrophe risk models, and loss prevention. Insurers also advocate proper land-use planning, zoning and building codes, ecosystem-based adaptation, and promote disaster preparedness.

As risk carriers, insurers protect households, businesses and governments by absorbing financial shocks caused by cyclones, floods, droughts and earthquakes. Insurance pricing also provides risk signals and rewards risk reduction efforts. Insurance solutions for renewable energy, energy efficiency and usage-based insurance for vehicles could enable the transition to a green economy.

Insurers are major institutional investors with more than \$30 trillion in global assets under management. Investments in renewable energy, green buildings, low-emission transportation, sustainable water management, sustainable agriculture, and climate and disaster-resilient infrastructure promote sustainable development.

The insurance industry could also influence positive behaviour by incentivising local authorities to undertake vigorous climate change and sustainability action in order to get affordable insurance packages. In the Nordic region, for example, insurance companies may file claims against municipalities for failure to protect essential public assets from climate-related risks (*Nordic Insurance Associations report, 2013*). In Sweden, the *Water Services Act (2006: 412)* stipulates that a municipality is responsible for ensuring that the dimension of pipes should take the risk of flooding into consideration – a clause that insurers can invoke to deny paying claims to the local government. Hence, the law in combination with the very realistic approach to disaster loss (ie insurance policy cash outs), forces Swedish cities to be extra vigilant when it comes to their water management systems.

In its latest assessment, the Intergovernmental Panel on Climate Change pinpointed the limitations of the insurance sector in supporting the urban poor around the world: "Standard insurance markets will not protect



Closer contact between local government and insurance industry officials would help solve many of the misunderstandings currently in effect

low-income urban dwellers. For example, around half of Mumbai's population lives in informal settlements mostly without protective infrastructure and at increasing risk of flooding under most climate change scenarios. This population... will not be served by insurance because of the low ability to pay, high risks, and the high transaction costs for companies of administering many small policies. Low-income groups rely instead on local solidarity and government assistance when disaster hits."

However, the insurance sector could still support cities in the Global South by providing essential disaster data. Accurate data on rainfall levels, wind strength, and storm surge maps, for example, could mean the difference between extensive losses and avoided damages.

Results from such efforts may take time. In the meanwhile, enabling public policy and solidarity funding could fill the gaps. Risk pooling or pooling-of-savings schemes such as the urban Community Development Funds implemented in Asia, could provide an alternative for urban poor communities to decrease and disperse the burden of disaster risk within a vulnerable community. Micro-insurance schemes may serve communities in similar ways by helping vulnerable households and small entrepreneurs (often female-led) gain access to funds when they most need it.

Closer contact between local government and insurance industry officials would help solve many of the misunderstandings currently in effect.

Aligning the language between the two and understanding the unique local context is the first necessary step. Cities have limited capacity to invest in understanding the insurance sector's role and requirements when it comes to climate risk management and insurance policies. Insurance texts are often particularly technical, which means local authorities would need to hire specialists to analyse the benefit of insurance solutions for their city – a privilege for even the most prosperous.



On the other hand, the insurance industry – even when operating locally – fails to understand the city's needs and challenges by misconstruing inaction or slow progress in achieving economic, social and environmental development as ineffectiveness.

Insurers don't necessarily see how cities are struggling with issues of informality that hamper their resilience and sustainability efforts. In that direction, an intermediary party, such as a local government network, could bridge this gap to bring these two stakeholders together (see box on UNEP PSI below).

The insurance industry can provide tools and knowledge for designing more resilient, insurable, and bankable infrastructure projects – if it is included early enough in the process.

The City Innovation Platform for African Infrastructure Risk and Resilience (CIP AIRR) is one initiative that aims to encourage such early inclusion via open collaboration and exchange. The concept was piloted in Dar es Salaam, Tanzania in October 2016 and brought together local government leaders, private sector and insurance experts, scientists, engineers and community representatives to help identify and promote viable solutions to major

infrastructure challenges in the urban areas of the region.

Getting the right people in the room shows that both cities and the insurance industry need to make significant strides to reach out to each other and build capacity to work together effectively.

Building the capacity of local leaders who propel changes in the direction of building a resilient and sustainable future is one piece of the puzzle; perhaps a less discussed counterpart is the capacity-building required from the insurance sector to understand cities' challenges and respond accordingly.

Since local governments have been officially recognised as stakeholders in three major global frameworks in 2015 – the *Sendai Framework for Disaster Risk Reduction 2015-2030*, *SDGs*, and the *Paris Agreement* – the insurance industry recognises the pressing need to work closely with cities and facilitate their efforts to locally implement the global frameworks in order to effect change from the ground-up. CRJ

■ *The 8th Resilient Cities Global Forum on Urban Resilience and Adaptation took place in May in Bonn, Germany. For more information, visit: resilientcities2017.iclel.org for more details*

The UN Environment's Principles for Sustainable Insurance Initiative (UNEP PSI)

Launched at the 2012 UN Conference on Sustainable Development (Rio+20), a public-private partnership between UN Environment and the financial sector capitalised on the opportunity to build a bridge between the two worlds – ie the insurance industry and global sustainability process – and encourage implementation of sustainability principles through incorporation of environmental, social and governance (ESG) considerations by financial institutions. UNEP PSI was endorsed by the UN Secretary-General and insurance CEOs and quickly developed into the largest collaborative initiative between the UN and the insurance industry. Today, the PSI has been adopted by more than 100 insurance and stakeholder organisations worldwide.

In early 2017, the PSI and ICLEI – Local Governments for Sustainability, the leading global network of more than 1,500 cities, towns, and regions – forged the largest collaboration between the insurance industry and the urban world to advance the global agenda of building sustainable and resilient cities.

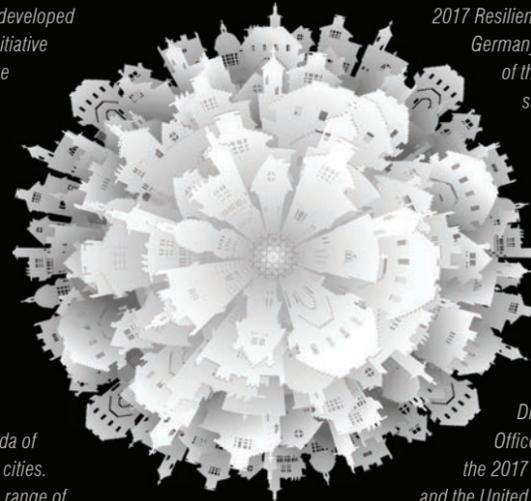
The PSI has carried out a wide range of projects and activities that have led or contributed to outputs including national and local level initiatives by the insurance industry on climate and disaster resilience; a global resilience research project to understand the most effective strategies, measures and activities to build disaster-resilient communities and economies; and the first-ever global survey by the insurance industry of how cities and SMEs are addressing climate risks.

Going forward, the PSI is determined to drive the urban resilience agenda and priorities, addressing the insurance and

investment challenges and opportunities therein. A key priority in this direction is understanding how the insurance industry can work together with governments at all levels in order to deliver local, national and international solutions that build inclusive and disaster-resilient communities and economies.

To increase understanding of how these two stakeholders can work together, PSI and ICLEI organised an Insurance Industry and Cities Summit – the first of its kind – integrated into ICLEI's 2017 Resilient Cities Congress, this May in Bonn, Germany. The summit explained the key roles of the insurance industry and cities in sustainable development, identified resilience and sustainability challenges and opportunities for cities, showed insurance industry solutions and innovated partnerships that build resilience and promote sustainability. The outcomes of this summit could benefit other important events throughout the year, such as the 2017 Global Platform for Disaster Risk Reduction of the UN Office for Disaster Risk Reduction and the 2017 UN Climate Change Conference and the United Nations Climate Conference.

PSI's long-term vision is to develop a set of Insurance Development Goals for the global insurance industry to support and accelerate the implementation of the UN's 2030 SDGs, the Paris Agreement on Climate Change, the Sendai Framework for Disaster Risk Reduction, and the UN Guiding Principles on Business and Human Rights. Starting in 2017, the PSI will be carrying out a global consultation process to develop insurance industry-wide sustainable insurance underwriting guidelines across lines of business to help realize the SDGs – also linked to the SDG for cities.



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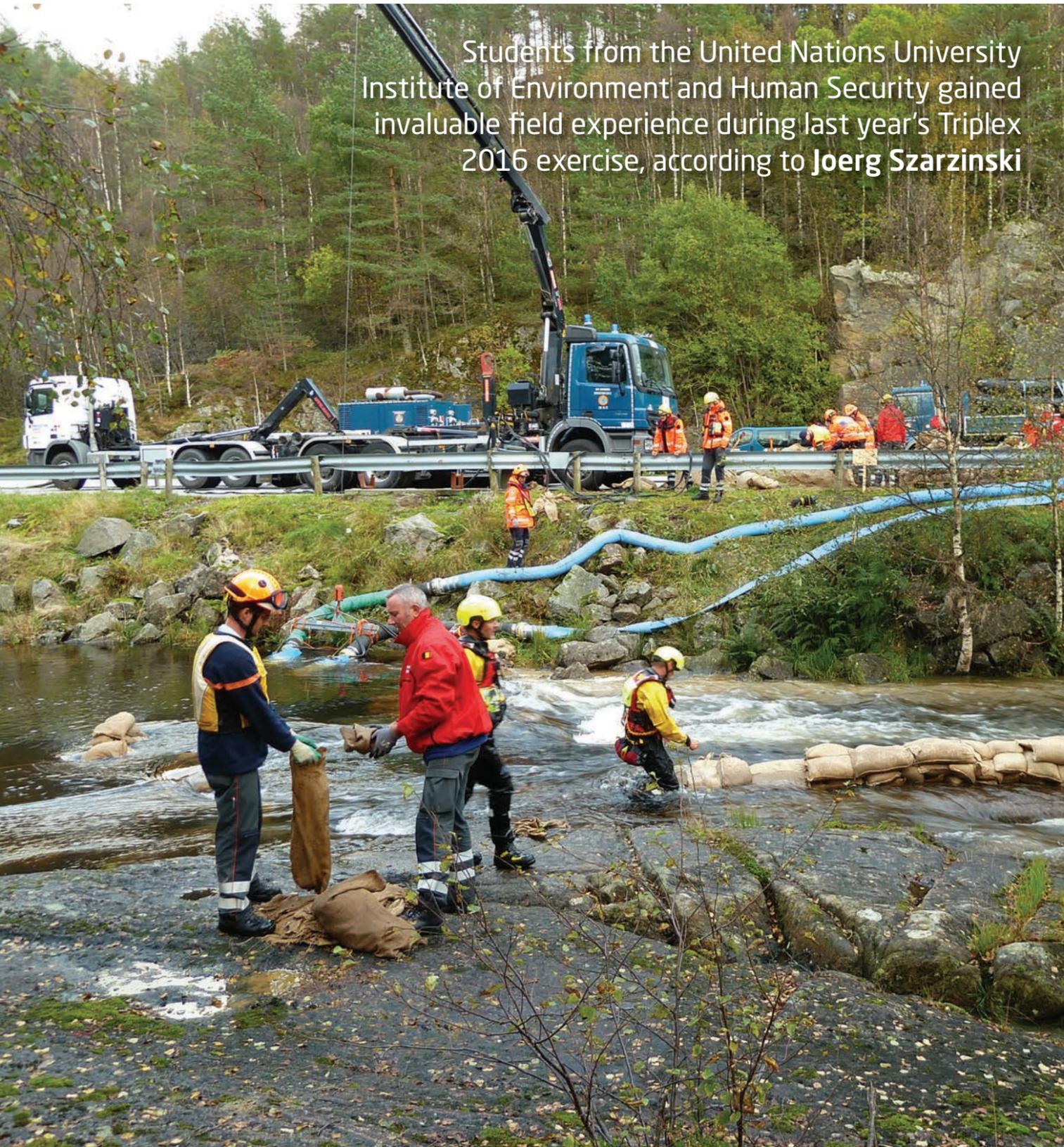
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Beyond the classroom:

Humanitarian field exercises



Students from the United Nations University Institute of Environment and Human Security gained invaluable field experience during last year's Triplex 2016 exercise, according to Joerg Szarzynski

Major disasters are assuming an increasingly prominent position in the work of disaster managers, national authorities and the humanitarian response community. Recent incidents reveal the extent to which disaster management constitutes a significant challenge for national governments and the international humanitarian community. The Nepal earthquake of 2015, for example, highlighted the tremendous challenges still associated with a co-ordinated disaster response. In order to guarantee that any emergency relief is as efficient and effective as possible, adjusting existing mechanisms and fostering improved co-ordination between different actors are of paramount importance. Disaster response simulation exercises are recognised as an effective means of preparing the humanitarian community and building essential capacity for international response missions.

Triplex is among the largest humanitarian and civil protection field simulation exercises in the world. Last year's event, Triplex 2016, was unique in terms of scope and complexity as it welcomed around 200 participants from more than 70 nations and 36 different international organisations. Together with the active participants, almost 400 people were involved in the preparation, exercise control, and final evaluation of this large-scale event.

During Triplex 2016, numerous UN organisations, civil protection agencies, technical modules and NGOs, as well as civilian and military representatives, exercised together within a joint scenario. This broad framework allows participants to test processes and procedures within an environment closely modelled on a real-life emergency. Standard Operating Procedures (SOPs) can be validated, and weaknesses or drawbacks undermining the overall performance are identified and improved upon. Less experienced staff members become acquainted with the international humanitarian system and they may profit from working alongside experienced senior disaster managers. Simulation exercises also provide the opportunity to make mistakes within a safe environment, with little to no consequence, before entering the harsh conditions of real-life response operations. In addition, Triplex provides a playground to improve interoperability between civilian, military and humanitarian actors.

In 2016, Triplex started with a two-day pre-exercise workshop addressing numerous topics and processes in the humanitarian context, including major themes such as field co-ordination, rapid assessment and information management, camp and shelter, and the inclusion of emergency medical teams. The workshop provided an excellent opportunity to learn from and exchange knowledge with subject matter experts.

For the international agencies involved, the five-day exercise served as an opportunity to rehearse a co-ordinated response to a sudden-onset emergency in a fictitious developing country, both in terms of working together and each working to their own specific mandates. For a group of 20 Joint Masters students from the United Nations University Institute of Environment and Human

Security (UNU-EHS) and the University of Bonn's Department of Geography, Triplex 2016 offered the chance to gain valuable, first-hand experience of every aspect of humanitarian aid and civil protection response to a disaster.

Liliana Narvaez, a second year Masters student, embraced the chance to put into action what she had learnt through the Joint MSc programme jointly organized by UNU-EHS and the University of Bonn. "The exercise was an amazing experience in many different aspects," she explains. "From my point of view as a media role-player, I got a privileged behind the scenes glimpse, but also just being part of the whole exercise allowed me to collect a lot of insightful lessons.

"The International Humanitarian Partnership (IHP) did an amazing job setting the whole scenario for a crisis arising from a major hurricane and ensuing floods affecting a small country in the mid-Atlantic. Every detail was taken into account and once the OCHA/ United Nations Disaster Assessment and Co-ordination (UNDAC) team was in the field, you could really feel the power of good co-ordination between different organisations; from the first arrivals at the airport to the actual action saving lives and bringing help to those in need."

Beyond the drama

Just as important as this insight into in-field logistics, the team experienced first-hand the pressures that come with being a disaster responder. Liliana continues: "For me, getting an insight into that human side of field work beyond the drama of the victims was also a wakeup call. On one hand it helped me to stop idealising their jobs (like some sort of superhero idea) and on the other it has inspired me to question myself whether I am up to the challenge: would I like to work with these types of organisations?"

"And mostly, would I be good enough to work with them? Do I really have what is needed to help in the field? Looking back at the exercise I would like to address one of the quotes from the exercise co-ordinator Geir Ellingsen; he called us the 'humanitarians of the future'. Two weeks later these words keep running in my head. I think it is still too soon to understand how this experience will affect my future professional decisions. But I can clearly see and feel that it is already making me think about aspects I never thought about before and I know the next time that either I get to work with one of these organisations or just act as a witness to their work on the field – for example in my home country of Colombia – I would look at them differently, with even more respect and admiration than I do now."

Liliana was one of a small team of Joint Masters students to be given media responsibilities. A professional cameraman from the German broadcaster Deutsche Welle also supported the UNU-EHS media team. Their tasks involved everything from capturing photographs and film footage as the disaster response unfolded, through to interviewing agency heads, most notably at the main joint press conference, on the fourth day of the exercise.

