National Operational Guidance

Incident Command Project Literature Review

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Contents

1. Introduction

This review is a critique of a selection of literature that relates directly to fire service incident command and incorporates a comparison of critical incident management outcomes as recorded by other industries. The bibliography of literature that has been reviewed includes documents focused on the fire service, especially reports in relation to fires involving the deaths of fire-fighters and members of the public. But it has also included relevant legislation and health and safety documents.

The review is in two sections. The first is a summary of key foundation literature, e.g. legislation, and the second is a review of literature that highlights current FRS performance against the foundation literature and highlights any areas in need of development or enhancement. Overall, the review will summarise, evaluate and show the relationships between the different documents, and out of that analysis recommend a number of work packages for the incident command project to consider.

2. The Foundation Literature

There are several pieces of legislation that define the work of the Fire and Rescue Services (FRS).

The Fire and Rescue Services Act (2004) stipulates the core functions of the FRS. Respectively under Part 2, Sections 7,8, and 9 of the Act, FRSs must make provision for fire-fighting, road traffic accidents, and emergencies other than fire-fighting and road traffic accidents as conferred upon them by the Secretary of State for the Department of Communities and Local Government. Under Section 7(2)(d) FRSs may obtain information in order to support their operations. However, in order to effectively discharge their functions Section 13 permits FRSs to enter into reinforcement schemes with other FRSs to secure mutual assistance. This section together with Sections 9 (2), 10 (2) (Directions relating to particular fires and emergencies), 11 (2) (Power to respond to other eventualities), 12 (2) (Other services) all relate to the discharge of these functions outside of a FRS's area. This indicates the need for effective interoperability between FRSs to ensure quality of the service to the public does not deteriorate as a result of that service being provided wholly, or in part, by another FRS. Part 7, Section 58 of the Act defines the term 'emergency' as 'an event or situation that causes or is likely to cause – (a) one or more individuals to die, be seriously injured or become seriously injured, or (b) serious harm to the environment (including the life and health of plants and animals)' (Fire and Rescue Services Act, 2004, p 27).

The Civil Contingencies Act (2004) designates FRSs as 'Category One' responders and under Section 2 of the Act (Contingency Planning) it places a duty upon them to assess, plan and advise upon the risk of an emergency occurring and to make arrangements, so far as is reasonably practicable, to ensure it is able to carry out its functions in the event of an emergency occurring. However, the definition of an emergency differs from that within the Fire and Rescue Services Act (2004). Part 1 of the Civil Contingencies Act (2004) defines an emergency as,

'1(1) (a) an event or situation which threatens serious damage to human welfare in a place in the United Kingdom,

(b) an event or situation which threatens serious damage to the environment of a place in the United Kingdom, or

(c) war, or terrorism, which threatens serious damage to the security of the United Kingdom.' (Civil Contingencies Act, 2004, p 1)

Part 1 further defines the nature of human welfare as not only relating to the loss of life or illness or injury, but extends it to include: homelessness; property damage; disruption to essential resources such as food and water, or to communication systems, transport facilities, or health services. It also extends the definition of serious harm to the environment to include: land, water or air contamination by means of biological, chemical or radioactive matter; and plant or animal life that is destroyed or its natural cycle disrupted.

The legislative framework around FRSs places wide ranging operational responsibilities upon them along with a need to work together for the mutual benefit of each other's service delivery, or in the context of a significant emergency.

In a more general sense, the Health and Safety at Work Act (1974), Part 1, Section 2 (1), places a duty of care, so far as is reasonably practicable, upon FRSs for the health, safety and welfare of its employees. Section 2(2) specifies the extent of that duty which includes the provision of information; equipment and systems of work; training and supervision; the place of work; and the working environment. Section 3 (1) of the Act places a duty of care , so far as is reasonably practicable, upon FRSs for the health and safety of non-employees who may be affected by the performance of its activities. Section 7 places a duty on employees to take reasonable care of themselves and others. Section 33(1) (a) – (o) set out the list of offences in relation to the statutory provisions of the Act. These include a failure to discharge a duty of the Act or duties and or requirements imposed by regulations made under Section 15 of the Act. In order to enforce the provisions of the Act it establishes a Health and Safety Commission and Executive, the latter of which is responsible for establishing an inspectorate. Of particular interest to FRSs is Section 37 (1) which states that where an offence has been committed with the consent/connivance of a member of the body corporate, or the offence is attributable to neglect on the part of a member of the body corporate, the individual as well as the body corporate will be deemed guilty. In addition, Section 47 of the Act sets out the civil liability of employers and individuals and specifies that legal action may be taken in the event of a breach of a duty imposed by health and safety regulations that results in the death or injury of an individual(s).

A significant set of regulations made under the Health and Safety at Work Act (1974) are the Management of Health and Safety at Work Regulations (1999). Section 3 of these regulations places a requirement upon FRSs to conduct suitable and sufficient assessments of the risks to which their employees, or people affected by the performance of its activities, may be exposed, to identify the measures they may take to remove or mitigate the risk. Consequently, Section 5 of the regulations requires that FRS Authorities have in place appropriate health and safety arrangements for the planning, organisation, control, monitoring and review these control measures.

To support employers to meet their health and safety obligations, the Health and Safety Executive (HSE) issued guidance entitled, Successful Health and Safety Management, otherwise known as HSE65. In 2013 this document is going to change from the Policy, Organising, Planning, Measuring performance, Auditing and Review (POPMAR) model to a Plan, Do, Check Act approach that 'achieves a better balance between the systems and behavioural aspects of management' (HSG65, 2011, p 1). However, the document outlines best practice for health and safety management which includes:

- Effective health and safety policies, including a reference to organisations needing to 'understand how human factors affect health and safety performance' (HSG65, 2011, p 14); the importance of establishing positive health and safety culture; and total quality management (TQM) which is represented by the 'Plan-Do-Check-Act' approach (see appendix 1). A systematic approach is advocated to ensure that 'the practical considerations of health and safety policies are thought through to avoid conflict between the demands of policy and other operational requirements' (HSG65, 2011, p 17). The guidance then lists some disasters, including the Herald of Free Enterprise[1] and Piper Alpha[2], which it cites as 'examples of the effect of giving insufficient attention or weight to health and safety' (HSG65, 2011, p 17) as a consequence of management decisions that led to, for example, inadequate training resources, a failure to account for the effects of fatigue, and unrealistic timescales leading to individuals cutting corners. The guidance then stresses that 'Learning from experience is essential. In many serious accidents, previous incidents foreshadowed the potential for serious injury' (HSG65, 2011, p 17)

- The structures and processes within an organisation for implementing its health and safety policy and defines the relationships and responsibilities within it to promote a positive health and safety culture. Performance standards that follow the maxim 'what gets measured, gets done' are regarded as having a pivotal role in delivering efficient and effective risk control. Additionally, effective communication of information that comes into the organisation, within it, and from it to others, is essential as it is 'often seen as the single most important area requiring improvement' (HSG65, 2011, p 29)

- The planning systems for implementing health and safety policies that enable the control of risks via co-ordinated actions of the members of the organisation. 'Effective planning is concerned with prevention through identifying, eliminating and controlling hazards and risks' (HSG65, 2011, p 39). Robust management arrangements are necessary to organise, plan, control and monitor risk control systems, i.e. systems that ensure adequate workplace precautions are provided and maintained. A primary feature of controlling risks is the risk assessment process (see appendix 2), the outcomes of which contribute to decisions about priorities.

- The means to measure performance to maintain and improve performance. Two methods are advocated within HSG65: active and reactive systems. The former includes systems for monitoring the operation of management arrangements, risk control systems and workplace precautions. The latter refers to the monitoring of, for example, ill health, accidents, and incidents. Active monitoring systems 'gives an organisation feedback on its performance before an accident, incident, or ill health' (HSG65, 2011, p 59) and ostensibly such systems monitor compliance with objectives, plans, performance standards, etc. The feedback from such systems informs decisions about improvements to controlling risks and the management of health and safety. Consequently, organisations must determine the methods for monitoring at different levels within their management structure and HSG65 recommends that managers

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[1] Herald of Free Enterprise was a roll on-roll off ferry which capsized moments after leaving the Belgian port of Zeebrugge on the night of 6 March 1987, killing 193 passengers and crew.

[2] Piper Alpha was a North Sea oil drilling platform that exploded, caught fire and was destroyed on 6 July 1988, killing 167 men, with only 61 survivors.

ought to be given the responsibility for monitoring 'the achievement of objectives and compliance with standards for which they and their subordinates are responsible' (HSG65, 2011, p 59). Several methods of active monitoring are referred to, including auditing, 'Systematic direct observation of work and behaviour...' (HSG65, 2011, p 60), and reactive systems such as investigations that are triggered by an event and allow an organisation to review and report upon performance to learn from mistakes and improve. Importantly, HSG65 states that 'good investigations identify both immediate and underlying causes, including human factors' (HSG65, 2011, p 66) and it provides a framework for analysing accident and incident causation (see appendix 3).

- Auditing and reviewing performance to maintain and improve an organisation's ability to manage risks and learn from experience. HSG65 identifies the characteristics of effective health and safety auditing as being carried out by a competent individual who is independent of the area being audited; and one that assess policy, organisation, planning and implementation, and measuring and review systems. When reviewing performance an organisation may 'benchmark' their performance against other, similar organisations by comparing accidents rates, management practices and techniques.

The Fire and Rescue Service Manual, volume II, Fire Service Operations, Incident Command sets out the 'command doctrine' of the FRS, i.e. its set of principles and values in relation to incident command. The doctrine focuses on the incident command system (ICS), leadership, decision making, organisation, risk management, and command competence. Leadership is quantified by the England and Wales FRS model for leadership called 'Aspire' (see appendix 4). It is organised to incorporate the core values of the FRS, the personal qualities and attributes (PQA) for each role, leadership capacities, and leadership domains. Leadership is definitively linked to the command and control of incidents and sits within the 'operational' domain.

The doctrinal chapter sets out the key areas of the ICS as comprising of:

- A systematic approach to the organisation of resources on the incident ground;

- A focus on incident risk management, which states that before deciding the tactics of an incident a risk assessment must be done and all relevant control measures implemented ahead of crews being committed into a risk area; and

- The importance of command competence, i.e. the acquisition and maintenance of the skills, knowledge and understanding needed by an incident commander.

It also describes some common characteristics of a critical incident that reflect the incident command environment. These are, time pressures, complexity, moral pressures, having a duty of care, and retrospective scrutiny.

The incident command policy framework advocated conforms to the five key elements of that contained within the existing HSG65 based on POPMAR and clearly links the ICS to the management of risk:

- An incident command policy based on the ICS described in the manual provides for a consistent approach to command that enables interoperability between FRSs.

- A management structure and arrangements need to be in place to deliver the policies.

- A systematic approach to planning and implementing the policies that incorporates risk assessment is advocated to minimise the risks.

- The establishment of performance standards to enable active self-monitoring to identify any under-performance in the management system by 'looking at equipment, processes and individual behaviour/performance' (Fire and Rescue Service Manual, Incident Command, 2008, p 12). In addition reactive monitoring of incidents will highlight the immediate and underlying causes of under-performance, which may be fed back into reviews of the management system.

- Audits and reviews of FRS performance ought to include lessons learned internally and a comparison with the performance and best practice of external organisations.

The role of the incident commander includes a reference to leadership that reinforces good communications, especially when handing over command and when doing so to ensure that there is not a period of critical decision making 'down time'. The key elements of the leadership role incorporate shared situational awareness, effective communications, planning and prioritising, providing direction, and resource management. The incident commander is 'principally concerned with the tactical co-ordination of tasks in progress, which will be based on approved operational objectives' (Fire and Rescue Service Manual, Incident Command, 2008).

Where an incident attended by the fire service involves a number of different agencies, e.g. the Police Service, Local Authority and NHS Ambulance Service, a common terminology and set of responsibilities is adopted by those in attendance to describe the level of command individual agency members are performing. Within a multi-agency structure there are three tiers of command: Bronze, Silver and Gold.

Bronze is termed the 'operational' level of command, which refers to the initial incident command conducted by the first officer to arrive on scene, or once a Silver Commander has taken over, the roles of members within her command team, e.g. Sector Commanders.

The Silver Commander operates at a tactical level of command and she has the role of managing the incident overall and planning and coordinating with other agencies to ensure the incident is resolved efficiently and safely. Consequently, a Silver Commander's leadership may extend into the other leadership domains, e.g. political (see appendix 4). A particular function of the Silver Commander is to consider the recovery phase of an incident, i.e. to manage the return of the scene to normal. Both the fire service Bronze and Silver level commanders will be based at the scene of operations, although in some cases, such as riots, the Silver Commander may base herself at an optimum location. Silver Commanders may be supported by FRS specialist advisors who have detailed knowledge and understanding on specific operations, e.g. Urban Search and Rescue Advisors provide advice on incidents involving collapsed structures and the equipment and techniques used by the specially trained rescue teams (see below).

Gold Commanders operate at a strategic level and consequently are not necessary for most incidents, which normally only require operational and tactical levels of command. However, if a single incident goes beyond the capacity or authority of a tactical level commander, or if there is a need to coordinate resources across more than one incident, then a Gold Commander is required. Gold level command is normally only exercised at multi-agency incidents such as major incidents, large scale civil disorder, or wide area flooding. A Gold Commander will not direct operations on the ground so are located remotely from an incident. They will support a Silver Commander at the scene by dealing with a number of issues, which include

- Manage political considerations and decide upon policy matters

- Manage FRS resources overall and prioritise demands from a number of Silver Commanders

- Ensure clear lines of communications

- Determine strategic objectives

- Plan beyond the immediate response phase for recovery and return to normality.

Where a major incident places considerable demands on multi-agency resources and disrupts the day to day functioning of the organisations with potentially long-term implications, a Strategic Co-ordinating Group (SCG) may need to be established to manage these issues. Furthermore, if the scale and impact of an incident warrants it, a Regional Civil Contingencies Committee may need to be established. The members of such groups come from all the relevant agencies and have the authority to make executive decisions.

Command competence within the manual is defined by the relevant national occupational standards (NOS), for example, EFSM 2 (see appendix 5) for managers operating at a Silver, or tactical level. Chapter 5 is dedicated to this key element of the ICS and basically describes the terms used within the NOS, e.g. a Unit, Element, Performance Criteria, etc. The knowledge and understanding that is described for an incident commander references technical knowledge in relation to, for example, building construction, the effect of fire upon a structure, the capabilities of resources, and also the political, social and environmental implications an incident may have. There is one small reference to personal qualities and attributes (PQA) and none at all to the FRS behaviourally anchored rating system (BARS). Both of these are used to assess performance at FRS assessment and development centres, e.g. for middle managers, and include, for example, situation awareness which is a fundamental element of decision making and dynamic risk assessment.

Incident management decision making makes reference to the complex processes associated with incident command and references a decision making model (see appendix 6) which is explained in detail in appendix 4 and describes it as a means to undertake a dynamic risk assessment. In particular, the cognitive and emotional processes which are highlighted in appendix 3 of the manual. It is recognised that understanding such psychological processes will help incident commanders 'in dealing with ones own reactions to challenging situations as they arise' (Fire and Rescue Service Manual, Incident Command, 2008, p 17). However, 'such a description of the cognitive processes is not a tool…to practically assist commanders in the discharge of their responsibilities' (Fire and Rescue Service Manual, Incident Command, 2008, p 17). Appendix 3 is entitled 'The Psychology of Command' and focuses predominantly on decision making and decision making styles, but also briefly refers to the causes and impact of stress on commander's decision making and leadership styles. The decision making strategy that is advocated is recognition primed decision making (RPD). RPD represents a very fast, intuitive process incident commanders undertake when making decisions in rapidly changing environments. It does not involve generating options, but based on the recognition of environmental cues it generates a workable solution rather than an optimal one. There are three levels of RPDM: level 1 the simple, level 2 diagnose the situation, and level 3 evaluate course of action (see appendix 7). Other decision making styles are highlighted, e.g. creative problem solving and analytical, which are time consuming processes and involve large amounts of information so are vulnerable to stress, distraction and interference when being performed in a dynamic situation. It also notes crew resource management training practised

in other industries and its focus on non-technical skills such as 'leadership, situation awareness, decision making, team climate and communication' (Fire and Rescue Service Manual, Incident Command, 2008, p 117). Begrudgingly, it notes that 'fire officers who have studied this particular type of human factors training have argued that it has clear applications for the fire service' (Fire and Rescue Service Manual, Incident Command, 2008, p 117).

Chapter two deals exclusively with the organisation of resources on the incident ground and details the incident commander role and responsibilities at operational, tactical, and strategic levels. It outlines the management structure a commander may superimpose upon an incident and quantifies some of the roles and responsibilities that may form part of a command structure (see appendix 8), e.g. sector commander and operations commander. Functional roles, e.g. water sector commander and BA main control sector commander, are also referred to, but not detailed in terms of their role and responsibilities. Command support 'should be introduced at all incidents to assist the incident commander…[and]…a suitably experienced member of personnel should be nominated as Command Support…[which]…may be a firefighter is the early stages of an incident…[with]…the task being delegated to a suitably trained and experienced officer as an incident develops' (Fire and Rescue Service Manual, Incident Command, 2008, p 33). The responsibilities of Command Support include:

- To act a s a point of contact for attending staff

- Operate and monitor radio communications

- Maintain records of risk assessments and decisions

- Record incident information, e.g. resource disposition, command structure, etc.

- Liaison with other agencies

- Liaison with crews of specialist units, e.g. BA Main Control, Urban Search and Rescue, etc.

The chapter also covers communication, including briefing. Briefing is recorded as being 'essential' and 'crucial' to effective communications, but does not explicitly explain why this is the case. In contrast, the reasons for 'debriefing' are clearly detailed and linked to the improvement of performance and post incident scrutiny such as Public Enquiries. FRS Post incident considerations are also referenced and include fire safety, fire investigation, accident investigation, and litigation.

Chapter three deals with 'Command within the UK Resilience Framework'. Resilience in FRS terms is the additional capacity within the FRS to deal safely and effectively with major incidents. The additional capacity makes provision for the following:

- A link to national Government and Government Departments via the Government Offices of the Regions who assist Gold Commanders by:
  - Updating the Cabinet Office Briefing Room (COBR);
  - Ensuring COBR take account of local interests and that Government interests are considered at the incident; and
  - Ensuring effective communication flows between the incident and COBR.

- A set of specialist advisors for incident commanders

- A FRS National Co-ordination Centre (FRSNCC) to mobilise and coordinate the national assets

- Specialist vehicles and equipment for use at significant, large-scale incidents

- Special provisions have been developed to successfully integrate them with local FRS resources. The special provisions include:

  o A 'Convoy Procedure' to manage the movement of a large number of vehicles over long distances;

  o A 'Strategic Holding Area' close to the scene of operations for the vehicles to be held in prior to being deployed to it; and

  o 'Enhanced Command Support', which is utilised to support the existing command structure and to control and co-ordinate the vehicles.

In addition 'during incidents where a FRS has made the request for national support or proactively on receipt of such information which identifies a possible threat to critical infrastructure or major emergency, the Communities and Local Government Emergency Room (Fire and Rescue) will be actively involved in the co-ordination of resources' (Fire and Rescue Service Manual, Incident Command, 2008, p 61) Once activated it is considered the centre of the advisory and co-ordination framework. The Communities and Local Government Emergency Room (Fire and Rescue) has seven principal roles:

- The provision of advice to government departments and minister;

- A hub for the collation and distribution of FRS-related information with regard to FRS activity at significant national events;

- Linking with Regional Resilience Teams;

- Co-ordinating cross-government and international support for the ICS;

- Providing cross-government and Fire and Resilience Directorate (FRD) strategic advice to FRSNCC, the National Strategic Advisor Team (NSAT), and the Gold Commander;

- Liaison with FRSNCC and operational commanders regarding incident progress; and

- Assist the co-ordination of overseas deployments and reception of teams from overseas.

The risk management of incidents covered in chapter four of the manual. It sets out the moral, economic and legal reasons for the management of health and safety and defines the terms associated with risk assessment. It signifies three distinctive levels of health and safety management:

- Strategic management that establishes health and safety policy, priorities, resources and a safety culture;

- Systematic management that is conducted by discrete departments who are responsible for the risk assessment of likely hazards at various types of operational incident for others to act upon and implement the control measures; and

- Dynamic risk management carried out by all personnel at an incident. The main responsibility for this lies with the incident commander whose professional judgement must be utilised to ensure safe systems of work.

