



Simulation: High fidelity and versatile. Train for the unexpected

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Abstract

The operational landscape and responsibilities of International Fire Service have changed dramatically over the last 15 years, which greatly affects the scope, severity and importantly the numbers of incidents attended worldwide. Over the same period significant changes have occurred to building design and construction with large and complex builds being rapidly undertaken. These often involve new and untested materials (for example timber laminates, metal facades and lightweight trusses) that in some instances have contributed to the rapid spread of fire. In the current climate, with resource constraints and imposed efficiency savings, emergency service organisations (ESO) must focus on developing the knowledge and expertise concerning these new building construction techniques, complex fire prevention strategies, multi-occupancy premises, and inter-operability command protocols that are required to resolve these complex incidents. ESO must also find the most effective and efficient strategies to develop policy and procedure, and deliver training programs that enhance the capability of personnel to respond to emergencies in these and traditional buildings.

Increasingly it has been recognised that ESO must develop the ability of their personnel to think and make effective decisions on the fire-ground. Although the majority of ESO possess a core of highly experienced personnel with extensive knowledge concerning fire engineering and safety systems this expertise may not being effectively shared with or accessed by those responding to fires. Developing expert decision makers requires extensive training and experience. In a time of fewer (but potential faster evolving) fires this presents challenges for all fire authorities.

The use of simulation as a tool within a comprehensive and consistent training strategy offers a number of advantages. In particular, XVR simulation provides high fidelity and realistic training opportunities for both the emergency services and relevant stakeholders to train and practise for the unexpected. It provides an environment where the risk of the incident can be analysed with respect to the affected individuals, the building, the community and importantly the safety of emergency services personnel, whilst enabling the most effective plan or evacuation strategy to be implemented to resolve the incident. In a world where incident numbers are dropping due to improvements in fire safety regulations, building design or vehicle safety systems, training and in



particular simulation-based training is the most cost-effective solution to compensate for this reduction in incident exposure.

Article

The evolving nature of the emergency services industry presents specific challenges for those involved in the built environs and fire engineering area. These personnel must stay abreast of significant changes to building design and construction and provide advice that may enhance the safety of these buildings as well as providing advice that may protect the safety of firefighters and the public in the event of a fire. Although ESO personnel working in the built environs and fire engineering domain are typically highly experienced personnel with extensive knowledge concerning fire engineering and safety systems this expertise is often not effectively shared or accessed in the event of a fire by the organisation as a whole.

Increasingly it has been recognised that effective emergency response is dependent on the ability of personnel to think and make rapid and effective fire-ground decisions. Five decision making behaviours have been identified (Launder & Perry 2014) that contribute to safe and effective decision making in urban fire settings. These behaviours include; developing situational awareness (for example Endlsey 2000), making a decision using an effective strategy, enacting decisions, where necessary formalising a plan with clear objectives and incident management structure and ensuring ongoing and dynamic incident review. Critical factors and abilities that contribute to effective fire-ground decision making include; the knowledge that personnel have of potential risks and hazards, their previous experience making decisions in similar situations, the ability to work under pressure and the ability to manage information and personnel.

In addition, an incident that occurs within an environment with high occupancy levels and has utilised new fire engineered preventive solutions or innovative building techniques provides additional challenges. The knowledge and expertise possessed by built environs and fire engineering personnel should be seen as critical to improving the decision making ability of fire service personnel. Critical information concerning modern building design and potential hazards must inform the collective decision making process. Even more importantly personnel must gain experience applying this knowledge to gain decision making experience in a time of fewer (but potential faster evolving) fires, this presents challenges for all fire authorities.



Traditionally, fire authorities may have provided incident management training by employing 'table-top' exercises, delivered using paper inject feeds, in addition to annotated photographs. Whilst this methodology provided a visual stimulus to the delegates and was relatively cost-effective to produce, it also has its limitations. The greatest limitation to a photographic or table top exercise is that they are static from a visual and decision making point of view. They do not evolve or present the same time critical challenges or level of stress that a real incident will provide. In short such exercises do not provide personnel with the same challenges as real life or the chance to 'train as you play'.