Manuel Urrutia II, also a second year Masters student and member of the media team, summarised his experiences:

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“Within the Triplex 2016 exercise, the media role-play team was a critical element in helping create the real world atmosphere that the practitioners experienced. The role of the media team was to ask practitioners tough questions in the midst of the response phase, such that they would be forced to rely upon their training to avoid being unprofessional.” The media team assumed the roles of two newspapers and a television news station. Depending on which media outlet the role players were simulating at any given moment determined whether they worked with the practitioners in helping to get out their key points in a fair and unbiased manner, or were pushing an obviously slanted position. Additionally, the media team was used to set up and trigger various injections throughout the exercise.

Regarding his own learning curve Urrutia II reflected: “The media role was technically demanding, requiring a firm grasp on how to produce written and visual media, in addition to knowing details regarding the agencies and NGOs involved in the simulation. Media team members gained significant knowledge regarding the operations, communication structures, and responsibilities of the international community involved in Triplex 2016.

“The ability of the media team to ask pointed questions to whoever they wanted and the fact they could visit all of the injection sites, provided these students the opportunity to view the many components in a manner that is rarely afforded to those participating in this exercise. The value the media team members gained from Triplex was reciprocated in the value the practitioners gained in interacting with the media.” He added that by asking tough questions, whether fair or unfair, the team provided a simulated real-world pressure that practitioners could expect to face in the field, which is immensely valuable training within a safe environment.

Other students, meanwhile, were given different mandates, ranging from working to provide food and shelter to victims displaced by the disaster, to treating the sick and injured. At the same time, all of the UNU-EHS team members present at Triplex were also required to roleplay different scenarios, including being rescued from freezing waters.

Lavender Mainye, a Masters student from Kenya, compares her Triplex experiences with the realities of disaster management in her home country. “Being part of Triplex 2016 gave me a clear insight into rapid onset emergency preparedness scenarios, alongside the opportunity to learn from a wide range of humanitarian experts,” she said. “The exercise got me reflecting on disaster management in my country, Kenya, and how unprepared we could be.”

She explained that in 2009, the Kenyan Government established the National Policy on Disaster Management, which institutionalises mechanisms for addressing disasters. Among other things, the policy emphasises preparedness from all stakeholders involved in disaster management in the country. “Even with the existence of this policy, there is still a major gap that hinders effective disaster management in Kenya, such as inadequate legal and institutional frameworks, lack of SOPs and lack of disaster emergency operation plans,” she explained. “This results in ineffective co-ordination during the onset of a disaster. Lack of funds, human resources and equipment is another gap,” Lavender added, explaining that institutions with a mandate to carry out disaster management operate on very low budgets and rely mostly on donor support. Generally, the amount

allocated is far less than what is actually needed to respond to a disaster effectively, let alone preparing for the unknown. Reflecting on intangible benefits, she quotes a statement from Koffi Annan, Seventh Secretary General of the United Nations: “Building a culture of prevention is not easy. While the costs of prevention have to be paid in the present, its benefits lie in a distant future. Moreover, the benefits are not tangible; they are the disasters that did NOT happen.”

Lavender explains that unlike the Triplex exercise, which was built on strong co-ordination and clear SOPs, the lack of integration and proper co-ordination among institutions, combined with poor infrastructure: “Have made disaster response efforts in Kenya ineffective. In summary, Triplex was an eye opener to me. It provided me with the opportunity to understand the missing gaps in our disaster preparedness and response strategies, and how we could avoid resource wastage and duplication of activities during emergencies.” She concluded with the wish that more of her countrymen will take part in future Triplex and similar exercises as part of the country’s capacity building in disaster management.

Sudden onset emergencies

The author of this article and Member of CRJ’s Editorial Advisory Panel, UNU-EHS Education Programme Director, Dr Joerg Szarzynski, was also actively involved in Triplex 2016, both as a panellist in the preceding workshop and as a participant in the official exercise evaluation group.

Alongside his affiliation with UNU-EHS Dr Szarzynski is also an active member of the UNDAC team, which is part of OCHA’s international emergency response system for sudden-onset emergencies.

For the majority of the UNU-EHS students, participation in this exercise means even more than an outstanding learning experience. Most of them are seriously interested in a future career in the area of humanitarian response and disaster management, thus coming in direct contact and exchange with staff, members from numerous international agencies is the perfect base for their personal further development.

In addition, such a large-scale simulation exercise provides a very realistic environment to get a first taste of the demanding, highly dynamic and often chaotic situation in the aftermath of a real emergency. Each student had the chance to decide individually if this could be their desired working environment in the future.

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Triplex 2016

The exercise was organised in Lista, Norway, by the Norwegian Directorate for Civil Protection (DSB) and other partners of the International Humanitarian Partnership (IHP) and the UN Office for the Co-ordination of Humanitarian Affairs (OCHA). The event received financial support from the European Union Directorate-General for European Civil Protection and Humanitarian Aid Operations (DG ECHO). IHP represents a coalition of eight different disaster management organisations from across Europe, including the UK Department for International Development (DFID), the Danish Emergency Management Agency (DEMA) and the Swedish Civil Contingency Agencies (MSB), the Estonian Rescue Board (ERB), the Luxembourg Rescue Services Agency, the Crisis Management Centre Finland (CMC), and the German Technical Relief Service (THW)

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Space technology for crisis management



Emergency operators in Romania have tested and evaluated the Spartacus system

CRJ 10:4 introduced the Spartacus project, which developed robust satellite tracking solutions – backed up by smartphone and web apps – for use in emergencies. **Clemente Fuggini** and **Ivan Tesfai** present the project's achievements

Global navigation satellite systems (GNSS) available today, such as Glonass and Beidou, are now consolidated technology that has demonstrated reliability in positioning and tracking moving objects.

The European Geostationary Navigation Overlay Service (Egnos) is increasingly being used in aviation applications, while the European Galileo satellite system's search and rescue (SAR) service went live in April this year. Both Galileo and Egnos will provide more robust positioning capability, enhancing the adoption of satellite technology in services where signal continuity and integrity are essential. This will support emergency and disaster management responders in mission critical operations through SAR and location-based services.

The Satellite Based Asset Tracking for Supporting Emergency Management in Crisis Operations (Spartacus) project concluded in October 2016, having achieved its objective of creating an integrated platform of spatial and terrestrial technologies to manage emergency and disaster scenarios. Co-funded by the European Commission, this project developed modular solutions and services (devices, smartphone apps, web applications) to support and ensure responder safety during crisis management operations. In large-scale disasters, Spartacus uses satellite and communication technology to help address safety-critical transport assets, such as dangerous goods being transported by road and rail, as well as emergency response operations involving police, civil protection, firefighting and humanitarian response.

Spartacus has been designed to track, trace, and localise critical transport assets, especially in times of crisis and in the event of communications or power network failure. It will also track the flow of relief supplies from despatch to receipt, as well as support the co-ordination and ensure the safety of first responders during disaster management operations.

In the aftermath of a disaster, the main challenge is to ensure there are no gaps in information or communication, so Spartacus has to provide failsafe reliability at all times, without relying on communication networks that could be damaged, overloaded or which have simply failed. To achieve this, it exploits satellite communication backhauling to restore local communications, or to establish dedicated networks.

Tracking mobile assets is a second major challenge. Satellite technology, used to track containers transporting dangerous goods or humanitarian relief supplies, can fail or be unavailable in urban locations, canyons, tunnels and so on. To this end, a dead reckoning solution has been developed to ensure continuous tracking in the absence of GNSS coverage.

Even more challenging is the matter of tracking frontline emergency responders to ensure their safety, especially when

they are operating in indoor locations. Here, Spartacus tracking capabilities also use dead reckoning solutions, implementing sensor fusion techniques to provide an independent source of positioning information and so being a useful support as alternative solution, when GNSS information may be subject to denial or be unavailable.

A wide variety of tools is currently used to support and enhance the management of disaster situations. While technological advancements provide significant benefits to crisis operations, numerous challenges still prevail.

Satellite backhauling

In urban search and rescue (USAR) operations, it is vital to pinpoint exact geographical locations with high accuracy, including GNSS blind spots, such as in buildings or in areas of poor satellite coverage. To overcome these limitations, Spartacus implements a tracking solution based on the integration of GNSS receivers and Inertial Navigation Systems (INS), guaranteeing localisation when satellite signals are not fully visible.

In addition to tracking, general field data needs to be transferred in a secure and trusted manner; this can present problems when relying on existing terrestrial communications network in an emergency, as their networks are often damaged or operating with limited capacity. Spartacus provides a lightweight communications infrastructure that integrates terrestrial mobile radio networks, namely WLAN and 4G, including tailored Terrestrial Trunked Radio (TETRA) features (group call, push-to-talk), with satellite backhauling systems. This allows rapid deployment of a telecommunication infrastructure when and where a terrestrial infrastructure is unavailable. Additionally, it provides interactive mission critical visual communication via bandwidth optimised protocols.

The vast quantity of information generated by robust positioning and a reliable communication network needs to be visualised in the most efficient way in order to provide real assistance to field operators. Situational awareness, defined as knowing what is happening as close to real time as possible, still remains one of the central challenges for decision-making during disasters. Spartacus has addressed this by providing a secure access platform that combines field inputs (positioning data) into a decision support system (DSS) to provide a common operational picture.

From a technical standpoint the system comprises: Smart field units, which are customised off-the-shelf devices; smart-devices that run localisation applications; co-ordination in the field and dead reckoning (Flare); the exchange of relevant geo-tagged multimedia content (Assign); and tracking and management of transport assets (Tiimiss and CTAT). Spartacus communication units provide the link between on-site and remote site elements using terrestrial cellular networks, namely 3G, 4G or WiFi or a satellite backhauling link. Tracking data, together with relevant information and critical content, are visualised by means of a mapping portal provided with decision support logics and capabilities embedded into a geographical information system (GIS) configuration. This continuously tracks and traces all units' time, position and ID, together with other local data and data



The Spartacus system provides reliable, satellite-based tracking and location of equipment and personnel

Authors

CLEMENTE FUGGINI, Msc, Phd, is a civil engineer responsible for R&D development at D'Appolonia SpA; **IVAN TESFAI** is Project Manager, Research and Innovation at D'Appolonia SpA, Italy; www.dappolonia.it

available from open services and third party platforms. By linking with each other through common communication architecture, the system can monitor and manage assets, helping delivery and first responders at the scene.

By working on technological solutions at both hardware and software levels, the system is a set of modular, scalable and configurable solutions, which are application-oriented, technologically advanced and user-accepted.

Spartacus has generated much interest at a local, European and international level. The Italian Red Cross in Bologna has been working with the project to test, evaluate and validate the system from an operational perspective, using Spartacus tracking for first responders working in indoor environments. Other national rescue and aid agencies have also been involved in testing and evaluation.

The Italian Red Cross unit that manages Remote Piloted Aircraft Systems (RPAS) has also expressed a strong interest in the future development of the system, which it

sees as being useful to manage daily operations in conjunction with its RPAS and mapping services.

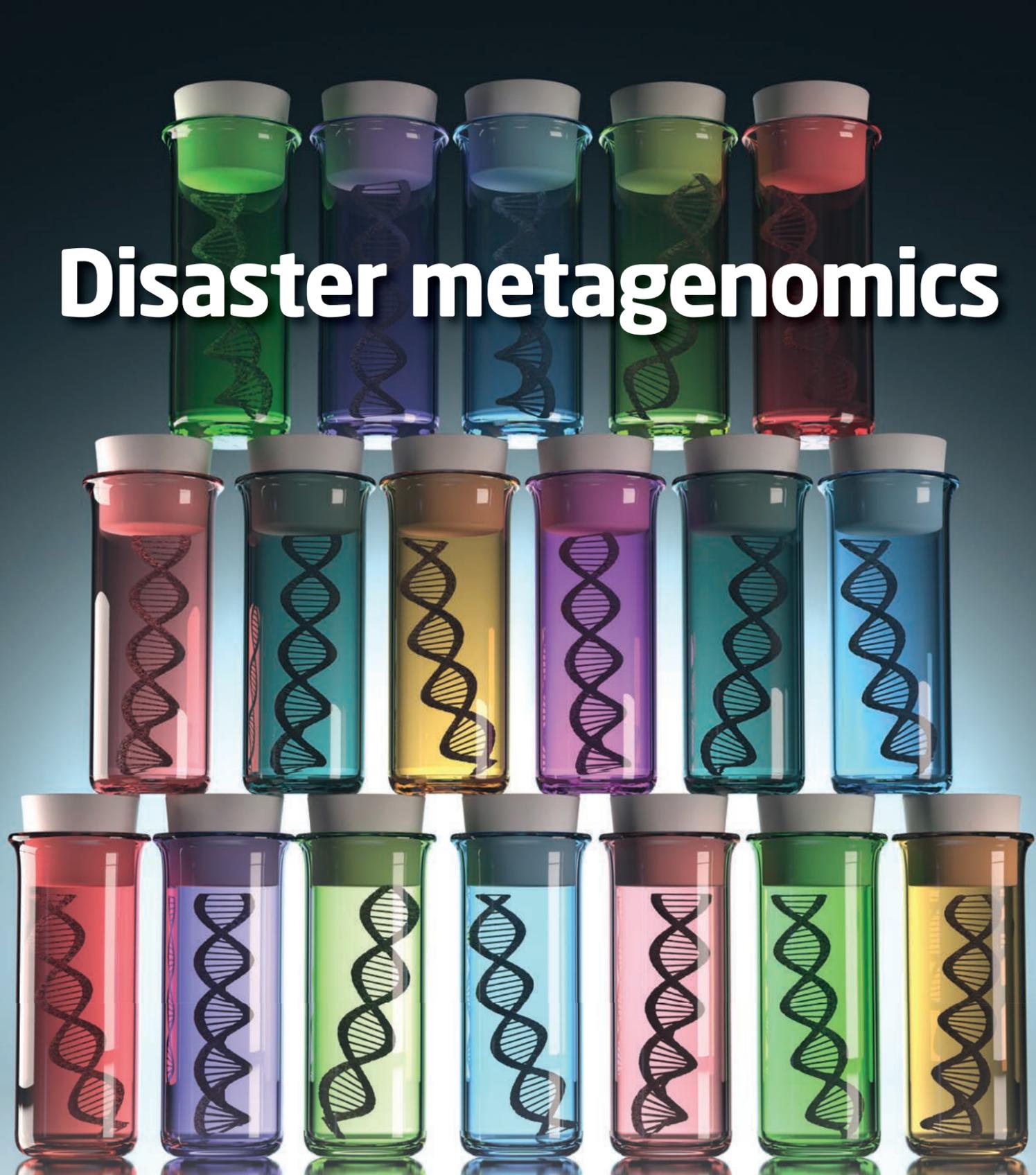
A spokesperson said: "Both the smartphone and hardware solutions are really interesting because they are able to increase our capabilities to localise personnel and victims in the field. They have a great impact on emergency operations."

The management of emergency services and aid after a natural or manmade disaster, is a subject of great interest and one in which the European Commission has taken a strong lead. Disaster prevention is high on the agenda of the EU Commission, in particularly with regard to identifying efficient ways to inform people during a crisis, and thereby decreasing a disaster's effect on emergency operations. With this in mind, D'Appolonia has developed a monitoring platform for critical transport assets (CTAT) to track vehicles and communicate in real time, strengthening co-ordination and situation awareness in harsh conditions.

This solution to monitor critical transport assets, together with other Spartacus smart-devices, was used successfully as part of a large-scale EU civil protection module exercise (EU ModEX) in the context of USAR and Advanced Medical Post with Surgery (AMP-S). The exercise was organised on behalf of DG ECHO by a consortium involving civil protection and crisis management agencies from Italy, Finland, Austria and Denmark.

Finally, Spartacus has recently demonstrated its support capabilities during the operational management of a crisis involving transport assets and first responders. On September 15, 2016, a simulated emergency scenario (train accident) was designed and implemented at the Romanian Railway Authority Testing Centre in Faurei, to demonstrate how the system supports railway emergency management procedures, as well as how it co-ordinates with the Romanian General Inspectorate for Emergency Situations (IGSU). Both railway and IGSU emergency operators were trained and equipped with Spartacus solutions to improve awareness, positioning and ground operations, using the system's mapping portals and sharing selected emergency information in real time.

