National Operational Guidance Programme

Local Government Association | CFOA Chief Fire Officers Association | in partnership with LFB London Fire Brigade

Title:	Performing rescues
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Synopsis:	The guidance consists of three main areas – searching for casualties, extrication of casualties and casualty care. The search and extrication incorporates incidents in the built environment, open environment and all forms of transport. This includes rescue of casualties from both fire and non-fire incidents.
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National Operational Guidance – Performing rescues second edition version one (ARCHIVED on 20-09-

Introduction

A 'person at risk' is defined as a person involved in any situation that exposes them to a risk of death, injury or illness. Those falling into this category may include bystanders, casualties and those involved in performing rescues, including fire and rescue service personnel. This extends to those involved in scene preservation and post-incident activities being carried out whilst the fire and rescue service is still at the scene.

A person may remain 'at risk' even after being rescued. For example, where somebody has been extricated or has self-extricated from a vehicle following a road traffic collision, but is required to remain at the roadside awaiting an ambulance.

A rescue is defined in the Cabinet Office UK Civil Protection Lexicon as the:

> *"Removal, from a place of danger to a place of relative safety, of persons threatened or directly affected by an incident, emergency, or disaster"*

This guidance is for incidents where the fire and rescue service personnel will conduct search and rescue operations. This includes both fire and non-fire incidents. For fire incidents, some elements of this guidance will be supported by the hazards and control measures contained in National Operational Guidance: Fires and firefighting

The performing rescues hazards and control measures should be read in conjunction with the 'all incident' and 'context' guidance. In particular, the hazards in the 'Transport' context and the control measures that enable responders to operate safely.

National Operational Guidance looks to share good practice; an example of this is the recommendation that search techniques may be enhanced by the use of audio or optical equipment and/or the use of canine resources.

The satisfactory identification and management of people at risk requires a combination of incident pre-planning, incident management and incident debrief functions, beginning with a service-wide appreciation of which incidents the organisation can and will respond to.

Fire and rescue services should use all available specialist knowledge to assist with rescue of casualties. This knowledge may be available from within the fire and rescue service either locally or regionally, external agencies or the owner/occupier.

Fire and rescue services should clarify the range of rescue and other functions they will provide and more importantly, which functions they are not able to deliver. This should inform the organisation's risk management plan. Where activities are identified that require the assistance of another fire and rescue service or agency (blue light, private sector, voluntary, etc.), clear, unambiguous agreements should be drawn up. These too should inform and be reflected in the risk management plan.

When drawing up the risk management plan and underpinning agreements, fire and rescue services should consider how information, intelligence and data can and should be shared among and between the command, control and communications elements for planning, co-ordinating, integrating and executing response operations.

Agreements should include:

- The span of activities to be undertaken
- Clarity of what roles and activities are to be performed and by whom
- A defined, clear, understood chain of command
- What resources are required
- The mechanisms for co-ordination of operations
- Suitable controls to cover the span of operations and resources deployed
- How access to the scene of operations (cordoned or not) is to be controlled and by whom
- Which roles, tasks and activities the fire and rescue service will have fulfilled before departing from the scene including:
    - Rescue of trapped persons
    - Provision of initial medical care to casualties
    - Assistance with casualty handling and body recovery
    - Extinguishing fires
    - Dealing with released chemicals, fuels and contaminants
    - Managing health and safety activity
    - Co-ordination with other agencies

Agreements should consider the provisions for co-operation and communication between the responders and agencies involved and/or present. Agreements should identify the measures required to effect formal handover of responsibilities as and where appropriate.

Where possible and appropriate, fire and rescue services should seek to gather Site-Specific Risk Information (SSRI) to inform their response arrangements. This information, together with local arrangements, agreements and memoranda of understanding (MoUs) should be tested and reviewed to ensure suitability and accuracy through a programme of exercises and debriefs involving relevant agencies.

Operational response should be underpinned by prevention and protection initiatives, delivered in partnership with local communities and a wide range of other relevant partners, locally, regionally and nationally.

In some incidents, it is important to determine the point when the fire and rescue service's duty to protect people from harm has been fulfilled.

Fire control rooms should ensure they employ robust information gathering wherever possible and pass this information on to mobilising crews. This information gathering process supports the Joint Emergency Services Interoperability Principles (JESIP) Joint Doctrine: The Interoperability Framework.

A more accurate picture of the situation can be developed through liaison with other agencies and information gathering from members of the public. This includes information about the number of people involved, their last known position (LKP) or point last seen (PLS). The information gathering process should continue throughout the incident and will inform the nature of operational response.

Risk management plan

Each fire and rescue authority must develop their strategic direction through their risk management plan. To determine the extent of their firefighting capability, strategic managers will consider their statutory duties and the foreseeable risk within their area.

Work to identify risk and prepare operational plans should consider all stakeholders, including local emergency planning groups and the fire and rescue service risk management plan.

Responsibility of fire and rescue services

Fire and rescue services are responsible, under legislation and regulations, for developing policies and procedures and to provide information, instruction, training and supervision to their personnel about foreseeable hazards and the measures used to reduce the risks arising from them.

This guidance sets out to provide fire and rescue services with sufficient knowledge about the potential hazards their personnel could encounter when performing rescues. Fire and rescue services should ensure their policies, procedures and training cover all of the hazards and control measures contained in this guidance.

Legislation

Fire and Rescue Services Act 2004

Fire (Scotland) Act 2005 (The Scotland Act)

Fire and Rescue Services (Northern Ireland) Order 2006 (The NI Order)

The Fire and Rescue Services (Emergencies) (England) Order 2007

Fire and Rescue Services (Emergencies) (Wales) Order 2007

Fire and Rescue Services (Emergencies) (Northern Ireland) Order 2011

Civil Contingencies Act 2004

The Civil Contingencies Act 2004 (Contingency Planning) Regulations 2005 (The 2005 Regulation)

The Civil Contingencies Act 2004 (Contingency Planning) (Scotland) Regulations 2005 (The Scotland Regulation)

The Civil Contingencies Act 2004 (Contingency Planning) (Amendment) Regulations 2012 (The 2012 Regulation)

The Northern Ireland Civil Contingencies Framework

Crime and Disorder Act 1998

Hazard and control statement

Hazard	Control measure
Search	
Lack of co-ordinated search plan (generic)	Gather information from the public and liaise with other agencies Request resources for search Have clearly defined area of operations Ensure search teams have detailed briefing Have a communication strategy Conduct search using thermal imaging equipment Provide adequate lighting Identify areas that have been searched
Lack of co-ordinated search plan (transport)	Search in hidden voids Review passenger/cargo manifests Be aware of seating and standing capacities Look for occupancy indicators
Noise impacting search operations	Isolate industrial processes, machinery or transport
Scene of operations or terrain	Isolate and lock out industrial processes or machinery Identify and maintain safe access and egress routes Incident ground safety management
Unstable ground	Employ a safe system of work to recover casualties and rescuers
Animals or insects encountered during search for or extrication of casualties	Isolate animals Establish alternative access/egress routes
Extrication of a casualty	
Failure to extricate the casualty without deterioration of their condition	Situational awareness Request resource for extrication Stabilise the casualty Extricate the casualty

Hazard	Control measure
Extrication (generic)	
Medical equipment	Identify and communicate medical equipment in use Isolate and remove medical equipment Be oxygen aware Establish an equipment, resource or tool area
Rescue tools	Use methods of space creation Identify the most appropriate rescue tool for the task Manage tool operatives and their actions Manage the effects of tool use Wear personal protective equipment (PPE) for rescues
Extrication from the built or natural environment	
Primary surface extrication of casualties following collapse of a structure	Highlight avoidance routes Incident ground safety management Provide adequate lighting Conduct search using thermal imaging equipment Have a communication strategy
Manual handling over terrain	Deploy adequate personnel Manage physiological stress Use casualty transport equipment Use motorised vehicles
Extrication of casualties from confined spaces	Isolate machinery, processes and utilities Establish appropriate safe systems of work Incident ground safety management Provide adequate lighting Establish effective communications Decontaminate firefighters and equipment
Restricted or complex layout affecting extrication of casualties	Deploy appropriate numbers of personnel Manage physiological stress

Hazard	Control measure
	Use casualty transport equipment Identify the most appropriate rescue tool for the task
Failure of internal fixings or exposed cables leading to entrapment	Highlight avoidance routes Follow breathing apparatus (BA) procedures Provide adequate lighting Remove or secure internal fixings or cables Use thermal imaging equipment to identify hazards
Extrication from any mode of transport	
Unstable vehicle containing casualties	Make a safe and controlled approach to the incident Manage pressurised air systems Stabilise the mode of transport Deploy appropriate number of personnel Identify and maintain access and egress routes Incident ground safety management
Construction materials	Identify and communicate vehicle or craft construction materials Avoid manipulation or damage to composite materials Use tactical advisers and responsible person Apply fine water spray or foam Know the capabilities and uses of rescue equipment Make the correct tool choice for vehicle construction Be aware of the respiration of particles and dermal irritation Consider the release of energy from structural vehicle components Manage heavy vehicle considerations
Extrication from air transport	
Military aircraft	Make a safe and controlled approach to the

Hazard	Control measure
	incident Liaise with specialist military advisers Restrict use of radio transmissions Gain safe access to the cockpit Make ejection seats safe Extricate the aircrew
Extrication from rail transport	
Delay in accessing driver or passenger compartments	Use designated doors and windows Use tactical advisers and responsible person
Extrication from road transport	
Alternative fuelled vehicles (AFV)	Identify and communicate the vehicle type Control the vehicle propulsion system Isolate high voltage systems Use appropriate extrication techniques for alternative fuelled vehicle
Unconventional or specialist road vehicles	Use tactical advisers and responsible person Identify and isolate electrical and fuel systems Contain the vehicle or cargo Use specialist cutting equipment
Vehicle supplementary restraint systems (SRS)	Identify the SRS and communicate the information Establish an appropriate safe distance for supplementary restraint systems (SRS) Isolate the supplementary restraint systems (SRS) Prevent manipulation or damage to supplementary restraint systems (SRS)
Extrication from machinery, lifts and escalators	
Gaining access to machine rooms and shafts	Establish a safe working environment
Noise	See National Operational Guidance: Operations – Physical hazards
Power systems	Request specialist advice Isolate and lock out power supplies

Hazard	**Control measure**
Stored energy	Prevent uncontrolled movement
Moving or displaced machinery parts	Establish safe system of work for moving machinery
Hydraulics and lubricants	See National Operational Guidance: Hazardous materials
Casualty care	
Failure to assess, identify and treat life-threatening problems of the casualty	Request resources for casualty care Follow principles of casualty care Carry out structured assessment and treatment using <C> Ac B C D E Maintain the privacy and dignity of the casualty
Single casualty in cardiac arrest	Use effective Cardiopulmonary Resuscitation (CPR) and use of Automated External Defibrillator (AED) Wear personal protective equipment (PPE)
Failure to hand over vital casualty information	Offer a structured handover to an appropriately trained and competent practitioner
Multiple casualties	Share situational awareness using METHANE Establish a triage sieve (adult and paediatric)
Bariatric casualty	Make an early identification of the bariatric casualty Use bariatric management equipment Request specialist medical support for bariatric casualty Consider structural stability
Thermal or chemical injury	Provide treatment to burns casualties
Casualty with crushed body part	Assess the casualty using standard <C> Ac B C D E Plan for the casualty deteriorating on release Protect from hypothermia or hyperthermia
Impaled casualty	Stabilise casualty and request medical assistance

Search

Operating principles

There are four phases in every search and rescue scenario. Depending on the incident, they may be present to a greater or lesser degree. They are known by the 'LAST' acronym:

Locate

Access

Stabilise

Transport

These phases are the basis of a set of principles that may be applied at every incident requiring search and rescue operations. The nature and complexity of the situation should determine the levels of management and control applied to the incident and the scale of the search and rescue operations.

Fire and rescue services should be prepared to deal with this type of operation. Guidance for operational planning may be found in Section 7 of the government publication Fire and Rescue Authorities, Health, safety and welfare framework for the operational environment.

The overall responsibility for search and rescue operations should rest with the appropriate (lead) agency and their representative. A competent person from the lead agency should be nominated as soon as possible in the operations to co-ordinate resources and activity around the search and rescue principles.

The requirement for search and rescue operations will usually fall into one of the following broad categories:

- Operations in the built environment, such as a fire in a building or a collapsed structure
- Operations in the natural (open) environment, such as unstable ground or a wide area search on land or water

Please note that an incident involving a confined space may occur in either of these categories.

Locate

- 'Locate' represents the search phase. This may be brief, in the case of a clearly identified casualty, or protracted, when the person is reported to be missing.
- Identify, record and mark the point last seen (PLS) or last known position (LKP), collectively referred to by UK search and rescue organisations and the police as the initial planning point (IPP).
- Record the casualty details and time at PLS or LKP
- Assess the situation in terms of significant hazards, operational activity and the required resources. Resources include personnel, personal protective equipment (PPE) and work equipment (including firefighting, rescue and communication equipment).
- Allocate tasks and brief operational crews on the working environment, hazards, tasks and communication method – enhance the briefing with visual information, such as suitable plans that have been annotated to provide clarification

- Take into consideration the resources available and, en route, consider what else may be required
- Establish search management records. Operational crews should landmark any recognisable features to:
    - Provide orientation, and therefore support. for effective briefing of crews
    - Support effective recording of the areas and compartments that have been searched
    - Communicate progress to inform the overall tactical plan
- If the casualty is not immediately located, a number of search phases may be identified and considered: primary phase, secondary phase, tertiary phase and so on
- Identify and employ a safe system of work throughout
- Ensure this information is communicated and included in the overall tactical plan

Access

- Start a dynamic risk assessment (DRA) and communicate the findings when the casualty is located
- Identify the agency with the appropriate capability to access the casualty
- Update search management records using progress and activity reports

Stabilise

- 'Stabilise' should involve stabilising both the situation and any casualties
- Stabilise the situation to reduce the risk to operational crews and prevent further harm to any casualties. Examples may include securing unstable structures or ground, or controlling a fire compartment
- Stabilise the casualty by physically isolating them from any immediate hazard with the potential to cause harm. Ideally, any hazard should be removed from the vicinity of the casualty. If the hazard cannot be removed the casualty should be moved to a place of (relative) safety
- Assess and secure the casualty following the <C> Ac B C D E approach
- Carry out casualty packaging for transport, extrication and rescue using, for example, a vacuum mattress, scoop stretcher or basket stretcher
- Prepare for transport and rescue
- Communicate progress to inform the overall tactical plan

Transport

'Transport' is the final part of the operation. It should provide the removal of any casualties to a place of relative safety and definitive care.

- It is important to remember that the casualty should be protected from any harm during this part of the operation
- Information that may be relevant and important for casualties to be safely and effectively transported should be passed to the responsible agencies. The hand over of accurate standardised information

recognised by local medical responders is essential. An example of an acronym to ensure that this is done is **ATMIST**, details of which can be found in the Casualty care section of this guidance. Information transferred in this format should contribute to successful pre-hospital care.

- Operational crews, their personal protective equipment (PPE) and other equipment should be removed to a place of safety

End of the incident

Operational activities should be safely and effectively managed throughout the closing stage of an incident. A debrief should be conducted to identify best practice and lessons learned.

Guidance on incident debrief can be found in Section 12 of the government publication Fire and Rescue Authorities, Health, safety and welfare framework for the operational environment.

See National Operational Guidance: Operations - Incident closure and handover

Hazard – Lack of co-ordinated search plan (generic)

Hazard	Control measures
Lack of co-ordinated search plan (generic)	Gather information from the public and liaise with other agencies Request resources for search Have clearly defined area of operations Ensure search teams have detailed briefing Have a communication strategy Conduct search using thermal imaging equipment Provide adequate lighting Identify areas that have been searched

Hazard knowledge

A search may be required for either a missing person or an absent person.

If a co-ordinated search plan is not carried out in a timely and structured way, the casualty may not be located and their condition could potentially deteriorate.

The working environment, weather conditions and time of day may affect the search, especially with regard to visibility. This may make it more difficult to carry out an effective search, as people and objects may be difficult to distinguish.

Control measure – Gather information from the public and liaise with other agencies

Control measure knowledge

Initial crews will need to gather information from members of the public and liaise with other agencies in attendance.

Strategic actions

Fire and rescue services should:

- Ensure all incident commanders are familiar with information sources at search incidents
- Arrange training and exercising with other agencies

Tactical actions

Incident commanders should:

- Confirm and communicate the number, type and severity of casualties at the earliest opportunity
- Anticipate casualty condition and potential survivability given the environmental situation
- Establish the last known position (LKP) or place last seen (PLS) of casualties, including times
- Liaise with the police search adviser where appointed
- Develop and communicate a co-ordinated search plan following JESIP principles

Control measure – Request resources for search

Control measure knowledge

Search and rescue incidents may require a multi-agency response and in many cases will require specialist teams. The skills required may need to be sourced from internal resources, other fire and rescue services or external agencies.

Fire and rescue services should have an awareness of National Resilience capabilities that should include an understanding of the arrangements contained in the National Co-ordination Advisory Framework (NCAF). They should also ensure that there are appropriate and current procedures to deal with any related requests.

Specialist resources to support search may include search dogs, UAVs (Drones) USAR, lighting, police teams, Maritime and Coastguard Agency, cave/mountain/mines rescue and other agencies

Strategic actions

Fire and rescue services should:

- Have arrangements with other category 1 and 2 responders for mobilisation and co-operation at search incidents

Tactical actions

Incident commanders should:

- Request adequate resources to enable effective search given the scope and environment of the incident

Control measure – Have clearly defined area of operations

Control measure knowledge

To carry out a co-ordinated search plan, the best way of defining and subdividing the search area should be considered. Once designated, search teams should confirm this, and provide regular updates to the incident commander.

Establish clearly defined parameters of the search area and subdivide into appropriate sizes depending on:

- Structure
- Terrain
- Natural features
- Type and size of transport involved
- Available resources

If visibility is reduced, or at night, give additional consideration to using safe routes and landmarks.

Strategic actions

Fire and rescue services should:

- Ensure incident commanders understand the principles of search co-ordination

Tactical actions

Incident commanders should:

- Implement a co-ordinated search plan, define parameters and sub-divide the area where necessary

Control measure – Ensure search teams have detailed briefing

Control measure knowledge

Before briefing personnel, incident commanders should consider all available sources of information. Team briefings should be based on incident needs and a plan should be constructed to achieve them. Continuous evaluation and review throughout the incident will determine whether the current objectives and subsequent plan are appropriate.

Crews should be given a brief, including the area to be searched along with information available on casualties, their last known position (LKP) or point last seen (PLS).

Strategic actions

Fire and rescue services should:

- Ensure that incident commanders are competent in delivering clear and concise briefings to crews

Tactical actions

Incident commanders should:

- Brief search teams on plans, parameters and casualty information, confirming understanding

Control measure – Have a communication strategy

Control measure knowledge

Effective communications should be established with the search co-ordinator and the deployed crews. These are essential for a successful outcome to operations, both within the incident command structure where they are vital to the incident commander in ensuring that the current objectives and subsequent plan are appropriate, but also between safety officers and crews. If distances are adequate, verbal communications may be more appropriate during the dynamic stages of the incident.

See National Operational Guidance: Incident command - Have a communication strategy

Control measure – Conduct search using thermal imaging equipment

Control measure knowledge

Thermal imaging equipment can be used to locate people, especially at night or if visibility is reduced. In these situations, thermal imaging equipment can prove invaluable to search operations. Thermal imaging equipment may include:

- Thermal imaging cameras
- Aerial appliances
- Unmanned aerial vehicles (Drones)
- Police/Coastguard helicopters

Strategic actions

Fire and rescue services should:

- Make arrangements for crews to access thermal imaging equipment for use at search incidents in poor visibility

Tactical actions

Incident commanders should:

- Adopt a methodical system when using thermal imaging equipment to search for casualties
- Consider using a range of thermal imaging resources such as aerial appliances, UAV and helicopters

Control measure – Provide adequate lighting

Control measure knowledge

Many searches will need to be undertaken at night or with reduced visibility. Adequate scene lighting should be used to define safe routes, and scene of operations. In some rescue situations generator powered lighting may hamper operations and present additional hazards; battery powered lighting that is silent and does not create toxic fumes should be considered.