The latter is achieved by gathering all available information from a wide range of resources, e.g. electronic data, other agencies, occupiers, etc. and the incident commander applying her professional judgement in conjunction with standard operating procedures (SOP) 'to decide the most appropriate course of action, weighting the benefits of proceeding with a task against the benefits likely to be gained' responsibilities' (Fire and Rescue Service Manual, Incident Command, 2008, p 64). Where the decision involves an occasion when a rapid intervention is required to effect a rescue, the incident commander must ensure that personnel are not put at an unnecessary risk by undertaking work outside of agreed safety procedures and may decide to 'adopt to a defensive approach until further information has been gathered' (Fire and Rescue Service Manual, Incident Command, 2008, p 64). That is an example of the 'default to defensive' tactic adopted by incident commanders the risk is deemed excessive. The FRS Operational Risk Philosophy is thus represented by the following statement:

> '...in a highly calculated way, firefighters:

> - will take some risk to save saveable lives

> - may take some risk to save saveable property

> - will not take any risk at all to try to save lives or property that are already lost' (Fire and Rescue Service Manual, Incident Command, 2008, p 65)

The operational procedures and practices within the FRS aim to promote safe systems of work. These are to be supported by team working and safety briefings. The chapter describes generic, dynamic and analytical risk assessment. Generic risk assessment refers to risk assessments that 'all commanders should be aware of when formulating operational plans' (Fire and Rescue Service Manual, Incident Command, 2008, p 67). Currently there are thirty-three such risk assessments[3]. Dynamic risk assessment (see appendix 9) refers to 'the continuing assessment of risk that is carried out in a rapidly changing environment at incidents...[and]...the outcome...is the declaration of a tactical mode' (Fire and Rescue Service Manual, Incident Command, 2008, p 67). There is an acknowledgement that actions such as rescues may have to be taken when all information is not known, but even in such circumstances the incident commander must conduct a risk assessment and implement control measures to reduce the level of risk to an acceptable level before committing crews into a hazard area. The dynamic risk assessment (DRA) forms the basis of an analytical risk assessment (ARA) which is carried out due to the changing nature of the operational environment. The ARA is reviews the outcome of the DRA to ensure it is accurate and where necessary leads to the introduction of new control measures. It is recorded and kept constantly under review throughout the incident. In this sense it appears to replicate the DRA

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[3] As listed on the GOV.UK website on the 28th September 2013

and does form the basis of 'future or on-going DRA', however, it differs in that it forms a detailed record available for debrief or audit purposes. (Fire and Rescue Service Manual, Incident Command, 2008, p 80).

There are three different types of tactical mode: Offensive, Defensive and Transitional. The decisions to determine a tactical mode are based on RPD (see above) and the risk appetite of the incident commander, i.e. the degree to which the incident commander is prepared to take a risk compared to the adverse impact from an event. When a DRA declares an Offensive tactical mode operational activities are carried out inside the perceived hazard area. A Defensive tactical mode means that those activities are conducted outside of the perceived hazard area. A Transitional tactical mode is declared when both Offensive and Defensive tactics are being undertaken at the same time, but in different sectors. The Transitional mode does not represent a tactical mode, but is an indication to firefighters that 'their actions may affect the safety of teams working in a different Tactical Mode in other sectors' (Fire and Rescue Service Manual, Incident Command, 2008, p 72).

The role of the safety officer, or safety sector commander to which it is also referred, is described. The person performing the role 'should be suitably qualified and of appropriate experience' (Fire and Rescue Service Manual, Incident Command, 2008, p 81). A safety officer's responsibilities include:

- Hazard identification;

- Safety officer liaison;

- ARA;

- Acting as an extra set of eyes and ears for sector commanders; and

- IC and/or operations commander liaison.

The Civil Contingencies Act (2004) was accompanied by a non-statutory guidance document entitled, Emergency Response and Recovery. This document refers to Integrated Emergency Management (IEM), which is 'an holistic approach to preventing and managing emergencies' (Emergency Response and Recovery, 2010, p 4). The approach embraces six key steps of which two are response and recovery and the preparation that is advocated for them concentrates on the consequences and broader impacts of events rather than what caused them. The response and recovery arrangements need to be flexible and fashioned to reflect the circumstances of the incident, but they follow a set of eight guiding principles:

- Anticipation: the on-going risk identification process, including during the incident where it is recognised it becomes dynamic.

- Preparedness: each organisation has a clear function and is prepared to perform it when required.

- Subsidiarity: decisions should be taken at the lowest appropriate level, with co-ordination at the highest necessary level, e.g. central and local government.

- Direction: provided via an agreed set of strategic aims and objectives.

- Information: acknowledged as critical to emergency response and recovery and must be supported by appropriate and effective information management systems which support single and multi-agency decision making and build situation awareness and a common recognised information picture (CRIP).

- Integration: there must be effective co-ordination between and within organisations at all levels utilising clearly defined structures to enable organisations to combine and act coherently, consult and decide upon key issues, and 'issue instructions, policies and guidance to which emergency partners will conform' (Emergency Response and Recovery, 2010, p 13).

- Co-operation: positive engagement based on mutual trust and information sharing between all organisations at all levels.

- Continuity: the emergency response and recovery should be based on existing organisational functions and familiar ways of working, consequently the role of the FRS is to rescue people, extinguish fires, deal with released hazardous materials, assist other agencies to remove flood water, assist the ambulance services to handle casualties, assist the police to recover bodies and undertake mass decontamination on behalf of the NHS.

With regards to an emergency response the document endorses the Bronze, Silver and Gold Commander roles (see above) to act respectively at the operational, tactical and strategic levels. In relation to multi-local resilience forums (multi-LRF) it sets out the current working arrangements[4] to enable central and local government to liaise with and support SCGs (see below).

To summarise, the key issues within the foundation literature are:

Command Support:

- Command support is essential to the successful management of an incident, with Enhanced Command Support being brought into play at major, wide area incidents requiring regional or national support. The staff that facilitate command support are referred to as being qualified to do so.

Communication:

- The FRS incident command manual focuses on the network to be established by the incident commander, i.e. radio channels and who to be in communication with. Briefing is recorded as being 'essential' and 'crucial' to effective communications, but the manual does not explicitly explain why this is the case. In contrast, the reasons for 'debriefing' are clearly detailed and linked to the improvement of performance and post incident scrutiny such as Public Enquiries.

Competence:

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[4] Note that a revised version of this document in 2010 introduced the DCLG Resilience and Emergencies Division (RED) to provide the Government liaison function on resilience issues below the national level replacing the Government Offices in the Regions.

- Command competence is highlighted within the FRS Incident Command manual and based on the NOS. However, there is little attention paid to the personal qualities and attributes (PQA) established by FRS for all levels and no reference to the behaviourally anchored rating system (BARS) utilised by the FRS for in their assessment development centres (ADC). Both PQAs and BARS, for example in relation to middle managers, include situation awareness which is a key feature of decision making and dynamic risk assessment and so safety management.

Decision making:

- Influenced by DRA with an emphasis in an appendix of the FRS Incident Command manual on RPD, a fast decision making process that does not involve the creation and comparison of options. There are references to other decision making styles set out in a table including analytical and thus slower decision making styles, as well as the impact of stress upon decision making. Yet decision making, the different styles, and the issues that affect them such as stress are not in the forefront of the FRS Incident Command manual.

- The relationship between decision making, DRA, SOPs and the use of professional judgement is quantified. The FRS Incident Command manual states that professional judgement is exercised by gathering all available information from a wide range of resources which permits the incident commander to apply her professional judgement in conjunction with standard operating procedures (SOP) to decide the most appropriate course of action striking a balance between the benefits of proceeding with a task against the risks to personnel.

Functional Roles:

- The lack of clear definitions of the role and responsibilities of all functional support roles, e.g. command support officer, marshalling officer, water officer, BA main control officer, etc. compared to that included in the FRS Incident Command manual for sector commander, operations commander safety officer. There are also no clear definitions of the roles and responsibilities of the specialist advisor roles in relation to FRS resilience, e.g. mass decontamination officer, urban search and rescue advisor, etc.

Health and Safety:

- It is clear that the duty of care upon FRSs for the health, safety and welfare of their personnel and those affected by the carrying out of their operations by the Health and Safety at Work Act 1974 along with that placed upon employees is reflected in the FRS documentation.

- Likewise the risk assessment approach required by the Management of Health and Safety at Work Regulations 1999. The suitable and sufficient assessments of risk to which their employees, or people affected by the performance of its activities may be exposed, identify the measures to be taken to remove or mitigate the risk. Additionally, the Regulations require management arrangements are in place for the planning, organisation, control, monitoring and review these control measures.

- The influence of HSG65 'Successful Health and Safety Management' is clearly visible within the command doctrine of the FRSs as described within the FRS manual on Incident Command. However, it also emphasises:

  o the importance of a positive safety culture;

  o human factors;

  o total quality management;

  o a systematic approach to control risks to get the balance right between the demands of policy and operational requirements; and

  o the importance of learning from experience, including via feedback from active and reactive monitoring where supervisors directly monitor work and behaviour and accident investigations identify immediate and underlying causes, including human factors.

It is worthy of note that the health and safety guidance explicitly refers to human factors, whilst the FRS literature does not, except to say in an appendix to the Incident Command manual, that those who have studied them and their associated training think they are beneficial.

Interoperability:

- The need for effective interoperability between agencies attending a major or large scale incident, and between FRSs at all levels of command. This is made clear within the Fire Services Act 2004 and the Civil Contingencies Act 2004 and in the accompanying non-statutory guidance on 'Response and Recovery'. The Incident Command manual provides details of the levels of command (Bronze, Silver and Gold Commanders) and their associated responsibilities.

Leadership:

- The focus on leadership is concentrated in the FRS Incident Command manual, including the reference to the 'Aspire' leadership model of the England and Wales FRSs and a brief description of the elements of leadership within the incident commander's role. However, overall, it is not as prominent as one would expect for a service whose philosophy advocates that firefighters *will* take some risk to save saveable lives, and whose Gold Commanders are expected to set strategic priorities and objectives for the FRS at incidents affecting a region, or even an incident with national consequences. Clear leadership is also required to promote a positive safety culture advocated by the HSE.

Risk management:

- The importance of DRA, i.e. the continuing assessment of risk that is carried out in a rapidly changing environment, in relation to decision making and the implementation of safe systems of work in accordance with the declared tactical mode is set out in the Incident Command manual. It clearly states that no personnel should be committed to

a risk area until a risk assessment has been completed and all control measures are in place, including when rescues need to be made when not all information may be known.

- A link is established between ARAs and DRAs where the former confirms the latter and influences DRA when new risks are quantified.

3. Recent FRS and Related Literature

On February 2nd 2005 three people died in a fire at Harrow Court in Stevenage, Hertfordshire. They were Firefighters Jeffery Wornham and Michael Miller and Ms Natalie Close. The recommendations for Hertfordshire FRS within the report with regards to supervision and command included:

- 'The ICS dynamic risk assessment ...approach should be part of the...system for managing risk...

- ...a robust system of performance management and review to fully comply with Reg. 5(1) of the 'Management of Health and Safety at Work Regulations 1999 which states ' every employer shall make effective arrangements for ... monitoring and reviewing preventative and protective measures'...

- ...use of the Integrated Personal Development System (IPDS) and current National Occupational Standards (NOS) should be integrated into officer ICS training to ensure the training provided is fully matched to the role...

- ...as part of the IPDS process individual operational performance should be tested, measured and recorded to ensure personnel are fully prepared and remain competent for their respective role...

- ...Officers with operational responsibility should be subjected to and tested on ICS to ensure that they have the correct knowledge and skills to implement the safe systems of work required...

- ...SIS document OPS 1/020 should be reviewed to summarise and specify generic ICS actions to be taken during the early stages of an incident including:

    o On arrival...crews must not self-deploy...until fully briefed...

    o ...effective briefing of crews following Dynamic Risk Assessment...should include individual and team goals, the allocation of responsibilities and the safety measures and procedures to be implemented...

    o ...correct and effective delegation of radio communications, including allocation of channels...

    o ...where there is any doubt as to the control measures...default to Defensive mode...

    o ...senior officers must make it clear when they are assuming command and relay this message to Control...

- ...initial training and development should be carried out using operational scenarios with a variety of training methods including:

o Knowledge & understanding...

o ...realistic training...

o ...exposure to incidents and debriefs...

- ...research should be instigated to determine the appropriateness of the current design...[of the Incident Command Board]...and associated procedure' (Hertfordshire FRS, 2007, p 40 – 42).

The report also makes a national recommendation in relation to the national assessment and promotion procedure, which does not test an individual's command abilities '...the Service should consider the impact not testing in command, which is a risk critical skill, has had on the operational competency testing prior to promotion...' (Hertfordshire FRS, 2007, p 47)

On July 7th 2005 London experienced a co-ordinated series of bombings affecting its transport infrastructure, in particular the London Underground system. Fifty-two members of the public were killed as a result of four bombings. In the Coroner's Rule 43 report the Rt. Hon. Lady Justice Hallet DBE highlighted that the initial crews were confronted with challenges regarding information gathering because of the location of the incidents, i.e. below ground in railway tunnels; limited communications because of the location of the incidents; and the resultant widespread disruption causing the number of incoming calls to overwhelm Control radio operators and congest radio and telephone communications. The Coroner also reports that there was inadequate information sharing between the emergency services and Transport for London's (TfL) London Underground control room (Network Control Centre). There were three significant contributory factors. First, over-reliance by TfL on the British Transport Police (BTP) to act as liaison with the other emergency services, e.g. the London Fire Brigade (LFB) log recorded a suspected bomb at 09:03 hours, whereas it was not until 09:40 hours that Network Control Centre became certain the incidents were terrorist related. Second, no representative of London Underground was at the 10:30 hours Gold (strategic command) meeting as they were not informed it was taking place. Third, CentreComm, TfL's control room for London Buses Ltd, was not aware until 09:53 hours, after the bus explosion, that the underground incidents were terrorist related.

The Coroner reports that the LFB's mobilising system performed unevenly with regards to the despatch of resources due to its addressing component, and a misunderstanding in a conversation between the London Underground Network Control Centre and the LFB resulted in an incorrect mobilisation of resources to Euston Square rather than Kings Cross. This led to a delay in the appropriate level of resources arriving at Kings Cross. In addition, 'a combination of human and computer error also contributed to delays in deployment of LFB resources to Edgware Road' (London Bombings Rule 43 Report, 2011, p 30).

Another major factor reported upon was the restricted radio communications due to the location of the incidents that inhibited the emergency services operations. First, there were limited means of communicating in the tunnels. Second, while London Underground, LFB and BTP had radios that worked in sub-surface railway stations, the coverage only extended to the platforms. Third, the Metropolitan Police Service (MPS), London Ambulance Service (LAS) and the City of London Police (COLP) did not have radios that worked below ground. Fourth, the emergency services radios and the London Underground radios were not interoperable. Overall, the communication problems made it extremely difficult to gather and share information between agencies at the scenes and from the scenes to control rooms. Consequently, it impeded effective management of the scenes.

The Coroner makes a number of recommendations to the emergency services in her report. First, to review the provision of inter-agency major incident training, with particular reference to the London Underground system. In support of this recommendation the Coroner states the following:

- '…some basic misunderstandings between the emergency services as to their respective roles and operations…

- …evidence of substantial confusion at all four bomb scenes…At Aldgate it was not clear to the LFB which of their staff considered themselves to be the initial incident commander…

- …differences in the way in which each emergency responder endeavoured to address common issues…

- …At Kings Cross…there was…a lack of communication between incident commanders on the surface and those in the tunnel,…lack of proper contact between Kings Cross and Russell Square stations…

- …[the lack of communications]…is not a new problem. Following the Kings Cross fire of 18th November 1987, Desmond Fennell QC…recommended…that 'the emergency services shall review the exchange of information between themselves and London Underground during an incident, both at their controls and at the site… (London Bombings Rule 43 Report, 2011, p 37 - 38).

Second, with regards to the use of plain English the Coroner is critical of the use of complex acronyms and unnecessary jargon with procedures and plans as they impede communication and undermine understanding of the roles and intentions of members of the other emergency services, and so adversely impact upon the coordination of effort.

Third, with regards to the declaration of a major incident by emergency services. Whilst there was clear evidence that each emergency service did have procedures in place to inform other agencies of their declaration of a major incident, there were delays and confusion about further declarations and in some cases whether a major incident had even been declared. In particular this affected London Underground's response as they 'had not been sufficiently in the loop for the emergency services' (London Bombings Rule 43 Report, 2011, p 41).

Fourthly, the Coroner comments on LFB operational discretion. Initially she sets out the dilemma faced by the initial crews at Kings Cross and Aldgate, who for different reasons had to wait several tens of minutes before initiating operations. The coroner quantifies their dilemma as '…the need to balance the understandable and human urge to get involved in a rescue mission against a proper assessment of the risks involved. In light of the protocols on the use of breathing apparatus and the practical reality that a single first attending crew will never be able to deploy underground where there is a risk of fire until further resources arrive, questions were raised as to whether, in striking that balance, fire-fighters are permitted a sufficient degree of individual discretion' (London Bombings Rule 43 Report, 2011, p 49). The Coroner provides the answer to this dilemma by advocating the use of DRA as a means to use judgement and common sense and also enabling 'protocols to be approached with a degree of flexibility, without putting fire crews unnecessarily at risk' (London Bombings Rule 43 Report, 2011, p 50).

On the 3rd December 2006 there was a fire and explosion involving fireworks at Marlie Farm, Ringmer, East Sussex. The explosion killed Watch Manager Geoff Wicker and Mr Brian Wembridge of the East Sussex FRS Service Headquarters and injured thirteen other people: nine FRS personnel, two police officers and two members of the public. The East Sussex FRS investigation made a total of 82 recommendations. The following are those that relate to incident command:

- '...review how risk information is stored and shared within the Service and introduce and process for regular review and update...

- ...instigate a formal procedure for the sharing of information of risk/safety information between emergency services and services at incidents...[including]...risk critical information...

- ...issue guidance to all operational personnel reminding them of the availability of operational guidance on the MODAS system...and to...[put in]...place such resilience measures as necessary to ensure that in the event of failure or unavailability of the MODAS system, the relevant risk information is still available to operational crews...

- ...for medium to high risk premises...risk information should be printed on the mobilising instructions, or there should be a...visible prompt for appliance commanders to check MODAS...

- ..provision of training and awareness of hearing protection/noise at work for personnel to include:

  o the responsibility of incident commanders to include consideration of hearing protection and fireground communications within their dynamic and analytical risk assessment processes...

- ...amend the manual note on fireground communications and provide additional training to ensure the following areas are addressed:

  o Limit the practice of using mobile telephones for sending command messages...

  o ...to cover ICS procedures such as confirmation of tactical modes and the need to disseminate information to all personnel on the fireground...

- ...refresher training for all...Commanders in the role of Incident Commander including communication of the tactical plan, Command Support Officer, Incident Safety Officer and other functional roles...

- ...all Incident Commanders to ensure that any non fire and rescue persons working on the risk area...are briefed on the likely risks, the emergency evacuation signal...

- ...review the...[operational policy on]...functional roles and associated 'prompt card' to include the responsibility of the Marshalling Officer...to inform arriving crews of safety critical requirements...

- ...produce a formal procedure for tactical withdrawal and emergency evacuation...

- ...review the training provision for all types of hazardous materials...to ensure that:

  o Incident Commanders are aware of operational procedures and control measures to be adopted...

- ...provide a policy for the crewing of the Incident Command Unit (ICU) including:
  - minimum crewing levels
  - training of personnel at other stations to provide resilience...
  - mobilising arrangements...to ensure that the ICU is mobilised...promptly...
  - identify the competencies and training arrangements for ICU operators...
  - ensure that competence is established and maintained...

- ...ensure that Incident Commanders...who are responsible for the safety of support staff when attending incidents, are made aware of the safety controls required, including which roles are permitted into hazard areas and that this is incorporated into the relevant Service Manual notes, i.e. Incident Command System...

- ...review the Health and Safety Risk Assessment Manual and associated process, training and documentation...

- ...raise with the Health and Safety Commission (HSC), Chief Fire and Rescue Advisors Unit (CFRAU and Chief Fire Officers Association (CFOA) on the absence of a national system to disseminate risk critical information and guidance...

- ...review the provision of inter-agency training, exercises and knowledge of roles of category 1 and 2 responders...

- ...implement a system of planning and recording visits and exercises at premises that have been considered under Section 7(2)(d) of the Fire 7 Rescue Services Act 2004...

- ...include Command Team attendance times as a performance indicator...

- ...introduce annual refresher training for dynamic risk assessment for all personnel attending incidents...

- ...review the ICS Manual note to include:
  - guidance on how to avoid a 'command gap'
  - provide criteria to assist...incident commanders with gathering information in order that they can carry out a suitable and sufficient dynamic risk assessment before committing personnel to an incident
  - a formalised system for liaison with other agencies at operational incidents...

- ...review the Incident Command System to require...all...Officers at an incident ensure that they have received a handover, assumed command and carried out a dynamic risk assessment before making command decisions, with the exception of safety critical decisions...

- ...provide training to all Service Commanders on the advisability of committing to offensive firefighting actions without a secure water supply...

- ...provide operational personnel with a programme of updates on how to operate the Incident Command System, reinforcing the need to declare the tactical mode at an early stage...

- ...provide structured training to remind operational personnel of the difference between offensive actions for saveable life as opposed to saveable property...

- …provide training to operational personnel to enable them to carry out the role of water resources officer…

- …provide training and guidance for Incident Commanders on how to avoid conflict with aggressive or emotionally distressed members of the public…' (East Sussex FRS, 2007 p 1 – 17).