■ To find more about Spartacus, as well as details of the consortium partners, visit www.spartacus-project.eu



Disaster metagenomics

A rapid pathogen detection method that can reduce disease and mortality in the aftermath of terror events with unknown biological release, natural disasters and war zones, is discussed by **Matthew Rusling, Carly Esteves and Ian Portelli**, who look at developments in disaster epidemiology

Whole genome sequencing, as discussed in *Tracking epidemics through genome sequencing (CRJ 12:2)*, is one of many genetic analyses positioned to play an important role in managing human health during large-scale disasters. Implementation of another genomic technology – metagenomic shotgun sequencing – could potentially reduce illness and mortality during disasters by providing accurate, nearly real-time pathogen detection across a range of events, from terrorist attacks to natural disasters and even war zones. Here we discuss the implementation, capabilities, limitations, and required infrastructure for metagenomic workup and analysis in a disaster environment.

Using the whole genome approach means that genetic material from a single species is analysed from samples, and information from non-target microbes is excluded. Generally, for whole genome sequencing to be performed, the target identity needs to be known and a reference genome of the target is available. We are often epidemiologically in the dark when responding to disasters, and forced to operate in an environment where pathogen presence or absence – and identity – are unknown. Disaster epidemiology is like looking for a needle in a haystack with the barn on fire, without knowing if the needle exists.

While whole genome sequencing has a crucial and undisputed role in epidemic management, metagenomics has certain advantages in a disaster context. Using portable sequencers and next generation isothermal reagents, responders can perform metagenomic shotgun sequencing in the field with sample to identification times of under six hours.

Readers familiar with epidemiologic tools may ask what advantages shotgun sequencing has over the host of multiplex kits currently available. Many of these kits rely on RT-qPCR, a process that requires fragile and time-intensive equipment to perform amplification and gene count. RT-qPCR requires a sensitive quantitative thermocycler device, which is made unnecessary by isothermal whole genome amplification reagents available for shotgun metagenomics. More importantly, gene primers included in multiplex kits can only identify a limited number of pathogens. This can be compared against the wide net of metagenomic sequencing, in which the diversity of pathogens shotgun metagenomics can capture is unconstrained thanks to de novo assembly.

Using de novo assembly, genomes from pathogens that have not previously been seen can be assembled. This has the benefit of capturing an infectious biological attack's initial genome at the time zero that it was released, or can provide early detection of novel disease. Using this analytical approach, we have the capacity to discover genomes of emerging pathogens in real-time. While it may seem odd that an assembled genome of an unknown species is useful, there are two important pieces of information that we can glean from these genomes – they could potentially yield information on geographic pathogen source, and genes within the unknown genome can be annotated using vast libraries generated from prior protein studies.

Genome annotation serves to identify the probable functions of an unknown species. This information specifically contains data on antibiotic resistance genes, toxin production and other immune-important functions. Bioinformatic tools can identify gene regions and protein studies can begin immediately in offsite labs located in unaffected areas, making the study of novel emergence possible before any signs and symptoms are shown in a population. Effectively, this brings the benefits of international expertise to the disaster site without burdening the response with additional personnel. Realistically, many de novo assembled strains will be produced during a disaster. Experimental research into effective methods to identify and flag de novo assembled genomes that pose threats to public health is an important next step in taking full advantage of shotgun metagenomics.

Disaster epidemiology is like looking for a needle in haystack with the barn on fire, without knowing if the needle exists in the first place

Currently, metagenomics is not widely used as a component of disaster response. Instead, public health management relies on sign and symptom surveillance. One risk of this type surveillance is the critical lag time between pathogen emergence and its recognition (ie the incubation period). Returning to the needle in a haystack metaphor, using current techniques, we can only find our proverbial needle a week or more after it has impaled our probing hand. And don't forget the barn is still on fire. Reliance on this surveillance method is also prone to a number of typical risks that present themselves during a disaster. Differences in communication and reporting standards between federal, state, and local responding agencies can challenge even the best systems to share information effectively and arrive at decisions collectively. As systems become overburdened, it becomes easy for sign and symptom trends to be missed, especially within the ambiguous data produced by this method.

Incident commanders stand to benefit from complementing non-specific sign and symptom surveillance data to improve decision-making in high speed, high consequence environments – for example, 71 per cent of the population has diarrhoea, with clear metagenomic outputs, ie this water is infected with cholera. When responding with an international medical complement, global variability in training can further decrease the function of sign and symptom surveillance. This is a particular risk if medical infrastructure in the affected community was underdeveloped before the disaster and/or trained responders are not available in adequate numbers to

meet the epidemiologic demands of large-scale surveillance coverage.

Effective scene management should consider the realities of community and responder resources during a disaster. Metagenomics allows us to make decisions

using clear, empirical data that is easily standardised across operators. This flexible option can be quickly implemented across disaster types, from terror events with unknown biological release, to natural disasters, or war zones. Shotgun metagenomics has a compelling place at the table as we work to harden response systems against global threats.

Metagenomic shotgun sequencing can find the needle in the haystack, tell us exactly what it is made of, and elucidate the probable geographic source if certain analytical criteria are satisfied, as this method has been shown to be able to provide pathogen identification within six hours of sampling. This data includes: Pathogen presence or absence; identity; and pathogen genomes of both known and unknown pathogens. Portable technology that easily fits into a backpack and can be operated by a single individual in remote settings from battery power and satellite connection is available (*CRJ 12:2*). All necessary workup can be completed at the sampling site without needing a traditional biological lab.

Shotgun metagenomics has key differences between whole genome sequencing in the workup and analysis of the data. Understanding the workflow associated with shotgun sequencing and analysis will help incident commanders to make an informed decision about the implementation of this technology.

The process begins with sample collection. Samples that can be sequenced successfully include swabs of hard surfaces, human excrement, water and even air samples from a disaster site, to monitor for low cell count airborne pathogens. Once a sample has been collected, a simple and brief step is required to obtain DNA for sequencing. These steps can also be done for RNA, but for clarity only DNA workup will be described here, even though the two processes are very similar. Workup takes anywhere from 20 to 40 minutes, depending on the techniques and reagents used. Many reagents require a centrifuge to separate DNA from proteins, lipids and other cell contents. There are many options available for battery-operated and 12V

DC centrifuges, making the requirement for this device a non-issue in the disaster setting. Once DNA has been extracted and cell contents removed using chemical and physical means, a second step of amplification may be necessary.

Amplification increases the number of DNA fragments available for sequencing by using a mixture of enzymes and free nucleotides (the smallest DNA unit) to make copies of the sample DNA that is added into the reaction. This step is traditionally performed using PCR reagents, which takes approximately six hours, and requires a heavy and power-intensive thermocycler. DNA amplification can be performed to the same (or better accuracy) using next-generation isothermal amplification reagents that remove the need for an operator to carry a thermocycler.

Gene annotation

The REPLI-g UltraFast Kit, an isothermal amplification reagent by Qiagen, uses Multiple Displacement Amplification and boasts bias-free whole genome amplification in 45 minutes. Using non-PCR methods also avoids known PCR difficulties in accurately amplifying GC rich regions and long stretches of repeated sequences. Depending on DNA concentration, amplification may not be necessary but for disaster applications, whole genome amplification should be considered because this increases the probability that rare species will be discovered during sequencing and analysis. Additionally, amplification will increase genome coverage during genome assembly. Many isothermal amplification reagents require two heating blocks, and a variety of portable battery-powered or 12V DC blocks is available.

At this stage, DNA comprises fragments of varying lengths. There are many kinds of sequencers and methods, and the article in *CRJ* 12:2 describes the technology behind the MinION, a widely used sequencer for fieldwork and epidemic management. The sequences of these fragments will be known after sequencing is performed. Using the MinION, run times are surprisingly short and provide real-time outputs while the device is performing sequencing. When MinION was used during the Zika outbreak, necessary runtimes to detect the virus were between two to four hours.

The general approach to determining the identity of each fragment is to align sequences against a library of known genomes. This process assembles the genomes of each species in the sampled environment. Genome coverage will vary, depending on the initial cell numbers and inter-population genomic variation. Using an open reference approach, only the fragments whose

identities are unknown are left over after attempts to align fragments to the library have been made.

To make sense of any unknown leftover sequences, these are overlapped with each other to re-create original genomes. Such genome reconstruction allows gene annotation, giving information on proteins produced by unknown species. It is crucial that the bioinformatician understands the limitations of the sequencing device so as to ensure correct results and care should be taken, especially when de novo or open reference bioinformatics are used. Depending on a number of variables, the MinION may be limited in its ability to provide accurate sequences for de novo and open reference assembly.

It may be necessary to have a high-throughput benchtop sequencer in the



command post if sequencing for de novo assembly is desired. The description here has been provided to give an overview of this process and is not an exhaustive exploration of the opportunities and limitations of the MinION or metagenomic approach.

How can this technology be employed effectively during a disaster? Prior studies find that metagenomics can play a role in pathogen detection of hotspots and transportation hubs. By designing a sequencing capability within your disaster response deployment, pathogen identification and surveillance can become automatic and reliable processes. Food and water sources, human waste collection sites and densely populated areas can provide large quantities of genomic information for emergent pathogen detection. However, barriers must still be overcome before shotgun metagenomics is actionable in a disaster setting.

As it stands, the analysis of metagenomic data poses a critical bottleneck as it is not yet automated and can be a slow and cumbersome process. Until this step becomes standardised, dedicated data scientists will be required to make sense of metagenomic outputs, and analysis times may not meet the timeframes demanded in a disaster response scenario.

Pipelines are needed that can be operated by non-experts and that can automatically perform library alignment and de novo assembly. These must produce elegant, accurate, and easily interpreted outputs reflecting taxonomic identities and functional properties of target microbial communities within a disaster-relevant timeframe. While these improved pipelines are being developed, attention should also be paid to sequencing technologies. When the MinION first launched, a 35 per cent error rate was reported.

However, with improvements to its chemistry and software, it is now tentatively sufficient for de novo assembly applications if an error-correcting step is included in the workup. We are not at the point where we can fully adopt this technology, but with careful development, disaster metagenomics stands to improve management of health surveillance and bioterrorism assessments. Metagenomic shotgun sequencing is a highly adaptable, flexible technology. Development, and plans for near-future utilisation of this tool should be as advanced as this tool itself.

Public health management relies on sign and symptom surveillance. One risk of this type surveillance is the critical lag time between pathogen emergence and its recognition, ie the incubation period

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Virtual Reality in PTSD and beyond

Anna Roselle, Carly Esteves, Matt Rusling and Ian Portelli describe how virtual reality is helping people who are suffering from PTSD, as well as how IBM's Watson Health programme is focusing on changing the way healthcare is accessed and utilised more generally

Post-traumatic stress disorder (PTSD) is a devastating fear-based anxiety disorder that presents with negative cognitions and mood states, as well as disruptive behavioural symptoms, and affects nearly 7.7 million American adults, according to the US National Institutes of Health. Anyone can develop PTSD, but it is more commonly seen in veterans and those involved in traumatic events, including natural and man-made disasters, war, torture and rape. Since military and disaster response personnel are at higher risk of developing PTSD, it is imperative that reliable treatments are developed and are accessible to the community. Advances in cognitive computing and virtual reality (VR) therapy present novel opportunities for understanding and better treatment of PTSD, and open doors for future treatment of mental health disorders around the globe.

Historically, treatment for PTSD has focused on talk-therapy, combinations of cognitive-behavioural therapy (CBT), medication, and group therapy. One form of CBT is prolonged exposure therapy (PE), a psychotherapy that aims to relieve PTSD symptoms by gradually confronting trauma-related situations, feelings and memories by talking about the details of trauma in a safe space. Group talk therapy allows patients to discuss their trauma with others who have had similar experiences.

While these therapies have proved successful in helping to diminish the symptoms of various types of trauma, they are often not enough to fully eliminate the vast array of PTSD symptoms. Longitudinal research has revealed that in some patients PTSD may develop into a chronic disorder that can persist for a lifetime; it can also present symptoms similar to those of traumatic brain injury (TBI).

Although many returning war veterans and those working in war-torn or disaster areas have some level of TBI in addition to PTSD, the effects of PTSD alone can be detrimental to a person's physical and mental wellbeing. Symptoms that accompany TBI and PTSD include insomnia, detachment, aggression, and a decrease in physical activity. While the long term effects of TBI have been highly publicised and the focus of many research projects, those of PTSD are not as well understood.

More severe cases of PTSD may require a cognitive processing approach, which helps the patient to understand their trauma and reduce avoidance behaviours that impede them from overcoming the traumatic event. Making the traumatic event more approachable can help to diminish avoidance of the memory or the things that trigger it. This therapeutic technique has led researchers and clinicians to consider VR as a possible approach to reconceptualise trauma and treat PTSD more effectively.

Research and development of VR systems at IBM may hold the key to providing improved therapy to meet future needs. VR therapy is largely used to implement exposure therapy, thought to be one of the most beneficial treatments for those with PTSD and extreme anxiety.

Today, Virtual Iraq/Afghanistan exposure therapy, created by the Institute for Creative Technologies at University of Southern California, is used at more than 60 sites across the US and has been shown to reduce PTSD symptoms.

Inspired by the video game *Full Spectrum Warrior*, VR uses exposure-based therapy to allow patients to confront trauma using combat simulation scenarios in the safety of a doctor's office. Perhaps the most beneficial aspect of this VR therapy is that it can help to confront triggers directly.

PTSD symptoms are known to worsen when triggered, whether deliberately or accidentally. A trigger can be anything from a person yelling, to a car door slamming shut, and are unique to every individual. These triggers lead to flashbacks in which the person may see, feel, hear, or smell something from a traumatic event.

VR goes beyond talk therapy and medication by harnessing many of the patient's senses into the therapy session. Each session can be tailored to specific fears and points of anxiety, and include relevant context to the personal traumatic situations. This includes themed city and rural environments, vibrations, and auditory and olfactory cues. The integration of multiple senses makes this therapy a valuable tool in assessing every aspect of one's trauma. When a patient faces their trauma in a controlled setting, monitoring of vitals and emotional response to

various cues is easier, allowing physicians to understand aspects of the individual's trauma and pinpoint areas in need of help via talk or other forms of therapy. Recent research has also revealed that VR therapy alone provides significant improvement of PTSD symptoms.

Modern research testing the validity of PTSD treatments has relied on pre and post-test designs. While these studies do show overall improvement, they fail to pinpoint when a significant breakthrough in therapy occurs. Is the therapeutic progress happening all at once or manifesting itself over the course of many sessions? Researchers working with veterans asked this question and monitored patient changes throughout the entirety of their VR therapy. Results revealed that re-experiencing their trauma throughout therapy on repeated occasions led to a significant decrease in the symptom clusters associated with severe PTSD. This supports the theory that VR therapy is a gradual process in which repeated exposure leads to significant decreases in PTSD symptoms and may have applications for a variety of other mental health disorders.

Imagination

As the use of VR in therapy and non-therapy contexts increases and diversifies, companies such as IBM are working to make it more realistic and applicable in a variety of settings. IBM's Watson Health programme is focusing on changing the way healthcare is accessed and utilised, and on providing vision for innovative health technologies and practices. By integrating understanding, reason, interaction, and learning, Watson's systems may be a key to improving VR therapy.

Watson goes beyond the computer-generated simulation of images and space that we think of when we hear the term VR. During the Imagination Recognition Hackathon, Watson displayed its skills by manifesting objects that participants had drawn; bringing their ideas to life and allowing them to interact with their own imaginations. Watson can simulate human thought processes using its

Integration of multiple senses allows this tool to assess every aspect of a person's trauma



self-learning systems, pattern recognition and language interpretation. Its cognitive computing abilities are said to be mimetic of the way the human brain works.

The newest VR technologies use game-like controllers to move around and function in the virtual world. IBM, however, is experimenting with using speech as the control. Many find it easier to be immersed in the virtual space by natural means alone, rather than operating a gaming switch. Using speech-to-text technology, the user can have conversations within the session, making the experience more realistic and immersive.

Watson's ability to understand and interpret audio and visual stimuli, as well as reasoning through problems based on the user's tone and emotion, presents exciting new avenues.

Gaining a better understanding of trauma and being able to interpret how the brain reacts to traumatic events, means that VR therapy can progress into a highly reliable treatment method for those with PTSD.

Watson's health solutions for individualised care focus



on engaging patients in their own therapy or treatment plans and in providing value-based solutions. This idea of value-based care means a lot when thinking about PTSD, because every VR therapy session is so intricately personal, and trauma can affect a person's values in regards to daily life. For example after a traumatic experience, many people experience changes in their assumptions of everyday life, including beliefs about where is safe, and in misinterpreting situations or the actions of other people. By taking a more comprehensive view of each patient, physicians will be better informed before and during treatment, leading to more effective therapy. A comprehensive look at each person would be achieved by examining all factors that influence the patient's health, not just information in medical records, as is current practice. These factors include, but are not limited to: Environment; socioeconomic status; social support system; and access to healthcare. IBM's Watson Care Manager programme addresses some of these areas.