- Consider how appropriate personal or scene lighting should be used
- Ensure sufficient lighting resources are requested
- Make sure generators are located at an appropriate distance from the scene of operations. This avoids exhaust fumes entering the void and can also reduce noise pollution

- Ensure sufficient quantities of fuel for generators are available at the scene to ensure a loss of lighting does not hamper rescue operations

See National Operational Guidance: Operations - Manage hazards in the physical environment

Strategic actions

Fire and rescue services should:

- Provide operational crews with access to a range of lighting equipment suitable for use in rescue operations

Tactical actions

Incident commanders should:

- Request sufficient lighting resources appropriate to the activities and identified risks
- Consider using battery powered lighting to reduce noise and eliminate fumes
- Locate generators at an appropriate distance from the scene to reduce risk from exhaust fumes and noise
- Secure fuel for generators to ensure loss of lighting does not hamper rescue operations

Control measure – Identify areas that have been searched

Control measure knowledge

To prevent duplication of effort and potential delays in covering unsearched areas, there should be effective search co-ordination as the incident progresses. Detailed debriefing of teams on their progress against objectives and the extent of the areas covered should be carried out and the results recorded. Any areas that have not yet been searched should be prioritised and identified to subsequent search teams as part of their brief.

Strategic actions

Fire and rescue services should:

- Have procedures for co-ordinating the areas to be searched
- Have procedures for debriefing teams following search and recording of outcomes in a way that can be shared with subsequent search teams

Tactical actions

Incident commanders should:

- Consider appointing a search co-ordinator to ensure all areas have been systematically searched

Hazard – Lack of co-ordinated search plan (transport)

Hazard	Control measures
Lack of co-ordinated search plan (transport)	Search in hidden voids Review passenger/cargo manifests Be aware of seating and standing capacities Look for occupancy indicators

Hazard knowledge

A search may be required for either a missing person or an absent person.

If a co-ordinated search plan is not carried out in a timely and structured way, the casualty may not be located and their condition could potentially deteriorate.

On arrival at incidents, the exact location of casualties or numbers involved may not be apparent, even after carrying out a scene assessment including an inner and outer survey (see below).

Surveying the scene

Once the incident commander has assessed the scene and determined the nature of any hazards present, they can decide to task others to carry out a more intensive survey of the scene. This can be achieved by initiating inner and outer surveys.

Performing a scene survey gives a full picture of the incident and can save valuable time by allowing the rescuers to develop an adequate plan of action.

Inner survey

An inner survey allows closer examination of the vehicles or crafts. One or two rescuers walk adjacent to the vehicles, checking the immediate area for casualties and any hazards. During this assessment a look around and under the vehicles can help identify:

- That there are no further casualties underneath
- Any weak areas of the vehicle due to accident damage that will require additional stabilisation
- The presence of any fuel or oil from the accident
- The presence of supplementary restraint systems (SRS)
- Any other situation requiring attention, e.g. the position of catalytic converters

Outer survey

One or two rescuers walk completely around the vehicle. They look in towards the vehicle or craft and out to the perimeter of the scene, checking for casualties, obstructions, and any potential problems, while remaining a safe distance from the vehicle. All information gathered should be shared with personnel in attendance.

Incident commanders should consider any areas of vehicles that may have not been thoroughly checked because they lack obvious signs of any casualties.

With larger forms of transport – aircraft and trains that have crashed or derailed, for example – the interior will be unfamiliar. As a result of the damage, disorientation may lead to confusion for the search personnel.

For example, the interior of an aircraft may be unfamiliar to fire and rescue service personnel. It is therefore vital to personnel working inside the aircraft that firefighting, search and rescue operations are methodical. In these situations, fire and rescue services should use the knowledge and expertise of the rescue and firefighting service personnel (from an airport) if in attendance.

Fire and rescue service personnel should be aware of the benefits of a structured and co-ordinated approach to search operations. Six elements should be considered; they will help in performing a well-controlled rescue from various forms of transport. These elements are:

- Scene assessment and safety
- Stabilisation and initial access
- Glass management
- Space creation
- Full access
- Immobilisation and casualty extrication techniques

The involvement of other emergency services, such as specialist USAR teams, or appropriate resources and casualty care should be considered.

Control measure – Search in hidden voids

Control measure knowledge

Before briefing personnel, incident commanders should consider all available sources of information and assess the developing incident. Incident commanders and crews should have an understanding of the layout of various road vehicles, including passenger-carrying vehicles such as cars, minibuses and coaches, commercial light goods vehicles (LGV), trains and aircraft.

Incident commanders should give crews specific briefings and ensure crews understand the plan. In structuring search plans, a thorough check of hidden voids should be considered. These include:

- Under seats
- Sleeping compartments on coaches, LGV, trains and aircraft
- Luggage compartments
- Toilets
- Cargo or luggage areas

Strategic actions

Fire and rescue services should:

- Ensure all personnel have an understanding of the construction of vehicle or craft likely to be encountered in a rescue

Tactical actions

Incident commanders should:

- Ensure that a systematic inner and outer survey of search area is carried out, including hidden voids

Control measure – Review passenger/cargo manifests

Control measure knowledge

Where possible, incident commanders should review passenger lists to determine the number of persons involved (though this will not apply to certain types of transport such as local buses with a transient and variable amount of passengers). Incident commanders should also check the lists against the number of casualties located, and those who may have been taken to hospital before fire and rescue service resources arrived. Cargo and load manifests should be checked for any potential hazards to casualties and rescuers.

Strategic actions

Fire and rescue services should:

- Have support mechanisms to enable incident commanders to obtain information from transport operators

Tactical actions

Incident commanders should:

- Question the driver and passengers to determine the number of persons and type of cargo involved
- Consider contacting commercial vehicle operators to obtain passenger numbers and cargo information

Control measure – Be aware of seating and standing capacities

Control measure knowledge

Incident commanders should consider confirming the seating and standing capacities of larger forms of transport. This can indicate the potential number of persons involved, though it should be borne in mind that the vehicle may not have been full at the time of departure and may have had several drop off points. Refer to the control measure *Review passenger/cargo manifests*

Searching in larger forms of transport should be done in a methodical manner and in a way that subsequent teams can assist or re-enter and continue with the search. The use of seat counting and simple laminated charts depicting seat layouts can be useful in identifying casualties and as a reference point for subsequent fire and rescue service rescue teams.

Strategic actions

Fire and rescue services should:

- Ensure all personnel have an understanding of the construction of vehicles and craft likely to be encountered in a rescue

Tactical actions

Incident commanders should:

- Consider counting the seats to identify potential number of casualties

Control measure – Look for occupancy indicators

Control measure knowledge

Casualties may have fallen or been thrown clear due to the impact. The incident commander should consider other visual indicators to identify this possibility, including the presence of:

- Child seats
- Disabled badges or ramp access
- Personal effects

Strategic actions

Fire and rescue services should:

- Have arrangements for requesting search teams at incidents where casualties may be spread over a wide area.

Tactical actions

Incident commanders should:

- Investigate the scene looking for indicators of vehicle and craft occupancy

Hazard – Noise impacting search operations

Hazard	Control measures
Noise impacting search operations	Isolate industrial processes, machinery or transport

Hazard knowledge

In this guidance, the term 'noise' incorporates any form of sound in a search environment that is due to industrial processes, machinery and transport, and that can affect the ability to communicate effectively or to hear audible warning devices.

In defining this hazard and associated control measures, it is assumed that the appropriate resources (personnel and equipment) are available, and that personnel have the training required to appreciate the potential impact of noise on communication between the incident commander and crews, and between crews directly.

An additional element of this hazard is that the noise generated by machinery or transport, including the equipment being used by the fire and rescue service, may prevent rescuers from hearing the casualty.

See also National Operational Guidance: Operations – Noise

Control measure – Isolate industrial processes, machinery or transport

Control measure knowledge

Before committing crews, incident commanders should ensure industrial processes, machinery or transport are isolated. This will have an impact on communications and could potentially affect the search for and extrication of a casualty.

Strategic actions

Fire and rescue services should:

- Ensure all personnel are aware of the risk that background noise can hinder search operations

Tactical actions

Incident commanders should:

- Isolate sources of noise following liaison with owners, occupiers or site engineers

Hazard – Scene of operations or terrain

Hazard	Control measures
Scene of operations or terrain	Isolate and lock out industrial processes or machinery Identify and maintain safe access and egress routes Incident ground safety management

Hazard knowledge

In this guidance, the term 'scene of operations or terrain' applies to the conditions underfoot and physical objects, both manmade and natural, that fire and rescue service personnel may have to traverse to the scene of operations, to locate, access, stabilise and transport casualties to a place of safety. This may include open land with underfoot hazards in a rural environment or machinery and plant in a built environment that fire and rescue service personnel need to cross when searching for or extricating a casualty.

See National Operational Guidance: Operations - Manage hazards in the physical environment

Control measure – Isolate and lock out industrial processes or machinery

Control measure knowledge

Before committing crews to the search area, incident commanders should ensure that industrial processes or machinery are isolated. If this is not possible, the condition of the utilities present in the structure should be continually monitored. Dynamic risk assessments based on the information received from the monitoring process can dictate additional control measures and will provide personnel with information on the working environment.

See National Operational Guidance: Utilities and fuel (to follow)

Strategic actions

Fire and rescue services should:

- Ensure personnel understand the need for isolating and locking out industrial machinery and processes

Tactical actions

Incident commanders should:

- Request the attendance of the responsible person or process expert
- Request the attendance of utility providers to isolate incoming supplies if local isolation is not possible
- Consider avoidance routes where processes and machinery cannot be isolated and locked out

Control measure – Identify and maintain safe access and egress routes

Control measure knowledge

Before briefing personnel, incident commanders should consider all available sources of information and assess the developing incident. Team briefings should be based on the incident with safe access and egress routes highlighted. This should ensure crews are not exposed to potential risks. Underfoot conditions and prevailing weather conditions should be taken into account, with continuous evaluation and review throughout the incident to determine whether the current incident plan is effective. Access and egress routes from vehicles and craft should be maintained, taking into account that an alternative egress route may need to be established if the mode of transport becomes more unstable or moves.

Strategic actions

Fire and rescue services should:

- Ensure responding personnel understand the requirement to maintain safe access and egress routes

Tactical actions

Incident commanders should:

- Identify and communicate access and egress routes to crews considering the incident plan and environment
- Define routes using physical barriers and clearly illuminate where there is reduced visibility
- Monitor access and egress routes as the incident progresses and review the incident plan if necessary

Control measure – Incident ground safety management

See National Operational Guidance: Incident command – Ineffective safety management

Hazard – Unstable ground

Hazard	Control measures
Unstable ground	Employ a safe system of work to recover casualties and rescuers

Hazard knowledge

In this guidance, sudden collapse or the failure of unstable ground can be attributed to adverse weather conditions or naturally occurring erosion that has undermined the integrity of the ground, so that it can fail without warning. The presence of unstable ground after a partial building collapse should also be considered.

Through knowledge pooling between various agencies and information sharing in local emergency planning groups; fire and rescue service personnel should be aware of specific areas within service boundaries where there is a risk of failure from unstable ground.

Involving specialist fire and rescue teams (such as USAR and line rescue) and other emergency services or appropriate resources should be considered.

See National Operational Guidance: Operations – Bodies of water and unstable ground

Control measure – Employ a safe system of work to recover casualties and rescuers

Control measure knowledge

Incident commanders should consider implementing a safe system of work which is capable of recovering casualties and their rescuers.

A recoverable system using line equipment is an example, but may not be appropriate in all circumstances.

Strategic actions

Fire and rescue services should:

- Ensure that crews understand the importance of having tag line and recovery systems in place when deploying crews around areas of existing and potential ground collapse

Tactical actions

Incident commanders should:

- Ensure personnel working around unstable ground are secured using fall restraint or work positioning system
- Establish tag line and recovery systems for crews deployed around unstable ground

Hazard – Animals or insects encountered during search for or extrication of casualties

Hazard	Control measures
Animals or insects encountered during search for or extrication of casualties	Isolate animals Establish alternative access/egress routes

Hazard knowledge

Animals or insects could be encountered in urban, rural, built or natural environments, while searching for or extricating a casualty. Domesticated and non-domesticated animals can be encountered in any type of environment, including private dwellings and farms. Animals or insects may also be encountered in commercial locations like medical research establishments, hospitals and zoos.

Hazards that may arise during or following contact with animals or insects include:

- Crush injuries
- Puncture wounds
- Abrasions, cuts and bruising
- Bites and stings
- Infection

Encountering animals or insects may result in personnel from the fire and rescue service, other emergency services and agencies being unable to carry out the extrication of a casualty effectively. Any resultant delay, and/or the animals or insects themselves, may result in the casualty's condition deteriorating.

Assistance from owners or keepers should be sought if appropriate, or consider other agencies such as the RSPCA. In particular, consider issues arising from the presence of animals or insects such as the risk of infection or disease and their implications on casualty care.

For further information, see National Operational Guidance: Operations – Animals

Control measure – Isolate animals

Control measure knowledge

Consider isolating the animals or insects where appropriate and possible to prevent exposure or injury to fire and rescue service personnel, other agencies and the casualty.

Strategic actions

Fire and rescue services should:

- Consider providing personnel with the means of controlling animals and insects where their presence may hamper rescue operations

Tactical actions

Incident commanders should:

- Request advice regarding animals from owners, keepers, vet, DEFRA, RSPCA or partner agencies

Control measure – Establish alternative access/egress routes

Control measure knowledge

Alternative access or egress routes could be used to minimise exposure to animals or insects.

See Identify and maintain safe access and egress routes

Strategic actions

Fire and rescue services should:

- Ensure that incident commanders and other responders understand the importance of maintaining safe access and egress to scene of operations

Tactical actions

Incident commanders should:

- Consider alternative routes if access or egress is obstructed by the presence of animals or insects
- Liaise with animal owners, keepers or occupiers to determine alternative safe access and egress routes

Extrication of a casualty

Casualties may need to be extricated from many environments. Further information will be provided in the 'Context' guidance including:

- Road transport systems (including Highways Agency managed motorways)
- Underground rail transport systems
- Overground rail transport systems, including overhead line equipment (OLE)
- Air transport systems
- Maritime environments and waterways (including docks and boatyards)
- Underground structures (including tunnels and mines) (not yet published)
- Areas with restricted access or egress (not yet published)
- Confined spaces (not yet published)

In this guidance, the term 'mode of transport' refers to any form of transport such as aircraft, rail vehicles, road vehicles, vessel or craft and will be referred to as 'vehicle or craft'.

For further information, see National Operational Guidance: Water rescue and flooding.

Each form of transport has its own set of hazards, relating to the materials used in construction, its contents and so on. Information on these hazards can be found in the relevant sections of this guidance.

Extrication of casualties may result in exposure to various hazards, many of which may be encountered at any incident. The control measures to address these more generic hazards will be found in the Operations guidance including:

- Manual handling
- Slips, trips and falls (on the same level)
- Falls from working at height
- Trauma/psychological stress
- Body fluids from casualties
- Physiological stress from work
- Mechanical hazards
- Environmental hazards
- Animal hazards

Extrication of casualties will take place within the inner cordon of the incident. The Incident Command guidance provides information about establishing cordons.

A casualty can suffer further injury, illness or death from the incident if they do not receive prompt medical aid. By adopting a systematic approach to casualty care, any life-threatening conditions can be rapidly identified and managed.

Hazard – Failure to extricate the casualty without deterioration of their condition

Hazard	Control measures
Failure to extricate the casualty without deterioration of their condition	Situational awareness Request resource for extrication Stabilise the casualty Extricate the casualty

Hazard knowledge

The primary focus should be on the extrication of the casualty. The impact of any secondary hazards that exist because of the location of the casualty should also be managed.

Control measure – Situational awareness

See National Operational Guidance: Incident command - Situational awareness

Control measure – Request resources for extrication

Control measure knowledge

Some rescue situations may require resources in terms of personnel and equipment that are beyond the capability of the initial response. Incident commanders should make an assessment of their available capabilities against the likely development of the incident and request sufficient resources to enable a timely extrication of casualties. Such resources may include heavy duty or specialist cutting equipment and heavy recovery vehicles.

Strategic actions

Fire and rescue services should:

- Have arrangements to enable the request of specialist rescue equipment that may be required at incidents

Tactical action

Incident commander should:

- Request sufficient resources to enable timely extrication of casualties at rescue incidents

Control measure – Stabilise the casualty

Control measure knowledge

The principles of casualty care listed below apply to all casualties, including trapped and non-trapped casualties:

- Protect the casualty from the hazards associated with the event
- Minimise on-scene time
- Extricate the casualty in the quickest way possible, considering their injuries and the overall threat to their life

Strategic actions

Fire and rescue services should:

- Provide training to crews on casualty stabilisation and scene safety

Tactical actions

Incident commanders should:

- Protect casualties by physically isolating them from immediate harm where possible

Control measure – Extricate the casualty

Control measure knowledge

A number of control measures may need to be implemented depending on the location of the casualty, their condition and the equipment and resources available and used.

Secondary hazards identified in making the inner cordon safer may previously have been managed, but may need to be considered further where interaction is required to carry out extrication of the casualty as a result of moving, manipulating, cutting or working in closer vicinity of the secondary hazard and so on.

It is also likely that secondary hazards not previously identified will become apparent during an extrication.

Refer to the control measures in the following sections of this guidance:

- *Extrication – Generic – Equipment used by other agencies*
- *Extrication – Generic – Tools*

Strategic actions

Fire and rescue services should:

- Provide personnel with training in a range of extrication techniques based on local risk

Tactical actions

Incident commanders should:

- Develop an extrication plan and communicate to rescue teams and other responding agencies

Extrication – generic

Hazard – Medical equipment

Hazard	Control measures

Medical equipment	Identify and communicate medical equipment in use Isolate and remove medical equipment Be oxygen aware Establish an equipment, resource or tool area

Hazard knowledge

In this document, the term 'equipment used by other agencies' refers primarily to equipment used by the ambulance service. This will include 'sharps' such as syringes and scalpels, and also drugs and oxygen. Further information can be found in the *Casualty care* section.

The hazards posed by the equipment used by other agencies include:

- Puncture wounds
- Cross-contamination
- Cuts
- Lacerations
- Explosion

It is reasonable to assume that the ambulance service will take responsibility for its own equipment. However, it is also reasonable to assume that when medical interventions on a casualty are taking place inside a vehicle, some equipment may be scattered. Other agencies do not always practise the discipline of creating an ordered equipment or tool point and this can create issues for maintaining a safe working environment.

It is important to realise that different agencies at the same incident have different ways of working, and may have different priorities to fire and rescue service personnel. This may also include their approach to appropriate levels of personal protective equipment (PPE). Co-operation and communication are important to resolve the incident. Regardless of the agency, or number of agencies, they should be focused on the casualty, making the incident safe and using a casualty centred rescue approach.

Control measure – Identify and communicate medical equipment in use

Control measure knowledge

Identifying the medical processes in place is the first step to controlling the hazard. Letting crews know if needles are in use has a self-explanatory effect. The importance of communicating with other agencies cannot be understated.

Strategic actions

Fire and rescue services should:

- Ensure that personnel have an understanding of the equipment likely to be encountered and the associated risks when working on multi-agency rescue operations

Tactical actions

Incident commanders should:

- Liaise with other agencies to identify and understand their activities and equipment

Control measure – Isolate and remove medical equipment

Control measure knowledge

Medical personnel normally carry sharps cases. In their absence, signposting, removing or covering up sharps in such a way that they do not become a hidden hazard should be considered.

Consider that the casualty could be carrying personal medical equipment required to manage their health condition. Medical alert tags, bracelets or cards may provide an indication of this. Be alert to the potential presence of non-prescription sharps.

For further information, see National Operational Guidance: Operations – Manage risk from biological hazards

Strategic actions

Fire and rescue services should:

- Ensure that personnel are aware of the risks posed by contaminants such as body fluids and routes of entry

Tactical actions

Incident commanders should:

- Identify and isolate personal medical equipment that presents a risk to responders
- Avoid handling sharps if possible and take precautions when it is necessary to handle sharps

Control measure – Be oxygen aware

Control measure knowledge

Remember that medical oxygen should not be contaminated with grease or oil; there is an associated hazard of ignition between a fuel and an oxidiser. Refer to the HazMat guidance for further information.

