Swedish Civil Contingencies Agency

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Tactics, command, leadership

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Stefan Svensson started his career as a fire fighter in the Swedish Air Force in 1986 and became a fire safety engineer in 1989. In 2002 he earned his Ph.D. at Lund University in Sweden. During the last fifteen years he has been involved in experimental and theoretical investigations on fire fighting tactics, including fire ventilation, fire suppression and command and control during fires and rescue operations. He is also involved at the local fire brigade, as a fire fighter/crew commander.

Thomas Winnberg currently works as the fire chief in Kiruna. He has been working at the Södertörn Fire and Rescue Association for a number of years, as an incident commander and staff officer. His duties include preparedness and turn-out activities. Since 1996 he has participated in the national development of municipal structures for providing rescue services in several different projects for the Swedish Rescue Services Agency. He is also involved in the training of personnel for international emergency response operations.

Preface

To the uninitiated, an emergency response operation can be perceived as a confusion of vehicles, equipment, personnel, smoke and injured people. There are cries for help, rescue personnel rush about with no apparent plan and vehicles are positioned more or less at haphazardly. But behind this apparent chaos, there is a plan, a thought or concept for how rescue personnel, along with their equipment, will be able to accomplish certain objectives at the incident site in a manner that is as effective as possible. The personnel are highly trained and motivation is often high.

Conducting emergency response operations is based to a large extent on proven experience, and the training of rescue personnel has a substantial element of practical training. In recent years, however, there has been increased interest in addressing basic safety engineering problems, including those encountered in emergency response operations, in a more scientific manner based on both technical and humanistic aspects.

Research, development, experience and the general flow of knowledge within the fields of tactics, management and leadership have come sufficiently far that a comprehensive approach can be appropriate. Most work in these fields is normally conducted based on the respective fields' points of view – leadership is viewed from a leadership perspective, management from a management perspective and tactics from some sort of tactical perspective. However, there can be reason for establishing the prerequisites for being able to cross-fertilise and thereby renewing the approach to conducting emergency response operations. It is important for management staff in rescue organisations to have good knowledge and understanding of both tactics, and management and leadership. Moreover, one must have insight into how these different fields influence one another – all to be able to conduct emergency response operations as effectively as possible.

Tactics, command, leadership is primarily oriented to management staff in municipal organisations for fire and rescue services. The leadership role is often challenging, especially in conjunction with municipal structures for providing rescue services. Management staff must have considerable knowledge, and there is much

to keep in mind and take consideration to. Tasks in conjunction with emergency response operations are conducted against the clock and in environments with major risks. But apart from the time aspect, this leadership role does not differ in principle from leadership roles in other types of organisations. It basically concerns making conscious decisions and accepting the consequences of the decisions made.

We have strived to address the knowledge that we consider to be fundamental for all leaders in municipal organisations for fire and rescue services. The focus is on conducting emergency response operations and the preparations that in various ways are required for this. We have written about matters that can be considered as rather obvious – emergency response operations, actions, units, duties, tactical principles, standard routines, management, management systems and leadership. But we have also strived to take up a number of less obvious but nonetheless equally important aspects. These include, for example, issues concerning time and space, situational perceptions and situational descriptions, control problems, ethics, decisions and decision making, and labour law.

It is our wish that our readers will find this both of interest and enriching, and that they will also perceive these areas' relevance to municipal organisations for fire and rescue services.

We also hope that the readers will take the opportunity to reflect upon the book's contents, engage themselves and help push development forward.

Many people have contributed in various ways to this book. We would therefore like to thank life, Olle, Per, Pär, Jan, Lars, P-A, Patrik, Britt, Ulrika, Staffan, Maria, Kristina, Ann, Gerry, Mamma, Samuel, Christian, Pia, Hans-Gösta, Mikael, Annika, Sören, Karin, Johan, Christer, Åsa, Berndt, Thomas, Åke, Kjell, Mats, Leif, Monica, Tommy, Pappa, Helena, Dennis, Anna-Lena, and not the least, all of our children and pets.

Stefan Svensson
Erik Cedergårdh
Ola Mårtensson
Thomas Winnberg

Preface to the English edition

Although there are differences between countries and cultures, we strongly believe there are more similarities than differences within the international fire and rescue service community. We do more or less the same things, we have similar technology, we use water for fire suppression, accidents are based on the same physics and chemistry, we have the same kind of protective equipment and we are all humans with similar behaviour and mental/physical capacity. And we are all in the need of knowledge and understanding, through training supported by experience and science in sweet harmony. We are all on the same side, no matter what side of the globe we live.

This book is of course based on Swedish conditions, cultures and regulations. It was first published in Sweden in 2005 and it has been used in the training of Swedish fire officers ever since, from crew commanders to incident commanders and fire chiefs. We don't believe it should be read from the first page to the last page. Pick out any chapter you'll find interesting, read a couple of sentences or a page at the time, give it some thought, put it in the context of some incident you have responded to and then read some more.

We hope the reader will find the book useful, as a source of inspiration for further development. Share your knowledge and experience with others and continue to develop the international fire and rescue community.

Keep up the good work!

The Authors

1. Introduction

Conducting an emergency response operation entails that people and equipment are mobilised, that assessments are made, decisions taken and actions carried out. Mobilisation, assessments, decision-making and carrying out decisions and actions are often made when time is of the essence and in environments with major risks. Tactics, command and leadership during emergency response operations do not fundamentally differ from corresponding tasks in other types of organisations. The difference can be considered to be that working under crisis-like conditions is the normal situation when it comes to working conditions for a rescue service, at least in terms of distress for third parties. The time aspect can often be critical, and both human life and property of major economic value can be at risk. In other words, decisions must often be made quickly and with much at stake, which places a number of special demands on both the individuals who belong to a fire and rescue organisation and the organisation itself.

The Swedish Civil Protection Act regulates society's needs for assistance in emergency situations. These assistance needs that are necessary as a result of emergencies must be put in focus. It is no end in itself to have a municipal structure for providing rescue services or to conduct municipal emergency response operations. The starting point must be to protect and rescue, and a municipality's fire brigade must be adapted thereafter. The importance of preventing emergencies from occurring is naturally substantial. At the same time, there must be an organisation that can provide assistance when individuals or organisations cannot deal with the emergencies that occur despite all measures taken to prevent them. For the time being, the occurrence of various types of emergencies cannot be entirely prevented.

We will begin with an overview of the book's contents. That which is described in this chapter will be addressed in more detail later in the book.

Tactical approach

An accident occurs and someone needs help. An emergency response operation is initiated, an incident commander is designated and the municipality's fire brigade drives to the incident site to provide the requested assistance. Available resources must be utilised in the best possible manner to gain and maintain control over the events. This entails that all individuals and units that are involved in the emergency response operation have a tactical approach to the assistance they provide. For example, those who work at a command support centre must be tactical in their assessments between ongoing rescue operations, the need for assistance, the risk situation and in maintaining preparedness for any other emergencies that may arise. The incident commander must be tactical in deciding on which actions are to be prioritised within the frameworks of the emergency response operation. Even a full-suit firefighter must be tactical in how he or she deals with the tasks that full-suit firefighters conduct. The entire system must be characterised by a tactical approach.

But what is a tactical approach? It is simply the optimal exploitation of the conditions that a situation presents. That is much as possible, turning poor conditions or less favourable conditions into advantages. To be able to juggle several balls at once and being able to determine which ball should be dealt with first, in consideration to all of the other balls and to other needs. To be able to make conscious and well-deliberated decisions that in various ways deal with developments.

A tactical approach is a requirement for being able to gain and maintain control. Control to a great degree is linked to decision-making and to the capability to create mental images of the situation and how it will be dealt with. By early in a response, taking consideration to information, often in the form of ocular impressions, and primarily to the knowledge possessed by individuals in the system, a form of mental control is established. The capability for creating such mental images of a sequence of events and conceivable developments is often the determining factor for the results of an emergency response operation. But control is also about purely physically dealing with the events and developments in conjunction with emergency response operations.

The degree of control will vary during the course of an emergency response operation and between different individuals. Most people at least have the ability to take some consideration to pre-

vious actions and to choose subsequent actions that correspond to the previous. The choice of the subsequent action is made with consideration to the possible effects of the action and plans are used as a foundation for choosing actions. Most people can also deal with more than one objective when decisions are made. But not everyone is able to take such consideration, neither when it comes to previous actions or to anticipated results. The choice of a subsequent action appears to be random and only one objective at a time is considered. Some individuals can be fully aware of what is happening and make calculated plans for dealing with the situation. Certain types of situations also demand initiation, execution and coordination of special actions. The range of possible actions must in such cases relate both to previous actions and future developments.

One can also have considerable help of a model of the situation that describes and explains the sequence of events. It can be a mental model with various degree of abstraction, but it can also be a physical model that describes the actual conditions, such as a drawing of a building or of the damage sequence. The individual's capability to create such models is sometimes based on, among other things, past knowledge of resource capacities and the effects of various actions. All individuals who are involved in an emergency response operation must have a fundamental understanding of emergencies and of how different types of sequences of events can be influenced. With the help of response intent, senior commanders communicate what is to be achieved by an emergency response operation. These response plans are also used by senior commanders to clarify which boundaries the emergency response operations must stay within, with respect to time, resources, orientation, etc. With unambiguous objectives for response operations, incident commanders indicate what is to be achieved by an individual emergency response operation. Both response intent and objectives are important tools for guiding the sequence of events in the desired direction, i.e. to gain and maintain control.

The intent of conducting an emergency response operation is to gain and maintain control using available resources. The entire process – from a municipal structure for providing rescue services being notified that someone needs assistance, to dispatching units and the sequence of events at the incident site – must be based on the capability to actually be able to influence developments.

The quality of the information that is provided and received is often crucial for the results of emergency response operations.

Without good information, it is impossible to create accurate models, to influence and thereby gain and maintain control. When information is lacking, however, one may need to make certain assumptions. But the more or better the facts, the fewer assumptions that need to be made.

At some point on the path to gaining and maintaining control, decisions must be made. The fire chief provides a framework for individual emergency response operations with the help of, for example, response intent, time considerations, the pertinent geography and available resources. The incident commander must have unambiguous and realistic objectives for response operations. A sector commander, based on these objectives, shall arrive at certain conclusions. And a crew commander must sometimes be able to provide unambiguous instructions to his or her personnel, or decide what is to be prioritised within the framework of the crew's duties, etc.

To be able to gain and maintain control, all of the following criteria must be fulfilled:

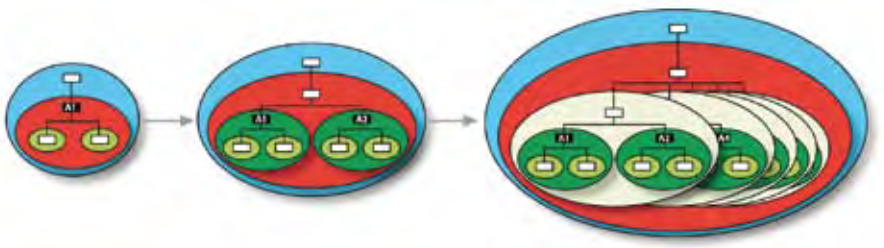
- There must be an objective.
- It must be possible to determine the status of the system.
- It must be possible to change the status in this system.
- There must be a model of the system.

Basically, control refers to the ability to make something happen as expected and to understand why. Control thus to a great extent deals with competence, knowledge and a tactical approach.

Flexible configuration

Effective emergency response operations require the ability to adapt the organisation based on the situation. The entire response must be oriented to providing the assistance that is most needed in the current situation. Based on the need for assistance, efforts are oriented to gaining and maintaining control.

When one allocates tasks and authorities among different individuals in conjunction with emergency response operations, this must be done in such a manner that concrete measures to prevent further damage or injury can be conducted without interruption. The allocation of tasks and authorities, and the establishment of an organisation at the incident site, must be conducted so that measures to prevent further damage or injury are facilitated. The establishment of the organisation and the gearing up of an



Scaling up in height and width

emergency response operation must be conducted upwards in the system, at the same time as it occurs laterally, Subordinate supervisors will then be relieved of certain management tasks without this negatively affecting efforts. The prerequisites for being able to improve the capability to lead the system will also be improved as the build-up occurs upwards. The role of the individual will then be similar throughout the build-up phase. The roles will not change for the individuals who have already been deployed at the incident site. One can speak of role logic, i.e. the expectations that exist for each person on different occasions being sufficiently alike that they are perceived as reasonable by the individual, which is an important aspect in the societal context that an emergency response operation constitutes – individuals (supervisors) must be able to feel secure in their roles. The expectations, in other words, should be logical for the individual from one occasion to the next. But role logic also entails that these reasonable role expectations for individuals should be similar for one and the same person during different phases of, for example, an emergency response operation.

As an emergency response operation gears up, the authority to deal with the objectives of the response is moved upwards in the system. For the decision domain *task command,* other authorities remain that are in line with the role logic. If needs arise for additional units, more task command decision domains are created, based on, among other things, span of control. This entails that task command can be viewed at various degrees of resolution. Objectives of operations thus belong to the decision domain *operational command* and intents of responses to the decision domain *system command.* If additional management capacity is needed for these decision domains, one or more staffs are attached. Note, however, that there should be different staffs for system command and operational command.

Three types of decision domains can be identified. The decision domain indicates which authorities are allocated, i.e. how much time, how much space or which types of issues, problems or information the domain has the authority to deal with and can influence, directly or indirectly. For each such type of decision domain, one can describe a certain content – in practice the authorities the individual has to work with.

The decision domain *system command* embraces continual definition, assessment and decision-making concerning the entire organisation's role in relation to the situation and other organisations in society. System command's duty is thus, in different ways and in different forms, to initiate emergency response operations, appoint incident commanders and to define and provide frameworks for responses in terms of response intent, resources, time and geography. System command must weigh any emergency response operations already underway against the risk profile and preparedness production. But primarily, the decision domain system command shall ensure that the total need of assistance is satisfied.

The decision domain *operational command* primarily decides on response operation objectives, and decides on and allocates tasks to the organisational elements that are associated with the response operation. This includes coordinating the tasks that these organisational elements perform. This also includes, as necessary, issuing directives and instructions of a practical, executive character or that are otherwise necessary for being able to coordinate work at the incident site. Operational command, however, must follow the instructions and guidelines issued by system command.

The decision domain *task command* is primarily intended to lead the organisational element in conducting the tasks that are allocated by the decision domain operational command, based on the objectives of the operation. With this as the starting point, or the information provided by operational command, task command must organise itself in such a manner that its allocated tasks can be conducted as effectively as possible. In some cases, the situation requires additional task command decision domains. Task command decision domains that are already active remain so and additional task command decision domains are attached in a further degree of resolution. In such cases the superior task command decision domain allocates tasks to subordinate task command decision domains. The task command decision domains can thus be handled in different degrees of resolution.

Management capacity deals with the system's capacity to handle itself in relation to its environment. There are different ways of increasing the management capacity in an organisation. For both the decision domain system command and the decision domain operational command, the management capacity can be increased by adding a staff. For the decision domain task command, the management capacity can be increased in several ways. A common alternative is to add more decision-makers. In this way, several task command decision domains come about. One can thus speak of task command in various degrees of resolution. This division and gearing up must be conducted with consideration to the role logic.

Turn-out operations are usually organised in a line organisation or a line staff organisation. Through one of these types of organisations, unambiguous channels are created for information flows, and allocation of authorities is often easy to define. This manner of organising, however, places considerable demands on all involved being able to cooperate on, among other things, the tasks that are to be conducted and on distribution of resources.

Time scale can be defined as the time relationship between the point in time when a situation is discerned and until information is gained about the results of the action or actions taken. A time scale is not just a measure of how far in advance plans are made. It is also a measure of reaction speed from impression or information, via assessment and decision. A time scale simply describes within which period of time that certain information, certain decisions or authorities are valid. Each decision domain must be able to handle several different time scales, however, a superior decision domain sets limits on the length of the time scales that subordinate domains can handle. Longer time scales set limits for shorter time scales.

Preparedness production must also be handled by the system. Preparedness production refers to the activities that include, among other things, establishment of a certain degree of preparedness in the form of personnel or other resources so that in the event of emergencies, one is able to proceed to the incident site and provide the necessary assistance. Moreover, constant assessment must be made of the risk profile.

The command system is the part of turn-out operations that handles allocation of authorities, resources, etc. and that controls turn-out operations. Turn-out operations encompass all of the

operations needed to satisfy an assistance need, including technology, competence, etc. Also included in turn-out operations is what is called management, i.e. a conscious influence on a system consisting of people and technology that occurs, in among other ways, through continual planning, implementation and follow-up. It is thus through management that turn-out operations are administered and controlled.

To manage means, among other things, to consciously influence a system comprised of people and technology and entails that a number of activities are dealt with. To fulfil the demands and expectations that are placed on those in management roles, they shall:

- Determine the way.
- Show the way.
- Establish prerequisites.
- Follow-up and adjust.

These management activities are similar, regardless of the position held in the command system.

Utilising resources

All reasoning concerning flexible configuration of emergency response operations and a tactical approach is based on the need to be able to utilise resources as effectively as possible. Resources can be managed and utilized based on plans and standard routines. But in certain cases, one must have a larger degree of flexibility in how the resources are used. This is based on one being well-familiar with the resources' capacity in, among other ways, relation to what one wants to achieve in the current situation. One must also have a good understanding of the situation as such, which is an important fundamental element in the discussion above concerning control. Without knowledge and understanding of the resources' capacity and of the situation's demands and needs based on conceivable developments, control cannot be gained and maintained. For practical reasons, resources are normally divided into units for the purpose of making the resources manageable from a management perspective. The unit can be defined arbitrarily, even if it is normally applicable to have predefined units that in different ways can be managed at the incident site.

One or more units are assigned one or more tasks and take certain measures. The measures are the smallest elements that

are handled from a tactical perspective. But one must also differentiate between what one is to achieve, i.e. measures, and how this is to be achieved, i.e. with the help of the unit.

What one intends to achieve in conjunction with emergency response operations is based on a specific damage or a specific destructive sequence relating to a specific object. The resources (units) shall thus be managed in an optimal manner based on the needs of the situation, with the damage to the object providing important input values. Persons in management roles must therefore have knowledge of the resources' capacity, of the object and how different types of damage evolve or can evolve in various types of objects, and depending on which measures one elects to take against a specific damage to a specific object. One and the same measure can have different effects on the destructive sequence based on, for example, what the object is. This entails that standard routines, templates and checklists must be used with caution.

Perceiving situations

It is impossible to plan for all conceivable situations. It is especially impossible to plan for inconceivable situations. Many of the tasks in conjunction with emergency response operations must thus be based on continually receiving and taking consideration to information from the world around; information about everything that can be of importance to operations. This can concern weather conditions, resources' capacity, buildings' fire science technology, properties, chemical substances, affected persons' needs or one's own organisation's needs. One can say that the entire system that deals with emergencies and risks should have a fairly similar perception of the situation.

The ability to deal with the situation is never better than the perception that one has of the situation. To be able to correctly make decisions, one must be able to establish a perception of the situation that is as accurate as possible. A faulty perception leads to faulty actions. As a rule, a faulty perception of the situation cannot be compensated by other measures. Establishing a perception of the situation entails much more than just creating instantaneous images. Instead of instantaneous images, it is usually more important and more relevant to create a model of the situation and how it can evolve, which is also an important part in gaining and maintaining control. Without the opportunity to determine the state, i.e. to perceive the situation, control cannot

be gained and maintained to any significant degree or with any greater reliability.

To conduct effective emergency response operations and to act instead of parry, the capacity is needed to quickly be able to identify the variables and parameters that affect the situation.

Factors relating to time and time dependency that should be considered include:

- The speed at which the emergency evolves with time
- The speed at which the risk profile changes with time
- The time interval during which all or parts of the system can be self-sufficient without requiring any form of input signal or stimuli from other parts
- Requisite time for activating or readying the management system
- Different levels' varying needs in time and space, such as varying needs concerning wealth of detail in the information flow

Subsequently, when dimensioning a management system, for example, it is not just the system's capability to initiate responses should be considered. The capacity to exercise management over time, i.e. to initiate, conduct and conclude the response and to maintain preparedness in relation to the risk profile must also be considered. The management system must be given sustainability corresponding to the duration of the emergency's chain of events that form the basis for dimensioning.

One should also keep in mind that time and space are related. The longer the period of time that must be dealt with, the larger the space normally becomes, i.e. geographic dispersion. And in the end, it is all about making decisions that have certain validity in time and space.

Making decisions

The decisions made in conjunction with emergency response operations are normally made in a dynamic environment. The decisions are made in a certain context. They are influenced by what has occurred previously and events at the time of decision-making. The subsequent decisions and measures that they result in influence events on both the short and long term.

As initial values for making correct and good decisions, consideration must be taken to – besides the situation's demands and needs – ethical and moral values, and internal and external

organisational rules and norms. Moreover, one must be aware that stress will affect all individuals who in various ways are involved in conducting emergency response operations. Stress can be both positive and negative. A certain degree of stress can often be positive, but it can be difficult for an individual to determine when he or she has reached his or her own threshold. Those in the vicinity, however, may be painfully aware that their superior's stress threshold has been reached because the decisions made are often irrational.

Tactics, command and leadership are strongly associated with making decisions. What is important to keep in mind in regard to decisions and decision-making, among other things, is that the issues that must be dealt with are sufficiently complex that a lone individual can seldom handle all of the decisions that are necessary for gaining and maintaining control. There is normally reason to distribute various types of decisions or authorities among several different individuals. The term *decision domains* is used as an umbrella term for the scopes of authority that are associated with decision-making. Different management personnel have different decision domains. The decision domains can constitute subsets of one another. A subordinate supervisor's decision domain is thus a subset of a superior supervisor's decision domain. The scope in these decision domains is restricted by a single individual only being able to influence a limited area and that a single individual can only handle a certain limited amount of information.

Due to the character of the decisions, responsibilities and information, in certain cases decisions must be handled in groups. Even if group decisions are not normally used – for clarity in the management system, a decision must be possible to link to a specific individual – it can be necessary that several individuals working together with information reach a consensus as to the decisions to be made and take joint responsibility for the decisions' execution. Lack of time, etc. can entail that there is not enough space to put all that much energy and effort into establishing a common understanding of the decisions made; the person in charge is always responsible for decisions. Effectiveness in the command system, however, is based on loyalty in regard to the decisions made.

There are differences between the ways that experts and novices make decisions. The differences are primarily in how individuals with varying degrees of experience or competence handle information and decision-making materials. The actual act of

decision-making is similar, but an expert in a certain field is normally better equipped to utilise correct or relevant information for his or her decisions. Note, however, that an expert in one field is seldom an expert in another. In some cases, one can thus engage several different experts to deal with a complex situation.

One can also speak of *dynamic decision-making*, i.e. that decisions are made in situations that are time-dependent and that often require several decisions in sequence that are directed towards the same objectives, and that the decision-maker receives information about the various decisions' impacts on the situation. Moreover, the situation changes with time, partially as a result of the decisions made, and partially of itself.

In conjunction with emergency response operations, subsequent decisions must often be made as new needs arise. Preferably, decisions should probably be made before a need arises. The issue of time scales is again applicable here. Higher system levels must be able to handle longer time scales and therewith also establish the conditions for the function of the entire system. Moreover, one must be aware of delays between decisions on a specific measure and the effect of the measure. All measures and decisions require time. During this time, events continue to occur, both intentional and unintentional.

Individuals and group members

Work in conjunction with emergency response operations is based on the capability to organise resources in a purposeful manner. The organisation is important for the individuals and groups that are included in the organisation in being able to see their roles in a larger context. In this way, the organisation creates a sense of security for the individual.

The fundamental concept of organisations is that through cooperation between individuals, one achieves objectives more effectively than through individual efforts. The effect of several individuals cooperating to attain a common objective is greater than if each individual worked alone, even if working towards the same objective. A formal organisation is generally characterised by there being a distribution of tasks and that the individuals in various ways are specialised, that work is coordinated and is controlled, that there is more or less pronounced leadership – someone is the leader and others follow this leader – and that the organisation has one or more objectives.

Individuals belong to various types of groups and participate in various group processes. The group processes deal with relationships between the members, such as handling conflicts between factions or the distribution of influence among the members in a decision-making process. The group's size also influences how the group functions.

To a large degree, it is the responsibility of the person in charge to ensure that a municipal structure for providing rescue services functions effectively. Commanders/officers must be able to employ leadership and leadership styles in managing the organisation. It is no end in itself to have a municipal structure for providing rescue services. The organisation exists to satisfy the need for protection and safety.

Within the organisation, work is regulated based on the stipulations and guidelines of labour law. There is normally some form of agreement between the employer and employees. Such an agreement is usually based on loyalty, i.e. that the employee conducts work for or on behalf of the employer and that this work is usually reimbursed with wages or a corresponding form of compensation. The incident commander's authorities are primarily directed towards third-parties, while labour laws are directed towards one's own organisation. What is essential is that work in conjunction with emergency response operations can be conducted effectively and purposely with the focus on the need for assistance.

Satisfying needs for assistance

An accident occurs and someone needs help. Based on this need, emergency response operations are initiated with the municipal structure for providing rescue services offering its resources to remedy something that has gone wrong. The actual response operation is defined here from case to case, i.e. in principle to determine if the need of assistance fulfils the criteria for that which is defined as rescue service and that which subsequently leads to a municipal structure for providing rescue services offering its services. Once the response operation and its scope is put in concrete form, one must, among other things, consider the object's size and type, the size of the affected area, available resources and various organisational aspects. With the help of the emergency response operation, one shall gain and maintain control by available resources being utilised in the best possible manner. This

involves taking consideration to a large number of factors and parameters.

It is not always easy to satisfy society's needs for protection. A lone individual or a single organisation cannot handle the entire range of problems and issues that arise in conjunction with emergency response operations. Response operations must be based on cooperation and collaboration between various individuals and many different organisations. Knowledge and understanding is therefore required of the preconditions of these various individuals and organisations.

One should also keep in mind that the quality of an emergency response operation is to a certain extent determined by third-parties, and how those in need of assistance perceive the assistance offered.

2. The problem

An automatic fire alarm goes off at the Market Hall, Lilla Tvärgatan 9.

It is 05.01 and the lights are switched on at the central fire station in Allmänsta.

Andersson lifts the receiver at the fire station garage and talks briefly with the dispatcher.

'We have received an automatic alarm from the Market Hall. A security guard is close by and he will meet up with you at the location.'

One minute later a vehicle leaves the garage.

'Adam 1 from 101; 101 and 103 proceed to the automatic alarm Market Hall, Lilla Tvärgatan 9.'

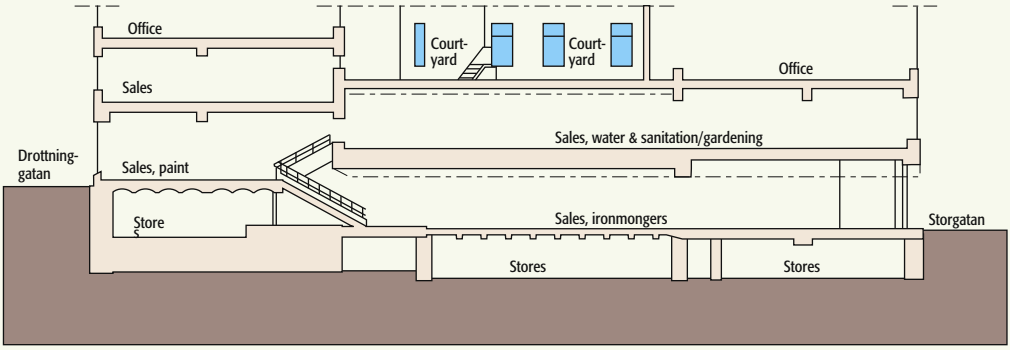
The market hall is situated in the centre of Allmänsta, only a couple of minutes drive from the fire station. The central alarm unit is located inside a door by the loading bay on a side street and the vehicle proceeds there.[1]

On arrival the vehicle is parked on the square and Andersson and Johansson go with the security guard to the central unit. After a few minutes they come to the conclusion that the affected section is in another building on the opposite side of Lilla Tvärgatan, Storgatan 68. Andersson, who now takes on the role of incident commander,[2] *proceeds with the guard to the department store. As they enter, they can smell smoke. Andersson calls Johansson, who is still at the central unit, on the radio.*

Allmänsta is a municipality somewhere in Sweden. There are two smaller communities in the municipality, Närby and Fjärrby. The municipal structure for providing rescue services is based in the main town of Allmänsta and comprises full and part time personnel,

[1] A correct and relevant assessment of the situation is important during the whole of response operation, but perhaps especially so during the initial stages. Response plans, which may be an important element of a situation assessment, can provide response personnel with necessary information about the object while on their way to the incident site and enable them to form a picture of the incident, possible response routes etc. Familiarity with the object is highly beneficial for a response operation, irrespective of what the object is. One should also remember that there is a difference between damage and object.