As it can mine massive amounts of data and combine results with medical literature, Watson Health may also be

able to uncover possible connections and make proactive treatment plans that help physicians provide the best care possible in a holistic manner. It will allow them to develop individualised and comprehensive plans that fit the clinical and health-related social needs of each patient. Combining physicians' insight, VR therapy, and predictive analytics based on past and present mental state, medical providers will be able to provide proactive care to those suffering from PTSD, and other life altering conditions.

Looking beyond the use of VR in PTSD therapy settings, Watson Health technology has the ability to be applied across a variety of medical fields and research areas. Watson is transforming how healthcare is provided and how it is received. In the US, competition among hospitals has led many institutions to investigate technologies to improve the healthcare experience for their patients and staff. Physicians and administration at Thomas Jefferson University Hospitals throughout Philadelphia have examined the use of 'Smart Hospital' technologies. The Thomas Jefferson University hopes that implementation of Watson-IoT speakers will improve the hospital's connection with its patients. Using voice recognition and interpretation technologies, patients in smart rooms can speak in their native language and communicate directly with their physician without an interpreter.

Future outcomes

Watson's predictive analysis capabilities with big data present another advancement. The ability to use past and present data to predict future outcomes is a valuable tool for many areas of healthcare, enabling workforce optimisation, more efficient use of space, and provides cost-efficient changes to hospitals based on employee skills, energy use, and environmental impact.

The application of Watson Health analytics also provides a promising future for application in clinical research. For example, vast data sets collected over years and across countries may hold valuable information regarding different diseases, but the ability to interpret, understand and derive meaning from different formats remains difficult. Cognitive computing provides a quicker and more in-depth method of addressing healthcare needs than a physician or researchers can do alone.

A 2016 study examining the effectiveness and reliability of Watson to accelerate pattern identification in big data sets suggests that its cognitive computing may provide novel insights that could be applied to medical development in a variety of areas. Utilising big data, this pilot study suggests Watson can greatly reduce the time it currently takes to find suitable candidates for drug development and drug targets. By examining data from animal studies, human trials, and post-marketing safety studies, research will be able to take a more holistic view of new drugs and devices and how they may affect people.

Cognitive computing could also benefit doctors in their offices. It is predicted that about 30 per cent of physicians will utilise cognitive analytics for patient diagnosis by 2018. For example, a person visiting their physician could have their symptoms entered into a computer, which would then find the latest research regarding how to diagnose and treat the condition. The computer would also quickly scan the person's medical records and those of their family and plan the best course of diagnosis and treatment. If diagnosis required tests such as an MRI, the computer could help

the physician to detect problems a human might miss.

Alongside this increase in data production and data sharing, Watson also addresses the need for advancements in cybersecurity. The need to protect healthcare records as adoption of electronic records becomes more widespread is one of the main challenges to new technologies. Health records are particularly valuable items that contain social security numbers, personal history and other information that makes identity theft easy. Watson cognitive computing improves the use of these electronic records while reducing the time they are exposed to possible risk. Watson IoT devices send data to private blockchain databases, which allows for secure sharing of records. A case study at McGill University Health Center used a new security intelligence platform based on Watson, which contains in-depth global intelligence capabilities. The case study demonstrated that hospitals can quickly detect and respond to possible attacks or breaches in security.

As the healthcare industry continues to grow, it becomes increasingly dependent on technology to aid in the delivery of high-quality, efficient care. Watson Health is designed to provide efficient analysis of data from large sets of electronic health records, physician records, and social determinants to provide population and patient specific care that is both individualised and high quality. By seemingly constant connection between records, new treatment, and emerging patterns of pathology, the world of healthcare can advance past merely treating the symptoms of disease, instead getting to its cause. The Virtual Iraq/Afghanistan exposure therapy for PTSD and Watson Health are an important part of the process.

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All images: The Virtual Iraq/Afghanistan Exposure Therapy allows patients to confront trauma in the safety of a doctor's office

Images courtesy Albert 'Skip' Rizzo, PhD, Director, Medical Virtual Reality – Institute for Creative Technologies; www.ict.usc.edu

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EENA and Waze join forces in emergency response pilot project

When changing the world seems impossible, let's try to change the small parts of it that we can, say **Petros Kremonas** and **Alexis Gizikis**, as they outline the strides that the European Emergency Number Association (EENA) has been making to enhance public safety

When discussing emergency response, there are many things that can contribute to a successful rescue operation: process-related protocols, resources of emergency response organisations (EROs), the dedication of the EROs staff, and more. One of these factors, whose gravitas seems to overshadow most others, is time.

In an emergency every second counts. It stands to logic that time is a deal-breaker; the time a caller takes to reach out to emergency services is important; the time an ERO needs to find this caller is important; the time an ambulance takes to reach this caller is important. Together, all these small pieces of time define, at least to a large extent, whether an emergency operation is successful or not.

Take road accidents for example – the faster a road casualty gains access to expert first-aid, the greater the chance of survival and full recovery. Research shows that road traffic deaths increase with longer ambulance response times, an element also proven to be strongly related to population density. The proportion of fatal crashes is lowest where ambulance availability is best, and highest where ambulance availability is poor.

This raises the question – how can we contribute to the improvement of response times? How can we minimise the time between point A, where a citizen in danger asks for help, and point B, where emergency services successfully reach him or her and provide assistance?

When looking for answers, there are many determining factors that come to mind, including technology,

information, co-operation with other stakeholders and more.

Let's start with technology. For many reasons, there is often a slow take-up of technology by emergency services, especially when compared to other sectors. Technology has come a long way during the last few years and Europeans continuously adopt and use new technologies in their everyday lives. Emergency services, on the other hand, experience several barriers, such as security issues, when it comes to adopting tools used by citizens.

Emergency location provides a good example.

How is it possible that when ordering an Uber ride after a night out the app can pinpoint your location in a few seconds and within a one to two metre radius, but when dialling the emergency services the average radius in the EU is two kilometres? And yes, that is not a typo, the figure is two kilometres.

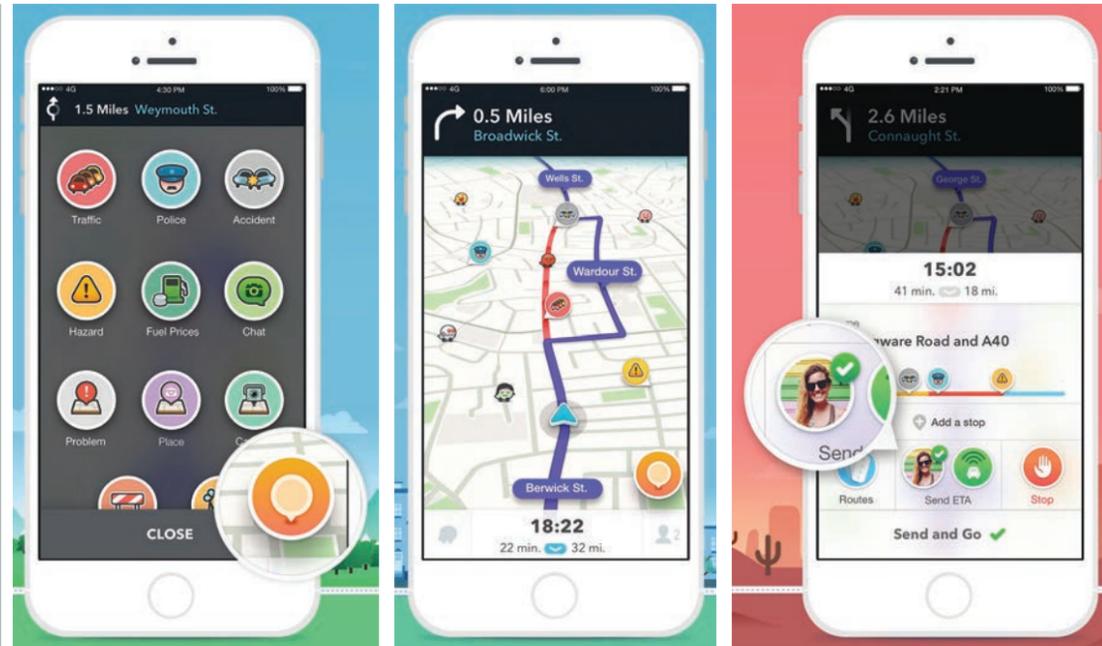
Many of us have grown accustomed to this reality and yet when faced with simple figures like this there is a moment of confusion: how is it possible? The answer to this is beyond the scope of this article, but even just asking the question goes a long way to show that the root of our problems is not a lack of available technology.

Together with technology advancements, people in the sector keep discussing the importance of data – existing data – and how we can harness this plethora of information. There are many topics debated; big data, fast data, and intelligent data... Whether big or small, fast and intelligent or slow and somewhat silly, there is broad consensus that our societies already have access to a great amount of information, certainly more than what we are currently taking advantage of. So how can we use this data – any data – to progress?

To answer these questions we first need to agree that no one can do it alone. The emergency response chain involves a variety of stakeholders from EROs, to companies providing solutions to assist them in their operations, mobile network operators (MNOs) and more. If we add to this mix the need for expertise, technology and data, then the stakeholders multiply to include umbrella associations fostering co-operation, start-ups, drone companies, handset manufacturers, emergency apps – the list could go on forever.

So how do we put all these pieces together? There are several successful stories that can shed some light, one of them being the recent launch of a partnership between the European Emergency Number Association





The world's largest community-based traffic and navigation app, Waze, is working with EENA on a project to understand how its data can contribute to improvement of emergency response

Waze

(EENA) and Waze. All the elements mentioned above are encapsulated within this partnership, namely technology, data and inter-stakeholder co-operation.

For those not familiar with the company, Waze is the world's largest community-based traffic and navigation app. By connecting drivers to one another, Waze helps people to create local driving communities that work together to improve the quality of everyone's daily driving. That might mean helping them avoid the frustration of sitting in traffic or shaving five minutes off of their regular commute by showing them new routes they did not know about.

Passively sharing

So how does it work? After typing in their destination address, users just drive with the app open on their phone, passively sharing traffic and other road data. But they can also take a more active role by sharing road reports on accidents, road closures or any other hazards along the way, helping to give other users in the area a heads-up about what's ahead.

EENA and Waze entered into a partnership in April 2017 and launched a pilot project to understand how using Waze data could contribute to improvement of emergency response operations for the benefit of citizens. Waze will provide real-time, anonymous, incident or delay-related information directly from the source, ie the drivers themselves.

It is important to know that Waze data is crowdsourced and provided in a structured way, so this data has been classified/categorised and geolocated. Receiving information in such an organised way saves time in processing it, greatly facilitating the work of emergency services and first responders.

This offers many possibilities. Three case studies will be examined and evaluated within the project, all of which aim to contribute to the work of EROs and to facilitate the work of rescuers.

Roughly speaking, when measuring response time the following components are taken into account: Call-processing; mobilisation; driving; and emergency

intervention. Although part of the same process, each step has different characteristics and decreasing its duration requires different approaches.

The first programme scenario will focus on route optimisation. The contribution of Waze data to route optimisation and planning for emergency vehicles can have a great effect on the work of EROs. Emergency services can use real-time traffic information provided to Waze by its users to plan or optimise the route taken by first responders, minimising intervention time and reaching people in need faster.

But such an undertaking also presents other opportunities, specifically related to communication.

Emergency management includes a significant communication task for emergency services – alerts, warnings, safety information, and so on. To add to this, citizens increasingly expect information on day-to-day emergencies that may have an adverse effect on their social life and daily routines – for instance traffic tips in case of an accident.

But the same logic can be applied the other way around – citizens become more of an information source themselves and they increasingly contribute, directly or indirectly, to emergency response and relief. New mobile technologies, apps and social media have penetrated people's lives and presented them with communication channels that they use in every other part of their lives – why not in emergencies as well?

In other words, there is a growing need for authorities to communicate to citizens using new channels; a need that coincides with a growing supply of information by citizens that can be valuable to authorities.

Taking the above-mentioned into account, the remaining two scenarios to be tested within the EENA/Waze project are outlined below.

Incident notification to emergency services: When users notify Waze about an incident, emergency services get the notification in their Computer Aided Dispatch (CAD) system via an integration that allows them to

receive data from Waze. The availability of this type of real-time information can be a significant asset in the hands of EROs, allowing them to have a clear view on the environment in which they operate.

Secondly, Waze provides a very interesting way for emergency services to provide data – quickly and efficiently – to citizens via the app. Providing data to Waze about real-time or planned incidents, such as an accident, planned construction work and so on, would allow Waze to notify (potentially) affected users, giving them the ability to avoid delays and reducing the numbers of people affected.

Four pilot sites from around Europe will join the project and, depending on their individual characteristics, each of the sites will test one or more of the scenarios listed.

This initiative aims to understand how the use of this data in emergency management can improve response operations.

More specifically, the objectives are to understand the good practice regarding the integration and use of traffic and road incident data with CAD systems, to gain experience from the user case study scenarios, to identify how the data exchange can be fully integrated in the command and control process and how it could be analysed in real-time or in a post-event review, and to gain a deeper understanding of the impact of this data in emergency response.

The idea behind this project is to produce tangible results that provide value to EROs. The project's duration is expected to be six months, after which the four pilot sites will be able to continue their operations with the Waze integration. Moreover, for the whole duration of the project, EENA and Waze will be communicating on milestones and results to emergency services organisations, flagging any possible opportunities, as well as risks.

Lastly, after the end of the project, a report will be available to all interested parties describing the project, the challenges, the learning from the pilot sites and future recommendations. The report will be published by EENA, Waze and the partners from the pilot sites, who will also host a webinar for the same reason: to discuss the lessons learnt with interested parties.

EENA has worked on similar projects in the past. Only a few months ago, EENA ran a project with DJI, the largest drone manufacturer in the world, in order to evaluate the use of UAVs in emergency response operations. The results were valuable – a report available for all stakeholders with lessons learned, a webinar where all interested parties could join

The European Emergency Number Association (EENA)



EENA is a non-governmental organisation based in Brussels with the mission to contribute to improving the functioning of emergency services for citizens. EENA serves as a discussion platform for all

stakeholders in the emergency services field: public authorities and emergency services, decision-makers, researchers, associations and solution providers. EENA membership includes more than 1,300 emergency services representatives from over 80 countries, 90 solution providers, 11 international associations/organisations, more than 200 Members of the European Parliament and more than 90 researchers (www.eena.org)

Citizens are expecting emergency services to take advantage of technologies that are used daily by millions of Europeans in every other aspect of their lives

and discuss the findings, and four pilot sites that benefited from being part of this innovative project by receiving education, equipment and, most importantly, experience.

Another example is location in emergencies. In the EU, average location accuracy for an emergency call has a radius of two kilometres. In some EU countries, this information can take up to 30 minutes to be received, and even then, only with a radius of several kilometres. EENA worked hard to raise awareness of a solution that can improve this number dramatically; the answer lies in advanced mobile location (AML): a non-proprietary, open-source, handset-based location method.

EENA worked with several European countries, as well as with Google, which enabled AML on all Android phones worldwide (around one billion phones were enabled with emergency location service in Google's Android implementation of AML). Estonia, Lithuania, the United Kingdom and several states in Austria have already deployed AML. As a result, a large proportion of their citizens benefit from much more accurate emergency location. The success stories are many and given the fact that several other countries are testing AML, they are about to become even more.

It is heartening to see how these initiatives have been embraced by emergency services organisations, demonstrating that there is great interest in taking advantage of newer technologies. In all the obstacles they face, many services are ready to explore and adopt new ways of working – it is their work after all that will be reaping the benefits, together with the citizens they serve.

Our societies are changing. We have at our disposal technologies and tools that were undreamed of just a few years ago – or at least by some of us. At the same time, citizens are expecting emergency services to take advantage of technologies that are used daily by millions of Europeans in every other aspect of their lives.

The EENA/Waze project hopes to contribute to decreasing emergency response times, to allow emergency services to send data via Waze to citizens, and receive information from the Waze app users via the platform. But maybe the take-away can be somewhat broader.

Perhaps this is an over-simplified version of reality. Indeed, there are many concepts that we have not touched at all: national legislation, budget constraints, bureaucratic burdens, and much much more.

But not everything can be solved at once. The conclusion is that if we adopt a 'get things done' attitude instead of 'continuing as we are', if we try to think outside the box instead of repeating what others have done before us, perhaps we can find ways to make at least a small contribution. When changing the world seems impossible, maybe what we should do is focus on changing the parts of it that we can.