On the 2nd November 2007 a fire broke out in a warehouse at Atherstone on Stour, Warwickshire. The fire was to claim the lives of four firefighters: Darren Yates-Badley, Ashley Stephens, Ian Reid and John Averis. Following the fire three of its incident commanders were charged with manslaughter and Warwickshire County Council was charged under section2 of the Health and Safety at Work Act 1974, i.e. it has a duty of care, so far as is reasonably practicable, for the health, safety and welfare of its employees. In May 2012 the three incident commanders were found 'not guilty' of manslaughter, but the council was fined £30,000 for the breach of its duty of care.

In the case of Warwickshire County Council in his written judgement and sentencing remarks, the Honourable Mr Justice MacDuff highlighted a number of concerns. He observed that,

'…it seems to me that one of the real difficulties here has been the proliferation of paper which has been generated in recent years both before and after the passing of the Fire and Rescue Services Act 2004…can a fire fighter, attending a fire in an emergency situation, remember what the picture on page 138 of the manual was intending to convey, how and when he should conduct his dynamic risk assessment, and which of the elements of the flow chart he should move between before forming a decision?' (Warwickshire County Council Judgement, 2012, p 2).

He also states that the language used within the paper work, i.e. procedures, directives, etc. is difficult to understand and contradictory and summarises his observation by stating that '…the confetti of regulatory and other advisory papers, intended to improve safe systems of working, is capable of being obfuscatory and counter productive' (Warwickshire County Council Judgement, 2012, p 2). Justice MacDuff also makes comment about the dynamic risk assessment exercised by all personnel on the day of the incident. He acknowledges the default to defensive mode where a risk assessment deems the situation too dangerous to operate in offensive mode; that all personnel had a duty of care for their own safety; and that there was no compulsion for them to enter the warehouse or to stay in it. At the time of the incident 'there was no possible reason to foresee the possibility that fire fighters entering the building might be unable to withdraw at any time that the required to do so' (Warwickshire County Council Judgement, 2012, p 4). Warwickshire FRS acknowledged that they did not have in place adequate information systems for the provision of accurate, update premises risk information, or water supplies. They were also deficient in their training record keeping and monitoring. Of these, Justice MacDuff only found that the inadequate provision of premises risk information 'may have been a contributory factor…[albeit]…a minor one…' (Warwickshire County Council Judgement, 2012, p 10)

In 2008 Mrs Alison Hume was walking home in the early hours of the morning when she fell 15m down an abandoned mine shaft, sustaining trauma injuries relating to her fall. She came to rest in water on a 'cap' of collapse debris that was 115m above the bottom of the shaft. It took fire crews over five hours to rescue her to the surface, but she suffered a heart attack brought on by hypothermia during her rescue and died. HM Chief Inspector (HMCI) of

Fire and Rescue Authorities was commissioned to undertake an Inquiry into the aftermath of the tragedy following the publication of the Fatal Accident Determination by Sheriff Desmond Leslie, which heavily criticised the response to the incident of Strathclyde FRS. In his Fatal Accident Determination, Sheriff Leslie concluded that the attempted rescue of Mrs Hume was impeded by:

- '...A lack of awareness within the rescues services of the range of potential rescue services which could assist and inadequate knowledge, communication and co-ordination between those services;
- Restrictive and proscriptive policies adopted by Strathclyde Fire and Rescue Service which combined with an inadequate appraisal of the equipment available and their training in the use of that equipment;
- Over reliance by Strathclyde Fire and Rescue Service on the delegation of certain rescues functions; and
- The failure of Strathclyde Fire and Rescue Service to engage in preplanning for an occurrence such as the collapse of a mine shaft' (Galston Mine Incident Report, 2012, p 7).

HMCI's report concentrated on the factors which influenced the time taken to rescue Ms Hume. He acknowledges that the incident was '...complex and dangerous and beyond the experience of any of the emergency service personnel who attended...' (Galston Mine Incident Report, 2012, p 4). He also acknowledges that a successful rescue was never guaranteed, but that 'the very long time...[Alison]...spent before being removed from the shaft greatly decreased her chances of survival' (Galston Mine Incident Report, 2012, p 4). HMCI goes on to observe that '...there was an inexplicable lack of focus on Alison's medical condition, the risk she faced of hypothermia and the consequent time pressure for a rescue' (Galston Mine Incident Report, 2012, p 4).

HMCI outlines the influence post incident scrutiny has on operational decisions as a result of incident commanders being held to account for them, even after very challenging incidents, i.e. that it is causing a growing cautiousness in those decisions. He also states that there was 'a significant weakness in the working arrangements and communication between blue light services...decision making, command and control arrangements were at best informal. Mobilisation of officers was dependant on individual judgement rather than by pre-planned policy' (Galston Mine Incident Report, 2012, p 5).

With regards to the decision to suspend FRS operations at the scene and hand it over to Strathclyde Police Mountain Rescue, he highlights that this was due to the policy changes brought about by the publication of two memoranda for the introduction of Safe Working Height equipment and the withdrawal of rescue lines. These memoranda 'effectively removed the ability of Strathclyde Fire and Rescue staff to adapt existing equipment and skills to perform specialist rescues in a way which was very much routine... this change in policy was one of the fundamental influencing factors on events at Galston' (Galston Mine Incident Report, 2012, p 18). HMCI adds that 'Fire and Rescue Service commanders became locked into their decision and were not able to review and alter their strategy as time went on' (Galston Mine Incident Report, 2012, p 18).

HMCI observes that the commanders at the scene had a duty to consider the Service's operational procedures as a feature of their decision making as, in another situation, they would have been held to account for not doing so. On this occasion they have been criticised for adhering to their Service's policies. Thus a balance needs to be struck between

the benefit to be gained at an incident against the risks to personnel and members of the public. This, HMCI states, is reliant on a subjective judgement, where different people will make different judgements given the same situation. However, he clearly sets out what is expected of an incident commander on the incident ground, i.e. they '...make this kind of judgement in a way which is both intelligent and informed...they should have the best possible understanding of the benefits to be gained...and the risks associated with the actions of the responding personnel before determining and plan of action' (Galston Mine Incident Report, 2012, p 23). HMCI reinforces this later by stating that an individual's '...length of service does not imply suitable experience...what is important in a modern approach to command decision making is that risks and benefits are discussed and understood before...[the incident commander]...defines a plan' (Galston Mine Incident Report, 2012, p 26).

The decision not to change that which led to the FRS operations being suspended is commented upon by HMCI. He attributes this to 'tunnel vision' where decision makers become 'blinkered' to environmental changes that they ought to take account and which ought to influence their decisions. HMCI acknowledges this is '...a phenomenon relating to the psychology of decision making...(Galston Mine Incident Report, 2012, p 23). Consequence the fire commanders did not adequately consider if their personnel and equipment could carry out a rescue.

HMCI makes comment on the lack of a means to record the decisions of incident commanders at the scene and the rationales behind them, which leaves post incident debriefs without a decision making audit trail to review. Consequently, this impedes any lessons learned afterwards and subsequently the feedback obtained to contribute towards Service improvements as it is reliant on memory recall.

There were also issues to do with the transfer of command, which took place on four occasions at the incident. On one occasion it took place between a Group Manager A and Group Manager B something that the HMCI indicates was unnecessary as '...there is no distinction within the role that could be applied to operational command...' (Galston Mine Incident Report, 2012, p 25). On another occasion it took place between two Group Manager Bs because one had been nominated as the duty command officer for the day. Sheriff Leslie in his report acknowledges that the transfers of command did not have an effect on the outcome of the incident. However, he questioned the value to operational command that so many transfers would have at an incident and reflected that at worst it might have added unnecessary complication to the decision making process. Additionally, Sheriff Leslie commented that keeping the number of command transfers down to a minimum would reduce the complexity and risk associated with transfer.

In July 2009 six people died in fire at a high rise block of flats called Lakanal House in Camberwell, London. They were Catherine Hickman, Dayana Francisquini, Thais Francisquini, Felipe Francisquini, Helen Udoaka and Michelle Udoaka. Following the incident the LFB reviewed and introduced a number of policies relating to site risk assessments, familiarisation visits, fire behaviour, communication between Brigade Control and those at an incident, the handling of fire survival calls, and the introduction of a Mobile Data System and Forward Information Boards. Whilst acknowledging this work HM Assistant Deputy Coroner, Francis Kirkham in her Rule 43 response made a number of recommendations. There were six transfers of command during the incident with some incident commanders only being charge for a few minutes so one recommendation was for the LFB to '...review its

policy and procedures concerning incident command, having regard to whether it is effective for the choice of IC to be tied closely to the number or type of appliances attending an incident and the effectiveness of a policy which may result in rapid and frequent changes of IC' (Lakanal House Rule 43 Report, 2013, p 2 - 3). The Assistant Deputy Coroner also recommended that consideration was given to the training of incident commanders and potential incident commanders to improve their performance in relation to:

- '...dynamic risk assessment and other management tools to enable ICs to analyse a situation, and recognise and react quickly to changing circumstances
- to recognise when to escalate an attendance by more experienced ICs
- to anticipate that a fire might behave in an manner inconsistent with the compartmentation principle[5]
- to be aware of the risks to those above and adjacent to the fire flat
- handover from one IC to the next and effective deployment of outgoing ICs
- the collection of information from all possible sources
- use of methodical search patterns' (Lakanal House Rule 43 Report, 2013, p 3)

The LFB were also recommended to consider if it would be beneficial to use extra breathing apparatus radio channels and personal radio channels at major incidents to reduce the volume of radio traffic on each channel.

Following on from the fatal fires at Harrow Court and Lakanal House in high rise blocks of flats, in April 2010 another occurred in 2010 in a block called Shirley Towers in Southampton. Firefighters Alan Bannon and James Shears died whilst fighting a fire on the ninth floor. The investigation report records a number of issues that affected the incident command performance at that incident. A significant conclusion concerned the '...failure to gather and include vital information in mobilising message' (Hampshire FRS, 2013, p 27). Important information from a 999 caller regarding the location of the fire was not passed on to the responding appliances, which in turn led to the bridgehead[6] being planned to be located on the wrong floor, and only by accident did it get set up on the correct floor due to the general confusion amongst crews as to which floor they were on.

The fatal fire investigation report makes 99 recommendations for the Hampshire Fire and Rescue Service (HFRS) to consider. Those that relate to the performance of incident command are listed below:

- '...ICs are reminded of ... the importance of obtaining all relevant information on the risk/premise being attended...
- ...that the use of mobile telephones for important operational communications should be discouraged...
- ...ICs..be reminded of...the need to ensure that a comprehensive informative message is sent at the earliest practical time...

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[5] The compartmentation principle: compartmentation is a fundamental design principle in blocks of flats that limits the spread of smoke and fire by using fire-resisting construction methods and materials. This helps to ensure that people living in flats have the same level of protection as people living in houses or bungalows. The high degree of fire separation between flats and the common parts is achieved by making each flat a fire-resisting enclosure.

[6] A bridgehead is a location selected within a multi-storey building from where fire service operations are conducted. It is usually two floors below the floor upon which the incident is located (or above in the case of sub-surface incidents).

- ...HFRS review the use, understanding and application of DRAs...effective use of DRAs should be practised during training and their usage on the incident ground monitored by supervisory officers...
- ... officers ensure they have a personal issue radio on the incident ground...
- ...officers at incidents should ensure the Control Point knows their location at all times. Wherever possible the IC should remain at the Control Point...
- ...review...the status of officer incident command competence and the currency of their qualifications...
- ...[conduct an]...urgent training and assessment of any unqualified officers to the appropriate level of incident command competence...
- ...all personnel required to take command of an incident, are trained ad assessed to maintain competence and qualification...
- ...the IC ensures any alteration to the on-scene Command Point is notified to Fire Control as soon as it is in operation...
- ...ICs ensure that, as they take over command of the incident, this is notified to Fire Control, the on-scene Command Point and all functional officers...
- ...review command vehicle mobilisation policy...a change would reduce the handover process between command vehicles and the potential for errors, omissions or delays such handovers may cause...
- ...Service Delivery/Fire Control review their methodology for passing information to officers and appliances en route to incidents. This includes forewarning them of any sensitive issues ahead of their arrival...
- ...officers are reminded of the importance of accurately informing Fire Control (or the on-scene Command Point) about their movements or location...
- ...personnel are reminded of...the importance of transferring information between Command Vehicles...
- ...HFRS review its ICS policy and guidance to ensure there is a specific reference to the implementation and resourcing of a Search Sector...
- ...the current methodology for conducting incident debriefs should be reviewed to ensure all pertinent findings form the debrief are robustly addressed and any remedial actions taken are fully auditable... (Hampshire FRS, 2013, p 38 -69).

The report also contains the outcomes of the HSE investigation and include some additional recommendations to those listed above. These were:

- '...review the assessment of command competence in the role of Sector Commander...
- ...re-emphasise monitoring of handovers of incident command, including briefing of and by Sector Commanders, to ensure adequate exchange of risk critical information...
- ...provide further guidance and training on the required or expected content of the briefing given by IC/SOs to initial BA teams and ECOs...
- ...implement a system for monitoring and assessment of the briefing given by IC/SCs to initial BA teams...
- ...clarify the role and provide additional guidance on the responsibilities of Incident and Sector Commanders and Entry Control Officers in relation to debriefing of BA teams...

- ...review...Command Support to ensure attendance of trained personnel at a sufficiently early stage of an incident to provide effective support for Incident/Sector Commanders and reduce their spans of control...
- ...training should be provided on the detail to record in the new analytical risk assessment forms... (Hampshire FRS, 2013, p 159 - 160).

In 2009 the Chief Fire and Rescue Advisor (CFRA) issues operational guidance for the National Co-ordination and Advisory Framework which was aimed at providing support for FRSs in the resolution of major incidents, in particular with their liaison with local and central government. The framework consists of two components: locations and teams. The strategic locations are: Communities and Local Government Emergency Room (CLG ER), FRS National Co-ordination Centre (FRSNCC), and the Strategic Holding Areas (SHA) (see above). The guidance highlights the CLG ER as the '...hub of the Advisory and Co-ordination Framework...responsible for achieving the most effective distribution of New Dimension (ND) assets during a major emergency...' (CLG, 2009, p 12). Within the CLG ER will be specialist teams with responsibilities for advising the CFRA on: fire and rescue operations, fire and rescue policy, regional resilience, scientific and technical matters, and security. The CLG ER has a number of principal roles (see above) and there are a number of activities which support these roles that include the provision of support for the affected FRS, obtaining resources from outside the FRS, and liaison with the Inter-Agency Liaison Officer (ILO) network[7]. The principal roles of the FRSNCC are:

- '...mobilisation of ND assets in association with the FRS...
- Providing a national co-ordination capability to support SHAs and the Incident Commander...
- Provide a range of mobilising options in liaison with CLG Emergency Room in the event of "allocation confliction"...' (CLG, 2009, p 16).

The primary team that will support the CFRA is the National Strategic Advisory Team (NSAT) which comprises Chief Fire Officers whose role is to assist the CFRA to provide national support and advice to the affected FRS Gold Commander. They may be deployed to or requested to attend the affected FRS to liaise directly with the Gold Commander or Chief Fire Officer. In turn to assist the NSAT the National Resilience Assurance Team (NRAT) which comprises members of the FRS will provide expert support and advice at a regional and national level. As with the NSAT team members they may be required to attend the SHA where they can provide personnel to carry out the role of Enhanced Command Support Officer (see above) or provide support to the Silver Commander. Finally, Subject Matter Advisors (SMA) are FRS personnel who are trained in and work with ND capabilities on a dat to day basis. Their role is to provide detailed tactical advice to the Silver Commander and also Bronze Commanders.

In March 2010 just before the deaths of Firefighters Alan Bannon and James Shears at Shirley Towers the HSE produced a document entitled 'Striking the balance between operational and health and safety duties in the Fire and Rescue Service'. Produced in collaboration with the FRS a statement of principles to '...help employers, HSE inspectors and the public understand how the Fire and Rescue employers can comply with health and safety requirements to

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[7] An Inter-agency Liaison Officer is a specially trained officer who has access to sensitive intelligence in relation to an incident, e.g. that it is terrorist related, which she is able to pass onto the incident commander

safeguard the public and their own staff while providing an effective emergency service' (HSE, 2010, p 2). The aim of the work is to:

- '...help firefighters, other staff and the public understand the practical application of health and safety law to the operational work of the Fire and Rescue Service;
- ensure consistency of approach and in decision making by HSE inspectors;
- promote a culture within the Fire and Rescue Service where hazards are dealt with in a sensible, proportionate and thought-through manner;
- set out expectations on the Fire and Rescue Authorities, as employers, in relation to the management of those of their operations that can be hazardous, fast moving and emotionally charged; and
- provide mechanisms for ensuring early and wide learning from incidents, new developments and research' (HSE, 2010, p 2).

The document then sets out a series of principles against a number of key factors for the FRS and HSE. Initially they recognise that the Fire and Rescue Authorities (FRA) face significant challenges:

- '... they have to send firefighters into dangerous situations in order to save lives...
- ...there is often an unrealistic public expectation that firefighters will put themselves at risk even when such risks outweigh an potential benefits to be gained;
- many incidents firefighters face can develop at speed, some can develop in unexpected ways – and firefighters may, from time to time, be confronted with situations outside their experience;
- they have to prepare individual employees to be able to make decisions in dangerous, fast-moving emotionally charged and pressurised situations, even when there may sometimes be incomplete or inaccurate information...
- they have to respond to dangerous situations which are not of their own making...
- they may not be able to control or mitigate some aspects of the working environment' (HSE, 2010, p 2).

In relation to health and safety duties the HSE acknowledges that the duties placed upon employers under Section 2 of the Health and Safety at Work Act 1974 and those placed upon employees under Section 7are not absolute, i.e. they are qualified by a test of what is reasonably practicable. As a result the Act does not require the elimination of all risks and the HSE 'recognises that...harm could still occur...[and]...that employees should act sensibly and responsibly within the command and control of their employer, they should not act recklessly' (HSE, 2010, p 3). The guidance clarifies what FRS staff should expect from their FRA as an employer as good health and safety management systems. Such systems should include:

- taking account of the broad context in which their staff operate,
- be based on '...robust, proportionate, carefully considered and non-bureaucratic risk assessments...' (HSE, 2010, p 3);
- arrangements for monitoring health and safety performance, '...including learning from incidents and using this information to improve performance...' (HSE, 2010, p 2).

The HSE then sets out what the FRS can expect from it in its role to promote good health and safety management. The activities include inspection and investigation where HSE inspectors will take appropriate action (including enforcement) in accordance with their

Enforcement Policy Statement, the principles of this document and guidance. When conducting an inspection or investigation the HSE will consider:

- '...the adequacy of the employer's plans, policies, risk assessments and procedures; if...adequate then...how they are/were put into practice...
- ...how the actions taken by that Authority measure up to what would be considered reasonable in the circumstances;
- the appropriateness and effectiveness of the command and control systems in place and used in operations;
- the extent to which any lack of preparedness contributed to the risks in particular circumstances;
- the actual information...available to staff when they had to make operational decisions...inspectors will not revisit decisions made during operations with the benefit of information that could not reasonably have been known at the time;
- the quality of the decision making at an incident as illustrating whether individuals had been adequately prepared for that incident by the service;
- the wider public duties on the Fire and Rescue Service, whether the arrangements and policies to fulfil these duties were sensible, effective and practical, the purpose of the operation and to what extent the risks that were taken were reasonable in the circumstances; and
- how...[FRA]...prepared incident commanders and firefighters for operational incidents, e.g. by training, provision of equipment and information on hazards, risks and control measures' (HSE, 2010, p 4).

During 2009-10 the HSE conducted 8 health and safety management inspections of FRSs to assess their compliance with the Health and Safety at Work Act 1974; obtain information of specific fire service operational topics; identify areas of concern; ensure FRSs continue to give appropriate consideration to safety critical aspects of activities; and to provide feedback. The four critical risk control topics sampled were: Breathing Apparatus (BA) and compartment fire behaviour (CFB), core skills training, incident command training and the provision of risk information.

In 2010 the HSE produced a consolidated report based on the eight inspections. The HSE adopted a POPMAR approach to their inspections. Under 'organisation' they scrutinised competence because they viewed '...how the arrangements for securing competence were implemented and monitored as accurate indicators of effective risk management' (HSE, 2010, p 6). In particular they examined the arrangements for planning, delivery and monitoring the effectiveness of training in core topics, including incident command. The HSE concluded in general that 'competence is the biggest single operational safety challenge presently facing the FRS' (HSE, 2010, p 7) this is because they found issue with the following:

- Training needs analysis
- Refresher training
- Comparable training for full-time staff and Retained Duty System (RDS)staff
- Rostering of RDS staff for essential training courses
- How to deal with staff who fail to demonstrate competence
- Training records

With regards to incident command training the HSE made the following recommendations:

- 'Services should ensure that they deliver effective training (acquisition and development) and assessment for all those who carry out incident command...
- ...National guidance should be provided on good practice in incident command training' (HSE, 2010, p 13).

These recommendations came about because the HSE found different approaches to the acquisition and maintenance of command competence and that this may affect interoperability between services. There were also marked differences in the 'extent and frequency of training and re-assessment' (HSE, 2010, p 12) and when officers failed re-assessments they were generally taken off the run until they could demonstrate competence. Finally, there were variations in the extent incident commanders received support from more senior officers at incidents; the extent to which their command competence was monitored; and the extent to which or if they received feedback.

