

Training Pathways for Effective Emergency Management Coordination above the IMT

Dr Ben Brooks
Dr Christine Owen

University of Tasmania
for the Bushfire Co-operative Research Centre

December 2012

Contact:

Christine Owen Christine.Owen@utas.edu.au

Ben Brooks bpbrooks@amc.edu.au

Executive Summary

This report is a response to the question: “How might we best train and educate personnel in the most effective emergency management coordination above the IMT?” This question is considered by examining the human factors literature in this area, current formal and informal training pathways and considering them in the context of the types of skills and knowledge recognised as relevant to emergency management coordination.

In making this assessment it is clear that we need to acknowledge the improvements in contextual learning, human factors and leadership education that have already occurred within the industry, and use these as opportunities to also enhance the development of those in senior coordination/leadership positions. It is also necessary to acknowledge that the solutions to any gaps in this area have already been identified via reports from the Bushfire CRC, AFAC and other organisations.

From this perspective the necessary training pathways are known and the materials needed to build the training initiatives are largely available. Given that the pathways are known, an initial reaction may be to presume that there has been a lack of opportunity, resources or political will (or any combination of these) to move in this direction. However, experience with other industries such as aviation, rail, healthcare or maritime transport suggests that training development in this area is very much a journey. This journey is marked by a progressive maturing of the industry’s own understanding of the value of this type of training, and that understanding only tends to occur when people see positive results from the training in the operational domain. These results take time, and explain the long term approach needed to reach a significant level of maturity in this area. Emergency management agencies are, in relative terms, at the early stages of this journey.

If any gaps do currently exist they can be seen as being in the following areas:

- Integration gaps (effective linking of formal training pathways with exercising, assessment and role performance), including the three stages of non-technical skills training (awareness raising, practice and continual reinforcement).
- A need to review, assess and possibly develop new ‘rules-of-thumb’ or ‘quick strategies’ for coordination above the IMT to manage in this complex, dynamic and uncertain environment.
- A need to train ‘at the edge of chaos’ (Renaud, 2010) to be more effective when coordinating out-of-scale events.
- A need to design advanced courses on decision-making that acknowledge the literature on practical and critical thinking.
- Improved approaches to assessment.

Recommendations

The overall recommendation of this report is to implement the human factors training pathways that have already been identified by the Bushfire CRC, noting the gaps outlined above.

Contents

Executive Summary	3
Recommendations	4
Background.....	6
Human Error during Coordination Events – When Non-Technical Skills Break Down.....	6
The Effect of Stress on Decision-Making	8
Emergency Management Competencies	9
Training Non-Technical Skills	10
Developing Expertise in Decision-making.....	12
Decision Skills Training	13
Thinking Critically and Practically	14
Developing Heuristics and Managing Biases in EM.....	15
The Zone of Coping Ugly (ZOCU)	16
Other Heuristics/Rules of Thumb Used in Emergency Management	17
Emergency Management Human Factors Training Approaches & Frameworks	19
Current Training Pathways	19
Public Sector Fire Safety Qualifications and AFAC Programs Framework.....	19
AIIMS & Continuing Professional Development Training in Human Factors.....	20
Recommended Future Activities to support Training Pathways	22
Appendix 1: Typology of Probing Questions.....	23
Appendix 2: AFAC Framework & Public Sector Qualifications.....	25
References.....	26

Background

Training and exercising are key components of a strategic move forward in effective organising above the Incident Management Team (IMT) level. These activities support managers and coordinators to build and maintain a range of skills that are both Technical (e.g., fire/flood behaviour) and Non-Technical (leadership, communication) in order to provide the most effective emergency management coordination possible. To this point there has been far greater emphasis on training the local IMT level and below than there has been above the IMT.

It is necessary to acknowledge that emergency management (EM) training and exercising activities face some significant constraints and these in turn constrain what can reasonably be proposed as a pathway in this report. Jurisdictional approaches above the IMT are not uniform, opportunities and resources for training above the IMT are not infinite, emergency events are changing in terms of complexity, intensity and duration and public and political expectations of managers are challenging, if not sometimes impossible to meet.

Murphy and Dunn (2012) recently collated the Noetic Group's experience with lessons learnt studies and post activity reviews for a range of emergency management events. They concluded that a pattern of leadership failure emerged from this analysis:

The failure is seldom one of character, but inevitably a lack of preparation and understanding. Leaders, and their teams, are unable to effectively apply their knowledge and skills to a situation that is either so novel, or of a scale that is beyond their experience and conception (p.2).

The Noetic report also made the following comments regarding training issues:

*After examining several disasters, it is clear there has been a lack of resources and insufficient attention given to training. The Noetic Group found that response **training for routine accidents is effective at all levels**. However this is not the case for novel or 'out of scale' disasters (p.7).*

There is a need to regularly practice and test senior leadership teams. These activities need to be realistic, challenging and thoroughly debriefed. Most importantly, the performance of senior leaders should be closely scrutinised during these activities. All participants need to learn from training activities and for this to be an intrinsic part of agency's continuous improvement (p.9).

Human Error during Coordination Events – When Non-Technical Skills Break Down...