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Small drones in search and rescue

Gemma Alcock and David Lane describe a newly-launched course for emergency services operators that provides familiarisation with the techniques for using UAVs and RPAS in search and rescue

Many questions arise from the assumption that a rescue technician, emergency responder or law enforcement officer wants to view video gained from an overhead search pattern by a smaller unmanned aerial vehicle (UAV) or remotely controlled aircraft system (RPAS) and then direct a larger unmanned aerial system (UAS) in order to achieve more detailed situational awareness of an incident.

Are sophisticated orthomosaics and digital elevation maps a priority for these purposes? Does the emergency scene commander or officer in charge, informed by the pilot, only wish to have a visual spectrum image from over the area concerned in real time?

Why have we converged on small multicopters as the default platform? Is it because of expert-in-the-loop flying and the physical constraints of landing zones?

It should be noted that fixed wing systems are not dismissed here, although current technology can make them unwieldy to use in some scenarios – such as earthquake terrain – owing to their landing zone requirements. What personnel are required? What crew organisation is needed and what concept of operations should be followed?

It is generally accepted that to operate safely with such systems, a minimum of a two-person field team is required. Others state that the ideal team size is five. The recent *EENA Operations Document 2016* outlined five roles within an RPAS team: Commander of the unit; chief pilot; flight safety manager; pilot; and spotter.

The pilot is the person who flies the aircraft and carries out 'eyes on requests', typically from the incident commander and the spotter, with assistance from the officer in charge, together with the management team back at base.

In resolving complex incidents such as wildfires or wide-area floods how do we integrate these needs and roles? Who makes the decisions of where to search in an emergency? Who is in charge of the UAS/RPAS, data management and backup and the primary screening?

The main functions of a search and rescue (SAR) team are contained in the acronym LAST, namely:

- Locate – define specific location of point

and rescue



DJI Inspire 1 UAV

- last seen or identify casualty location;
- Access – establish rescue teams access to the casualty and safe egress from the scene (with casualty) by appropriate transport methods, such as walking or wading, or by boat or helicopter;
- Assess – equipment requirements;
- Stabilise – scene environment, medical and physical stability to secure casualty; and
- Transport – transport of casualty and rescuers to safety.

Clearly these are issues that need to be resolved, but all can be assisted by data obtained from the sky.

Earlier this year, the SkyBound Rescuer Project and Professional Rescue SAR Academy held their first rescue drone awareness course for the emergency services in the UK. The aim was to inform participants about the factors that affect drone performance in emergency response, outline present and forthcoming aviation regulations that they have to abide by, provide guidance on how to select the correct drone equipment appropriate to the agency and mission, and to allow participants to experience a DJI Inspire flight demonstration by UAV Insight.

One of the motivations to set this up course was the realisation that often the only way for an emergency service to receive drone guidance is generally by contacting salespeople and manufacturers, which often have no SAR or emergency response background.

The aim, therefore, was to tailor the course with specific SAR drone advice, and to provide impartial and unbiased insight into drone operations within an emergency services context.

The course was also prompted by concerns of a knowledge gap and the realisation that a completely new perspective was required on how to use this technology in emergency situations.

As this technology gets easier to use, the misconception grows that it is simple to use drones to

achieve great results in a SAR mission. But purchasing the wrong drone or buying a great system and using it incorrectly, will significantly limit the value the technology can offer an emergency service.

The course's objectives are to demonstrate how many variables can affect an end-user technician's performance, from having a casualty or target go completely undetected, to being able to detect and recognise a search object by simply introducing a better understanding of a

drone system's technical criteria and specifications. To employ drones to their fullest and most effective capability, an understanding of their specifications and limitations is vital to their operation, which is a key focus throughout the instruction.

The authors, who designed this course, also say that it is essential for an emergency service to

Often the only way for an emergency service to receive drone guidance is by contacting salespeople and manufacturers with no SAR or emergency response background

understand marketing issues so as to avoid purchasing the incorrect equipment for specific requirements. Rather than simply receiving generalised drone specifications, it is important to know how to approach drone manufacturers and salespeople to extract the most useful information for their own specific purposes.

To achieve these outcomes, the course's schedule comprises 12 Modules, four group exercises, and flight demonstrations, together with achieving seven CPD hours as granted by the Institution of Fire Engineers.

This emergent technology has become a passion for the course's founders, to try to ensure that it becomes functionally useful in saving lives in SAR and making intelligence gathering for emergency responders more efficient. The safe integration of RPAS or drones involves gaining a better understanding of operational issues, such as training requirements, operational specifications, system equipment, and technology considerations.

The intention is to develop this further, into a fit for purpose National Qualified Entity (NQE) and help to answer all those questions we posed at the outset.

Authors

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Authors David Lane (left), Gemma Alcock (centre) and UAV pilot Mickey Delahunty

All images: Ian Alcock, ARPS





Early warning systems in small Caribbean islands

The Caribbean islands face repeated hazards on an annual basis, many of them weather-related, according to **Marlon Clarke** and **Danielle Evanson**, who say that early warning is the key as they discuss the opportunities and barriers to integrated early warning systems

Hurricane Matthew, Haiti, October 2016: The multi-hazard environment in these countries, coupled with social and physical vulnerabilities, creates a context of very high, and often underestimated, risk in the Caribbean

UN Photo | Logan Abassi

It is widely accepted that the Caribbean is one of the most hazard-prone regions of the world, within a multi-hazard context of droughts, floods, hurricanes, landslides, volcanoes, earthquakes and tsunamis.

Between 2002 and 2017, according to various damage assessments and situation reports, the islands of Barbados, Dominica and St Vincent and the Grenadines experienced impacts to the tune of over US\$770 million. The 2010 Haiti earthquake alone resulted in excess of US\$7 billion in damage and losses, while the impact of Hurricane Ivan in 2004 on Grenada was over 200 per cent of its GDP, estimated at US\$885 million.

These events capture a snapshot of the repeated impacts faced annually by these small islands, and a stark reminder of the development-halting catastrophe that can shock an entire country in a single day.

The multi-hazard environment in these countries, coupled with social and physical vulnerabilities – including high income inequality; high indebtedness; aging infrastructure; rapid under-regulated urban expansion; and eroding protective ecosystem functions – creates a

context of very high, and often underestimated, risk. Given that risk is a social construct, this lens must also colour the approach to risk management and resilience and the constraints and opportunities facing households, businesses or governments. Risk perception has many variables, including income level, and therefore the measurement of and strategies to reduce risk must address the underlying drivers within this complex social, economic, political and cultural web of constraints and opportunities.

Fundamentally, these underlying drivers of vulnerability to natural hazards are a reflection of barriers to sustainable development. The United Nations Development Programme (UNDP) surmised that 85 per cent of persons exposed to floods, droughts, earthquakes and tropical cyclones live in countries with medium or low levels of human development, and further contends that most disasters represents a failure in the development process. Among the suggested remedies to this, it recommends appropriate governance to regulate development in the light of disaster risk, also in recovery and reconstruction and improving risk knowledge and assessment, including with respect to climate change. UNDP further highlights the need to address risk from a multi-faceted perspective (economic, social, gender, political, environmental).

It is also widely agreed that early warning systems (EWS) are imperative for reducing losses and damage from natural hazards. *The Sendai Framework for Disaster Risk Reduction 2015-2030* affirms disaster risk reduction (DRR) as essential to the achievement of sustainable development, requiring the understanding of the local characteristics of risk, and engagement of all of society. One of the seven global targets is to: “Substantially increase the availability of and access to multi-hazard early warning systems and disaster

risk information and assessments to people by 2030.” Similarly, the *Caribbean Comprehensive Disaster Management (CDM) Strategy 2014-2024* prioritises: “Improving and further vertically integrating early warning systems,” as part of addressing community-level vulnerability.

The World Meteorological Organisation (WMO) and the UN Office for DRR (UNISDR) recognise four components as being integral to an effective EWS specifically: Detection, monitoring and forecasting the hazards; risk analysis and knowledge; dissemination of risk knowledge and timely warnings; and capability to prepare and respond.

An EWS should also be people-centred, such that it empowers at-risk individuals and communities to: “Act in sufficient time and in an appropriate manner so as to reduce the possibility of personal injury, loss of life,

damage to property and the environment, and loss of livelihoods.” Multiagency and vertical (local to national to regional, where applicable) co-ordination, community participation, and engagement of civil society and the scientific community are also key to EWS operation.

WMO has further articulated ten common principles for

successful multi-hazard EWS (MHEWS). These are:

- **Political recognition:** There is a strong political recognition of the benefits of early warning systems, reflected in harmonised national and local disaster risk management policies, planning, legislation and budgeting;
- **Common operational components:** Each effective system is built upon the four aforementioned components;
- **Role clarification:** Stakeholders are identified, their roles and responsibilities and co-ordination mechanisms are clearly defined and then these are documented within national and local plans, legislation, directives and memoranda of understanding, including those of technical agencies such as National Meteorological and Hydrological Services (NMHS);
- **Resource allocation:** EWS capacities are supported by adequate resources (human, financial, equipment, etc) across national and local levels, and the system is designed and implemented for long-term sustainability;
- **Risk assessment:** Hazard, exposure and vulnerability information are used to carry out risk assessments at different levels, as critical input into emergency planning and development of warning messages;
- **Appropriate warnings:** Warning messages are clear, consistent and include risk information. They are designed to link threat levels to emergency preparedness and response actions (using colour, flags, etc) and understood by authorities and the population; and issued from a single (or unified), recognised and authoritative source;
- **Timely dissemination:** Warning dissemination mechanisms are able to reach the authorities, other stakeholders and the population at risk in a timely and reliable fashion;
- **Integration into response planning:** Emergency response

Fundamentally, these underlying drivers of vulnerability to natural hazards are a reflection of barriers to sustainable development



Early warning is vital, and work is underway across the region to improve hydrometeorological monitoring and data analysis, as shown in this installation in Barbados (top) and Dominica (bottom)

plans are developed with consideration for hazard/risk levels, characteristics of the exposed communities (urban, rural, ethnic populations, tourists and particularly vulnerable groups such as children, the elderly and the hospitalised), co-ordination mechanisms and various stakeholders;

■ **Integration in relevant educational programmes:**

Training in risk awareness, hazard recognition and related emergency response actions is integrated in various formal and informal educational programmes and linked to regularly conducted drills and tests across the system to ensure operational readiness at any time; and

■ **Feedback:** Effective feedback and improvement mechanisms are in place at all levels to provide systematic evaluation and ensure system improvements over time.

Consequently, the measure of the effectiveness of an EWS is not whether an alert was issued, but rather whether everyone received that alert and whether it triggered an appropriate response. It is within this context that this discourse on the recent evolution of EWS in the Caribbean will be framed.

UNDP has been working strategically with multiple partners at regional and national levels to improve multi-hazard EWS (MHEWS) in the region, most notably in the Eastern Caribbean and in Cuba. Cuba has been recognised as a global good practice in EWS, and the Common Alerting Protocol (CAP) international standard is being gradually replicated throughout the Eastern Caribbean.

Evidence suggests that many projects have been carried out and significant financial investment has been made around EWS in the Caribbean since 2010. Of the 25 Caribbean interventions (projects, reports, studies, research) reviewed since 2000, at least 75 per cent of these have sought to address more than two EWS components. The data also suggest that most of the interventions focused on EWS warning tools, equipment and capacity building components. From the financial viewpoint, more than US\$87 million has been invested in the Caribbean during the period 2003-2016, of which the investment from ECHO alone towards EWS has been significant, estimated at US\$30 million through 51 projects.

There exists a peculiar situation in the Eastern Caribbean where a number of sovereign states rely on the meteorological services in other countries for forecasting hazards and issuing warning information, and the country in question may or may not have a small local unit. For instance, the Barbados Meteorological Service has responsibility for covering Dominica and St Vincent and the Grenadines, and similarly Antigua and Barbuda for Montserrat, St Kitts and Nevis and Anguilla. While the timeframe for most tropical cyclone hazards allows sufficient warning time (as much as 72 hours), there are instances where such weather systems may develop rapidly, and there is little warning for the receiving country. Such was the experience with Tropical Storm Erika in Dominica. For this reason, several countries are gradually building their own national capacities.

With funding from the Government of Italy and technical support and technology transfer from the CIMA Research Foundation, UNDP and the Caribbean Institute for Meteorology and Hydrology (CIMH) led, with collaboration among other partners, the establishment of the Caribbean Dewetra Platform. Dewetra is a data management platform that supports co-ordinated risk-based decision-making across the disaster management community, including support for EWS. The platform

provides access to near real-time data from monitoring networks, operational weather radar outputs, numerical weather and wave forecasts, while providing the ability to overlay exposure, geophysical and population data.

Through collaboration with the Caribbean Institute for Meteorology and Hydrology (CIMH), UNDP and DIPECHO supported the expansion of the regional hydrometeorological monitoring network with CAP-enabled rain gauges and water level monitoring stations in seven vulnerable communities within Barbados, Dominica, Saint Lucia and St Vincent and the Grenadines. St Vincent and the Grenadines immediately benefitted from this intervention during the passage of Tropical Storm Matthew in 2016, as it provided near-real time precipitation and river stage data, facilitating the understanding of the magnitude and persistence of the episode in support of disaster management decision-making. Data received from the stations allowed national personnel to receive instantaneous rainfall rates and water levels and use the information to inform downstream communities.

CIMH monitors this regional network, with over 35 automatic stations across 14 countries (there is also a wide set of manual stations), including several from other networks and partners, as well as over 40 pending integration. CIMH also advises CDEMA and the Eastern Caribbean Development Partners Group for Disaster Management (ECDPG-DM) before and during significant hydrometeorological events to inform co-ordinated response. Forecasting has proven highly reliable, as was shown during Hurricane Matthew 2016, Hurricane Danny and Tropical Storm Erika during 2015. It has also enabled warnings to populations to enable response and evacuations, as occurred in Haiti and St Vincent and the Grenadines in 2016.

Based on identification of a need for a mechanism to receive tsunami alerts and provide hydrometeorological alerts as redundancy to the off-island meteorological services, Emergency Managers' Weather Information Network (Ewmin) systems were provided to 11 Dutch and British overseas territories and CIMH; training on installation and operation was completed with financing from the EU.

CIMH has been an invaluable continuous partner in this process of strengthening EWS in the Caribbean. It also has a critical role as the regional technical leader in training, research and services for climate-related phenomena. CIMH monitors and maintains a wide range of instrumentation across the region; it also conducts modelling and forecasting, provide seasonal drought and precipitation outlooks, sector-specific (agriculture and coral reefs) climate bulletins and provides technical training for NMHS staff.

CIMH is currently undergoing the process of becoming a WMO-certified Regional Climate Centre for the Caribbean. In this respect, its function would be to support the region's socioeconomic development through provision of user-defined climate products and services for risk-informed decision-making at national and regional levels. These include the provision of early warning products such as seasonal drought, temperature and precipitation outlooks and sector-specific (eg agriculture, coral reefs) climate bulletins. CIMH continues to work with sectors to improve products and service delivery.

This process has been improved through the development and implementation of the Early Warning Information Systems Across Climate Timescales (Ewisacts) initiative, which has led to the development

of a multi-sector consortium, specifically to strengthen the climate products and services in the areas of agriculture, water, health, tourism, and energy.

■ *Part II of this series addresses the importance of risk analysis and examines some of the technology that is essential to early warning systems in small islands, as well as exploring barriers surrounding effective public communication and awareness, and presenting solutions*

Definitions

Dewetra is a real-time data and information integration system for hydrometeorological risk forecasting, environmental monitoring and disaster risk mitigation.

The Caribbean Disaster Emergency Management Agency (CDEMA) is a regional intergovernmental agency for disaster management. The agency was established in 1991 as CDERA (Caribbean Disaster Emergency Response Agency) with responsibility for co-ordinating emergency response and relief to participating states. It transitioned to CDEMA in 2009 to embrace the principles and practice of comprehensive disaster management

The Eastern Caribbean Development Partners Group (ECDPG) was established to provide a forum for information sharing among donors and development partners, and make strategic decisions regarding programme development and co-ordination. It facilitates effective, timely and co-ordinated response operations in rapid onset emergencies upon request from an affected member state and in support of the existing regional mechanism.

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Localising robotics for good

This issue, **Andrew Shroeder** describes how the Flying Labs – where local people work on how to apply drones for good in their country before a crisis hits – were set up and how the concept has developed

WeRobotics is building a global network of labs where people accelerate and scale the impact of their humanitarian aid, global development and environmental protection efforts using appropriate robotics solutions. Robots, such as drones, are radically transforming multiple industries through rapid and dramatic gains in efficiency and productivity.