The HSE also sets out reasonable expectations with regards to incident command and these include:

- '...systems are in place to assess incident commanders and potential incident commanders...[and]...there is a supporting maintenance programme to ensure ongoing competency and a mechanism to feedback into incident command related policies and processes...
- ...arrangements in place to ensure suitable and sufficient training for incident commanders in identifying and assessing risks...[including]...appropriate measures that need to be taken to control and mitigate risk as well as the appropriate arrangements to respond to and manage unexpected events...
- ...incident commanders have a thorough knowledge of the dynamic risk assessment process and the Generic Risk Assessments and their application...
- ...the assessment of individuals may present a challenge for services that have significant numbers of RDS firefighters...the challenge is recognised. However, where the risks and hazards are the same for whole time and RDS staff, the training achieves similar outcomes...
- ...a mechanism for monitoring managers' performance in respect of how they ensure the safe application of skills, processes and procedures...
- ...procedures are in place to ensure that all information about an incident, including the decisions made and the reasons for those decisions informs feedback/debrief processes. (HSE, 2010, p 20 - 21).

In relation to the provision of information the HSE's recommendations include:

- '...it is important that the risk critical information provided to an Incident Commander is accurate, timely and suitable...Services need to ensure that their systems to capture and maintain risk critical information are robust...
- ...incident commanders are able to access the information to inform their command decisions... (HSE, 2010, p 13 - 14).

The Chief Fire Officers Association (CFOA) evaluated the HSE Consolidation report and highlighted a number actions it would take to address the recommendations made by the HSE. With regard to incident command CFOA 'Aim to establish Nat/UK guidance on best practice principals for command training and embedded command performance monitoring...'(CFOA, 2010, p 1). In terms of meeting public expectation CFOA intend for this to be incorporated into operational policy and operational risk assessments as an issue that

needs to be managed. In addition, for the provision of risk critical information CFOA 'Aim to establish national/UK best practice and guidance on the provision and dissemination of risk information, incorporating human factors guidance to support effective Dynamic Risk Awareness which informs operational dynamic decision making...' (CFOA, 2010, p 5).

In 2010 Lord Young of Graffham produced a report following a Whitehall-wide review of health and safety laws and the growth of the compensation culture. This resulted in one recommendation in relation to the FRS: 'Police officers and firefighters should not be at risk of investigation or prosecution under health and safety legislation when engaged in the course of their duties if they have put themselves at risk as a result of committing a heroic act...' (HM Government, 2010, p 35).

The following year in 2011 the HSE endorsed the recommendation in Lord Young's report and defined what constituted an act of heroism that would not bring about a prosecution as '...when it is clear that...[firefighters]...have decided to act entirely of their own volition in putting themselves at risk to protect the public or colleagues and there have been no orders or other directions from senior officers to do so and when their actions have not put other firefighters at similar high risk' (HSE, 2011, p 1). The HSE elaborate on their definition by acknowledging that firefighting is a complex activity that involves clearly defined roles and responsibilities and is carried out by teams of firefighters. Furthermore '...it is important that command and control discipline is maintained to ensure the safety of firefighters and others...' (HSE, 2011, p 1). Therefore, they highlight that an independent decision by a firefighter to place herself at risk is highly likely to place others at risk in their team. However, they also acknowledge that such decisions may be made by firefighters working together in a rapidly changing, dangerous situation when they have not received orders to do so or when there is no safe working system. Overall, the HSE perceives acts of heroism as rarely occurring and expects incidents to be resolved using SOPs and common operational and command practices.

The HSE policy statement indicates that if they initiate an investigation into a serious event and during that investigation it '...becomes clear...that the incident involved an act of heroism by firefighters, then HSE will not investigate the actions of the individuals in order to take any action against them..., (HSE, 2011, p 2).

In 2013 the DCLG published a health, safety and welfare framework for the operational environment for FRAs based on the POPMAR approach set out in the HSE's HSG65 (see above). The framework focuses on '...the operational and training environments that are unique to firefighters...' (CLG, 2013, p 4). Its purpose is to assist FRAs to fulfil their health and safety duties by the '...planning and delivery of safe systems of work based on the safe person principles (see appendix 10)' (CLG, 2013, p 5) and to emphasise the importance of welfare and wellbeing issues. The guidance within the framework aims to assist FRAs '...in integrating day-to-day safety management for controlling risk...with the challenging nature of managing activities in the extremely dangerous environments in which personnel have to work when dealing with operational incidents...' (CLG, 2013, p 6). The guidance sets out a number of guiding principles which include:

- 'Clear and positive safety leadership...
- ...promotion of safety leadership in order to set a positive safety culture...
- ...recognition that management is accountable...accepting prime responsibility for accident and ill health prevention...
- ...the personal responsibilities of individuals are clear...

- ...well established management and incident command arrangements are in place for controlling the operational risks to firefighters...
- ...appropriate resources are...available to ensure a high standard of...incident command...
- ...provision of high quality training to ensure all personnel are competent to perform their roles and to make appropriate operational decisions...
- ...monitoring safety performance and incident command...is central to ensuring the operational risks are being effectively managed...
- ...ensuring internal standards and safe operational procedures aim to optimise the balance between risks and benefits – which does not mean avoiding risks but managing them responsibly on the basis of likelihood and severity' (CLG, 2013, p 8 - 9).

In order to organise the safe delivery of operational activities FRAs are guided to establish and maintain control (control means commanding and directing) as a core feature of all management functions. FRAs need to '...ensure the communication of safety critical information...in a timely manner to relevant personnel...' (CLG, 2013, p 15) and ensure the competence of operational personnel, i.e. for personnel to 'consistently achieve the stated outcome of workplace performance as described by an individual's role within...nationally agreed standards... '(CLG, 2013, p 15). The guidance states that to achieve competence comprehensive policy is required along with complimentary procedures to provide '...clarity, structure, confidence and transparency in the process, not to create volumes of paperwork...' (CLG, 2013, p 16). Competence needs to be mapped based on accurate role, risk and hazard profiling and relevant benchmark standards set to define competence.

In relation to command competence the guidance emphasises the importance of FRAs to be able to identify those in need of extra support and development as soon as possible and besides advocating the use of simulation it highlights the potential to use workplace assessment at incidents as a source of performance evidence. However, it notes that '...the effectiveness of workplace assessment strongly depends on the competence of the assessors...' (CLG, 2013, p 18) and to provide a full learning experience an individual should be debriefed as soon after the assessment as possible. Further, the guidance states that where under-performance in risk critical areas has been evidenced that suitable arrangements are in place to '...remove the individual from their operational role until a suitable demonstration of underpinning skill, and knowledge has been obtained...' (CLG, 2013, p 18).

With regards to planning, the guidance highlights three levels of effective planning:

- Strategic
- Systematic
- Dynamic/incident

Systematic planning is where the FRA '...plans the delivery of strategies to minimise hazards and risks to employees, to deliver a positive safety culture...[and]...this planning ensures that managers assess the level of risk and apply the necessary controls in the operational environment...' (CLG, 2013, p 20). Whereas, dynamic/incident planning consists of the continuous evaluation and management of risk at an incident along with debriefing as an important part of risk management as it enables information to be fed back into the strategic decision making process. However, at incidents such planning only forms a foundation upon which sit four pillars of risk assessment:

- Generic hazard and risk assessments: support FRAs development of incident specific risk assessments.
- Strategic risk assessment: identifies the control measures required to eliminate or reduce risk, e.g. training, risk information, equipment and appliances, SOPs, etc.
  - FRAs must give consideration to adjacent FRAs when developing their SOPs to ensure intraoperability is not undermined.
  - Risk critical information, including site-specific information, is an essential part of the planning process to ensure safe operations and FRAs should have systems in place to ensure that it is immediately available to incident commanders.
- Dynamic/incident risk assessment ,i.e. the process used by incident commanders to identify hazards and risks at an incident:
  - take account of site-specific risk information, SOPs, visual cues, and eye witness testimony.
  - The primary priority of the incident commander is the safety of everyone, the creation of a safe working environment via safe systems of work.
- Individual risk assessment (see appendix 11 for an example): that undertaken by unsupervised firefighters who encounter unexpected situations the outcomes of which influences their risk taking behaviour and actions.

In relation to operational decision making the guidance advocates that SOPs provide a framework of good practice to support incident commanders and that they need to be flexible enough to '…allow the Incident Commander to exercise discretion on the resources and procedure required to resolve the emergency…the decision to exercise operational discretion…should be based on a balance in terms of risk versus benefit and the Incident Commander knowing the actions which are normally required by the relevant standard operating procedure…' (CLG, 2013, p 23). This implies that an incident commander when making decisions must know when they have deviated from a SOP.

Communication at incidents is referred to as an important 'non-technical' skill that can be learned, developed and improved by training. 'Effective communication is paramount in maintaining shared understanding of the situation…' (CLG, 2013, p 24). The guidance highlights that briefings enable incident commanders to establish effective control as they are the mechanism for sharing information about the risks involved at the incident. It also emphasises the importance of confirming the understanding of those who have been briefed to prevent and misunderstandings and the need for FRAs to have an incident briefing model.

In terms of the individual responsibilities that comprise a 'safe person' the guidance outline five key elements:

- 'Competency…
- …self awareness, i.e. knowing their physical and personal limitations… (note no reference is made to psychological limitations)
- …being observant and constantly aware of their situation… (note this is situation awareness)
- …decisive about hazard and risk…[understanding]…when and how to communicate safety critical information…
- …communication…' (CLG, 2013, p 29).

The guidance quantifies leadership within operational command as having a risk critical and central role, particularly in relation to decisions made affecting firefighter safety.

Human factors feature significantly in the guidance. It notes that '80 per cent of industrial accidents can be attributed to human factors or omissions...[and]...most firefighter injuries are influenced by the same factors...' (CLG, 2013, p 32). Therefore, the guidance defines human factors in relation to the planning and delivery of FRA services and advocates that they should '...consider the impact of 'human factors' on the safe, effective, and timely resolution of an incident. This includes...environmental, organisational and task demands...[and]...human and individual characteristics that influence the behaviour of teams and individuals. Understanding these 'human factors' is critical to effective health, safety and welfare management...the influence of human factors on behaviour at incidents should not be underestimated...' (CLG, 2013, p 32).

- Organisational factors: potentially have the most significant influence on team and individual behaviour, e.g. poor communication, poor training, poor health and safety record, etc. in other words, people's behaviour is heavily influenced by the normal practice and culture of an organisation. The guidance states that these factors along with human factors are '...often overlooked in the design of work, procedures and tasks, as well as during the investigation of safety events...' (CLG, 2013, p 32). It is well documented that disastrous decisions are made by people even when they are aware of the risks and the consequences of these failings may be active (immediate) or latent (delayed) (see below).
- Task factors: matching tasks to people is a vital aspect of the 'safe person' at an incident and helps ensure that individuals and teams are not overloaded and can contribute effectively to the achievement of task objectives.
- Human factors: the guidance states that an individual's personality is fixed, but attributes such as their competence, attitudes and beliefs may be changed and '...this is why developing non-technical skills is so important and can influence the behaviour of individuals in the safety critical operational environment...' (CLG, 2013, p 34). It is an individual's appetite for risk that dictates what their behaviour will be in such circumstances.

The involvement of human factors in accidents may be active or latent failures. Active failures have an immediate affect and when they occur in circumstances where there is little or no room for error they immediately impact upon health and safety. The guidance points to accident investigation evidence of decisions made by firefighters and incident commanders to commit to tasks in dynamic, hazardous, and ambiguous environments for which they do not have sufficient resources, but there is an expectation to do something. As the guidance points out these decisions risk death or serious injury. However, it lists a series of principles that can control active failures:

- '...safety leadership
- ...safe operational culture
- accurate, two-way risk communication
- ...suitable resources
- managing task demands (rest, recovery and stress)
- developing safe systems of work based on detailed national and local guidance' (CLG, 2013, p 35).

The guidance describes latent failures as typically involving management systems, e.g. ineffective training, inadequate supervision, ineffective communications, uncertainty in roles and responsibilities and insufficient monitoring and review of performance. It states that 'suitable and sufficient planning is vital in reducing the influence of latent failures and enhancing the safety of operational personnel...' (CLG, 2013, p 36).

Measuring of performance is essential to maintain and improve health, safety and welfare. The guidance indicates two types of performance indicator:

- Leading indicators, i.e. those that require routine systematic checks that activities are being performed as intended and utilise proactive systems to provide information, e.g. debriefs, operational assurance at incidents, workplace inspections, etc.
- Lagging indicators, i.e. reactive measures of performance that has already occurred, e.g. the number of accidents. Such indicators are not as effective as a management tool compared to leading indicators and utilise reactive systems to provide information such as data analysis, accident reports, damage reports, etc.

The framework has a specific meaning when it outlines auditing, i.e. '...a structured process of collecting information on the efficiency, effectiveness and reliability of the health, safety and welfare management system...' (CLG, 2013, p 41) and states that they must be conducted by competent personnel.

In relation to the review of performance the guidance states that '...reviewing is a process of making judgements about the adequacy of performance and taking decisions about the nature and timing of the actions necessary to remedy deficiencies...[it]...is a continuous process...(CLG, 2013, p 44). A reviewer must be competent and the outputs of their reviews must highlight the failures in operational activities and workplace precautions to:

- 'remedy sub-standard performance...
- ...[assess]...plans at individual (appraisals), departmental, station, district/division or organisational level...' (CLG, 2013, p 44).

The guidance sets out a number of methods to review performance either proactively or reactively:

- Incident debriefs: ought to:
  - Take place as soon as possible after the incident at a suitable time
  - Utilise any site-specific information, tactical plans, images, etc.
  - Identify and record shortcomings/areas for improvement and positive outcomes
  - Disseminate the recorded outcomes to relevant personnel to feed into organisational learning and the development of operational response
  - Contribute to the reduction of risk and improvement of service delivery
- Incident monitoring will help to identify whether sub-standard performance is due to procedural design, equipment usage or individual performance, '...including how many human factors may have influenced incident outcomes...' (CLG, 2013, p 47). To this aim a performance review process is described and ought to:
  - Start as soon as possible at an incident
  - Review the command function and operational tactics
  - Be completed by an officer attached to the incident
  - Provide on scene coaching and mentoring for the incident commander
  - Include feedback to the incident commander

- o Inform individual and organisational learning
  - o Permit the monitoring officer to assume command whenever necessary
- Incident/event investigations, i.e. investigations into accidents, injuries and near hits, have a 'primary purpose...to identify the immediate, underlying and root causes of the safety event (including the human factors), in order to identify remedial action that will prevent recurrence...' (CLG, 2013, p 48).

Managing the outcomes of learning is important and good organisations emphasise the positive and concentrate on encouraging progress on matters that will improve risk control. The guidance promotes 'double loop learning theory'[8] (see appendix 12) as means for a FRA to '...demonstrate transformational change from post event/incident review and debriefs...' (CLG, 2013, p 49). The double loop process '...provides opportunities for improvement, innovation, collaboration and partnership to be identified...' (CLG, 2013, p 49) in addition to the learning outcomes for the single loop learning process[9].

The guidance states that popular research advocates a blame free post-event learning environment, but it recognises that the 'safe person principles identifies areas of individual and collective responsibility for safety. With these responsibilities comes accountability and, despite taking into account human factors such as honest slips, lapses and mistakes, on occasion violation will make it difficult for a...[FRA]...not to take corrective measures...' (CLG, 2013, p 49).

In order to close the learning loop a FRA should put in place arrangements to ensure learning from all post event/incident investigations influence change and improve safety.

Welfare arrangements referred to in the guidance include: toilets and hygiene facilities at protracted incidents, refreshments, hydration, rest, recovery and relief of personnel. It also refers to fatigue and how dangerous that can be when personnel perform tasks that require high degrees of concentration. It identifies that fatigue '...can be either physical or mental and may significantly affect a person's ability to function...' (CLG, 2013, p 51). The guidance lists some of the potential outcomes of fatigue:

- 'poor judgement
- reduced capacity for effective communication
- reduced concentration
- reduced visual perception
- reduced vigilance
- slower reaction times
- lack of concentration' (CLG, 2013, p 51).

Whilst there is no specific reference to incident commanders, it can be seen that the above effects of fatigue would but clearly be a significant risk factor.

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[8] The work of Chris Argyris (1923-) describes the concept of double-loop learning (DLL) in which an individual, organization or entity is able, having attempted to achieve a goal on different occasions, to modify the goal in the light of experience or possibly even reject the goal.

[9] The work of Chris Argyris (1923-) describes the concept of Single-loop learning (SLL) as the repeated attempt at the same problem, with no variation of method and without ever questioning the goal.

Stress in the workplace is also another significant factor that may impair command performance and affect incident safety and welfare. Managing a traumatic event can induce stress reactions within personnel, with an increased likelihood of individuals experiencing psychological distress.

To summarise the key issues and outstanding issues in comparison to the foundation literature are:

Command Support:

- The FRS Incident Command manual contains a section on Command Support and states that at larger incidents it should be provided by a suitably trained officers. It also sets out some of the functions command support is expected to provide at an incident and indicates that it may be provided via a specialist command vehicle. Yet a number of the FRS incident investigations and/or Coroner Rule 43 reports incorporated recommendations for improvement in relation to it. For example, Harrow Court where there were concerns over the delegation of radio channels and the suitability of the incident command board; Marlie Farm where one of the recommendations was to provide a policy for the crewing of the incident command unit, including the use suitably trained and competent personnel; and Shirley Towers where one of the recommendations was to '...review command vehicle mobilisation policy...a change would reduce the handover process between command vehicles and the potential for errors, omissions or delays such handovers may cause...' (Hampshire FRS, 2013, p 63).
- An Enhanced Command Support role features in the CFRA's operational guidance for the National Co-ordination and Advisory Framework and the Enhanced Command Support Officer is provided by NRAT.

Competence

- The Hertfordshire FRS (HtFRS) Harrow Court investigation makes a national recommendation in relation to the national assessment and promotion procedures, which at the time of its completion do not test for an individual's command abilities. The recommendation states '...the Service should consider the impact not testing in command, which is a risk critical skill, has had on the operational competency testing prior to promotion...' (Hertfordshire FRS, 2007, p 47). The report also included a series of recommendations for HtFRS in relation to the development, training, testing, measuring and recording of operational performance.
- The East Sussex FRS Marlie Farm investigation includes recommendations in relation to additional training required to cover incident command procedures and refresher training for incident commanders.
- Justice MacDuff in his judgement of Warwickshire County Council observed that the FRS were deficient in their training record keeping and monitoring.
- HMCI report into the Galston Mine incident raises a number of concerns in relation to the incident commanders' DRA, transfer of command, tunnel vision and judgement.
- The Coroner's Rule 43 report for Lakanal House recommended that the LFB considered providing training for incident commanders and potential incident commanders in relation to a range of command-related issues such as DRA and the transfer of command.

- The Hampshire FRS Shirley Towers investigation made many recommendations which included: a review of incident commander competence and qualifications; assessment and training of unqualified incident commanders; and all incident commanders to be trained and assessed to maintain competence.

- The HSE within their 2010 'Striking the Balance' document crystallises the importance of incident command competence for FRAs as having to '…prepare individual employees to be able to make decisions in dangerous, fast-moving emotionally charged and pressurised situations, even when there may sometimes be incomplete or inaccurate information…' (HSE, 2010, p 2). The document also sets out its considerations when conducting an inspection or investigation and in so doing references the extent to which a lack of preparedness contributes towards the risks; how well prepared incident commanders were for operational incidents including their training; and that they will regard '…the quality of the decision making at an incident as illustrating whether individuals had been adequately prepared for that incident…' (HSE, 2010, p 4).

- In the same year the HSE published a consolidated report of their fire service inspections conducted in 2009-10. Within that document they comment that '…competence is the biggest single operational safety challenge presently facing the FRS…' (HSE, 2010, p 7). Therefore, they later stipulate their reasonable expectations of a FRS as including: incident commander and potential incident commander assessment systems to ensure competence; training for incident commanders in identifying risks; and the provision of DRA training. Significantly, these expectations also extend to RDS staff.

- In response to the HSE's consolidated report CFOA aimed to '…establish Nat/UK guidance on best practice principals for command training…' (CFOA, 2010, p 5).

- In the DCLG 2013 health, safety and welfare framework for the operational environment, FRSs a set of guiding principles for FRSs are set out and include: '…the provision of high quality training to ensure all personnel are competent to perform their roles and to make operational decisions…' (CLG, 2013, p 9). The framework also emphasises the importance of identifying those in need of extra support and development as soon as possible and the use of workplace performance assessment as a source of performance evidence. It goes on to state that '…the effectiveness of workplace assessment strongly depends on the competence of the assessors…' (CLG, 2013, p 18). In addition the framework highlights five key elements in terms of individual responsibilities that comprise a safe person, one of which is competence. Significantly, the framework highlights that 'Organisational Human Factors' potentially have the most influence on team and individual behaviour, .e.g. poor training, which is described as a 'latent failure', i.e. one that typically involves management systems. With regards to individual 'Human Factors' the guidance states that attributes such as competence may be changed and '…this is why developing non-technical skills is so important and can influence the behaviour of individuals in the safety critical operational environment…' (CLG, 2013, p 34).