Earlier in this project we investigated the frequency and distribution of human error associated with selected major bushfire events across Australia. Our report applied the Human Factors Accident and Classification System (HFACS) to interrogate three secondary sources of information about the Wangary, Canberra Fire Storm and

Black Saturday fires. The sources are Commissions of Inquiry reports. Key conclusions included the following:

- Decision errors were often associated with time constraints, uncertainty, fatigue, the complexity of the situation and personal interactions. At higher levels of coordination, decisions were sometimes made without questioning the veracity of the information or by making decisions with limited information or decision processes. This is consistent with the findings of Fallesen et.al (1996) regarding decision-making errors in the U.S. military.
- Within HFACS, skill-based errors are associated with skills that occur 'without significant conscious thought'. Coordinators of wildfire events, especially at the higher levels of operation, are rarely performing skill-based operations when considered using this definition. This may require a reconceptualisation of skill-based errors in this domain.
- Crew Resource Management issues constituted approximately 25% of all issues across the three fires at the IMT level, suggesting that the coordination within and between teams can be significantly improved. Emergency management competencies indicate the need for a range of personality-driven, technical and non-technical skills to support communication.
- Above the IMT level it is clear that the Regional and State Control Centres struggled to effectively supervise IMTs. This reflects the challenges of supervising while allowing IMTs to manage their span of control, and is also a product of the complexity inherent in multi-team systems.
- The system of EM coordination is regularly degraded during a fire event – either through lack of information on the fire itself or resources, or fatigue, those managing must work outside the boundaries of what might be considered the 'safe system'.
- The need to operate a degraded system and the sheer complexity of the EM effort suggests that managers need to be able to apply simple, robust 'heuristics' (rules of thumb) to manage emergency events.
- Safety theory (e.g. Rasmussen, 1997) suggests that one way to approach this is by making boundaries between safe, nearly safe and unsafe systems visible. This is different to traditional approaches that place 'defences' along pre-planned paths.

A summary of the results of this study can be found in TABLE 1. It suggests that when EM and coordination 'goes wrong' in out-of-scale bushfire events, it occurs because communication breaks down, poor decisions get made for a variety of reasons and those decisions are not subject to the sort of scrutiny necessary to 'catch' and correct them. This occurs in a resource constrained environment where the organisational processes/system sometimes cannot adjust to the scale of the event.

These situations exceed the capacity of the agency’s ability to respond, and this leads to EM coordination outside the boundaries of what might be considered ‘safe’, or at least the types of fires that the system and associated training has been set up to respond to. The complexity of the situation is important in this respect. We need to be able to improve technical skills in highly novel contexts where the training system and associated tools provided as simple, flexible and robust.

TABLE 1: DISTRIBUTION OF HUMAN FACTORS ISSUES ALL CONTROL LEVELS COMBINED

All Control Levels <i>n= 118</i> *	N	%
Unsafe Acts – (Decision-errors)	19	17
Unsafe Acts – (Exceptional Violations of procedures)	17	14
Preconditions - (Crew Resource Management – communication issues)	28	24
Unsafe Supervision (Inadequate supervision and Planned Inappropriate Actions)	34	29
Organizational – (Resource Management & Organizational Processes)	10	8

*Note that only main categories of error are included and will not necessarily sum to the total number of errors.

The Effect of Stress on Decision-Making

It is also important to recognise that fire-fighters and those coordinating the response work in a stressful environment and that this stress may compromise individuals’ wildfire safety-related decisions and actions (McLennan et.al., 2012). Actions on the fireground may be affected in four key ways:

1. Attention is likely to become narrowly focused.
2. Important tasks may take longer and mistakes may be more likely
3. Working memory is likely to be impaired and important information may not be remembered
4. Forming sound judgements and making decision may become difficult as thinking becomes more rigid (McLennan et.al., 2012)

Although some key stressors present on the fireground are absent from the coordination environment (e.g., heat) it is reasonable to suggest that there are other stressors (e.g., complexity of interactions) in the coordination environment not present on the fireground. The implication may well be that the level of stress is roughly commensurate, although the proportional decrements in cognitive performance associated with stress may vary. In order to define training pathways

not only is it necessary to consider what job roles look like when they break down, or how they might be stressed, it is also necessary to examine them in a positive light, considering the skills or competencies relevant to the role.

Emergency Management Competencies

Hayes and Omodei (2011) used semi-structured interviews with experienced IMT personnel to derive a set of 12 key competencies important in bushfire IMT roles. The authors used the following definition of competencies: “the repertoire of capabilities, activities, processes and response available that enable a range of work demands to be met more effectively by some people than by others” (p. 3). Although the focus of the current project is above IMT, it would be reasonable to assume some overlap between the competencies at and above the IMT.

As indicated earlier in this report, those competencies can be categorised in a number of ways, however a basic delineation might be made between non-technical and technical skills (Flin et.al., 2008), which also relate to taskwork competencies and teamwork competencies (McIntyre & Salas, 1995).

The list of key competencies from this report is reproduced in TABLE 2:

TABLE 2: KEY EMERGENCY MANAGEMENT COMPETENCIES

Key Competencies

Interpersonal and Communication Skills

Disciplined

AIIMS knowledge and processes

Management skills

Leadership

Decision-making ability

Flexible and adaptable

Analytical thinking and problem solving

Calm and level-headed

Situational awareness

Technical expertise

Other (maintain sense of humour; self-confidence, demonstrate initiative)

The table can also be seen to identify some key ‘groupings’ of competencies, acknowledging a degree of overlap between these. Technical expertise and AIIMS knowledge and processes might be considered technical or task related competencies. Being disciplined, flexible and adaptable, calm and level-headed, self-confident, maintaining a sense of humour and demonstrating initiative are essentially qualities of the individual, strongly linked to personality-type, and also correlated with expertise and experience. Finally there are a range of non-technical or teamwork

competencies that include communication/management skills, leadership, decision-making and an ability to maintain situational awareness.

The categorisation of technical, personal and non-technical competencies is important for a number of reasons. Each category requires a different type of competency; however the application of these types of competency must co-exist during emergency events. The competency may also be more or less difficult to acquire. Competencies linked to personality type may be very difficult for some to develop, and almost 'innate' for others. It is also possible that individuals working above the IMT have 'evolved' to have these competencies because those that do have these competencies tend to survive best in that environment.