WeRobotics wants to create the same impact in a responsible and meaningful way by building local capacity and incubating new businesses in developing countries. The genesis of our ideas on localised robotics came about when we started to wonder: “What if, when the earthquake happened, there was already some kind of experienced local humanitarian drone organisation in Nepal – one that could already use the technology, understood the key use cases, spoke the local language and had connections with the relevant regulatory agencies?”

That idea evolved over a few months into the creation of a new local institution, a Nepali NGO called Nepal Flying Labs, where local people can work on how to apply drones for good in their country before a crisis hits. From the outset, local Nepalis would set the agenda and do the work, supported internationally to whatever degree might be necessary.

The benefits of this type of institution for humanitarian drone response are manifold: regulatory agreements would already be in place with the government; when a disaster struck, the regulators would already know the organisation. Work flows might already be in place on the front end, rather than pieced together ad hoc on the back end.

The core issue of using robotics for good is not so much getting individuals to learn the technology but of creating institutions which enable routine collaboration and structured work. As the French technology theorist Bruno Latour writes: “It is by mistake or unfairness, that our headlines read, ‘Man flies,’ ‘Woman goes into space.’ Flying is a property of the whole association of entities that includes airports and planes, launch pads and ticket counters. B-52s do not fly, the US Air Force flies. Action is simply not a property of humans but of an association of actants.”

Nepal Flying Labs (NFL) was the first node in the WeRobotics Flying Lab network. It was established through a specific project collaboration between WeRobotics, a set of local partners including Kathmandu University and Kathmandu Living Labs, the Swiss photogrammetry company Pix4D, and drone manufacturer, DJI. In mid-September of 2015 a joint

WeRobotics and DJI team returned to Kathmandu to begin testing the proposition that careful cultivation of local robotics capacity might begin to resolve some of the co-ordination, regulation and interpretation issues that plagued immediate earthquake relief efforts.

The most significant starting point was not the robots themselves, but engagement with local stakeholders to identify problems that might be addressed meaningfully with drones. Following a couple of months of dialogue, the field narrowed to issues of building inspection and mapping for analysis of large-scale infrastructure impact. While these were the immediate issues emphasised by the key stakeholders in the scoping process, many also noted the importance of longer term agricultural applications, including experiments with aspects of ‘precision agriculture’ for smallholder farmers.

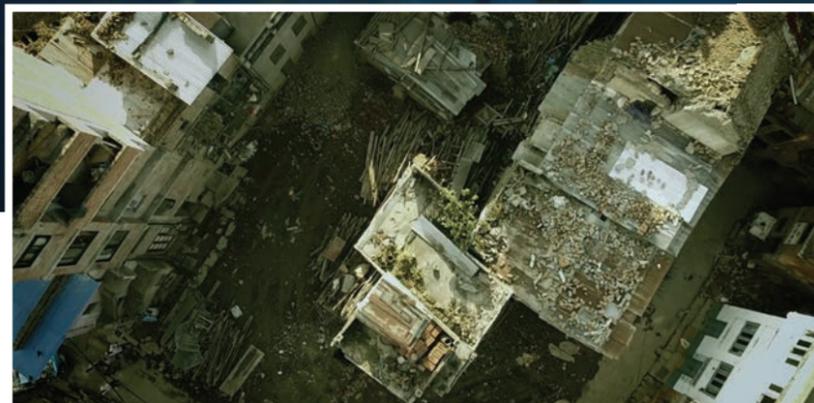
Some expressed interest in logistics, primarily in the medical field for essential medicines, vaccines, diagnostics and supplies. Students from Kathmandu University wanted to work out whether this technology might have a commercial future in their country, or if they might be able to start businesses and create jobs with drone technology. Not everything went according to plan. Among creation of 3D models of damaged health facilities. The models could be placed into web-based environments like Sketchfab or ArcGIS Online to engage a broader global public of industrial engineers than might already exist in Nepal. The theory was that the earthquake had left Nepal with a sudden over-supply of buildings in need of rapid assessment, especially critical infrastructure like health facilities.

However, the country only maintained a fixed number of individuals with sufficient training to do the assessment and the mismatch resulted in a labour bottleneck. Drone-produced models linked with global engineering supply could ease the bottleneck and speed recovery.

The health facility inspection plan sounded great, even positively disruptive, in theory. But the Nepali Ministry of Health already had a set of requirements in place governing health facility inspection. Those requirements stipulated that to be declared ‘inspected’, the building had to be visited in person by an approved inspector. Pushing the data to the crowd, even highly accurate 3D data generated proximately by drones, did not fit the bill. The Ministry was uninterested in disrupting its current process so did not back the necessary permissions and the project was shelved.

On the other hand, greater success was achieved when engaging the community disaster management team in





WeRobotics and Kathmandu Flying Labs integrated new underwater robots from OpenROV, enabling clear and controlled photography at great depths, linking the scientific research in hydrology and geology to new disaster resilience work planning and preparing communities for the risks of climate change

OpenROV

the town of Panga, outside Kathmandu. Kathmandu University had been in close contact with the community disaster management team, which told us that the town was devastated, and that even months after the earthquake, assessment was still lacking. They were in dire need of better data. The collaborative team ventured out to Panga for an exercise in mapping and modelling of a single town.

As morning rose over Panga a fleet of DJI Phantom 3 drones took to the air. The Pix4D staff held forth below amid the rubble on the finer points of drone mapping, from the selection of launch and landing zones to the calculations for stitching together multiple maps, to best practices for oblique images. The students and other KFL participants listened, then tried their own hands at the same. Over three days, dozens of drone flights danced over Panga, with photogrammetry calculations being performed in the evenings and the future members of Kathmandu Flying Labs absorbing the core concepts at a remarkable speed. The learning and doing of humanitarian robotics braided into a single high-focus stream of activity.

One of the end results was the creation of a remarkable map of Panga – a near-real-time 3D map of the town in its entirety. All maps, including this one, are abstractions of physical space into representational space. This particular map took that representational abstraction, in the context

of a disaster-afflicted territory, to entirely new levels. In this map, zoomed all the way in, or maybe inside the immersive views of virtual reality, one can practically walk down the main streets, observe the distribution of damage up close, gaze up at the shattered facades, and come to independent conclusions about the scale and nature of the event's impact. The map cannot yet be annotated to guide inspections, but this is in development.

A map produced this way feels present to the user, both in time and space, in a sense that defies our common sense of inherent cartographic distance. With more practise and preparation, this level of data-driven presence might become the norm, tying together more tightly than ever before the distributed global community of digital humanitarians with affected communities, civic leadership and international humanitarian responders.

The crucial test of a successful Flying Lab is not what happens during training and initial projects, but in the evidence of local abilities to carry out ongoing work independently. As Bruno Latour noted about the hybrid 'actants' in the conjoint technological and human processes that enable 'flight', there is little sense in focusing on the drones themselves in isolation within humanitarian applications. The technology itself does very little; rather, when embedded within strong local

institutions and global networks, it enables the kinds of flights that produce transformative information artefacts such as the map of Panga. Without strong local institutions, Flying Labs or similar ventures, the flying robots risk being unsustainable and, ultimately, inert.

By this measure KFL has exceeded expectations. Over months following initial training on the mapping of Panga, members of Kathmandu Flying Labs carried out over a dozen independent projects using the technology and the skills they had acquired. They first noted a missing section of the Panga map itself and re-ran the same exercise to complete that work. They built 3D models of key buildings on the Kathmandu University campus, including the university hospital, as part of disaster preparedness design. They identified proximate towns with significant rebuilding needs and extended the same model to them.

With minimal start-up funding beyond the initial technology and skills transfer, and no fixed working location, the lab became a hive of social innovation and robotics for good activities.

By September of 2016, one year after the foundational work in Panga, much had transpired in Nepal and in the general scope of WeRobotics to place the concept and practice of the Flying Labs on more stable ground. Colleagues from the Swiss association Drone Adventures, highly experienced in short-term drones-for-good missions, decided they shared the Flying Labs vision and joined the core organising team. The Rockefeller Foundation, through its innovation grants program, seed funded WeRobotics, with a focus placed on firming up the base structures of three Flying Labs in different parts of the world. Those three would be positioned in Kathmandu (Nepal), Dar es Salaam (Tanzania) and Lima (Peru).

In each case the focus would be different: Kathmandu began to explore agricultural applications; Dar es Salaam emphasised large area parcel mapping; while Lima settled on experiments in medical payload delivery. In each case the process was similar. Coalitions of local groups were convened around a common vision of practical research into expanding the horizons of social possibility pushed by rapid developments in robotics hardware and software.

Linking use cases and social good sectors has become just as important in as ensuring that elements of technical systems are working in harmony. The reality on the ground is that no one lives their life in a 'sector'; they live within integrated worlds where food and nutrition are linked to prices and jobs and agricultural production, which link with health systems, which link with responses to extreme short-term stresses.

WeRobotics and all Flying Lab activity is founded on the proposition that work which begins with demand from one sector or use case, should be pursued with the end in mind to migrate relevant tools, techniques and data to other sectors and use cases.

For instance, in a scoping project in the Maldives archipelago in June 2016, demand from the local population and local government focused initially upon disaster response systems for the increasingly frequent and powerful storms that churn through the Indian

Drone-produced models, linked with global engineering supply, could ease the bottleneck and speed recovery

Ocean. In preparing for storm response with drones for rapid situational awareness we discovered that mapping for environmental protection and settlement planning should be part of the same activity framework. The impact of storm waters was in many ways conditional upon the rate of erosion and the conditions of the coral. By intending to do work in disaster relief, we discovered that we had to join local partners and extend our vision to include ecosystem services and resilient planning.

At the same time, by linking together use cases and sectors, we also found new practical applications for robotics technologies. Through his engagement in the Nepal response and recovery, Patrick Meier was able to connect with scientists researching the impact of climate change on glacial lakes in the Himalayas. These lakes have been changing so rapidly in some cases that the underlying geological containment becomes unstable, resulting in catastrophic Himalayan tsunamis crashing down upon remote communities.

The scientists were using surface-based robots, along with mapping drones, to collect data to determine the multi-dimensional factors contributing to the lakes' destabilisation. In dialogue with WeRobotics and Kathmandu Flying Labs, the team was able to integrate new underwater robots from OpenROV, enabling clear and controlled photography at great depths, and to link the scientific

research into hydrology and geology to new disaster resilience work planning and preparing communities for the risks of climate change in the Himalayas.

Likewise, marine robotics are becoming part of the repertoire of Kathmandu Flying Lab,

which is, in turn, driving new thinking on how best to use emerging robotics technologies to respond to emerging risks. As a result, a joint project focusing on sustainable integration of marine and aerial robotics into research and resilience activities in the Himalayas is being planned.

In Nepal and Tanzania the original vision of having a local agency ready to use aerial robotics in the event of disaster is also coming online. Although in Bukoba the team did not arrive for the assessment until one month after the disaster, the government is now aware of its work, local staff have access to appropriate technology and are working on regular projects.

Based on the assessments that took place, workflows for response teams to engage in humanitarian response are within sight. Likewise, Kathmandu Flying Labs is now engaged with all relevant authorities on permissions for agricultural and other aerial robotics projects.

Were a significant earthquake to strike Nepal again, a local agency would already be in place, trained effectively, speaking local languages with access to robotics technology, experienced across multiple social good sectors, and capable of responding to demand for better disaster response. Whether that actually changes the underlying dynamics of robotics applications in humanitarianism remains an open question.

CRJ

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■ Next issue, the author examines what choices about what kinds of automated systems ought to be constructed, and what values those systems ought to reflect, especially in terms of humanitarian response

The nature of hyper-complex crises

In this final part of his series on developing incident command systems to deal with today's hyper-complex crises, **David Rubens** sets the scene for how decentralised non-hierarchical response management systems can be developed

If traditional crisis management modelling saw crises as little more than large-scale incidents, limited in terms of their geographical spread and leaving the rest of the operating environment relatively unscathed, the nature of today's threats are infinitely more complex, with cascading consequences that are literally incalculable. The hyper-complex scenarios examined by Patrick Lagadec reflect the concerns first circulated in a seminal paper setting out the parameters for what were labelled 'wicked problems' by Rittel and Webber.

Initially focussing on issues of social planning, wicked problems describe open-ended, unbounded crisis environments, which can neither be described in traditional mechanistic terms, nor solved through traditional crisis management approaches.

Hurricane Katrina was a classic example of a wicked problem, in that the original triggering event soon became relatively unimportant in the consequential crises that it caused. Immediate crisis dilemmas included rescuing thousands of stranded citizens, housing, feeding and caring for tens of thousands of homeless people, restoration of a city, preservation of public safety in light of the impact on critical infrastructure, the impact on adjacent jurisdictions and the political implications of perceived failures of the government, the emergency management community, the homeland security agencies and the President himself, who was seen to embody those failures on the public stage.

The 2011 Fukushima earthquake and tsunami in Japan provide another example of where the initial trigger point soon became superseded by the impact of a nuclear breakdown, the subsequent cascading effects on the food supply to Tokyo and the threat of a transnational nuclear cloud, as well as disruption to the country's global component manufacturing supply chains.

Rittel & Webber's analysis identified a new class of crisis that would not only fail to respond to classical risk management methodologies, but had mutated into a completely different class of event. Similar to a virus that mutates so much from its original form that it not only refuses to respond to traditional approaches, but redefines the parameters of what the threat is, so the new threat must be seen in terms of a completely new and distinct topology, rather than being a sub-set of previously modelled problems. Unbounded and hyper-complex events

can no longer be seen merely as a higher, more dynamic form of accident. They are a central reality of the modern world. If classical risk management was the domain of the statistician, predicting future possibilities based on an analysis of an aggregate of the masses, the threat set by the new paradigm is predicated on the criticality of the singularity, the outlier – the unknowable and inconceivable.

The dilemmas that wicked problems pose to crisis managers, strategists and planners are twofold; the nature of their scale, complexity and non-bounded nature means any particular response option can only be made in a context of ambiguity, incomplete and uncertain information and organisational fragmentation. In other words, it is often hard to know what exactly the problem is, and almost impossible to know what the solution might be.

It is this ambiguity, created by lack of central single focus, combined with unbounded potential consequences and impacts, that distinguishes the true wicked problem from, for example, the major fire that Bigley & Roberts use in their critique of ICS within disaster management scenarios.

Wicked problems

The second problem is that there are no classes of wicked problems that can act as a template for possible responses. Any response to a wicked problem is, by definition, going to be innovative, self-generating and based on ad hoc meetings of minds between a disparate range of knowledge-holders, who will develop situational responsive solutions, based on their own knowledge, experience and insight. The simple truth of wicked problems is that anyone who thinks they have a solution has clearly not understood the question.

The polar opposite of such undefined, unbounded and unknowable situations are the tightly-coupled, interdependent systems described by Perrot (1999), in his study of high reliability organisations. Such systems, often sitting within the national critical infrastructure, are characterised by the potential catastrophic effects of even minor systems failures, involving both fast escalating (developing into fully-blown crisis), and rapidly cascading (affecting multiple levels of society across a wide geographical spread) consequences.

High Reliability Theory (HRT), is the theoretical modelling of decision-making that aims to create highly reliable operation management programmes that are fail-



In CRJ 3:1 (2007) Michel Nesterenko and Patrick Lagadec said that chaos theory – involving complex dynamic systems where behaviour is unpredictable, yet patterns can be observed – had appropriate applications in today's hyper-complex emergencies. How can we develop a command system that is ready to face these challenges?