[2] The question of who is the incident commander is tied to the Civil Protection Act and to certain areas of responsibility and authority that are given here. An aspect that is equally if not more important is responsibility for the work environment and who has the authority to lead the work.



while in Närby and Fjärrby there are only part time personnel.

Petersson is the fire chief and has held this position for several years. He has considerable experience of urban areas and a comprehensive basic as well as complemented education and training. Olsson, who has also worked in the municipality several years, is one of his assistants. Olsson is on standby at home every forth week, and is on standby just now. When Petersson or Olsson are not on duty or not available, Andersson is responsible and has a number of commanders to assist him, one of whom is Johansson.

Andersson says curtly to Johansson, 'I want you to take 101 and 103 with you to Storgatan 68, and quickly, for once. There is the smell of smoke coming from the ground floor of the department store. Join me at the entrance.'

'Does he always have to speak to me like this?' Johansson says to himself as he goes out to 101.[3]

In the meantime Andersson proceeds directly through the ironmongery section of the store, a distance of some 30 metres, and opens a fire door to the stores for the paint section. A wall of smoke and heat comes at him, and he quickly closes the door and rushes back to the entrance and Storgatan. He is aware that there is already a fully developed fire in the paint store.[4] *Once out of the building he calls for reinforcements by 102, 104 and Olsson in car 106. The square is the meeting point. It is now almost 05.30 and the fire has been burning for just over half an hour. Pumping appliance 101 with Andersson, Johansson and three firefighters, and a ladder appliance with one firefighter are now at the incident site on Storgatan.*

At the same time as the fire gains strength in the paint store, it spreads via a pipe opening to the paint section on the floor above. There is an entrance to the department store on Drottninggatan on the other side of the building, but none of the crew is aware of

[3] The relationships between personnel in a fire brigade crew can be fundamental to how work at an incident site progresses. Offensive command or a commander who has a poor relationship with response personnel will often make things more difficult or result in it taking longer for allocated tasks to be executed. The quality of a fire brigade's work is often reflected in the quality of leadership and how it functions. A commander should be very aware of how he or she addresses subordinate personnel.

[4] What risks should a commander subject him or herself or their personnel to? Is it reasonable that the highest commander at an incident site exposes him or herself to the greatest risks? Are the risks taken worthwhile in relation to the possible consequences of them? In some situations a commander can gain invaluable first hand information through taking risks.

this, since both 101 and 103 drove down Lilla Tvärgatan. The paint section adjoins the ironmongery and gardening sections.[5]

Pumping appliance 101 parks outside the department store at Strorgatan 68, behind ladder appliance 103, which is set up outside the entrance to Storgatan 66. This entrance leads via a flight of stairs up to offices above the department store. It is also the personnel entrance for a hotel. BA firefighters prepare themselves and then go into the ironmongery section with the aim of entering the paint store, which is now fully ablaze. There is an extreme amount of smoke and when the unit reaches the stairs up to the paint section they see that this section, which is above the paint store, is now also ablaze. They report this to the BA unit commander. They then open the door to the paint store and attempt to extinguish the flames. Within a short time they are forced to give up their attempt due to excessive smoke and heat. They pull back to the entrance of the ironmongery section closer to Storgatan. The paint section above the paint store is by this time fully ablaze. It is now just after 05.30.

On the basis of information received from the BA unit, Andersson has gone round to the other side of the building, to Drottninggatan, and can see for himself that the paint section is ablaze.[6]

At about this time pumping appliance 102 with a commander and two firefighters, aerial appliance 104 with one firefighter, and command vehicle 106 with Olsson and one firefighter arrive. 106 enters the square and Andersson hurries towards Olsson. Andersson reports the situation to him.[7]

Olsson says, 'Ok! I'll take over as incident commander now.'[8]

Olsson is fairly familiar with the floor layout in the building since he has recently carried out an inspection there. It was built at the end of the 19th century. Fire safeguards have been improved in connection with a renovation and repair work but it is a wooden beamed building. There are also some old

[5] As geographical aspects among others limit how much a person can see (purely visually), one should try to apply all the senses, rational thought and creativity. A diffuse picture of a situation and the course of events can create significant problems for the subsequent work. In relation to this, one should also always be prepared for the unexpected, surprises that should, as much as possible, be avoided by, among other things, trying to gain as good and balanced a picture of the situation as possible.

[6] Firefighters who are on the 'front line' are partly the eyes and ears of the commander and should therefore be consciously observant and report back relevant information. The incident commander should also, when possible, confirm information and gain a personal picture of the situation.

[7] In some situations it can be beneficial to use appropriate templates, e.g. for situation reports, so that both the sender and the receiver work on the same basis. At the same time it is necessary to be careful with the use of such templates and, as in this case, the type of information that is supplied. Templates must only provide a means to an end; they are not an end in themselves.

[8] Role allocation at an incident site must be uniform and clear, to all concerned. When authority is transferred from one commander to another, one's role can become unclear. There should, therefore, be a well prepared plan in place for the allocation of roles, tasks and authority during a response operation. These roles, tasks and authority should be logical and align with the roles, tasks and authority that 'normally' exist in the organisation's role logic. The organisation at an incident site should develop on the basis of the problem(s) to be solved and must be flexible in order to adapt to these problems.

wooden ventilation shafts left, one of which, via a connection in the ceiling of the office floor above the shop water & sanitation/gardening section, passes into the attic.[9] *On his way to the incident site Olsson has also called for reinforcements by part time firefighters in Allmänsta and Närby.*[10]

'I want a sector on Drottninggatan, one at the hotel, one at the department store sports section and one on Storgatan. Andersson, you take command of the Drottninggatan sector. That's where we'll work primarily with the aim of preventing the fire spreading up through the building. Johansson will be the sector commander at Storgatan.'[11]

101, 102, 103, 104 and 106 are now at the incident site. Part time firefighters 121 and 125 are on their way. A total of eight firefighters and four commanders are operative at the incident site. A further four firefighters and one commander are on their way to the incident site.[12] *Part time firefighters from Närby, 131 and 137, four firefighters and one commander*[13] *are on their way to Allmänsta fire station.*

[9] Familiarity with the object is often a prerequisite for forming a realistic plan. Knowledge of the parameters that in different ways steer the course of events is also beneficial. In the case of a burning building, personnel should have varying degrees of knowledge of the fire safety aspects of structural engineering.

[10] It is important to, at an early stage, be able to pick up signals indicating that a situation may develop into something exceptional. The provision of resources and sustainability are important aspects and must be dealt with during the course of an operation, at the same time as emergency preparedness must also be taken into account. This is where gaining a balance between the ongoing operation, assistance need, risk situation in the municipality and emergency preparedness comes into the picture.

[11] It can often be advantageous to divide a large incident site up into sectors, to the purpose of clarifying tasks, roles and responsibility. These can be formed on the basis of tasks or geography. The important thing is to be clear in the allocation of authority to different commanders. This is where decision domains come into the picture. A decision domain is defined in terms of certain areas of authority in time and space. They can be formed in different ways depending on, among other things, the situation.

Olsson reaches agreement with Andersson and Johansson to coordinate an effort from their respective sectors with the aim of extinguishing the fire in the paint and ironmongery sections and preventing it from spreading upwards in the building.[14] *Olsson also says that 121 and 125 shall be allocated the task of ensuring water supply*[15] *and, together with the police, evacuating the hotel.*[16]

Less than ten minutes later a coordinated effort is launched from both sides of the building. Two firefighters with tender 125 have been allocated the task of ensuring the water supply, while the remainder of part time firefighters from Allmänsta, together with two police officers, evacuate the hotel. In addition the security guard has been allocated the task of checking the premises Drottninggatan 1 and Storgatan 70 and the courtyards connected to these. Thanks to the coordinated effort, the fire in the paint store and the paint section has been extinguished and the situation is looking promising.

Shortly after 07.00 the fire on the lower floor of the shop is extinguished. Unfortunately though, the fire has spread up through the building via the old ventilation shafts to flammable structural beams and wall construction. There are also flames on the outside of the building on the courtyard walls which are spreading up the outside towards the attic. Two pumping appliances with five firefighters in each, and an aerial appliance with two firefighters arrive from Närstad and Fjärrstad.

'I have just received a report that a problem has arisen higher up in the building,' says Andersson. 'The lads from 102 are on the other side with a hose, but everything seems to be ok there.[17] *It appears, though, that fire has broken through into the office*

[12] It is important, with regard to following up a situation, to have an overall view of crews involved, those at hand but not engaged just as much as those engaged, as well as resources that can be available within a certain time. Without such an overview it is difficult to apply the right measures, in the right place at the right time. Knowledge of the capacities of resources in time and space is also important input value for the basis of decisions.

[13] Emergency preparedness can often be maintained with the help of part time firefighters. A commander should, however, be aware that this can place other demands on leadership since part time firefighters must be considered on different terms to full time personnel.

[14] Many response operations require that measures are coordinated and executed in such a way that their combined effect becomes greater than their sum. It is not, however, always easy to create models in advance that are perhaps a prerequisite for the collective effect of several dependent measures.

[15] A picture of what is to be done must be formed at an early stage and there must be a realistic plan for achieving this. Once again the capacity of resources forms an important input value for such a plan and it is equally important that this value is regarded in the light of the goal of the response operation.

[16] A single organisation can seldom, if ever, handle the full range of problems and issues that can arise in connection with emergency response operations. The efforts of public bodies in terms of protection and rescue, rely upon cooperation, coordination, assisting each other and the sharing of resources between the various organisations to the purpose of reaching a common goal. The starting point must be the assistance need that has arisen as a result of an incident or accident or the imminent danger of such.

space above the paint section, and it looks as though there is smoke coming from the attic also.'

'Yes I know,'[18] says Olsson. 'I've just spoken to Petersson and he has given us a framework to work with.[19] We can't count on getting more resources. It will take some time for them to come from outside the municipality. We may even have to release some resources, as there has been a car accident

[17] A very important aspect with regard to forming an operation tactically, is having a clear picture of what is to be achieved and how this can be done. In many cases a rather diffuse picture of the effect of measures can be given. Sometimes it is difficult to ascertain whether measures achieved anything at all. In the worst scenario measures could have an undesirable effect. It is important that a commander is observant as to the effects of executed measures and aware of the fact that the situation is dynamic.

[19] The senior commander is always responsible for operations, regardless of whether he or she is at the incident site or not. By using a suitable leadership style, depending on, among other things, the situation, the commander can serve as an example, inspiring and motivating subordinates to do the right thing. The relationship between commanders, and commanders and subordinates must be based on trust.

[18] 'I know' comments can be a result of ones own stress symptom but can also be a pattern of communication and personal style of leadership. If he 'knows' why has he not already done something about it? The 'know' reaction can be a sign of authoritarian leadership and a commander who is not prepared to place trust in others. A commander must be aware of his or her role and be able to handle the social interaction aspects even during an ongoing response operation.

Fire and rescue service in Allmänsta		
Full time in Allmänsta (90 seconds turn-out time, 3 minutes travel time)		
101	pumping appliance	1 station officer + 1 sub-officer + 3 firefighters
102	pumping appliance	1 sub-officer + 3 firefighters
103	ladder appliance	1 firefighter
104	aerial appliance	
105	tender	
106	commander's vehicle	1 fire protection engineer + 1 fire-fighter
Part-time in Allmänsta (6 minutes turn-out time, 3 minutes travel time)		
121	pumping appliance	1 sub-officer+ 3 firefighters
125	tender	1 firefighter
Part-time in Närby (6 minutes turn-out time, 10 minutes travel time)		
131	pumping appliance	1 sub-officer + 3 firefighters
137	hose carrier	1 firefighter
Part-time in Fjärrby (6 minutes turn-out time, 20 minutes travel time)		
141	pumping appliance	1 sub-officer+ 3 firefighters
145	tender	1 firefighter
Other resources		
201	pumping appliance	1 sub-officer + 4 firefighters (reinforcement from Närstad)
203	ladder appliance	2 firefighters (reinforcement from Närstad)
301	pumping appliance	1 sub-officer + 4 firefighters (reinforcement from Närstad)

in Fjärrby.[20] *But we don't know how serious it is yet. We have to try to limit the fire to the department store. It must not be allowed to spread from there. I would like an aerial appliance on Drottninggatan, one on Storgatan and one on Tvärgatan. Initially they are to extinguish visible flame on the upper floors, but they should also make sure that the fire doesn't spread over the roof. Then despatch BA firefighters to work their way up inside the building.'*[21]

Andersson tries several times to contact a unit within his sector.

'102 from sector Drottninggatan, where are you just now, come?'[22] *After several minutes he gets a reply. 'Where are you?' Andersson shouts.*

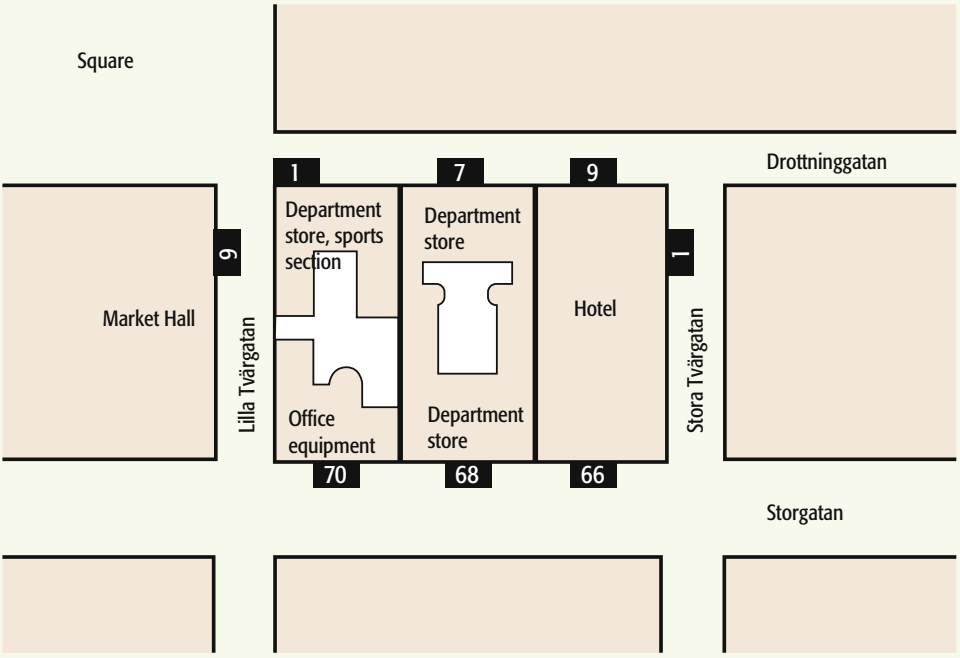
'We have just come out of the hotel where we have checked the property dividing walls in the attic,' the commander for 102 answers.

'The whole unit? I said that you should take one man with you to check the attic,

[20] It can in some cases be necessary to change the direction of an operation while it is underway. It may also be necessary to discard a plan, due to requirements from higher or lower levels of command. Even if higher levels should do everything possible to retain the conditions necessary for the ongoing operation, the operation must also be able to adapt to the framework given by the higher level, even if this involves reducing the aim of the operation.

[21] The commander must always be very clear when it comes to the goal of the operation, give clear directions as to what is to be done, but leave the details to subordinate commanders. Ensure that there is a realistic possibility of carrying out the allocated tasks and that they are feasible in relation to the situation.

[22] Having a clear picture of the situations operative firefighters are in is paramount purely for safety reasons. A diffuse picture can arise through 'free lancing', which may be caused by inability on the part of the operative personnel (they do not understand what they should do) or by poor leadership (personnel do not follow instructions and do not execute allocated tasks). A commander must also be able to deal with these types of situations.



not the whole unit,' groans Andersson in dispair.[23]

A new problem arises – information. Employees from the premises are arriving for work and are asking many and difficult questions. Police Inspector Pålsson has a suggestion.

'If I understand correctly, a fair amount of smoke has already entered both the hotel and the sports section of the department store. I suggest that we call in a reorganisation company to take out everything of value. The employees can assist in this as they arrive for work.'

'That sounds like a good idea,' comments Olsson, 'but just make sure nobody goes where they shouldn't.'[24]

The response operation has been underway for some time, much longer that would reasonably have been expected when the alarm went off several hours ago. The personnel involved are now becoming, if not exhausted, then extremely tired. Even if considerable value has been saved at both the hotel and

[23] Here we see two problems that can arise: reluctance to divide previously allocated units into smaller units and inability to carry out allocated tasks.
I some cases the group needs to be divided in order to carry out a task. The municipal structure for providing rescue services in the first place executes tasks, not work in groups.

[24] One should always be open to new ideas, tips and advice. It can make things easier if other organizations are able to deal with problems that your own organisation for some reason cannot.

the sports section of the department store, the main section of the store appears not to have been saved.

During the course of the morning the situation was brought under control, largely thanks to sectioned buildings.[25] *Through a number of concerted efforts at just a few points, the fire will soon be almost totally extinguished. During the course of the day crews return to their respective fire stations.*[26]

Parallel with the post fire fighting work in the afternoon, safety measures are discussed with the property owner, insurance company and a clerk of works. Among other things and for safety reasons, decisions are taken to demolish some beams, walls and roofing. In addition the possibility of a criminal investigation is discussed with the police.

At 17.30 Olsson concludes the response operation after consulting with the property owner and the insurance company.[27]

[25] The inbuilt safeguards in buildings and installations may very often be the deciding factor for the result of a response operation.

[26] At the same time as the organisation is being configured at the incident site, one should also consider a plan for concluding the work, so that the crews can return to their bases when the work is finalised.

[27] Some types of decisions in connection with response operations are associated with the role of incident commander. It is the decisions of authorities that must be recorded to include, among other details, the time the decision is taken, what the decision concerns and who is affected by it.

3. Emergency response operations with the focus on the need of assistance

Emergency response operation is the term normally used for the occurrence of all, or larger or smaller parts of a municipal structure for providing rescue services being dispatched to an incident site for the purpose of remedying problems in various ways, i.e. helping those in need of assistance. Once at the incident site, various types of measures are initiated, coordinated and executed under the leadership of one or more commanders/officers, and in some cases together with a staff or in collaboration with other organisations such as the police or medical services. The starting point for all of this work, however, is that a *need of assistance* has arisen – someone is in distress, cannot handle a situation alone and therefore needs help. Without the need of assistance, the entire concept behind emergency response operations is invalidated. Conducting emergency response operations is thus not a goal in itself. Furthermore, organising a fire brigade, building command systems or even discussions in terms of tactical approaches are not goals in themselves either. The starting point for the line of argument presented throughout this book is thus that an incident has occurred, or that there is in some way, a tangible risk that an incident can occur. The need of assistance that accordingly arises – in consideration to the damage that the incident produces and the object where the incident occurred – must constantly be in focus.

Definition of emergency response operations

The term emergency response operation can be viewed in its widest context. All measures that are taken to rescue something can be a form of emergency response operation. A person who is walking down the street, sees an accident and begins taking action is conducting a form of an emergency response operation. Addressed in this book, however, are the emergency response

operations, in accordance with the Swedish Civil Protection Act (2003:778), that municipalities are responsible for conducting in the event of emergencies or impending risks for emergencies so as to prevent and limit injury to people, and damage to property and the environment. A municipality is only obligated to take action if, with respect to the need for a rapid response, the threatened object's importance, the costs for the response operation and other circumstances, it is necessary for the municipality to take responsibility for the response operations. The purpose of the municipal structure for providing rescue services is not to release the individual from responsibility and liability for costs for response operations in the event of emergencies. The intention is that the municipality shall maintain an organisation that can take action when individuals do not have sufficient resources to handle a situation. A municipality shall therefore take action when it is reasonable to assume that the municipality is responsible for the required measures so as to quickly be able to prevent or limit damage or injury (Prop. 2002/03:119).

It is not always that easy to define what an emergency response operation is. Apart from legal stipulations, over a period of many years, a perception has developed that it is considered as reasonable that a municipal structure for providing rescue services takes actions to fight fires, but also to avert and limit other hazards, damage or emergencies such as traffic accidents or accidents that involve dangerous chemicals. But it is not always all that obvious as to what constitutes municipal rescue service when a municipal structure for providing rescue services is obligated to take action.

The Civil Protection Act (2003:778) provides a number of fundamental criteria for what can be considered as an emergency response operation. Above all, an emergency must have occurred or there must be an impending risk that an emergency will occur. Considered as emergencies are: incidents caused by natural phenomena or incidents that in some other way occur without human involvement; or incidents that are caused by human involvement or simply because humans have failed to act, regardless of whether this is intentional or not. In cases involving impending risk for an emergency, however, there must be concrete signs that an emergency is imminent. One should also take a certain amount of consideration to the time aspect due to the fact that measures should not always be considered as an emergency response operation even when there is an obvious risk for an emergency occurring at some point in the future.

Example 1

Maintenance work is being carried out in a silo but the stipulated safety equipment against falls is not being used. There is a considerable risk of somebody falling and being seriously injured, but it is impossible to say when this may happen. There is not an imminent danger of an incident or accident that would warrant an emergency response operation. But if somebody were to fall, there is a likelihood of it resulting in a response operation. This type of rescue work can require special equipment such as a lowering device or protective breathing equipment.

Slowly progressing or continual chains of events are thus not considered as emergencies unless an incident occurs suddenly or if there is an impending risk that an incident will occur suddenly, that the incident can be anticipated to occur at an approximate point in time and that the incident is concrete. That there is an impending risk of an emergency occurring entails both substantial probability that the emergency will occur and substantial probability that it will occur in the near future. Examples of situations when a municipal structure for providing rescue services does not normally take action can be in the event of structural damage to buildings caused by earth movement or erosion. The obligation to take action primarily arises only when there is an impending risk that a building will collapse or when erosion will obviously cause a landslide, or after a collapse or landslide has occurred.

Emergency rescue operations are often conducted in *dynamic environments,* i.e. environments that in various ways are time-dependent – events at an incident site change and develop in part independently and in part as a result of the measures taken by a municipal structure for providing rescue services. In other words, the events will change and develop regardless of if a fire brigade is present or not. One can also then say that the purpose of the measures that a fire brigade takes, and which is also the purpose of conducting an emergency response operation, is primarily to cause the events at an incident site, including the emergency's chain of events and its impact on people, property or the environment, to develop as intended by the fire brigade. In this context, one can speak of *an objective or objectives of operations*, which indicate what one wants to achieve in a certain situation, for example, to save a certain part of a burning building or limiting the release of a certain chemical. One of the important tasks of those in charge is defining and communicating such response objectives.

A response operation extends in *time* and *space* with *logistics* often constituting an important function, i.e. handling the supply of materials, production planning and physical distribution of personnel, materials, etc. Logistics encompasses planning, development, coordination, organisation, administration and control of material flows, both physical resources in the form of vehicles and equipment, and personnel. A response operation is conducted to fulfil a specific purpose, In general, one can say that this purpose is to prevent or limit injury/damage to persons or property, or in the physical environment in the event of an emergency or impending risk for an emergency. The measures that a fire brigade takes at an incident site are used as 'tools' for achieving this purpose (Svensson, 1999).

Coordination is another function of a response that must be managed, i.e. that the resources and the measures that are taken are harmonised, coordinated and synchronised into a cohesive and structured organisation so that all component parts are moving in the same direction. Coordination is dependent both on the resources and knowledge of the individuals involved, how the situation develops and the objectives of the response operation. Situational perception and coordination should be considered as dependent upon one another so that coordination is conducted based on the actual situation and the need for assistance that arises as a result of the emergency. It is naturally fundamental that decisions are

made and measures taken based on the circumstances that exist at the pertinent incident site. Making decisions or taking measures in a routine manner can create major risks and often creates more problems than one is trying to resolve.

A municipal structure for providing rescue services is not normally obligated to take action and conduct major and costly emergency response operations to save property that has no greater financial value. It may nonetheless be reasonable to conduct operations so as to protect nearby property or the environment. In such cases, one should also keep in mind that a response operation in itself can negatively impact the environment, such as when certain types of firefighting agents are used or when other risks are involved. The execution of the emergency response operation can thus also entail that one does not take any concrete measures at all in counteracting the sequence of events. If it is a matter of rescuing people or otherwise hindering or limiting injury to people, it is obvious that the fire brigade shall respond. The costs in such cases are of no importance. In the event of an emergency, or when there is an impending risk of an emergency, that in some way will negatively impact the environment, however, it can be very difficult to assess the damage and to compare the costs of a response operation against the costs of the damage that may occur in the environment. In such cases, one should obtain assistance from the municipality's environmental organisation or other expertise that can assess the damage, based on which measures are taken or not taken.

This issue can be more complicated in regard to animals. In general, a municipal structure for providing rescue services has no obligation to take action and conduct response operations in the event of emergencies that affect wild animals. It is only when injury to animals has consequences for the environment in a wider context that a municipal structure for providing rescue services is obligated to take action. This can be the case after the release of chemicals, for example. Domestic animals, however, are normally treated as property. Many domestic animals have significant monetary value, both horses, and cattle and pigs. Ethical values can, however, can lead to a municipal structure for providing rescue services allocating resources to rescue domestic animals having no greater monetary value, such as pet dogs and cats. In such cases though, the risks should be carefully considered in regard to personnel and any deficiencies in *preparedness production.*

Example 2

There are fires in two areas of a forest. The long distance between them means that they have no physical effect on one another, and there is no direct physical connection between them. There is, however, a dependency between them when it comes to resources. For example, only one helicopter is available and the use of this must be optimised as it is a limitation resource, i.e. a resource that in some way limits what can be achieved with regard to the two fires. Maintenance service, public assistance in accordance with the legal possibility of enforcing compulsory service and other resource aspects may also need to be coordinated between the two. The basic criteria for what a rescue service is can otherwise be considered as fulfilled in the example. Seen from a damage perspective the fires can be taken as involving two separate emergency response operations. But seen from a resource perspective they should perhaps be considered as involving a single operation. The resources are, then, the limiting factor and the manner in which they are to be handled needs to be taken into account when the response operation or operations is or are being defined. Irrespective of whether this is taken as one or two response operations, it is important that all those involved share a common view of the situation. There is no obvious solution to this type of problem, but agreement must be reached and decisions made, if not beforehand, then when the situation arises.

Example 3

After a long period of heavy rain and large quantities of water from melted snow causing extreme rates of flow into rivers and lakes, flooding has occurred upstream from a dam, and a number of buildings are threatened. Considerable effort is being made to erect barriers to protect these properties. Additional sluice gates need to be opened to prevent the water rising faster than the protective barriers can be built. But this would result in the same problem occurring downstream where barriers are perhaps also being erected to protect property. The consequences of the physical phenomenon can then occur in a completely different geographic location to where measures, in this case opening sluice gates, are applied. The other measures are being taken at two widely separated locations but despite the distance between them, they are subject to a common physical dependency. In such situations it can also sometimes be necessary to act on the legal right to infringe the rights of others, in this case, in two different places. What is more, it is very likely that the problem will be transferred from one municipality to another, which further complicates the issue. Here, it is largely the physical perspective of the course of events that will determine the scope of responsibility of the response operation or operations. All the organisations involved need to cooperate and be coordinated. It has never been the purpose of legislation to create a situation where a municipal rescue service should alone manage all the possible emergency situations that can arise.

A continual weighing must be conducted between maintaining preparedness and conducting response operations or taking action in the event of impending risks for emergencies. Not even in smaller municipalities can one ignore the fact that a fire can occur at the same time as a traffic accident, or that two traffic accidents can occur at the same time at different geographic locations. A fire chief must therefore be prepared in various ways to be able to allocate resources or make informed decisions on how resources are utilised.

The issue of defining an emergency response operation is also influenced by whether one, two or even more operations are concerned. This issue is of interest both from an organisational perspective and when it comes to the responsibility issue.

The issue of whether it is a matter of one or two response operations must be defined from case to case. There is normally no right or wrong; it is instead up to the fire chief to take a position and make decisions. In taking a position, there are a number of factors that one should take consideration to: These factors include:

Physical perspective of emergency developments

- Object
- Size, type, natural boundaries, etc.
- Scope
- Amount of damage
- Cause-effect

Resources

- Competition for restricting resources, i.e. resources that restrict what can be implemented or achieved

Organisation/management

- Organisational coordination benefits of joint management
- Practical/organisational (maintenance service, transports, etc.)
- Geographic proximity
- Capability to survey operation(s)
- Collaboration with other organisations

The definition of an emergency response operation or operations should be made based on the alternatives that provide the most/best benefits based on the factors above. In the event of very large incidents, within the framework of one and the same response operation, there can be several affected areas with one or more incident sites within the respective affected areas.

An additional problem is that one seldom reflects over the rescue service concept other than when financial reimbursement is at issue (and hardly even then). There is also a need to examine the rescue service concept from a management perspective.