- Overall, the matter of incident commander competence, its acquisition, assessment, measurement and maintenance is of primary importance, including its expansion to include the non-technical skills as advocated by the HSE, which is not currently advocated within existing guidance.

Decision Making:

- Decision making is mainly covered in an appendix in the FRS Incident Command manual entitled the 'Psychology of Command'. It mainly focuses on RPD, i.e. a style that is used by incident commanders in dynamic and ambiguous situations. Appendix 4 covers in detail a decision making model and sets it out as means to conduct a dynamic risk assessment - which could be confusing as another appendix details the dynamic risk assessment process. It has a close relationship with dynamic risk assessment as an outcome of the latter is a decision on which tactical mode to adopt for operations. An incident commander needs to make many and varied decisions about resources, operational tactics, communications, etc.
- Despite the two appendices that provide some information on decision making it does not form an upfront feature of the Incident Command System and there is insufficient detail on the different types of decision making styles and the context in which they are used.
- Professional judgement is referred to in the FRS Incident Command manual and is applied in conjunction with SOPs once all available information has been gathered '...to decide the most appropriate course of action, weighting the benefits of proceeding with a task against the benefits likely to be gained' responsibilities' (Fire and Rescue Service Manual, Incident Command, 2008, p 64). Where the decision involves an occasion when a rapid intervention is required to effect a rescue, the incident commander must ensure that personnel are not put at an unnecessary risk by undertaking work outside of agreed safety procedures and may decide to 'adopt to a defensive approach until further information has been gathered' (Fire and Rescue Service Manual, Incident Command, 2008, p 64). This approach is reinforced in a recommendation within the Harrow Court investigation and was a feature of the Garston mine incident where an incident commander decided to suspend FRS operations and follow policy and await the arrival of a mountain rescue team. HMCI who reviewed the Garston mine incident acknowledged that the incident was beyond the experience of any of the emergency personnel who attended. Also that a balance needs to be struck between the benefit to be gained at an incident against the risks to personnel and members of the public. However, the HMCI observes that striking that balance is reliant on a subjective judgement, where different people will make different judgements given the same situation. But, he clearly sets out what is expected of an incident commander on the incident ground, i.e. they '...make this kind of judgement in a way which is both intelligent and informed...they should have the best possible understanding of the benefits to be gained...and the risks associated with the actions of the responding personnel before determining and plan of action' (Galston Mine Incident Report, 2012, p 23).
- Operational discretion is referred to by the Coroner in relation to the London bombings of 2007. She observes that '...the need to balance the understandable and human urge to get involved in a rescue mission against a proper assessment of the risks involved...' (London Bombings Rule 43 Report, 2011, p 49) and queries '...whether, in striking that balance, fire-fighters are permitted a sufficient degree of individual discretion' (London Bombings Rule 43 Report, 2011, p 49). She resolves the dilemma by advocating the use of DRA as a means to use judgement and common sense and also enabling 'protocols to be approached with a degree of flexibility, without putting fire crews unnecessarily at risk' (London Bombings Rule 43 Report, 2011, p 50).

- The HSE in their 'Striking the Balance...' document recognise that one of the significant challenges for the FRS is that '...they have to prepare individual employees to be able to make decisions in dangerous, fast-moving emotionally charged and pressurised situations, even when there may sometimes be incomplete or inaccurate information...' (HSE, 2010, p 2). The HSE go on to state that when conducting an investigation it will '...not revisit decisions made during operations with the benefit of information that could not reasonably have been known at the time...[and consider]...the quality of the decision making at an incident as illustrating whether individuals had been adequately prepared for that incident by the service...' (HSE, 2010, p 4).
- The HSE's policy statement defines an act of heroism by a firefighter and acknowledges that decisions by firefighters to place themselves at risk is highly likely to place others at risk in their team. However, they also acknowledge that such decisions will be made by firefighters working together in a rapidly changing, dangerous situation when they have not received orders to do so or when there is no safe working system. Subsequently, if during an investigation into a serious event by the HSE, it '...becomes clear...that the incident involved an act of heroism by firefighters, then HSE will not investigate the actions of the individuals in order to take any action against them..., (HSE, 2011, p 2). This would appear to endorse operational discretion where firefighters may act outside of a safe system of work in order to save or protect life.
- Operational discretion is referred to in relation to incident commanders in the CLG health, safety and welfare framework for the operational environment for FRAs. It advocates that whilst SOPs provide a framework of good practice to support incident commanders they need to be flexible enough to '...allow the Incident Commander to exercise discretion on the resources and procedure required to resolve the emergency...the decision to exercise operational discretion...should be based on a balance in terms of risk versus benefit and the Incident Commander knowing the actions which are normally required by the relevant standard operating procedure...' (CLG, 2013, p 23). This implies that an incident commander when making decisions must know when they have deviated from a SOP.

Dynamic Risk Assessment:

- Despite the emphasis placed on the importance of dynamic risk assessment in the FRS Incident Command System a number of FRS incident investigations and/or Coroner Rule 43 reports incorporated recommendations for improvement in relation to it, e.g. Harrow Court, Marlie Farm, Galston mine incident, Lakanal House, and Shirley Towers. In addition the importance of dynamic risk assessment was reinforced in 2010 in the consolidated report of the HSE's inspections of FRS during 2009-10. It stated that '...incident commanders have a thorough knowledge of the dynamic risk assessment process...' (HSE, 2010, p 20).
- The dynamic risk assessment process found in an appendix in the FRS Incident Command manual is complex and not obviously representative of a dynamic process.
- In a report produced by the CFOA in response to the consolidated HSE report, CFOA stated an '...aim to establish national/UK best practice and guidance on the provision and dissemination of risk information, incorporating human factors guidance to

support effective Dynamic Risk Awareness which informs operational dynamic decision making...' (CFOA, 2010, p 5).

- In 2011 the HSE commented in its policy statement on acts of heroism by firefighters that in very exceptional circumstances firefighters may make an independent decision to put themselves at risk in dynamic environments and where there is not a safe system of work in order to save or protect life.

- In 2013 CLG produced a health, safety and welfare framework for the operational environment for FRAs. Within that document it referred to four pillars of risk assessment, one of which was dynamic risk assessment, but it also introduced 'individual risk assessment' which arguably is to fire-fighters what dynamic risk assessment is to incident commanders.

Functional Support Roles:

- The Coroner's Rule 43 report into the July 2005 London bombings makes a number of recommendations in relation to the emergency services. In support of her recommendation in relation to training the Coroner states that there were '...some basic misunderstandings between emergency services as to their respective roles and operations...' (London Bombings Rule 43 Report, 2011, p 37).

- In the East Sussex FRS Marlie Farm investigation training for commanders was recommended in the roles of Command Support Officer, Incident Safety Officer and other functional roles. Another recommendation required East Sussex FRS to review their policy on functional roles to include an extra responsibility for the Marshalling Officer role, whilst a third recommended training be provided for the role of Water Resources Officer.

- The HFRS investigation into the fatal fire at Shirley Towers recommends that HFRS review its policy and guidance to make reference to the implementation and resourcing of a Search Sector, which is not a role currently prescribed in any FRS incident command literature. The investigation also records a HSE recommendation to '... review of the assessment of command competence in the role of Sector Commander...' (Hampshire FRS, 2013, p 159).

- In CFRA's 2009 operational guidance for the National Co-ordination and Advisory Framework there are several references to a variety of teams whose role it is to support either the Gold Commander or Silver Commander dealing with a major or large area incident. However, there is only a small amount of information in relation to the practical application, role and responsibilities of the roles of the team members, e.g. that of the Enhanced Command Support Officer.

- Existing guidance, e.g. the FRS incident command manual does quantity in broad terms a small number of functional support roles, e.g. safety officer, sector commander and operations commander. However, it only lists a number of other functional support roles and does not provide guidance on, for example, their relationship with the incident commander.

Human Factors:

- The HSE's document HSG65 Successful health and safety management, specifies best practice for health and safety management which includes '...Effective health and safety policies, including a reference to organisations needing to 'understand how human factors affect health and safety performance' (HSG65, 2011, p 14). In relation

to different means of active monitoring it advocates, '...systematic direct observation of work and behaviour...' (HSG65, 2011, p 60) and importantly, HSG65 states that 'good investigations identify both immediate and underlying causes, including human factors' (HSG65, 2011, p 66). In contrast the FRS Incident Command manual only makes few references to human factors, e.g. fire officers who have studied...human factors training have argued that it has clear applications for the fire service' (Fire and Rescue Service Manual, Incident Command, 2008, p 117).

- Human factors were inevitably a feature at the tragic incidents reported in this document, but FRS incident investigations and/or Coroner Rule 43 reports do make any explicit reference to them and they do not form a section within any of the FRS investigations. However, in HMCI's Galston mine incident report he makes the following observation with reference to the inability of the incident commanders to change their decision to suspend FRS operations despite significant environmental changes. The HMCI acknowledges that this is '...a phenomenon relating to the psychology of decision making...(Galston Mine Incident Report, 2012, p 23). Likewise human factors will be a feature of an act of heroism.

- CFOA in their response to the HSE's consolidated report on the inspections of FRSs they carried out in 2009 – 10 stated in regard to the provision of risk critical information that it was an 'Aim to establish national/UK best practice and guidance on the provision and dissemination of risk information, incorporating human factors guidance to support effective Dynamic Risk Awareness which informs operational dynamic decision making...' (CFOA, 2010, p 5).

- Human factors feature significantly in CLG's health, safety and welfare framework for the operational environment for FRAs. A chapter is devoted to them and states that '...80 per cent of industrial accidents can be attributed to human factors or omissions...[and]...most firefighter injuries are influenced by the same factors...' (CLG, 2013, p 32). The guidance states that understanding human factors is critical to effective health, safety and welfare management and their influence on behaviour should not be underestimated. It cites 'Organisational' factors as potentially having the greatest influence on team and individual behaviour, e.g. training and communications and that human factors are '...often overlooked in the design of work, procedures and tasks, as well as during the investigation of safety events...' (CLG, 2013, p 32). With regards to individual 'Human Factors' the guidance clearly states that attributes such as competence, attitudes and beliefs may be changed and makes a direct link between the ability to do this and non-technical skills because they '...can influence the behaviour of individuals in the safety critical operational environment...' (CLG, 2013, p 34).

- In relation to the involvement of human factors in accidents the CLG guidance highlights that they may be active or latent. Active human factors failures are those that have an immediate effect on health and safety and include decisions by incident commanders to commit to tasks in dynamic, hazardous and ambiguous environments without sufficient resources, but where a high expectation to act exists. The guidance advocates a set of guiding principles that can control active failures that includes safety leadership, safe operational culture, and accurate, two-way communication. Latent human factors failures are referred to as typically involving management systems, e.g. ineffective training, inadequate supervision and uncertainty in roles and responsibilities.

- The CLG framework also defines fatigue as an issue that may be '...either physical or mental and may significantly affect a person's ability to function...' (CLG, 2013, p 51). The guidance clearly highlights how dangerous it can be when personnel are required to conduct tasks that require prolonged periods of concentration by listing some of its potential outcomes. For example, the list includes poor judgement, reduction communication, and reduced visual perception. These and the other outcomes listed all relate directly to non-technical skills, i.e. decision making, communication, and situation awareness.

Interoperability:

- There are legal requirements that either establish the opportunity for interoperability such as mutual assistance schemes within the Fire and Rescue Service Act 2004, or require it as per the Civil Contingencies Act 2004. The UK Resilience arrangements are detailed in the Incident Command manual. Yet a number of the FRS incident investigations and/or Coroner Rule 43 reports incorporated recommendations for improvement in relation to it. For example, the London Bombings 2007 where there were '...some basic misunderstandings between the emergency services as to their respective roles and operations...' (London Bombings Rule 43 Report, 2011, p 37) ; Marlie Farm where there were recommendations for improvements to inter-agency liaison and information sharing; and the Galston mine incident where there was '...a lack of awareness within the rescues services of the range of potential rescue services which could assist and inadequate knowledge, communication and co-ordination between those services...' (Galston Mine Incident Report, 2012, p 7) and '...a significant weakness in the working arrangements and communication between blue light services...decision making, command and control arrangements were at best informal...' ' (Galston Mine Incident Report, 2012, p 5). A confounding factor in some of these incidents was the complex language in which critical documents were written. The Coroner for the London Bombings was critical of the use of complex acronyms and unnecessary jargon with procedures and plans as they impeded communication and undermined understanding of the roles and intentions of members of the other emergency services, and so adversely impacted upon the coordination of effort.
- The CFRA's operational guidance for the National Co-ordination and Advisory Framework sets out a dispersed network of teams to support Gold Commanders and Strategic Co-ordinating Groups, who in turn are supporting Silver Commanders at the scene of a major or large scale incident. This emphasises the continued importance of interoperability between FRSs and across multiple agencies and it is worth noting that the organisation of this support has been updated in the current version of the non statutory guidance on response and recovery, e.g. the replacement of the Government Offices of the Regions with the Resilience and Emergency Division, since the Incident Command manual was last revised.
- The HSE in their 'Striking the Balance...' document state that when conducting an investigation it will examine '...the extent to which any lack of preparedness contributed to the risks in particular circumstances...' (HSE, 2010, p 4).
- The guidance within the CLG's health, safety and welfare framework for the operational environment for FRAs describes latent failures as typically involving management systems, e.g. uncertainty in roles and responsibilities and it states that

'suitable and sufficient planning is vital in reducing the influence of latent failures and enhancing the safety of operational personnel...' (CLG, 2013, p 36).

Leadership:

- It has already been observed that leadership does not appear to have the prominence it warrants within the FRS Incident Command manual. It is surprising to note that there are no explicit references to leadership within any of the FRS fatal fire investigations nor any of the Coroner Rule 43 reports. Yet the sequence of events recorded in those documents would imply that leadership was an issue, e.g. the decision to with suspend FRS operations the Garston mine incident by an officer who was en route to it. Leadership is implied in the CFRA's operational guidance for the National Co-ordination and Advisory Framework in so far as FRS Gold Commanders will be in the forefront of agreeing strategic objectives for a major, large scale incident. However, the CLG health, safety and welfare framework for the operational environment for FRAs advocates positive 'safety leadership' and the promotion of safety leadership as two of its guiding principles. Significantly the guidance quantifies leadership within operational command as having a risk critical and central role, particularly in relation to decisions made affecting firefighter safety.

Provision of Risk Information:

- The provision of information is specified in the Health and Safety at Work Act 1974 under Section 2(2)(c), the Fire And Rescue Services Act 2004 under section 7(2)(d) and Section 12 of the Civil Contingencies Act 2004. Within the non statutory guidance in relation to the Civil Contingencies Act 2004 in relation to response and recovery one of the eight guiding principles is information. This is acknowledged as critical to emergency response and recovery and must be supported by appropriate and effective information management systems which support single and multi-agency decision making and build situation awareness and a common recognised information picture (CRIP). Within the Incident Command manual it is implied rather than up front with it only really referenced in chapter three on FRS resilience in terms of the provision of advice and the maintaining of communication flows between the incident and COBR, for example.
- However, the impact the lack of risk information has on command decision making is highlighted in a number of FRS incident investigations and/or Coroner Rule 43 reports, e.g. the London Bombings in 2007, Marlie Farm, Atherstone on Stour, Lakanal House and Shirley Towers.
- The HSE in its 'Striking the Balance..,' document states that when conducting an investigation it will consider the information available to staff at the time they had to make operational decisions. In a consolidated report of the HSE's inspections of FRSs in 2009-10 it made two recommendations with regard to the provision of information:
  - o '...it is important that the risk critical information provided to an Incident Commander is accurate, timely and suitable...Services need to ensure that their systems to capture and maintain risk critical information are robust...
  - o ...incident commanders are able to access the information to inform their command decisions... (HSE, 2010, p 13 - 14).

- The 2013 CLG health, safety and welfare framework for the operational environment for FRAs listed the four pillars of risk assessment and under 'strategic' risk assessment which identifies the control measures required to eliminate or reduce risk, one of those measures was the provision of risk information. It also quantified the importance of risk critical information, including site-specific information, as an essential part of the planning process to ensure safe operations and that FRAs should have systems in place to ensure that it is immediately available to incident commanders.

Transfer of Command

- The transfer of command between officers has also been raised as a cause for concern. In the HtFRS Harrow Court investigation one recommendation to review and summarise generic incident command system actions includes the need for senior officers to make it clear when they are assume command.
- The Rule 43 Coroner's report on the July 7th 2005 London bombings includes a reference to confusion at all four sites and that at '...Aldgate it was not clear to the LFB which of their staff considered themselves to be the initial incident commander...' (London Bombings Rule 43 Report, 2011, p 37).
- A recommendation to ensure that all officers at an incident receive a handover before making command decisions is made by the East Sussex FRS investigation into the Marlie Farm fatal fire and explosion.
- HMCI comments on the four transfers of command demonstrated at the Galston Mine incident. He queries the value added to the overall operational command of so many transfers, some of which were not necessary. Importantly, HMCI reflects that at worst so many transfers of command might have added an unnecessary complication to the decision making process.
- The Coroner's Rule 43 Report on the Lakanal House fatal fire includes a recommendation for the LFB to consider providing training on the handover of command between one officer and another.
- Within the Hampshire FRS Shirley Towers investigation the HSE recommend that HFRS '...re-emphasis monitoring of handovers of incident command...to ensure adequate exchange of risk critical information...' (Hampshire FRS, 2012, p 159).
- The importance of the command handover cannot be understated as it needs to be comprehensive and include all risk critical information. It is therefore, a pivotal point in the on-going safety management of an incident. Consequently, it could be argued that any handover of command ought to be structured, monitored and recorded to ensure no risk critical information is omitted.

4. Other Industry Literature

There are a number of other industries who expect their staff from time to time to work in dynamic, high risk, safety critical environments. For example, surgeons and anaesthetists in the healthcare industry; airline pilots in the aviation industry; ships Captains in the marine industry; and off shore drilling crews and managers in the oil and gas industry.

Organisations within each one of the industries above occasionally experience accidents or events that cause their performance to be scrutinised and reported upon. Equally, as organisations they have responded to the findings of their performance reviews. This

section of the literature review summarises a selection of those reports and other related documents.

Aviation Industry: On the 27th March 1977, two Boeing 747 aircraft collided on the runway of Los Rodeos airport on the island of Tenerife. Both aircraft had been diverted to the airport due to a terrorist incident at their original destination, Las Palmas. Once Las Palmas reopened, Los Rodeos airport was shrouded by thick fog and the air routes were congested because of the earlier re-routing of aircraft. A KLM aircraft was awaiting clearance to take off at the end of the runway, whilst a Pan Am aircraft was instructed to cross the runway to reach another taxiway. As the Pan Am aircraft crossed the runway the KLM Captain mistook an instruction from Air Traffic Control (ATC) for clearance to take off and began to accelerate his aircraft down the runway. He could not see the other aircraft due to the foggy conditions and likewise the ATC were unable to see either aircraft, but also there was not a runway radar system. The Pan Am crew noticed the KLM aircraft just 10 seconds before they collided, but could not take evasive action. The collision resulted in 583 lives being lost. The immediate cause of the accident was a failure of non-technical skills within the KLM crew. In terms of communication, the Captain failed to confirm the ATC instruction was for take-off (he had only been given clearance for the route they were fly); ignored a comment from his co-pilot about this; and later over-ruled a comment from his Flight Engineer that the Pan Am aircraft might not be clear of the runway. However, there were other failures within the team that related to leadership behaviours and:

- '...the temporary nature of the cockpit crew...

- ...stress...

- ...groupthink...

- ...pluralistic ignorance...[which]...means I am puzzled by what is going on, but I assume no one else is, especially as they have more experience, more seniority, higher rank...

- ...group interaction...' (Weick, 1990, p 587 – 589).

On the 8th January 1989 a British Midland Airwarys (BMA) Boeing 737 was enroute from Heathrow to Belfast airport. As the aircraft was climbing through 28, 300 feet a fan blade in the left (No 1) engine failed. This caused the airframe to shudder and sparks, flames and smoke to be observed by passengers and members of the cabin crew. The smoke and fumes also entered the flight deck. The flight crew believed that the damage had been caused to the right (No 2) engine and so shut it down, which stopped the vibration and led them to believe they had resolved the problem. The Captain decided to divert the aircraft to land at the East Midlands Airport and during this phase of the filght the No 1 engine performed normally. However, on the approach to the airport the No 1 engine began to vibrate heavily until it failed 2.4 miles short of the runway. An unsuccessful attempt was made to restart the No 2 engine and the aircraft crashed short of the runway on the embankment of the M1 motorway. 47 people lost their lives. The AAIB investigation determined that the cause of the accident was the erroneous shutting down of the No 2 engine. The contributory factors were:

- '...The combination of heavy engine vibration, noise, shuddering and an associated smell of fire were outside...[the flight crew's]...training and experience...

- …they reacted to the initial engine problem prematurely and in a way that was contrary to their training…

- …they did not assimilate the indications on the engine instrument display before they throttled back the No 2 engine…

- …they were not informed of the flames which had emanated from the No 1 engine which had been observed by many on board, including 3 cabin attendants in the aft cabin…' (AAIB, 1990, p 2).