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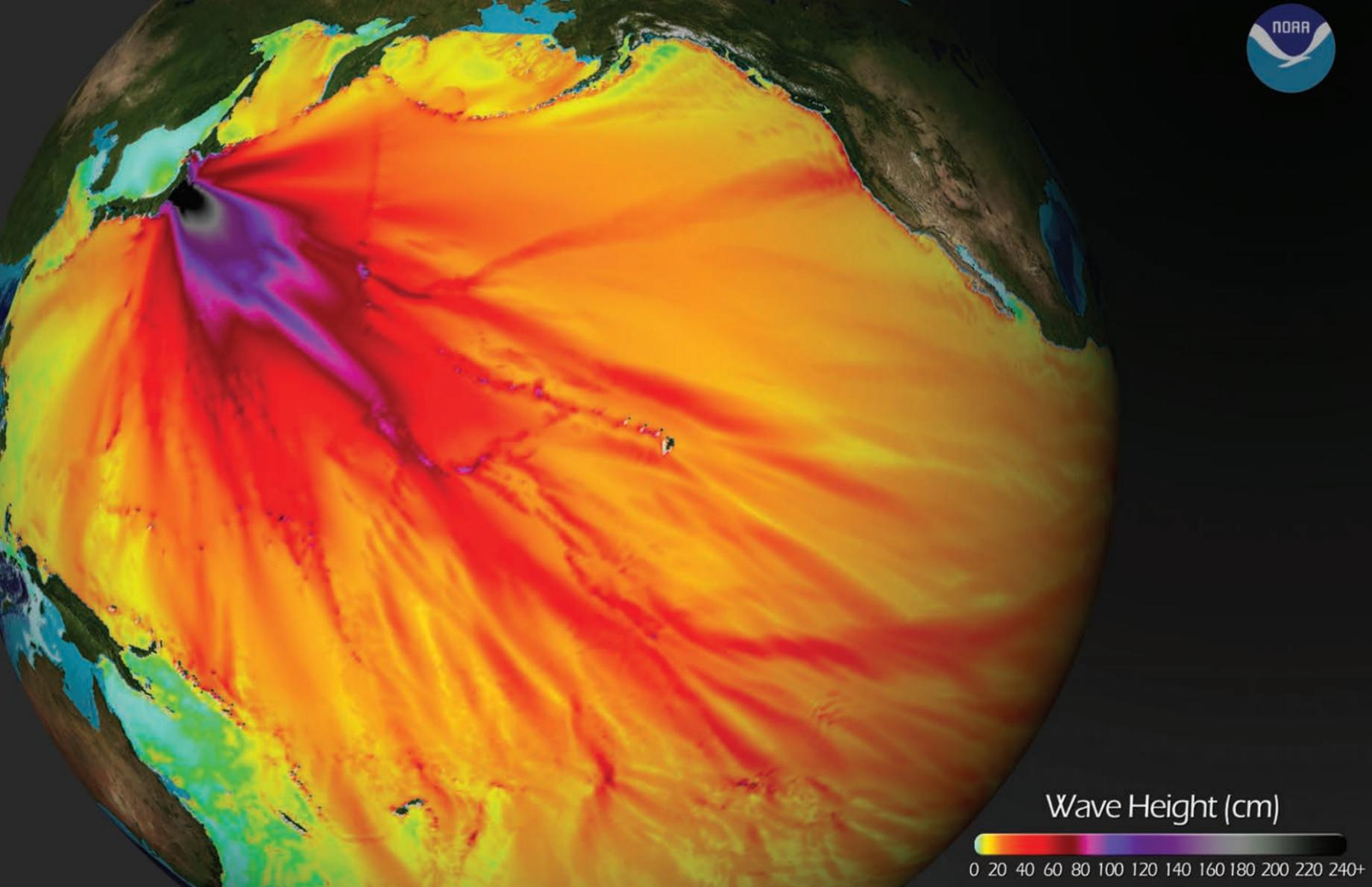
safe within the context of highly complex, interconnected and inter-dependent networks. HRT depends on granular modelling of system dependencies, identifying potential vulnerabilities and creating safeguards to ensure that the likelihood of any malfunction is minimised, while simultaneously identifying gestational problems at the earliest possible stage to allow early intervention.

It has generally been accepted that the highly interdependent and tightly bounded nature of HRT precludes the possibility of innovative and creative solutions to potential or actual problems. However, even within the system dependency and tight coupling of a major power management system, it is the ability of operators dealing with the immediate realities of emerging problems to create innovative solutions using their experience and improvisational abilities that allows them to deal with surprises and volatile events. In fact, the undirected actions of self-asserting operators responding to the immediate demands of an emerging crisis situation are seen as critical in almost every crisis.

This suggests that there may be lessons that can be drawn from the highly-designed environment of critical infrastructures that could have value and relevance within the unformed chaotic environment of crisis management.

The model of crisis management that has been discussed so far follows the assumption that correct analysis of a problem, through identification of critical decision paths, will allow the 'correct' solution to be discovered to reach a desired solution. However, with the growth of the understanding in concepts such as fuzzy thinking in the 1970s, it became clear that there were other decision-making methodologies available in addition to the centralised control of increasingly small components of activity. Although the reductionist, mechanistic models may have been appropriate to the problems of the emerging industrial age, they are not applicable to the messy problems characteristic of the 21st Century. Whether they are labelled as wicked, hyper-complex or catastrophic events, it is now recognised that responses to increasingly complex crisis scenarios are based on emergent ad hoc interactions between different groups, each with their own organisational culture, language and wealth of embodied experience. The challenge is to find a way of creating the space wherein these groups, each with its own highly developed but, at the same time, highly focused expertise, are able to develop collaborative relationships based on trust, communication and a recognition of the shared values of the other.

Rittel considered that the fundamental nature of wicked problems is that there is no answer to them, and although there may be experts who have particular specialist insight into and – understanding of – specific aspects of the crisis, there are no experts who can claim to know how to solve them. Solutions are not so much managed, as brought into existence through an iterative decision-making process that is in a constant state of flux. This perspective assumes solutions to crisis situations must be pragmatic and situation



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responsive, rather than being predicated on the management of mechanistic systems-based and process-based solutions.

The people who are interacting with the crisis environment are constantly monitoring and assessing changing situations and creating new decision-paths, which are monitored, assessed and adapted. This process is dependent on the interaction of experienced practitioners, who are the repositories of specialised knowledge that is in itself tacit, intangible and context-dependent. Such knowledge, by its very nature, resists attempts to codify it into universally applicable response plans.

Fuzzy gambling

The acknowledgment that the future state of the project is unknown, even as it is being initiated, changes the whole crisis management process from one of mechanistic control of a tightly-managed production procedure at the end of which there lies the finished article (the solution), to one where the project itself is seen as inherently innovative, experimental and ambiguous. Within such working spaces, project management strategies are more likely to be focused on a probe and learn methodology based on 'clumsy solutions', or even 'fuzzy gambling'. This is where the project itself is seen as a learning, reflective

The 2011 Fukushima earthquake and tsunami provide examples of where the initial trigger point became superseded by the impact of a nuclear breakdown, the subsequent cascading effects on the food supply to Tokyo, and the threat of a transnational nuclear cloud, as well as disruption to the country's global component manufacturing supply chains

NOAA Environ Visualisation Laboratory

process, progressing through a series of failures and improvement, and where managers can do no more than grope along in their move towards organisational goals.

All this stands in contrast to the classical understanding of strategic decision-making, which is focused on developing deliberately conscious guidelines that can be used to help formulate decisions in the future. One of the fundamental challenges in wicked problems, which lies at the heart of all crisis management decisions, is the fact that there is no single correct answer, because there is no way of testing the outcomes or consequences of any particular option. All decisions are taken in the knowledge that not only are they likely to have unintended outcomes, but that those outcomes have a high potential for becoming crises in their own right.

Rather than issuing predetermined responses that are transmitted through a highly striated network of hierarchical commands and instructions, the general tone is one of consultancy between peers holding embodied knowledge. As such, the role of the central command team is to co-ordinate actions and to support local teams in appropriating resources and resolving conflict, rather than directing and commanding.

The realities of the challenges of responding to either unthinkable (9/11) or highly-predicted but nevertheless

surprising events (Hurricane Katrina), led to an understanding of the significance of Emergent Multi-Organisation Networks (EMONs) as a critical stage in creating effective solutions within the context of high-stress, highly unstable and rapidly mutating threat environments. The criticality of such ad hoc and often spontaneous EMONs in creating innovative solutions is offered as an alternative theoretical model to the tightly controlling centralised management system that has been the prevailing orthodoxy in crisis management studies. Its fundamental need – and nature – were described 50 years ago, by Burns in 1963: "Organismic systems are adapted to unstable conditions where new and unfamiliar problems and requirements continually arise which cannot be broken down and distributed amongst specialist roles within a hierarchy... Responsibilities and functions and even methods and powers have to be constantly redefined through interactions with others participating in common tasks or in the solutions to common problems."

However, despite the ad hoc nature of such non-hierarchical, decentralised, free-forming emergent groupings, the efficiency of both the individual components and the interconnected whole are dependent on the amount of training that participating agencies undertake. As such, effective response within the unstable crisis environments in which EMONs thrive, is still dependent on pre-event organisational preparation and training, as well as the capabilities and motivation of critical individuals.

Given the lack of a theoretical understanding of how the knowledge and insight of experienced practitioners can be encoded and transferred to organisational frameworks, which can then be utilised in a range of contexts, it is no surprise that those who talk of such issues often sound as though they are searching for the correct terminology that can capture and convey exactly what is required.

In acknowledging that such professional insight is, by its very nature unspoken, intuitive and even indescribable, one is reminded of the opening lines of the Tao Te Ching: "Tao which can be described in words is not The Tao."

Bresnen et al stated in 2003: "In case of process innovation... what is learned is often tacit, intangible and context-dependent... Such learning is not only difficult to measure and evaluate, it is also difficult to capture in explicit forms, in ways that can be understood and applied in new contexts... How is the organisation able to capture learning and deploy it over the long term, when it is so embedded in the individual and manifested in their particular expertise and range of contacts... The individual embodiment of engineering knowledge and expertise militated against the transfer of such knowledge..."

It may seem paradoxical to ask how that which cannot be talked of can be shared, and that which cannot be described can be taught. But just as with any paradox, the answer lies not in confronting mutually self-negating contradictions, rather in rephrasing the question. As such, the role of the strategic crisis manager is not so much to facilitate the transfer of explicit knowledge directly from one knowledge holder to another knowledge receiver, much less to command and direct, but rather to create and support a working environment that facilitates the development of a truly interactive community, one which can collectively develop and explore the innovative solutions that are at the heart of modern crisis response.

Our ability to understand, model and then accept

the challenges associated with hypercomplex crisis events will be crucial in developing a crisis and disaster response capability appropriate to the challenges of the 21st Century. The recognition of the nature of crisis response as a free-form interaction between a community of knowledge holders, each with their accumulated experience, insight and embedded understanding of potential options, and the ever-changing situation that they are facing, will set the foundation for the ongoing debate as to how decentralised non-hierarchical response management systems can be developed.

While many of the issues covered in this series are well known, it is the ability to transmit the lessons learned to the realities of actual crisis response environments that will be the true test of their value. It is hoped that this paper will contribute to the dialogue currently being undertaken by members of the emergency and crisis management community, whether from the practitioner or the academic wings, and will have some value for those people dedicating their lives to delivering innovative solutions to some of the most testing events that we are currently facing. **CRJ**

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Simulating tunnel fires



In his third article, **Christian Brauner** introduces two Swiss tunnel training facilities in Balsthal and Lungern, reflecting on the current possibilities and limitations of simulating tunnel fire situations

Both of the International Fire Academy's (IFA's) tunnel training facilities serve two purposes – as a laboratory for developing and testing procedures and equipment for firefighting and search and rescue (SAR); and for practical training. The facility in Balsthal covers basic training in road tunnels and the entire field of railway tunnels. The facility in Lungern simulates particularly demanding road tunnel incidents, as well as emergency situations during tunnel construction.

The Balsthal training facility was put into service in 2009. In the preceding six years of development, the first question was: how real does a tunnel training facility have to be? The longest tunnel possible seemed to be the ideal, where cars and lorries, railroad cars or even entire trains could be set on fire to be extinguished by participants. This would provide invaluable experience for the firefighters taking part. But there were also inherent risks – in real smoke conditions, the slightest mistake could have lethal consequences.

Realistic firefighter training cannot be risk-free. Many studies show that participants already reach their physical performance limits in conventional fire training houses owing to high thermal stress. For this reason the IFA's development team defined its fundamental safety goals: Normal errors cannot have fatal consequences; and accidents and even minor injuries must be avoidable through proper behaviour. To achieve this, five adjustable parameters were identified for simulating incident operations; namely: Penetration depth; heat stress; smoke; weight load; and working environment.

The importance of penetration depth has already been explained in the second article of this series. The IFA defines it as the distance between a safe area and the actual work area; or, for example, the area of a tunnel section between two emergency exits that is to be searched. Incident evaluations and tests conducted by the IFA show that distances of 80 metres and more place increasing strain on firefighters. Penetration depths greater than 500 metres are hardly manageable, either with SCBA or with rebreathers. As a consequence, the training facility provides a tunnel with a length of several hundred metres, but no more than about 500 metres.

As also shown in the preceding article, a fire's heat load within a traffic tunnel is a manageable challenge from the point of view of fire services. Even if several lorries are fully on fire, working conditions on the upstream side are sufficient. However, in rooms with low ceilings, such as in underground car parks, even a full car fire can produce unbearable heat. For this reason, large fires are still accessible on the upstream side within



the training facilities. This is achieved by means of gas-fired mock-ups of cars, vans, lorries and a coach.

The three main hazards are associated with smoke are smoke toxicity, loss of visibility and smoke ignition, although risk of the latter is considered to be very low in tunnels. Because of toxicity and smoke irritation, firefighters are strictly required to use respiratory protective equipment. Thus, the loss of visibility is a critical challenge for practising. This can be compensated by using thermal imaging cameras, but trainees are also required to train in zero visibility conditions. Low or almost complete lack of visibility can be achieved with non-toxic white artificial smoke, although this cannot simulate soot deposits, whether on vehicles that are to be searched or on equipment (mask window, manometers, thermal imaging camera lenses and monitors). To reproduce soot deposits on such items and thereby simulate complete lack of visibility, real smoke would have to be used (from a real vehicle fire or smoke cartridges). But smoke is toxic and, if used continuously, would lead to complete contamination of the training facility and pollute equipment.

Firefighters also have to bear heavy weights at structure fires, both when carrying their equipment and when persons require rescue. This is feasible across short distances but when longer distances are involved, such loads become a central challenge of incident operations in underground transport systems. Combining penetration depths, smoke and weight makes these unique operational conditions realistic for participants. Training dummies or other course participants are used to simulate victim rescue.

The working environment encompasses all of the training tunnel's visual, audible, tactile and functional properties, as well as the vehicles and equipment used for training inside it. To achieve a high degree of reality, the IFA's training tunnels precisely mirror real road or rail tunnels and use real road and rail vehicles, as well as replicating dimensions, wall and lane surfaces, functionality of emergency exit doors and so on.

In summary, therefore, the IFA developed and built tunnel training facilities with the following features:

- Realistic penetration depths of up to 700 metres;
- Realistic heat strain achieved through gas-fired simulation systems;
- Realistic loss of visibility via artificial smoke;
- Realistic weight load by using original equipment and training dummies; and
- Realistic working environment.

Besides recreating the incident conditions, the usefulness of training facilities is decisively determined by its response and feedback for the participants. Here the simulation is highly limited because the entire training situation itself is not a real emergency. No one is really in mortal danger. Consequently, no one can be truly saved.

So far unresolved is the representation of real extinguishing effects during regular training operations so as to give participants clear feedback on whether they have selected the optimal combination of distance, water flow rate, water stream direction, angle and other parameters. To achieve this, real vehicle fires within a tunnel would be required. However, as shown above, this is too risky because it could lead to uncontrollable training conditions. The gas-fired fire simulation systems can easily be stopped in an emergency by pressing a button. The disadvantage of this is that it is the instructors who simulate the extinguishing effect by throttling the gas supply as a 'reward' for correct firefighting actions. This indirect assessment of the exercise is always, to some degree, subjective.

However, the IFA offers well thought out tunnel training facilities, where almost all tasks of an incident operation that could be expected in underground transport systems can be simulated. These simulated conditions place very high strains on the participants, without exposing them to unnecessary risks. Many participants reach their performance limits and take this as a valuable experience. So far none of the more than 10,000 people trained in these tunnels has had a severe accident.

■ The subject of the next article is respiratory equipment in operations with high penetration depths and, in particular, the question of if – and how – the operating times can be extended with rebreathers

Fires are simulated by gas-fired fire training systems, providing a realistic training environment

IFAR

Author



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Major UAV event in Brussels features 'Drone Hero 2017' competition

The global drone market is now projected to top US\$12 billion by 2020, according to a report from Business Insider Intelligence in June 2016.

The report predicts that growth in the enterprise sector will outpace the consumer sector in both shipments and revenues, as regulations open up new use cases in the US and EU, the two biggest potential markets for enterprise drones.

Technologies such as geo-fencing and collision avoidance will make flying drones safer and make regulators feel more comfortable with larger numbers of drones taking to the skies, it adds.

According to another report from Grand View Research, North America dominates the global industry, owing to high production and increasing applications in the commercial sectors. However, the European commercial drone market is expected to grow considerably in the next seven years, thanks to relaxations in regulations and increasing applications in law enforcement and agricultural applications.

According to a recent European Commission Report on Unmanned Aircraft: "Within 20 years, the European drone sector is expected to directly employ more than 100,000 people and have an economic impact exceeding €10 billion per year, mainly in services."

Diversified Communications, the event organiser behind the US event, Commercial UAV Expo, will run its first European commercial drone expo and conference in Brussels, Belgium, in June, 2017.