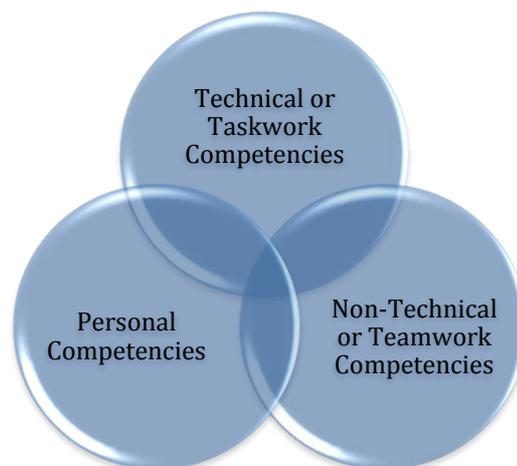


FIGURE 1: COMPETENCY TYPES IN EMERGENCY MANAGEMENT

An obvious question then becomes, how do we train people to improve taskwork, teamwork and personal competencies? Are the approaches for each of this group of skills different? We have already suggested that personal competencies are related to personality type and to the level of expertise, and to some extent are naturally selected by the organisational environment. However studies of personality in occupations indicate that the distribution of personality types (based on profiles such as Myers-Briggs) in occupations is not significantly different from a random sample within a population (Pittenger, 1993). What are the implications for training with respect to Hayes and Omodei's (2011) 'calm and level-headed' or 'disciplined' competencies from this perspective? Part of the solution may be to detach these competencies from personality profiles and instead focus on provision of experience through simulation and exercising to train control of emotional responses to highly novel and disturbing situations. This is a difficult and complex area and beyond the scope of the current report to examine in any significant depth. Instead we turn our attention to those teamwork skills so important to emergency management coordination.

Training Non-Technical Skills

Other work domains have been training in Non-Technical Skills for many years (Flin et.al, 2008). Typically these approaches have followed the path of traditional training

development – performing a training needs assessment, developing the training materials and building tools to assess/evaluate the outcomes. Various strategies are available to train people in the development of non-technical skills. Approaches to Crew Resource Management (CRM), for example, have evolved since being introduced in the 1980's. Topics in CRM training are designed to: *“target knowledge, skills and abilities as well as mental attitudes and motives related to cognitive processes and interpersonal relationships”* (Flin et.al., 2008, p.248), embedded in three distinct phases:

1. The Awareness Phase – this is the classroom component that introduces the theoretical aspects of Non-Technical Skills (NTS).
2. The Practice and Feedback Phase – this is typically the simulation component; however training strategies such as role-playing can also be used.
3. The Continual Reinforcement Loop – this includes refresher training and more recently the alignment of workplace auditing, standard operating procedures and training systems in order to reinforce the NTS through different aspects of the management system. In the absence of regular training and reinforcement, attitudes and practices tend to decay, so this also typically includes refresher training.

A number of training strategies are possible and Flin et.al., (2008, p.251) has identified when each might be most appropriate; see TABLE 3 below:

TABLE 3: TRAINING STRATEGIES FOR DEVELOPING NON-TECHNICAL SKILLS

Type of training	Specific recommendations
Team coordination training	<ul style="list-style-type: none"> • Effective even with teams that do not have a fixed set of personnel • The training addresses a particular set of non-technical skills
Cross-training	<ul style="list-style-type: none"> • Team has high levels of interdependence between members • There is a lack of knowledge about the roles of other team members • High staff turnover
Team self-correction training	<ul style="list-style-type: none"> • Team has high levels of interdependence between members • Low staff turnover
Event-based training	<ul style="list-style-type: none"> • Useful when there are problems with a particular subset of tasks, and the tasks can be simulated
Team facilitation training	<ul style="list-style-type: none"> • There are limitations is training resources

The issue of training strategies in emergency management is discussed in more detail in the section ‘EM Human Factors Training Approaches & Frameworks’.

Ramsussen (1997), in discussing the ‘safety space’ and the boundaries between safe and unsafe behaviour provides a clue as to how we can train for these sorts of situations. “Rather than striving to control behaviour by fighting deviations from a particular pre-planned path, the focus should be on the control of behaviour by making the boundaries explicit and known and by giving opportunities to develop coping skills at boundaries” (p.191). Much of the previous research about identifying boundaries in the fire domain has been framed in the context of decision-making. It is to this issue we now turn.

Developing Expertise in Decision-making

The history of decision-making can be mapped to show a growing realisation that humans are far from perfect in their approach and in the outcomes of the decisions that they make. We don’t evaluate all the alternatives, we don’t comprehensively measure their utility and we are subject to a range of biases that lead us into error. These errors usually seem completely plausible at the time the decision is made. The corollary of this statement is that our ability to approximate, more often than not, allows us to make decisions that are reasonably accurate, or at least avoid major consequences most of the time.

However, in high risk situations, being ‘reasonably correct’ can be problematic – and evidence of decision errors during major bushfire coordination events has been found in earlier studies of secondary source material in this project. This leads to several questions associated with the aims of this report. Can we train people to improve their decision-making during EM coordination events? What approach is best? How, if at all, should this be integrated with other training activities?

The Recognition-Primed Decision Making Model (RPD Model) was developed following observational research on fire-fighter decision-making (Klein, 1998). They noted that these commanders didn’t seem to ‘make decisions’ as such – they just acted. Underlying these actions was an intuitive approach to decision making that had developed in response to the uncertain, dynamic environment that is urban firefighting. The model actually has three variants:

1. If the situation is a routine one and familiar to the commander, the decision is intuitive and automatic.
2. If the situation is not straightforward, but is ambiguous and unfamiliar, the commander must actively work at generating an accurate assessment of the situation, but once they have that assessment the action to take becomes obvious.
3. If the commander recognises a situation, but retains a degree of uncertainty over the appropriate action, they will envision an appropriate course of action and use mental simulation to mentally ‘test’ its effectiveness.

Decision Skills Training

If we are to train people in some way to make better decisions when managing emergency events, how should this occur? Klein (1997) suggests that this does NOT involve teaching specific decision strategies. There is little empirical research to suggest that trainers can identify superior decision strategies that could be used under 'field conditions' (i.e. in the control centre). Instead Klein (1997) suggests we should consider two different strategies to improve the expertise of the decision-maker:

- Teaching people to 'think' like experts.
- Teaching people to 'learn' like experts.