Objects and damage/injury

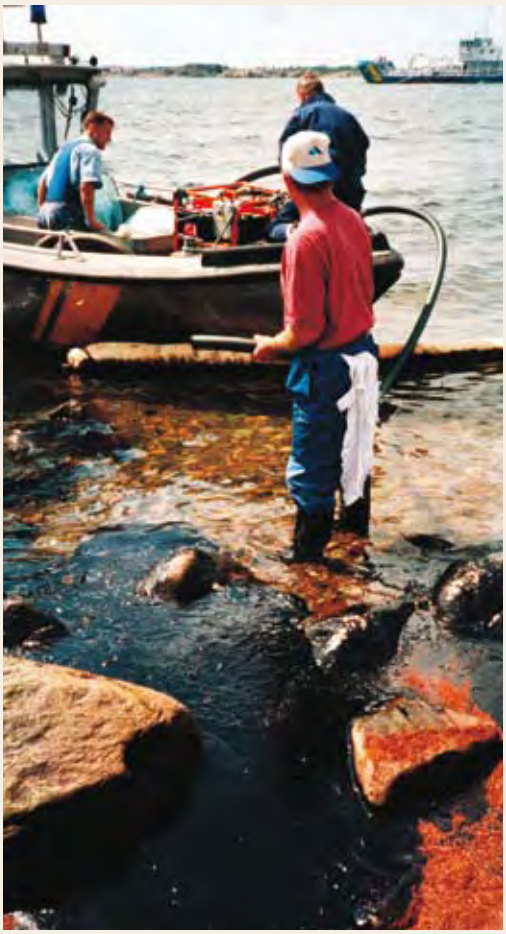
When it comes to determining what an emergency response operation is, one should differentiate between *objects* and *damage/injury*. Damage/injury can be the same for two different objects, but the objects can have different values. It may also be that the objects are equivalent but that the damage/injury significantly differs. As the person in charge in conjunction with response operations, one must thus deal with three factors: objects, damage/injury and resources. Resources are further discussed in the section on satisfying needs for assistance.

Basically, it is some form of *object* that is subjected to the risk for *damage/injury.* The object can be a person, property or the environment. Property can be divided into various categories, such as medical facilities, dwellings or objects that are parts of the public sector's infrastructure. For this type of object, it can be worthwhile to be able to identify the object's design, for example, in the form of bearing capacity, various structural elements, active safety systems, such as detectors and sprinkler systems, and other types of control and regulating functions. Depending on the type of object that is threatened, there are various societal consequences. Accordingly, a fire in an object that constitutes a part of the country's power supply, for example, can have serious consequences for society on a wider scale. Different forms of damage/injury can also occur. Examples of these are discharges of chemicals, water leaks and fires in kitchens. Sometimes a fire brigade's personnel can find themselves in situations in which different objects, such as dwellings or offices, are subjected to the same type of damage, for example, water damage caused by cracked pipes. Even if the damage is the same, the objects can be of sufficiently different character that one must make entirely different assessments and prioritisations. The situation can sometimes be such that two similar objects (for example, two single-family dwellings beside one another in a residential district) have different types of damage (for example, fire damage and water damage). Despite the similarities of the objects, the character of the damage differs and different assessments must be made. The categorisation can

be a basis for formulating priorities, for example, for what is to be achieved and how the resources will be allocated, for example, between several different ongoing response operations. The distinction can also be useful in certain situations for determining in which respect a response operation should be expanded. If an operation expands, one can, for example, ask oneself if the damage will increase or change character, or if the number or type of objects will change.

Even in the event of individual physical damage, i.e. during a single emergency response operation, one should reflect upon the

Example 4



An oil discharge has occurred in a harbour area. Booms have been placed out, which had limited the damage caused. However, as this took some time, a quantity of oil spread outside the boomed area, something that the incident commander did not notice or could not oversee. Involvement by a senior commander may be necessary in order to allow for a broadening of the geographic framework by, for example, increasing management capacity with the help of staff or by introducing a further level of command. Another alternative would perhaps be to divide another organisational element to create a second response operation.

framework of operations, i.e. which physical and mental limits the response operation is within. The most common is that the geographic limits are constituted by the normal cordoning off of the incident site. But the damage can in some cases extend beyond these boundaries. It can be necessary for a higher management level to determine which geographic overview the person in charge at the incident site has. It can, for example, be difficult for an incident commander, who physically or mentally is working very close to the incident site in a stressful situation, to have control over more than the area closest to the damage. Stress can create a type of tunnel vision and there may be physical limits as to how large an area that an individual can visually survey.

One may also need to identify within which framework that incident site command takes actions when in comes to injured persons. If both long-term and short-term effects of an emergency are considered, there can be a very large number of persons who are affected to larger or lesser degrees. It can then be necessary to define the emergency response operation based on the needs of the affected persons. One should then be aware that these needs can vary widely for one and the same response operation. The persons affected by an emergency are not a homogeneous group. However, once the emergency stage has passed, the events are no longer considered as municipal rescue service. Nonetheless, a municipal structure for providing rescue services cannot ignore the fact that the persons affected require further assistance. These people may require assistance from another party or be offered assistance from another source. As an example, it may be necessary to contact the municipal social services.

Fire chief and incident commanders

A *fire chief* is primarily responsible for ensuring that operations are appropriately organised for the tasks at hand, regardless of the number of ongoing response operations or if operations are being carried out at all. A municipal *incident commander* is appointed when an emergency response operation is initiated and there shall be an incident commander for each operation. According to Swedish law, the fire chief is the incident commander. However, he or she can appoint another person to serve as the incident commander, but still retains overall responsibility for operations. Because the fire chief appoints incident commanders, it follows that it is the fire chief's responsibility to initiate emergency response

operations. The fire chiefs's command function thus remains active.

Incident command can thus be considered as loaned out. As necessary, the actual orientation of a response operation can be influenced by decisions made by the fire chief, and the appointed incident commander must follow the instructions and directions issued by the fire chief. The fire chief may, for example, in conjunction with assigning an incident commander, limit this person's authorities. If the incident commander does not comply with the issued instructions, the commission can be withdrawn. If several emergency response operations are underway simultaneously, the fire chief has overall responsibility for all response operations. The fire chief must in such cases, among other things, decide upon a distribution of resources, appropriate for the tasks at hand (Prop. 2002/03:119).

The fire chief can influence the orientation of response operations through the *aim of operations*. In turn, the incident commander can influence the orientation of an ongoing response operation through the *objectives of the operation.*

The incident commander's duties and authorities are regulated by the Swedish Civil Protection Act (2003:778) and the ordinance on civil protection (2003:789). These duties and authorities primarily encompass:

Infringement on the rights of others. If a risk to life, health or property, or for damage in the environment cannot be suitably counteracted in any other way, the incident commander and participating personnel may during an emergency response operation effect entry to another person's premises , cordon or evacuate areas, use, remove or destroy property, and make other infringements on the rights of others to the degree that the infringements can be justified with consideration to the character of the risk, the damage inflicted through infringement and other circumstances. The police shall provide any necessary assistance in the event of infringement on the rights of others. The person who has decided on cordoning or evacuation shall to a reasonable degree, assist in arranging accommodations for those requiring such as a result of the measures taken. Infringement on the rights of others can, for example, concern taking measures that entail confiscating materials or equipment for use during a response operation. It can also involve measures that entail that property is destroyed or lost without this entailing any complementing of the rescue entity's rescue equipment.

Requesting *official duty.* When necessary, everyone between 18 and 65 years of age is obligated to participate in rescue service to the degree permitted by his or her knowledge, health and physical abilities. Official duty shall preferably be performed by volunteers.

Requesting *assistance from another government authority.* A national authority or a municipality is obligated to participate in an emergency response operation upon the request of the incident commander. Such obligation only applies if the authority or municipality has appropriate resources and if participation will not seriously hinder normal operations.

To report certain *observations.* If in conjunction with a response operation, a deficiency or unsatisfactory state is discovered that can lead to another emergency or fire, the incident commander shall notify the authorities of such conditions.

To *conclude the emergency response operation.* The decision shall be documented in writing. When a response operation has been concluded, the incident commander shall if possible, notify the owner or the beneficial occupier of the property that was affected by the response operation of the need for security, salvage, decontamination and clean-up work. If security is necessary due to the risk for new emergencies but is not deployed, the incident commander may provide security at the expense of the owner or beneficial occupier. The police shall assist as required.

The intention of these authorities, especially that of being able to infringe upon the rights of others, is to enable rapid and effective operations.

Decisions may not be made on an arbitrary basis or due to customary procedures. This especially applies to such decisions that entail limitations to citizens' constitutional rights and freedoms (1974:152/RF). Decisions on measures shall be possible to relate to laws and their paragraphs. When a certain piece of legislation is applied, the means of coercion shall be related to the intention the legislators had in enacting the legislation in question. A means of coercion may only be used if necessary for resolving the task at hand, and if the reason for the measure outweighs the effect of the infringement upon the individual. 'Infringement

on the rights of others' as regulated by the Civil Protection Act provides the incident commander with considerable authorities under certain circumstances and one should exercise these authorities with moderation.

The Swedish Penal Code (1962:700) also permits lesser and urgent infringements if necessary. The Penal Code, however, grants no authorities. This entails that measures that would otherwise have been punishable by law, may under certain conditions be conducted without being subject to punishment, even though such measures nonetheless constitute criminal behaviour. Note that this is a contingency stipulation that cannot be used as a basis for conducting planned operations. Here there is no distinction between rescue personnel and the general public.

Definition of an emergency response operation must be based on actively taking a position. Besides the criteria in rescue service legislation, this taking of a position should embrace resources, damage and objects. Note that this taking of a position ultimately concerns a municipal structure for providing rescue service's ability to handle the entire need of assistance that can arise as a result of emergencies. This need of assistance must therefore be central for conducting emergency response operations and for assessment of what is and what is not an emergency response operation.

4. Leading and being led

For emergency response operations that are extensive, that continue over a long period of time, that involve large numbers of personnel or personnel from several different organizations, there can be a certain risk for uncertainty as to who is in charge on various levels at incident sites. Issues concerning responsibilities, obligations and authorities thus also become uncertain. The Swedish Civil Protection Act (2003:778) stipulates that in a municipality, there shall be a *fire chief* and that this person or a person appointed by the fire chief is the incident commander. It is also stipulated that the operational commander shall lead response operations. If the fire chief has appointed another person as the incident commander, the fire chief still retains overall responsibility for operations. The appointed incident commander must follow the instructions and directions issued by the fire chief. In other respects, the Civil Protection Act includes no stipulations regarding the relationships between management personnel and other personnel.

The Civil Protection Act includes stipulations concerning the incident commander and this person's responsibilities, obligations and authorities, primarily as related to third parties and other organizations. The act clarifies, among other things, the relationships between third parties and a municipal structure for providing rescue services. The stipulations concerning incident commanders are insufficient in describing and clarifying the internal distribution of responsibilities, obligations and authorities. There is, however, another piece of legislation that also applies to the execution of emergency response operations, not the least in matters of responsibility relationships between management staff and subordinate personnel.

Labour legislation and labour management legislation

Fire brigade personnel are employed by a municipality and there is normally some form of agreement or employment relationship that regulates the individual firefighters', as well supervisors',

relationship to the municipality as an employer. The issues related to management staff's responsibilities and duties therefore actually deal with who is the employee and who is the employer, or rather the employer representative (Glavå, 2001). The relationship between various management levels is normally considered as the relationship between the employer and employees. However, it is not always clear as to who is the employer or employee in an employee-employer relationship. Here one can speak of *labour law*, which is an umbrella term for the rules that govern working life.

There is normally some form of employment agreement that regulates the relationship between the employer and employees. The employment agreement is a form of collaboration where the employee places his or her labour at the disposal of the employer. The collaborative form is based on what is called subordination, i.e. a superior-subordinate relationship. This is expressed by the employee performing labour on behalf of the employer, in compliance with the employer's instructions and under the employer's leadership. Moreover, this interaction is ordered in a societal context. Such an employment agreement is thus based on loyalty. In this context, the employee shall (Glavå, 2001):

- Perform work for or on behalf of the employer
- Work under the employer's leadership
- Be reimbursed for labour (salary or equivalent)

Collective labour agreements regulate a large portion of the conditions at a workplace. A collective labour agreement is an agreement that deals with, among other things, salaries, working hours and holiday compensation. Collective labour agreements entail that everything can be improved but nothing worsened. At each workplace, the employee may improve his or her conditions through local negotiations. Similarly, an employer can always provide better conditions for his or her employees. The collective labour agreement does not regulate how good a workplace *can* be, but rather how good it *must* be. Collective labour agreements also make working life more effective – no unnecessary negotiations are needed in matters that one is already in agreement on.

Through employment, employees perform tasks that are stipulated by the employment agreement and the other agreements that

are related to employment. An agreement between an employer and employee on employment is based on a certain performance of labour. Such an agreement also includes the right/obligation for a party, in this case the management employee, to serve as the employer's representative in dealings with other employees. Fundamental issues for such agreements include:

- That work is conducted under the leadership and control of one or more supervisors. In certain cases, however, the degree of control can be low due to the employee being more knowledgeable of the detailed execution of a particular task. In this context, one can speak of *management by objectives*, with the person in charge specifying the objective of a task and the employee being given greater or lesser degrees of freedom in executing the task in a manner that he or she deems suitable.

- That working conditions are not necessarily of a permanent nature. No demand for permanency is set as a criterion for employment; entirely temporary work can be considered to be included in employment. The employee shall execute tasks that the employer or the employer representatives (in our case, an incident commanders or fire chiefs) specifies as work is in progress. It is thus not always a mater of predefined, restricted tasks, especially in conjunction with emergency response operations. The tasks are normally determined based on the current situation. For example, in the event of a traffic accident, certain types of tasks are performed, while in the event of a fire in a flat or an accident that involves large amounts of dangerous goods in a densely populated urban environment, entirely different tasks are performed. The way of working, equipment and even the risks associated with the tasks obviously vary. It is in the nature of the employment, which in turn is in line with the municipal structure for providing rescue service's duties as required by law and the associated legal stipulations to prevent or limit injury/damage to people, property and the environment.

- That work is normally conducted using the equipment, machinery and implements provided by the employer. This also requires that the employer has given employees the opportunity, through time, money or other methods, to train in how

the equipment is used, and that the employer ensures that the knowledge required to execute tasks with the equipment is available. In addition to the employer placing reasonable demands that employees are well-familiar with their equipment and are able to handle it correctly, there should reasonably be an interest of sorts on the part of the employees in being able to correctly use their equipment. Through employment, the employer can also place certain demands on various forms of training being conducted with and for employees.

- That employees receive reimbursement for direct outlays and reimbursement for labour in the form of salary. In certain cases, labour can also be exchanged for time off.

In our case with municipal structures for providing rescue services, with the municipality being the employer, the fire chief is thus an extension of the employer in dealings with employees. I.e. those holding management positions at municipal structures for providing rescue services are employer representatives. This entails that it is the duty of those holding management positions who take part in emergency response operations to ensure that tasks are distributed and executed by the employees.

The employer's right to make decisions in matters of how tasks are distributed and executed may not, however, be exercised in an arbitrary or otherwise improper manner. This can also be expressed as the employer's right to make decisions that are not in conflict with laws and good practices. This places certain demands on those in management positions at municipal structures for providing rescue services, such as demands on competence and good judgement. The person in charge is also an employee, but in this case the municipality is the employer (possibly represented by a senior management employee), which means that the relationships described in this section also apply to management staff as employees. Because there are several management levels, i.e. there are subordinate and superior relationships between the persons in management positions, the relationships between them are similar to the supervisor-firefighter relationship. Even here, there is consequently a relationship between employees and employer representatives.

In this context, one can speak of *labour management rights*. Labour management rights specify starting points in both everyday ope-

rations and in conjunction with emergency rescue operations (Glavå, 2001). In regard to labour management rights, it generally applies that the employer has the right to, among other things, decide who executes tasks, which tasks will be executed, in which way they will be executed, the location at which they will be executed and which equipment will be used. In a corresponding manner, the employee is obligated to execute the prescribed tasks, i.e. the obligation to execute the work assigned. Labour management rights thus entail, among other things, that it is the employer who decides which technical equipment will be at a workplace and how it will be used, and the employee is obligated to follow the instructions issued by the employer. Labour management rights shall also be reasonable from the health and safety perspectives and may not conflict with laws or good practices. The Swedish Work Environment Act (1977:1160) also regulates work and its execution in different ways. This act thus not only focuses on preventing accidents and poor health at workplaces, but also on work content. The intention is that the working environment shall provide positive yield in terms of rich job content, job satisfaction, camaraderie and personal development (Work Environment Authority, 2004).

The employer's labour management rights also include a right to enforce regulations (Glavå, 2001). Also note that the employer, within the framework of this regulatory right, can demand medical examinations, for example. Even if the employer's regulatory right is extensive and applies as a starting point, it is not unrestricted. The employer's regulations may not conflict with laws, good practices or in any other way be excessive or unsuitable, and they may not entail infringement upon the integrity of the individual. When it comes to the employer's intentions of regulating the employer, normally the need for safety regulations should be greater than efficiency regulations or regulations related to maintaining order, not the least in conjunction with emergency rescue operations. Efficiency and order should be regulated using other means or in other contexts, such as through training.

Working environment responsibility

The employer also has *working environment responsibility* and this responsibility in turn has two aspects: safety responsibility and liability responsibility (Work Environment Authority's website).

Safety responsibility entails the obligation to take measures to ensure that the working environment is satisfactory and that any risks are eliminated. This responsibility is distributed among a number of different roles, with safety responsibility being different for the different roles and it can be limited to various degrees. The employer has the most extensive responsibility and is obligated to take all reasonable measures needed to safeguard employees from poor health and accidents. Moreover, safety responsibilities for the various roles do not exclude one another. On the contrary, it is normal that in each situation that there are several roles, each with its own responsibility. Additionally, it is often said that 'everyone is their own safety representative.' Particularly in conjunction with emergency response operations, all involved must be able to determine and asses the risks they subject themselves to, and when necessary, suspend work. This does not relieve the person in charge from his or her obligation to make corresponding assessments. During emergency response operations, one must also weigh what can be achieved against the risks involved. The employer is also obligated to ensure that personnel are competent and make the assessments that are necessary for safety responsibility. The risk to personnel must be in reasonable proportion to what can be saved, and this is an assessment made in each individual case.

Liability responsibility entails establishing who will be held responsible for any accidents or incidents after the fact. The internal distribution of labour and responsibility is not a determining factor in assigning liability responsibility but is normally of significant importance in court proceedings. When hearing a case, consideration is taken as to whether the responsibilities that a natural person has been assigned are counterbalanced by sufficient authorities and resources, and that the person has sufficient competence for working environment responsibility. The proceedings also concern clarification of whether the person has acted wilfully or carelessly.

The responsibility issue and distribution of responsibility are internal matters. It is an aspect of management responsibility to establish such distribution. This responsibility also includes following up the distribution that has been made and ensuring that it functions smoothly, and to intervene if necessary. The distribution of responsibilities and authorities in municipal structures for providing rescue services is an issue that

is at least as important as identifying the incident commander. Both for safety and practical reasons, it is important that an organisation is always clear as to who commands whom and how both responsibility and authorities is distributed. It is the employer (the person in charge) who ultimately determines which risks can be taken in order to achieve a specific objective, even if the employee must also be able to make this assessment. Especially in conjunction with emergency response operations, it can be difficult for a person in charge to make the entire assessment alone, for among other reasons because this person does not normally have access to the inside of a burning building.

A fire chief is always the senior commander and thus responsible, regardless of whether he or she is at the incident site or not. On the other hand, the role of incident commander, for example, can change during an ongoing response. The incident commander role should logically be held by the person having the greatest benefit of the associated authorities, or who can be considered as most competent, based on the situation's demands and needs. Here as well, one should consider *role logic* and how one has chosen to organise in other respects. This can, for example, entail that it is not necessarily the person with the highest formal competence at an incident site who is the incident commander. This naturally also depends on how one defines the competence concept. However, one should keep in mind that as stipulated by law, an incident commander leads response operations and he or she decides how they will be conducted and which rescue measures will be taken. The purpose of appointing an incident commander is to make emergency response operations as effective as possible and to avoid uncertainty as to who is responsible for efforts in conjunction with the operation. Incident commanders have been assigned special authorities and duties in relationships with third parties in leading operations. Among other things, there is the issue of measures that entail the exercise of authority.

Delegation, decisions and exercise of authority

Delegation entails that one transfers decision-making rights to another person (Andersson, et al., 2002). The entity or the individual having the authority to make decisions in a specific

matter or in certain types of matters, can for various reasons want to commission someone else, a so-called delegate, to make certain decisions. A smoothly functioning organisation requires that decision-making rights not be concentrated to a single central entity or a single person. By distributing decision-making rights to the person or persons who have the best opportunity to survey the consequences of a decision, one gains a more effective organisation, and quicker and simpler decision channels. The central entity can focus on general and principle issues, while issues that are often recurring, of a routine character, or that require some form of surveyability or knowledge of details, are decided upon at a lower level. Issues of a more general nature can concern, for example, decisions on the degree of preparedness in a municipality or how resources will be moved or distributed depending on, among other things, the risk profile in the municipality, for example, when several operations are underway at the same time and one simultaneously wants to maintain a certain preparedness so as to deal with any other alarms that are received. Also included here is making assessments so that the needs of assistance that arise during emergency response operations are satisfied. Decisions that more concern individual response operations or even limited portions of a response operation can, for example, concern which task or tasks will be prioritised by a full suit firefighting team, such as sealing leakage or cleaning up released chemicals.

A fundamental rule is that the individual or entity that surrenders decision-making rights cannot divest itself of responsibility. That which is delegated is only the authority to make decisions in certain matters. The responsibility for these decisions always remains with the entity that decided on the delegation. In conjunction with work at an incident site, this can entail, for example, that the person delegating a decision-making right must ensure that the person receiving this delegated decision-making right has the competence and the equipment required for the task at hand. The delegation would otherwise be rather pointless. A reflection in this context is that some form of resource is needed for a municipal structure for providing rescue services to be able to resolve the problems it is confronted with. It is thus not enough to be responsible or to make decisions in certain matters; one must also actually resolve the problem at hand, i.e. the emergency, by conducting certain types

of measures or in some other way utilising available resources. This may seem obvious, but there must be a realistic connection between the decisions made and the tasks assigned, and the capability to actually perform the tasks. See the Swedish Municipal Act (1991:1990) for more information.

One should also differentiate between *decisions, implementation and preparatory measures* (Andersson, et al. 2002). In routine operations, a large number of decisions are made that are not formal decisions in the spirit of the law. This primarily concerns measures lacking in independence that are of a purely preventive or implementive nature. Typical for such measures is that they do not include any decision alternatives or selection options. Examples of such preventive measures can be preparing and producing materials for decisions that are to be made by senior staff members, or issuing directives as to how certain tasks are to be performed. Operational descriptions and instructions usually concern matters related to a normal distribution of work among the employees. In these cases, delegation is not an issue. The use of equipment and decisions of a purely implementive character, which are necessary for correctly using equipment, are matters that should be addressed in conjunction with, for example, training. For example, en route to an incident site, a municipal structure for providing rescue services takes so-called preparatory measures or makes certain decisions in order to be prepared for tasks at the incident site. Such preparatory measures or decisions are thus normal and not formal decisions in compliance with the spirit of the law. Here it can be more relevant to speak in terms of labour management.

Upon delegation, delegation should concern actual decision-making rights, i.e. such decisions that if delegation had not occurred, would normally rest with the administrating and implementing entity. Characteristic of such decisions is, among other things, that there are several alternative solutions and that certain considerations and assessments must be made. It is unavoidable in many cases that the boundary is fluid between what constitutes a decision that can be subject to delegation and what is to be regarded as purely implementive. The delegation should also be considered in advance, including within which time or space the delegate has to work. An incident commander, who is tasked with leading work during an emergency response operation, is ap-

pointed by a fire chief. This is done in advance in the great majority of cases and the work that a fire chief at a municipal structure for providing rescue services conducts is in accordance with plans established beforehand in some form of delegation structure. The delegation structure should specify who is superior to whom at an incident site, as well as at other times. An operational commander also has a superior who can provide the incident commander with guidelines or directives for how work is to be conducted during a response operation.

If a specific delegation structure has been specified for who is superior to who at a municipal structure for providing rescue services, this does not exclude a senior commander from making a so-called *command visit*. The fire chief appoints a person as the incident commander for an incident calling for a municipal emergency response. This is often a practical issue, because one and the same person (the fire chief) can hardly be expected to serve as an incident commander in the event of simultaneously occurring emergency response operations. Note that certain difficulties can arise in cases in which the fire chief is the incident commander during a response operation. Assume, for example, that an emergency has occurred and an incident commander (not the fire chief, however) is at the incident site and leading operations. The fire chief can visit the incident site and conduct a command visit, without assuming the duties of an incident commander. The fire chief is still superior to the incident commander, regardless of whether the fire chief is at the incident site or not. The fire chief cannot divest himself of overall responsibility for the response operation being conducted by the incident commander within certain given frameworks. The incident commander must observe the guidelines and instructions that are issued by the fire chief. The fire chief can appoint a new incident commander, even during an ongoing response operation.

If units from several municipalities are involved in the response, the normal delegation structure applies in the respective municipalities. The incident commander at the site is responsible for conducting operations, while the assisting organisation retains its ordinary command structure if not otherwise regulated through agreements or similar arrangements. This is a form of collaboration between authorities, which entails that the assisting authority should also dispatch a commander to serve as the employer representative from the assisting authority. Regardless of how one resolves the

issue from one case to the next, it is still, however, the assisting authority that is the employer of the personnel who are sent out. The municipalities are normally expected to resolve these issues through collaboration and cooperation. As previously discerned, it was never the intent of the lawmakers that the individual municipalities would be able to deal with all emergencies that arise.

The municipal structure for providing rescue services is a municipal administration even though one conducts emergency response operations. At the same time, the Swedish Civil Protection Act provides this structure with a number of authorities, obligations and a certain amount of responsibility in certain types of situations. The reasoning behind the relationships between employers and employees, delegation structure, etc., however, does not exclude that one in various ways must adapt responsibility relationships to the situation at hand in conjunction with conducting municipal emergency response operations. A delegation structure must include the capability to create a flexible management system, which in turn should be based on the needs for assistance that arise during emergencies. One should keep in mind that an incident commander's authorities are primarily directed towards third-parties, while labour laws are directed towards one's own organisation.

Certain types of decisions shall be documented. This primarily applies to decisions with a clear connection to legislation, or so-called authoritative decisions, and decisions that concern the individual, such as decisions on infringement on the rights of others, requests to perform official duty and decisions concerning the termination of rescue services. Here one can speak of the exercise of public authority (administrative law 1986:223 and Andersson et al., 2002). *Exercise of public authority* means that an authority, or entity that represents an authority, exercises its authorities to make decisions concerning individual citizens on benefits, rights, obligations, disciplinary actions, dismissals or other comparable matters. This concerns both positive and negative decisions for the individual. What is decisive here is that the authority's actions are supported in law and that the individual (citizen) is in a position of dependency in relation to the authority.

In the exercise of public authority, both measures taken and measures not taken, i.e. failure on the part of the authority or the representative of the authority to take measures

as required by law or ordinances, or that one can otherwise expect. Both decisions to take measures and to not take measures must be documented. Criminal liability for misconduct in the exercise of public authority not only embraces those who independently make decisions, but also those who carry out tasks related to such decisions. Subordinate personnel such as office workers with duties limited to paperwork and dispatching, for example, are exempt. In conjunction with emergency rescue operations, this can entail that several supervisors can be criminally liable in the event of misconduct, but those who carry out decisions, often firefighters, are not criminally liable because firefighters cannot normally view a response operation in its entirety. This assumes, however, that the decision does not lead to obviously improper conduct or failure to act, even on the part of firefighters. As discussed previously, the employer must provide equipment for executing tasks and the employees must train and exercise in using this equipment. This reasonably entails that there is a certain responsibility on both the part of employers and employees to utilise new technology and new methods.

5. Organisations, groups, leaders

In encounters between people or groups of people, many different types of relationships arise. These relationships create the preconditions for how different situations are dealt with. In these relationships or preconditions, what is often called leadership occurs. The definitions concerning the leadership concept vary, depending on which literature one consults or who one asks. Leadership is often an elusive concept, but with the help of a number of general layperson perceptions, a better understanding can be gained of what leadership entails (Bolman, et al., 1995). The first tells us that leadership is the ability to get other persons to do what we want. This perception equates leadership with power, which is a rather generous definition, while at the same time it represents a very narrow definition of leadership. Another common perception of leadership is that leaders through leadership motivate people to get things done. Results are thus an important aspect of leadership's implications. A third perception of leadership is that leaders provide visions, which adds the factors purpose, objective and vision. An additional perception of leadership is that it concerns facilitation, i.e. a participative, democratic, facilitative and supportive task that helps co-workers or followers to find their way and fulfil their tasks.