The European event will focus exclusively on the highest precision tools for industrial use for a number of areas, including: Process power and utilities; civil infrastructure; surveying and mapping; and law enforcement, emergency response and search and rescue.

Exhibitors will be drawn from specialists in UAV/UAS hardware and systems, component manufacturers, software providers and service providers interested in non-military, commercial applications of UAVs.

Attendees will be professionals who use, or plan to use, precision-grade drones to capture and process data. Additional attendee categories could include regulatory and privacy professionals, service providers, government policymakers and university researchers involved in this emerging market.

The event will also feature a competition – Drone Hero Europe 2017 – where innovators will be able to demonstrate their drone applications. The winner will receive support to develop their innovation.

The contest is open to everyone, says the organiser, including students, research institutions, start-ups and companies that are developing or implementing drone solutions. These solutions can consist of any combination of hardware or software, services. The deadline for applications is May 30, an independent jury will select the top ten finalists on June 5 with the ten finalists making their pitches during the Commercial UAV Expo Europe event before a final winner is announced.

For complete contest rules and information, visit www.dronecommunity.eu

■ Commercial UAV Expo Europe takes place in Brussels, Belgium, on June 20 – 22, 2017. See diary dates for details. 

Emergency Services Show 2017

The Emergency Services Show returns to the NEC in the UK on September 20 – 21, 2017, with a host of interactive features and demonstrations for the evolving fire and rescue sector.

New learning opportunities will focus on the "UK fire offer" for overseas markets, road safety and the health and well-being of the emergency services, while free seminar programmes, CPD workshops and water rescue demonstrations will run across the two-day event.

Last year's Emergency Services Show attracted 6,433 visitors, including a significant increase in overseas visitors. Recognising the growing interest from abroad in British fire protection and fire safety excellence, the show has secured the support of the Joint International Fire Board (JIFB) and will work closely with it to develop overseas opportunities.

A feature dedicated to road safety and rescue will incorporate live demonstrations with a competitive element, as well as free seminars. The aim is to bring together teams of fire and rescue personnel to display their abilities, while also expanding their practical skills by learning from and teaching others involved in the same field.

West Midlands Fire & Rescue Service will host a national Extrication Challenge live on the exhibition floor; teams of UK firefighters will be briefed on road traffic collision scenarios and compete in extrication from two cars using the latest kit and rescue techniques.

A Medical and Trauma Challenge is also planned using simulation technology.

■ More details from: www.emergencyuk.com



May 22 – 26, 2017
2017 Global Platform for Disaster Risk Reduction, Cancun, Mexico
unisdr.org/conferences/2017/globalplatform/en

May 23 – 24, 2017
Maritime Search and Rescue, Helsinki, Finland
maritime-sar.com

May 24, 2017
Australian & New Zealand Search and Rescue Conference, Jupiters Hotel, Gold Coast, Australia
sar.anzdm.com.au

May 30 – June 1, 2017
Search and Rescue Europe, Copenhagen, Denmark
searchandrescueeurope.iqpc.com

May 31 – June 2, 2017
Border Management & Technologies Summit, London, UK
intelligence-sec.com

June 6 – 8, 2017
ISDEF – The 8th International Defense & HLS Expo, Tel-Aviv, Israel
isdefexpo.com

June 7 – 8, 2017
ASIS 27th NYC Security Conference, New York City, USA
www.asisonline.com

June 12 – 13, 2017
Security of Things World, Berlin, Germany
securityofthingsworld.com/en

June 12 – 15, 2017
Gartner Security & Risk Management Summit, National Harbor, MD, USA
gartner.com

June 14 – 15, 2017
Third Aid & Development Asia Summit, Myanmar
asia.aidforum.org

June 19 – 20, 2017
Port Security Technology, London, UK
smi-online.co.uk

June 20 – 22, 2017
Information Operations Summit: Countering Violent Extremism, London, UK
informationoperationsevent.com

June 20 – 22, 2017
Commercial UAV Expo Europe, Brussels, Belgium
expouav.com/europe

June 21, 2017
Resilience Conference 2017, Emergency Planning College, Easingwold, York, UK
the-eps.org

June 22, 2017
The World Conference on Disaster Management (WCDM) 2016, Mississauga, USA
wcdm.org

June 28 – 30, 2017
The 7th China International Fire Safety Exhibition, China Guahngzhou Pazhou Poly World Trade Center Expo, China
cfe.cn.com

July 19 – 20, 2017
Aidex Dhaka Conference, Bangladesh
aid-expo.com

August 20 – 23, 2017
Resilience 2017: Resilience Frontiers for Global Sustainability, Stockholm, Sweden
resilience2017.org

August 23 – 25, 2017
Eighth Conference of the International Society for Integrated Disaster Risk Management, Reykjavik, Iceland
idrim2017.com

September 6 – 8, 2017
InterDrone, Las Vegas, USA
interdrone.com

September 8, 2017
BCI India Conference, Bangalore, India
bcindiaconference2017.com

September 12 – 15, 2017
DSEI, ExCel, London
dsei.co.uk

September 13 – 14, 2017
Aidex Nairobi Conference, Kenya
aid-expo.com

September 14, 2017
Crisis Management Conference, London, UK
steelhenge.co.uk/crisis-management-conference

September 19 – 20, 2017
Twelfth European Conference on Disaster Management, Berlin, Germany
civil-protection.com

September 26 – 28, 2018
Asian Defence, Security and Crisis Management Exhibition and Conference, Manila, Philippines
adas.ph

Global Platform held in Mexico

Mexico: The 2017 Global Platform for Disaster Risk Reduction will be held in Cancun on May 22 – 26, and is expected to draw more than 5,000 participants, including policymakers and disaster risk managers. This will be the first time the most important international forum dedicated to the disaster risk reduction (DRR) agenda has been staged outside Geneva.

The event will mark the first opportunity for the international community to review global progress in the implementation of the *Sendai Framework for Disaster Risk Reduction*, which was adopted in Japan in 2015.

The event will focus on several thematic areas, the first being national and local DRR strategies integrating with climate change and sustainable development plans. The event will also examine how to reduce the vulnerability of countries in special situations and will consider the readiness of countries to measure their progress against the targets that were set in Sendai. A plenary session will focus on building coherence between the *Sendai Framework* and the *2030 Agenda for sustainable development*. This session will also integrate the outcomes of other key post-2015 development

processes, including the *Addis Ababa Action Agenda*, the *Paris Agreement* and the *New Urban Agenda*, as well as taking forward some of the key DRR commitments made during the World Humanitarian Summit in 2016.

A number of thematic areas will also be covered, including: Multi-hazard early warning systems and disaster risk information; enhancing disaster preparedness for effective response; DRR governance; critical infrastructure; international co-operation; risk insurance and its role in building resilience; risk information and disaster loss databases; community resilience; inclusive and people-centred DRR; the private sector's role and engagement; science and technology; local authorities' roles; health and DRR; cultural heritage; ecosystem protection and management; and urban land use and spatial planning.

The Multi-Hazard Early Warning Conference takes place immediately before the Global Platform (May 22–23, 2017) at the same venue. Some 45 side events are also being organised between May 24–26.

■ For more details, visit www.unisdr.org



The 2017 Australian New Zealand Search and Rescue Conference is taking place on May 24, 2017. Chaired by Martin Boyle, who is also a Member of *CRJ's* Editorial Advisory Panel and who edits *CRJ's* Search and Rescue (SAR) blog, the event has lined up an exciting programme of inspiring speakers.

Martin says: "The SAR industry encompasses a diverse group of people, from professionals to volunteers, civilians to law enforcement and military, across every conceivable environment.

"SAR is carried out on land, at sea and by air, with many specialist sub disciplines in each context. It is important work that's done on a daily basis by extraordinarily skilled and motivated people."

SAR2017 is a ideal platform for SAR practitioners to share ideas, discuss case studies, and take a critical look at some of the new developments in technology that are poised to fundamentally change the way that all SAR professionals go about their business. Martin adds: "As we strive for continual improvement, this conference will encourage cross-pollination of ideas, transfer of information, and new ways of thinking."

The event will cover a number of pertinent issues, including an examination of the Australian SAR system from Louise Proctor of the Australian National SAR Council. Command issues will also be discussed, as will retaining emergency services volunteers and preparing personnel for safe and effective operation in harsh and volatile environments.

In addition to personnel safety, recruitment and training, technology will also come under the spotlight, with presentations on UAVs and drones in SAR, the evolution of radio direction finding and location technologies, and the world's first optical radar that will assist in maritime SAR operations. Speakers include:

- Rhett Emery, Secretariat, NZSAR;
- Rich Hungerford, Director/Senior Instructor, Bush Lore Australia;
- Assistant Commissioner Rob McNeil, Assistant Commissioner Regional Operations, Fire & Rescue NSW
- Associate Professor Benjamin Brooks, Research Fellow, National Centre for Ports and Shipping at the University of Tasmania;
- Professor Jonathan Roberts, Professor in Robotics, Electrical Engineering and Computer Science, Science and Engineering Faculty, Queensland University of Technology; and
- Henry van Tuel, President, Coastguard New Zealand.

■ The 2017 Australian New Zealand Search and Rescue Conference is held at the Star Gold Coast in Queensland, over a period of three days in May. See calendar for further details.



Search and Rescue event



Mohamad Razi Bin Husin | 123rf

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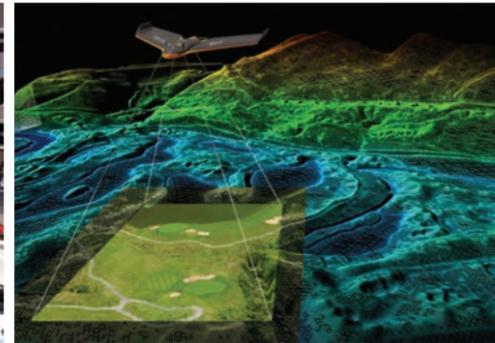


Image credit: Future Aerial Innovations



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looking back



Deadliest aircraft accident in history

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Forty years ago the deadliest aircraft accident in the world happened on the ground when two Boeing 747s collided at Los Rodeos Airport on the island of Tenerife, resulting in the deaths of 583 people, writes **Tony Moore**

The two aircraft, one operated by KLM and the other by Pan Am were scheduled to have landed on the nearby island of Gran Canaria on March 27, 1977. But a bomb explosion at that airport earlier in the day, along with a further bomb threat, closed the airport. Five large commercial aircraft and several smaller planes were diverted to Los Rodeos Airport on the nearby island of Tenerife.

Los Rodeos (now renamed Tenerife North), a small one-runway regional airport, was liable to rapidly changing weather conditions, particularly cloud, and was not equipped with ground radar. Unused to catering for large commercial aircraft, it quickly became congested and the normal taxiways were blocked. When the airport at Gran Canaria was re-opened, the Pan Am flight was ready to depart, but could not do so because the refuelling KLM flight blocked its only route to the runway.

Once refuelling was completed, KLM's captain was instructed to taxi the full length of the runway and make a 180-degree turn ready for take-off. Shortly afterwards, the captain of the Pan Am flight was instructed to follow down the same runway, but to take the third exit on his left to clear the way for the KLM flight to depart. Heavy cloud had descended on the airport and, in the deteriorating weather conditions, the Pan Am flight crew missed the exit.

The KLM flight was commanded by Captain Velduyzen van Zanten, the airlines' chief flying instructor. On reaching take-off position, he started the KLM flight down the runway, just as the Pan Am flight was turning into the fourth exit. About 100 metres short of the turning Pan Am flight, the KLM flight left the ground. Its nose just cleared the Pan Am flight but the landing gear, engines and lower fuselage ripped into its upper fuselage. The KLM aircraft stalled, rolled sharply and hit the ground approximately 150

metres past the point of impact, exploding in a fireball.

All 234 passengers and 18 crew on the KLM flight were killed; because of the fire, the remains of many were never recovered. The Pan Am flight fared slightly better in that there were 61 survivors, including seven crew, but 326 passengers and nine crew perished. Both were holiday flights; thus, in many cases, whole families died.

Although there was initially disagreement as to blame, accident investigation teams from Spain, the Netherlands and the US finally concluded that the weather conditions were such that Air Traffic Control (ATC) could see neither of the aircraft and the crews of the two planes were unable to see each other. Although it was accepted that there was some confusion about radio communications, the basic cause of the accident was that van Zanten, concerned about exceeding his flying hours, had taken off without clearance from ATC. There was some suggestion that because of his seniority in KLM, junior members of the crew, namely the co-pilot and flight engineer, were hesitant to challenge him.

Crew resource management

Sweeping changes were made to international regulations, particularly to communication procedures, after this accident. Following findings relating to this and two other deadly accidents in the US, NASA convened a workshop in June 1979, which led to the introduction of Crew Resource Management (CRM), designed to emphasise crew co-ordination and the management of all resources available to the crew. Such was its strength that CRM has been adopted by a variety of occupations, including the offshore industry, healthcare and the fire service.

In Holland, a memorial to those killed on the KLM flight stands at the Westguarde Cemetery in Amsterdam. The memorial to those who died aboard the Pan Am flight is at the Westminster Memorial Park and Mortuary in California. On the 30th anniversary of the disaster, an International Memorial was inaugurated on Messa Mota Mountain in Tenerife. Designed by a Dutch artist, it is shaped like a spiral staircase connecting the earth with the sky. Beneath it a simple plaque gives the date and the words: "Monument erected in memory of the 583 victims of the air crash at Los Rodeos airport," in Spanish, English and Dutch.

Author
TONY MOORE is a regular contributor to CRJ

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Giving voice to young women in global security



Emily Hough speaks to Alaa Murabit, a Libyan-Canadian doctor and international advocate for the rights of women and young people, who says that we need to reintroduce compassion, care, and empathy into global security and policy

A medical doctor by training, and an international peacebuilder, Alaa Murabit works as a UN High Level Commissioner and UN Sustainable Development Goals Advocate. At the age of 21 she founded The Voice of Libyan Women, which focuses on women's political, social and economic leadership.

"My love for medicine was born young. My dad, a general surgeon, would come home with stories or take me to work after school," she says. "Some people say mosques, churches, temples and synagogues are the most holy places where they can feel God's presence. For me, it is hospitals. I would hear loved ones praying – a universal hospital experience, even for those who don't believe in God. And while for many people it was their most painful experience, I've never witnessed so much strength, humility

Alaa Murabit speaks at TEDWomen2015 at the Monterey Conference Center, California, USA

Marla Aufmuth | TED

and kindness. It was what drove me to medicine."

This is something she sees daily in conflict areas – the moments of desperation that are daily reality for families in conflict: "I think people don't often recognise the incredible similarities between global security, peacebuilding and in health," she says.

It is essential, according to Alaa, to take greater account of the variables upon which sustainable peace is dependent, such as culture, corruption, collapsed justice systems, poverty, unemployment, and inadequate education and health systems – all while addressing the urgency of growing threats and immediate dangers. One frustration she highlights is concern that focus will continue to be on the polarising, superficial reasons for conflict, rather than: "Addressing the underlying nuances which drive and propagate conflict, despite the glaring evidence that this just doesn't work."

Alaa works with the Dalai Lama and others to: "Redefine what power means. In a time where power is defined by military capabilities, we need to reintroduce compassion, care, and empathy into global security and policy."

As an MIT MediaLab Director's Fellow she is currently working on *Forbidden Histories*, which explores the overlooked histories that provide the foundations for our existing – "and weakening" – global co-operation systems. As a UN Global Goals Advocate she conducts research that provides global advocacy on the importance of prevention as peace building. Alaa also works with governments, businesses and civil society on issues such as gender equality, health and education, climate change, justice and strong institutions.

"I enjoy the intersection of research and advocacy. I appreciate seeing people change their mind on important issues right in front of me, and knowing that laws and policies exist because we were determined to look at things from a different perspective."

When asked what are the essential skills she needs in all these activities, Alaa cites her 'eagerness', which manifested itself at the young age of five when she would sneak into her parents' car when they were going on errands without her. "I learnt that you need to take the initiative, make it clear when you're interested, or when you want to learn and be part of something."

Much of her knowledge and success is thanks to mentorship: "Women who have opened doors for me, pulled down ladders and gave me courage and strength to voice my opinions and lead," she notes, explaining that her work in global security and policy is a daily reminder of the absence of these important voices.

And it is for this reason, when continuing her work on securitisation, global sustainability and peacebuilding, she will continue, passionately, to support the essential voices and leadership of young minority women.

CRI

"**Hearing first-hand** how operations were handled during **past incidents** is really useful to our future planning."

Tina, Authorised Firearms Officer, MDP



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