Klein's earlier work in this area involved revision of the firefighting training manuals for the National Emergency Training Centre in Maryland USA. He notes that:

What the instructional manuals seemed to need the most was an explication of the critical cues and judgements, so that readers could learn how more experienced commanders saw the world, and could thereby make progress in thinking (and seeing) as an expert (Klein, 1997, p.347).

They identified the cues by working with an experienced retired commander and embedded the decision training within the existing course structure. There are, however problems with this approach. Identification of cues, patterns and associated strategies can be complex, teaching them can be labour intensive, those cues may not be exhaustive for all situations, especially in the dynamic environment of EM coordination. Such problems led Klein to consider whether we might be able to train people to 'learn' like experts. "We can provide tools for helping people gain expertise on their own, without trying to predefine the nature of that expertise" (1997, p.347).

TABLE 4: STRATEGIES FOR ACHIEVING EXPERTISE IN DECISION MAKING

Strategies for Achieving Expertise in Decision Making

Engaging in deliberate practice, so that each opportunity for practice has a goal and evaluation criteria

Using attentional control exercises to practice flexibility in scanning situations

Sampling alternative task strategies

Compiling an extensive experience bank

Obtaining accurate, diagnostic and reasonably timed feedback

Enriching experiences via review to derive lessons learnt and identify mistakes

Building mental models

Obtaining coaching

There is some evidence that the strategies identified by Klein (1997) (see TABLE 4) are already being implemented within the emergency management domain to a

greater or lesser degree. For example the various organisations that have initiated 'Lessons Learnt' processes in the Australian fire agency domain could be considered an approach for compiling an extensive experience bank while deriving lessons learnt/identifying mistakes. There is also support for human factors training provided by the Australasian Fire and Emergency Authorities Council (AFAC) that supports non-technical communication, decision-making and teamwork skills.

These issues will be examined in more detail in a subsequent deliverable that follows this report – *3.2.5: Report on evaluation of mental model training and strategies for change in practice.*

Thinking Critically and Practically

Critical thinking has been described as “active, persistent and careful consideration of a belief or supposed form of knowledge in light of the grounds which support it and the further conclusions for which it tends (Kiltz, 2009, p.9). This approach has been used in military environments to train naval officers (Klein, 1997). The typology of Probing Questions has been applied in domains such as higher education to improve critical thinking skills. It identifies five question types:

1. Clarification;
2. Assumptions;
3. Reasons and evidence;
4. Viewpoints or perspectives;
5. Implications and consequences.

Kiltz (2009) suggests that “I have found that this approach provides infinite opportunities for critical thinking” (p.14). Critical thinking can be aligned with the concept of 'Practical thinking' as applied in the [command and control] C2 environment of the U.S. military (Fallesen, 1996). Practical thinking is based on a number of propositions:

- Thinking skills can be improved
- Thinking is not always positively correlated with IQ
- Reasoning errors can be decreased
- Thinking is goal-directed and done in context
- Models of normative decision-making (where all alternatives are thoroughly evaluated and assessed for utility) and rules of formal logic are not very useful for improving practical thinking
- Recognise that not everyone thinks the same way, make people conscious of strengths, weaknesses of their personal thinking style

“Practical thinking was defined...to consist of the application of creative and critical thinking skills to reason and reach conclusions about 'everyday' situations and

problems” (Fallesen, 1996, p.36). The topics in this practical thinking course included the following elements:

- Critical thinking introduction, creative thinking
- Multiple perspectives (barriers to, and creativity, when to use)
- Metacognition (decision triage, crisis decision-making, reorganisation, the value of concepts)
- Hidden assumptions (what else, detailed exercising, managing unexpected events)
- Practical reasoning in the face of uncertainty
- Integrative thinking
- Visualisation & prediction
- Diagnostics (before and after testing)
- Review and assessment

See Appendix 1 for further descriptions of the types of questions that might be used to support Critical Thinking. Such a course/workshop would support the development in decision-making skills likely to be required above the Incident Management Team in out-of-scale events.

Developing Heuristics and Managing Biases in EM

It will be necessary to arm coordinators with effective ‘quick decision-tools’ that are cognisant of the emergency management (EM) environment. They must be able to be used dynamically, they must be relatively straightforward and they must support the development of shared mental models of the current situation and a prediction of future states (i.e. build situational awareness).

Biases (preferences for certain decision approaches) and heuristics (rules-of-thumb) are two characteristics of decision-making that impinge on EM and must be acknowledged in any enhanced training systems.

Since the work of Kahnemann et.al (1982) we have understood the existence of a range of biases when making decisions. People may suffer from a representative bias, for example, making generalisations from a small sample size. Wilson et.al., (2011) tested the prevalence of risk-based biases in 206 line officers and incident command personnel from the USDA Forest Service. They concluded that the participants exhibited biases such as:

- Loss aversion (choosing a safer option when the consequences of the choice were framed as a potential gain); and
- Discounting (choosing to discount short term over longer term risk in the belief that this longer term risk can be controlled).

Such biases do not necessarily lead to decision errors – choosing safer options and discounting short-term risks are not inherently incorrect decisions. However, biases are just that – a preference for a certain decision-result which can lead a decision-maker to ignore contradictory evidence. Biases tend to reduce a decision-makers' flexibility.

Heuristics (sometimes called rules-of-thumb) are strategies using readily accessible information to control problem solving. They are typically general in nature such that they can accommodate many situations, and rely on the notion that approximate action will be good enough. This is pertinent in situations that are dynamic, complex and uncertain – all characteristics of emergency management coordination.

The Zone of Coping Ugly (ZOCU)

The heuristic we have created is a response to Klein's suggestion that we teach people how to build mental models and practice flexibility in scanning a situation. It is also a recognition that managing emergency events is often about managing a system that is 'degraded' in many ways – through a lack of resources, or information or because of fatigue.