The decision of the Captain to divert to the East Midlands Airport was correct, but it significantly increased the workload of the flight crew preventing a review of the emergency and the actions he had taken. None of the pilots had received any simulator training on the recognition of engine failure or '…on the decision-making techniques in the event of failures not covered by standard procedures…' (AAIB, 1990, p 142).

Up until the late 1970's aircraft accident investigators had assumed that the primary causes of aircraft accidents were technical failures of the aircraft. However, a series of accidents including the Tenerife accident obliged investigators to review this assumption and identify other contributory factors such as 'pilot error' or the human factors associated with aircraft accidents. Cockpit voice recorders (CVR) enabled the conversations of flight deck crew to be analysed before and during an accident. The analysis of such material '…suggested failures in leadership, poor team co-ordination, communication breakdowns, lack of assertiveness, inattention, inadequate decision-making and personal limitations, usually relating to stress and fatigue' (Flin, O'Connor & Crichton, 2008, p 4). Therefore, these failures involved non-technical skills.

The response to this discovery was for the aviation industry to introduce Crew (nee Cockpit) Resource Management (CRM) training for all flight deck crew based on a set of core non-technical skills identified by amongst others, NASA and the University of Texas. John Lauber is quoted in Wiener, Kanki and Helmreich (1993) as defining CRM as '…using all available resources – information, equipment, and people – to achieve safe and efficient flight operations…' (Wiener, Kanki & Helreich, 1993, p 4). CRM training was enshrined within the Civil Aviation Authority's (CAA) Civil Aviation Publication (CAP) 737: Crew Resource Management (CRM) Training. The non-technical skills identified by this document were: situational awareness, planning and decision making, interpersonal communications, teamwork and factors affecting individual performance such as managing stress, and fatigue (CAA, 2006). In 2003 a European Joint Aviation Authority (JAA) research project produced a behavioural maker system called NOTECHS to assess the non-technical skills of flight deck crew '…to achieve a generic method of evaluation of non-technical skills throughout the JAA countries…a generic method would minimize cultural and corporate differences, and maximize practicability and effectiveness for airline instructors and examiners…' (Flin et al, 2003, p 96). Subsequently, the CAA have developed an accreditation framework for CRM instructors and examiners in the UK that complies with the European regulations EU-OPS and JAR-OPS 3 that specify the minimum safety and related procedures for commercial passenger and cargo aviation (CAA, 2013).

Marine Industry: On the 6th March 1987 the roll on roll of ferry the Herald of Free Enterprise left Zeebrugge en route to Dover. Despite favourable weather and sea conditions shortly after leaving the confines of the harbour the ship sank with the loss of 188 lives. The immediate cause of the tragedy was the failure to close the inner and outer bow doors prior to putting to sea. The main contributory causal factors included several non-technical skill

failures. For example, the failure of the Assistant Boson to control or manage his fatigue that led him to fall asleep and fail to close the bow doors; the failures of communication between the Second Officer, Chief Officer and Master to confirm that the doors were closed; and likewise the ineffective handover of 'loading officer' duties between the Second Officer and Chief Officer. In addition there was a failures of supervision to ensure the bow doors were closed by the Chief Officer and Master. These were active failures with immediate consequences, however there were also latent failures by the management of Townsend Car Ferries Ltd. These included failures to consider the management of ship safety that led Justice Sheen to refer to them as a '...disease of sloppiness...' (Department of Transport, 1987, p 14). There were issues with the company's standing orders, e.g. they were vague and contained interchangeable terminology, and evidence the company did not take its primary role of safe management seriously, e.g. a refusal to install door open indicator lights on the bridge in 1985.

On the 3rd January 1993 a motor tanker named Braer left Norway en route to Quebec, Canada carrying 84 700 tonnes of light crude oil. Throughout the voyage it encountered a severe southerly storm which caused some spare pipes to break free from their fastenings and move freely about a deck. This was not noticed by the crew until several hours after the event, during the intervening period the pipes had caused damage to equipment related to the ships diesel tanks causing sea water to contaminate them. In turn this led to engine failure causing the ship to drift at the mercy of the sea. The Master of the vessel was faced with the sudden, unexpected loss of power in the midst of a severe storm. Despite efforts to restore power the ship's engineers were unable to do so and it eventually grounded on Garths Ness.   Whilst, no lives were lost, damage caused to the vessel led to significant quantities of crude oil to leak into the environment. The Marine Accident Investigation Report's findings included a number in relation to the decision making of the Master:

- '...When it was reported to the Master on the morning of 4th January that the pipe sections had broken loose he failed to take any action...this was a serious dereliction of the Master's duty to preserve the seaworthiness of his vessel and the safety of her crew...(Chief Inspector of Marine Accidents, 1993, p 71)

- '...the Master was at fault in allowing the navigation officers and ratings to spend their entire periods of bridge duty inside the wheelhouse. This was an unseamanlike practice, particularly in heavy sea conditions when it is essential to be aware of what was happening on deck areas not within sight of the wheelhouse...(Chief Inspector of Marine Accidents, 1993, p 72)

- '...The Master made no effort to ascertain the direction and rate of drift of his vessel, even after being asked to do so by the Coastguard...' (Chief Inspector of Marine Accidents, 1993, p 73)

More recently, and 19 years after the grounding of the Braer, on the 13th January 2012 the cruise ship the Costa Concordia collided with rocks just off the shore of the Italian island, Giglio resulting in the deaths of 30 people. The Captain had planned to conduct a high speed pass of the island in an area of coastline that was dark and ultimately too close to the shoreline. The collision with the rocks uniquely breached 5 continuous water tight compartments of the ship, well above the ability of the ship to survive, each one of which contained equipment vital to the ship's operation. Consequently, the collision brought about a sudden stop and immediate loss of power and propulsion.

The Italian Marine Casualties Investigative Body (MCIB) report made a number of findings in relation to the Captain's decision making. He:

- Failed to immediately activate the 'General Emergency Alarm' and inform the search and rescue authorities of the collision (the latter was done so by a member of the public on the island). The Captain eventually alerted the search and rescue authorities 41 minutes after the collision took place.

- Failed to put out a distress signal and only did so at the insistence of the search and rescue authorities 53 minutes after the collision.

- Failed to initiate an effective General Emergency Alarm ahead of the abandon ship alarm (only used a 'signal-voice announcement which some passengers did not hear), that led to a delay in the management of subsequent phases of the emergency.

- Failed to use the correct navigational charts and directions for directing the ship's course and disregarding the proximity of the shoreline.

- Failure to comply with Safety Management System procedures to co-ordinate the crew's response to the emergency.

However, the MCIB report also referred to other issues directly related to non-technical skills and the management of the emergency. For example, in terms of leadership the performance of the Captain (and his Bridge Team) was effected by his decision to permit unauthorised people to be on the bridge. Consequently, they were distracted from their duties and did not pay the '...required attention...[to]...e.g. ship steering,...[ship's]... position...' (MCIB, 2012, p 6). In addition, there were a '...lack of orders from the Bridge to crew involved in safety issues...[which]...hindered the management of the general emergency-abandon ship phase...' (MCIB, 2012, p 6). With regards to teamwork, the Bridge Team did not act to challenge the Captain's orders or to warn him of their potential consequences.

Overall, the report states that '...the human element...[was]... the root cause in the Costa Concordia...[accident]...' (MCIB, 2012, p 9) and it goes on to observe that '...emergency management is, in general, influenced by the correct management of the human resources, which depends on...recruitment...training...minimum safe manning...and the familiarization with the special duty assigned...[to a crew member]...in case of an emergency...' (MCIB, 2012, p 74). In recognition of the importance of these issues it recommends to the International Maritime Community that a systematic approach should be adopted to mitigate the influence of human factors on future accidents by providing education, training and technology.

The response to such causes of shipping accident of one section of the shipping industry in the early 1990's was to model training in non-technical skills for Ship's Captains and Bridge Teams based on that developed by the aviation industry it was called Bridge Resource Management. More recently, similar training has also been developed for ships engineers and in 2008 a behavioural marker scheme was developed to enable the assessment of non-technical skills of them. In 2010 amendments to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 introduced regulations for Bridge Resource Management, Engine-room Resource Management, Leadership and Managerial Skills and the Application of Leadership and Teamworking Skills. In the same year the Warsash Academy in the UK developed a behavioural marker scheme for officers in the Merchant Navy.

Oil Industry: On July 6th 1988 the Piper Alpha oil platform experienced a series of devastating explosions and fires which killed 165 people on the platform and claimed a further two lives from those who were involved in the rescue attempt. The cause of the explosions was the uncontrolled release of condensate (hydrocarbon liquids such as butane and propane found in Natural gas) when a pump was restarted after some maintenance. During the maintenance a relief valve had been removed for servicing, but it was not completed by the end of the engineers shift. The permit to work system was not complied with as the fact that the relief valve work was not finished or that the pump was missing a relief valve was not correctly recorded or reported. In addition this was not handed over to the next shift.

The situation was further compromised following the explosions and fire by the platform's deluge system being unavailable because the diesel powered fire pumps were in manual operation mode due to divers working round the platform. This was despite a recommendation in a 1983 fire audit to stop the practice because personnel would have go to the pumps to get them operational. Consequently the deluge system for the platform was unavailable as the pumps could not be reached and the steel structure was unprotected and subject to rapid failure. Yet even if it was operational approximately 50% of the sprinkler heads were plugged due to maintenance operations falling behind.

Another contributory factor to the scale of the accident was Piper Alpha's position as a hub for a network of platforms interconnected by oil and gas pipelines. These pressurised pipelines were ruptured by the explosions, but the other platform managers assumed they would be requested to shut down their lines if needed, not appreciating the seriousness of the accident. Consequently pressurised oil and gas were fed into Piper Alpha, fuelling the fire until well after the initial explosions. The intensity of the fire prevented all rescue attempts.

Other issues identified by the investigation included:

- '...emergency response training given to personnel was cursory and not uniformly provided...

- ...Evacuation drills were not conducted weekly as required...[and]...no full-scale shutdown drill had been conducted in the three years prior to the explosion...

- ...platform managers had not been trained on their response to such an emergency on another platform...' (Centre for Process Safety, 2005, p 3).

In the Gulf of Mexico a British Petroleum, oil and rig was drilling in extremely deep water, when without warning the drilling riser separated 3200ft from the surface of the sea. The drilling riser is a large diameter pipe is connected between the well head on the sea bed and the rig that 'returns' the chemical mud to the surface. On this occasion on the 21st May 2003 the well head equipment worked perfectly and there was no contamination involved in the Thunder Horse riser incident. Following it a review took place into the incident command skills used by the members of the shore-based incident command team and those on the rig. The review identified the following skills: '...decision making, situation awareness, communication, leadership and teamwork, all of which can be affected by stress, as well as organisational factors that influenced the outcome of the incident...' (Crichton, Lauche & Flin, 2005, p 1).

However, whilst the circumstances of the Macondo oil well blowout were similar with regards to the nature of its drilling operations the outcomes could not have been more

different. On the 20th April 2010 the Deepwater Horizon mobile drilling vessel was carrying out exploratory drilling for oil and gas in 5000ft of water in the Gulf of Mexico. At approximately 22:00 hours an uncontrolled flow of water, oil, mud, gas and other materials forced itself up the drilling riser and onto the mobile oil rig. This was quickly followed by a series of explosions and a fire that resulted in the deaths of 11 people. Over the next two days the fire was fuelled by the unchecked flow of hydrocarbons coming from the oil well. After two days the Deepwater Horizon sank and the fire was extinguished, but in so doing the drill riser broke off from the blowout preventer at the wellhead on the sea floor. This led to the world's largest oil spill in history with approximately 4.9 million barrels (779 million litres) of oil being released into the Gulf of Mexico and devastating marine and coastal environments over an 83 day period. During that time many and various attempts were made to cap the well, but eventually a pressure bearing cap with a new blowout preventer attached was bolted onto the drill riser. Subsequently, two relief wells were drilled that intersected the original well allowing mud and cement to be pumped into it.

The investigation that followed commented that '...this disaster was preventable if existing progressive guidelines and practices had been followed...BP's organizations and operating teams did not possess a functional safety culture...' (Deepwater Horizon Study Group, 2011, p 9). The investigation goes on to state that '...the Macondo well disaster was an organizational accident whose roots were deeply embedded in gross imbalance between the system's provisions for production and those for protection...' (Deepwater Horizon Study Group, 2011, p 9). Furthermore, that '...there was not any effective industry or regulatory checks and balances in place...[and]...as a result of a cascade of deeply flawed failure and signal analysis, decision making, communication, and organizational-managerial processes, safety was compromised to the point that the blowout occurred with catastrophic effects...' (Deepwater Horizon Study Group, 2011, p 9). However, in 2008 the Deepwater Horizon received an award for its safety record and on the day of the explosion there was a celebration on board in recognition of '...seven years without a lost-time incident...' (Deepwater Horizon Study Group, 2011, p 38).

As with so many disasters the circumstances closely relate to other major disasters within the offshore oil and gas industry, including Piper Alpha. '...In all...[such]...disasters, risks were not properly assessed in hazardous natural and industrial-governance-management environments. The industrial-governance-management environments unwittingly acted to facilitate progressive degradation and destruction of barriers provided to prevent failures...' (Deepwater Horizon Study Group, 2011, p 10). The report recommends that the '...industry must address important challenges to upgrade selection (people with the right talents for the tasks to be performed), training (for normal, emergency, and abnormal activities), mentoring, collaboration, and teamwork...' (Deepwater Horizon Study Group, 2011, p 13).

The American Institute of Chemical Engineers commissioned a human error analysis of the seven critical events of the Deepwater Horizon disaster to identify the likely causes. The research developed an error classification system which identified errors in:

- '...design...
- ...maintenance/testing...
- ...policy/procedure...
- ...training...
- ...decision making...

- …organisation/management…

- …risk perception/risk acceptance…

- …communication…' (Smith et al, 2013, p 220).

The greatest number of human errors involved 'organisation/management' followed by 'decision making' and 'risk perception/risk acceptance'. The majority of these were latent errors, but there were several active errors which had immediate consequences. For example, the misinterpretation of a negative pressure test to check if fluids could enter the well (it was read as none were doing so when in fact the well was not sealed); and the loss of situational awareness of the well's condition by the oil rig crew and the technicians monitoring the contents of the circulating mud within the drilling pipe (mud loggers) due to distractions from multiple, simultaneous activities and visiting VIPs.   The research reflects the findings of Sneddon, Mearns and Flin (2006) when they examined situational awareness and safety in offshore drill crews, i.e. '…situation awareness (SA) and human cognition are crucial to the safe operation of complex systems…the level of SA is often directly related to the level of safety found during an operation…' (Smith et al, 2013, p 220). Overall, the research concludes that '…there was a total safety system breakdown…evidence of…[which]…can be seen in lack of maintenance on critical systems, a failure to follow industry guidelines, and the management's continuous decisions to sacrifice safety by cutting corners to save time and money…' (Smith et al, 2013, p 222).

The response of the oil and gas industry has been similar to that of the aviation and marine industries. In 1997 'Step Change in Safety' was launched in the UK aimed at making the UK oil and gas industry the safest in the world. Behavioural change was a major feature of the efforts to improve safety and in 2000 the 'Changing Minds' report was published which aimed to '…provide a practical framework for the process of identifying behavioural issues and taking effective action to address them…' (Step Change in Safety, 2000, p 5). In 2003 Crew Resource Management (CRM) training based on the non-technical skills was piloted amongst North Sea oil production companies. The subsequent report concluded that the training was well received and had a positive effect on the participants' attitudes, however, the '…development of valid techniques to assess CRM attitudes and skills are required…the aviation industry is addressing this issue…[by]…the use of behavioural marker systems…' (O'Connor and Flin, 2003, p 606). In 2010 Step Change in Safety's Human Factors Steering Group produced the 'Human Factors how to take the first steps…' which sets out a series of accident case studies and highlights offshore oil platform workers was piloted the human and organisational factors that caused them to provide organisations an '…opportunity…to recognise how human factors impact on…[their]…work' (Step Change in Safety, 2010, p 3). To date behavioural marker schemes have yet to be developed but the identification of non-technical skills to develop CRM training is an on-going area of research within the industry.

Healthcare Industry: Patient safety has developed an ever increasing importance within the healthcare industry. In 2005 the National Audit Office reported that the Department of Health estimated that '…one in ten patients admitted to National Health Service (NHS) hospitals will be unintentionally harmed…[and that]…around 50 per cent of these patient safety incidents could have been avoided, if only lessons from previous incidents had been learned…' (National Audit Office, 2005, p 1). The report identifies that the most frequent patient safety incidents reported in 2003 – 04 were '…patient injury (due to falls) followed by medication errors, equipment related incidents, record documentation error and communication failure…' (National Audit Office, 2005, p 1). In 2009 the Healthcare

Commission published its investigation into the high mortality rates of patients admitted as emergencies at the Mid Staffs NHS Foundation Trust. The investigation discovered a litany of organisational and human errors that led directly to harm being caused to some patients admitted as emergencies, including a high number of fatalities. These included:

- a lack of leadership and governance

- a lack of consultant medical cover;

- a lack of nurses on duty to perform triage;

- a lack of nurse training and development;

- a lack of proper equipment such as defibrillators;

- inadequate supervision, training and support for junior doctors;

- patients not receiving the correct medication;

- inadequate handovers for patients, doctors and nurses;

- inadequate nursing care;

- inappropriate layout and environment (chaotic) of the emergency assessment unit, i.e. a unit that provides early assessment and treatment of adult patients from accident and emergency (A & E) prior to admission to an inpatient bed;

- confusion amongst A & E staff about the purpose and use of the clinical decisions unit, i.e. a short stay unit designed to manage conditions that can be treated within 48 hours;

- poor and inadequately followed patient care pathways leading to patients being sent to the wrong ward;

- little, if any, learning from complaints and patient incidents;

- surgical patients on wards other than trauma wards being cared for by nurses who did not understand their condition;

- delays in surgery leading to poor outcomes for some patients and no system in place to prioritise surgery at weekends;

- poor management of pain;

- poor relationships between consultants in general surgery and little evidence of multidisciplinary teamwork;

- poor governance in surgery with inadequate reviews of patient notes of those who had died and missed opportunities to learn from the outcomes of coroner's inquests;

- no quality assurance system in place for surgery; and

- occasionally very sick patients remained anaesthetised in the surgical recovery unit until a bed became available in the critical care unit.

Overall, the investigation concluded that:

- '...[the Trust]...did not have a grip on operational and organisational issues, with no effective system for the admission and management of patients admitted as emergencies...

- ...[the Trust]... did...[not]...have a system for monitoring outcomes for patients, so it failed to identify high mortality rates...

- ...when the high rate...[of mortality]...was drawn to...[the Trust's]...attention...it mainly looked to problems with data as an explanation, rather than considering problems in the care provided...

- ...the Trust's board and senior leaders did not develop an open, learning culture, inform themselves sufficiently about the quality of care, or appear willing to challenge themselves in the light of adverse information...

- ...the clinical management of many patients...fell short of an acceptable standard in at least one aspect of basic care...

- ...some patients who might have been expected to make a full recovery...did not have their condition adequately diagnosed or treated...

- ...[there were]...unacceptable examples of assessment and management of patients...[and]...the trust was poor at investigating such incidents...

- ...[the Trust]...appears to have lost sight of its real priorities...

- ...The Trust was galvanised into radical action by the imperative to save money and did not properly consider the effect of reductions in staff on the quality of care...it took a decision to significantly reduce staff without adequately assessing the consequences... (Health Commission, 2009, p 10 – 11).

Later in 2009 a House of Commons Health Committee report into patient safety made several conclusions and recommendations for the NHS. For example, with regards to an open and learning NHS the report observes that because of the blame culture and fear of litigation or prosecution, many patient safety events are under reported. Additionally, that the data collated by the NHS on such events does not identify deep root causations '...unlike reporting systems in other safety-critical industries...' (Health Committee, 2009, p 98). In relation to patient safety at the front line the report critically reflects that solutions to patient safety events fail to be adopted across the NHS even when disseminated by Patient Safety Alerts as they are handed down, if at all, as diktats from senior management. The report goes on to state that '...lack of non-technical skills can have lethal consequences for patients. However, the NHS lags unacceptably behind other safety-critical industries, such as aviation...human factors training must be fully integrated into undergraduate and postgraduate education...' (Health Committee, 2009, p 99). Consequently, this industry has acknowledged the role human factors play in patient safety and in 2009 the NHS issued a guide to implementing human factors in healthcare that aimed to '...build awareness of the importance of human factors in making changes to improve patient safety...' (NHS, 2009, p 3). However, over the last decade and more this industry in the UK has embraced the identification of non-technical skills to inform CRM training to reduce avoidable errors and improve patient safety. Ultimately this has led to the development of behavioural markers schemes and currently these exist for anaesthetists (Fletcher, et al, 2004), surgeons (Yule, et al, 2006), and scrub practitioners, i.e. surgical nurses and technicians (Mitchell et al, 2013)

with research being undertaken into the non-technical skills of Paramedics (Shields & Flin, 2013) and Pharmacists (Irwin, in preparation).