Besides these laypersons definitions, researchers in the field also have their definitions concerning leadership. These definitions are fairly similar. Hogan, et al. (1994) writes that leadership deals with persuasion, not coercion. Those who cannot get others to perform tasks for them through either their power or position are not leaders. Leadership only occurs when other people comply and follow certain objectives that are placed in or for a group. There is a relationship between cause and effect, and a relationship by definition between leadership and a group's performance. This is described by Hogan (1994) as persuading people to temporarily put aside individual opinions and following a common ob-

jective that is important for a group's area of responsibility (task) and welfare. Moreover, he writes that the criterion for leaders is 'performance of teams', i.e. quality of leadership is demonstrated in the group's performance and accomplishments. This view of leadership seems suitable from a rescue service perspective.

To understand the implications of leadership and their significance for behaviour in various types of emergency response situations in which a number of factors, such as stress, will be influential, one needs to be aware of what a group is, what affects the group's existence and reactions in various situations, and the individual's manner of acting and reacting in relation to other people. Individuals and groups often belong to various types of organisations. One should therefore also be aware of what an organisation is, what controls and influences an organisation's functions, and the forms that relationships between individuals, groups and organizations can take.

Organisations

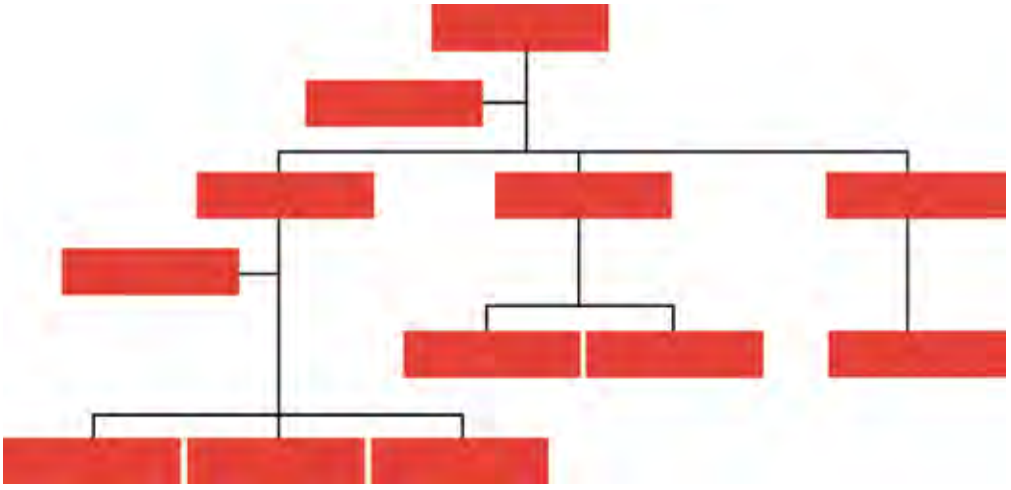
An organisation is a group of people who share a certain amount of tasks and thus constitute a system with differing roles. The fundamental concept of organisations is that through cooperation between individuals, one achieves objectives more effectively than through individual efforts. The effect of several individuals cooperating to attain a common objective is greater than if each individual worked alone, even if working towards the same objective.

A formal organisation is generally characterised by:

- There being a distribution of tasks and that the individuals in various ways are specialised.
- That work is coordinated and controlled in some manner.
- That there is more or less expressed leadership – someone is the leader and someone else follows this leader.
- That there are one or more objectives.

The focus here will be on formal organisations, in contrast to social organisations. The term social organisation refers to general interaction between people, both internally within formal organisations and externally.

An organisation is important for the individuals and groups that are included in the organisation in being able to see their roles in a larger context. In this way, the organisation creates a sense of security for the individual, which can be needed if one is



An example of an organisational structure, in this case the elements and role relationships in a line-staff organisation.

to work in a hazardous environment and where people may have been severely affected by accidents. Unfortunately, this can be a disadvantage if in conjunction with an emergency response operation, for example, one is forced to abandon established organisational plans due to the situation and the problems that are to be resolved necessitating certain restructurings. Such restructurings can lead to the individual losing his or her sense of security.

Let us now regard the organisation as a system. This approach entails that the organisation consists of a number of parts that are interdependent and that have various types of relationships to one another. The component parts and the relationships between these parts determine the system's structure. A whole is thus formed by the parts and relationships, where both the component parts and the relationships will jointly characterise the system's characteristics. When one speaks of organisations, most people probably picture some form of structure, i.e. which parts are included and how these parts relate to one another. This leads one's thoughts to some form of organisational chart.

For the organisation to function, a general concept for the organisation's tasks is required. Normally, such a concept is formulated based on the principal interests' expectations on the organisation. One can say that the legal formulation 'to prevent and limit injury/damage to persons, property or the environment' constitutes such a general concept on a high level. In everyday work, the general objective must be broken down into sub-objectives and concret tasks. For the organisation to function effectively, even during emergency response operations, one should have a form

of general concept in conjunction with these operations. What is important here as well is that one formulates a general concept that is based on the principal interests' expectations, i.e. in this case, based on the needs of those seeking assistance. It is no end in itself to organise in a certain manner at an incident site. The organisation is there for a specific purpose, and in conjunction with the execution of an emergency response operation, this purpose should be fairly concrete and clear due to the fact that one establishes clear objectives for the response operation.

For practical reasons, it is naturally impossible to create an entirely new organisation each time an emergency occurs. Some form of basic structure is needed, or at least that the component parts of the system are ready. Even if one can create a large portion of the relationships between the parts at the incident site, and add several new parts (such as by creating more resources), certain parts and their mutual relationships must be prepared beforehand, not the least for reasons concerning labour and environmental law.

The organisation at the incident site, or otherwise in conjunction with emergency response operations, must serve as an aid. This is in part for the benefit of personnel, but primarily for the assistance work that is conducted. This entails that the organisation that is established for dealing with an emergency must take consideration to the problems that are to be resolved (on both the short and long term), how one intends to resolve these problems and available resources. Moreover, one must consider the responsibility issues and weigh available competence against the roles that are necessary for conducting the tasks and the expectations on these roles that arise.

An important aspect is that the organisation at an incident site must be built from beneath. One can call this a from-beneath perspective, which entails that the system's structure must be based on the current situation and on the current need for assistance. In this respect, one must sometimes take consideration to, among other things, the number of units in the management system that each supervisor can handle.

Groups

Svedberg (2003) provides three definitions of groups. According to the first, a group consists of two or more mutually dependent individuals who influence one another in a social interaction. The second definition maintains that a group exists when two or more persons define themselves as group members and when the group's existence is recognised by at least one other individual. According to the third definition, a group is a number of persons who communicate with one another during a certain period. According to this definition, each person must be able to communicate with the others but they need not be at the same geographic location.

Napier and Gershenfeld (1981) maintain that the following requirements must be fulfilled for one to be able to retain the group as a group:

- Membership must be established. One knows who the members are.
- The members have a perception of the group as organised, i.e. the members are not at the same location by chance.
- There is a sense that the members have a common purpose.
- The members can explain why they are in the group.
- There is a sense of sympathy and non-sympathy between the members and this provides feedback among the group members.
- There are expectations that are established by the group as to how the members are to conduct themselves in various situations.
- There is a policy or rules for leadership.

These requirements on a group can be reasonably considered to apply to rescue services. Through employment, formal membership is established and the employees feel that they belong together, and that the group, which is included in a municipal structure for providing rescue services, has some form of common purpose. The formal membership issue is resolved, but this does not necessarily mean that it complies with the definition of the group concept in other respects. The group members provide support to one another, they know how to behave in interaction with one another and how they are to work together, not the least in conjunction with emergency rescue operations. Moreover, there are certain more or less established rules for management roles and leadership. In groups there are often different forms of sta-

tus systems where one or more individuals in various ways raise themselves above others in the group. There is a hierarchy within the group. Such hierarchical systems can vary in strength and have varying degrees of significance in different groups. Within a municipal structure for providing rescue services there is also a formal hierarchy in the form of various management levels, i.e. established subordination relationships between those in management positions, or between employers and employees.

According to Heap (1980), groups can be divided into primary and secondary groups. A primary group is a group that has so few members that one has direct personal contact with all group members, face to face. The personal relationships within the group are such that one is able to develop long-term and reciprocal relationships. The family is described as the most common example of a primary group in that there is reciprocal identification and influence. Other examples can be fixed groups that stay together from the childhood and teenage years. Examples of secondary groups are political associations, sports associations and workgroups. The secondary groups lack the intimacies and deep personal affiliations of the primary groups. Within rescue services, work is conducted in such a manner that it can be difficult to differentiate between primary groups and secondary groups. Through the nature of the job and the special conditions that can exist in conjunction with helping injured persons, and in situations where there are potentially major risks, the group attains more familiar bonds than what is normal for other types of professions. This can be influenced both by the group's work and the leadership relationships in the group.

Heap (1980) maintains that there are three main types of group formations that can be related to the degree of volunteerism on the part of the members. In some groups, individuals are coerced into membership; someone outside the group decides that they will belong to a specific group. It can be, for example, a work team within a municipal structure for providing rescue services. Coerced membership does not exclude there being common objectives for the group. The various work teams within a municipal structure for providing rescue services should reasonably have a common objective for their work. A person who needs help as the result of an accident should not notice any difference in the performance of rescue services, regardless of if the accident occurs on a Tuesday evening or a Sunday morning. The other type

of group is the constituted or organised group. In these cases, the initiative comes from above. Here the members have a higher or lower degree of free choice as to whether or not they belong to the group. Examples of such organised groups are study circles or sports teams. The third group is the natural group, which comes into being spontaneously. Such groups are formed without coercion or anyone taking the initiative, but rather due to chance or other circumstances. Examples of such groups are circles of friends in which group affiliation has developed over the years without anyone knowing who started the group or how it came into existence.

In rescue services, personnel are assigned to work teams, i.e. to a group with no or minimal opportunities to determine themselves which group they will belong to. But with the passing of time, all or parts of the group develop close relationships that can even entail that group members meet during off-duty hours, together with families and spouses. Common parties, trips and similar activities are arranged. One naturally spends time with those with which one shares common interests and needs. Work teams can function as natural groups even if they have originally been initiated from outside the group. The balance in the group and the group-dynamic relationships can be detrimentally influenced when, for example, a substitute enters the work team or when firefighters change shifts with one another.

The professional role can suffer when co-workers and supervisors have both a private and professional relationship. In conjunction with emergency response operations, one could imagine that the group will become more unified and thus conduct operations more effectively due to the members knowing one another's strengths and weaknesses, both privately and professionally. But it is also conceivable that there are relationships in the group that are perceived as limiting. An example of this is when one is to provide feedback and it is felt that one must take consideration to one another in a manner that hinders rather than develops cooperation in the group. Another example can be that the group takes substantial consideration to someone being in the midst of a divorce and does not provide called-for criticism of a certain behaviour in conjunction with, for example, a response operation. Consciously or unconsciously, the group often establishes informal rules as to how this is to be handled. Those who belong to a municipal structure for providing rescue services should be suffi-

ciently professional in conducting their profession that 'bad days' do not negatively affect work, especially work in conjunction with response operations since third parties are directly dependent on how work is performed at the incident site.

Rescue service personnel and perhaps not the least, those in leadership positions, must therefore be attentive to how private relationships affect professional roles. A relatively high degree of professionalism is required by the individuals in a municipal structure for providing rescue services. At least temporarily, one should be able to disregard any problems and difficulties in the group's internal collaborative forms for the benefit for those in need of assistance. At the same time, one must ensure that work during a response operation does not make collaboration more difficult.

Group norms

According to Heap (1987), all groups establish their own group norms, consciously or unconsciously. Group norms deal with attitudes, values and behaviour that is recognised and accepted by the group. The interaction between the group's members supports and rewards conformity with the group's norms. Deviations from group norms are criticised and controlled in different ways. According to Granér (1991), group norms are based on, among other things, the informal rules that are established in the group, i.e. a set of spoken and unspoken rules of behaviour, thoughts and feelings that are developed or nurtured within a group and that control the group's way of functioning. The norm system describes behaviour and attitudes that are needed in the group in order to satisfy the purpose of the group. There is usually some form of sanction system if one does not comply with the group's purpose, and there are various strengths of the sanctions depending on how strong the group's purpose is. The stronger the purpose, the more important it is that the members comply with the group's norms. The norms can be more or less expressed and the norm system exists on both a conscious and unconscious plane.

Behaviour in given situations can, according to Sjöland (1979) be considered as normative regulated via group norms when it comes to the development of rules, standard requirements and routines. In informal groups, the norms are usually unwritten, not explicitly formulated. Sjöland points out that the group's norms are forced upon its members to higher or lower degrees. After a time, the group norms are incorporated so that they become a

part of the members' own views and perceptions, which the members subsequently assert in the presence of others, both within and without the group. There are also unwritten rules in formal groups, which in addition to the formally adopted rules of play, influence the group's work to the highest degree.

In a group there is also a control need (Mann, 1973); a need to control the group members' behaviour, attitudes and relationships in order to safeguard the group's continued existence. The control need often has, along with the group's sanction system, a restraining influence on the group members. Various forms of pressure can convince the members to follow the norms and feel aversion to breaching them.

In rescue services, there are both locally supported norms and norms that are applicable on a wider perspective. There is a certain culture in rescues service that is more or less generally applicable and even applies on a national perspective. Work methods, attitudes, problems and discussions that are conducted at the workplaces are often similar. This can sometimes depend on, among other things, that there is a nationwide system for training and recruiting, and that instructors have similar backgrounds. Knowledge concerning how various types of emergencies are dealt with is similar, and the available equipment is also similar, which is perhaps primarily due to the market being fairly small and the rate of development thus being slow. It is worth noting that there are also a number of similarities from the international perspective.

The rules that are accepted as legitimate by the group's members are those that are considered as appropriate, and naturally practical as well, for the group's operations. The group norms are thus important and in fact the foundation for the professionalism of rescue services. Such group norms can also be developed and formalised into so-called standard routines, especially if the group norms significantly concern the actual manner of carrying out tasks or work methods.

A conclusion of the line of reasoning above is that informal rules control the group's way of functioning, not the least in conjunction with emergency response operations. What is important to remember is that these informal rules can be much stronger than the organisation's formal rules, and that they can affect response operations in various ways. Rules or group norms that are not in agreement with an organisation's objectives and purposes should be modified by those in management positions. A supervi-

sor who attempts to breach group norms, for example, when this is required by the situation at an incident site, must be prepared to encounter resistance. Potential conflicts are often held back during ongoing response operations, but the effects of breaches against group norms can reveal themselves long afterwards and when they do, can entail exceedingly negative influences on the group and its work.

Group size

The group's size influences the group's work. Among other things, the relationships between leaders and other group members are affected. A person in charge of a small group can influence, control and establish a perception of how each group member conducts his or her work. A person working on a high decision level with, for example, duties that affect several deployed units or decisions that affect an entire municipality's emergency response operations and preparedness production, must have an overview and a different degree of detail in the information flow.

According to Wessam and de Klerk (1987), the interaction pattern changes, i.e. how influence is exercised in a group as it increases in size from four up to ten or more members:

- It becomes more difficult to participate actively in the group both because others want to assert themselves, and because of the increased risk of 'stage fright' or the fear of failing in front of the group (the fear of revealing one's ignorance in a larger context).
- It becomes more difficult to affect the behaviour of others.
- The difference in the degree of participation between different members increases. In large groups, the majority of group members hardly speak at all.
- The diversity of personalities and talents increases, and there is a greater variation in behaviour.
- Discussions become less limited and disunity is more easily expressed in words and deeds.
- If the group has a job to do, there is a tendency to rely on rules and to divide up tasks.

The productivity and results of the group's work is consequently affected by the size of the group. When a group increases in size, four different types of problems can arise.

- The communications pattern becomes more complex and indirect.
- Organisational problems become more numerous and larger.
- The demands on individuals become weaker.
- Individuals receive less personal satisfaction.

According to Wessam and de Klerk (1987), the difference in the degree of activity between the group members in small groups (three to four members) is rather small. The difference, however, is clear between the most active group members and the other members in somewhat larger groups (five to eight persons).

In ten-person groups, the need may exist for relationally creating common values, attitudes and behaviour. In groups of three to five persons, there may instead be a need for the supervisor to justify diversity and to ensure that it is acceptable to have different competences and personalities.

The problems, limitations and opportunities that arise due to a group's size have less significance from a short time perspective. However, the foundation for work at an incident site is often established in everyday tasks at the fire station. Problems, limitations and opportunities can become influencing factors, for example, when serving on a staff where one may be working with longer time scales. Group size should normally be determined based on the demands and needs related to the task or tasks to be executed. There may be reason, for example, to divide a large group (unit) during a response operation into smaller groups. This in turn will affect work in the group, especially if one divides a group that has worked and trained together smoothly for a longer period.

Leaders

Even if leadership is normally associated with groups and with the relationships between different individuals, it is nonetheless the individual that much revolves around. In organisations, there are supervisors, and leadership is often equated with them and their relationships to the group. One often differentiates between supervisors and leaders, where 'supervisor' denotes a position, while 'leader' entails a relationship. In the definition above, it can be deducted that those who use power to get things done are not leaders. However, these persons may very well be supervisors. They have conditions of employment as supervisors, and through their positions, they can thus exercise a certain type or degree of power and make decisions that affect other persons. This does

not, however, necessarily make them leaders. But for the sake of simplicity, let us now equate supervisors with leaders, i.e. that a supervisor has the capability to utilise employees' common capabilities and competences, and can get them to pull in the same direction.

In conjunction with a municipal fire brigade, leadership deals fundamentally with getting a group to conduct certain tasks, preferably based on a common foundation of values. But it is the supervisor who is ultimately responsible for the task execution and thereby also makes decisions, provides guideline for how work is to be conducted and assigns tasks to the group. It is also the supervisor who must be able to handle the problems that arise in the group, i.e. the social context.

The relationships in a fire brigade crew can be determining factors for how work at an incident site proceeds and how work with executing tasks is conducted. The supervisor must in various ways, nurture the relationships in the group so that there is balance between the individuals' needs, the group's needs and the problem or problems to be resolved. There is always someone, such as an injured person, who needs help from the fire brigade's personnel. The supervisor cannot be afraid of taking on conflicts when necessary.

Good leadership and good personal relationships can often entail that it becomes easier to conduct assigned tasks and that they go more quickly. The quality of a fire brigade's work is often reflected in the quality of leadership and how it functions. As a supervisor, one should consider how one expresses oneself to subordinate personnel. Certain situations entail, for example, due to time restraints, that one expresses oneself rather harshly and to the point, while in other situations one has more time to consider that the person one is speaking to is an individual who one may have worked with for a fairly long time and who one will also work with in the future. Regardless of the situation, one should keep in mind that poorly formulated tasks or less suitable choices of words can create discord within the group for a long time to come. But at the same time, a person in charge cannot be afraid to put his foot down and lay down the law in plain language when this is made necessary by the situation at hand. Labour management law provides this opportunity.

To be able to provide someone with help in certain cases, a supervisor must raise himself above the group, i.e. in everyday

language, 'steamrolling' other people and using the power accorded by the supervisor position to ensure that a certain task is executed. Working with certain types of tasks may not always be popular among fire brigade staff, for example, running hose over long distances through a densely forested area. But such a task can very well be a determining factor for the results of the response operation and someone must therefore conduct this task. The employee shall conduct the work on behalf of the employer that is included in the applicable conditions of employment. In conjunction with official duty, the exercise of power is clearer, even if volunteers should be initially recruited.

Certain types of tasks in conjunction with emergency response operations can be directly repulsive, such as attending to a large number of seriously injured persons, the dead or body parts. Such tasks should be handled with a higher degree of volunteerism. Moreover, supervisors should ensure that personnel, both before and during such tasks, receive any care they may need. The risks associated with a task may never be disproportionate to the anticipated benefits.

It is often pointed out that supervisors and leaders are key persons and one can easily be led to believe that leadership is a matter for leaders. However, employees' assumptions of responsibility and attitudes to their work have major significance in this context. In this context, one often speaks of employeeship, where all individuals in the group are viewed as mutually responsible in the work process and parties in the dialogue at the workplace. Employees are knowledgeable and competent, contribute with various things and approaches, and participate in formulating important decisions. Work at an incident site, for example, should be conducted in consensus between the individuals who are engaged in this work. Through employeeship, the conditions within the group are described as a relationship of partnership within which the person in charge invites initiative, skills development and performance. Many times one has gone over from management by details to management by objectives, from direct control to indirect control, via work results and increased responsibility, etc. This requires a certain autonomy in the ability to lead between different levels due to the need to be able to work effectively in a dynamic environment, i.e. at an incident site where events are time-dependent and occur as a result of a number of causes that are difficult to survey. Management employees on various levels

must have the ability to independently handle a given situation without continual guidance. How a situation is dealt with must be based on general directives or instructions, through management by objectives.

Management by objectives places stringent demands on supervisors' leadership abilities. Moreover, one should keep in mind that the fundamentals of management, through both management by objectives and management by details, are established in everyday work. The form of management is affiliated with an organisation's culture. An organisation that is trained to deal with various types of situations through management by objectives is often easier to manage according to details when necessary (Zetterling, 1995).

Management by objectives entails that the person in charge states what is to be done, what work should result in and often which resources that are available for this. This provides freedom of action for subordinates. Management by objectives does not, however, exclude certain guidelines, restrictions or frameworks that for various reasons must remain in place. Management by details is the opposite of management by objectives, i.e. that one specifies in relatively detailed terms how a task is to be conducted – which tools and methods are to be used, when and where the task is to be conducted and even who is to conduct it. Indirect control entails in a corresponding manner that work performance and task execution is assessed based on work results – that one delivers that which is agreed upon. Direct control entails that work is controlled and assessed based on actual work performance. Management by objectives and indirect control place demands for higher competence or advanced and further training for all personnel, not the least for those in charge. The difference between management by objectives and management by details rests to a certain extent in when the details are provided in relation to the task's execution. Even in management by objectives, there can be a high degree of detail, but the details are provided far in advance, for example, through training and skills development. Moreover, supervisors must make decisions and provide directives, instructions, assign tasks or distribute tasks, regardless of if one chooses to lead through management by objectives or management by details. To be successful with management by objectives, everyone who works in the management system must direct their attention upward with the focus on the objectives and intentions

Example 5

During an attic fire the incident commander decides to allow the whole of the attic to burn in a controlled form. The work largely concerns ensuring that the fire does not spread downwards in the building. A single firefighter is not aware of the whole picture and consequently begins to shoot large quantities of water towards the attic from outside the building, causing considerable water damage.

To avoid such things happening, firefighters must have faith in the decisions of the commander and realise that there are logical reasons for, as in this example, not applying certain measures.

of a response operation as set by the superior level. Management by details, however, involves attention being directed downward from a superior level so as to monitor what is occurring and how tasks are being executed. Through management by objectives, the issue of control is oriented to results, not to how a task is executed (Swedish Rescue Service Agency, 1998a).

Peoples' perceptions of their own abilities can be more or less realistic. It is relatively unusual that one grossly overestimates one's own abilities. It is much more common to underestimate one's own qualifications and abilities. Among other things, the ability to interpret one's surrounding environment varies. The interpretation is always influenced by one's own needs, expectations, knowledge and previous experiences. An employee who does

not understand the purpose of a group or work team's tasks can be very difficult to work with. Certain types of tasks at an incident site, for example, can in such cases be difficult to conduct, even if they have an important purpose in a larger context. Employees may not have a clear perception of the big picture. But at the same time, for a supervisor to explain in detail why it is important to conduct a certain task in each situation cannot be warranted. Employees must feel a sense of security in relationships with their superiors and in relation to the tasks that are assigned.

A person always acts rationally in some sense, but he or she can only do so based on his or her present standpoint in the current situation. An act or form of behaviour that may seem irrational to an external observer can very well be perceived as absolutely correct or rational by the person carrying out the act.

Unreasonable demands cannot be placed on individuals in a group, neither on those in charge nor subordinates. All individuals in a group have responsibilities relating to task execution, the relationships between individuals, etc., but this responsibility is channelled in various ways through the person in charge. It is ultimately the person in charge who bears responsibility, and the higher this person is in the management system, the greater the responsibility.

Leadership qualities

A leader has a significant role in the group. The group often has a number of opinions and perceptions as to how the leader should exercise leadership. Concepts such as trust, responsibility, setting an example and fairness are often mentioned. Rubenowitz (1994) provides the following summarising descriptions of desirable leadership qualities that constitute the foundation of leadership behaviour. A good leader:

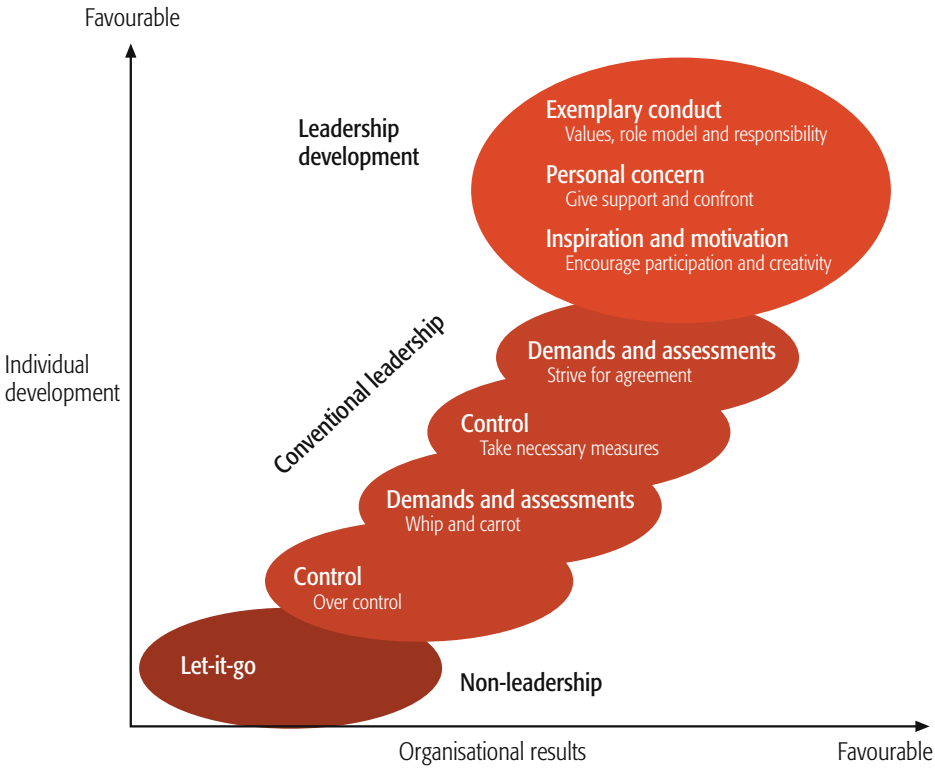
- Has a positive outlook on people and has trust in the will and ability of subordinates to participate in decisions concerning their work.
- Is primarily production-oriented but avoids applying such leadership principles that on the short term can increase production but negatively affect attitudes.
- Has competent authority and strives to master his or her profession.
- Has the ability to manage work through objectives and has coordinating independence as a primary administrative principle.

- Has good self awareness and an inner sense of security that provides the ability to deal with conflicts and to stand for his or her opinions.
- Attempts to strive for good internal unity and loyalty.
- Is consistent, provides straightforward information and has the ability to inspire a sense of security.
- Has the will and ability to train and assist – replacements and subordinates.
- Has an understanding that communications from beneath and upward are as important as communications from above and downward in a hierarchy, and is able to create such a spirit of mutual understanding that relevant information is provided.
- Uses control in a constructive manner.

Opinions regarding leaders and leadership have changed over the years and the perception of the importance of leadership has varied. Earlier theories emphasised leadership ability as a quality that people either have or do not have. Leaders were seen as stronger, braver and somewhat more gifted than those they led. According to this approach, leadership was constituted by two basic dimensions – the degree of task orientation and the degree of relational orientation (Boëthius & Jern, 1998).

Leadership is now perceived in a somewhat more nuanced manner. It is often emphasised that a leader should base his or her actions on the group members' competence and motivation, and be able to both delegate, and support and direct. Several different leadership models have been developed and used frequently, not the least in various types of management and leadership courses (see, for example, Hersey & Blanchard, 1993).

Napier and Gershenfeld (1981) maintain that leadership is dependent on the situation rather than on the person. Leadership is basically the performance of a certain role in a group within an organisation. This role is primarily crystallised with consideration to power and the ability to influence others in the group. When membership changes, the conditions for the leader also change. Leadership is constituted by actions that help the group to reach its objectives. Leadership is exercised to help the group to achieve objectives, to facilitate matters for the group in working in accordance with established objectives, to improve the quality of interpersonal relationships between the group members, and to provide necessary resources to the group.