The use of oxygen at an incident scene will pose additional hazards because oxygen supports combustion, making non-combustible items likely to become more flammable. If the oxygen cylinder is damaged in any way during an extrication, and this results in a larger uncontrolled leak, it should be identified and managed immediately.

Further information can be found in the Casualty care section.

Strategic actions

Fire and rescue services should:

- Ensure that all personnel are aware of the risk presented by working with medical oxygen

Tactical actions

Incident commanders should:

- Identify and communicate the presence of any oxygen equipment to emergency responders
- Wear medical gloves when handling oxygen equipment and ensure isolation from oil and grease

- Consider the risk from oxygen enrichment when using tools, equipment or defibrillators

Control measure – Establish an equipment, resource or tool area

Control measure knowledge

Fire and rescue service equipment or tool points, and good housekeeping in the immediate vicinity of the incident, help create a safer working environment for all personnel. Consider establishing a personnel marshalling point – a location for unused personnel from all agencies to congregate away from the immediate scene of operations.

For example, a screwdriver dropped on the floor in the extrication path of a casualty being removed from a vehicle by emergency responders may seem innocuous. But if an emergency responder slips on the screwdriver and loses their balance while managing the casualty's head and neck, the outcome could be significant.

Strategic actions

Fire and rescue services should:

- Have procedures for safe management of the incident ground including equipment, personnel and debris

Tactical actions

Incident commanders should:

- Consider establishing an equipment, tool, debris or personnel area
- Encourage the use of fire service equipment or tool area by ambulance personnel and other agencies

Hazard – Rescue tools

Hazard	Control measures
Rescue tools	Use methods of space creation Identify the most appropriate rescue tool for the task Manage tool operatives and their actions Manage the effects of tool use Wear personal protective equipment (PPE) for rescues

Hazard knowledge

In this guidance, the term 'tools' relates to different types of specialist rescue equipment such as:

- Cutters
- Rams
- Spreaders
- Combination tools

- Reciprocating saws
- Angle grinders
- Disc cutters
- Chisels

This list is not exhaustive and encompasses tools powered by manual, battery, pneumatic and hydraulic systems.

The hazards posed by tools may occur as a result of a malfunction, misuse or in normal use by the operator. These may include:

- Noise
- Muscular skeletal injuries
- Projectiles
- Impact injuries
- Crush injuries
- Amputations
- Sparks
- High pressure liquids/hydraulic injections
- Irrespirable exhaust gases
- Dust / toxic particles
- Corrosives
- Toxic materials
- Irritants
- Flammable substances

For further information, see National Operational Guidance: Operations – Physical hazards and National Operational Guidance: Operations – Chemical hazards

It is reasonable to assume that all fire and rescue service equipment will be well-maintained and tested, and only used by trained operators. However, it is also reasonable to assume that a combination of advances in materials, ageing equipment and human error can all contribute towards safety events, which encourages further control measures.

Refer to the *Extrication* sections relating to vehicle construction for further information about composite materials, metals and other materials.

Although equipment is manufactured with safety features to prevent and protect against misuse or malfunctions, operators should still be aware of the varied materials being tackled and the energies involved, whether stored inside the structure or as part of the operation of the tool; high-pressure liquids and hydraulic injections for example.

Control measure – Use methods of space creation

Control measure knowledge

Personnel should employ a hierarchical approach to creating space, using the easiest and/or quickest methods as a priority such as creating space through the adjustment of internal features like seats, steering controls and removal of any luggage.

Using larger tools such as hydraulic rescue equipment may not be the most appropriate solution. Opportunities may exist to use spanners, torque wrenches and smaller tools that may support simultaneous activity better.

Alternative extrication paths for the casualty should be identified to ensure they can be safely removed, whilst considering their injuries and the overall threat to their life. The use of tools to create or maintain space should not impede the plan of action and extrication route.

Tackling high strength components used in construction may introduce high energy dispersal throughout the item. Formulating a space creation plan to suit the needs of the rescuers and casualties should be considered, which involves tackling components that can be displaced and/or removed using low energy strategies. Refer to the *Extrication* sections for new or heavy vehicle construction.

Other agencies may need to attend the incident, such as medics, environment agency, vehicle recovery companies, Highways Agency, police collision investigation team, and so on. They may need access to the incident to perform their respective roles.

Where a vehicle or craft has come in to contact with street lighting, agencies such as electricity providers may need to be contacted to isolate the power. If a tree is resting on a vehicle, specialist resources may need to be contacted to aid with the extrication.

Strategic actions

Fire and rescue services should:

- Ensure that personnel have a good understanding of space creation techniques in a range of rescue environments

Tactical actions

Incident commanders should:

- Identify and request assistance from other agencies where specialist response is required
- Brief agencies working in the inner cordon on hazards and control measures
- Implement appropriate space creation techniques in line with the casualty extrication plan
- Consider prioritising rescuer access and egress when developing the space creation plan
- Consider internal contents and furniture when developing the space creation plan
- Be aware that the size, shape and integrity of the structure may change during space creation
- Consider the integrity of the surrounding structures and environment before, during and after space creation

Control measure – Identify the most appropriate rescue tool for the task

Control measure knowledge

Once the need for a tool is identified, it is important for the operator to select the most appropriate tool for the task. Most manufacturers offer an extensive range of tools, from small tools designed for use in confined compartments to heavy duty tools designed for use on Large Goods Vehicles (LGV).

Selecting the smallest tool appropriate for the task can help to avoid manual handling injury to the operator and reduce the need to rotate crews, speeding up the extrication while avoiding unnecessary imposition on the casualty. See National Operational Guidance: Operations.

Manufacturers offer guidance on best practice in using their tools, which is cascaded to crews during regular training. This guidance should normally include connecting the equipment, use, possible techniques, advantages, limitations and ongoing maintenance requirements to ensure that the tools are operationally ready.

Strategic actions

Fire and rescue services should:

- Ensure personnel have access to a range of rescue tools suitable for the environments likely to be encountered by rescuers
- Ensure that all operators are aware of the limitations and manufacturer's guidance on the use of rescue tools
- Have a schedule of inspection and maintenance for rescue tools

Tactical actions

Incident commanders should:

- Select the appropriate rescue tool considering the condition of the casualty, extrication plan and materials
- Monitor rescue tool performance for indicators of unidentified materials

Control measure – Manage tool operatives and their actions

Control measure knowledge

Effective management of tool operatives and maintaining crew discipline within the inner cordon will improve the effectiveness of simultaneous activity. Incident commanders should consider establishing a marshalling point for personnel to report to following completion of their task.

A safe working area should be established immediately around the tool operation wherever possible. Only essential personnel should be in the area (approx. 2 to 5 metres from the tool). Other responders and casualties should be warned immediately before the operation of tools by the use of terms such as 'cutting', 'spreading' or 'impact' to alert them to the potential for noise and movement caused by the tool's action.

At extrications a safety officer's role will involve overseeing the actions of emergency responders using tools and ensuring their safety. This wider view allows improved awareness of the impact of the tool operations, the item being operated on and those directly surrounding it.

See National Operational Guidance: Incident Command - Establish appropriate cordon controls and National Operational Guidance: Incident Command - Incident ground safety management

Strategic actions

Fire and rescue services should:

- Provide information and training to operational personnel on the safe operation of rescue tools in a range of extrication situations

Tactical actions

Incident commanders should:

- Consider positioning a safety officer to monitor rescue tool operation
- Co-ordinate the simultaneous activities of extrication teams and tool operators

Tool operators should:

- Establish a safe area around the tool operation wherever possible
- Use action words to warn others when operating rescue tools
- Manage hydraulic hoses carefully within limitations and avoiding kinking
- Reveal hidden areas to aid identification of components that could damage tools or cause uncontrolled release

Control measure – Manage the effects of tool use

Control measure knowledge

As mentioned in the hazard knowledge, the hazards posed by using tools can be extensive. The impact or likelihood of hazards resulting in harm are directly related to the type, location of use and the operator's capabilities.

It is important to remember that many of the tools used in extrications will be extremely powerful and can easily lead to uncontrolled movements when not managed correctly and in an appropriate manner.

Continuous familiarisation with the tools intended for use is recommended, including a check before use. This should be done outside a risk area or inner cordon, to re-familiarise operators with the equipment and check that the tool is working correctly before entering a work position.

For example, reciprocating saws create a lot of vibration and noise, which may be transferred on to, or distress the casualty. This may vary with the tool design, the item or material being cut and the operator. A simple test cut, where available and possible, on similar items or materials but without the inherent hazards, will result in improved tool use.

Operators should consider the following elements when using tools:

- Look for hidden hazards before you operate. Make sure the operator knows what is being cut, moved and so on
- Think about what the tool will do. How will it react, what direction it will move, etc.?

- Think about what the item or material you are manipulating will do. Will it affect any other item, will it release explosively, and will it cause fragments or dust to be liberated?
- Compensate and manage the inevitable hazard of fragments of certain items or materials that are cut, squeezed, manipulated and so on as part of an extrication being liberated, despite the best efforts of tool operators. A combination of hard and soft protection should be placed between the tool and the casualty as a minimum, depending on the actions being undertaken and the item or material being affected.
- Ensure tool operators consider using further protection when required during cutting operations, such as a water spray on laminated glass

Strategic actions

Fire and rescue services should:

- Ensure all personnel are trained and maintain competence in the safe and effective use of all rescue tools

Tactical actions

Incident commanders should:

- Monitor the use of rescue tools to ensure capabilities are not exceeded
- Consider rotating crews involved in the use of rescue tools to reduce fatigue, exposure to noise and vibration
- Provide hard and soft protection between the tool and the casualties, operators and other responders
- Minimise the production of airborne particulates during extrication and provide respiratory protection

Control measure – Wear personal protective equipment (PPE) for rescues

Control measure knowledge

All fire and rescue service personnel working in the inner cordon should wear full protective clothing, which includes:

- Full firefighting gear, suitable overalls or similar
- Medical gloves
- Additional debris gloves or heavy duty gloves if handling cables etc.
- Eye protection at all times
- Helmet visors to be worn whilst actually cutting, spreading etc.
- Hi-visibility jackets or markings

Emergency responders who are not protected may take unnecessary risks and can become a liability rather than an asset to the situation.

There has been recent research into the need to use respiratory protective equipment (RPE) when managing glass, particularly in relation to the glass dust or particles produced during cutting operations. This research has

been made available for fire and rescue services to make their own assessment of level of RPE they provide to personnel when managing this hazard.

See National Operational Guidance: Operations – Wear personal protective equipment (PPE) and/or respiratory protective equipment (RPE)

Strategic actions

Fire and rescue services must:

- Ensure that suitable personal protective equipment is provided to personnel who may be exposed to a risk to their health or safety
- Ensure that PPE worn or used simultaneously is compatible and continues to be effective against the risk or risks

Tactical actions

Incident commanders should:

- Ensure all personnel wear PPE according to service risk assessment and procedures

Extrication from the built or natural environment

Hazard – Primary surface extrication of casualties following collapse of a structure

Hazard	Control measures
Primary surface extrication of casualties following collapse of a structure	Highlight avoidance routes Incident ground safety management Provide adequate lighting Conduct search using thermal imaging equipment Have a communication strategy

Hazard knowledge

Following the partial or full collapse of a structure, initial attending fire and rescue service personnel may have to extricate casualties located on the surface of the debris pile or those entrapped because of fallen masonry and metalwork, before specialist resources such as Urban Search and Rescue (USAR) or canine search teams arrive.

The following details the framework for the CFOA National Resilience *Six Stages of Rescue*. Although initial attending fire and rescue service personnel should be aware of this information, their participation in this type of incident may need to be restricted to non-specialist activities.

To assist in the creation of an operational plan, *Six Stages of Rescue* provides a framework for the organisation of any collapsed structure incident. Whilst it is likely that there will not be a clear delineation between each stage, and there will be times when stages overlap, the incident command structure must ensure that each stage is undertaken and completed. This logical and progressive approach will mean that rescue personnel will maximise effectiveness, particularly in the early stages of an incident.

In simple terms, any operations conducted in a sector will have a defined search phase followed by a defined rescue phase, although these two phases may run concurrently across multiple sectors dependent on the size and scale of the incident.

Progression through the *Six Stages of Rescue* takes a considerable time even at a small, single-dwelling collapse. The tactical plan should take account of this and the resources required to achieve a safe and successful conclusion to the incident.

Rescue operations are conducted under the following six stages:

R Reconnaissance and survey

E Elimination of utilities

P Primary surface search and rescue

E Exploration of voids and spaces

A Access by selected debris removal

T Termination by general debris removal

Stage 1: Reconnaissance and survey

The area is searched for possible victims (surface and/or buried), and the evaluation of the structure's stability and potential danger to rescue personnel is performed. Immediately after a collapse, the debris of the building is very unstable and prone to additional movement. Rescuers must assess the nature of the scene and the pattern of the collapse before entering onto a pile of rubble to ensure their own safety and that of those potentially buried in it. Thermal imaging cameras may assist in this task. Before attempting rescues, shoring may be necessary to prevent movement.

Gather as much information as possible at the onset of the incident. Intelligence regarding the last known locations and activities of those believed to be in the structure will greatly assist in developing a plan for recovery efforts. Preliminary efforts should be concentrated on areas where people were last seen or known to be.

It is suggested that a search co-ordinator be designated to interview those who may have escaped the collapse, were eyewitnesses, or were in the building and rescued early in the effort. A list of the people normally in the building should be obtained if one is available.

Stage 2: Elimination of utilities

During this stage of the incident, all utilities must be evaluated and controlled for safety. If necessary, utility services should be isolated before any rescue work proceeds, and if this is not possible, the condition of the utilities present in the structure should be continually monitored. Dynamic risk assessments and subsequent analytical risk assessments based on the information received from the monitoring process can dictate additional control measures, and will provide personnel with information as to the working environment.

Personnel should be aware that some supplies may not have been located and made safe and, therefore, should not cut the following:

- Water pipes: flooding, or a sudden ingress of water, has been known to drown rescuers and casualties in flooded basements. The sound of flowing water can also interfere with the use of acoustic search equipment
- Gas pipes: gases leaking into a collapsed building can pool at lower levels such as basements, depending on the density of the gas
- Electrical cables or wires: experience has shown that other wiring (e.g. telephone cables) can become live after coming into contact with mains wiring

Stage 3: Primary surface search and rescue

At this point in the incident, it may be appropriate for the incident commander to withdraw all personnel and to assess progress made up to that point. It may also be appropriate for the incident commander to review the suitability of the ICS structure in place at that time. Consideration should be given to designating one or more specific search sectors dependent on the size of the incident, each of which should be nominated its own site identification number.

After ensuring rescuer safety and minimal movement of the debris, small organised teams should be deployed to search each sector systematically in specific grids. Canine search teams can be particularly effective in undertaking this task. An agreed marking scheme should be used to demonstrate visually the areas that have been searched, any areas of canine interest, and those areas that could potentially contain victims. Care should be taken when using some methods of marking (e.g. spray paints) as these may interfere with ongoing canine search operations when indoors. The chosen method of marking should also consider the need for discretion where casualty locations are to be noted.

As many as half of all building collapse survivors have historically been rescued near the surface of the debris and early on in the operation. The initial search should be concentrated on those areas that are believed to be the last known locations of people when the collapse occurred. All surface casualties should be removed as quickly and safely as possible.

Extreme care should be taken during this phase to ensure that rescuers do not become victims. Personnel should not be misled by the outward appearance of a structure; what appears to be a settled pile of debris could, in reality, be lacking any genuine support, and a secondary collapse could occur without warning.

Stage 4: Exploration of voids and spaces

All voids and accessible spaces created as a result of the collapse must be searched and explored for live victims. An audible call-out system can be used during this phase. Only trained canine or rescue personnel should be used to search voids and accessible spaces. Voids should be explored visually, by canines and with technical search equipment.

Good practice dictates that at approximately every hour on the hour all work on the site be shut down for a few minutes to listen for calls for help. During that period sound detection devices can be used to listen for movement or sounds deep within the debris.

Stage 5: Access by selected debris removal

Selected debris removal using special tools and techniques may be necessary after locating a victim. It may be necessary to remove only certain obstructions that are blocking access to the victim. Information concerning a

victim's location prior to the collapse can be helpful during the selected debris removal phase. Information gathering on other possible victim locations can greatly enhance the operation.

Stage 6: Terminate by general debris removal

General debris removal is usually conducted after all known victims have been removed. Exceptions would be:

- When information is obtained that indicates the possibility of other victims not originally accounted for
- When large amounts of debris are impairing or obstructing operations. The decision to use heavy equipment during this phase must be given serious consideration, especially when the possibility exists that there are still live victims in the debris

Involving other emergency services or appropriate resources and casualty care should be considered. Refer to the *Casualty care* section.

The incident commander, while developing their tactical plans, should take the following hazards that may be present following a structural collapse into account, and carry out a Dynamic Risk Assessment (DRA) that considers them:

- Incoming and/or damaged utilities. See National Operational Guidance: Utilities and fuel (to follow)
- Sub-surface voids
- Underfoot conditions, including the unstable nature of surface (rubble). See National Operational Guidance: Operations
- Manual handling. See National Operational Guidance: Operations
- Secondary collapse
- Uncontrolled rescue attempts
- Secondary or further collapse as a result of wind, rain, vibration, etc.
- Intimidation or violence from casualties, etc.
- Noise levels. See National Operational Guidance: Operations
- Dust (airborne, static or caustic). See National Operational Guidance: Hazardous materials
- Damage to mass storage vessels
- Asbestos. See National Operational Guidance: Hazardous materials
- Obstructed, hidden or flooded voids
- Glass
- Glass dust. Refer to the *Extrication – Generic – Tools* section
- Falling objects including glass
- Temperature-induced illness. See National Operational Guidance: Operations
- Arduous working conditions and physiological stress

- Hazardous materials (HazMat); irrespirable/hazardous atmospheres, explosives, flammable, toxic or biological materials/substances etc. See National Operational Guidance: Hazardous materials
- Environmental conditions such as darkness
- Fire, heat and smoke. See National Operational Guidance: Fires and firefighting
- Snagging, e.g. sharp edges from damaged building components, for example reinforcement bars
- Falls from height. See National Operational Guidance: Operations

Control measure – Highlight avoidance routes

Control measure knowledge

Before briefing personnel, incident commanders should consider all available sources of information. Team briefings should be based on incident needs and a plan should be constructed to achieve them. Continuous evaluation and review throughout the incident will determine whether the current objectives and subsequent plan are appropriate.

Consider the following sources of information throughout the incident:

- Building and site plans
- Premises information boxes (PIB)
- Responsible Person (or appointed competent person)
- Observation
- 360 degree external surveys of the building and area
- Reconnaissance of the location reported to be involved
- Information from personnel operating in the building and/or risk area
- Witnesses
- Occupiers
- Other agencies

Strategic actions

Fire and rescue services should:

- Ensure that all personnel are aware of the risk and correct procedures for avoidance routes

Tactical actions

Incident commanders should:

- Access any operational or site specific risk information and confirm accuracy
- Identify sub-surface voids and highlight avoidance routes at building collapse incidents
- Establish clear routes to the scene of operations and confirm them to all personnel
- Identify any utilities not isolated and communicate to all personnel

Control measure – Incident ground safety management

See National Operational Guidance: Incident command - Incident ground safety management

Control measure – Provide adequate lighting

See Lack of co-ordinated search plan (generic): Provide adequate lighting

Control measure – Conduct search using thermal imaging equipment

See Hazard - Lack of co-ordinated search plan (generic)

Control measure – Have a communication strategy

See National Operational Guidance: Incident command – Organisation at an incident

Hazard – Manual handling over terrain

Hazard	Control measures
Manual handling over terrain	Deploy adequate personnel Manage physiological stress Use casualty transport equipment Use motorised vehicles

Hazard knowledge

When extricating casualties from the natural environment in rural and urban settings, fire and rescue service personnel may have to use additional equipment and techniques. This may be due to terrain and potential travel distances, or to alleviate any manual handling issues that may arise in transporting equipment to and from the scene of operations, and/or for extricating casualties to a place of relative safety following initial clinical assessment. For further information, refer to the *Casualty Care* section.

Teams should have received appropriate manual handling training and should receive briefs on the hazards and risks, both known and perceived, that can be encountered when extricating casualties from the rural natural environment, specifically in relation to manual handling issues due to the terrain and/or travel distances. Through a joint agency approach and initial information gathering, fire and rescue services, will establish a multi-agency response to ensure appropriate resources are mobilised. Refer to the *Intraoperability and interoperability* section for further information.