HSE: In 1999 the HSE produced HSG48 'Reducing error and influencing behaviour'. Within this guidance the HSE state that '…proper consideration of 'human factors' is a key ingredient of effective health and safety management…' (HSG48, 1999, p 1). The guidance highlights the impact human error and behaviour can impact on health and safety; how human behaviour and other workplace factors may affect the health of workers; and provides practical ideas on how to identify, assess and control risks originating from human factors. It breaks down human factors into those associated with the job, organisation and individual (see appendix 13).

The guidance explains that '…organisational factors have the greatest influence on individual and group behaviour…' (HSG48, 1999, p 2). Moreover, it states that organisations need to establish positive health and safety cultures that involves employees and emphasises that '…deviation from established health and safety standards is not acceptable…' (HSG48, 1999, p 2). Organisational factors that influence its health and safety culture include:

- '…senior management commitment…[is]…crucial to a positive health and safety culture…best indicated by the proportion of resources…and support allocated to health and safety management and by the status given to health and safety…

- …management style…a 'humanistic' approach to management involving more regard by managers for individuals' personal and work problems is likely to be more effective…

- …visible management…staff need to believe that all their managers are committed to health and safety…

- …good communications between all levels of employee…

- …a balance of health and safety and production goals…excessive production pressure creates an atmosphere of distraction and a shortage of time which makes human errors more likely… (HSG48, 1999, p 46).

The guidance also contains a chapter on understanding human failure and cites examples of major incidents that involved human error as causal factors, which included Piper Alpha and the Herald of Free Enterprise. It differentiates between active and latent failures as consequences of human failures and with regards to accident investigations it indicates that '…very often, little attempt is made to understand why human failures occurred…' (HSG48, 1999, p 11). The different types of human failures (see appendix 14) are described and explained with the two main types being 'errors' that involve unintentional acts and 'violations' that involve deliberate acts. The circumstances where human errors are more likely to occur include:

- '…work environment stressors, e.g. extremes of heat, humidity, noise…

- …extreme task demands, e.g. high workload, tasks demanding high levels of alertness…situations with many distractions and interruptions…

- ..social and organisational stressors, e.g. insufficient staffing levels, conflicts with work colleagues, peer pressure…

- …individual stressors, e.g. inadequate training and experience, high levels of fatigue, reduced alertness, family problems…

- …equipment stressors, e.g. poorly designed displays and controls, inaccurate and confusing instructions and procedures… (HSG48, 1999, p 15)

The guidance lists some methods that may be adopted in order to manage the influences on human behaviour such as time management, communication, training and goal-setting.

Organisational Learning: The ability for an organisation to learn has been referenced as a key organisational factor in safety management. The degree to which personnel within organisations feel able to report accidents and near misses depends on the organisational culture. Within the aviation industry there are anonymous reporting systems such as NASA's Aviation Safety Reporting System which is an online reporting system for pilots, air traffic controllers, dispatchers, cabin crew, maintenance technicians and others. The reports '…may describe both unsafe occurrences and hazardous situations…[and]…information…gathered…[is]…disseminated to stakeholders…' (NASA, 2013, p 4). The incentives to report incidents are that they are voluntary, confidential and non-punitive. Within the UK the Civil Aviation Authority has mandatory occurrence reporting scheme. This confidential reporting system (subject to legal requirements) aims to '…contribute to the improvement of flight safety by ensuring that relevant information on safety is reported, collected, stored, protected and disseminated. The sole objective of occurrence reporting is the prevention of accidents and incidents and not to attribute blame or liability…' (CAA, 2011, p 1). There is also a combined aviation and maritime industry incident reporting system run by a charitable trust called 'CHIRP', which stands for 'confidential hazardous incident reporting programme' for the maritime industry. Whilst this system is not anonymous the reporter's identities are kept confidential and the maritime programme guidance states that '…incident reporting schemes have proved to be valuable tools in the identification of safety related issues and the definition of corrective actions…' (CHIRP, p 1). Furthermore, the NHS's National Patient Safety Agency provides an online portal for the reporting of patient safety incidents and developed a framework for reporting and learning from serious incidents requiring investigations. The framework '…supports openness, trust, continuous learning and service improvement…' (National Patient Safety Agency, 2010, p 4). Significantly, human factors are a focus of all the reporting systems describes above.

In addition to an open, confidential reporting system, organisations are able to learn by '…looking at incidents outside their own sector…' (Crichton, et al, 2009, p 24). Crichton, et al (2009) identified a number of recurring themes from the lessons learned following incidents in a variety of industry sectors. In terms of the 'response' to an incident the following recurring themes that emerged included:

- '…avoid overrigid Command and Control. Flexibiity is vital to accommodate 'factors and initiatives outside the lines of pre-drafted plans, strategies and instructions…

- Clarify supervisory roles

- Achieve robust situational awareness…

- Beware assumptions…communicate openly to make extremely clear…the assumptions underpinning the assessment of risk…

- …recognize uncertainty…in order to be open in communications. Openness leads to trust…

- …develop responder's vital skills in decision making, task leadership, communication, team working especially under conditions of high uncertainty and stress…

- Build teamwork and relationships through exercises and incident reviews to allow responders to work together and coordinate effectively, both intra- and interorganizationally...

- ...take care of yourself and your people...manage the risk of fatigue... (Crichton, et al, 2009, p 29 – 30).

The learning gleaned from an examination of the recurring themes from incidents that occur in other sectors of industry can be used to review how resilient your own organisation's plans are with regards to them.

To summarise the key issues in comparison to the foundation, recent and FRS related literature are:

- **Industry responses to major incidents:**

  The response of the industries examined to major incidents involving the loss of life has been consistent.

  - Investigations included an examination of the human factors involved at organisational, job and individual levels to identify the latent or active human errors that led directly or indirectly to the cause of the safety-critical incidents. Alternatively, scientific research was conducted to determine these factors.
  - Scientific research was conducted to identify the non-technical skills that individuals effectively utilise in the performance of their safety-critical roles, e.g. surgeons, pilots, ship's captains, and offshore oil and gas drilling crews.
  - Non-technical skills training is then embedded within the industry workforce
  - Scientific research is used to develop behavioural marker systems as a means to and evaluate the effectiveness of the non-technical skills training in the training environment and workplace. Additionally, they are used as part of the assessment of competence alongside the more traditional, technical assessments.

- **Non-technical skills:**

  These were consistently found to be a fundamental part of effective safety management.

  - A House of Commons Health Committee reported in 2009 that '...lack of non-technical skills can have lethal consequences for patients. However, the NHS lags unacceptably behind other safety-critical industries, such as aviation...human factors training must be fully integrated into undergraduate and postgraduate education...' (Health Committee, 2009, p 99). The aim of introducing these skills into the NHS workforce was '...to improve patient safety...' (NHS, 2009, p 3).
  - Following the Thunder Horse riser failure incident in the Gulf of Mexico a review of the incident command skills used by the shore-based incident command team and those on the rig identified a set of skills that were regarded as playing a significant role in the successful outcome. These were: '...decision making, situation awareness, communication, leadership and teamwork...' (Crichton, Lauche & Flin, 2005, p 1).

- Members of the marine industry developed its original non-technical skills training called Bridge Resource Management based on those comprising Crew Resource Management (CRM) training within the aviation industry. However, more recently such training has been made part of the training required to be undertaken by all seafarers under the Standards of Training, Certification and Watchkeeping for Seafarers (STCW) 1978 as amended by the 2010 Manila Convention:
  - '...Reg. A-II/1 for Bridge Resource Management
  - Reg. A-III/1 Engine-room Resource Management
  - Reg. A-II/2 and A-111/2 for Use Leadership and Managerial Skills
  - Reg. A-II/1, A-III/1 and A-III/6 for Application of Leadership and Teamworking Skills...' (Swedish Club Academy, 2012, p 2).
- The aviation industry began non-technical skills training when cockpit voice recorders revealed that the majority of aircraft accidents occurred not as had been assumed via technical failures, but rather by human failures. Specifically, the analysis of such material '...suggested failures in leadership, poor team co-ordination, communication breakdowns, lack of assertiveness, inattention, inadequate decision-making and personal limitations, usually relating to stress and fatigue' (Flin, O'Connor & Crichton, 2008, p 4).

- **Organisational culture:**
  - The primary goals of organisation were eroded or fundamentally altered, e.g. the Mid Staffs NHS Foundation Trust '...[the Trust]...appears to have lost sight of its real priorities...' (Health Commission, 2009, p 11); and BP in relation to the Deepwater Horizon disaster '...the Macondo well disaster was an organizational accident whose roots were deeply embedded in gross imbalance between the system's provisions for production and those for protection...' (Deepwater Horizon Study Group, 2011, p 9).

  - These losses of organisational perspective were at odds with organisational policies and procedures and as such contributed significantly to unsafe working practices. For example, in the Mid Staffs NHS Foundation Trust ...when the high rate...[of mortality]...was drawn to...[the Trust's]...attention...it mainly looked to problems with data as an explanation, rather than considering problems in the care provided... (Health Commission, 2009, p 10). Alternatively, with regard to the Herald of Free Enterprise Disaster the management failures to consider the management of ship safety led Justice Sheen to refer to them as a '...disease of sloppiness...' (Department of Transport, 1987, p 14).

  - The HSE records that organisational factors have the greatest influence on individual and group behaviour and identifies those which will contribute towards a positive health and safety culture, e.g. senior manager commitment is regarded as '...crucial to a positive health and safety culture...' (HSG48, 1999, p 46).
  - References are made in several publications with regard to open and learning cultures (or the lack of) that encourage the reporting of accidents and near misses. For example, the investigation into the Mid Staffs NHS Foundation Trust found '...little, if any, learning from complaints and patient incidents...'

(Health Commission, 2009, p 71). The HSE define a learning organisation as one that '...continually improves its own methods and learns from mistakes...' (HSG48, 1999, p 44) and highlights that as a key organisational factors that is associated with good safety performance...' (HSG48, 1999, p 44).

- o Organisational learning to improve safety can be supported by an easily accessible, confidential, voluntary incident reporting system with a focus on human factors. Likewise via the systematic examination of the lessons learned within other industry sectors will enable a review of your own organisation's plans in accordance with any emerging themes.

Overall, the importance of identifying and then training personnel in the non-technical skills cannot be underestimated. Likewise the subsequent development of a behavioural marker scheme to assess staff as competent in their use of non-technical skills in the training and work environments; and to evaluate the effectiveness of such training. Yet alongside these skills the influence of organisational culture has the greatest impact on individual and group behaviour. Training personnel in non-technical skills will help to reduce active human failures, i.e. those that have an immediate impact on safety and often made by frontline staff. Whereas, the development of a positive health and safety culture will help to reduce latent human failures, i.e. those that are made by people who are remote from an accident in terms of time or location that typically relate to ineffective training, poor equipment design, inadequate supervision, ineffective communications and lack of role clarity.

Finally, Professor Rhona Flin draws non-technical skills and the behaviours they illicit together with organisational culture in a lecture given to the 2013 NVVK Congress. She states that '...the most powerful way to change the safety culture in a workplace is to change the behaviour of the people who work in the organization...' (Flin, 2013, p 1). In her conclusion she suggested that CRM training '...with its focus on non-technical skills, may be one method of shifting what is currently accepted as normal work behaviour towards a set of behaviour patterns that are safer and more efficient. It is important to recognize that these are not unusual skills, rather they reflect behaviours which the safest and most efficient workers use regularly and the rest of us demonstrate on a good day. With senior managers, a similar approach has been taken to identify the non-technical skills they require for effective safety leadership...' (Flin, 2013, p 6 – 7). Ultimately Professor Flin concludes that '...ensuring workplace safety and avoiding major accidents are considerable challenges that require an understanding of human behaviour at all levels of the organization...' (Flin, 2013, p 7).

5. Conclusions

From the literature review covering foundation literature, recent FRS and related literature, and that in relation to other industries a number of recurring themes have emerged in relation to incident command:

- Command Support
- Competence
- Decision making
- Dynamic risk assessment
- Functional support roles
- Health and safety management

- Human factors

- Inter and intra-operability

- Leadership

- Organisational culture

- Provision of risk information

- Transfer of Command

In addition to the themes listed above another factor that has come into focus are legal considerations in light of a number of issues, e.g. the HSE guidance in relation to decision making and acts of heroism.

Command Support: this refers to the support in terms of trained personnel, vehicles and equipment, including radio channels, that is provided to an incident commander. It reflects the concerns raised following FRS investigations and Coroner's Rule 43 letters in relation to Harrow Court, Marlie Farm and Shirley Towers. It also highlights concerns in relation to the transfer of information between command support vehicles and a need for clarification on the role and integration of Enhanced Command Support at major, large-scale incidents.

Competence: this is the greatest challenge faced by FRS's. In 2007 the Harrow Court investigation recommended the re-introduction of command assessments into national assessment and promotion procedures. The majority of FRS investigations, Coroner's Rule 43 letters report shortcomings in incident command training and competence. The HSE's 'Striking the Balance' document clearly states that FRS's must prepare their employees to be able to make decisions in hostile, ambiguous, dynamic environments and that the decisions of these individuals will indicated to them how well a FRS prepared their personnel. In addition one of the guiding principles in the DCLG's 2013 'Health, Safety and Welfare Framework for the Operational Environment' is the provision of high quality training to ensure all personnel are competent, including training in the non-technical skills. This includes Retained Duty Staff although the ability for them to achieve and maintain competence given the limitations on their time available for training is questionable. It is important to have in place a process to deal with those who do not consistently demonstrate competence. Overall, it may be inferred that current training, development and assessment practices associated with incident command do not meet the needs of incident commanders and FRSs.

Decision Making: There are a number of issues related to decision making. Overall, it is not to the forefront of current incident command manual and the relationship between the decision making model and dynamic risk assessment model is in need of clarification. The information on decision making is relatively one dimensional with only one type of decision making method explained, i.e. RPDM. Therefore, current decision making theories and methods are in need of review. The absence of operational discretion, i.e. where an incident commander decides to act outside of SOPs following the outcome of a dynamic risk assessment which indicates the benefits outweigh the risks, has been questioned by some coroners, e.g. following the Lakanal House fire and Garston mine incident. Consequently, the issue of operational discretion needs clarification. Likewise the recent HSE publications, 'Striking the Balance' and 'Heroism in the Police and Fire and Rescue Services' demand that these be explained and put into context for personnel at all levels.

Dynamic Risk Assessment: A deficiency in this aspect of incident command has been a feature of all the FRS investigations examined as part of this literature review. Coroners have also

made recommendations for improvements in relation to it, e.g. Harrow Court, Lakanal House, and the Marlie Farm. The model found in the current incident command manual is complex and not obviously representative of a dynamic process. It would be beneficial to conduct a review of dynamic risk assessment and models associated with it, as it is regarded as one of the four pillars of risk assessment within the CLG's 2013 'Health, Safety and Welfare Framework for the Operational Environment'.

Functional Support Roles: This refers to the roles carried out in support of an incident commander, but excludes the command roles of Sector Commander and Operations Commander. There is little or no information on the majority of roles referred to in the Incident Command manual, in particular the nature of their relationship with the incident commander is absent. In addition there a number of relatively new roles that have come into being since the last manual was written, e.g. Search Sector Commander and tactical advisors that are not referred to at all. Thus a review of functional support roles, including those associated with resilience, with a view to providing clear definitions for all roles would be beneficial and also assist with improvements needed to be made in relation to the interoperability between different agencies.

Health and Safety Management: In addition to the extensive legal requirements of the Health and Safety at Work Act and its Regulations, HSG65 'Successful Health and Safety Management' emphasises the importance of a positive safety culture, human factors, total quality management, and learning from experience. The latter includes the outcomes of accident investigations that identify all immediate and underlying causes, including human factors. HSG48 'Reducing Error and Influencing Behaviour' states that organisational cultures have the greatest influence over individual or group's behaviour. In 2013 Professor Rhona Flin comments that the most effective way to change an organisation's safety culture is to change the behaviour of those who work for it. She goes on to suggest that non-technical skills training is a means to achieve changes in individual behaviour, but that it cannot be done in isolation. Safety leadership and commitment from senior managers is also required. It is clear that human factors need to become embedded as part of the FRS health and safety management.

Human Factors: Human factors stand out as a vital missing element within the FRS and need to be incorporated. The CLG's 2013 'Health, Safety and Welfare Framework for the Operational Environment' states that most firefighter injuries are influenced by human factors. It goes on to stipulate that understanding human factors is critical to effective health, safety and welfare management and that their influence on behaviour should not be underestimated. Two years earlier HSG65 advocated that best practice health and safety management included needing to understand how human factors affect health and safety performance. For decades human failures have been known to be the causes of major accidents and disasters in other industries, e.g. the aviation and marine industries. The provision of human factors/non-technical skills training has correspondingly been present in these industries for many years. The basic non-technical skills are:

- Situation awareness;
- Decision making;
- Communication;
- Teamwork;
- Leadership;

- Managing stress; and

- Coping with fatigue.

A feature of communication that warrants development relates to briefings by one officer to another, or to fire crews. There is no specific guidance on how to do this within the Incident Command manual, which contrasts to the content for debriefs. More recently other industries have developed behavioural marker systems to evaluate the training and assess the non-technical skills performance of their personnel. The CLG Framework and HSG48 highlight the nature of human failures, i.e. they may be active (immediate effect) or latent (delayed effect). In particular active failures are often made by frontline personnel who are expected to make decisions in dynamic, hazardous and ambiguous environments without sufficient resources, but where high expectations to act exist. The CLG Framework also references the impact fatigue may have on the ability of an individual to function, which if combined with the environment referred to above may have serious consequences.

Inter and Intra-operability: A number of concerns following investigations in to major incidents have been raised regarding FRS inter and intra-operability, which need to be reviewed. The Galston mine incident highlighted that officers and crews at the scene were not aware of the availability of other rescue service agencies. The coroner was critical in a Rule 43 letter about London Bombings of July 2007 of the use of complex acronyms and jargon within various procedures that impeded communication and interoperability. The importance of inter and intra-operability is highlighted by the CFRA's guidance for the National Co-ordination and Advisory Framework in relation to UK FRS resilience. The CLG's 2013 'Health, Safety and Welfare Framework for the Operational Environment' clearly advocates use of clearly defined roles and responsibilities and sufficient planning to enhance operational safety.

Leadership: The main issue regarding leadership is its lack of prominence within the FRS incident command manual or any of the FRS investigations. In the latter there are no explicit references to leadership and it is not referred to by Coroners in their Rule 43 letters. By contrast the investigations of other industries into major incidents and disasters do readily make references to leadership, e.g. the Costa Concordia investigation. This is most likely due to human factors being embedded in those industries to a much greater degree than in the UK FRS. However, the CLG 2013 'Health, Safety and Welfare Framework for the Operational Environment' clearly advocates positive safety leadership and the promotion of safety leadership as two of its guiding principles. The links between safety leadership and an organisation's culture have already been made (see above) and so it is clear that the standing of leadership needs to be enhanced in the FRS.

Organisational Culture: Organisational factors have the greatest influence on group and individual behaviour, e.g. senior management commitment to health and safety is vital to a positive health and safety culture. An open and learning culture is one where individuals within an organisation have access to a voluntary, confidential incident reporting system that will disseminate information derived from an analysis of the data collated to industry stakeholders. Additionally, a culture that has embedded within it the desire to examine the lessons learned of industries following incidents is more likely to review its own incidents and reduce the likelihood of errors and incidents repeating themselves.

Provision of Risk Information: FRS's have a legal obligations to provide information under several Acts, e.g. Fire and Rescue Services Act 2004. The provision of information is acknowledged within the non-statutory Emergency Response and Recovery guidance issued by the Cabinet Office, as being critical and must be supported by effective information

management systems that support single and multi-agency decision making and builds common situation awareness. The lack of risk information on command decision making was highlighted in a number of FRS investigations, e.g. Atherstone-on-Stour, and Shirley Towers. The HSE clearly emphasise the importance of risk critical information being provided to an Incident Commander that is accessible, accurate, timely, and suitable in their 'Striking the Balance' document. In other industries the lack of such information has had harmful consequences, e.g. incorrect charts being used on the Costa Concordia, or inadequate information about an A and E patient being handed over during a patient transfer process.

Transfer of Command: This refers to the transfer of command between two incident commanders and between members of a command team, i.e. the group of officers comprising the incident commander's command structure. A number of concerns have been raised about this in a number of FRS investigation and Coroner Rule 43 letters. For example, during the London Bombings of July 2007 the Coroner reported that at Aldgate the LFB personnel were uncertain as to who amongst them was in charge. Alternatively, the excessive and often unnecessary transfers of command at the Garston Mine were also criticised by HMCI and the Coroner recommended that LFB officers received handover training following the Lakanal House Inquiry. Consequently a review of handover and takeover protocols and procedures would be beneficial.

6. Recommendations

This report asks the Incident Command Project Board to:

1. Endorse this literature review

2. To feed the outcomes of this literature review into the project team currently developing a Command Qualifications and Command Training document for the UK FRS.