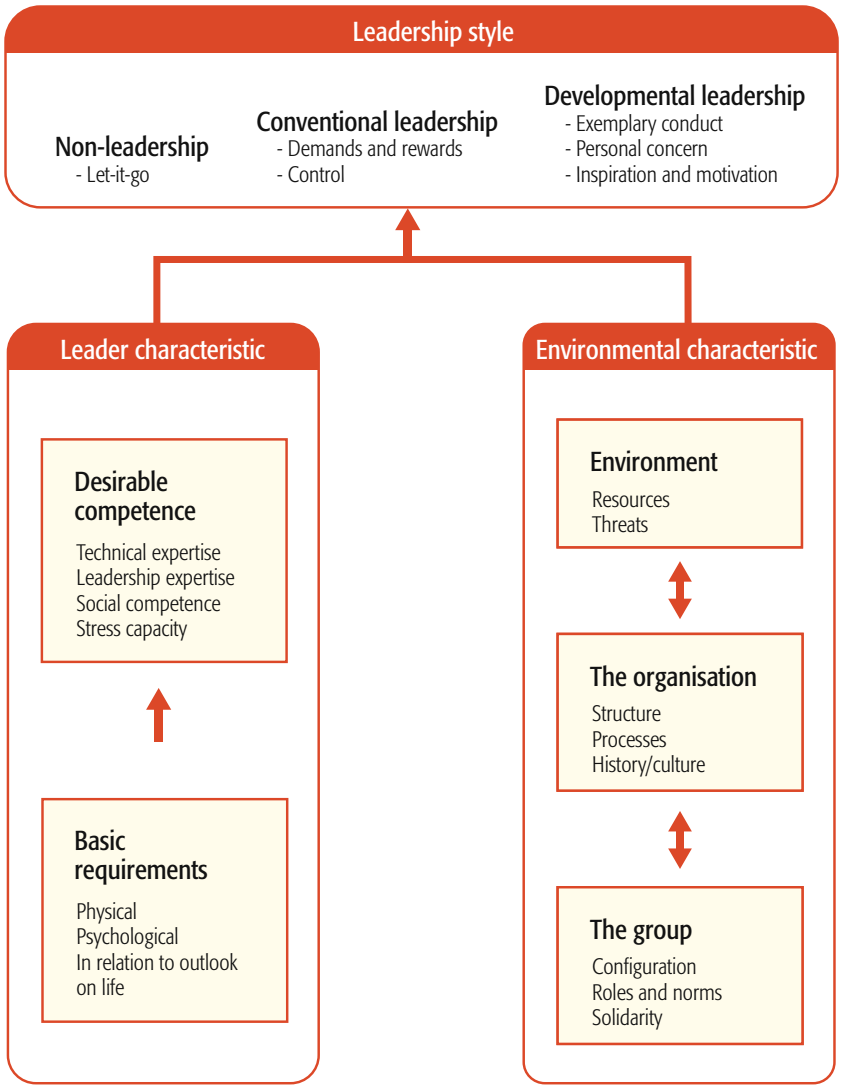


Leadership style model, from Larsson et al. (2003).

Arvonen (1995) emphases the needs for the leader to serve as an example, to be a visionary and to be able to create a working environment that motivates personnel in an organisational culture that is guided by the vision of the organisation.

Intentionally or unintentionally harmless and even more malicious acts, thoughts and feelings form a pattern that becomes prevalent for a group and thereby for the group's members, both for management employees and others. Together they shape a workplace's organisational culture and they affect the results of emergency response operations, whether or not this is the intention. Organisational culture refers to the sum of what an organisation has learned and that is now taken for granted as to how one deals with the surrounding environment and internal collaboration. Organisational culture is regulated by written and unwritten rules, norms and behaviour (Schein, 1992). An important duty for an incident commander is therefore to describe and explain how a fire brigade crew is to collaborate during an emergency response operation, to set limits for certain tasks and to clarify how the group's members are to evaluate one another during and after a response operation.

But in this context, one can also speak of leadership styles in relation to the organisation's effectiveness and employees' job satisfaction. This can be summarised in a leadership style model (Larsson, et al., 2003). The model illustrates the relationship between various types of leadership styles, expressed in a coordinate system with the axes organisational results and individual development, and describes a relationship between various types of leader behaviour. With leadership that consists of demands and rewards, the organisation can attain the objectives that are agreed upon. An organisation and



Leadership style model, from Larsson et al. (2003).

its employees can, however, attain better results with the help of so-called leadership development. Leadership development entails, among other things, that a person in charge serves as an example, is thoughtful in dealings with personnel, motivates others, and in short, adapts his or her leadership to the situation at hand. Most leaders consciously or unconsciously utilise various types of leadership styles to larger or lesser degrees depending on, among other things, the current situation.

A model has been developed in Sweden for bringing to light leadership's most important component parts and how these relate to one another (Larsson & Kallenberg, 2003). Note that the model is based on the leader's perspective and consists of three main areas: leader characteristic, environment characteristic and leadership styles. The leader characteristic area encompasses two parts: fundamental qualities and desired competence. The fundamental qualities influence development of the desired competence. So the better the fundamental qualities the leader has, the greater is the capacity to develop the desired competence. A favourable combination of these two parts is a prerequisite for successful leadership. Neither is sufficient on its own and they do not represent any guarantee for successful leadership. Factors in the environment will, as previously mentioned, also have an influence. The model shows that groups and organisations influence one another and are mutually dependent upon one another. The same applies to organisations and their environments.

Groups and organisations need leaders. However, leadership cannot be exercised unless there is a group that is willing to be led and to surrender in some sense the right to make decisions to another person. The ability to lead is highly dependent on the group's willingness to permit itself to be led. Leadership entails that one participates in an interplay between various entities having different intentions and different needs.

The management role can often be complex. A person in charge not only works with his or her own group, but must also deal with other groups that exist in a wider context. The decisions made will affect other groups in the subsequent echelon and it will be up to this subsequent echelon to implement decisions and guidelines from higher levels. Even if the decisions that are made at a higher level are oriented in some respect to a wider context, management staff and decision-makers on higher levels must be aware that these decisions will affect other groups or individuals

working on entirely different levels. It may, for example, seem relatively simple for senior management to make the decision in conjunction with a major flood to not pump out individual buildings. But for the individual firefighter, this can lead to conflicts, both within the group and with those in need of assistance. This is especially true if fire brigade personnel are acquainted those in need of assistance, which is not all that uncommon.

A senior commander is always responsible for operations, regardless of whether he or she is at the site or not. By using a suitable leadership style – depending on, among other things, the situation – the person in charge can serve as an example, inspire and motivate subordinates to take correct actions. But it is also a matter of providing support or confronting subordinates when necessary, so that the person in charge can make adjustments to or control ongoing response operations or measures that have already been initiated. This also is related to the form of management. In general, one can say that management by details is more closely related to conventional leadership, while leadership development is more closely related to management by objectives. Also note that 'hands-off' leadership entails no management at all. Ultimately, it all comes down to the management system being able to deal with the dynamics that characterise the situation, flexibly and quickly.

One should also take consideration to the differences between men and women, both from the perspective of the group and the individual. Men and women use different body language and ways of expressing themselves, function differently in groups and assess different things in different ways. There are also individual differences, regardless of gender, that affect our behaviour. These differences are positive for organisations and create good prerequisites for creativity and good decisions. One should thus not strive for uniformity. In most cases, it is beneficial with diversity and that all individuals are unique, which one should exploit in different ways.

6. Decisions and decision making

Tactics, command and leadership are closely associated with decision making. It can be a matter of making decisions regarding tasks, task execution or that someone has been given the authority to make certain decisions. Decision making is in turn associated with responsibility, i.e. taking responsibility for decisions. In a given situation, it is the legal system that allocates authorities to those in charge, while morally they take responsibility for their conduct. Please refer to the line of reasoning on delegation that was presented in the chapter on leading and being lead.

During recent years, extensive research has been conducted concerning decision making in various types of real-life situations. Such decision-making situations are often characterised according to Orasanu, et al. (1992a) by the following:

- Problems and situations that the decision maker encounters are poorly structured.
- Information about the problem or the situation is incomplete, multifaceted and continually changing.
- Objectives are (or compelled by the situation's course of events) variable, poorly formulated or even contradictory.
- The decisions that are made affect several different problems or situations at the same time.
- There is a shortage of time.
- The risks are substantial, at times even life-threatening.
- Many participants take part in the decision, either in preparatory measures or in the practical consequences of the decision.
- The decision maker must weigh the needs of personnel against those of the organisation due to the fact that the assessments and objectives that decisions are based upon are not always in line with the preferences of personnel.

These characteristic aspects can also be said to be typical during emergency response operations. Making decisions in conjunction

with leading a municipal fire brigade, conducting emergency response operations or conducting tasks are thus not simple duties.

Research, however, points to a number of clear conclusions that can be worthwhile for decision makers to be aware of in conjunction with response operations. Among these conclusions, one can mention that decision makers who are experts within their particular fields and that participate in actual situations, do not tend to generate several different decision alternatives (Orasanu et al., 1992a). A decision maker instead generates a highly probable alternative based on his or her assessment of the problem, and evaluates it against the current situation. If it is deemed correct, the decision complies with this alternative. The alternative is otherwise modified or replaced and evaluation is repeated. It is apparent that the factors that primarily differentiate experienced decision makers from those less experienced are their ability to assess the situation and their manner of reasoning or making decisions. An experienced and knowledgeable decision maker can study a situation and quickly interpret it with the aid of his or her experience base. This is highly relevant in conjunction with emergency response operations, where the theories concerning emergencies and the escalation of various types of emergency situations are very limited. The lack of such theories entails that there are not always practically applicable models to rely on, but one is instead forced to base a large portion of knowledge on personal experience and the experience of others.

This in turn leads to decision makers usually utilising a satisfactory strategy for their decisions rather than an optimised. Decision makers tend to make a decision that is good enough but that is not necessarily the best decision. One can speak here of a type of passable decision making, i.e. decisions and decision making that are not optimal but that approximately fulfil that which is to be achieved. While this can entirely suffice, it is also important to be able to determine when it does not and when a decision requires better decision making data.

Many of the situations that a fire brigade encounters in some sense are new or encompass phenomena that are more or less unknown. Even in such situations the decision maker can utilise reasoning in arriving at a decision or a solution with the aid of a scheme or predefined model, rather than a specific method of calculation. In such cases, the decision maker often uses his or her knowledge to organise, interpret and define the problem so

that the problem corresponds to an existing model for decisions. These models are often very simplified, which can constitute a major source of errors in the decisions that are made. Reasoning and taking measure are often interrelating rather than differentiating. Instead of analysing all aspects in a situation and making a decision to take action thereafter, decision makers act by thinking a little, taking a little action, evaluating the results and subsequently thinking and taking action a little more, even in complex situations. In other words, decision making in this context is strongly associated with taking action.

Dynamic decision making

Dynamic decision making is characterised, according to Brehmer & Allard (1991), by four characteristics:

1. A series of decisions is necessary for achieving an objective, i.e. gaining and retaining control in a situation is a continual process with several decisions and where each decision can only exist in its context.
2. These decisions (and especially their implications, i.e. their results) are not independent. Later decisions influence earlier decisions, which in turn will influence later decisions.
3. The basis for making decisions changes, in part autonomously (on its own), and in part as a result of earlier decisions.
4. The decisions (the series of decisions) are made either in real-time or with time otherwise having a significant influence.

A dynamic decision-making situation thus consists of a situation with one or more problems that are to be resolved. To resolve the problem or problems, it is necessary that several decisions in sequence are oriented towards the same objective and that the decision maker receives information about the various decisions' affects on the situation. There are therefore opportunities in later decisions to correct for any negative consequences of previous decisions in the sequence. Moreover, the situation changes with time, both as a result of the decisions made and on its own.

Dynamic decision making in conjunction with emergency response operations has a number of special conditions or limitations in respect to time, of which decision makers should be aware (Brehmer, 2000). First of all, decisions must be made after a need arises. Preferably, decisions should perhaps even be made before an actual need arises. This is where an important relation-

ship between time and space arises. Secondly, many emergency situations, such as fires, are dynamic situations. They are time-dependent and the situation will evolve and change regardless of if a fire brigade is present or not. Moreover, the emergency's course of events is guided by physical laws – they are in various ways physical processes. These dynamic and physical processes are to be dealt with using another dynamic process, decision making, which can largely be said to be a mental process. Lastly, one must be aware of differences in time scales. Decisions that are made on different levels, based on different authorities, have varying degrees of repercussions in time and space – they have different time scales. But even the actual emergency can have different time scales, for example, in different geographic sectors or under different phases of an emergency response operation.

Also note that dynamic decision making even involves the decision maker taking consideration to any consequences of decisions in the future in ample time. Once can call this proactive behaviour, i.e. that one is at the leading edge of decision making.

Beyond these time-related limitations, there are also a number of delays that will affect decision making, such as the delay between a decision on a certain measure and the effect that the measure produces. Another example can be the delay that occurs in conjunction with situational reporting and in allocating tasks. All actions and decisions take time, and during the intervening period other things will occur, regardless of whether one wants them to or not.

Experts and novices

Experts and novices do not fundamentally differ in the method of making decisions. There are differences, however, in how they assess situations, i.e. how experts and novices gather and process information that customarily results in a decision (Klein, 1998).

That which is characteristic for experts in their manner of reasoning their way to solutions and decisions is that they have the ability to create overviews and to see the large and more comprehensive problems first, and that they see patterns in these problems and in conceivable solutions. On can also mention 'tricks of the trade' and experts' perceptual abilities, i.e. an instinctive feel for the situation and for details that can have a major impact on the decision. This is normally based on reasonably solid experience. Experts also often have an ability to discover anomalies, i.e. things that deviate from the norm.

Through their experience, experts have also gained the ability to improvise and are therefore not as bound to rules as novices. They often do not feel restrained by any special conditions other than those that apply to the current situation. In this improvisation, some form of mental simulation is often used, i.e. the expert can envision situations from within and mentally review the results produced by various decisions.

What is important to keep in mind, not the least for a novice, is that among other things, the method of assessing a situation is often critical for the decision. Experts often create mental pictures of a situation and can thereby 'simulate' the results of various decisions or alternatives for taking action. It is important to understand the context in which the decision 'lives', i.e. the situation and the sequence of events that will result from the decision. Decisions cannot be made as individual events; as a decision maker one must be aware of the dynamics that decisions influence and that decisions in themselves, to a certain extent, create. One should also emphasise the importance of solid knowledge concerning the capacity and limitations of resources, and why various types of emergencies occur. Moreover, one must take consideration to people.

One cannot ignore the experience bank that experts have built up and that they base their decisions on. A novice must therefore try to build up an experience bank through, for example, mental simulation, participation in experiments and research, and through coaching, and that one receives help from someone else and together 'thinks out loud'. As a novice, one can also attempt to envision how one would take action or make decisions in a given situation that someone else actually has responsibility for or is handling.

Working with decisions in groups

Decisions should, not the least in a rescue service context, be linked to a specific individual. It is a specific person in command who makes a decision, which can be determined through some form of delegation order. But the task of arriving at a decision, i.e. producing the supporting information for a decision, can be conducted in a group. An example of such a group can be a staff, but it can also be another type of group, such as a BA firefighting group. Groups that are temporarily assembled for a specific purpose normally work somewhat differently than established groups. In established groups, experience of working together leads to the individuals having shared mental models for how they work, which enables them to anticipate one another's behaviour and needs in an entirely different way than when groups are temporarily assembled. For groups to be effective, it is important that the participants train together and that one strives to keep the groups intact. For a municipal structure for providing rescue services to be effective, it is thus important that units regularly train together.

Orasanu et al. (1992b) summarise a number of research works concerning the problems that can arise and the pitfalls one can encounter in conjunction with work with producing information for decisions in a group which can lead to decisions turning out wrong. The supporting information for decisions cannot address all significant aspects. The group does not take consideration to, consciously or unconsciously, all factors that can be of importance. One pitfall is that which is referred to as group pressure. The group refrains from its rational evaluation ability and its rational ability to product good information for decisions in order to maintain solidarity. Group pressure can, for example, be due to hostilities or competition between one or more group members, lack of cooperative ability, lack of knowledge, insufficient motivation or tensions between higher and lower member status in the group. Insufficient rationality can then become a way for the group to suppress these reasons and the group's solidarity becomes more important than the results of the group's work.

In a group, individuals often tend to take more extreme positions than they would have taken individually. The more extreme the individual's position is from the beginning, the more extreme it will be in a group. The group can also fail in sharing objectives and values, so that an incorrect consensus of sorts arises in which

Example 6

A man has become clamped in a garbage press at a recycling station. It soon becomes apparent that if extensive resources are not applied, the man will die. At the same time an alarm comes in concerning a fire at the hospital's energy supply station. A power cut will affect many people and put many people's lives at risk. It quickly becomes apparent that this incident also calls for extensive resources. What should be done? Should the municipal structure for providing rescue services use its resources to save one person now or several people later?

Because of, for example, group pressure, the group focus on the clamped man and a heightened enthusiasm for his capacity, as commander, to solve this problem, there are many complications in making the decision.

(This example is taken from Svensson (2000), where the issues involved are developed further.)

someone believes that someone else shares or understands the perceptions, objectives or values that are applicable for a certain situation, a certain decision or a certain piece of information for decision making. Such failure can also lead to so-called pluralistic ignorance, where someone believes that he or she is odd, even when this is not the case. Sometimes there is a mind-set of 'it's better to be thought a fool than to open your mouth and remove all doubt', but in decision making situations, this can be a devastating approach. It can be better to bring apparently irrelevant issues to the surface, because they can very well be completely valid issues that must be addressed before a decision is made. Better to ask and seem ignorant, than to not ask and remain so.

Group pressure can also entail that the group unconsciously develops a tunnel vision of sorts, where the primary task to be conducted only has a single solution from the group's perspective. The group overestimates itself and its competence, ignores warnings and information that can disturb the group's internal picture of the problem, and censures all forms of knowledge that can disrupt the unified group. This exaggerated trust in the group's competence results in one ignoring or not even producing objectives and alternative solutions. One only seeks selective, confirming information or does not assess risks. The group is mired in an internal, self-centred enthusiasm. The accelerating trust in its own competence causes the group to fall into group narcissism (self-absorption).

Orasanu et al. (1992b) use the term 'team' instead of 'group'. The primary difference is that a team works with current tasks in a wider context, for a specific purpose. The team exists to jointly solve one or more problems. The participants also have knowledge and competence that is relevant in relation to the task and the decisions that are to be made or the supporting information for decision making that is to be produced. One also emphasises that the team consists of individuals with a high degree of specialisation and who competence-wise are independent of one another, but who together in various ways represent the competence needed to be able to solve a specific problem. It is therefore often difficult to change members without it affecting the team's work. A team thus has a generally higher degree of specialisation than what a group normally has. It is important to remember that teams, in order to function as teams, must train as teams. Traditionally, training is conducted in individual skills with people later being

brought together and expected to function as a unit. Orasanu et al. (1992b) emphasise the importance to teams, and in the training of teams, that:

- Everyone understands the task/objective and its implications.
- The informal and formal roles are clarified.
- Guidelines and rules for the team's work are established.
- One clarifies each other's demands and expectations.
- One creates space for an open and creative critical analysis of the team's shared tasks.

Although anyone in a group can have a solution to a problem, it is essential to have support for the solution within the group and from the person leading the group. It is important to have an atmosphere within the group that stimulates collective problem solving. Such an atmosphere is largely dependent on leadership in the group and on the leadership style of the person in charge. Leadership development, where inspiration and motivation are keywords, can be an appropriate leadership style in many situations.

Yet another aspect that is important in understanding work with decisions and supporting information for decision making in groups is that the situations groups encounter can be complex and dynamic. A situation's complexity can go beyond individual expertise and require that various specialists communicate with one another so as to establish an understanding of the entire situation. The problems are too large and too complex for a single person to handle.

Unfortunately, the organisational context is perhaps the greatest source of problems when working with decisions and supporting information for decision making in groups or teams, i.e. there is a policy, an organisational essence or an organisational atmosphere that either permits or forbids certain things, certain conditions or certain behaviour. Organisational structures and constructions often affect a team's cognitive strategies. Teams that work with distributed decision making in dynamic situations require a clear distribution of tasks where various experts, based on their various premises, can analyse and monitor the areas that are of significance to them. The problem with this, however, is that individuals can make faulty probability assessments, circumvent logic and possibly confirm a hypothesis rather than reject it. Individuals can, as can groups, fall into the trap of overestimating their capacities and competences, and ignore warnings,

information and knowledge that disturb their own perceptions of problems.

In making decisions and handling supporting information for decision making, various types of technical systems are often employed. One often speaks of hardware and software, with hardware being constituted by technical equipment such as radio gear or computers. Software is the support that these technical systems need to function, e.g., a certain radio channel or a computer program. By using hardware and software, one can attain various objectives, such as:

- Providing information that is accurate, more complete and more rapidly distributed.
- Reducing strains on coordination.
- Reducing a group's negative influences by shifting the focus from normative influences (controlling through rules) to informative influences (controlling through information).
- Increasing accessibility to information for the purpose of more rapidly establishing an understanding of a task.

Technical support to both groups and decision makers has increased but the effects, however, are still unclear (Duffy, 1992). In some cases, technical support creates more problems than it remedies. There is always a certain amount of risk involved in becoming dependent on technical support for decision making. Should the technical system fail that one has become dependent on, it may no longer be possible to make correct decisions.

Distributed decision-making

When it comes to practical work with making decisions and working with supporting information for decision making, there can be reason to distribute the rights to make various types of decisions or authorities among several different individuals into so-called decision domains. A functioning organisation builds on various types or degrees of authorities that are distributed over the entire system and normally also among several different individuals.

Distributed decision making embraces and is based on two aspects (Brehmer, 1994):

1. A physical aspect that entails that a single individual can only affect a limited area.
2. A cognitive aspect that entails that a single individual can only process a certain limited amount of information.

The entire system can normally not be shaped or handled by a single person. This means, for example, that an emergency response operation must be divided into a number of smaller parts with sizes that are appropriate with consideration to the information flow that can be handled by the individual or individuals who control and handle the information flow within the respective parts. Such a division must take consideration to both time aspects and spatial aspects. The issue thus arises as to how the system will be organised and function in its context with handling preparedness production, risk profiles, individual emergency response operations and the tasks that are conducted in conjunction with these emergency response operations.

In general there are three factors that decision makers on various levels must take consideration to in conjunction with distributed decision making (Brehmer, 1998).

1. That the various decision makers have a similar situational perception and a similar picture of the surround ing environment.
2. That one in various ways can agree on resources and distribute them in a suitable manner.
3. That joint operations are coordinated.

What can be important to keep in mind with distributed decision making is, among other things, that as pressure against the clock increases, that the degree of negotiation between the entities also increases in regard to the distribution of resources and coordination of operations. As pressure against the clock further increases, coordination based on a plan becomes the only viable alternative. In coordinating operations in such cases, the decision makers must instead communicate their intentions to their organisations. In the event of extreme pressure against the clock, one cannot involve oneself in details.

Issues that in various ways must be taken into consideration when decisions are to be distributed among various individuals include (Orasanu et al., 1992b and Duffy, 1992):

- Discrepancies between different levels in a hierarchical system, where lower levels need more current but less general information about the situation, while higher levels can often get by with less current but more general information about the situation.
- The need to shape and adapt the organisational system based

on the task to be executed, i.e. a weighing between the need for assistance and the organisation.
- The need to shape and adapt the organisational system based on the time scales that decision makers are working with.
- The need to find methods for developing common understanding between various decision makers of tasks and task demands.
- The need to shape and adapt communications based on the tasks that are to be executed.

By distributing areas of responsibility and thus decision making rights in different matters, the ability increases in the management system to deal with the entire range of issues that must be handled within the system.

Significant issues for distributed decision making include conflicts between different levels in a hierarchical system, where lower levels need more current but less general information about the situation, while higher levels can often get by with less current but more general information about the situation. The organisational system must be shaped and adapted based on the task to be executed, the existing need for assistance and on a from-beneath perspective. Due to practical considerations, one normally needs to structure the organisational system in advance. In doing so, one needs to examine a type of comprehensive risk profile for the relevant municipality. In other countries, but also in Sweden, there are examples of how one can dimension rescue service based on the risks that exist for a particular municipality. These are, however, usually very general and should be used with a certain amount of caution. Primarily, one must avoid viewing a problem from just one perspective, for example, from only a financial or logical perspective. Dimensioning of municipal rescue service is more complex than this.

Stress

Stress is often experienced as a negative state, created in the relationship between an individual and his or her surroundings. Most people feel some form of anxiety or uneasiness in new, unfamiliar situations or due to direct threats, either against themselves or their surroundings. In the same manner, one can become uneasy when one perceives that there is too little time for the tasks at hand.

How an individual perceives and evaluates a given situation is decisive for whether the individual will experience stress. In this context, one can speak of appraisal and coping, which according to Lazarus (1991) constitute the core of the stress complex of problems.

The term appraisal encompasses how an individual perceives and evaluates a situation. It does not, however, entail any rational interpretation of the situation. Lazarus also writes of primary and secondary appraisals. A primary appraisal entails that an event has occurred in the surroundings that has relevance to the individual's well-being. It is only if there is at least a degree of personal interest at stake that any form of stress reaction will occur. Primary appraisals generate the question: Does it affect me? Secondary appraisals entail the degree or extent to which a given alternative can prevent, improve or increase a certain result. Secondary appraisals generate the question: Is there a threat? If there is a perceived or actual threat and this affects or is perceived to affect the individual, stress occurs.

Coping entails cognitive and behavioural attempts to deal with specific external and internal demands that are placed because of the situation (and reciprocal conflicts) and that are appraised as demanding or that exceed the resources of an individual. It is a product of personal variables and environmental variables, and entails how the individual in various ways handles a situation.

In brief it can be said that appraisal concerns how an individual perceives and evaluates a situation, and coping is how an individual deals with the situation. Coping and appraisals influence the individual's relations with the surroundings and the experience of stress. But once again, appraisals and coping do not entail any rational interpretation of the situation.

Factors in the surrounding environment that can cause stress are called stress factors. When one is subjected to one or more stress factors, the body reacts mentally, behaviourally and biologically in certain ways.

People react physically to stress (Enander, et al., 1993) with physiological and motoric changes. The physiological changes primarily include reactions in the autonomous (not consciously activated) nervous system, hormone system and immune system. Upon acute stress, the body enters an alarm state that among other things is marked by increased heart rate, heightened blood pressure and tightening of the muscles. The motoric changes in-

clude muscular tension, which among other things can lead to trembling, twitching stiff and jerky motion, defective speech and a change in stance.

Mann (1992) prepared a research overview on the relationship between stress, emotional states and risk taking. Among other things, the conclusions were described that maintain that stress which is created by crises produces a reduced time perspective, so-called cognitive rigidity, i.e. that the individual becomes conservative in his or her thoughts. This subsequently leads to:

- Immediate objectives or objectives within a brief period of time being more highly valued.
- Conclusions being drawn prematurely.
- Limited searching for alternatives.
- Less careful evaluation of alternatives and their consequences.

The reader surely perceives the substantial significance this can have on the decisions that are made, and consequently on the results of an emergency response operation. A certain amount of stress is often necessary in encouraging the search for information and the evaluation of alternative actions. In the event of heightened stress, however, this process becomes less rich in content and the quality of the ensuing decision thus suffers. Extreme pressure against the clock has a direct negative effect on the decisions that are made. Mann (1992) suggests an experiment in which decisions that involve substantial losses are to be made under extreme pressure against the clock. He anticipates that the results of such experiments would demonstrate that an anxious or troubled decision maker would be more likely to exercise less caution than more.

One of Mann's (1992) primary conclusions is otherwise that mildly positive emotional states result in the individual avoiding risks and exercising caution under conditions with substantial probability for significant losses. Positive emotional states can entail careless decisions, but can also entail that the decision maker does not involve himself sufficiently in a problem and makes it more complex than necessary.

Orasanu (1997) prepared an overview of the effects of stress, and summarises a number of research efforts in four points:

1. Individuals subjected to stress make more mistakes in a variety of different types of tasks than individuals who are not subjec ted to stress.

2. When stress occurs, attention tends to be directed towards central issues, which can lead to 'tunnel vision'. Under high stress, the search for information is chaotic, for example, which can lead to incorrect conclusions or conclusions drawn on the wrong grounds.
3. Memory capacity declines, which among other things affects short-term memory and the individual's ability to reason and draw conclusions based on information that comes from several sources.
4. A stressed individual changes his or her way of working, usually by speed being valued higher than carefulness. In the event of stress, many people also behave as if there is pressure against the clock, even if this is not the case.

Bass (1990) writes of two different sources of stress that can be identified in organisations or groups: role conflicts and role ambiguity. Role conflicts involve contradictory demands between roles, conflicts in time allocation between roles and insufficient resources. Role ambiguity involves ambiguity concerning tasks and objectives in roles, and uncertainty as to the demands that are placed on task execution. Bass also adds role overload to role conflicts and role ambiguity. To keep overloading in check, persons in charge try to stay organised so that they are 'on top of things', and to escape overloading of the role, they prioritise tasks based on their own preferences, i.e. based on what they think is most pleasant or least disagreeable. Here one sees the significance of role logic, i.e. that the role that the decision maker holds feels familiar, that the role is well-practiced, that the decision maker has the right competence for the role and that there is a certain agreement between the everyday demands and needs of the role, and the emergency situation's demands and needs.