Consider involving specialist fire and rescue service USAR teams, other emergency services or appropriate resources and casualty care.

Control measure – Deploy adequate personnel

Control measure knowledge

Team size should be appropriate to the task and the team equipped with the necessary resources to undertake specific briefing, subject to fire and rescue service level of training. The incident commander should review all

sources of information to ensure timely request for appropriate and additional resources. Subject to the demands of the developing incident, this may include requesting other agency resources.

Strategic actions

Fire and rescue services should:

- Provide information, instruction and training in the hazards, risks and control measures associated with the physical movement of casualties over challenging terrain or long distances

Tactical actions

Incident commanders should:

- Deploy an appropriately sized team to ensure the safe transportation of casualties
- Consider requesting additional resources or specialist teams to assist with the transportation of casualties

Control measure – Manage physiological stress

See National Operational Guidance: Operations – Manage physiological stress

Control measure – Use casualty transport equipment

Control measure knowledge

Subject to their own fire and rescue service provisions, the incident commander should consider the use of suitable spinal stabilisation equipment such as basket stretchers, scoop stretchers or equivalent, to assist crews in extricating casualties, and to reduce any manual handling issues for fire and rescue service personnel, while also reducing possible further deterioration of the casualty condition. Requests for suitable resources or equipment from other agencies should be also considered; refer to the *Intraoperability and Interoperability* section.

Refer to the *Casualty care* section for further information

Strategic actions

Fire and rescue services should:

- Ensure that crews are aware of, and how to request, a range of casualty transport equipment such as stretchers or equivalent

Tactical actions

Incident commanders should:

- Stabilise casualties until resources or specialist teams are available to assist with extrication of the casualty
- Transport casualty using appropriate stretchers or equivalent means

Control measure – Use motorised vehicles

Control measure knowledge

Subject to their own fire and rescue service provisions, the incident commander should consider the use of suitable motorised vehicles to assist crews in the extrication and transportation of casualties. Consideration should also be given to utilising other agencies or emergency services resources.

The benefits of using motorised vehicles to assist in the transportation of casualties include:

- Access and egress to scene of operations
- Impact on the ongoing operations of other fire and rescue services or other agencies
- Condition of the casualty
- Welfare of crews due to manual handling issues

Refer to the *Intraoperability and interoperability* section.

Strategic actions

Fire and rescue services should:

- Ensure that incident commanders are aware of motorised patient transport that may be available on request if required at an incident

Tactical actions

Incident commanders should:

- Consider requesting motorised vehicles for patient transport over long distances

Hazard – Extrication of casualties from confined spaces

Hazard	Control measures
Extrication of casualties from confined spaces	Isolate machinery, processes and utilities Establish appropriate safe systems of work Incident ground safety management Provide adequate lighting Establish effective communications Decontaminate firefighters and equipment

Hazard knowledge

The hazards in a confined space arise through a combination of the confined nature of the workplace and the possible presence of substances or conditions that could increase the risk to the health and safety of personnel. Fire and rescue services should consider the possibility that a hazard could be introduced to a confined space during an incident, for example, water.

Definitions

The Confined Space Regulations 1997 define a confined space as:

“any place, including any chamber, tank, vat, silo, pit, trench, pipe, sewer, flue, well or other similar space in which, by virtue of its enclosed nature, there arises a reasonably foreseeable specified risk.”

A 'specified risk' is further defined as a risk of the:

- Serious injury to any person at work arising from a fire or explosion
- Loss of consciousness of any person at work arising from an increase in body temperature
- Loss of consciousness or asphyxiation of any person at work, arising from gas, fume, vapour or lack of oxygen
- Drowning of any person at work arising from an increase in the level of liquid
- Asphyxiation of any person at work arising from a free flowing solid, or the inability to reach a respirable environment due to the entrapment by a free flowing solid

Under the regulations, a confined space has two defining features:

1. It is a space which is substantially (but not always entirely) enclosed
2. There is a reasonably foreseeable risk of serious injury to personnel from hazardous substances or conditions in the space

Incidents that fire and rescue services may attend, which can be defined as confined spaces, may include:

- Rescues from sewers
- Rescues from silos
- Rescues from trenches and pits

Before committing personnel into any hazard area, incident commanders should take account of the actual information about the incident that is available, to make operational decisions in what are recognised as sometimes dangerous, fast-moving and emotionally charged environments.

A thorough safety brief should be carried out before personnel are deployed in the hazard zone. Areas that the incident commander will have to consider include:

- Working at height. See National Operational Guidance: Operations
- Falling equipment
- Internal conditions
- Oxygen deficient or flammable atmosphere. See National Operational Guidance: Hazardous materials
- Excessive noise. See National Operational Guidance: Operations
- Restricted access/egress
- Stability and condition of the soil in and around trenches and pits
- Reduced visibility
- Heavy and/or moving machinery. Refer to the *Extrication from machinery, lifts and escalators* section
- Electricity supply. See National Operational Guidance: Utilities and fuel (To follow)
- Nature of stored material
- Voids, bridging

- Biohazards. See National Operational Guidance: Operations

Consideration should be given to the involvement of other emergency services such as USAR teams, rope rescue teams or appropriate resources and casualty care. Refer to the *Casualty care* section for more information.

Control measure – Isolate machinery, processes and utilities

Control measure knowledge

All machinery, processes and utilities should be isolated and controlled for safety. If full isolation is required in the hazard area, isolating all utility services should be considered before any rescue work proceeds. DRAs based on the information received from the monitoring process can dictate additional control measures and will provide personnel with information on the working environment.

For further information, refer to the *Extrication* section for machinery.

Strategic actions

Fire and rescue services should:

- Ensure that all personnel have an understanding of isolation and lock out procedures to enable safe operation around machinery

Tactical actions

Incident commanders should:

- Ensure machinery and processes are isolated and locked out before starting rescue operations
- Identify the presence of live utilities and isolation points
- Request the attendance of utility providers to isolate incoming supplies if local isolation is not possible

Control measure – Establish appropriate safe systems of work

Control measure knowledge

Because of the potential need for rapid evacuation from the confined space, good access and egress should be established as soon as practicable and maintained throughout. Access and egress should be monitored for signs of collapse, water ingress and so on which may affect the safety of personnel within the silo, trench or pit.

See National Operational Guidance: Sub-surface, height and structures (To follow)

Strategic actions

Fire and rescue services should:

- Ensure that crews are aware of the hazards associated with confined space working

Tactical actions

Incident commanders should:

- Commit personnel who have the required competency to operate in confined spaces
- Implement appropriate breathing apparatus procedures based on risk assessment

- Implement appropriate tag line and recovery systems for teams working within confined spaces

Control measure – Incident ground safety management

See National Operational Guidance: Incident command - Incident ground safety management

Control measure – Provide adequate lighting

See Hazard - Lack of co-ordinated search plan (generic)

Control measure – Establish effective communications

Control measure knowledge

Appropriate communications are essential for a successful outcome to operations; both within the incident command structure, where they are vital to the incident commander in ensuring that the current objectives and subsequent plan are appropriate, but also between safety officers and crews. If distances are adequate, verbal communications may be more appropriate during the dynamic stages of the incident. Refer to the Operations guidance for further information.

See National Operational Guidance: Incident command - Have a communication strategy

Strategic actions

Fire and rescue services should:

- Ensure crews have access to intrinsically safe radio equipment for use in flammable or explosive atmospheres

Tactical actions

Incident commanders should:

- Use intrinsically safe radio equipment in atmospheres where there is a risk of fire or explosion
- Allocate radio channels to incident ground functions and communicate radio procedures to all personnel

Control measure – Decontaminate firefighters and equipment

See National Operational Guidance: Hazardous materials – Contaminated responders

Hazard – Restricted or complex layout affecting extrication of casualties

Hazard	Control measures
Restricted or complex layout affecting extrication of casualties	Deploy appropriate numbers of personnel Manage physiological stress Use casualty transport equipment Identify the most appropriate rescue tool for the task

Hazard knowledge

This hazard relates to the impact of an internal layout of premises or complex access or egress routes on extrication activities. This may be due to the effects on a building from fire, partial collapse or complex layouts such as sewers, trenches and silos. Fire and rescue service personnel may have to use additional equipment and techniques to extricate casualties.

Teams should have a good understanding of the hazards they may encounter when extricating casualties from premises with complex layouts or restricted access/egress routes. They may be required to extricate casualties before fire and rescue service USAR teams or other agencies arrive.

Consideration should be given to involving specialist fire and rescue service USAR teams, other emergency services or appropriate resources and casualty care.

Control measure – Deploy appropriate numbers of personnel

Control measure knowledge

Team size should be appropriate to the task and the team equipped with the necessary resources to undertake specific briefing, subject to fire and rescue service level of training. The incident commander should review all sources of information to ensure timely request for appropriate and additional resources. Subject to the demands of the developing incident, this may include requesting other agency resources.

Strategic actions

Fire and rescue services should:

- Develop rescue procedures that consider team size

Tactical actions

Incident commanders should:

- Deploy an appropriate team size into confined or restricted areas for search and rescue tasks
- Consider requesting specialist resources for rescue operations involving restricted or complex layouts

Control measure – Manage physiological stress

See National Operational Guidance: Operations – Manage physiological stress

Control measure – Use casualty transport equipment

See Hazard – Manual handling over terrain

Control measure – Identify the most appropriate rescue tool for the task

See Hazard – Rescue Tools

Hazard – Failure of internal fixings or exposed cables leading to entrapment

Hazard	Control measures
Failure of internal fixings or exposed cables leading to	Highlight avoidance routes

entrapment	Follow breathing apparatus (BA) procedures Provide adequate lighting Remove or secure internal fixings or cables Use thermal imaging equipment to identify hazards

Hazard knowledge

Entrapment due to failure of internal fixings or exposed cables applies to the built environment. Incident types may not require the use of breathing apparatus (BA). Potential outcomes could result in death, serious injury due to electrocution, electrical burns and electric shock to fire and rescue service personnel, other agencies and casualties.

For further information, see National Operational Guidance: Utilities and fuel – Electricity (To follow). For cables in buildings, see National Operational Guidance: Fires in the built environment – Cable entanglement

Control measure – Highlight avoidance routes

See Hazard – Primary surface extraction of casualty following collapse of structure

Control measure – Follow breathing apparatus (BA) procedures

Control measure knowledge

If BA is in use teams should be given specific briefings. It is essential that every BA team is fully briefed by the appropriate person at the Entry Control Point (ECP), including:

- The nature and layout of the structure to be searched
- The operational search procedures to be employed and equipment to be used

The incident commander should ensure that BA teams follow all appropriate safe systems of work, search and rescue procedures and personal safety techniques during the extrication of casualties.

Refer to the Operational Guidance: Breathing apparatus for further information.

Control measure – Provide adequate lighting

See Hazard - Lack of co-ordinated search plan (generic)

Control measure – Remove or secure internal fixings or cables

Control measure knowledge

To maintain access and egress from the scene of operations, crews should remove or secure internal fixings or cables where possible, subject to confirmation by a competent person that services have been isolated.

Strategic actions

Fire and rescue services should:

- Provide information and instruction to crews on the risk of cable entanglement and release techniques

- Consider providing rated insulated cutters for cutting electrical cables

Tactical actions

Incident commanders should:

- Ensure that cable cutting equipment is available at rescues involving the risk of entanglement
- Avoid exposed cables where there is any risk of live electricity

Control measure – Use thermal imaging equipment to identify hazards

Control measure knowledge

Thermal imaging cameras (TIC) may assist in identifying internal fixings that have been subjected to heat, either from processes within the premises or after being exposed to fire, as they may not be readily identifiable by the naked eye. If operations are taking place at night a thermal imaging camera may prove invaluable.

Strategic actions

Fire and rescue services should:

- Have arrangements for thermal imaging equipment to be made available at rescue incidents

Tactical actions

Incident commanders should:

- Consider the use of thermal imaging cameras to identify hazards and locate casualties
- Ensure that search and rescue teams employ navigation procedures according to service training

Extrication from any mode of transport

The content of this section is relevant to the activity of searching for and extricating casualties from incidents involving modes of transport and transport networks. It should not be read in isolation as many of the hazards associated with working in these environments are in the context guidance. See National Operational Guidance: Transport

Hazard – Unstable vehicle containing casualties

Hazard	Control measures
Unstable vehicle containing casualties	Make a safe and controlled approach to the incident Manage pressurised air systems Stabilise the mode of transport Deploy appropriate number of personnel Identify and maintain access and egress routes Incident ground safety management

Hazard knowledge

In this guidance, the term 'mode of transport' refers to any form of transport such as aircraft, rail vehicles, road vehicles, vessel or craft that has become unstable due to the incident. The instability may be as a result of damage caused to the vehicle during the incident, as a result of its location or resting position, or a combination of these factors.

At the scene of a vehicle rescue incident, the geographic layout may be less than obvious. An obvious hill or slope may be a reminder to secure the vehicle, but an insignificant gradient may go unnoticed.

The vehicle may well be secured by collision damage but it should be remembered that ramming, cutting away or pulling during operations could release the vehicle, allowing it to become a ‘runaway’.

The risk associated with incorrect stabilisation application or poorly managed and maintained stabilisation increases dramatically the larger or heavier the unstable vehicle.

Where the casualty is injured, especially seriously or in a critical, deteriorating condition, the vehicle should be secured and stabilised. This will yield several benefits, some of which may not be obvious to the attending fire and rescue service personnel. Proper stabilisation will prevent the floor pan flexing and the vehicle moving or rocking, particularly when personnel climb into or onto the vehicle.

It is important to note that if a firefighter climbs in to or on to a collision-damaged vehicle before suitable stabilisation, they may be subjecting the casualty to further crushing. The body weight of personnel in the vehicle may be directly supported by the casualty's trapped legs, particularly where a vehicle component has given way under impact or is cut during the rescue.

Securing the vehicle in a realistic manner will help to avoid rocking when carrying out certain techniques and will suppress jarring when operating equipment, especially where a part may be released under load, such as a forced door removal. It will also ensure that medical attendants have a sound base for their pre-hospital care.

There is seldom any feedback about the person who was trapped, but it is known that post-collision trauma is potentially lethal. Being released from a correctly secured vehicle should be considered less traumatic.

Before beginning any work on the vehicle, it should be completely stabilised to prevent further injury to the casualty and to protect the rescuers.

The properties of a good stabilisation method are:

- It should secure the vehicle safely
- It should completely immobilise the vehicle, preventing it from moving at all and reducing the casualty's chance of further injury
- It should be simple, being able to stabilise a vehicle in the position it was found on arrival of the rescue crew, and not hinder the appropriate extrication of the casualty
- The method should not take a long time to set up
- It should allow for easy checking on a regular basis to ensure the vehicle remains stable

Fire and rescue service personnel should practise and train as a crew to effectively stabilise different vehicles in a variety of locations, such as soft ground or in ditches. Fire and rescue service personnel should also be familiar with differing construction techniques, including the materials used, to ensure that stabilisation

techniques make best use of the load bearing parts of a vehicle's structure to support the vehicle, rather than sheet metal, fascia sections etc. Refer to the *Extrication* section for new or heavy vehicle construction.

Everyone should know the speed required to stabilise, be aware of the importance of doing so, and be aware of the ways the objective can be reached.

The vehicle may continue to move or collapse because of instability, resulting in injury to members of the public, fire and rescue service personnel, other agencies and so on. It could cause damage to the environment, other vehicles or surroundings.

Control measure – Make a safe and controlled approach to the incident

See National Operational Guidance: Transport - Transport incidents

Control measure – Manage pressurised air systems

See National Operational Guidance: Transport – Unstable mode of transport

Control measure – Stabilise the mode of transport

See National Operational Guidance: Transport – Unstable mode of transport

Control measure – Deploy appropriate number of personnel

Control measure knowledge

To ensure that personnel inside the vehicle and their movement do not make any instability worse, the numbers of emergency responders should be controlled, taking fire and rescue service and other emergency service personnel into account, along with any casualties.

Strategic actions

Fire and rescue services should:

- Develop rescue procedures considering the deployment of minimum numbers of personnel required to avoid affecting stability

Tactical actions

Incident commanders should:

- Minimise the number of personnel operating in the vehicle or craft to minimise effect on stability

Control measure – Identify and maintain access and egress routes

See Hazard – Scene of operations and terrain

Control measure – Incident ground safety management

Control measure knowledge

Because of the nature of the incident, appointing safety officers should be considered. The safety officers should be specifically briefed to monitor potential movement of the vehicle, and there should be a pre-arranged evacuation signal.

The supporting terrain on which any vehicle has come to rest should also be considered. Awareness of any movement in the terrain, and its associated effect on stabilisation of the vehicle, should be maintained.

See National Operational Guidance: Incident command – Ineffective safety management

Hazard – Construction materials

Hazard	Control measures
Construction materials	Identify and communicate vehicle or craft construction materials Avoid manipulation or damage to composite materials Use tactical advisers and responsible person Apply fine water spray or foam Know the capabilities and uses of rescue equipment Make the correct tool choice for vehicle construction Be aware of the respiration of particles and dermal irritation Consider the release of energy from structural vehicle components Manage heavy vehicle considerations

Hazard knowledge

See National Operational Guidance: Transport – Construction materials

Control measure – Identify and communicate vehicle or craft construction materials

See National Operational Guidance: Transport – Construction materials

Control measure – Avoid manipulation or damage to composite materials

See National Operational Guidance: Transport – Construction materials

Control measure – Use tactical advisers and responsible person

See National Operational Guidance: Transport – Transport incidents

Control measure – Apply fine water spray or foam

See National Operational Guidance: Transport – Construction materials

Control measure – Know the capabilities and uses of rescue equipment

Control measure knowledge

Transport incidents are usually complex and a wide range of materials will have been involved in construction. Working at transport incidents will often involve the use of specialist equipment. The type of equipment and the hazards involved will vary but typically may include:

- Potential injury from failure of equipment causing collapse or sudden movement of loads under pressure
- Cuts, nip, trap or entanglement hazards from the moving parts of equipment
- Excessive noise and/or vibration.
- Damage to high-pressure hydraulic or pneumatic systems involved with cutting or spreading tools can cause soft tissue injuries
- Burns from hot and/or cold components
- Accidental ignition of fuels

Refer to the *Extrication – Generic – Tools* section, for details of the control measures that apply when considering the capabilities and use of rescue equipment.

Control measure – Make the correct tool choice for vehicle construction

Control measure knowledge

Due to the wide range of materials used by manufacturers in the construction of vehicles, the choice of tool has become increasingly important.

The fundamental goal for using tooling is to achieve the required task while minimising the hazards associated with tackling the vehicle materials. To achieve this, the tool operator should identify the material being tackled as far as possible.

The tool operator should have a thorough knowledge of the tools and their configurations. This is important to ensure that vehicle materials are tackled with awareness of the dust and fibres that may be created, in addition to the energies that can be introduced to the vehicle structure, and potentially to any casualties.

Where the tools required to achieve objectives are likely to introduce additional energy, alternative tools should be considered. Where this is not appropriate, the vehicle should be further stabilised and detailed communications made.

- Identify vehicle materials before cutting/repositioning, to aid appropriate tool choice.
- Closely monitor the tool when vehicle materials cannot initially be identified
- Reconsider the choice of rescue tools and operational methodologies, if the rescue tools in use do not perform as expected; unknown materials may be present
- Consider alternative rescue tools or introducing additional control measures, like water mist to minimise airborne dust particles, where the activity is producing additional material hazards
- Consider identifying operational plans that involve lower risk materials

Strategic actions

Fire and rescue services should:

- Provide information and training to crews on the identification of vehicle construction and techniques for performing rescues
- Provide suitable tools and procedures to enable personnel to work safely, effectively and efficiently

Tactical actions

Incident commanders should:

- Select rescue tools and techniques based on the materials and vehicle construction identified

Control measure – Be aware of the respiration of particles and dermal irritation

Control measure knowledge

Material deformation due to collision and the cutting of vehicle materials to remove structural elements produces a range of material particulate sizes. Inhaling these particles to the upper and lower respiratory tract poses a significant risk to emergency responders and casualties, both during the extrication phase and during the recovery phase of an incident where clearing up may be undertaken.