Decision making is a very individual process, influenced by incident exposure, technical knowledge and life experiences. All of these factors affect the way in which we process information at times of high stress or in a time critical situation. Developing the ability to make effective decisions in low time high risk settings only occurs when the decision maker is placed in situations that mirror those they will be faced with on the fire-ground. But how do you practise the making decisions that involve emergencies in complex settings that include hazards such as ultra-high-rise buildings, super-liners/cruise ships or aviation fires involving passenger airliners carrying over 600 people? It is no longer sufficient to just know where the incident or fire is located and apply a one-dimension attack, instead a multi-faceted approach is often needed, which utilises the knowledge of external experts and specialist equipment or techniques. The complex tactics or strategy that this kind of 'multi-agency' approach require will only become more familiar with experience and practise.

How does a major international airport train its emergency personnel, in the functionality of a new concourse building, but without affecting any of its service delivery or importantly its revenue, through the closure of the concourse?

How does a major cruise-liner company sustain business continuity and fulfil its obligations for the increasing safety standards as per SOLAS (Safety Of Life At Sea) and STCW (Standards of Training, Certification and Watch-keeping for Seafarers), without taking a vessel out of service? How should a government funded emergency service train its personnel to manage incidents in such environments while maintaining its ability to respond to the 'normal' emergencies it faces?



Effective incident commanders possess a wealth of knowledge concerning the risks and hazards they face. They need to know the organisational rule-book, doctrine, policy & procedural framework and at an incident they need to know which policies and procedures should be applied and how. But we believe the most critical factor is the ability of incident commanders to make and execute decisions under time and consequential pressure. Furthermore we believe that thinking commanders come from thinking firefighters. For example, if you train firefighters to think in a fire behaviour training, they will be able to read the fire. They will understand what they're looking at and they'll make a decision about what firefighting tactics to apply. They won't just open the door and deal with the fire from a fixed procedural perspective, they will read the fire understand what is likely to happen and make effective decisions about what to do. In short, we believe to produce expert incident commanders agencies must invest in the development of thinking firefighters who will one day become thinking incident commanders capable of safe and effective decisions.

We believe the most efficient answer is to concentrate on the development of key incident management decision making behaviours that are required at all of these incidents. This requires an organisational focus on decision making behaviours rather than specific procedural or role-based competencies. Testing the ability of an individual to resolve an incident by turning to the right page in the procedure manual and apply an organisational procedure by rote will not improve decision making. Decision making can only be improved by applying experiential knowledge to make decisions in realistic settings and learn what works and what doesn't. Ideally decision making should be practiced in settings that replicate the time and stress demands of real incidents.

Individuals need to be given repeated opportunities to apply the specific competences of knowledge, experience and skill, acquired from training or operational exposure and develop command competence and expertise. The two-dimensional information they have learned must become an effective mental model in their head – in essence a movie that they can rerun in their heads that tells them what will happen and what they should do. A training environment that replicates real life and requires decision making helps them cement their learning. If they make appropriate decisions, there must be appropriate outcomes at the end. If a BA crew is given a good quality brief and appropriately equipped with hose and sufficient water, then the fire should go out. Conversely, if a poor brief is given and the fire continues to develop, then the commander needs to be given the opportunity to review their decisions and make tactical changes to the plan, based on the dynamically changing visual cues.



The most effective and cost efficient answer currently available to train large numbers of personnel in incident command decision making is the use of high quality, simulation and accredited training methodologies to maximise the training benefit. Simulation gives incident command trainers the opportunity to create a whole array of scenarios and allow people to make mistakes. We learn best by making mistakes and figuring out what we should do different next time. Modern simulation tools provide sophisticated, immersive and high fidelity training environments to train for these multi-agency responses, to practise the implementation of emergency plans and importantly to give operational personnel the opportunity to gain familiarity of stipulated procedures, so these competencies become a naturalistic (intuitive and therefore fast) response.