It also follows from the assertion that if you've been in this industry a while, you've seen some ugly situations. We've coined the phrase 'coping ugly' to build a heuristic that helps coordinators assess where they are with respect to an ideal or notional 'safe system', whether they are heading towards or away from that 'safe system' and what might be done under these circumstances. This is supported by our understanding of how experts often make decisions and the recognition that each situation only requires a certain level of precision. Take a \$1 coin for example – people do not need to remember the type or number of animals on the coin to use it – the necessary knowledge is imprecise.

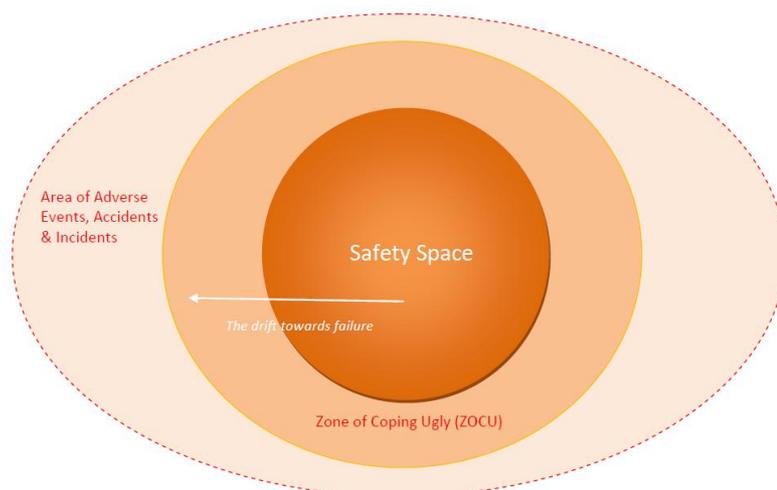


FIGURE 2: THE SAFETY SPACE AND THE ZONE OF COPING UGLY

Perhaps EM is similar:

An important attribute of expert decision-makers is that they seek a course of action that is workable, but not necessarily the best or optimal decision... time pressures often dictate that the situation be resolved as quickly as possible. Therefore it is not important for the course of action to be the best one; it only needs to be effective (Phillips, Klein & Sieck, 2004, p.305).

From a systems perspective, the 'Zone of Coping Ugly' also addresses the drift from safe to less safe performance to situations that may include accidents and incidents. These are the boundaries that Rasmussen (1997) talks about and approaching or crossing them indicates a need to adjust the coping strategies being used.

One of the most significant problems in thinking and decision-making for out-of-scale events is when people lose flexibility and creativity, and instead become anchored to a particular solution. This leads to the conclusion of the need for a 'playbook' of coping repertoires. Coping repertoires are groups of coping responses derived to deal with certain situations. They are our plans, as well as our Plan B's, C's, D's etc.... and plans that emerge organically in response to changing events. As Perlin and Schooler note (1978, p.14) "perhaps effective coping depends not only on what we do but also on how much we do".

Other Heuristics/Rules of Thumb Used in Emergency Management

'2-down-2-up': The Noetic Group (Murphy & Dunn, 2012) advocate for the use of this rule-of-thumb for senior leaders. They suggest that it is necessary for these leaders to visit/engage with subordinate leaders two levels below and consult with senior leaders two levels above, to assist with the identification of weak signals and to reduce ambiguity. Presumably this is also an action that will increase redundancy by providing another perspective on decisions at different levels of leadership.

S.M.E.A.C.S. is an acronym used in briefings to gain an overview of the emergency situation and also might be considered a rule-of-thumb for building a shared mental model of the operational domain.

Situation (Overview of the incident; current expected weather; behaviour; life and property at risk; resources deployed summary)

Mission (Incident Objectives – strategies, relevant tactics, assets to protect, tasking details)

Execution (Handovers, sectorisation, strategies and tactics, resources, timeframes, constraints)

Administration/Logistics (ICC location; operational control points, staging areas, water points, traffic, catering support, etc...)

Command/Communication (Incident Management Structure/roles, Communications Plan Strategic Telephone Numbers)

Safety (Weather Known/Anticipated Hazards; Watchout Situations; Safety equipment/PPE; Welfare – hydration/first aid)

In order to advocate for particular heuristics in the EM domain they need to be tested for their reliability and validity via training/exercising. This would create an evidence base that can then be fed into a Non-Technical Skill program following the three key stages of awareness raising, practice, and continual reinforcement.

Emergency Management Human Factors Training Approaches & Frameworks

Current Training Pathways

Public Sector Fire Safety Qualifications and AFAC Programs Framework

The core units contained within the Certificates II and III in Firefighting and Emergency Operations reflect the competencies required by firefighters involved in structural firefighting operations. The core units contained within the Certificates II and III in Firefighting Operations reflect the competencies required by firefighters involved in wildfire firefighting. The Certificate IV covers leadership and supervisory functions, while the Diploma and Advanced Diploma qualifications address management functions. Within the various levels of the Qualifications Framework are units relevant to training for effective emergency management coordination. A simple first question to ask might be whether there exists a viable training pathway for human factors-related concepts and competencies. By way of example, we might consider the training pathway associated with working in, leading and managing teams as illustrated in TABLE 5.