Bass (1990) also writes that the person in charge can also constitute a stress factor for the group. If he or she, due to the situation, experiences stress and consequently demonstrates stress reactions, such as acting irrationally, this can amplify the group's stress behaviour. It can even happen that a superior officer or management employee leads his or her group or organisation into a crisis or worsens a crisis through reduced time perspective and conservative thought. A stressed leader may be unable to adapt a group's actions to the needs of the current situation, which entails that the group's stress increases with even poorer results as

the consequence. One is caught in a vicious circle. The group's survival is dependent on a type of leadership that can hold together individual members and subgroups in working towards a common objective. This is especially important when the group and its members, including its leader, are subjected to stress.

Stress is often an entirely normal phenomenon. The problem is rather how one copes with stress. One often speaks of an optimal stress level at which the body is sufficiently activated so that one feels good, produces good results both physically and mentally, and has a sense of general well-being (Swedish Rescue Service Agency, 1992). Stress reactions can also have a survival value, i.e. reacting 'just enough' to stress can entail that an individual escapes unharmed from a given situation. This optimal stress level varies from individual to individual and from situation to situation.

Ethics, morals and values

An important foundation for decisions is constituted by the decision maker's ethics and morals. Within Swedish municipal fire brigades, there are no established ethics rules or any code of conduct for how one should conduct oneself during an emergency response operation. In other countries, fire brigades often have some form of code of conduct in exercising their profession. An association that has established such a code is the International Association of Fire Fighters (IAFF). There is, however, an embryo of rules for ethics and a code of conduct within the Swedish rescue services as well. This is often illustrated with an eight-point star that symbolises the code's key aspects.

- Knowledge
- Endurance
- Skill
- Tact
- Courage
- Consideration
- Loyalty
- Attention

It is not sufficient, however, to rely on a symbol without reflecting upon what it entails and placing the symbol and what it represents in a context. Göransson (2004), for example, addresses the importance of ethics, theory and practice together, i.e. that the heart, brain and hand jointly constitute an important basis

The fire brigade's leading star, where each point represents something worth striving after.

In many countries, the Maltese Cross is used as the insignia of the fire service. The eight points represents symbolize the Beatitudes given in the Sermon on the Mount (Matthew 5:3-10).

for conduct. The challenge for an organisation, and especially for those in command, is to comply with established values. It is in everyday duties that those in charge demonstrate whether they serve as examples for others, and whether they comply with their organisation's ethics and morals. And subordinates normally follow the lead of their superiors.

Aristotle, one of the Western world's most influential moral philosophers, maintained that people should nurture four virtues: wisdom, justice, bravery and moderation. The conventional picture of leadership primarily contains bravery and justice. But wisdom and moderation point to another approach: a careful and balanced manner of dealing with decision making situations, especially when issues become problematic from an ethical perspective. The significance of wisdom and moderation should in other words, not be underestimated.

Ethics deals with justice, with what is right or wrong and with which rules one establishes for responsible conduct between individuals and between groups. The word ethics stems from the Greek word ethos: shared fundamental traits, which are typically expressed in attitudes, habits and beliefs. Morals in turn comes from the Latin word moralis, which concerns customs and embraces the aspects of norms and values that form the basis for what is good or bad, right or wrong. Morals normally designate the actual pattern of behaviour, while ethics have come to designate moral doctrines or thought on morals (Lundberg, et al., 1997). Morals are demonstrated in a person's manner of living up to his or her ethics.

Ethics can be divided into normative ethics, which stipulate how one should conduct oneself in various situations; descriptive

ethics, which describe how various people and societies believe that one should conduct oneself under different circumstances; and meta ethics, which pursue logic semantics, i.e. linguistic concept analysis of such ethics terms as 'good', 'right' and 'duty'. When it comes to morals, one can say that they are based on three foundation stones: norms are what is right or wrong, appraisals of good and evil and the outlook on mankind (Koskinen, 1993). Koskinen describes three fundamental criteria for correct conduct with each corresponding to a particular theory: duty ethics, consequence ethics and intension ethics.

Duty ethics simply indicate for us that certain actions are wrong and should therefore be avoided, while others are right or even constitute duties, i.e. that one must perform them. Four levels of duty can be differentiated, from the most abstract to the most concrete: principle, fundamental norm, conduct norm and rule. Many duty ethics rules and norms have probably originated from experiences in times gone by as to which conduct is suitable or unsuitable. Justification for an action is often unnecessary as to whether it leads to good or bad consequences – it is right or wrong 'in itself'. The Ten Commandments is an example that seldom needs to be justified, even for non-believers (e.g., 'Thou shalt not kill.')

Consequence ethics (or results ethics) view actions in the light of (conceivable) consequences of actions. A formal and general criterion for a correct action can be worded, for example, as follows: A certain action is right if and only if it produces better consequences than any other available action.

According to Koskinen (1993), consequences can be judged by their intensity, duration, probability (or improbability), proximity in time, fruitfulness (the chance that negative experiences are followed by positive), purity (the risk for a positive value on the short term not being followed by a negative on the long term) and diversity (the number of people affected by positive/negative consequences).

Both duty ethics and consequence ethics are related to what one does (or fails to do). Intention ethics, in contrast, stipulate that an action's moral value does not just depend on the degree to which one fulfils rules and norms, or on which consequences result from the action. Intention ethics indicate the importance of disposition and the intention behind an action. A criterion for a good action can be that a certain action is good if and only if the intention behind the action was good and has originated from a good disposition.

An important foundation stone is constituted by values, which are strongly linked to both the ethics and morals a particular individual possesses. A value is a fundamental perception of what is good and desirable or bad and worth rejecting or refraining from. Values are deeply rooted and require preparation and maturity to be changed (Swedish Rescue Service Agency). Awareness of values constitutes the foundation for all contemplated conduct.

According to Lundberg et al. (1997), groups are considered to be morally inferior to individuals in their conduct. There are at least two reasons for this. One is that the individual does not feel responsibility as strongly if sharing it with others. The other is group pressure. Consideration to people outside the group tends to be toned down in favour of consideration to people within one's own group.

In this context, it can also be of interest to bring up the Golden Rule: Do onto others as you would wish them to do onto you (Mathew, 7:12). Upon reflection, this seems to be a good fundamental principle for all conduct and all decisions, even in conjunction with conducting municipal emergency response operations.

Reality's need for decisions

The decisions made in conjunction with emergency response operations are made in a dynamic environment. The decisions made in a specific context are affected by what has happened previously and what is currently occurring. Decisions and the measures that they result in can influence events on both the short and long term. Because of a situation's character, in certain cases, more individuals are needed to make decisions or in some other way work with decisions, the supporting information for decision making and carrying out decisions, with various scopes in time and space. For work with these decisions, either one's own expert knowledge is employed or that of experts from other organisations. In work with decisions, one must – besides purely expert knowledge on the actual sequence of events and based on the need of assistance in the situation – also take consideration to the stress that most decision makers experience to various degrees. An important basis for decisions is also taking consideration to ethics, morals and values.

One often desires, especially as a novice, to have support for one's actions or decisions. To obtain this support – and against the background of the entire rather complex situation that decision making represents – there is always a major risk that one bases

one's conduct on checklists and templates. Checklists indicate for us in a structured manner, more or less exactly, what should be done and the order in which it should be done. This enables specific measures or decisions to be checked off as they are initiated or completed. There can sometimes be certain alternative solutions, depending on the results of previous decisions or measures. An example of such a checklist can be:

1. Do A.
2. Do B.
3. If the result of B is b, go to point 4, otherwise go to point 5.
4. Do C1, go to point 6.
5. Do C2.
6. And so on…

Templates can be more flexible due to their use of more general terms to describe conceivable actions or to structure actions or action patterns. The risk involved in attempting to write down several more or less important phenomena, events or activities that in various ways should be taken into consideration, is that one can overlook other and at least as important phenomena, events or activities. The effect can be similar to looking so closely at a map that one forgets that there is a reality. Not the least in situations when time is at a premium, it is easy to rely on what feels safe, which in this case is a template or checklist. The obvious risk is that one can make incorrect decisions and take improper actions.

In some cases, there can be reason to have a template or checklist, but one must be very attentive to the content being valid for the current situation. Both templates and checklists must support decision making; they may not hinder one's thinking in a particular situation. Everyone has different knowledge and experience, thinks and reasons in different ways, and perceives situations differently. Subsequently, an individual can create a personal template or checklist, but this individual cannot normally create a template or checklist for someone else. Standard routines are a variant of templates and checklists, and these are addressed in detail in the chapter on resources.

Ellsberg's paradox can be mentioned in this context. This entails that decision makers, when making decisions (conscious or unconscious), tend to take consideration to the quality or reliability of knowledge on the anticipated results of various decisions. Through, for example, focusing too strongly on the worse case

scenario, a decision maker can miss the opportunity to make a decision that is more correct or relevant in the particular context. The opposite can also be true; that by focusing on an easier decision with prospects for better results or with milder consequences, a decision maker may not see the risks associated with this decision or the opportunities of other decision alternatives (Ellsberg, 1961).

To avoid surprises or that an emergency response operation comes to a halt due to, for example, decision wavering or due to measures not having the intended effect, there must be an ability to take control the response operation as required. One must have the ability to critically review the sequence of events, the need for assistance and the decisions that are made. One must be able to contemplate and illuminate decisions from various perspectives, perhaps especially from how those seeking help perceive the help that is provided. In this respect, one may have previous experiences that influence decision making in a negative direction. Experiences can cause one to have a predetermined perception concerning certain phenomena, which can lead to one not seeing or taking consideration to how the situation is in reality. Here as well, perceptions of, among other things, time and space, are important to take into consideration. Zetterling (1995) maintains that the starting point must be to attain independent and initiative-rich conduct on all levels. The ability to improvise is considered to be of fundamental significance in complex and dynamic situations. Emergency responses are often characterized by high tempo, but at the same time by unclear situations, and conduct must often be based on diffuse grounds. Afterwards, execution is adjusted and a large amount of flexibility is required. Zetterling (2000) maintains that the aims of management by objectives are to:

- Establish increased participation among personnel.
- Involve more people in the planning, decision-making and execution process.
- Create better preconditions for focusing on general issues.
- Place the decision maker closer to execution of the decisions that are made.
- Create flexibility and adaptivity (the ability to adapt).
- Provide space for greater initiative ability.
- Establish better improvisation ability.

Management by objectives can be a suitable principle for controlling a sequence of events, but under certain circumstances, one

must also be able to manage in detail. An example can be when the person in charge has detailed knowledge of a certain aspect or if the situation is especially perilous. In some situations, this can demand that various tasks are coordinated with a high degree of detail and that the decisions that are made must be adapted thereafter (Swedish Rescue Service Agency, 1998a). Management by objectives provides the prerequisites for the command system, when necessary, to establish speed in making and carrying out decisions. By having local authority to make certain types of decisions, one avoids decisions being transferred to higher levels and the ensuing delays that this produces.

7. Time and space

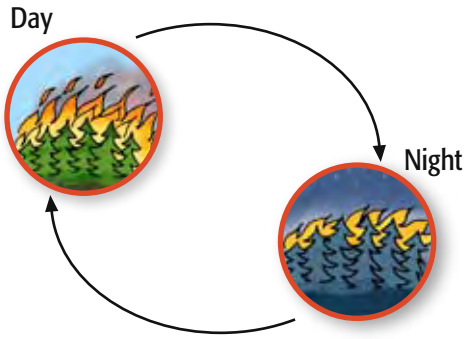
The aspects of time and space are fundamental to emergency response operations. They need to be taken into account when dimensioning a rescue service and in the planning of response operations. A response operation is executed in a particular geographical location and there is only a certain amount of time available. But time and space represent much more than this. Both can be considered from a wide range of perspectives that affect response operations in different ways, from the purely physical to the more abstract.

Time

Time, around which our whole existence is built, is an extremely difficult concept to define. Our understanding and relationship to time is individual and largely culturally determined. We are not born with a concept of time. Rather the concepts of time that are applied in different cultures are socially determined and especially adapted to suit the ways of the respective cultures.

A municipal structure for providing rescue services represents a particular culture with a particular perception of time. One concept within the rescue service can be the understanding that a short response time is extremely advantageous, something which, however, in some situations can prove to be absolutely not the case. For some kinds of alarms it would perhaps be better not to rush but to take time to think over the situation. In such cases the quality of information received might be more beneficial than the quantity, something which rescue service culture can have difficulty accepting. The priority of time, in such cases, is reduced. The perception of time within the municipal structure for providing rescue services may also be dependent on how, for example, in practical terms, the rescue service has been produced with respect to the political system or simply seasonal requirements (in terms of autumn storms, winter road conditions or the forest fire season).

We can for example consider a decision maker who deals with issues and problems from an overall standpoint. As the perception



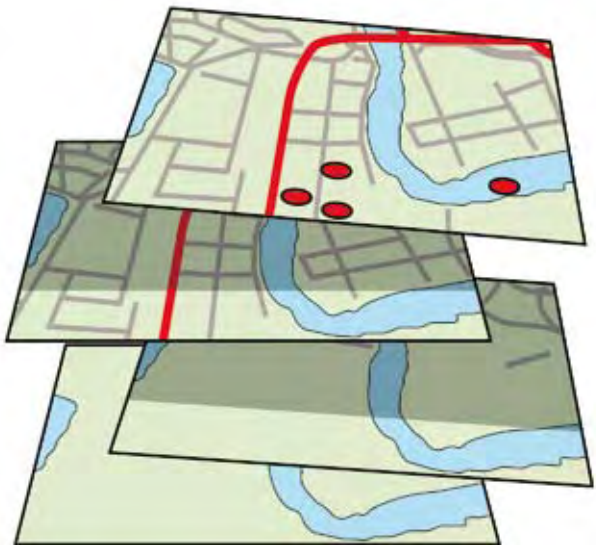
One can feel as though time goes in cycles, i.e. as something repeating itself.

of time the decision maker exists in, at this level, can be long and the space extensive, the time it takes to receive, for example, information during a response operation can seem extremely long. It can, in this situation, be easy to fall into the trap of putting pressure on the response operation by demanding more information. This does not always benefit the system as a whole. Even if, as a decision maker, one is dependent on information, it is perhaps not always best to request it to the extent that it disrupts other aspects of the system.

Time and space go hand in hand. In the same way as length represents the distance between two points in space, time represents the distance between two incidents; they either occur at the same point or not. The progress of time can be observed and measured in terms of change such as movement or aging.

Space

The concept of *space* can be difficult to define also, though not as difficult as time, as space can be described in strict geometric terms. It is often easy to draw space, for example, using a map. Space can be considered as a surface area forming a tangible region somewhere on the surface of the earth, in a town or a building. It is possible to move around in different spaces or between them, and the connection between them is perhaps not always obvious or simple. Space can be seen for example as different layers, where each contains various types of information that can be of interest depending on the approach taken.



Space can be thought of as a map with different layers, where each layer represents a certain amount of information.

Let us take, for example, a fire in a warehouse containing chemicals; it is of primary interest to conduct a technical analysis of some parts of the affected space in order to extinguish the fire at the same time as limiting the flow, out of the building, of chemically contaminated extinguishing water. In other parts of the affected space it may be a question of focusing more on the long term effects of the extinguishing water on the environment. It can under such circumstances be difficult to transfer relevant and important information between the different parts of the space.

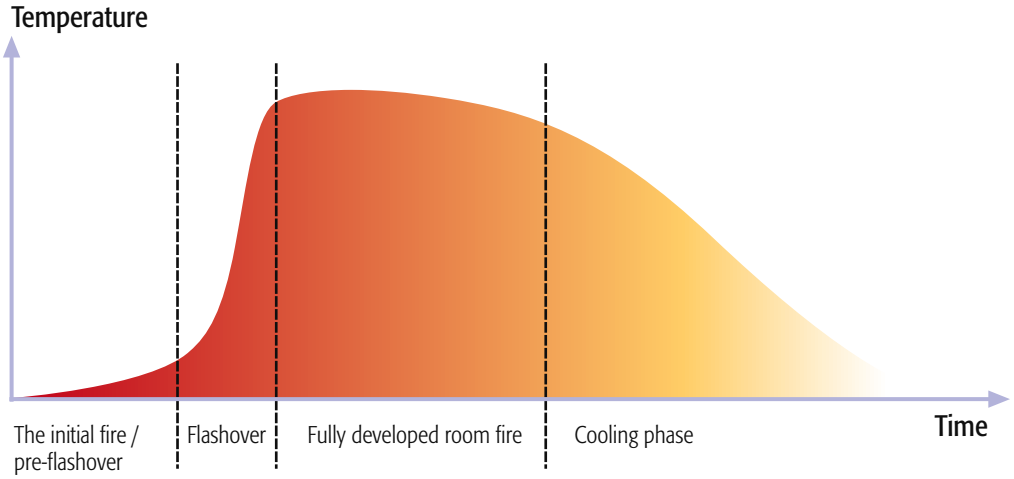
It can also be perceived as being of a relative and abstract magnitude, for example as the x-axis on a graph, a distance measured in kilometres or perhaps simply in time. The development of a fire in a (physical) space is for example often described using graphs explaining the relationship between time and temperature within that space. Important in the concept of space then is that it is normally considered in connection with time.

It can also be perceived as being created through interplay with various societal and institutional processes. A particular organisation has a certain amount of space within which to function, limited by legislation or other forms of agreement. There are for example a number of legislative criteria stipulating what can be taken as a rescue service and when an emergency response operation can be terminated. Such criteria limit the space that the municipal structure for providing rescue services has to function within and concern both time and geometric space.

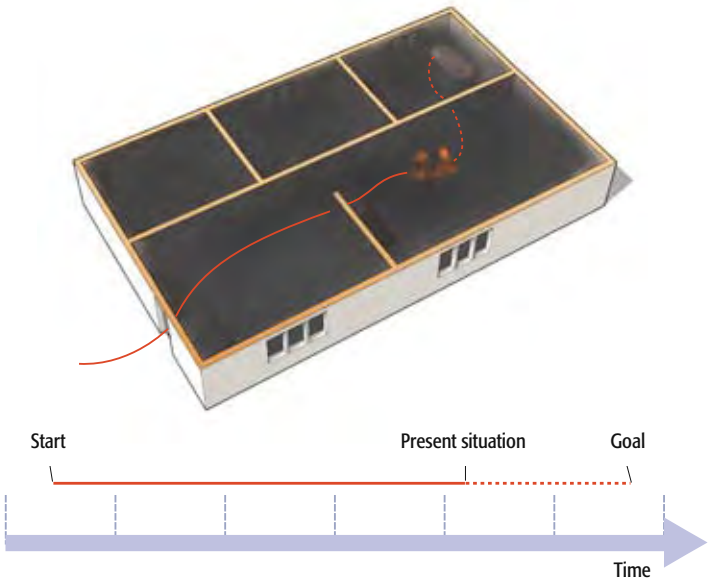
Example 7

There is a fire in a storeroom for hazardous waste. To reduce the effect, the fire brigade in Allmänsta applies a large quantity of extinguishing water. Unfortunately the water carries hazardous waste with it from the store and out into a nearby stream. The long term effect of water on the environment must be dealt with at the same time as the fire must be extinguished. To manage this problem, one requires a good understanding of how various sections of space can affect one another in the short and long term.

Since the world is in a constant state of change, space cannot be considered as a static condition where everything is standing still. There are static elements in space, however, in the form of buildings, roads, forests etc. Even legislation can, over a certain period, be taken as relatively static. On consideration of the preparatory work behind forming legislation, however, it becomes apparent that there is more dynamism within the process than first envisaged. More locally based regulations and norms can be changed much more rapidly, even during the course of a response operation. We can consider, for example, extensive flooding affecting large areas of a municipality, where, during the course of



(Above): A fire can, for example, be illustrated using a time/temperature graph. See Bengtsson (2001).



(On the right): The connection between time and space: it takes, for example, a certain time to travel a certain distance.

events, the decision is taken not to pump out individual houses as the resources required for this should to used to maintain societal functions such as electricity and fresh water supply. It is important to remember that the definitions of time and space change continually, but usually not quickly. This is not always the case, however; the development of an incident can force a municipal structure for providing rescue services to change the space it has to function within.

Even this relatively basic description of time and space provides cause for reflection over their significance in terms of emergency response operations.

Dynamics

Emergency response operations are executed, naturally, in time and space. They start at a particular point in time and end at another. Between these two points various things happen, some as a consequence of the measures applied by the rescue service, some as a consequence of measures not applied by the rescue service. Some things occur due to the physical laws that control and affect such courses of events whether the rescue service is involved or not. This collective effect we call the *dynamics* (i.e. time related) of the course of events. This can vary. Situations can be less or more dynamic.

In addition response operations are executed within a certain geographic area, sometimes a relatively large area. Consequently it is important that the responding rescue service has a good understanding of the time and space aspects, not least in order to gain and maintain control.

The two concepts must be considered together, and they influence the response operation in many different ways. In considering a commander's role as the decision maker we can, in simple terms, relate to several steps with a connection to both time and space:

- The first step is to gain information. This happens continually, but this step is often treated, with both positive and negative consequences, as a single begun and finished activity. Here it concerns, among other things, creating a picture of the situation. The gaining of information or creation of a picture of the situation takes time, whether considered as a continuous or an intermittent process. The time required is directly related to the geographic space involved. The greater the geographic space, the longer it takes to gain the necessary information, even when using technical aids.

- The next step is to process the information into a basis for decision making. This can happen very quickly or can take considerable time. If a longer period is required it can be necessary to form a partial basis for decision making which is then successively built upon and refined to create the complete picture of the situation and the basis for decision making. We should always bear in mind, since the situation is dynamic, that information being processed can be updated before processing is complete. In other words the situation or an individual's

understanding of the situation is continually changing. Note that the understanding of a situation is not always the same as the actual situation - our senses cause us to filter and comprehend on the basis of previous experience.

- The third step is the decision making and issuing of instructions, tasks or the carrying out of processes. All three of these initial steps both in thought and practical application take a relatively short time. However, in many cases, it would be better if considerably more time and effort were applied primarily to processing information into the basis for decision making and the formulation of the decisions made. This is of course very dependent on the urgency of the situation. It can sometimes be necessary to reach a quick decision, or a decision at all, and sometimes to reach the right decision.

- On reaching a decision (which is too often incorrectly taken as an isolated aspect in the complete decision making process) the next step is implementation. This can take a very long time as it is here we find the primary connection to space. The decision to execute a certain action and issue information to units can for example require the preparation of equipment prior to transportation, transfer and preparation of equipment after transportation and finally application of the equipment in the actual execution of the action decided upon. The execution of different types of action requires different amounts of time, depending upon type of action, conditions, quality of equipment and available competence.

- The fifth, final and crucial stage is to gain the desired effect from the action taken. The effects of some types of action are often quite obvious, which can be a problem in itself. For example the effect of some measures can become evident too quickly and perhaps in an undesirable way. Rapid processes and quickly developing effects can for example be detrimental to the safety of personnel. But the biggest problems often occur when the effects of different measures do not become apparent for some time or are either weak or unnoticeable, but which nevertheless have a significant effect on the end result of the response operation. This is a question of balancing the here and now need for action to solve an immediate problem

against action aimed at a future situation with regard to the total solution for the whole incident site. This problem can be discussed in terms of the notion time constant, i.e. a type of measurement of sluggishness in the system or parts of the system.

It is not always the case that the above steps follow the order given here or even that the processes occur as separate entities. It is quite possible that several of the above steps can overlap or run in parallel, especially when bearing in mind that there are various levels in the system or that a large number of greater or lesser separate problems may need to be solved simultaneously. Every individual in the system, regardless of whether they are formal decision makers or not, receives information, processes it, makes decisions and bases actions on these. And even if we only consider commanders and formal decision makers, the decision making process and its connections to time and space become complex and extensive.

Time and space perception

We can speak in terms of, *time perception*, which entails some degree of understanding of aspects that concern time, such as *wait, first, later, now, in a little while*. Good perception of time is required to effectively execute tasks consisting of a combination of activities that have to be carried out in stages, for example, in a *tactical pattern*, or to wait for the particular effect an initiated and executed measure will result in. This can be very evident during the execution of emergency response operations. The fire chief for a municipal structure for providing rescue services must be capable of perceiving and understanding the longer term consequences of the decisions made. Decisions are transformed into instructions or tasks, units are assigned these and they execute certain actions; a certain amount of time is required for this and to ensure that the desired effect of the actions is obtained. It is not sufficient to view the problem from one time axis in which one action is followed by another. One must be capable of surveying the complete sequence of events as a continuous process and creating models of the development. Sometimes it is necessary to initiate certain measures on the basis of early indications and personal experience, in order to combat a problem before it has had a chance to develop. When, for example, an attic fire breaks through the roof of a

building, it can then be too late to implement certain actions. Therefore on the basis of indications and previous experience of similar situations, decisions need to be taken and action initiated in case the fire breaks through the roof. Even when it comes to distributing resources between several simultaneous response operations, decisions have to be taken at a very early stage, before the actual need for the resources occurs. When a request is received from an individual response operation to a higher level of command for a particular resource, this resource should already have been initiated and be on its way. This places high demands on the time and space perception of commanders, a demand which increases in line with the level of responsibility.

In the same way we can consider *space perception*, which describes the degree of ability to understand the relationship between oneself and space and between different objects in space. Space perception entails, among other things, being able to recognise and describe important properties of geometric figures, patterns and surroundings generally, and to be able to compare, estimate and measure lengths, areas, volumes, angles and mass (and also time). Space perception also encompasses being able to use drawings and maps and the scales to interpret them, read off and interpret data given in tables and graphs and being able to use elementary positioning methods. This may sound rather basic but it is not always that easy to understand the relationship between, for example, yourself as commander, the applied resources, and the area concerned in the form of one or several incident sites. It can for example be difficult to see or understand what is happening at the back of a burning building, especially if no information is available. But the back of the building exists and things are happening there, regardless of whether the incident commander is there or measures are being taken there or not.

Space perception at an incident site is important and it concerns among other things being able to think three dimensionally, even when the eyes are only providing you with two. Correspondingly, it is also important that different individuals have time and space perceptions which, depending on the environment, are relevant. The situation becomes more difficult when the decision maker is not physically at the incident site, but must nevertheless create an understanding of the situation, in terms of time and space, and make decisions to affect the outcome of the response operation.

The difficulty of seeing and understanding what is happening on the other side of a burning building.

Time is a more abstract concept than space. Space can be investigated and experienced through sight, feel and body. Experiencing time is more of a thought process that among other things is dependent on an aptitude for dividing attention, i.e. having several thought processes running simultaneously, changing focus from one to another, retrieving images the eye took in and be able to create and see images of future situations. Difficulties in time perception sometimes concern the problem of visualising a course of events in its entirety. This makes it difficult for the individual to plan events, and places various demands on others who are working with different types of information, even within the framework of a single emergency response operation.

The connection between time and the physical world becomes apparent when for example it is necessary to assess how much of a specific task can be executed in a minute or how the emergency preparedness in a municipality can be changed within a certain period of time. It is easier to estimate the time required on the basis of previous experience of a similar situation than when confronted with a totally new situation. It is important to examine how one in retrospect evaluates and possibly adjusts, up or down, the speed of execution, especially if the same task is to be executed again. The need, also at higher levels of command, for being aware of the amount of time required to, for example, execute different types of tasks or actions at an incident site should not be underestimated.

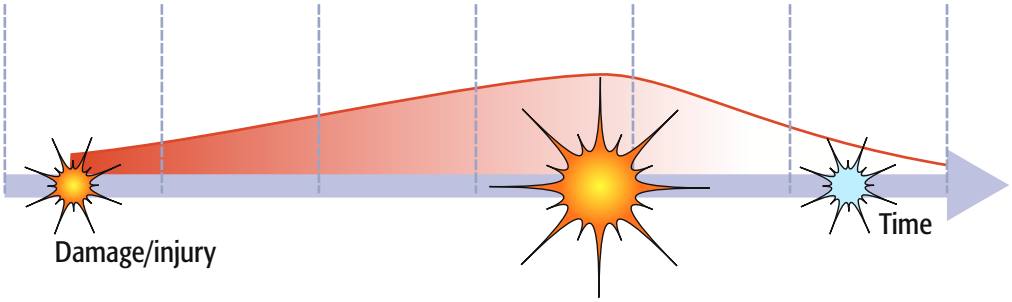
In rescue service work the term *forward planning* is sometimes used, i.e. when looking forwards in the development of a response operation. This term can be somewhat misleading, as what it really concerns is seeing the effect of what is happening at present

in relation to what will happen later. As a commander it is especially important to be able to envisage the effect of decisions and actions taken, in both the short and long term. A commander must be able to take in the big picture, with respect to both time and space, and see the then, now and later aspects of the event as dependent, linked occurrences. The need for being able to envisage future developments varies depending on where the decision maker is in time and space.