Airborne continuous filament particles and their associated health hazards depend on respirability; the potential to enter the lower regions of the lung, where lung disease can be caused.

Where dust or fibres are produced during collision or through the extrication process, itching can also occur when there is direct contact with soft tissues such as the skin and eyes. Such irritation is more prevalent when soft tissue is exposed to resin coated fibrous material, especially GFRP and CFRP

Dust can be found on equipment or PPE and can also be transferred to other personnel and their equipment.

- Consider damping down any dust on scene or any dust created during the cutting process
- Consider introducing barrier membranes like plastic covers between casualties and any materials being cut
- Consider alternative extrication strategies to reduce the requirement to cut
- Consider alternative tool strategies to reduce any dust produced
- Provide respiratory protective equipment (RPE) to rescuers and casualties when dust is likely, and ensure RPE is disposed of correctly after use
- Consider washing equipment and PPE and ensure that affected PPE is replaced or cleaned

Strategic actions

Fire and rescue services should:

- Ensure that crews are supplied with PPE and RPE that protect against the dermal irritation and respiration of particulates likely to be encountered in rescue operations
- Ensure PPE and RPE is compatible with simultaneously worn protection for other incident types

Tactical actions

Incident commanders should:

- Minimise the risk to crews from dust and particles released during rescue operations
- Ensure that PPE and RPE is worn in accordance with service risk assessment at rescue incidents

Control measure – Consider the release of energy from structural vehicle components

Control measure knowledge

The characteristics of some new vehicle materials such as dual phase and boronated steels mean that where an impact occurs they are less likely to deform. Where deformation occurs, it indicates that high energies have existed. Where deformed components need to be repositioned consideration should be given to the sudden release of energy.

Materials such as glass and polycarbonates may fracture when large energy forces are applied. Surface tension across the material can lead to sections being released uncontrollably as projectiles.

- Use alternative extrication routes to avoid cutting deformed high strength materials
- Consider tool choice to reduce energy input to materials that can fracture
- Ensure stabilisation is effective before releasing high energies from vehicle components

Strategic actions

Fire and rescue services should:

- Provide information and training to crews on the identification of vehicle construction

Tactical actions

Incident commanders should:

- Consider the potential release of stored energy as part of the extrication plan

Control measure – Manage heavy vehicle considerations

Control measure knowledge

In this control measure, the term 'heavy vehicle' primarily relates to LGVs and PSVs, but will incorporate elements relating to incidents involving any rail stock or large aircraft i.e. working at height.

For further information, refer to the *Extrication* sections relating to vehicle construction, including composite materials and metals.

The enhanced issues presented when carrying out an extrication from a heavy vehicle include:

- Weight and construction of vehicle components with the potential to cause injuries due to manual handling issues
- Sectional thickness or cross-sectional area
- Construction materials
- Reinforcement

- Access
- Tool or equipment damage
- Working at height
- Vehicle systems (including 24 volt systems)
- Sleeper compartment locations and other voids

The size requirements of heavy vehicles, and the significant weight associated with the loads they carry, contribute to the use of high strength, low alloy (HSLA) steels and heavy gauge materials in their construction.

If vehicle structural components need to be displaced or removed there will be significant weight associated with them. This should be managed appropriately. For example, the weight associated with removing LGV components such as doors may be further affected by the height of the components from ground level.

Operating above ground level with rescue equipment introduces a number of significant working difficulties such as:

- Gaining access and egress
- Manual handling of the casualty
- Manual handling of any tools

A clear working area should be established around the vehicle to allow the use of mobile platforms from which crews can work. Such platforms allow same level working between the crews and the casualty location without having to encroach on the minimal space available within a compartment.

Where platforms are used, personnel should be managed to ensure that the limited space is used effectively. Crews should be kept to the minimum required for the extrication.

Where vehicle components are removed or displaced considered the effect on vehicle stability strategies in use.

- Recheck stability when structural components are to be removed from heavy vehicles
- Use lowering mechanisms for items of significant weight: ‘Try before you Pry’
- Ensure a safe area of work exists below any vehicle components being removed
- Minimise the size of the component being removed from the vehicle to reduce weight and manual handling issues where appropriate
- Use safe working platforms and ensure a clear working area exists around the platform
- Ensure fall arrest equipment is used where required

Strategic actions

Fire and rescue services should:

- Provide information and training to crews on the risk presented by heavy vehicles at rescue operations

Tactical actions

Incident commanders should:

- Consider the size and weight of the vehicle as part of the extrication plan
- Consider requesting specialist rescue resources to assist with extrications involving large and heavy vehicles

Extrication from air transport

For more information, see National Operational Guidance: Transport – Air

Hazard – Military aircraft

Hazard	Control measures
Military aircraft	Make a safe and controlled approach to the incident Liaise with specialist military advisers Restrict use of radio transmissions Gain safe access to the cockpit Make ejection seats safe Extricate the aircrew

Hazard knowledge

See National Operational Guidance: Transport – Working around military aircraft

Control measure – Make a safe and controlled approach to the incident

See National Operational Guidance: Transport – Transport incidents

Control Measure – Liaise with specialist military advisers

See National Operational Guidance: Transport – Working around military aircraft

Control measure – Restrict use of radio transmissions

See National Operational Guidance: Transport – Working around military aircraft

Control measure – Gain safe access to the cockpit

Control measure knowledge

A military aircraft cockpit is covered/protected by a canopy; a canopy is usually constructed from a transparent material and is extremely strong and heavy (canopies can weigh in the region of 100kg).

Once a canopy is open it will need to be secured in place to prevent it from slamming shut, which could render serious injury to emergency service personnel and/or aircrew.

Methods of rescuing aircrew from the cockpit will result in one of three entries:

- Normal entry
- Emergency entry
- Forced entry

Note – This emergency entry only applies to aircraft fitted with a miniature detonating cord/linear cutting cord and requires a cordon at least three metres forward of the cockpit area when activating it.

Forced entry to the canopy is highly dangerous and is not recommended. It would be extremely difficult to assess the state of any damage to the aircraft canopy on a crash damaged aircraft, which could ultimately activate and 'fire off' if the canopy frame is interfered with

Strategic actions

Fire and rescue services should:

- Ensure personnel are aware of the cockpit canopy types likely to be encountered and the location of their release mechanisms

Tactical actions

Incident commanders should:

- Take instruction from aircrew on safe access and release from the cockpit
- Open the canopy by releasing the mechanism on the outside of the aircraft, following written instructions
- Attempt to gain access to the cockpit

Control measure – Make ejection seats safe

Control measure knowledge

In normal conditions, only trained and competent technicians from the relevant military services should attempt to make an ejection seat safe. However, emergency service personnel may be faced with undertaking the task in exceptional circumstances, where the risk associated with attempting to work around the hazard affects the ability to save life.

When an aircraft is parked on the ground safety devices, in the form of distinctive safety pins, are fitted to prevent the accidental actuation of the ejection seat.

Modern ejection seats have changed considerably from their earlier equivalents. In most cases, they can be made safe for rescue using just one or two sear pins or by the operation of the seat safe lever. The seats vary in aircraft, but they all work in a similar manner. Once initiated, the ejection sequence is fully automatic and cannot be stopped.

All UK aircraft carry a set of sear pins in the cockpit for making the seat safe for rescue. However, some non-UK aircraft no longer carry sear pins and rely solely on the seat safe lever.

These actions should be carried out in an emergency situation only (exceptional circumstance)

- Look for the seat guide rails projecting out of the canopy area on arrival at the aircraft. If they are visible, it can indicate that the seats have fired from the cockpit and the aircrew may be some distance

from the airframe. Never assume the seats have gone; a two-seat aircraft may have had only one occupant or a seat may have failed to operate.

- Making an ejection seat safe requires controlling the firing sequence by pinning the ejection handles or the safe seat lever.
- Ejection seats can be made safe at varying levels, usually described as:
    - Safe for rescue: seat firing sequence is inoperable but the seat systems are still active and elements such as the drogue gun can still be fired
    - Safe for servicing: seat totally disabled for maintenance purposes by a competent technician
- To operate the seat safe lever, reach into the cockpit and rotate the lever in an anti-clockwise direction, to turn from armed to safe egress.

Strategic actions

Fire and rescue services should:

- Ensure that responding personnel have an awareness of ejection seat mechanisms and associated safety precautions

Tactical actions

Incident commanders should:

- Seek specialist advice before making any attempt to make safe any ejection seat

Control measure – Extricate the aircrew

Control measure knowledge

This activity will involve operating in a very confined space. Great care should be taken not to accidentally operate any switches or equipment.

Electrical systems are identified by labelled switches marked with black and yellow hatching.

Military aircraft are increasingly fitted with infra-red guidance systems for weapons targeting. These may be both Forward Looking Infra-Red (FLIR) and Sideways Looking Infra-Red (SLIR).

These emissions can be damaging to delicate eye tissues and all emergency service personnel should be aware of the dangers of looking directly into glass panels located on the aircraft nose or elsewhere on the aircraft, until it can be confirmed that all systems have been isolated. Military laser guidance systems, unlike medical lasers, operate at a much higher intensity for targeting purposes and have the potential to cause harm, particularly to the eyes and delicate tissues.

The likelihood of infra-red and laser guidance systems operating post-crash is minimal, due to the aircraft safety system; crash switches, weight on wheels switch, isolating systems and so on. The infra-red guidance systems have to be manually selected by the pilot and therefore it is unlikely these will be activated at a crash site.

Any radar on civilian aircraft is normally restricted to weather indication and is relatively small in size and power output. Radar on military aircraft is primarily for detection and surveillance. These radar units operate on differing wavelengths and at much greater power output when switched on.

The EC3 Sentry AWACS uses an externally mounted dish scanner for airborne early warning and control with a range of over several hundred miles. In normal operating mode, the dish rotates and has a large white strip across its surface; however, it should not be assumed that it is switched off if the dish is not rotating. The Nimrod uses fully enclosed nose cone search water radar, of extremely high power, and there is no external indication of its operational status.

Strategic actions

Fire and rescue services should:

- Provide all personnel with information and training on the safe extrication of pilots from military aircraft

Tactical actions

Incident commanders should:

- Release aircrew harness starting at the head, work downwards releasing main harness last
- Consider that aircrew may be suffering from possible spinal injury; seek medical assistance if time allows
- Ensure all cables and connectors are released before attempting to extricate pilot from cockpit
- Document any movement of aircraft controls at the earliest opportunity for investigation purposes
- Identify the presence of infra-red and laser systems; do not look directly at the source

Extrication from rail transport

See also National Operational Guidance: Transport – Rail

Introduction

Many types of rail vehicles are used to provide services for passengers and freight. This guidance is not intended to cover any of these types in detail but to highlight the reasonably foreseeable hazards and to detail options for control measures when performing rescues specifically from railway rolling stock.

This guidance does not cover the hazard of diesel fuel, as this is classified as a hazardous material.

Extrication and evacuation of casualties from rail vehicles can be resource intensive, requiring specialist local and potentially national resources.

Hazard – Delay in accessing driver or passenger compartments

Hazard	Control measures
Delay in accessing driver or passenger compartments	Use designated doors and windows Use tactical advisers and responsible person

Hazard knowledge

If there is a delay in gaining access to driver or passenger compartments, either through damage caused or the resting position of the carriage, the condition of casualties could deteriorate.

The design strategy for most modern rail vehicles is for the structure to resist the effects of impact or derailment and to provide adequate protection for passengers, whilst keeping them contained within the vehicle.

Control measure – Use designated doors and windows

Control measure knowledge

The preferred route to gain access to train carriages during emergencies should be through the carriage doors. Most modern rolling stock is fitted with door release mechanisms, which will be labelled and operable from the outside.

Where access via doors in not available, there are three other options:

1) Windows: designated emergency windows will be marked inside and out, and will break more easily to provide access. Whilst windows may be used initially to gain access to casualties, they would not normally provide a long term solution for access and egress due to size constraints and the difficulty manoeuvring stretcher bound casualties
2) Corridor connector: provides a weatherproof connection between two carriages.
3) Create openings in vehicle body

Request early identification and use of designated access points. Alternatively:

- Corridor connector: Depending on design, it may be feasible to vertically cut through this to access vehicle end doors. **Warning**: some vehicles may contain cables in this area (refer to Context – Electricity guidance)
- Windows: glazing systems in modern rail stock are designed to survive severe collision impacts. Whilst the outer element can be managed using existing road vehicle techniques, the plastic membrane of the inner laminated element is significantly tougher and will require significant effort to penetrate
- Create openings in vehicle body

Strategic actions

Fire and rescue services should:

- Ensure emergency responders have an awareness of gaining access to railway carriages and rolling stock

Tactical actions

Incident commanders should:

- Gain access to railway carriages and rolling stock via doors, corridor connectors, and windows, or create an opening
- Obtain specialist advice and assistance from rail network operators regarding the most appropriate access

Control measure – Use tactical advisers and responsible person

Control measure knowledge

See National Operational Guidance: Transport – Transport incidents

Extrication from road transport

For more information, see National Operational Guidance: Transport - Road

Hazard – Alternative fuelled vehicles (AFV)

Hazard	Control measures
Alternative fuelled vehicles (AFV)	Identify and communicate the vehicle type Control the vehicle propulsion system Isolate high voltage systems Use appropriate extrication techniques for alternative fuelled vehicle

Hazard knowledge

See National Operational Guidance: Transport – Alternative fuelled vehicles (AFV)

Control measure – Identify and communicate the vehicle type

Control measure knowledge

If an AFV has been involved in a collision that has led to components such as battery units becoming detached, it is important for the scene assessment to consider the presence of:

- High voltage electricity/systems
- HazMats; due to the leaking of electrolytes from batteries
- Pressurised systems

The location of the incident and level of damage experienced by the AFV will dictate the initial actions of emergency responders.

All AFVs present their own hazards, and combinations of hazards, which will require different actions according to the incident, many involving HazMat related considerations and procedures. For further information, see National Operational Guidance: Hazardous materials. See also National Operational Guidance: Transport – Alternative fuelled vehicles (AFV)

Strategic actions

Fire and rescue service should:

- Make information available to operational responders at incidents regarding the types of alternative fuelled vehicles and methods of safe isolation
- Consider requesting specialist advice from vehicle manufacturers regarding credible scenarios and methods of managing the various situations in advance of emergency incidents, given the relatively new nature of the AFV technology

Tactical actions

Incident commanders should:

- Isolate alternative fuelled vehicle high voltage electricity/system and establish cordon or exclusion zone

Control measure – Control the vehicle propulsion system

See National Operational Guidance: Transport – Alternative fuelled vehicles (AFV)

Control measure – Isolate high voltage systems

See National Operational Guidance: Transport – Alternative fuelled vehicles (AFV)

Control measure – Use appropriate extrication techniques for alternative fuelled vehicle

Control measure knowledge

Using conventional extrication techniques, in particular hydraulic rams, may cause damage to AFV battery fuel cells. Refer to the *Extrication* section on Tools.

The routing of fuel pipes and high voltage cabling in AFVs has to be considered by manufacturers, and as such they are sited in protected areas under the vehicle or within the vehicle panels. Where a vehicle has been involved in an impact and needs to be stabilised, consider the potential detachment of cables/fuel lines. Refer to the *Extrication* section on unstable vehicle containing casualties.

The resting position of an AFV involved in a RTC may be unconventional, given the location of its internal combustion engine and high voltage systems. This should be considered when attempting to stabilise the AFV to carry out a rescue.

- Identify the area that will be used in the stabilisation plan and ensure that any stabilisation does not compromise fuel lines or high voltage cables
- Adopt alternative methods for extrication if the fuel cells could be compromised

Strategic actions

Fire and rescue services should:

- Provide emergency responders with information and training on alternative extrication techniques suitable for alternative fuelled vehicles

Tactical actions

Incident commanders should:

- Consider vehicle fuel lines and high voltage cables when planning stabilisation and extrication

Hazard – Unconventional or specialist road vehicles

Hazard	Control measures
Unconventional or specialist road vehicles	Use tactical advisers and responsible person Identify and isolate electrical and fuel systems Contain the vehicle or cargo Use specialist cutting equipment

Hazard knowledge

See National Operational Guidance: Transport – Unconventional or specialist road vehicles

Control measure – Use tactical advisers and responsible person

See National Operational Guidance: Transport – Unconventional or specialist road vehicles

Control measure – Identify and isolate electrical and fuel systems

Due to the unique and sometimes bespoke nature of specialist vehicle design, it may prove difficult to locate and gain access to mechanisms that can isolate a vehicle's driven and consumer power sources. Some vehicles may have specialist electrical installations to power devices in the vehicle, and so may have a number of power supply options such as battery or backup generators.

See National Operational Guidance: Transport – Fuel and electrical systems

Control measure – Contain the vehicle or cargo

See National Operational Guidance: Transport – Unconventional or specialist road vehicles

Control measure – Use specialist cutting equipment

Control measure knowledge

Specialist vehicles may be constructed with additional layers of high strength material. When component relocation is necessary or access to the vehicle is required, specialist equipment may be needed.

- Consider alternative access and extrication routes that can be made using standard pumping appliance equipment, such as security vehicle escape hatches
- Identify the location of any required specialist equipment and consider mobilisation timings to scene
- Seek advice on the equipment required for the vehicle being tackled

Strategic actions

Fire and rescue services should:

- Make arrangement for emergency responders to access specialist cutting equipment suitable for incidents involving rescue from unconventional or specialist vehicles

Tactical actions

Incident commanders should:

- Consider requesting specialist cutting equipment at incidents involving unconventional or specialist vehicles

Hazard – Vehicle supplementary restraint systems (SRS)

Hazard	Control measures
Vehicle supplementary restraint systems (SRS)	Identify the SRS and communicate the information Establish an appropriate safe distance for supplementary restraint systems (SRS) Isolate the supplementary restraint systems (SRS) Prevent manipulation or damage to supplementary restraint systems (SRS)

Hazard knowledge

See National Operational Guidance: Transport – Road

Control measure – Identify the SRS and communicate the information

See National Operational Guidance: Transport – Vehicle supplementary restraint systems

Control measure – Establish an appropriate safe distance for supplementary restraint systems (SRS)

See National Operational Guidance: Transport – Vehicle supplementary restraint systems

Control measure – Isolate the supplementary restraint systems (SRS)

See National Operational Guidance: Transport – Vehicle supplementary restraint systems

Control measure – Prevent manipulation or damage to supplementary restraint systems (SRS)

See National Operational Guidance: Transport – Vehicle supplementary restraint systems

Extrication from machinery, lifts and escalators

If a person is trapped in machinery, the initial focus and actions should be to ensure the safety of fire and rescue service personnel by safely accessing and stabilising the scene and the casualty, to ensure that rescue operations are not compromised.

This guidance will be valid for rescues from all types of machinery, including lifts and escalators.

It is important to remember that when assessing the risks associated with lifts and escalators, temporary lifts such as those on construction sites, whilst used for transporting people and equipment may not meet the same standards as permanent lifts.

Hazard – Gaining access to machine rooms and shafts

Hazard	Control measures
Gaining access to machine rooms and shafts	Establish a safe working environment

Hazard knowledge

Machine rooms may be situated in remote parts of the premises and under normal circumstances should be locked and secured. These areas may have restricted access or space, which will need to be considered when performing a rescue. Crews should anticipate that unsecure lift rooms in publically accessible buildings may contain drug paraphernalia, human and animal excrement.

For lifts, these rooms can be either at the top or bottom of the building depending on the type of lift machinery.

In the case of escalators, machine rooms will normally be at the top of the escalator either under a floor trap (for small escalators, such as those in shops) or, in larger premises (such as those used in transport systems) a separate room will be used. On railway premises such as London Underground, access is usually available at both the top and the bottom of the escalator.

Personnel requiring access to machine rooms will generally have to either ascend or descend stairs. They may also have to climb unprotected vertical ladders and pass through access panels. There is a risk of collision with fixed objects when moving around machine rooms.

Machine rooms may have trapdoors and hatches, be on different levels, and will often have displaced lubricants on the floor. This may require implementing additional measures to maintain safe access and egress.

There is a risk of falling from height when ascending or descending unprotected vertical ladders or when working near or inside an open lift shaft. Some machine rooms may require personnel to cross roofs without edge protection, thereby increasing the likelihood of falls from height.

The risks associated with gaining access to a machine room may be increased by the conditions inside; noise, heat and lack of lighting.