Although simulation tools provide significant advantages for teaching we believe they are best utilised within a structured training program, which stipulates learning objectives and gives individuals the opportunity to translate taught processes, into natural competences. By training people in this way, you end up with assertive, effective and safe commanders. Individuals who are confident and self-aware, who are well-trained and competent. They have good situational awareness and are able to lead their teams in a clear and cohesive way. You can trust them, and incident command decision making revolves around trust. By developing decision making skills in your commanders you are equipping them to progress to the status of an 'All Hazards Commander' a commander who has the confidence and competence to deal with the unexpected!

'Built Environment' and Fire Engineering experts have a critical role to play in the development of incident commanders within the fire industry. They possess expert and detailed knowledge of the risks and hazards that will be faced by firefighters in the 21st century. They know how likely or rapidly a fire will evolve and what challenges that will present. This knowledge must be used in a number of ways. Firstly, it must inform agency operational practice so that knowledge of risks and hazards and potential treatments lead the development of accurate and effective policy and procedure. But this expertise must also inform the development of training programs. If simulators are used these must accurately replicate the challenges that will be faced in real life or ultimately the training will be flawed and potentially dangerous. However, in many fire authorities the links between Built Environment and Fire Engineering experts and operations or training are tenuous at best.

Senior management in both the public and private sectors, has a responsibility to ensure that their personnel and that of the partner agencies have the capacity to react to the incident they are exposed to. They must ensure effective risk assessment, policy and procedure development, the



provision of appropriate and fit for purpose equipment and that personnel have been provided with realistic and repetitive training to safely manage the risks they will face. We believe agencies must train their personnel to appropriately analyse the risk of the incident to the affected individuals, the building, the community and importantly the safety of their personnel, to evaluate that information accurately and then implement the most effective plan to resolve the incident whilst ensuring that safe systems of work are activated. In a world where incident numbers are dropping due to improvements in fire safety regulations, building design or vehicle safety systems, training and in particular simulation-based training is the most cost-effective solution to compensate for this reduction in incident exposure.

References

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Dr Katherine Lamb MIFireE, MSc (Oxon), BSc (hons)

Dr Katherine Lamb is a respected authority on the Incident Command training and assessment. She received her MSc from the University of Oxford and her doctorate at the University of London, and worked as an accomplished and well published research scientist before joining the Fire Service in 2004. For the last 4 years she specialised in Incident Command and crisis decision making, and developed and established the Introspect Model. This development tool is used to train and assess command competence and decision making, and is widely used within the UK fire service domain. In addition, she has published several scientific, peer-reviewed articles on the origin and application of competence assessment methodologies within the Fire Service environment.

In 2015 and in collaboration with Dr David Launder from South Australian Fire Service, she has established EffectiveCommand.org. Effective Command, is a charitable organization which has been set up to bring together best practices in Incident Command development and assessment. It has the aim of supporting international joint improvement and scientific research in this area, to develop the concept of the thinking commander, a commander who has the capacity to deal with the unexpected. In addition, she is a consultant who provides comprehensive incident management, business continuity and crisis management training to both the private and public sector.

Dr David Launder MIFireE, B.Ed. MA DBA

David is the Director of Organisational Development with the South Australian Metropolitan Fire Service (MFS) and is responsible for the agency's planning, governance and reporting as well as overarching learning, development and assessment strategies.

David led the development of one of the first competency-based career pathways for professional firefighters in Australia. This staff development framework provides MFS personnel with access to accredited training from Certificate II through to post-graduate level programs. Ninety percent of MFS senior officers now hold Master's degree or higher.

In 2005 David was responsible for the development of a comprehensive Strategic Management Framework (including aligned plans and reporting systems) to ensure agency compliance with standards of corporate governance and business excellence. This model was subsequently adopted



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by the broader South Australian Emergency Services sector. In 2010 David was awarded the South Australian Emergency Services Medal in recognition of this contribution and previous work in firefighter development.

David has 20 years' experience within the emergency services industry, prior to this he worked in the education sector in both secondary and tertiary institutions. David holds Bachelors and Master's degrees in Education and completed a Doctorate investigating how firefighters make decisions in rapidly changing urban fire environments.