Generally speaking it can be said that rescue service organisations are action oriented organisations. Action goes before thought, and it is important that things happen as quickly as possible. This orientation influences the education and training of personnel and also the recruiting process for commanders. There is a tendency to engage energetic managers in action oriented organisations. Action – getting things done – is obviously important. But it is more important that there is thought behind the action. Taking the time necessary or available to reach a decision can be of ultimate importance to the end result. First think through the situation, the problems that need to be solved and how this can best be done. Then take action. Thought prior to action also creates space for a long term approach – for actions to have a long term effect, also, for a longer period or more extensively. Taking that little extra time can also be significant in terms of safety. But there must of course be a reasonable balance between thought and action.

Delays

Delay is also a subject for discussion. Processes or work tasks suffer from various types of delay. It takes time to carry out a process or task and it may take time before the effects of the completed process or task show themselves. We can compare this situation with a means of transport which requires a certain amount of time to travel a certain distance. This is questionable, however. Processes and work tasks are often carried out in a context in which they have to compete with other processes and tasks and also with the resources that are available. So the time it takes to travel a certain distance does not only depend on the means of transport but also on how other traffic and the road conditions affect the speed. The effect of a particular action can depend upon other possible actions that are being carried out at an incident site. The success or failure of an action can depend on other actions also being suc-



A single time axis is not sufficient for describing and handling the course of events in the system and its surroundings.

cessful or even on their failure. In the same way it is possible that the result of one response operation can result in another simultaneous operation being less successful. These are examples of less obvious connections between various occurrences. We can say then that a single time axis is not sufficient to describe, explain, understand or generally handle several simultaneous processes, tasks or developments.

Delays can also be denoted by the term *inherent time*. If one as a commanding officer is aware of delays, they should not normally increase the problem load, as they present the opportunity to compensate and adjust for when in time or where in space one or more actions should be taken? Complications that can be difficult to take into account can always occur during practical execution. Consequently decisions should be taken and actions initiated and executed in such a way that delay is treated as a natural part of them. It is often desirable to make any possible delay as short as possible. However, sometimes measures are taken in order to deliberately delay the development of an incident as much as possible. Long delays can be desirable, at least at some stage of a response operation, in order to provide time to investigate other aspects. The important thing is that these occur as part of a conscious approach to decisions taken to initiate certain types of action at an incident site. Through initiating certain types of action at an early stage, delay can be used to create margins or working space in terms of both time and space.

In the same way it is possible perhaps, in the event of several simultaneous operations, to distribute resources in such a way as to delay the course of events at a particular incident site. An active approach to the distribution of resources between incident sites can then lead to a successful conclusion of the collective operation, even if the developments at some stage may be undesirable.

Example 8

The fire brigade in Allmänsta receives an alarm concerning a fire in a barn. It is obvious from the start that the building cannot be saved. But there are cattle inside the barn. Measures are therefore taken to slow down the spread of the fire allowing time for the animals to be rescued. Through applying certain types of measures a course of events can be delayed, providing time for the execution of other measures that would otherwise be difficult to execute.

A response operation is a goal oriented operation which is made up of a number of measures. These must normally be executed in a particular order, even if several are being applied simultaneously. An action that is to be executed (because the situation demands it) can require cooperation between several individuals and/or that the individuals have access to equipment and material. This entails the individuals having a common perception of time and space and that their perceptions can be coordinated in a relevant manner.

Delays can influence more than one would imagine on first impression. In combination with the cause of the delay, it is necessary to handle different types of delays in different ways.

Example 9

In an extensive district fire, the individual BA firefighters must be relieved. This can be done 'at the nozzle', i.e. the replacement firefighter can directly take over the equipment being used by the present firefighter. This type of takeover normally only requires a couple of minutes and the delay it causes seldom results in any significant problems.

Later during the same response operation there is a need to relieve a whole unit – personnel are tired, cold and hungry. The equipment is worn and needs to be replaced. This type of takeover takes longer, perhaps 30 to 60 minutes.

Still later in the course of events it becomes necessary, for some reason, to replace (or transfer) a complete sector, involving many personnel. This type of adjustment can take several hours, not least because of transportation. The delays caused by such a move can, in a worst case scenario, result in the total failure of an operation and must be planned for very carefully.

Regardless of how long the delay is, the reduction in emergency preparedness, among other things, must be taken into account. There is a limit to the number of personnel available and the longer it takes to conduct relief replacements the greater can be the reduction in emergency preparedness.

Restrictions in time and space

In a given situation both time and space, separately or together, can place restrictions. Appropriate measures compete for the available time and space. In this context questions of justification and expectation can easily arise with regard to what is best for here and now and what is best for there and later. The competition results, for example, in some individuals having to wait to execute their measures, or not execute them at all. In the case of emergency response operations the actions that will or should be executed are positioned hierarchically. Some measures are fundamental and consequently more important than others. These are prioritised and placed higher in the hierarchy. Many measures are never executed as there is not sufficient space for them. These are at least as interesting as the executed actions, not least during the analysis stage on completion of an operation, as they provide information on the measures that are available to some individuals in certain surroundings.

The equivalent can apply in the case of several simultaneous ongoing response operations. Some are fundamental and prioritised, while others are not prioritised or perhaps not executed at all, rescue service legislation still nevertheless being met. It is important in such competitive conditions that the right measures or response operations are applied and that the less important ones, even though they may be completely justifiable in the circumstances, are postponed or omitted. It is easy to fool yourself when the apparently less important measures or response operations can be of greater significance in the long term. They can be providing the conditions necessary for the execution of more fundamental measures or responses at a later stage. The commander needs to be able to see beyond the direct consequences of an action or response and envisage the effect in the longer term, in time and space. This applies primarily to commanders at higher levels.

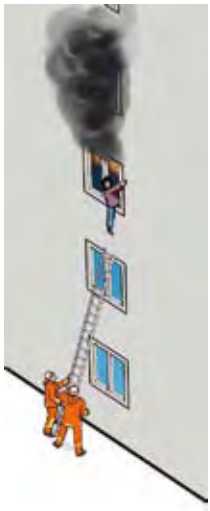
Here we can refer to *limited resources and competing resources*. These place limits on what or how something can be done on a particular occasion. It is of interest to look at the possibilities and limitations of what can be executed or achieved within a certain time or at a particular place. The analysis of restrictions placed by the time and space then becomes central. Such *restrictions* can be placed in three groups (Hägerstrand, 1970):

1. Capacity restrictions
2. Connection restrictions
3. Control restrictions

Capacity restrictions are the limitations of an individual on the grounds of physical constitution, i.e. that a person cannot physically carry out certain tasks. They also include limitations in mental capacity, i.e. that an individual is limited by how much the brain can process. In addition there are capacity restrictions in terms of the facilities an individual has available to them. This concerns such aspects as, for example, the need, normally, to sleep so many hours per day and to eat at regular intervals. In connection with this we can take up the aspect of sustainability, i.e. it is necessary for commanders to be aware of these capacity restrictions in order to prepare for relief before the individual's performance is affected and urgent measures become necessary. In the same way commanders have to be aware of limitations in resource capacity in the form of, for example, availability of extinguishing water.

There is also a capacity restriction in the balance between emergency preparedness and the threat situation. There already exist at a basic level, i.e. in the situation that is the norm for the municipal structure for providing rescue services, restrictions caused by, among other things, response time to the various areas within the municipality. If the emergency preparedness situation is changed, for example, through physically moving part or all of the organisation, the capacity restrictions will be altered. If, through such temporary or more permanent moves, response times to some parts of the municipality are reduced, they will probably be increased to others. This is, however, a relatively easily solved optimisation problem.[1] To dimension the emergency services and locate the fire stations on the basis of response time and number of staff is not difficult. There is, however, much more involved in dimensioning a municipal structure for providing rescue services.

Connection restrictions arise through demands for coordination between individuals, equipment and material, and even, for example, between various incident sites or response operations. The majority of measures taken during a single emergency response operation need to be coordinated and it is seldom that just one measure is executed at an incident site. Normally several are executed, some simultaneously and others consecutively. It is often the case that several such simultaneous and consecutive measures are dependent on each other for their actual execution or to achieve the desired result. These sets of measures that are executed

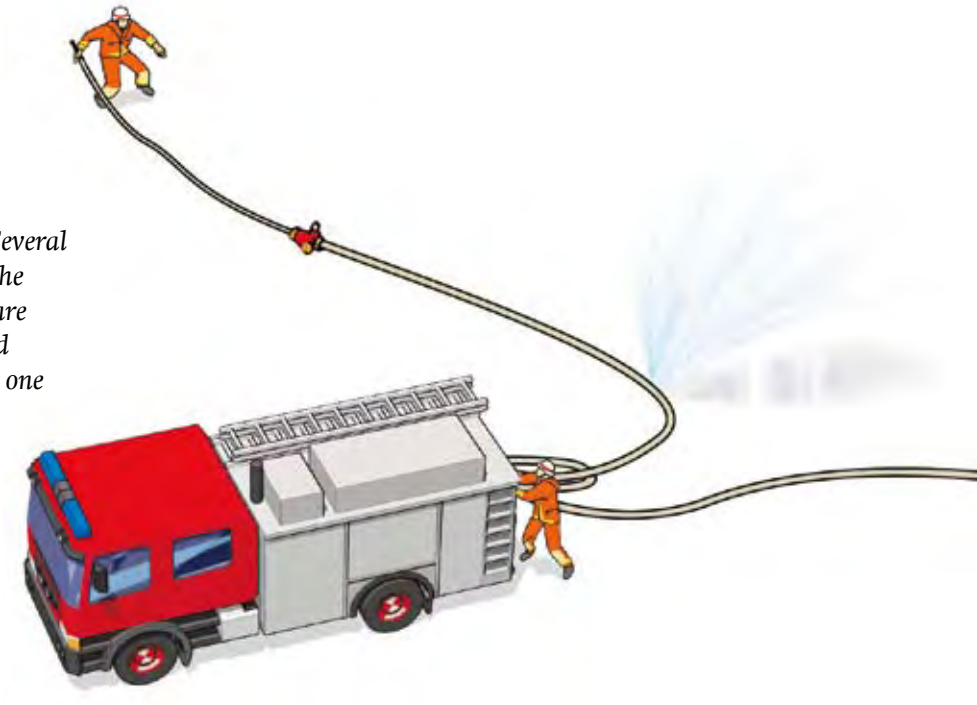


Capacity restrictions. The ladder is too short for the allocated task.

simultaneously in parallel or consecutively in series are called a *tactical pattern*. Coordination requires that individuals and equipment are available at a certain place and at a certain time. The location, the individuals and the equipment are then engaged and consequently unavailable for other response operations or measures. It can, however, be necessary to transfer some special equipment between different operations. Here the competition for time and space takes on another perspective compared to its existence within the framework of a single response operation.

Control restrictions concern various aspects of exercising power. In the first place this concerns control over space and the authority to access different parts of the space, for example, parts of an incident site or a municipality. The concrete space constitutes a hierarchy of domains that are controlled by various individuals or organisations. Access regulations can be very or less stringent. Not even the municipal structure for providing rescue services has access to all parts of the space, at least not always. Sensitive areas such as military or nuclear technology installations, where there is strict access control can be taken as examples of this. Control restrictions also concern control of an individual's use of time. If, for example, an individual or group of individuals (a unit or rescue team) is instructed to carry out a task, this must perhaps be completed within a certain time, either because the individuals must then carry out other tasks or because subsequent to that period the task will no longer have an effect on the incident or accident.

1. An example that is well known within mathematics and optimisation theory is the 'travelling salesman problem'. This involves a salesman who is to visit a number of towns. Each town shall only be visited just once and the problem is to find the routes between the towns that will result in the minimum total road distance. This scenario is well known within optimisation theory and can be solved in several ways.



Connection restrictions. Several measures at the incident site are connected and dependent on one another.

A significant part of control restriction arises through legislation that has to be adhered to. In the case of emergency response operations this can, for example, concern limitations imposed by the Civil Protection Act or working environment legislation. Both of these concern what can or may be done as much as what cannot or may not be done.

The different types of restrictions that arise in time and space are important. One important aspect, among others, concerns what significance the restrictions in time and space have. On the side of these restrictions there are other limiting factors, for example, the possibilities an individual has to execute tasks or response operations. The way in which time is used is not only controlled by restrictions in time and space. In the case of an emergency response operation one can, for example, ask oneself the following:

- How are the possibilities for the commander to execute a task within a given time or at a given place limited? What makes certain alternatives for action possible and others not? It could, for example, simply be a question of shortcomings in competence, i.e. that the education, training or experience required for the rescue service personnel to carry out certain types of tasks is missing. It could also concern resource shortcomings, such as insufficient foam.

- What happens to the execution of the response operation or task in terms of time and space if the operation is changed or if organisational or technical changes are made? A complete unit could, for example, be eliminated during an ongoing operation: a pumping appliance could drive off the road during the turn-out, or a large quantity of hose could be destroyed in connection with a forest fire.

- Which circumstances steer the use of time, or, more precisely, the use of time and space? Examples of such circumstances are the time constants discussed above, which place certain limitations on the use of time and space.

- What are the effects of the various phenomena that exist side by side in time and space? What are the consequences of the co-existence in the time and space? A fire, for example, affecting an LPG tank can be taken as a case consisting of two phenomena existing simultaneously (and which also affect one another). The fire is one phenomenon and the transfer of energy to the LPG in the tank another; which problem is the biggest and consequently the one which should be tackled first? Another example could be two separate, simultaneous fires in a large forest area in the time and space which will have both independent and combined consequences. What restrictions will this result in, for the separate responses and for the system as a whole?

The command system created for the municipal structure for providing rescue services must naturally be conscious of time prior to and when one or more response operations are being executed.

Control restrictions. Because of the risk of contamination, emergency services personnel may have limited access to a nuclear installation.

The issues concerning time and dependency on time that should, among others, be taken into account are:

The speed at which the situation develops in terms of time. Is there any development/change at all? How should one, for example, consider the progress of time, as cyclic or linear? Does the speed aspect of the situation change, for example, because of cyclic, recurring conditions, such as night and day?

The speed of change with regard to the threat situation, i.e. the speed at which the threat situation within the municipality changes over time. Also here one can reflect over whether time should be taken as cyclic or linear.

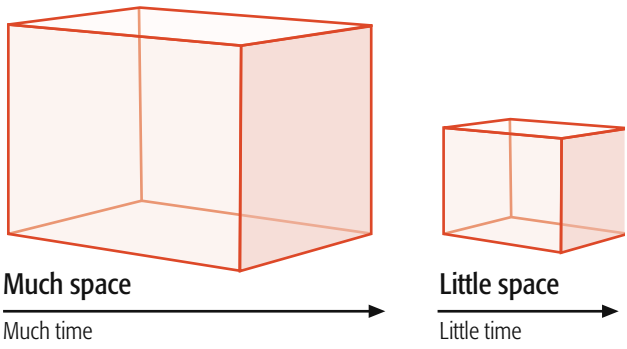
The autonomy that is built into the system, i.e. the time interval during which all or parts of the system can function alone without some form of input or stimulation from other parts or from outside. An emergency response operation must continue for as long as the need for assistance remains (until the criteria of legislation is met), regardless of whether there is a senior officer delegating tasks or not.

The capacity to quickly activate the command organisation, resulting in valuable time being saved in the initial stages, when the planned system is put to the test. A response operation can proceed for some time without any overall leadership, but eventually shortcomings in effectiveness and coordination will make it necessary. Decision makers at different levels will have various opportunities to influence the development in the time and space.

The variation in needs of the various decision makers in the time and space, with regard to, for example, degree of detail in the flow of information.

The command system must provide a degree of sustainability that matches the expected duration of the response operation or operations, i.e. the staying power must align with the prognosis for the response operation or operations that are being executed. This sustainability must also be continually capable of adapting to changes in the threat situation and emergency preparedness. Consequently, when dimensioning, for example, a command system, more needs to be taken into account than simply its capability to initiate response operations. The capacity to command over a period of time, i.e. to carry through and complete the operation as well as maintain preparedness in relation to the threat situation must also be accommodated. The command system should be provided with a degree of sustainability corresponding to the duration

The longer the period of time that can, should or shall be managed, the greater also becomes the space requiring command.



of the incident on which the dimensioning is based. It is therefore important to obtain an estimation of the duration of the response operation or operations and the time required to apply the correct measures and obtain the required effect from them. If this is not done there is a risk of the response operation quickly taking on a parrying character. In addition it is necessary to bear in mind that higher levels must overview a longer time perspective and greater space than lower levels. Decisions that are made and the aims that are established at higher levels set the limits for lower levels, with respect to both time and space. Decision makers, then, at different levels work on different time scales.

Resource growth and completion of operations

Here will shall consider the aspect, *resource growth*. An emergency response operation must provide resources of both the quantity and quality required to execute the work and achieve the desired result. The command organisation should therefore also be structured in such a way as to cope with the strengthening of resources, with regard to both the course of events at the incident site and the additional resources. The effect on the other levels within the organisation should also be taken into account. In the same way, for example, emergency preparedness in the municipality must be provided with a capability that minimally meets the requirements of the current threat situation. In addition, one should bear in mind that the threat situation changes continually and that this can place other demands on sustainability of the municipal emergency preparedness. The threat situation neither begins nor ends; it is always present, continually forming the basis for new decisions. An organisation is not formed instantaneously, even if its structure has been planned in advance. This applies primarily to the ini-

tial stages of structuring a response operation. Normally the practical build up, i.e. manning of positions and the turn-out of, for example, units and commanders, takes some time; this is known as the build-up phase. Personnel often arrive separately and are allocated a task or a position for this phase. The amount of time required to establish a particular function in the command system may vary. This is also a form of inherent time, delay, which was discussed above.

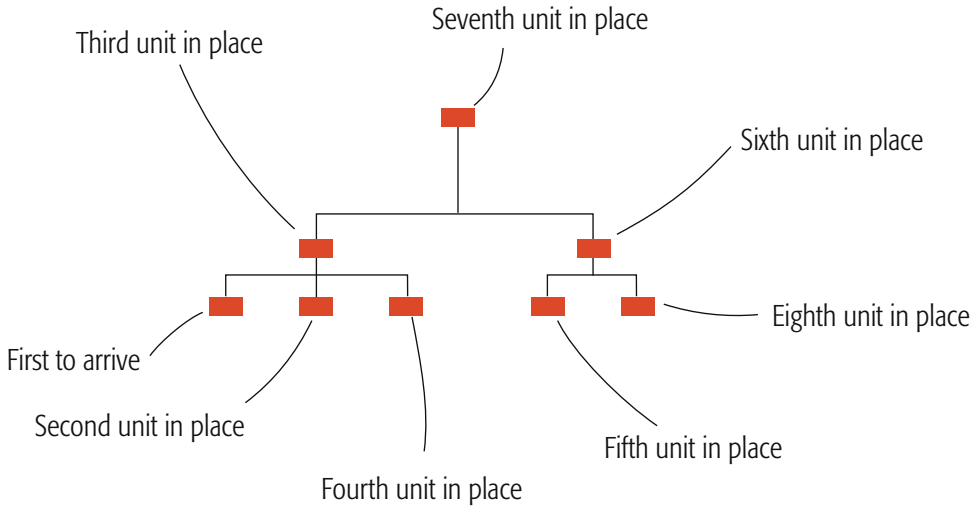
In this connection we should also bear in mind that at some point the operation will be wound down and completed. This will, among other things, affect the production of emergency preparedness. The longer units are engaged at a specific incident site, the longer emergency preparedness production is affected. It is necessary to continually weigh up the benefits of having a particular resource available and not engaged in a response operation (for example at a break point), engaging the resource in work at the incident site, moving it to another incident site or using it for emergency preparedness production. This weighing up will cause both time and space to be influenced in different ways.

The location of the command post

Another question often asked of the municipal structure for providing rescue services, which has a connection to the above discussion on time and space, concerns the geographic location of different commanders. For both practical and legal reasons a location that facilitates obtaining a picture of the situation should be selected, depending, among other things, on the authority of the commander in question. This entails different commanders being located in different places since the nature of the task or its scope calls for this. The optimal location of a commander can also change with time. There are several factors involved in selecting the best location. A visual impression is very beneficial to understanding the development of a situation, but higher commanders must completely or partially depend on reports that they receive. As discussed above, this requires good time and space perception.

In the majority of response operations the incident commander is in personal contact with his or her subordinate officers. This clearly facilitates communication; basic reports and instructions can be relayed verbally.

Even body language can be an important source of information.



The configuration of an organisation takes time, even if it is preplanned.

Here we find a direct link between time and space, as closeness in time also provides closeness in space, which, however, can also be detrimental since a commander may then lose perspective of his or her work tasks. If the path decisions and reports take is short, their delivery time is also normally short.

One should also be aware to ensure that the perspective does not become too large or too small. If the perspective becomes too large, contact with reality may be lost. If it becomes too small the overview is lost and there is too much focus on detail.

In the case of a geographically widespread incident or an extensive incident site, it becomes extremely difficult in practical terms to obtain closeness to the whole area. The advantages given in the above discussion then no longer apply, while the disadvantages of leading operations from a temporary or distant location remain. The disadvantages that must be weighed up against the advantages are, for example, shortcomings in coordination, use of audio-visual aids and the assistance of weather and wind. Under such circumstances parameters other than closeness to the incident site should steer the choice of location for the command post. Incident command for a single response operation should, however, under normal circumstances, be located close to the incident site.

Command on a longer time scale or larger area than a single response operation lies within the sphere of activity for the whole rescue service organisation, i.e. at a higher decision making level. There is then no geographic link to a particular incident site or

response operation. Activities at higher levels should generally be based somewhere providing good conditions in the form of, for example, a practical premises, good communication means and technical aids. Irrespective of the level, command work should always be carried out from the location providing the best conditions for just that. Note the comment above on the need, in some cases, to vary the location of the command post. When locating a high level commander one should also cater for command. The general purpose of these should among others be for the commander to familiarise him or herself with the situation so as to facilitate decision making with respect to the continued direction of the total response operation in relation to the current assistance needs. The purpose should also be a follow-up to ensure that the current assistance needs are being provided by the response and if necessary to adjust the framework of the response.

Situation perception

In order to make the correct decisions, it is necessary to obtain as accurate a picture of the situation as possible. In addition it is quite often necessary to create this picture quickly. In this context we can apply the term *situation perception*. The capability to handle a situation can never be better than the understanding or picture of the situation the handling is based on. An inadequate picture results in inadequate handling. It is also normally the case that shortcomings in the understanding of a situation cannot be compensated for by other means. If, for example, in the event of a forest fire one has no concrete evidence as to where the fire is, it makes no difference what resources are available or the control the commander has over them. If it is not known where the resources should be applied, the situation cannot be handled and it is not then possible to obtain and maintain control. In order to overcome this and create as accurate a picture as possible, certain criteria are referred to, such as orientation, information gathering, provision of intelligence, visualisation, observation and forward planning.

Gaining an understanding of the situation involves more than simply looking around. Instead of visual impressions, in the majority of cases, it is more important or more relevant to create a model of the situation and how it may develop. For example, during

Example 10

An incident has occurred and the emergency services have arrived and are engaged in an emergency response operation. The incident commander has set the goal of the operation and is leading the work at the incident site.

The fire chief has ultimate responsibility for the operation and for how work is carried out at the site.

Through setting the aim of the response the fire chief can influence the work at the site without taking over the role of incident commander. By carrying out a command visit, the fire chief can gain valuable first hand information and thus better evaluate the goal of the operation in terms of the aim of the operation.

The fire chief should not get involved in either the problems of the individual incident site or in too much detail. After a completed command visit the fire chief should, therefore, be able to leave the incident site, even if a long term operation may call for several visits.

the forest fire season, one can continually be updated with regard to fire risk assessments and weather forecasts. And through this continually carry with you a mental model depicting how a possible forest fire may develop and the resources that may be required to deal with it. In this way emergency preparedness production can be continually accounted for, and the conditions are created to gain and maintain control when response operations are being executed.

To provide effective emergency response operations it is necessary to, at an early stage, identify the variables and parameters influencing the situation, in order to act and not parry (Johansson, 2000). It must also be possible to distinguish between cause and effect, and this necessitates models which depict or explain the links between these variables and parameters. A model of the situation must also include the damage aspect and its development as well as the resources and their strengthening and application. This is to say that it must encompass the problems to be tackled and the means of tackling them.

Knowledge of reality is gained, principally, in two ways. One is through empiricism and the other through rationalism (Molander, 1988). *Empiricism* bases gaining knowledge of the outer world on

- sensory impression
- memory, and
- experience.

The outer world is taken up via five senses, we remember these impressions and our memory forms experience. Most people normally need to see reality in order to understand it. It is consequently often not enough to have reality explained - it must be experienced. *Rationalism* bases knowledge on

- reason,
- logic, and
- spontaneous insight.

Here the senses or experience is not being used; something is accepted as true or false on the grounds of reason, logical conclusion or instantaneous insight. Examples of the latter are the insights that the shortest distance between two points that are close together is the straight line between them, or if something is wet it cannot be dry.

Example 11

The municipal structure for providing rescue services has received an alarm concerning a tank lorry that is on fire. The fire brigade personnel on site sense that the radiated heat is extreme, to the extent, they understand, that it has caused another vehicle some distance apart to catch fire. After the event everybody remembered the intensity of the heat, not least since it had caused a second vehicle, out of range of the fire, to burst into flames. On the next occasion of a tank lorry fire, they were aware, through the experience gained, of the need to take measures to prevent the fire spreading through heat radiation. One can read about such a situation and calculate what a safe distance would be. But it is when the situation is met in reality that it makes its mark and the experience is gained.

In the case of a response operation for a minor apartment fire, reason tells us that the best way, depending naturally on certain situation dependent circumstances, of fighting the fire is to send in personnel equipped with hoses to extinguish the fire from the inside. Logic tells us that it is not a good idea to shoot water from the outside into the building. It is not, for example, certain which room or rooms the fire is in, and fire fighting from the outside of a building requires more water, which can cause more extensive secondary damage. The floor plan etc. makes it difficult to reach the flames from the outside. Also buildings normally have a degree of protection against external moisture. Information such as "... there is a fire, on TV ..." normally gives us an instantaneous insight into the problem and how it should best be approached, even with limited experience. In such cases we compare with, for example, a burning sofa, which purely in principle amounts to the same thing. But it is perhaps necessary to take other criteria into account, such as enthalpy of combustion, i.e. the amount of heat that may be generated when certain objects burn.

The conclusions of rationalisation are drawn through *deduction*, by applying generally applicable rules. From the general case, through further deduction, conclusions are drawn for the special case.

This process can be put to good use in connection with fire service work, in order to draw conclusions on a particular situation. The search for information can unwittingly be restricted as a result of standard, routine procedure. Information channels or experience that is familiar is applied which is often, in the case of response operations, limited simply to visual impressions. At the same time, it is obvious that we, to a greater or lesser degree of awareness, also use other senses, such as hearing, feeling, smell and taste. The smell of the smoke can in some cases result in concluding the central source of the fire. In the same way the sense of smell can be used in some types of chemical accidents, providing that the concentrations of material that have leaked are not so strong as to be a direct danger to health. Listening involves more than just listening to the spoken word (via radio or direct communication). Our hearing also allows us to distinguish between, for example, high pressure or high flow rate and low pressure or low flow rate leaks. They sound different. Some types of fire technology phenomena also emit characteristic sounds which can help us draw conclusions.

Creating a picture of the situation, then, involves much more than simply taking a look. In order to create as comprehensive a picture as possible several senses must be employed, more consciously. The visual impression may even be the one that should be the least regarded since it can often give a false impression. In cases of response operations in the dark or in fog, perhaps in unfamiliar terrain, a plane crash, for example, it may be necessary to rely on reports. In major fires, that can give strong visual impressions, it may not always be the fire itself that is the heart of the problem. It may perhaps be hot ash that is being quickly transferred via ventilation ducts or crawl space, which normally would not be visible. In such cases knowledge of, for example, the building's fire protection system would contribute to creating a comprehensive picture of the situation, which in turn would lead to certain decisions being taken and tasks allocated.

In the case of dispersion of gaseous, toxic chemicals or fires issuing large quantities of harmful combustion gases, it is perhaps not the situation in the direct area that is the problem. The problem perhaps lies further forward in time and further away in space, when the gas cloud reaches a hospital situated several kilometres from the incident site. It is then necessary to create a picture of the situation that encompasses much more than that provided by the senses. The properties of the chemical or the combustion gas are then important parameters to take into account. Measures to safeguard against long term environmental consequences of days, months or perhaps years can be of considerably more significance than those of the moment, executed to influence a close foreseeable future of seconds, minutes or hours.

For a commander who is not present at the incident site, it can be difficult to create an accurate picture of the situation for a specific response operation. No visual impression is available and reports can be incomplete and ambiguous or even contradictory if they come from several sources. A command visit or a visit by a command staff member can then be justified to the purpose of creating a personal picture of the situation on the ground, the developments, applied resources and assistance needs.