Machinery incidents may involve or create working environments where there is minimal headroom and space to manoeuvre. Any available space may be further restricted by the use of fire service equipment or items of machinery that have been left on the floor during maintenance operations.

Control measure – Establish a safe working environment

Control measure knowledge

Before entering a machine room, personnel should recognise and fully assess the risks and hazards associated, as the risk can range from minor cuts and abrasions to being trapped or fatally injured by moving machinery or falling down a lift shaft.

Personnel should be aware of the proximity of other moving parts of the equipment. It is important that the correct equipment is identified so that the corresponding machinery and power systems can be isolated.

Strategic actions

Fire and rescue services should:

- Provide emergency responders with information and training on the safe management of incidents involving lifts and other machinery

Tactical actions

Incident commanders should:

- Ensure that inner and outer cordons are established, identified and communicated
- Establish safe access and egress routes to machine rooms and shafts
- Consider the need for fall arrest or work positioning equipment when working near shafts
- Consider requesting the attendance of tactical advisers, subject matter experts and specialist resources

Hazard – Noise

Hazard	Control measures
Noise	See National Operational Guidance: Operations – Physical hazards

Hazard knowledge

See National Operational Guidance: Operations – Physical hazards

Hazard – Power systems

Hazard	Control measures
Power systems	Request specialist advice Isolate and lock out power supplies

Hazard knowledge

Personnel should be aware that the risk from electrocution or electric shock will be present until all electrical power supplies have been isolated.

It should be remembered that there may be more than one power source. These may include battery powered standby or emergency generators that activate automatically when the power supply is interrupted. It should be remembered that safety systems may have been circumvented.

It is common for there to be two separate electrical sources in a machine room:

- 230-volt electrical supply for the lighting and any power sockets fitted
- 415-volt electrical supply for the machinery that drives the lift, escalator or machinery

Control measure – Request specialist advice

Control measure knowledge

The owner or occupier, on-site engineers or maintenance engineers should be able to provide specialist knowledge.

Strategic actions

Fire and rescue services should:

- Have arrangements to enable responding crews to contact specialist advisors when extricating crews from complex machinery

Tactical actions

Incident commanders should:

- Liaise with the owner or occupier, on-site engineers or maintenance engineers regarding power systems

Control measure – Isolate and lock out power supplies

Control measure knowledge

The owner or occupier, on-site engineers or maintenance engineers should be able to provide specialist knowledge. Where specialist knowledge is not available, crews may be able to identify instructions either on or near the machinery or locate emergency stop buttons to isolate the machinery.

Strategic actions

Fire and rescue services should:

- Provide emergency responders with information and instruction on the importance of safe and effective isolation of power supplies to plant and machinery at rescue operations

Tactical actions

Incident commanders should:

- Request advice from responsible person or engineer regarding isolation and lock out of power supplies
- Isolate and lock out power supply to machinery using emergency stop following specialist advice

Hazard – Stored energy

Hazard	Control measures
Stored energy	Prevent uncontrolled movement

Hazard knowledge

The release of stored energy may result in the unexpected movement of machinery.

Machinery may move slowly downwards after personnel have isolated the power supply. It should also be remembered that fluid in the hydraulic systems may leak; this has the same effect on machinery movement. In both cases, it creates a risk of a crush injury.

The braking system should be disengaged to enable manual hand winding of the machinery. Once it has been disengaged, the stored energy within the system is released, creating the potential for rapid uncontrolled movement of the machinery.

Once the power to a lift or escalator has been isolated and the braking system is active, the stored energy will be controlled.

Control measure – Prevent uncontrolled movement

Control measure knowledge

The owner or occupier, on-site engineers or maintenance engineers should be able to provide specialist knowledge in the operation of the machinery. Where specialist knowledge is not available, crews may be able to identify instructions either on or near the machinery or locate emergency stop buttons to isolate the machinery.

Isolating and locking out the power supply will not guarantee uncontrolled movement of machinery where there is stored energy. The energy stored in the machinery could be released at any time in a gradual or sudden movement placing casualties and rescuers at risk of serious injury or death. Wherever possible machinery should be physically prevented from moving using shoring, chocking or similar methods.

Strategic action

Fire and rescue services should

- Provide access to equipment suitable for preventing the uncontrolled movement of machinery

Tactical action

Incident commanders should

- Prevent the uncontrolled movement of machinery through shoring, chocking or similar means

Hazard – Moving or displaced machinery parts

Hazard	Control measures
Moving or displaced machinery parts	Establish safe system of work for moving machinery

Hazard knowledge

All personnel working near working machinery should be aware and briefed on the potential risk associated with moving parts of machinery such as:

- Gears
- Chain wheels

- Drive shafts/rams
- Sliding doors
- Slack cables
- Moving treads/handrail
- Parts of machinery that open and close or between lift car and shaft wall. This is particularly relevant if the machinery has been exposed by removal of safety guards

Moving machinery presents a range of risks to personnel working in the vicinity including being struck, drawn-in, trapped, cut, crushed, burned or given electric shock. It should also be considered that safety systems may have been circumvented.

Control measure – Establish safe system of work for moving machinery

Control measure knowledge

The owner or occupier, on-site engineers or maintenance engineers should be able to provide specialist knowledge. Where specialist knowledge is not available, crews may be able to identify instructions either on or near the machinery or locate emergency stop buttons to isolate the machinery.

Where the movement of machinery cannot be completely ruled out and crews cannot be completely isolated from moving parts, suitable control should be adopted such as a safe system of work, adequate supervision and appropriate PPE based on dynamic risk assessment.

Strategic actions

Fire and rescue services should:

- Ensure crews are aware of safe systems of work to be adopted around moving machinery

Tactical actions

Incident commanders should:

- Request the attendance of the responsible person or process expert
- Isolate and lock out moving machinery prior to commencing rescue operations
- Implement a safe system of work for rescue operations in the vicinity of moving machinery

Hazard – Hydraulics and lubricants

Hazard	Control measures
Hydraulics and lubricants	See National Operational Guidance: Hazardous materials

Hazard knowledge

Leaking hydraulic fluid can cause slippery surfaces, leading to slips, trips and falls. Contact with this fluid can also lead to skin irritation and skin disorders. Some fluids may be carcinogenic.

Where hydraulic systems are under pressure there is a risk of hydraulic injection; refer to the *Extrication – Generic – Tools* section.

There is a high likelihood that supplies of lubricants (which can be oil or grease) will be found in machinery rooms.

Lubricant containers may create trip hazards and, if spilled, lubricant will create hazardous surfaces in and around machinery. Lubricants can also have properties that can have detrimental short and long-term health effects. Some lubricants are carcinogenic and others cause an allergic reaction if they come into contact with skin.

See National Operational Guidance: Hazardous materials.

Casualty care

The guidance in this section has been written with the support of the Faculty of Pre-Hospital Care of the Royal College of Surgeons of Edinburgh. Pre-hospital care is a well-established branch of medicine in the United Kingdom, practised mainly by the ambulance service.

As the face of pre-hospital emergency medicine changes, the Faculty of Pre-Hospital Care aims to set and maintain clinical standards for all practitioners of the evolving specialty.

The principles of casualty care are to:

- Keep the casualty safe
- Identify and control catastrophic external compressible bleeding
- Recognise and assess, manage and/or support airway compromise
- Control the potential or actual injured spine
- Recognise and assess, manage and/or support breathing and ventilatory compromise while treating life threatening chest problems
- Recognise and assess, manage and/or support circulatory compromise and stop and/or identify bleeding
- Assess and manage the patient with reduced level of consciousness
- Expose and assess the casualty and evacuate to definitive care. This should be achieved whilst minimising exposure of the casualty to the cold environment (hypothermia) and putting strategies in place to reduce hypothermia (active rewarming with heaters or blankets)

Adopting a systematic approach to casualty care assessment, for example <C> Ac B C D E, allows life-threatening conditions to be rapidly identified and managed. Problems identified in this assessment should be dealt with as they are found. Following the intervention, the casualty is then reassessed. The principle of constantly reassessing of the casualty should be promoted.

The fire and rescue service may be presented with a single casualty or multiple casualties. Both situations will be dealt with in this guidance.

If a casualty is non-responsive, medical alert tags, bracelets or cards may provide information about pre-existing medical conditions.

Hazard – Failure to assess, identify and treat life-threatening problems of the casualty

Hazard	Control measures
Failure to assess, identify and treat life-threatening problems of the casualty	Request resources for casualty care Follow principles of casualty care Carry out structured assessment and treatment using <C> Ac B C D E Maintain the privacy and dignity of the casualty

Hazard knowledge

A casualty can suffer further injury, illness or death from the incident if they do not receive prompt medical aid. By adopting a systematic approach to casualty care, for example <C> Ac B C D E, any life-threatening conditions can be rapidly identified and managed.

Identify the need for specialist medical advice or care, according to local protocols.

Control measure – Request resources for casualty care

Control measure knowledge

It may take time to mobilise advanced medical support. Requesting the attendance of such resources at an early stage will benefit the casualty as it may reduce delay in treatment and promote recovery.

Strategic actions

Fire and rescue service should:

- Hold contact details for specialist medical responders to enable a timely response to incidents

Tactical actions

Incident commanders should:

- Request advanced medical support at rescue incidents as soon as a need is identified

Control measure – Follow principles of casualty care

Control measure knowledge

The principles of casualty care, listed below, apply to all casualties, including trapped and non-trapped casualties:

- Protect the casualty from the hazards associated with the event

- Minimise on-scene time
- Extrication of the casualty should be carried out in the quickest way possible, considering their injuries and the overall threat to their life, to:
    - Allow 360-degree access to the casualty for assessment, treatment and packaging
    - Minimise transit time to definitive care (for example a major or specialist trauma centre)
    - Reduce the casualty's exposure to the elements
    - Reduce pain
    - Reduce the psychological impact of the event

Strategic actions

Fire and rescue services should:

- Ensure that responders have access to appropriate pre-packed medical equipment for treating casualties

Tactical actions

Incident commanders should:

- Make a safe approach to the casualty and maintain a safe environment for all involved
- Identify the casualty's level of consciousness and offer reassurance where possible
- Make a timely request for appropriate medical response from the fire control room or 999/112
- Question the casualty, other responders and witnesses to understand incident factors and history
- Address life threatening injuries or conditions in line with service training

Control measure – Carry out structured assessment and treatment using <C> Ac B C D E

Control measure knowledge

Structured assessment and treatment using <C> Ac B C D E aims to prioritise the needs of the casualty and focus activity towards those injuries or conditions that may do more harm to the casualty, or may cause death.

A structured assessment of the casualty may involve:

- <C> Control of catastrophic external compressible bleeding
    - The use of tourniquets, by trained personnel, forms part of the Faculty of Pre-Hospital Care (FPHC) consensus statement.
    - If there is a concern that a major bleed may occur on the casualty's release, tourniquet(s) may be applied loose, prior to extrication. These can then be quickly tightened if required – this action should only be undertaken by trained personnel.
- Airway
    - A simple 'airway ladder' approach to airway care should be promoted
    - Assessment and monitoring of the airway should be continuous

- Suction should be available to clear the airway

- c-spine
  - If possible, self-extrication of the casualty is encouraged, following the guidelines promoted in the Faculty of Pre-Hospital Care (FPHC) spinal consensus statement
  - Manual in-line stabilisation is an acceptable method of stabilising the c-spine
  - A long board is used for extrication only and the casualty is placed onto a spinal stabilising device. Ideally a vacuum mattress or split device (for example a scoop stretcher) should be used to transport the casualty to definitive care
  - If extrication cannot be effected quickly, a request for advanced medical support to deliver advanced medical care (doctor or immediate care practitioner) should be considered at the earliest opportunity

- Breathing
  - Assessment of breathing / ventilation and the chest should be structured
  - Suggest RV-FLAPS WET:
    - Rate and Volume of breathing
    - Feel the chest
    - Look at the chest
    - Armpits clear of injury
    - Press the chest wall
    - Search the back and side/shoulders
    - Wounds on the neck
    - Emphysema felt in the neck
    - Trachea central in the sternal notch
  - Assessment and monitoring of breathing should be continuous
    - Minimum (rate and volume)
    - The means to support a casualty who has stopped breathing should be available – pocket mask and/or bag valve mask (BVM)
  - Self-ventilating patients will receive high-flow oxygen via a non-rebreathe mask
  - Sucking chest wounds should be covered with either a gloved hand or appropriate chest seal dressing with one-way air release valve

- Circulation
  - All bleeding should be stopped or controlled
  - Stopping bleeding is a priority and should be achieved using the 'bleeding ladder' approach:

- Pelvic injuries should be treated as per Faculty of Pre-Hospital Care (FPHC) consensus statement
- Shock is a life-threatening condition that occurs when the body is not getting enough flow of blood – if there is no evidence of external blood loss, there is likely to be internal bleeding

- Disability
  - The casualty's level of consciousness is measured using **AVPU**:
    - **A**lert
    - **V**oice
    - **P**ain
    - **U**nresponsive
  - AVPU assessment should be recorded every 3 to 5 minutes
  - Casualties should have a pain score recorded
  - The irritable or uncooperative casualty will require early specialist medical assessment and treatment
  - If the casualty is presenting with a psychiatric illness or personality disorder the police should be involved early
- Exposure, Extrication and Evacuation
  - Casualties should be protected from the elements
  - Active rewarming is encouraged
  - Casualties may require stripping to skin to enable assessment
  - The dignity of the casualty should be maintained
  - If trapped, extrication should be, where possible, swift but controlled
  - Casualty handling principles should be adopted as per Faculty of Pre-Hospital Care (FPHC) consensus statement

Strategic actions

Fire and rescue services should:

- Ensure that responders are trained to carry out a structured assessment and provide medical treatment to casualties

Tactical actions

Incident commanders should:

- Assign suitably trained responders to carry out casualty assessment and provide treatment
- Check casualty for presence of medical ID, jewellery and other indicators of pre-existing conditions

Control measure – Maintain the privacy and dignity of the casualty

Control measure knowledge

There are situations that result in the exposure of a casualty to members of the public or the media; as a result, the casualty's privacy can be breached.

It is an important principle for all emergency services to maintain and protect the privacy and dignity of the casualty.

The benefits for protecting the scene from members of the public, or the media are:

- Prevention of the casualty's identity being compromised, possibly to their relatives or friends, via the media (including television and social media)
- Protection of the dignity of the casualty, especially if their clothing has to be removed for them to receive medical treatment
- Avoiding unnecessary distress of other emergency responders, other casualties and uninvolved members of the public, particularly over a large scene
- Protecting the scene affords a degree of privacy for the medical teams and allows them to work efficiently and without distraction

Some improvised methods of erecting screens could include:

- Positioning vehicles to provide a visual barrier
- Attaching equipment to street furniture or vehicles
- Deploying personnel to hold sheets, tarpaulins or screens
- Providing overhead protection to restrict aerial views

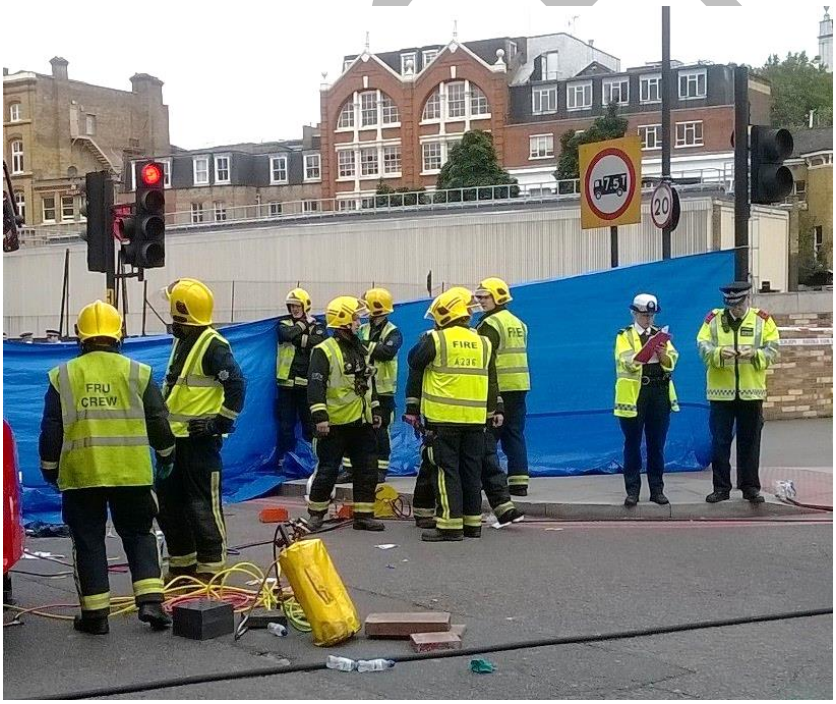

Figure 1: Scene screened off to preserve dignity of casualties – photograph courtesy of Rodney Vitalis

Strategic actions

Fire and rescue services should:

- Train their personnel on the important principle of maintaining the privacy and dignity of casualties and assign someone with responsibility to ensure this happens on scene
- Consider providing fire and rescue service vehicles with the equipment that could be used to provide adequate screening at an incident involving a casualty, for example:
    - Salvage sheets
    - Tarpaulins
    - Canvas screens

Tactical actions

Incident commanders should:

- Consider screening casualties from the view of the public, media or other casualties
- Use available equipment to provide a screened-off area for the casualty and medical teams
- Consider the use of portable shelters to provide screening to casualties
- Consider extending cordons to a sufficient distance to prevent photography or filming of the casualty

Hazard – Single casualty in cardiac arrest

Hazard	Control measures
Single casualty in cardiac arrest	Use effective Cardiopulmonary Resuscitation (CPR) and use of Automated External Defibrillator (AED) Wear personal protective equipment (PPE)

Hazard knowledge

When initial fire and rescue service responding personnel have a single 'dead' casualty to deal with, it may be considered appropriate to act by carrying out the following control measure. For the casualty in cardiorespiratory arrest a systematic approach to care should be adopted, using Safety ABC. Good effective chest compressions and early defibrillation are key.

Control measure – Use effective Cardiopulmonary Resuscitation (CPR) and Automated External Defibrillator (AED)

Control measure knowledge

For adult basic life support and automated external defibrillation see https://www.resus.org.uk/resuscitation-guidelines/adult-basic-life-support-and-automated-external-defibrillation/

For paediatric basic life support see https://www.resus.org.uk/resuscitation-guidelines/paediatric-basic-life-support/#sequence

Strategic actions

Fire and rescue services should:

- Consider making automated external defibrillators (AED) available to responding crews
- Train crews to provide prompt resuscitation treatment to casualties in cardiac arrest following the latest Resuscitation Council guidelines

Tactical actions

Incident commanders should:

- Assess casualty and where cardiac arrest is suspected use an AED or commence CPR as soon as practicable
- Extricate a casualty who is trapped and in cardiac arrest by the quickest means possible

Control measure – Wear personal protective equipment (PPE)

See National Operational Guidance: Operations – Failure to manage health, safety and welfare

Hazard – Failure to hand over vital casualty information

Hazard	Control measures
Failure to hand over vital casualty information	Offer a structured handover to an appropriately trained and competent practitioner

Hazard knowledge

Failure to hand over information relating to the casualty's injuries (or condition) may result in further harm or death and compromises accepted standards in record keeping.