TABLE 5: TRAINING PATHWAY FOR WORKING IN, LEADING AND MANAGING TEAMS

<i>Certificate II</i>	
PUATEA001A	Work in a team
<i>Certificate IV</i>	
PUATEA003A	Lead, manage and develop teams
BSXFMI402A	Provide leadership in the workplace
<i>Diploma</i>	
PUAOPE005A	Manage a multi-team response
PUAOPE001A	Supervise response
PUAOPE004A	Conduct briefings/debriefings
PUAOPE005A	Manage a multi-team response
BSXFMI506A	Manage workplace information
PUAOPE007A	Command agency personnel within a multi-agency emergency response
PUACOM007A	Liaise with other organisations
<i>Advanced Diploma</i>	
PUAOPE008A	Coordinate resources within a multi agency emergency response
PUAMAN003A	Manage human resources
<i>Graduate Certificate*</i>	
S1	Foundations of Strategic Management
S3	Leadership and Organisational Change
<i>Graduate Diploma*</i>	
S1	Contemporary Leadership
S2	Executive Leadership Development

* As delivered by Australian Institute of Police Management

We might therefore suggest that if an individual had completed this 'pathway' that they would have an effective understanding of the theory and practice associated with managing teams. One issue might therefore be how many personnel working in leadership positions in coordination environments at regional and state centres have these qualifications. Are they mandatory? If not then it will be important to map different pathways in terms of the non-technical skills development discussed earlier.

Associated with this, we might ask how effective the training is translated into practice, the assessment of that practice and the relationship with agency training and exercising. It is therefore not enough to identify that training pathways exist to improve EM coordination. If the issue is the application of competencies during EM events, then the training needs to be considered within a broader framework.

In the discussion paper titled "*Professional development pathways for Protecting Fire Fighters, Human Factors and Emergency Management Leadership*" (Owen & Omodei, 2009), the authors consider education and training opportunities under the auspices of BCRC research utilisation from key projects on health research (Aisbett), decision-making (Omodei) and incident management teamwork (Owen). They note the apparent demand for professional development and informal courses in these areas.

In parallel with the above and assuming there is validation of a need for a formally recognised learning pathway to develop a cross-institutional collaborative development of emergency management/human factors coursework within a formal higher education pathway using an appropriate model. Models for consideration include the models similar to the National Forestry Masters program and/or utilising existing structures like those on offer through the Australian and New Zealand Schools of government (ANZSOG) (Owen & Omodei, 2009, p. 5).

AIIMS & Continuing Professional Development Training in Human Factors

For this report we performed a desk-top review of the AIIMS Training documentation (including Facilitator's Guide; Participant Workbook and PowerPoint presentations) for the modules listed in TABLE 6. The review indicates that a significant proportion of the fundamental human factors issues and skills are covered in these modules for activities at the IMT level.

TABLE 6: AIIMS TRAINING IN HUMAN FACTORS ISSUES

S2	Human Factors and Incident Management
S12	Incident Action Planning
S13	Communication
S14	Incident information
S15	More Thinking
S16	Leadership and Teamwork

For this material to translate to above the IMT it would need to include further layers of complexity (i.e. the concepts in the modules have been somewhat simplified to suit the target audience). Beyond this, however, it will be necessary to define how the functional differences of working above the IMT (i.e., in terms of complexity, strategic as opposed to operational) alter the type of skills and knowledge coordinators need. At present it is not possible to define this systematically, given the different ways different jurisdictions manage and organise above the IMT.

Our point here is to suggest there are pathways in human factors training that can be mapped and once the industry has a systematic approach to defining the work that occurs above the IMT level then it will be possible to align and further develop the non-technical skills associated with these roles.

The report *“Enhancing capability through human factors professional development”* was developed for the Bushfire CRC as a discussion document and identifies the scope of current Continuing Professional Development courses in this area plus a suite of intermediate and advanced courses currently not delivered but which would be integrated into a holistic approach to human factors training within the emergency management space. The proposal “is aimed at assisting agencies to build capacity in understanding those human factors that are currently believed to influence decision making and performance in emergency services contexts” (Krusel, N.D., p.2) and is outlined in the diagram below:

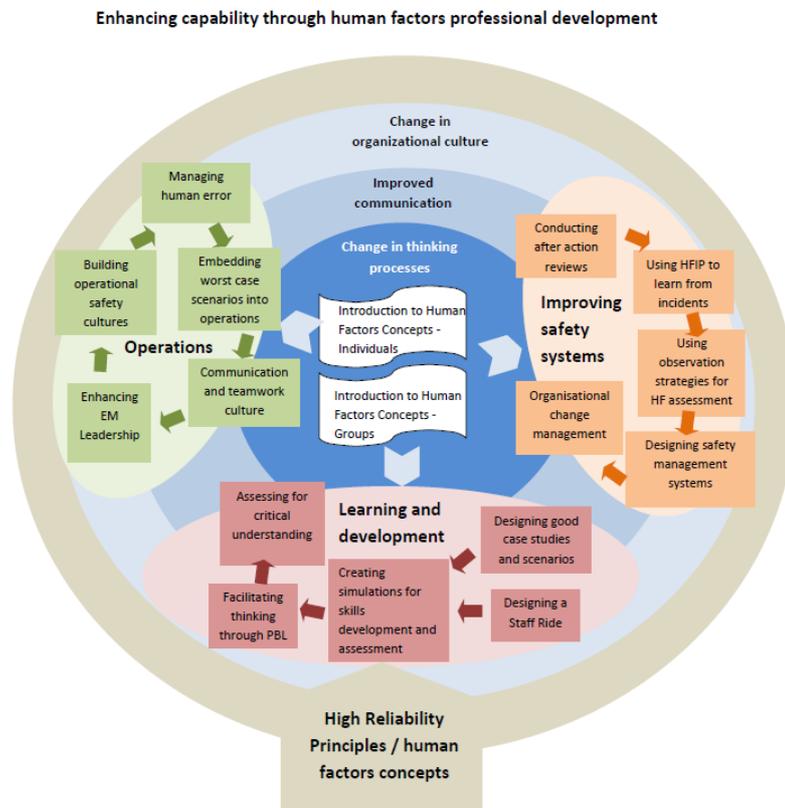


FIGURE 3: ENHANCING CAPABILITY THROUGH HUMAN FACTORS PROFESSIONAL DEVELOPMENT

The range of advanced workshops identified in this document, if implemented, would move agencies a significant distance towards accommodating human factors above the IMT. In particular the following workshops will be most beneficial for emergency managers working above the IMT:

Assessing for Critical Thinking and Understanding (This module will assist participants to identify and assess critical thinking and to be able to analyse levels of complex understanding)

Enhancing EM Leadership (This module will encourage participants to rethink traditional models of leadership and to identify their own leadership styles)

Communication and Teamwork (This module will address the implications of human factors concepts for incident management team processes and performance monitoring to assist in enhancing teamwork)

It may be possible to fold elements of these courses into a version of Crew Resource Management (CRM), or perhaps ECRM – Emergency Coordination Resource Management. There are some further activities within and beyond the current Bushfire CRC project that will need to be completed in order to underpin such a training product. Importantly the training will need to follow the three phases of Non-Technical Skill workshops outlined earlier – linking classroom/awareness raising with exercising and continual reinforcement of the concepts and associated skills.