3. To utilise the outcomes of this literature review to form the basis of a generic risk assessment for incident command

4. To consider the following as suitable topics to form the workpackages of the project going forward:

   - **Human factors:-**

     i. Non-technical skills - to examine the non-technical skills and behaviours demonstrated by incident commanders that contribute to effective incident command and safety management in the FRS; and to recognise those that have been identified in other industries and how the FRS might identify those that apply to FRS incident command

     ii. Leadership - to revise the FRS leadership model and increase the prominence of leadership within the Incident Command manual

     iii. Decision making - to revise current literature on decision making styles and its relevance to FRS incident commanders in order to increase their profiles within future guidance. To review and update the existing decision making model

     iv. Stress and fatigue – revise the guidance to provide more in-depth explanations of the impact stress and fatigue have on incident

commanders. In addition, identify the key stressors that have an adverse impact of incident commanders' judgement and ability to function

- **Communication:** revise the guidance to ensure comprehensive, structured briefings takes place when incident command is handed over by one officer to another, or when an incident commander is briefing sector commanders or functional officers. In particular, to ensure the hazards and control measures to reduce the risks are understood and that the time taken to conduct the briefings do not result in decision making gaps.

- **Interoperability:** to revise current guidance to ensure FRS guidance is up to date, in particular with the CFRA's operational guidance for the National Co-ordination and Advisory Framework. Additionally, to examine the practical implementation of the components of the framework in order to produce more detailed advice on the practical application and integration into existing incident command structures of national resilience assets and support.

- **Command support and functional support officers:** to revise policies and guidance in relation to command support to ensure suitably qualified personnel provide it at incidents using appropriate vehicles and support systems. Provide clear definitions of the roles and responsibilities of all functional support roles, including tactical advisors, in particular the nature of their relationship with the incident commander.

- **Safety Management:** this is the overarching theme that has emerged from the literature review to date. The health and safety-related documents have clearly reflected the Health and Safety Executive's (HSE) desired outcomes for the fire service in relation to incident command, based on the findings of their inspections and those forthcoming from the fire service-related reports in relation to fires involving the deaths of fire-fighters. This workpackage to concentrate on the components that are associated with effective safety management arrangements such as:

    i. The monitoring of incident commander performance, and its subsequent recording and action taken to rectify under-performance

    ii. A review of analytical risk assessment and the means to record it,

    iii. A review of suitable risk critical information systems for incident commanders

    iv. A review the existing dynamic risk assessment process and model against those adopted by other industries to determine the most appropriate one for the FRS and to identify means to improve DRA upon the incident ground which clearly indicates when it is to be used, in particular its association with operational discretion used by commanders and fire-fighters, and to acts of heroism

    v. A review of other industry's processes to systematically review, analyse and disseminate the lessons learned by other safety critical industries

    vi. The development of an open, voluntary, confidential incident reporting system for the UK FRS that focuses on human factors to mirror those in place in many other safety critical organisations

vii. The development of a UK FRS system whereby all incidents attended by 10 or more pumping appliances are subject to a thorough investigation, in particular of the human factors involved, to identify and disseminate throughout the FRS good practice and any lessons learned

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8. Appendices

Appendix 1: HSG65 Plan-Do-Check-Act model for health and safety

Plan-Do-Check-Act for health and safety

P

Step 1
Establish standards for health and safety management based on risk assessment and legal requirements

Step 2
Implement plans to achieve objectives and standards

D

Step 4
Review against objectives and standards and take appropriate action

Step 3
Measure progress with plans and compliance with standards

A

C
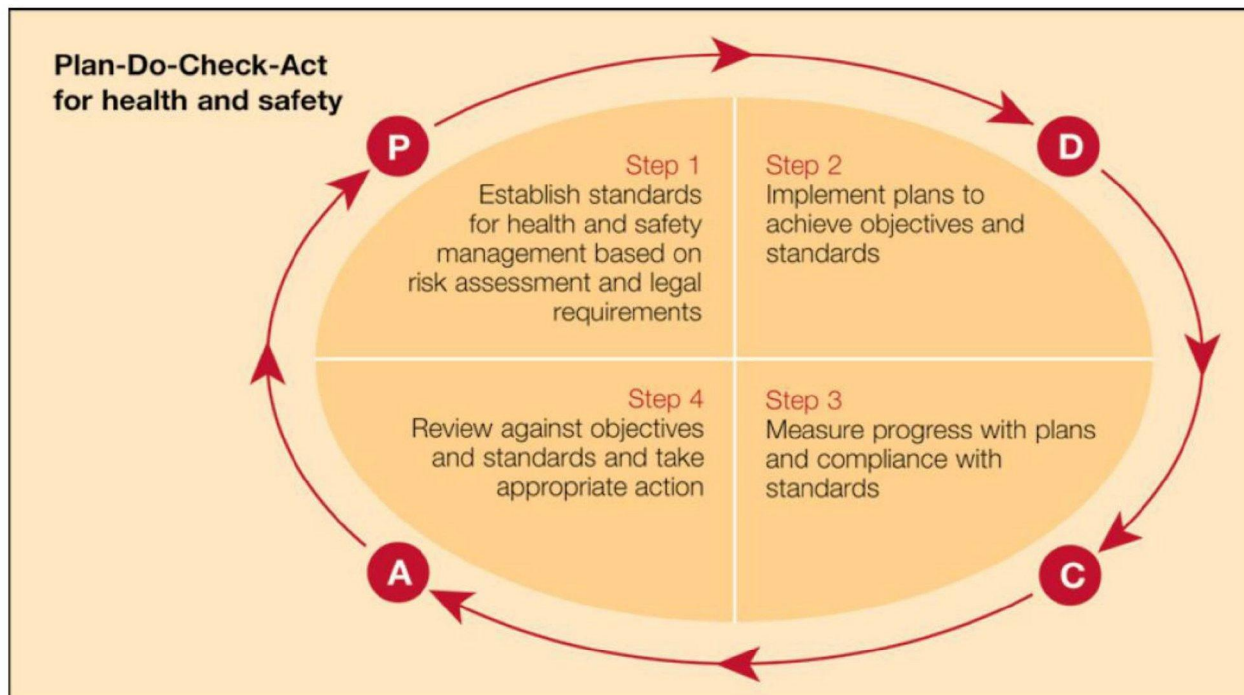
Appendix 2: HSE 5 steps of risk assessment

Step 1
Identify the hazards

Step 2
Decide who might be harmed and how

Step 3
Evaluate the risks and decide on precautions

Step 4
Record your findings and implement them

Step 5
Review your assessment and update if necessary

Appendix 3: HSE Framework for analysing accident and incident causation

Immediate causes

Personal factors

Including:

- The behaviour, suitability and competence of those doing the work

Job factors

Including:

- The adequacy of the workplace precautions for the premises, plant, substances involved and the procedures and systems of work used.

Person(s)   Job

Organisation and management

Underlying causes

Management and organisational factors

Including:

- The adequacy of health and safety policy
- How work is controlled, co-ordinated and supervised
- How the co-operation and involvement of employers is achieved
- The adequacy of the communication of health and safety information
- How competency is achieved and tested (including the provision of health and safety assistance)
- The adequacy of planning, risk assessment and the design of RCSs
- The adequacy of measuring and monitoring activity
- The adequacy of review and audit arrangements

Appendix 4: FRS Aspire leadership model

■ **CORE VALUES**
■ **PQAs**
■ **LEADERSHIP CAPACITIES**
■ **LEADERSHIP DOMAINS**

Appendix 5: Skills for FRS, National Occupational Standard: EFSM 2

EFSM2
Lead, monitor and support people to resolve operational incidents

Overview

This standard relates your leadership role at operational incidents. This includes your initial review and planning of incident management, operating within the incident command system. It includes implementing, reviewing and monitoring plans and management of resources to resolve the incident. It also includes planning and conducting relevant briefings.

There are three elements

1 **Review and determine incident status**
   This includes your initial review of the incident type, status and progress, the collection of relevant information and analysis of implications for the community and for resource allocation.
2 **Assume responsibility and implement action to support those involved in the incident**
   This includes your formulation of a plan for resolution of the incident, taking account of anticipated risks, monitoring the progress of activities against your plan and making relevant adjustments. It includes obtaining advice from relevant specialists and the conduct of operational briefings with relevant personnel.
3 **Debrief following resolution of incidents**
   This includes the arrangement and conduct of relevant briefings both immediately following and at later stages of incident review.

Performance criteria

Review and determine incident status

You must be able to:

P1 obtain sufficient information from all available sources on incident progress, risks, deployment, resource availability and existing incident management

P2 confirm that current action complies with relevant legislation and protocols

P3 determine the current involvement of other agencies, their current activities and key contacts

P4 determine and resolve discrepancies between information obtained at the incident and information provided pre-incident

P5 confirm roles, responsibilities and communication channels with key personnel

P6 confirm risks and implications for personnel, for the community and for the wider context

P7 anticipate likely future resource needs including consideration of possible escalation of incident

P8   confirm the priority actions for resolution of incident

P9   ensure that information concerning change in roles and control of the incident reaches those who assist with its resolution

Assume responsibility and implement action to support those involved in the incident

You must be able to:

P10 plan a response which takes account of all available information and anticipated risks

P11 implement the plan, and confirm roles, responsibilities, tasks, and communication channels

P12 monitor the progress of activity against your plan

P13 anticipate risks to health, safety and welfare and ensure adequate and timely control measures are implemented

P14 review your incident plan to meet the emerging needs of the incident

P15 obtain technical and professional advice from suitable sources to support decision making

P16 provide information to other agencies to assist with their decision making

P17 conduct comprehensive briefings with relevant people to obtain progress reports and instigate action

P18 evaluate the implications of the incident on the organisation, the environment, the local community and other agencies roles and responsibilities

P19 ensure that relevant people are updated regarding identified implications

P20 provide accurate information to the media and utilise media resources to inform and protect the community

P21 confirm that objectives within immediate responsibility of the organisation have been met

P22 handover status to relevant agencies before you withdraw support from the incident

Debrief following resolution of incidents

You must be able to:

P23 arrange sufficient debriefs of suitable type and frequency to meet the needs of the incident type and scale

P24 gather and review pertinent information from internal and external sources

P25 support a full review of procedures and performance relevant to the incident in order to identify learning outcomes for the organisation and individuals

P26 identify possible changes to procedures and resource requirements that would improve future practice and service delivery

P27 recommend improvements, with supporting evidence, to relevant people

P28 identify trends and their implications for future service delivery

P29 provide feedback to personnel and other agencies involved

P30 establish the support needs of personnel involved in the incident and instigate action to deliver this

P31 agree action to be taken following debrief activities including responsibilities and timescales

Knowledge and understanding

You need to know and understand:

K1 the range and sources of information required to evaluate and manage incidents and how to access this

K2 relevant legislation and its correct interpretation and implementation

K3 your role, responsibilities and level of authority at operational incidents

K4 the roles, responsibilities, limitations and capabilities of personnel and other agencies

K5 lines of communication at incidents and the incident command system

K6 the range and type of resources available at incidents, their capabilities and limitations

K7 how to prioritise and allocate tasks and set clear objectives at incidents to achieve operational objectives

K8 your local community, its characteristics and associated risks

K9 dynamic risk assessment and associated health, safety and welfare issues

K10 how to communicate effectively and efficiently with personnel to achieve changing objectives and manage sensitive issues

K11 how to anticipate needs and requirements of the incident and of the personnel involved in its resolution

K12 issues of confidentiality
    K12.1   security - including data protection
    K12.2   intellectual property rights
    K12.3   Human Rights and the implications of potential litigation

K13 organisational objectives, values and how to operate within them

K14 methods, styles and principles of leadership and their application in operational contexts

K15 the range, type and extent of information needed for effective debriefs

K16 how to analyse trends, identify needs for change to procedures and instigate action to make relevant improvements

K17 methods of providing feedback and how to select those appropriate to the context and sensitivities of the situation

K18 requirements and methods of reporting on incidents and how to report to key internal, external, political and community contacts

K19 how to formulate and implement an incident plan and the factors affecting this

K20 the range of specialists available and how to make best use of their technical expertise and support

K21 procedures for reporting meritorious action

Appendix 6: The LFB decision making model

DECIDING		ACTING

EVALUATING

Information about the Task or Event		Information on Progress

Information about Resources	GATHERING AND THINKING	OBJECTIVES	PLAN	COMMUNICATING	OUTCOME
				CONTROLLING	

Information about Risk and Benefit

The Decision Making Model

Level 1– Simple Match

Experience the Situation in a Changing Context

Perceived as typical [Prototype or Analog]

Recognition has four byproducts

| Expectancies | Relevant Cues |
| Plausible Goals | Typical Action |

Implement Course of Action

Level 2 – Diagnose the Situation

Experience the Situation in a Changing Context

Diagnose [Feature Matching] [Story Matching]

Perceived as typical [Prototype or Analog]

no

Interference

Clarify

yes

Recognition has four byproducts

| Expectancies | Relevant Cues |
| Plausible Goals | Typical Action |

Anomaly

Implement Course of Action

Level 3 – Evaluate Course of Action

Experience the Situation in a Changing Context

Perceived as typical [Prototype or Analog]

Recognition has four byproducts

| Expectancies | Relevant Cues |
| Plausible Goals | Action 1 ...n |

Evaluate Action (n) [Mental Simulation]

modify

Will it work?

yes, but

yes

Implement Course of Action

Appendix 8: Example of a command structure at a 25 pump fire

Appendix 9: Dynamic risk assessment process

Dynamic Risk Assessment

Evaluate the situation ······ **Identify Hazards** e.g. Chemicals, Collapse, Smoke Identify **Who's at Risk** e.g. Personnel, Public, etc.

Evaluate Risks based on severity of hazard & likelihood of occurrence

TACTICAL MODE ······ Declare the appropriate Tactical Mode, OFFENSIVE, DEFENSIVE, or TRANSITIONAL in response to the HAZARD & RISK evaluated

Select systems of work ······ Choose & assess the optimum systems of work & tasks to be adopted.

Re-assess systems of work ······ Do not proceed with tasks, until you have considered viable alternatives.

Are the risks proportional to the benefits? ······ Proceed with selected systems of work once satisfied that it is beneficial to do so

TACTICAL CONTROL ······ Control operations, include all possible measures to protect personnel.

Additional / alternative control measures ······ Consider whether further control measures can/should be introduced

Review ······ Monitor incident & review the process prior to sending the next TACTICAL MODE update message

Appendix 10: The safe person principles of FRAs

The assessment and selection of people with the appropriate skills, abilities and attributes for development as firefighters,

The assessment and selection of people with the appropriate skills, abilities and attributes for development as supervisors, managers and commanders

The provision of structured training to establish and maintain the skill, knowledge and competence of firefighters, their supervisors, managers and commanders

Suitable arrangements for the maintenance and recording of the incident command skill and competence of supervisors, managers, and commanders

Ensuring safe and effective operations by the provision of detailed guidance

The provision, maintenance and response of suitable appliances and equipment necessary to deal with the range of operational incidents a Fire and Rescue Authority will be called upon to attend

The provision and maintenance of any necessary personal protective equipment, including respiratory protective equipment, to ensure the safety of operational personnel

Identifying, gathering, analysing, and providing operational risk information; and suitable arrangements for its review

The provision of suitable welfare arrangements for rest, recovery and replacement of personnel during operational incidents, and post event support for personnel

Learning from post event analysis, incident debrief and review

Appendix 11: An example of an individual risk assessment

It is accepted that on occasions firefighters may be working at incidents without direct supervision. This may mean that firefighters encounter unforeseen or unexpected and sometimes life threatening circumstances.

This is when there is a need for DECISION MAKING, often with little time in which to react.
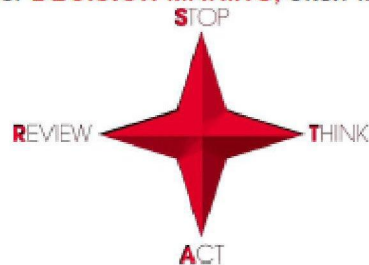
STOP

It is vitally important that in such circumstances you STOP any intended actions and quickly focus on the new SITUATION.

THINK

Then it is necessary to THINK about this new situation and assess the surroundings.

Is there a solution; is it clear what to do to reduce the risk of injury or harm?

How can you and those you are with stay as safe as possible in the circumstances?

ACT

Once aware of the situation now is the time to ACT.

If it is not clear what the safest course of action is, then the best thing to do is to communicate and get help and warn others that you are not adequately equipped or it's not within your range of skill or experience.
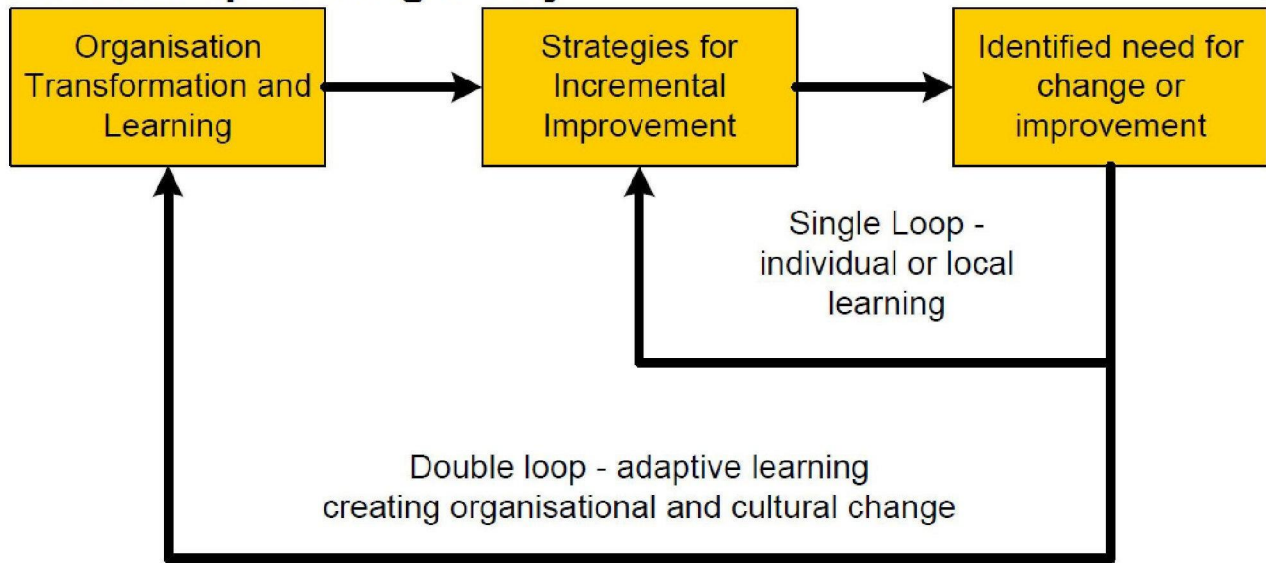
REVIEW

Once you've taken your chosen action, you and anyone with you should have an immediate REVIEW to assess the outcome. You may now have to STOP, THINK, ACT and communicate again.
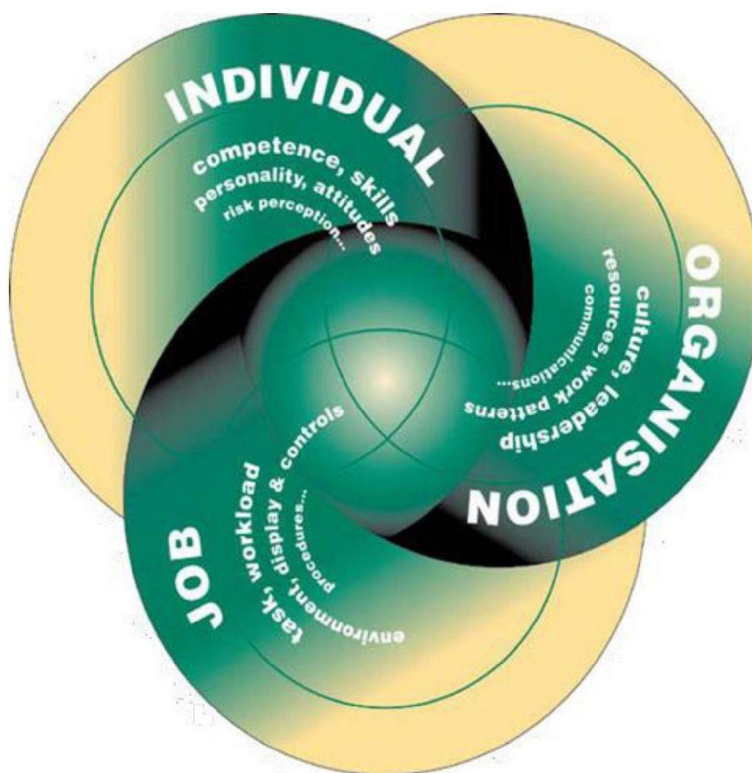
Courtesy of West Midlands FRS

Appendix 12: Double loop learning theory

Double loop learning theory

Organisation Transformation and Learning	→	Strategies for Incremental Improvement	→	Identified need for change or improvement

Single Loop - individual or local learning

Double loop - adaptive learning creating organisational and cultural change

Appendix 13 HSE48 Breakdown of human factors

Appendix 14: HSG48 Different types of human failure

Human Failures (HSG48)