Control measure – Offer a structured handover to an appropriately trained and competent practitioner

Control measure knowledge

Handover of accurate standardised information, that is recognised by local medical responders, is essential. An example of an acronym to ensure that this is done is **ATMIST**:

- **A**dult or child
- **T**ime that the incident happened and what time the casualty is expected to arrive in the Emergency Department (ED)
- **M**echanism: how the incident occurred and mechanism of injury
- **I**njuries: what injuries have been found – follow a <C> Ac B C D E format
- **S**igns and symptoms: what signs the casualty is showing (respiratory rate, pulse rate, pallor) and what symptoms the casualty is telling you about (pain, feeling sick, cannot feel their legs)
- **T**reatment: what treatment have you given (again follow an <C> Ac B C D E format)

Example of an ATMIST handover

A	ADULT/PAED			40 year old male
T	TIME OF INCIDENT			The accident happened at 13.40 – he was trapped for 40 minutes
M	MECHANISM OF INJURY			Driver, high speed frontal impact into a wall. One metre deformation of the engine compartment seen.
I	INJURIES FOUND	A		Airway is clear and self-maintained, jaw line intact
		B		There is a flail segment on the right side of the chest, his armpits and back are clear
		C		He has an open fracture of his right femur which was oozing blood
		D		He has a bruise to his forehead and a laceration to his right ear
S	SIGNS AND SYMPTOMS	A		Talking
		B		Resp rate 35 and stable, complaining of pain over his right chest wall on breathing
		C		He has a radial pulse but he is pale and sweaty. His heart rate is 95 b/min.
		D		He has a bruise to his forehead and a laceration to his right ear. A – AVPU.
T	TREATMENTS GIVEN	A		Clear, manual in-line stabilisation of his neck
		B		Oxygen at 15 l/min, splinted his chest with his hands
		C		Applied a tourniquet to the right femur, manual traction has been applied
		D		Sterile pad and gauze applied to laceration on his right ear

Figure 2: Example of an ATMIST handover

When handing over information to medical responders, consider the following:

- Keep the handover brief; aim for 30 seconds to get the information across
- Do not rush the handover
- Use written notes for reference
- Identify the team leader (or the next link in the chain of care) and introduce yourself
- Let the team know if the casualty is awake or not
- Tell them the name of the casualty
- Present accurate and standardised information
- Ask for any questions or points of clarification before handing over the casualty

Strategic actions

Fire and rescue services should:

- Align service casualty handover protocols with that of local medical emergency response
- Ensure that responders are aware of casualty handover protocols

Tactical actions

Incident commanders should:

- Provide a structured handover when transferring casualty to medical responders

Hazard – Multiple casualties

Hazard	Control measures
Multiple casualties	Share situational awareness using METHANE Establish a triage sieve (adult and paediatric)

Hazard knowledge

During a multiple casualty situation, it is important to notify control of the event in a structured manner. Adults and children may need to be triaged.

Where a number of patients are involved in an incident and not enough personnel are available to treat them, it is important that a system of triage is used before any casualty care is undertaken.

Control measure – Share situational awareness using METHANE

Control measure knowledge

On arrival at the scene, the fire and rescue service will be required to update fire and rescue service control using a METHANE structure.

METHANE

- **M**ajor incident declared
- **E**xact location
- **T**ype of incident
- **H**azards
- **A**ccess and egress
- **N**umber and severity of casualties, number of dead
- **E**mergency services present and required

See National Operational Guidance: Incident command – Incident commander communication

Control measure – Establish a triage sieve (adult and paediatric)

Control measure knowledge

The core principle of triage is to do the most for the most. The initial triage method in a multiple casualty situation is the triage sieve.

The triage sieve will identify immediately life-threatening problems based on the C < A B C > system and correctly prioritise the patients for treatment. Not doing this will potentially risk lives.

All fire and rescue services should be aware of this system and be prepared to employ it in a multiple casualty situation or at a major incident.

As a principle, in a poorly resourced scene, minimal casualty care is carried out in a multiple casualty situation. The following list provides guidance on what could be achieved without breaching the core principle of triage:

- Quickly turn a patient to protect an airway
- Encourage self help
- Encourage a bystander to apply direct pressure

With the publication of the 2013 Ambulance Clinical Practice Guidelines (JRCALC) it was acknowledged that now ambulance services are all practising C < A B C > in their initial patient assessment, the standard triage sieve needed to be updated to take account of the importance of initial assessment and treatment of catastrophic haemorrhage.

The diagram below is the new National Ambulance Service Medical Directors Group (NASMeD) Triage Sieve, which was published in 2013 for use by all ambulance staff at a major incident (NARU, 2013).

The priorities are described as:

- P1 or red tags (immediate) are used to label those who cannot survive without immediate treatment but who have a chance of survival
- P2 or yellow tags (observation) are for those who require observation (and possible later re-triage). Their condition is stable for the moment and they are not in immediate danger of death. These victims will still need hospital care and would be treated immediately under normal circumstances.

- P3 or green tags (wait) are reserved for the 'walking wounded' who will need medical care at some point, after more critical injuries have been treated.

The JESIP casualty triage has an additional priority:

- P4 or P1E (expectant) is used for those whose injuries are so extensive that they will not be able to survive given the care/resource that is available. This is only to be used under authorisation of the Medical Incident Officer. They alone have the responsibility to match these patients' injuries with the number and type of the other casualties and the remaining resources available to the hospitals.

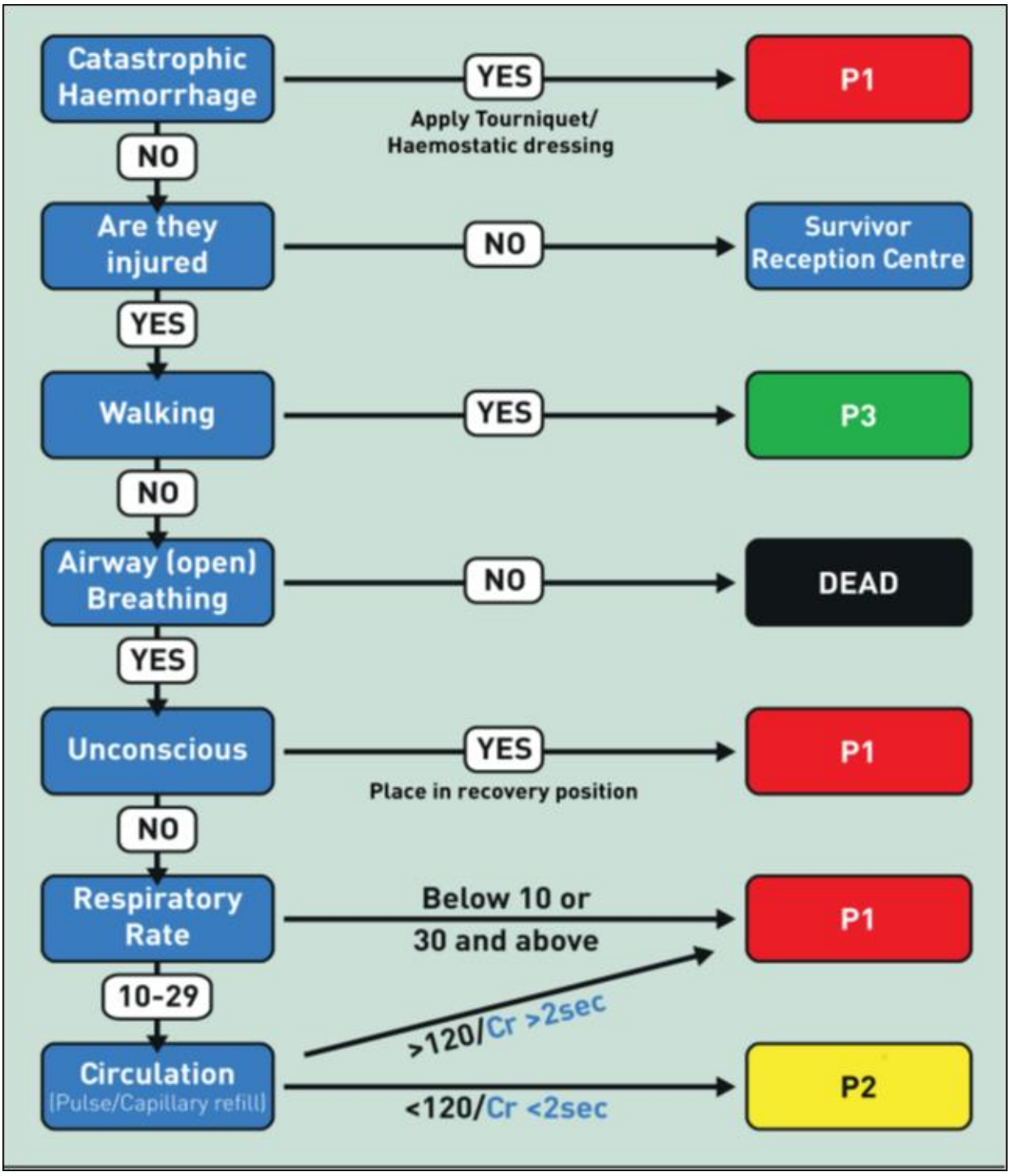

Figure 3: Triage Sieve

Source: National Ambulance Service Medical Directors Group (NASMeD)

The same triage principles apply to children. Paediatric triage tape is available, which groups children by length, weight and age and provides normal physiological values for respiratory rate and pulse in each of the groups to carry out the triage process.

Having labelled the casualty with their priority, casualties are handed over to an appropriately trained and competent practitioner. A record or log of the numbers of each priority should be kept.

When referring to casualties and the above categories at the scene of an incident, everyone should be sensitive to those who may be nearby, which could include relatives and other members of the public.

Strategic actions

Fire and rescue services should:

- Ensure that responders understand the principle of casualty triage at incidents involving more than one casualty

Tactical actions

Incident commanders should:

- Identify the number of casualties requiring medical attention and instigate a triage process
- Record the outcome of triage and communicate to medical responders

Hazard – Bariatric casualty

Hazard	Control measures
Bariatric casualty	Make an early identification of the bariatric casualty Use bariatric management equipment Request specialist medical support for bariatric casualty Consider structural stability

Hazard knowledge

A bariatric casualty presents a range of amplified hazards for fire and rescue service personnel, and for the casualty (HSE, 2007):

- Manual handling
- Difficult access, weight, size, shape or mobility of casualty
- Slips and trips
- Cluttered environment, loose carpeting, uneven floor surfaces etc.
- Crushing
- Hands or limbs pinned between person and hard surface

- Fatigue
- Lifting aids unavailable, limited space, distance carried
- Biohazards
- Blood or other bodily fluids. Refer to the Operations guidance
- Altered physiological states
- Difficult to maintain an airway
- Respiratory reserve is small
- Cardiac function is compromised

The casualty often has multiple medical conditions associated with obesity

Control measure – Make an early identification of the bariatric casualty

Control measure knowledge

Making an early identification of a bariatric casualty allows for an appropriate response by the fire and rescue service, initiating a response for advanced medical support and appropriate bariatric management equipment.

- Make an early identification of the bariatric casualty
- Make an early **TILE** risk assessment:
  - **T**ask
  - **I**ndividual capability
  - **L**oad
  - **E**nvironment
- Use the principles of safer moving and handling:
  - Avoid
  - Assess
  - Reduce
- Consider access and egress considerations or complications in getting to and from the casualty

Strategic actions

Fire and rescue services should:

- Enter into arrangements with local care providers and other agencies to establish protocols for response to bariatric rescue
- Provide information, instruction and training to crews on the factors relating to the rescue of bariatric casualties

Tactical actions

Incident commanders should:

- Consider manual handling when planning to extricate or transport bariatric casualties
- Adopt service protocols for multi-agency working at bariatric rescues

Control measure – Use bariatric management equipment

Control measure knowledge

Bariatric management or lifting equipment may reduce hazards, and it is important to understand what equipment is available from the fire and rescue service and emergency medical service. Appropriate personal protective equipment (PPE) for the situation should be worn.

Strategic actions

Fire and rescue services should:

- Make arrangements for the mobilisation of bariatric management equipment; for some organisations this may not be readily available out of normal office hours

Tactical actions

Incident commanders should:

- Consider requesting hazardous area response teams (HART) or equivalent for bariatric rescue bariatric rescue
- Consider requesting specialist fire and rescue service technical rescue teams for bariatric rescues
- Request the attendance of specialist bariatric medical support teams and ambulances
- Plan for the distance and the environment when transporting bariatric casualties

Control measure – Request specialist medical support for bariatric casualty

Control measure knowledge

Understanding the clinical issues associated with bariatric casualties for both trauma and medical situations is helpful. Shift resources should be managed as availability may be limited outside of normal working hours

Request an early deployment of advanced medical support because of an increased risk of complications to:

- Airway management
- Respiratory or ventilatory support
- Cardiovascular compromise
- Management of pre-existing medical conditions and co-morbidities

Strategic actions

Fire and rescue services should:

- Ensure that responders understand the acute health risks to bariatric casualties and the advanced medical support that may be required and available.

Tactical actions

Incident commanders should:

- Request deployment of advanced or specialist medical support for bariatric casualty

Control measure – Consider structural stability

Control measure knowledge

Normal domestic floor and staircases are designed with imposed and dead load rating equivalent to 1.5 kN per square metre or 1.4 kN for concentrated loads, this may be reduced due to age or alterations. The presence of specialist beds and other equipment for bariatric people may cause to floor load to be near capacity, the introduction of a large number of rescue personnel could lead to structural failure.

At some incidents the casualty rescue may necessitate changes to the structure of the building such as widening of door openings or creating new openings in structural walls. Where such measures are required specialist structural advice should be sought at the earliest opportunity.

Strategic actions

Fire and rescue services should:

- Provide information and instruction to responders on the risk of structural failure during bariatric rescue

Tactical actions

Incident commanders should:

- Consider the risk of structural failure at bariatric rescues and request specialist advice or USAR team
- Request specialist advice prior to creating new or wider openings in existing structural elements

Hazard – Thermal or chemical injury

Hazard	Control measures
Thermal or chemical injury	Provide treatment to burns casualties

Hazard knowledge

The priorities and treatment of casualties who are involved in thermal, chemical or radiation events are the same as for any other trauma situation. Casualties with thermal injury may have other coexisting injuries.

Having extinguished the fire or carried out decontamination, a full primary survey should be carried out using <C> Ac B C D E. If spinal injury is suspected or cannot be excluded, manual in-line stabilisation should be applied.

The burning process should be stopped as quickly as possible and the patient removed from the source of thermal injury. Burnt clothing should be removed from the patient, along with any jewellery, unless either are adherent to the skin.

Patients with chemical burns may need irrigation with large amounts of water to clear the contaminant and specialist advice should be sought if a chemical is involved. Dry chemicals should be carefully brushed from the burn.

Irrigation for more than 10 minutes may cause hypothermia in the casualty. Be aware of the risk of hypothermia, especially in children and the elderly (NICE, 2012).

Thermal or chemical injuries should be assessed as in:

https://fphc.rcsed.ac.uk/media/1754/burns-patient-management.pdf

Control measure – Provide treatment to burns casualties

Control measure knowledge

Effective treatment of thermal and chemical burn injuries can be treated through:

- **SAFE** approach:
  - **S**hout/call for help
  - **A**ssess the scene
  - **F**ree from danger
  - **E**valuate the casualty
- Stop the burning process with irrigation (tap water)
- Cool the burn wound, warm the patient
- Dress the affected area
- Assess and manage immediately or imminently life threatening problems
- Request specialist advice and medical response

Strategic actions

Fire and rescue services should:

- Make burn treatments available to responders likely to encounter casualties
- Train responding personnel to understand the treatment of casualties suffering from burns

Tactical actions

Incident commanders should:

- Identify the nature and extent of casualty burns and communicate this to medical support teams
- Cool skin burns using the recommended method and request specialist medical assistance
- Dress burns according to service procedures and training

Hazard – Casualty with crushed body part

Hazard	Control measures

Casualty with crushed body part	Assess the casualty using standard <C> Ac B C D E Plan for the casualty deteriorating on release Protect from hypothermia or hyperthermia

Hazard knowledge

Casualties that have body parts trapped or crushed pose serious problems for the responding fire and rescue service and medical support.

Early release is always the goal. Emergency amputation is a very rare event and is seen as a last resort for extrication by medical responders.

In the context of a crushed limb, the application of a tourniquet by trained personnel is appropriate to stop bleeding. Crush syndrome is not reduced by the application of tourniquets.

Advanced medical support may be required for surgical release – this should be mobilised early (*Greaves et al, 2003*).

Control measure – Assess the casualty using standard <C> Ac B C D E

See Hazard - Failure to assess, identify and treat life-threatening problems of the casualty

Control measure – Plan for the casualty deteriorating on release

Control measure knowledge

The fire and rescue service can assist the medical response in planning for a deterioration in the casualty's condition once released, by forming clearly designated areas for resuscitation and reassessment

Strategic actions

Fire and rescue services should:

- Ensure that all responding personnel have an awareness of acute medical care for casualties suffering from crush trauma

Tactical actions

Incident commanders should:

- Create and resource a suitable casualty care point
- Assist medical responders with appropriate casualty care where resources allow
- Communicate status of the casualty to medical responders using accurate information

Control measure – Protect from hypothermia or hyperthermia

Control measure knowledge

The casualty that remains trapped is exposed to the environment and is unable to adjust to extremes of heat and cold. Both have a negative effect on the casualty's ability to survive injury.

Strategic actions

Fire and rescue services should:

- Ensure that responding personnel are aware of hypothermia and hyperthermia and their associated prevention and first aid treatments

Tactical actions

Incident commanders should:

- Protect casualties from environmental exposure to reduce risk of hypothermia or hyperthermia

Hazard – Impaled casualty

Hazard	Control measures
Impaled casualty	Stabilise casualty and request medical assistance

Hazard knowledge

Fire service personnel may be called to respond to incidents where casualties have been impaled by objects that are still in situ. Such incidents require special medical advice and the priority of responders should be to stabilise casualties until support arrives.

Control measure – Stabilise casualty and request medical assistance

Control measure knowledge

Casualties that have been impaled on or by objects should be given immediate medical attention. This should, in the first instance, consist of life sustaining treatment carried out in situ. Only where resuscitation is required should consideration be given to moving the casualty, as removal of the casualty from the object or the object from the casualty may result in worsening their condition.

Strategic actions

Fire and rescue services should

- Provide personnel with training on the treatment of impaled casualties

Tactical actions

Incident commanders should

- Stabilise an impaled casualty by immobilising injured area and stemming any blood loss
- Request specialist medical advice prior to attempting to move casualty unless injuries are immediately life threatening

Glossary

Term	Acronym	Description
Absent person		Defined by the College of Policing (Authorised Professional Practice) as 'A person not at a place where they are expected or required to be and there is no apparent risk'.
Actuator		An actuator is a type of motor that is responsible for moving or controlling a mechanism or system. It is operated by a source of energy, typically electric current, hydraulic fluid pressure, or pneumatic pressure, and converts that energy into motion. Actuators are commonly used for aircraft controls.
Airstair		An airstair is a set of steps built into an aircraft so that passengers may get on or off the aircraft
Amputation		The intentional surgical removal of a limb or body part
Armaments		Military weapons fitted to an aircraft, for example missile launchers
Asbestos-containing material	ACM	Materials used in construction that contain asbestos
Audial		Relating to or perceived through the sense of hearing
Automated external defibrillators	AED	An automated external defibrillator (AED) is a portable electronic device that automatically diagnoses the life-threatening cardiac arrhythmias of ventricular fibrillation and ventricular tachycardia in a patient, [1] and is able to treat them through defibrillation, the application of electrical therapy which stops the arrhythmia, allowing the heart to re-establish an effective rhythm.
Avionics		Avionics are the electronic systems used on aircraft, with systems including those for communication and navigation
AVPU		The mnemonic AVPU refers to an assessment of the basic scale of consciousness. It identifies the following levels: A – The patient is awake and alert. This does not necessarily mean that they are orientated to time and place or neurologically responding normally. V – The patient is not fully awake, and will only respond to verbal commands or become roused after verbal stimuli. P – The patient is difficult to rouse and will only respond to painful stimuli, such as nail bed pressure or trapezius pain. U – The patient is completely unconscious and unable to be roused.
Bag valve mask	BVM	A manual resuscitator or "self-inflating bag" is a hand-held device commonly used to provide positive pressure ventilation to casualties who are not breathing or not breathing adequately

Term	Acronym	Description
Ballistic recovery system		A parachute system which lowers an entire light aircraft safely to the ground in the event of loss of control, failure of the aircraft structure, or other in-flight emergency
Bariatric		The most commonly accepted and consistent language for identifying and defining bariatric patients has been through the use of the Body Mass Index or BMI. The World Health Organization describes people who have a BMI greater than 30 as obese, and those having a BMI greater than 40 as severely obese.
Breathing apparatus	BA	Self-contained respiratory protective equipment
Canine support		Dogs that are used by the fire and rescue service for a variety of activities including searching for missing or trapped persons and fire investigation
Cardiopulmonary resuscitation	CPR	A first aid technique which combines external cardiac massage with rescue breathing (inflating the lungs by using mouth-to-mouth resuscitation)
Casualty centred rescue approach		This approach has the aim of reducing extrication times through simultaneous activity, with multiple tasks being carried out at the same time
Chest seal dressing		An airtight and watertight dressing for chest wounds
Chin lift		An action to lift a casualty's chin, thereby opening their airway
Co-morbidities		Two or more diseases existing at the same time in the body
Compressible		The ability to apply pressure, especially to control bleeding
Confined space		A confined space is a place which is substantially enclosed (though not always entirely), and where serious injury can occur from hazardous substances or conditions in the space or nearby (e.g. lack of oxygen).
Consciousness		The quality or state of awareness
Control room operator	CRO	Person who takes calls in a fire control room
Crankcase		Usually the largest cavity in an engine which houses the crankshaft
Crumple zone		A crumple zone is a structural feature mainly used in road vehicles. They are designed to absorb the energy from the impact of a traffic collision by controlled deformation of the vehicle's structure.
Crush syndrome		A medical condition characterised by major shock and renal failure after a crushing injury to skeletal muscle
Definitive care		The completion of recommended medical treatment