An ECRM course is not, however, a complete training pathway for managers working above the IMT. A complete pathway links formal training and education with continual professional development and agency or multi-agency based training and exercising to allow individuals to “learn like experts”.

Recommended Future Activities to support Training Pathways

The following are some suggestions to move forward for the industry to consider should it wish to continue development of non-technical skills for personnel working at regional, state and national levels in emergency management:

- Complete future deliverables in the current project ‘*Organising for Effective Incident Management*’ related to training development.
- Can we actually teach non-experts to think like experts? Develop a longitudinal evaluation of training from this perspective.
- Support the structure of human factors training identified previously by the Bushfire CRC.
- Will tools such as ‘coping ugly’ (and the associated development of coping repertoires) actually help improve the effectiveness of emergency management coordination above the IMT?
- Build an Emergency Coordination Resource Management course.
- Assess training and exercising for the degree to which they ‘train at the edge of chaos’.

This report has discussed suggested resources for inclusion in non-technical skills training based on the research conducted thus far and articulated appropriate training pathways for personnel working above the IMT. The training review also identifies the following areas that can be strengthened to build capability in the industry:

- Integration gaps (effective linking of formal training pathways with exercising, assessment and role performance), including the three stages of non-technical skills training (awareness raising, practice and continual reinforcement).
- A need to review, assess and possibly develop new 'rules-of-thumb' or 'quick strategies' for coordination above the IMT to manage in this complex, dynamic and uncertain environment.
- A need to train 'at the edge of chaos' (Renaud, 2010) to be more effective when coordinating out-of-scale events.
- A need to design advanced courses on decision-making that acknowledge the literature on practical and critical thinking.
- Improved approaches to assessment.

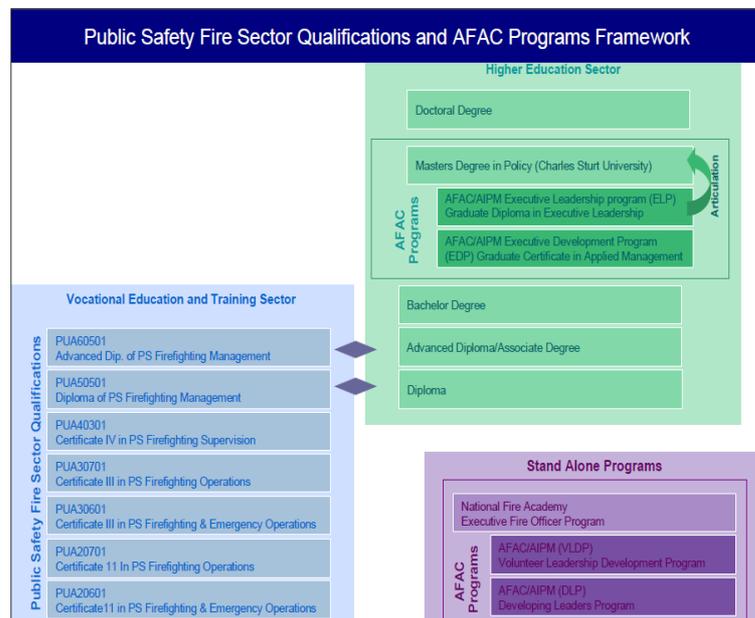
Appendix 1: Typology of Probing Questions

TABLE 3: Typology of Probing Questions

Questions that probe for:	Example Questions
Clarification	<p>Let me see if I understand you; do you mean ___ or ___?</p> <p>What do you think Mike means by his remark, Dee?</p> <p>How does this relate to our problem/discussion/issue?</p> <p>Jane, can you summarize in your own words what Richard said?</p> <p>Richard, is this what you meant?</p> <p>Would this be an example?</p> <p>Would you say more about that?</p> <p>How does ___ relate to ___?</p>
Assumptions	<p>What are you assuming?</p> <p>What is Jenny assuming?</p> <p>What could we assume instead?</p> <p>You seem to be assuming ___. Do I understand you correctly?</p> <p>All of your reasoning depends on the idea that ___. Could you have based your reasoning on ___ instead of ___?</p> <p>Is that always the case? Why do you think the assumption holds here?</p> <p>Why would someone make that assumption?</p>
Reasons and evidence	<p>What would be an example?</p> <p>Do you have any evidence for that?</p> <p>What other information do you need?</p> <p>What led you to that belief?</p> <p>How does that apply to this case?</p> <p>What would change your mind?</p> <p>Is there a reason to doubt that evidence?</p> <p>Who is in a position to know that is true?</p> <p>What would you say to someone who said that ___?</p> <p>What other evidence can support that view?</p>
Viewpoints or perspectives	<p>When you say ___, are you implying ___?</p> <p>But, if that happened, what else would happen as a result?</p> <p>Why?</p> <p>What effect would that have?</p> <p>Would that necessarily happen or only possibly/probably happen?</p> <p>What is an alternative?</p> <p>If ___ and ___ are the case, then what might also be true?</p>
Implications and consequences	<p>How can we find out?</p> <p>Can we break this question down at all?</p> <p>Is this question clear? Do we understand it?</p> <p>To answer this question, what other questions must we answer first?</p> <p>Why is this issue important?</p> <p>Is this the most important question, or is there an underlying question that is really the issue?</p>

Appendix 2: AFAC Framework & Public Sector Qualifications

Graduate Diploma of Executive Leadership (Policing and Emergency Services) (=AIPM601 plus AIPM701)							
AIPM 601 Graduate Certificate in Applied Management (Policing and Emergency Services)				AIPM 701			
NOTE: <ul style="list-style-type: none"> All four subjects of AIPM601 are core There are no elective subjects for the AIPM601 The Graduate Certificate is a qualification in its own right and also represents the first half of the Graduate Diploma of Executive Leadership (Policing and Emergency Services) (AIPM 701) 				NOTE: <ul style="list-style-type: none"> Students are expected to have completed AIPM 601 or equivalent before entering the Graduate Diploma. 			
AIPM 601 SUBJECTS				AIPM 701 SUBJECTS			
601 S1	601 S2	601 S3	601 S4	701 S1	701 S2	701 S3	701 S4
FOUNDATIONS OF STRATEGIC MANAGEMENT	STRATEGIC ANALYSIS & PLANNING	LEADERSHIP & ORGANISATIONAL CHANGE	CONTEMPORARY ISSUES IN PUBLIC SAFETY & EMERGENCY SERVICES	CONTEMPORARY LEADERSHIP	POWER, POLITICS AND POLICY DEVELOPMENT	EXECUTIVE LEADERSHIP DEVELOPMENT	STRATEGIC POLICY REVIEW
→				→			
601 S1 is a pre-requisite for 601 S2/S3	601 S2 & S3 are co-requisites and are pre-requisites for 601 S4			701 S1 is a pre-requisite for 701 S2	701 S2 is a pre-requisite for 701 S3	701 S3 is a pre-requisite for 701 S4	
Distance Mode	Residential Mode		Distance Mode	Distance Mode	Distance Mode	Residential Mode	Distance Mode
Credit Transfer available	No Credit Transfer/RPL available		Credit Transfer and RPL available	Credit Transfer available	Credit Transfer available	No Credit Transfer/RPL available	
Part Time 128 Hours	Full Time 256 Hours		Part Time 128 Hours	Part Time 128 Hours	Part Time 128 Hours	Full Time 128 Hours	Part Time 128 Hours
8 Credit Points	8 Credit Points	8 Credit Points	8 Credit Points	8 Credit Points	8 Credit Points	8 Credit Points	8 Credit Points
↑ ENTRY POINT 1				↑ ENTRY POINT 2		↓ EXIT POINT	



References

- Fallesen, J., Michel, R., Lussier, J., & Pounds, J. (1996). Practical Thinking: Innovation in Battle Command Instruction. Technical Report 1037. Alexandria, Virginia, U.S Army Research Institute
- Flin, R., O'Connor, P., Crichton, M. (2008) Safety at the Sharp End – A guide to Non-Technical Skills. Aldershot UK, Ashgate.
- Hayes, P. & Omodei, M. (2011). Managing emergencies: Key competencies for incident management teams. *The Australian and New Zealand Journal of Organizational Psychology*, 4, 1-10.
- Kahneman, D., Slovic, P., Tversky, A. (1982) *Judgement under uncertainty: heuristics and biases*. Oxford UK, Oxford University Press.
- Kiltz, L. (2009) Developing Critical Thinking Skills in Homeland Security and Emergency Management Courses. *Journal of Homeland Security and Emergency Management*, 6(1), 1-23.
- Klein, G. (1997). Developing Expertise in Decision Making. *Thinking & Reasoning*, 3(4), 337-352.
- Klein, G. (1998). Naturalistic Decision Making. *Human Factors*, 50(3), 456-460.
- Krusel, N. (n.d.) Enhancing capability through human factors professional development. Melbourne Australia, Bushfire CRC.
- McIntyre, R. & Salas, E. (1995) Measuring and managing for team performance: emerging principles from complex environments. Guzzo, R., Salas, E. & Associates (Eds), *Team Effectiveness and Decision Making in Organizations*. San Francisco, Jossey-Bass. pp 9-45.
- McLennan, J., Strickland, R., Omodei, M., & Suss, J. (2012) Wildfire safety-related decisions and actions: lessons from stress and performance research. IAWF Safety Summit, October 2012. Sydney, Australia. pp 1-12.
- Murphy, P., & Dunn, P. (2012) Senior Leadership in times of crisis. Deakin West, Australian Capital Territory, Noetic Group Ltd.
- Owen, C., and Omodei, M. (2009) Professional development pathways for Protecting Fire Fighters, Human Factors and Emergency Management Leadership – A discussion paper. Unpublished?
- Perlin, L., and Schooler, C. (1978). The structure of coping. *Journal of Health and Social Behaviour*, 19(1), 2-21.
- Pittenger, David J. (November 1993). "Measuring the MBTI...And Coming Up Short.". *Journal of Career Planning and Employment*, 54(1), 48–52.

- Phillips, J. K., Klein, G., & Sieck, W. R. (2004). Expertise in judgment and decision making: A case for training intuitive decision skills. In D. J. Koehler & N. Harvey (Eds.), *Blackwell Handbook of Judgment and Decision Making*. pp. 297-315.
- Rasmussen, J. (1997). Risk management in a dynamic society: a modelling problem. *Safety Science* 27(2/3), 183-213.
- Renaud, C. (2010). *Making Sense in the Edge of Chaos: A framework for effective initial response efforts to large scale incidents*. M.Arts Thesis. Monterey, CA: Naval Postgraduate School.
- Wilson, K. A., Salas, E., Priest, H. A., & Andrews, D. (2007). Errors in the heat of battle: Taking a closer look at shared cognition breakdowns through teamwork. *Human Factors*, 49, 243-256.