Term	Acronym	Description
Defragmentation		Breaking up
Drag		The aerodynamic force that opposes an aircraft's motion through the air
Drogue gun		A device that fires the initial parachute of an ejection seat in an aircraft
Efflux		Force or wind generated behind a jet engine, particularly on or before take-off when high or full power is set, but also when the aircraft is taxiing
Emergency department		Also known as accident and emergency (A&E), emergency room or casualty department
Emphysema		A disease of the lungs that can make breathing difficult
Entry control point	ECP	The position for the command and control, deployment and monitoring of breathing apparatus wearers in a risk area
Equipment or tool point		An area created in which to store equipment or tools during an incident
Explosive canopy		In aircraft fitted with ejection seats, the transparent enclosure (or canopy) over the cockpit is blown upwards and rearwards by an explosive charge
External cardiac massage	ECM	A first aid technique using chest compressions to pump the heart and keep the circulation going
Fall arrest system		A personal fall arrest system is a fall-protection system that uses a harness connected to a reliable anchor to arrest and restrict a fall and prevent the user hitting the ground.
Fire control room	FCR	Department or centre that takes emergency calls for the fire service
Firewall		In vehicles or aircraft, a firewall is the part of the bodywork that separates the engine from the driver or pilot and passengers or crew
Former		The frame of an aircraft fuselage
G-force limiter		Reduces the force of the seat belt above a certain threshold, in conjunction with belt tensioners
Girt bar		Metal bar that connects an emergency slide to the fuselage of an aircraft
Glasgow Coma Scale	GCS	The Glasgow Coma Scale is a more in-depth way than AVPU used to assess a casualty's true level of responsiveness
Governance		This is provided by a medical doctor who is acting as the Medical Director for that organisation and therefore personnel; they will have agreed as to what level they are trained to, and are therefore able to work at, to deliver casualty care.
Haemostatic agents		A variety of chemicals that are designed to stop the flow of blood from open vessels

Term	Acronym	Description
Hidden voids		A void is an area that has been intentionally left completely empty. In vehicles this could include luggage or sleeping compartments. A hidden void is such an area that cannot be readily seen.
Highways Agency Managed Motorways		A managed motorway entails the permanent conversion of the hard shoulder to a running lane, whilst retaining the ability to dynamically control traffic
Hydraulic injection		Hydraulic injection can be defined as the puncturing of the epidermis by a jet of a fluid under pressure
Hyperthermia		Overheating of the body
Hypothermia		A condition in which the body's core temperature drops below that required for normal metabolism and body functions
Immediate care practitioners		Highly trained doctors who provide their services in support of the ambulance service
Industrial processes		A systematic series of mechanical or chemical operations that produce or manufacture something
Inner cordon		An inner cordon is established to control access to the immediate scene of operations
Insulated cutters		Cutting tools that provide additional protection against electrical shock
Interoperability		The joint working of emergency services, especially during a major or complex incident.
Intraoperability		The joint working of fire and rescue services, through combined use of resources and assets, sometimes in a cross-border situation. This can also mean the combined involvement of a fire and rescue service with National Resilience assets.
Intrinsically safe radios		An intrinsically safe radio is one that has been designed and tested to not become an ignition source in a flammable atmosphere
Jaw thrust		A professional technique used on a casualty, especially if there is suspected spinal injury, to open their airway
Last known position	LKP	During a search, clues will be gathered about the person. Occasionally, the clue will be solid enough to be reasonably certain the search subject left it. Since the LKP is more recent than the PLS, this provides a new starting point for the search.
Loadmaster		Member of the aircrew (civilian or military) who is in charge of planning and distributing cargo and passengers on an aircraft
Local emergency		Known as:

Term	Acronym	Description
planning groups		• Local resilience forums (England and Wales) • Regional or local resilience partnerships (Scotland) • Emergency preparedness groups (Northern Ireland)
Long board		A patient handling device, used primarily in pre-hospital care, to provide rigid support during movement of a patient with suspected spinal or limb injuries
Major incident		A major incident is any incident that requires the implementation of special arrangements by one or more of the emergency services, the NHS or the appropriate Local Authority for: • The rescue and transportation of a large number of casualties • The involvement either directly or indirectly of large numbers of people • The handling of a large number of enquiries likely to be generated from both the public and the news media usually to the police • Any incident that requires the large scale combined resources of the emergency services • The mobilisation and organisation of the emergency services and the supporting services to cater for the threat of death, serious injury or homelessness to a large number of people.
Man-made mineral fibres (MMMF) or Machine-made Mineral Fibres (MMF)	Composite materials	A wide range of materials that use the inherent strength and durability of woven fibres bonded together with resins
Manual in-line stabilisation		Maintaining the head and neck of an unconscious casualty in neutral alignment
Memorandum (Memoranda) of Understanding	MoU (MoUs)	An MoU is an agreement that may exist between organisations such as the emergency services. It provides clear guidelines for local implementation of policies, strategies, and tactical and operational practice in accordance with local circumstances.
Miniature detonation cord or linear cutting cord		Many aircraft with ejection seats have systems that destruct the cockpit canopy. If the eject handle is pulled, the miniature detonation cord or linear cutting cord, which are embedded within the acrylic plastic of the canopy, use an explosive charge to shatter the canopy a few milliseconds before the seat is launched.
Missing person	MISPER	Defined by the College of Policing (Authorised Professional Practice) as

Term	Acronym	Description
		'Anyone whose whereabouts cannot be established and where the circumstances are out of character or the context suggests the person may be subject of crime or at risk of harm to themselves or another'
Mutual aid		Mutual aid is an agreement among emergency responders to lend assistance across jurisdictional or geographical boundaries. This may occur due to an emergency response that exceeds local resources, such as a disaster or major incident.
Nasopharyngeal airway		A method of using a flexible tube to secure a nasal airway when the casualty does not have, or may lose their ability to keep their own airway open
National Resilience	NR	The national capability to deal with the consequences that are common to most types of emergency, regardless of whether those emergencies are caused by accidents, natural hazards or man-made threats.
Natural		Not man-made
Neck extension		The positioning of the casualty's head and neck to assist with their breathing or resuscitation
Non-rebreather mask		A device used in medical emergencies for a casualty that requires oxygen therapy
Ordnance		Military weapons, for example missiles
Oropharyngeal airway		A hard "J" shaped plastic device that secures an oral airway, and can also be used to keep the teeth open for a more permanent airway. It also prevents the tongue from obstructing the airway.
Overhead line equipment	OLE	High-voltage power lines to provide electric current to trains, trams or trolleybuses
Paediatric		Specialist medical care provided to babies, children and young people (under 18 years of age)
Pain score		A numerical rating scale enabling the casualty to rate their pain score, usually from zero (absence of pain) to ten (the most intense pain possible)
Pallor		Pale colour of the skin which can be caused by illness, emotional shock or stress
Pantograph		A pantograph is an apparatus mounted on the roof of an electric train or tram to collect power through contact with overhead line equipment
Peel and reveal		The method of making an initial inspection by peeling back the inner trim of a panel or post of a vehicle. Once the inside of the panel or post is revealed and any components identified that should be avoided, the cut or other action can be carried out.

Term	Acronym	Description
Personal protective equipment	PPE	Personal protective equipment includes items such as fire tunics, over-trousers, helmets, fire hoods, gloves and boots. Specialist personal protective equipment may be used for certain types of incident.
Plastic bolster		The plastic cover over a deployable airbag, for example a knee airbag
Pocket mask		A hygiene device used to more safely deliver rescue breaths during a cardiac arrest or respiratory arrest
Point last seen	PLS	This is the point on the map or plans where the person was last spotted by a witness who provides a positive identification. If it is known for certain that the person was seen standing in a certain place just two hours ago, this provides a place to begin the search. By calculating how far the person might be able to travel in two hours and/or their likely exit route from within a premises helps to limit the search area.
Premises information box	PIB	Premises information boxes contain key information that will be needed by fire and rescue crews at the time of an incident. The information should be simple and useable with the following being the essential items: • Operational contingency plans • Simple plans and or schematic representations of the building and information about equipment or fixed installations, such as the design and functions provided for means of escape or firefighting operations • Basic operating instructions for fire protection and fixed firefighting equipment
Pyrotechnic		Materials capable of undergoing self-contained and self-sustained chemical reactions for the production of heat, light, gas, smoke and/or sound
Ram air turbine	RAT	A small turbine that is connected to a hydraulic pump, or electrical generator, installed in an aircraft and used as a power source
Rendezvous point	RVP	After initial response, emergency services personnel attending an emergency or major incident should be directed to a designated rendezvous point.
Rescue		Removal, from a place of danger to a place of relative safety, of persons threatened or directly affected by an incident, emergency or disaster
Respiratory protective equipment	RPE	Respiratory protective equipment includes breathing apparatus, particle masks and respirators.
Responsible Person		The Fire Safety Order details the duties of a Responsible Person for carrying out a fire risk assessment and ensuring the building is suitably safe for all relevant persons

Term	Acronym	Description
Road traffic collision	RTC	The law defines a reportable road traffic collision as an accident involving a mechanically-propelled vehicle on a road or other public area
Rollover		A rollover is a type of vehicle accident in which a vehicle tips over onto its side or roof
Rural environment		The rural environment often refers to areas in the country which are less densely populated. There are different types of rural areas, depending on how accessible they are from urban areas ranging from the rural urban fringe to the extreme or remote rural areas.
Safety officer		Safety officers are appointed by the incident commander prior to commencement of operations. They will be located at point which provides them with overall view and control of the inner cordon and scene of operations.
Scoop stretcher		A scoop stretcher has a structure that can be split vertically into two parts, with shaped 'blades' that can be brought together and secured underneath a patient
Scope of practice		This is the level at which an individual is trained to deliver casualty care in their area of work, under their clinical governance. They should NOT go outside their scope of practice under their clinical governance.
Sear pin		A pin used to make an ejection seat in an aircraft safe for performing a rescue
Search		The processes used to locate a missing person, absent person or object
Skin		The outer surface of an aircraft
Space creation		To enable extrication of a casualty, sufficient space and room for the medics to work on the casualty needs to be created. This can include removing the roof of a vehicle involved in a road traffic collision.
Spar		A major component of an aircraft wing framework
Sponson		Any of several structures that project from the side of a boat or ship, especially a gun platform
Spot cooling		Effect of using a water jet, for example on hot metal such as the undercarriage of an aircraft after a crash landing
Squib		A miniature explosive device used to generate mechanical force, for example ejection of aircraft components
Stalactite		Icicle-shaped formation
Sternal notch		The sternal notch is a well-defined, triangular depression in the lower front of the human throat

Term	Acronym	Description
Stringer		A thin strip of material to which the skin of the aircraft is fastened
Structural		A building or other object constructed from several parts
Tail-cone jettison system		A means to deploy the tail-cone to gain access to an evacuation slide of an aircraft
Tailpipe		An outlet by which engine exhaust gases are expelled from a vehicle or jet aircraft
Thermal imaging camera	TIC	By displaying infrared radiation as visible light, thermal imaging cameras can detect body heat, making them useful when emergency responders are searching for casualties
Time critical		Term used to describe a casualty who needs immediate treatment or intervention of a life-saving manner
Tourniquet		A constricting or compressing device, usually a bandage, used to control venous and arterial circulation to an extremity for a period of time
Trachea		Also known as the windpipe, this is the tube that connects the mouth and nose to the lungs. It goes divides into two airways that supply air to each lung
Triage		The assignment of degrees of urgency to wounds or illnesses, to decide the order of treatment for multiple casualties
Urban environment		The urban environment is characterised by higher population density and vast human features in comparison to the areas surrounding it. Urban areas may be cities, towns or conurbations.
Urban Search and Rescue	USAR	Urban search and rescue locate, extricate and provide initial medical stabilisation of casualties trapped due to structural collapse, natural disasters, mines or collapsed trenches.
Vacuum mattress		A medical device used for the immobilisation of patients, especially in case of a vertebra, pelvis or limb trauma, in particular for femur trauma. It is also used for manual transportation of patients for short distances as an alternative to a stretcher.
Ventilatory		Relating to or serving for the provision of air to the lungs or respiratory system
Witnessed cardiac arrest		A cardiac arrest that is seen or heard by another person or an arrest that is monitored
Work restraint system		A work restraint system is a fall-prevention system, which relies on personal protective equipment, consisting of a harness and a lanyard, which is adjusted or set to a fixed length that physically prevents the person from getting to the place where they could fall.

Term	Acronym	Description
Working at height		Working at height means working in any place where, if there were no precautions, a person could fall a distance liable to cause personal injury
Zoonoses		Infections or diseases that can be passed from animals to humans

Bibliography

A Brief Introduction to Polymeric Materials, Tuttle, M., University of Washington

Aircraft Rescue and Fire Fighting, 5th edition, International Fire Service Training Association

Basic Introduction to Carbon Fibre Reinforced Plastics, UKRO 2013

Bureau Veritas Airborne Particulate Monitoring During Road Traffic Collision Training Exercise November 2008

Department for Communities & Local Government Fire and Rescue Service Circular 42/2006 – National Mutual Aid Protocol

Derbyshire Fire and Rescue Service, Glass Dust and RPE Research 2014

Faculty of Pre-Hospital Care (FPHC) core material – 2014

Fire and Rescue Circular 54-2004 Emergency Call Management

Fire and Rescue Service Manual - Incidents involving Rescue from Road Vehicles, 2007, TSO

Fire and Rescue Service Manual Volume 2 - Aircraft Incidents, 1999, p8, para 1.5.3

Fire and Rescue Service Manual Volume 2, Aircraft Incidents, 2011, Section 1.2.4, DCLG, Home Office, HMSO

Fire and Rescue Service Manual, Incidents involving rescue from road vehicles, 2007, para 3.2.1 - 3.2.1.3, 4.3.1 - 4.3.2, 4.3.3, 5.1.1.5, 5.1.1.6, 5.1.2.5, 5.1.2.6, TSO

Fire and Rescue Service Manual, Volume 2 Fire Service Operations, Incidents Involving Rescues from Road Vehicles, 2007, p46, TSO

Fire and Rescue Service Manual, Volume 2 Fire Service Operations, Incidents Involving Rescues from Road Vehicles, 2007, pg50-51, 4.2.2 – 4.2.4, TSO

Fire and Rescue Service Manual, Incidents involving Rescue from Road Vehicles, 2007, Appendix 3

Fire and Rescue Service Manual, Incidents involving Rescue from Road Vehicles, 2007, pg14-16, paras 1.12.5-1.12.5.5

Fire Rescue Service Manual - Incidents involving Rescue from Road Vehicles, 2007, pg. 8-12, paras 1.12.3.2-1.12.3.9

Fire and Rescue Service Manual, Volume 2, Incidents Involving Rescue from Road Vehicles, 2007, pg61-66, paras 4.5.1 - 4.5.8, TSO

Fire and Rescue Service Manual, Volume 2, Incidents involving Rescue from Road Vehicles, 2007, para 4.5.1 & 4.5.2, TSO

Fire and Rescue Service Operational Guidance, Aircraft Incidents, p133, 8C6.11 – 86C.25, p137, 8C6.36 – 8C6.40, DCLG, TSO

Fire and Rescue Service Operational Guidance, National Co-ordination and Advisory Framework, DCLG, TSO, 2009

Generic Risk Assessment 2.1.4: collapsed structures, DCLG, TSO

Generic Risk Assessment 2.1: rescues from confined spaces; DCLG, TSO

Generic Risk Assessment 2.3: rescues from lifts and escalators, DCLG, TSO

Generic Risk Assessment 2.6: rescue of trapped persons, DCLG, TSO

Generic Risk Assessment 4.3: incidents involving transport systems – Air, 2010, DCLG, TSO

Generic Risk Assessment 4.3: incidents involving transport systems – Air, 2010, pg. 13-14, para, command and control, pg. 14-15, para Personnel protective equipment. Department for Communities and Local Government, TSO

Generic Risk Assessment 4.3: incidents involving transport systems, p13 Command and Control, p14 para PPE; Department for Communities and Local Government, TSO

Generic Risk Assessment 4.3: incidents involving transport systems, Air, 2010, Pg13-14, Command & Control, Department for Communities and Local Government, TSO

Generic Risk Assessment 4.3: incidents involving transport systems – Air, p9, Equipment in use, pg13-14, command and control/PPE & RPE; Department for Communities and Local Government, TSO

Generic Risk Assessment 4.3: incidents involving transport systems – Rail; Department for Communities and Local Government, TSO

Generic Risk Assessment 4.5: working with helicopters, 2010, p8-9, Incorrect approach, boarding and/or disembarking, p15, Personal protective equipment. Department for Communities and Local Government, TSO

Institute of Occupational Medicine, Inhalation Toxicology Study ,IOM Edinburgh 2000

Interfleet information

Materials for Automobile Bodies, Davies G., Butterworth-Heinemann, 2012

New Materials and Vehicle Construction, UKRO 2008

Operational Guidance - Aircraft Incidents, 2011, DCLG, TSO

Operational Guidance - Incidents involving HazMats Pg. 513-514 7C15.8 -7C15.9, DCLG, TSO

Operational Guidance – Rail

Operational Guidance, Aircraft Incidents, 2011, p60, para 2.3, 2.4 pg98-99, para 8C2.27, 8C2.28, 8C2.29, pg124-125, para8C5.2, 8C5.3, 8C5.4, 8C5.5, 8C5.6, 8C5.7, 8C5.8, TSO

Operational Guidance, Aircraft Incidents, 2011, pg103, paras 8C2.56, 8C2.57, 8C2.58, 8C2.59, Pg114, para8C3.31, pg104-105, para 8C2.60, TSO

Operational Guidance, Aircraft Incidents, p171, para 8, C9.21-9.22, p181, para 8C9.69-9.70, p181, para 8C9.73-9.75, p173-174, para 8C9.26-9.28, p187-188 para 8C9.88, 8C9.93-97, p190, para 8C9.105-109, p190, para 8C9.110-118, p193, para 8C9.119-122, TSO

Operational Guidance, Aircraft Incidents, pg. 218, para 8C11.27, TSO

Operational Guidance, Aircraft Incidents, pg. 219, para 8C11.37, TSO

Operational Guidance, Aircraft Incidents, pg. 60, para 2.3, 2.4, pg100-101, para 8C2.34, 8C2.39, 8C2.41, 8C2.46, 8C2.49, TSO

Operational guidance: breathing apparatus, 2014, DCLG, TSO

Paediatric Triage Tape, T J Hodgetts, J Hall, I Maconochie, C Smart, Journal of Pre-hospital Immediate Care 1998;2:155–159

Ref source material DCOL 6 1983 Item C and MAN Truck & Bus Emergency responder guide Pg.55 4.7.4 & Ops guidance - Railway Incidents Pg. 136 8C10.68

Thatcham Research on New Materials, UKRO 2011

Websites (accessed July 2016):

College of Policing – Authorised Professional Practice for Missing Persons

National Institute for Health and Care Excellence - Burns and scalds

National Ambulance Resilience Unit - The New Triage Sieve

Health and Safety Executive - Risk assessment and process planning for bariatric patient handling pathways

Resuscitation Council UK

Shropshire Fire and Rescue Service - Fires in farm vehicles (radiation hazards)

Australian Government - Hazards at aircraft accident sites: Guidance for police and emergency personnel

BRS Ballistic Parachutes - Information for Emergency Personnel

Faculty of Pre-Hospital Care - The Royal College of Surgeons of Edinburgh: Consensus Statements

Joint Emergency Services Interoperability Principles (JESIP) Joint Doctrine: the Interoperability Framework