The damage caused and the course of events can make it difficult to gain an accurate picture of the situation. But applying certain measures can help to create one. Testing, studying and analysing the effects of these measures should help to provide a fuller picture, make better decisions and execute more effective measures.

Example 12

The rescue service receives an alarm one cold December day concerning an accident in which a tank lorry has been driven off the road into a river. At the incident site it becomes apparent that the lorry has slid down the bank into the river and now the greater part of the cab and front section of the lorry are under water. The driver is sitting with his head above water, showing no signs of life. The water appears to be deeper further out, which is a reasonable assumption as the river is fairly wide. The tank is full of carbon disulphide, which is both poisonous and highly flammable. Full suits & masks are not carried in the pumping appliance, and the question is raised as to whether the driver can be quickly removed from the cab and his life saved. There are no signs of leakage from the tank. The chemical database tells us that carbon disulphide is heavier than water (density 1260 kg/m³), that it is not easily dissolved in water (0.29 mass-% at 25°) and that its evaporation point is low (21.6 kPa at 5° C). The evaporation point is not relevant since any leakage will have direct contact with the water in the river. As its solubility is low and its density high any leakage would remain compact, sink to the bottom and move out to deeper water. Consequently, any leakage under water would not mix with the air, and it is reasonable to assume that the cab of the vehicle is not affected by any possible discharge. This makes the task of wading out to the cab to remove the driver relatively safe, even if the tank is leaking under water. As a safety measure, though, the task should be carried out on the upstream side of the vehicle.

As commander it is extremely important that you are, both geographically and figuratively speaking, totally aware of where you stand, where you have come from and how you are going to proceed. Questions you should continually ask yourself are:

- Where am I?
- Have I been here before?
- Where was I previously?
- How did I get here?
- How do I get back?
- How do I achieve the desired result?

These are questions of principle, and do not normally require a direct answer. They are, nevertheless, highly relevant.

There is also a risk of receiving the wrong *initial value* for a situation.

The wrong signals may be received because information is inaccurate or other reasons. This then creates the risk of being selective without being aware of it, i.e. of looking for something that does not exist, which can result in the illusion of finding this non-existent something, or drawing completely the wrong conclusions concerning the course of events, or of not picking up on other relevant issues.

An important conclusion to the above discussion is then that the more facts one has available the less one needs to suppose. They provide a stronger basis for decision making and, in turn, improved results for response operations. Many turn-outs, nevertheless, are based on supposition. It is often the case that one has very little information about a situation on arrival at the scene. And it should also be pointed out that it can be dangerous to place too much trust in supposition. The section on gaining and maintaining control takes the discussion on this problem further on the basis of the aspects of *feedforward* and *feedback*, i.e. to act in line with the plan, as opposed to acting on the basis of the actual situation.

8. Meeting the need for assistance

In order to execute emergency response operations effectively, it is necessary to take the best possible advantage of the collective resources. To enable this, it is important that, among other things, one is fully aware of the capacity of the available resources, the measures that are therefore possible and appropriate to execute and what happens when various measures are applied at different places in time and space. This is really what tactics is about – being able to use the available resources in the best possible way.

If you are going to take part in a game, you have to know the rules of the game. Otherwise you can never win or even be placed. There is even a good chance of being disqualified and banned from participation - maybe for quite some time. The situation is similar when it comes to emergency response operations - participants have to be familiar with the rules that steer and affect the course of events as well as the restrictions they impose. This can imply a comprehensive understanding of fundamental physical phenomena and the characteristics of the problem. If one does not fulfil these requirements, naturally disqualification is not the penalty, but this could result in causing more damage than is caused by the incident itself and subjecting personnel and others involved to danger unnecessarily. The rules that apply to response operations comply, in principle, with the fundamental rules of physics and chemistry. Since the measures executed through response operations are affected by these rules and regulations in various ways, it is on these that the structure of the response must be based. At the same time as there are many people-related aspects and regulations to take into account. A commander must continually relate to these rules and regulations. And the knowledge and application of them enables the effective use of resources, which in turn enables the gain and maintenance of control.

The damage and the object

Important starting points in the discussion are the aspects of *incident* and *damage*. An *incident* can, for example, be defined as an unexpected occurrence with negative consequences or a course of events with many causes which unintentionally results in personal injury or damage to property or the environment. An incident can be a painful or sad event, development or situation, and is often only taken as the sudden occurrence that is close to the damage done or injury inflicted in terms of both time and space. In some incident investigations a narrow perspective causes the conduct of the directly involved person to be pointed out as the main cause of the incident, to which the term the human factor is often applied. This approach results in dangerous aspects of the technical or organisational environment being neglected, despite the fact they can be both easily recognisable and easy to correct. Moreover, it is seldom a single event that causes an incident or accident. They are more often the result of a sequence of events (Perrow, 1984).

In the same way *damage* can be defined as a physical change that negatively affects a person or thing, or some other detrimental change in a person's economic or personal circumstances. It often relates to something not working as it should, to the appearance of something having changed or its effect in some way being devalued, or can also be regarded as the cause of unfortunate circumstances.

The Rescue Services Act (repealed & replaced by Civil Protection Act) refers to and defines the area of responsibility of the municipal structure for providing rescue services in relation to the term *emergency* (Prop. 2002/03:119).

If we consider the situation from the opposite standpoint, we can also talk of *crisis*. The victims of incidents and accidents or who are in some other way caused damage can be said to be in a state of crisis. The problem is often associated with a particular form of behaviour or types of physical or emotional reaction. Even though these aspects lie outside the scope of this book, they cannot be ignored totally; not least since the help the municipal structure for providing rescue services provides must necessarily be based on the needs of those requiring it. It is important to bear in mind that these people are undergoing some form of crisis. The discussion in this section is based, however, on the physical consequences of an event rather than

the psychological or social, even though a commander very much needs to be aware of these also.

A point of interest here is that incidents and accidents, and the damage they cause, almost always entail some form of energy change. It could for example imply a change in energy caused by a car driving off the road and hitting a tree. When the car collides with the tree the kinetic energy in the car is transferred to the tree, which moves (if only slightly) and pieces of bark and wood are dislodged. The change in energy also causes the car to be compressed, panels are deformed, members are bent and broken and the engine and wheels can be detached from their mountings. But above all, a great deal of the energy is transferred to the passengers in the car, who suffer internal and external injury as a result.

This situation can in principle be likened to a fire in a room. Different materials or combinations of materials have different characteristics which cause fires to develop in different ways, depending on, among other things, the configuration of the fuel they provide. A room fire is also affected by the layout of the room, even with the same fuel, as the surroundings also influence the conversion of energy. In other words the object affects the outcome of the incident and how damage is inflicted. It is, for example, a well known fact that sawdust does not burn in the same way as solid wood, despite their physical properties, apart from the obvious one, being the same (Bengtsson, 2001). In the case of a chemical substance leaking from a tank, it is, for example, the pressure energy or the potential energy that causes this to happen. The character of the discharge will change, depending on the properties of the chemical concerned, the design and condition etc. of the vessel and several environmental factors.

According to the first law of thermodynamics, energy can neither be created nor destroyed. It can, however, be changed or converted and it is these changes that often occur in connection with incidents and accidents. In which case the change in the energy is an unwanted one within a system, between systems or from one form of energy to another. Changes or transference that causes an incident or accident results in some form of damage or personal injury. Note that even if in principle two incidents are the same, for example, with regard to the forms of energy involved and the way in which the energy is converted, there can be considerable variation in the objects in which the conversion

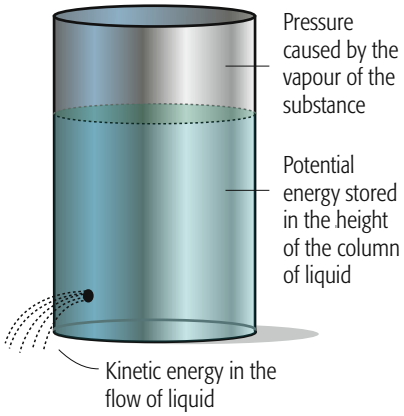
Example 13

Incidents and the damage they cause are the result of energy conversion or the transfer of energy between objects. In a fire the energy that exists chemically bonded in the fuel is converted to energy in the form of electromagnetic wave motion in molecules and elementary particles. This form of energy is transferred via radiation to firefighters, where it is absorbed by their clothing and bodies. The energy is converted again, causing increased molecular motion which gives the firefighter the feeling of warmth.

occurs. The way in which the damage develops is to a large extent dependent on the object.

Stability and safety at the incident site are also founded on energy conversion and energy transfer. An example of such a situation could be work in connection with a traffic accident that is to be carried out safely, which, in turn, depends on, among other things, being able to stabilise the situation in various ways. The damaged vehicle is supported and forces applied to it through the use of cutting tools and pressing cylinders (energy is transferred) in order to release trapped passengers.

When a tank leaks the pressure and potential energy are converted to kinetic energy in the liquid that is flowing out.



The mechanics of the system and the mechanical properties are also based on the transfer of energy. Work that is performed by, for example, a pump is converted to kinetic energy in the water which then returns to being work as it leaves the nozzle. Some energy is lost along the way in that a small quantity of the kinetic energy is given off through, among other things, turbulence.

The majority of buildings and installations have some form of protection system. These are designed to activate and protect the object against different forms of undesirable energy conversion or transfer. A simple example of this is a car seat belt, which in a collision absorbs some of the kinetic energy which otherwise would cause personal injury to the passenger. In the same way fire cells protect the area surrounding them against the energy a fire would otherwise release. Retaining barriers are designed to protect against various forms of energy conversion that occur when, for example, chemicals are discharged. And the water a sprinkler system sprays onto a fire is designed to absorb some of the energy that has been developed and is threatening to spread the fire.

The measures that the municipal structure for providing rescue services applies work in exactly the same way: through various means they prevent and limit the degree of damage caused by the energy that is released or converted in an incident or accident.

A commander should, therefore, have a fundamental understanding of the forces at work, how energy is converted and what happens when different measures are initiated, coordinated and executed. Primarily because it is on his or her shoulders that the responsibility for the work carried out at the incident site lies. A *tactical approach* is founded on fundamental knowledge of incidents, damage and objects.

Example 14

One cold winter's day a flange to a tank of ammonia starts to leak. The fire brigade has arrived and is weighing up the various measures that can be taken to deal with the situation. It is immediately apparent that the leak can be stopped by tightening the flange bolts, and work is begun on this. But for this to be done safely, the full suit firefighters need protection, and the dispersion of the leaking ammonia gas must be limited. A water cannon is set up to spray water over the leak. However, when water is sprayed over the tank, the flow of ammonia increases dramatically. The water is heating up the tank, increasing the pressure in it and increasing the flow – the situation has been worsened.

Since incidents such as, for example, fires and discharge of chemicals are basically controlled by the laws of physics, it is often possible to predict courses of events by applying these same fundamental laws. In this way it is possible to anticipate the development of certain types of incidents on the grounds of the measures executed or not executed in the response operation.

Measures

The municipal structure for providing rescue services is normally associated with the execution of various types of *measures* at an

Example 15

A tank lorry full of petrol has tipped over on a main trunk road that passes through Allmänsta municipality. The lorry is lying in its side on the bank at the side of the road. The casualties have been attended to and taken to hospital. The fire brigade is pumping the contents of the tank lorry over to another tank lorry standing on the road. Suddenly the tipped lorry starts to move and rolls down to the field at the bottom of the bank. The firefighters working on the pumping managed to get out of the way just in time and escaped, luckily, with nothing more serious than a lesson learned. During the course of emptying the tank, the vehicle's centre of gravity moved. It was lowered until eventually the potential energy in the vehicle was converted into kinetic energy.

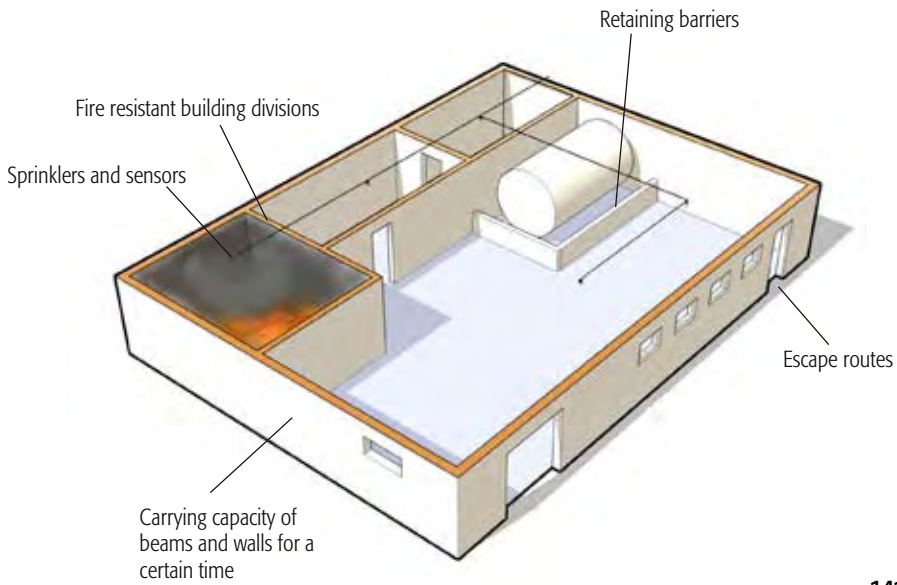
incident site. These are carried out by people who often, but not always, have some form of equipment to work with. It could for example concern fire fighting where one or more firemen uses a hose and nozzle to shoot water into a blaze or to protect themselves against the fire. It could also concern a water supply measure in which a firefighter uses a pump connected to a supply of water (a water tank, fire hydrant or a combination of these) in order to provide for a hose system. Or it may concern taking care of victims in various ways. On the other hand it may also be something of a more general nature such as gaining information for

a public announcement (VMA) or handling the administration of the response operation by documenting the decisions taken and compiling reports and follow-up. A measure that is appropriate in one situation is naturally not always appropriate in another, even though the situations may be very similar.

Different measures are also dependent on one another. In the fire fighting example above it is quite apparent that the provision of water is a condition necessary for the fire fighting, at the same time as the extinguishing measure is a condition necessary for the water supply measure to have any relevance at all at the incident site (extinguishing or protection). An important public announcement can have a decisive effect on the reaction of the public, which in turn can, among other things, affect the measures decided upon to provide the assistance need or even the approach to a particular risk situation. Another example of the dependency of measures on one another is clearly demonstrated in traffic accidents, where various measures to release people from vehicles must be applied in a certain order.

The links between the various measures are, however, not always obvious. The connection can be direct, as in the example of water supply and fire fighting, but this is not always the case. An example of the latter would be when a fire brigade crew applies foam at the scene of a traffic accident, even though there is no fire. The foam is used to prevent fire and to avoid rapid spreading of a fire should one break out. In the same way it is perhaps neces-

Object and damage and their different conditions.



sary to create resources in order to prepare for the risk situation that exists. These created resources can be needed to maintain a level of preparedness without there being any real need to apply them during a particular response. In this case a measure is taken that could have considerable bearing on the future, but which would also be a complete waste, if not required. The effect of the measure is then less obvious, even though it may be considered important for reducing the risk for personnel directly involved and, in the wider perspective, the public at large. The links to other measures then also become less obvious, even if it is accepted that there is a connection. The spreading of foam can have a longer term effect, for example, on the environment; a connection that cannot be denied.

There can be direct conflict between the short and long term effects of various measures, including environmental effects. Something won in the short term may well result in something lost in the long term and vice versa. It may also be more difficult to consciously lose in the short term in order to gain in the future. Such decisions can be both difficult to make and controversial.

Conflicts between long and short term effects can also involve taking an ethical standpoint. In the extreme it could concern rescuing one person now or several later. Peer pressure or the defence mechanism of an individual could easily cause them to favour the short term solution over the long term, even though the latter may be far more advantageous in the big scheme of things (Svensson, 2000).

Executing different measures at an incident site is obviously no end in itself. The purpose of this should be to solve one or more problems. The choice of measure then should be guided by the effect or result that can be expected of it, in relation to the problem to be solved. It concerns selecting the best measure for solving the specific problem and it is the need to solve this problem which determines the measure that should be executed. Some measures can be expensive, but if the justification is solid, these should, despite the high cost, always be applied. Evacuating a hospital or blocking off a main road because of pending danger can be costly and should be thought through carefully, but it should be done if it is required.

Traffic accident	Chemical accident	Fire
Freeing using electrical/hydraulic/power tools	Stopping leakage	Door forcing
Removing the risk of fire at the incident site using foam	Setting up retention barriers	Water supply
Stabilising vehicles	Boom placement	Extinguishing from aerial appliances
Alleviate risk at incident site by disconnecting batteries	Absorption	Informing the public/media
Releasing trapped casualties	Transfer pumping	Pressure ventilation
Cleaning up the road (glass/other small articles)	Evacuation	Property transfer inventory
	Packing	Water cooling of neighbouring objects
	Evaluation of protective distances	Shooting/puncturing gas bottles
	Measures against static electricity	Shutting of gas/electricity supply

Examples of measures applied in emergency response operations in connection with traffic accidents, chemical accidents and building fires respectively.

The time constants of measures

Different types of measures take different lengths of time to execute and they can have varying validity in both time and space. Measures are also often restricted with regard to how long they can be applied before the resource they are based upon or include is exhausted. Here we can think in terms of different time constants for different types of measures, i.e. that the measures have a certain time span within which they can be expected to have effect. If foam is spread over an area of leaked petrol, there is an expectation for how long it will remain effective, i.e. before it becomes necessary to apply more foam. The foam is slowly broken down and the protection against ignition that is expected of it decreases with time. The time constant indicates the degree of inertia the measure has, i.e. the time span between decision and implementation and the period of time that the measure influences the course of events. If, for example, a water cannon is put to work against a burning stack of recycle paper, an effect is expected within a certain amount of time. Otherwise the measure is taken as unsuccessful and other measures should perhaps be considered. So, it takes time for a measure to be implemented and to take effect. In some cases this time can be considerable, depending on, for example, preparation or that it has to be transported over a long distance. It is important for the outcome of

the response that the decision maker is familiar with such time constants and delays.

It can, however, be difficult to assign strict values to these time constants. In general terms we can say, though, that measures with high time constants should not be applied to short term tasks, in which a rapid effect is called for, as it may well take longer to implement and gain an effect from the measure than the situation calls for. In can also be inappropriate to apply measures with a low time constant to longer term situations, since the measure and the resource it is based could possibly become exhausted before the goal is achieved. An example of the latter would be foaming, which requires that a minimum amount of foam is produced before the process is begun. Starting a foaming measure before there is sufficient foam to cover the required area can create more problems than it solves, in the form of unwanted effects on the environment for example, without the problem (the fire) for which it was applied being dealt with satisfactorily. Another example is the measure of sawing a hole in a roof to release heat and combustion gases. Such measures, in some cases, can be rather time consuming. If the fire in the space under the roof expands quickly the sawing measure can become meaningless on completion or not be completed because the work becomes too dangerous.

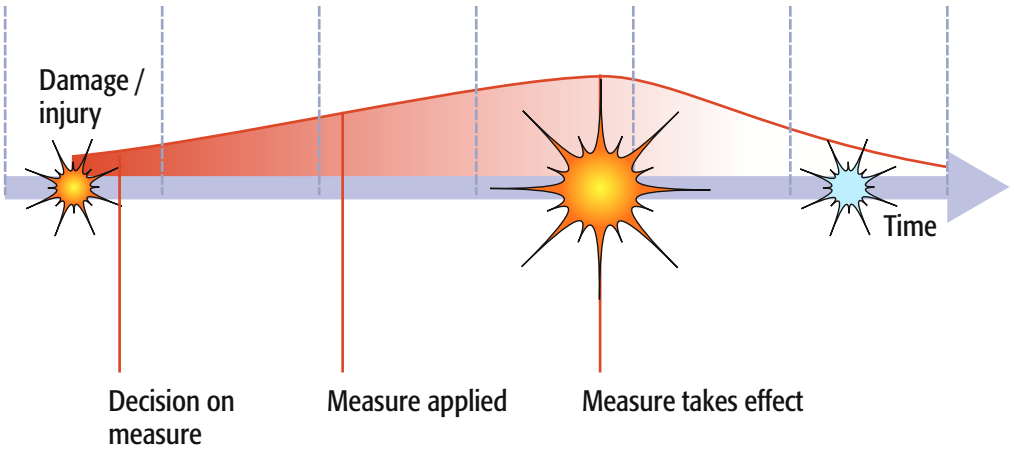
The time constants of measures incorporate, among other aspects, the capacity of the resources. There is also an important link between the time constant of a measure and the time constant of the damage, which is to say that there are important connections between the capacity and sustainability of the resources and the development of the damage. Consequently, it must be possible to control the resource in such a way as to affect the relationship between the resource and the damage. Let us say, for example, that in connection to a chemical discharge there are two full-suit fire fighter units available that can be used in different ways depending on the capacity requirement. They can be applied simultaneously and thereby increase the capacity at an earlier stage – more hands available to repair the damage more quickly. Or sustainability can be improved by engaging the groups consecutively, allowing the work to continue longer. Or, alternatively, safety can be increased by engaging one unit as a protective measure for the other. The best solution depends on, among other things, the

nature of the damage and the development of the situation in time and space. Note that the capacity of a resource is also dependent on the physical and mental capacity of the individuals as well as of the group. The commander must also be able to deal with these types of resource issues. He or she must, moreover, be very aware of his or her own physical and mental capacity.

Applying the wrong measures such as ones with the wrong time constant in relation to the course of events of the incident, risks causing more damage than the incident itself may cause. We can also here think in terms of taking a big risk to gain a lot, a small risk to gain a little, but no risk to try to gain something that is already lost. The problem or problems that must be solved are steered in turn by the assistance needs at the incident site, i.e. the help that the victims require in order to, in the short or long perspective, return them to their normal way of life. It is then important to be aware of and to have thought about the time constants of the various measures that a rescue service can execute. But it is also important to be able to assess and decide the equivalent time constants for different types of incidents, which certainly does not simplify the issue. A commander must, therefore, be capable of good judgement with respect to the capacity of resources and the effect of measures, as well as damage and its development.

Example 16

The rescue service in Allmänsta receives an alarm concerning a fire in a rubbish room. On arrival at the incident site the fire is relatively limited, to a single container. Instead of tackling the blaze quickly with a hand fire extinguisher, the incident commander decides to apply water via a hose and nozzle. A fan is also taken in with the intention of using pressure ventilation. By the time the preparations have been made, the fire has spread to the whole rubbish room including the ceiling. Despite the fact that the object cannot be saved it was decided that an effort would be made, which resulted in a firefighter suffering burns to the hands. In retrospect all those involved agreed that the wrong course of action had been taken, causing unnecessary risk. Preparations also took too long in relation to the development of the situation. One can take a big risk to gain a lot, a small risk to gain a little, but no risk to try to gain something that is already lost.



There is normally a time lapse between when a measure is decided upon and when it takes effect.

Measures in a problem solving system

The measures that are executed during a response operation are the smallest elements that constitute the operation from a tactical perspective. Measures can be defined as formalised heuristics and algorithms for carrying out tasks in a problem solving system (Jones, 1993). Heuristics is a method of discovering or forming new (relevant) knowledge. An algorithm is a systematic process that, in a limited number of steps, discovers how to solve a calculation or problem. A problem solving system can then be defined as a group of players that carry out dependent activities in order to solve one or more problems. Measures are then the processes in the problem solving system that actually solve the problem or problems. A problem solving system works as per definition in a state of insecurity, indistinctness and ambiguity. Insecurity can be taken as incomplete information, indistinctness as the need to establish an understanding of an unclear situation and ambiguity as alternative hypotheses, i.e. several alternative solutions. Measures do not only solve the problem; they also result in the discovery and formation of new knowledge. This is an important aspect as this gained knowledge will form the basis for solving similar or even identical problems or situations in the future. This is in part what we normally call experience.

Because of the insecurity, indistinctness and ambiguity that the problem solving system exists in, the experience that is gained is important as it enables the whole system to learn how to handle a wide variety of incidents and accidents in as many different situations. Note also that the learning process goes on throughout the response operation itself and the knowledge base is then further enhanced by the experience gained through retrospection. The learning process then calls for reflection and a deliberate effort to gain experience.

The discussion above points out the heart of the problem, i.e. that the whole response operation should in principle be based on problems that have to be solved, that is to say on the basis of the assistance needs of the victims at the incident site. This in turn affects how command should be structured at an incident site and how authority should be allocated.

Measures are based on material as much as personnel resources. Moreover they incorporate knowledge. Measures at an incident site occur when personnel use resources to solve various problems. Both the resources and the personnel set limits for the measures that can be executed. Not least among these is the physical and mental capacity of personnel, but equipment also has its safe working limits. Such limitations must be identified and acknowledged by the problem solving system. Otherwise the system will not work effectively, through, for example, the ineffective application of resources and personnel. What is more, dangerous situations can easily arise when limits are stretched. As the rescue service works in a state of insecurity and the work itself involves taking certain risks, the work at an incident site must be executed as safely as possible, by, for example, following the formal and informal regulations and directions that apply to certain tasks or with the use of certain pieces of equipment. Training and exercises are fundamental to this.

The resources at an incident site incorporate many different forms of hardware and software. It is normally easy to identify both the equipment itself and its limitations; if by no other means, by looking up the relevant information in the instruction manual. Examples of hardware that are used in response operations are pumps, nozzles, hoses, fans, chain saws, power cutters, axes, pumping appliances, aerial vehicles, BA (breathing apparatus), full suits and masks, and ladders. The list can go on for

ever. Such resources have in many cases been developed through experience and on the basis of practical needs for the solution of problems and execution of various measures at incident sites.

For the problem solving system to work effectively, commanders and their crews alike must be very familiar with the effects of the resources that are applied. These are often, but certainly not always, easy to identify or define. The consequences of shooting water into a blaze are well known and the extinguishing need can often be quantified, estimated or judged, either through theoretical knowledge or practical experience (Särdquist, 2002). The problem arises when measures are combined and different measures are applied at different points in time and space. The effects of some measures or some combinations of measures are not fully appreciated (Svensson, 2002).

Corresponding problems can be identified at several levels in the system with varying degrees of resolution. It can, for example, be difficult to obtain a fully comprehensive picture of what happens when two or more ongoing response operations compete for certain physical resources. It may then be necessary for a higher level of command to step in, prioritise and distribute the resources between the operations. But it can be difficult to assess the consequences of this for the individual operation. Prioritising and distribution of resources between several ongoing operations can mean that control over the situation is held in the broad perspective, even though it is lacking temporarily for the individual operation. Since the work is aimed at gaining and maintaining control, higher levels of command must be fully aware of the effects of the decisions they make, for both the individual operation and the system as a whole.

Units

A term that is often used within the municipal structure for providing rescue services is unit. The term *unit* here refers to an organisational element comprising one or more persons that with the help of equipment have the capacity to execute measures against one or more destructive sequences. The unit is assigned one or more *tasks* and executes one or more *measures*. The main purpose of forming units is to obtain manageable working entities. A unit can influence the extent or character of the damage caused. It can also carry out many types of tasks. Each organisation needs to define its unit concept when configuring its operations. Not least because the size of a unit must be based on local circumstances. Note that a unit can comprise a single person or several. This entails variation in the degree of detail issued when tasks are assigned to larger as compared to smaller units. The units should be defined prior to an emergency response operation being initiated. This must not, however, be permitted to reduce flexibility in terms of confronting the incident.

The forming of units is a way of creating manageable resources, especially when time is short. A flexible approach regarding the use of resources and units is required to ensure the necessary flexibility towards the needs of the actual situation.

As the reason for division into units is to create a manageable situation, the term can also be described from the perspective of the command organisation. From a command standpoint a unit is the smallest entity in a call-out organisation. That a unit is the smallest entity from a command perspective means that it is the degree of resolution in terms of resources that can be used as a starting point for communication between the various organisational elements or levels when resources are being allocated. When requesting a particular type of team, the amount of information is held to a minimum, but despite this the sender and the recipient interpret the contents in the same way. The different measures that a unit can execute are included as a condition when a unit is sent to an incident site. Division into units simplifies the handling of large resources. Units also make it possible to form, in a structured manner, a response operation at an early stage so that the organisation can be expanded as and when required.

Division into pre-determined units creates the opportunity to specify the capacity of a resource. If the capacity is known the conditions are created for allocating resources to a response

A unit is an organisational element comprising one or more persons that with the help of equipment have the capacity to execute measures against one or more destructive sequences.

operation in proportion to the need. It becomes, quite simply, easier to assess how resources should be allocated on the grounds of the character of the damage and the capacity of the resource. This, of course, providing the units are configured in the right way. Capacity has been expressed in different ways, for example in terms of the type of measure a unit can execute. On the basis of the measure, the capacity of a certain unit will also affect

- the measures the unit can execute simultaneously in time and space,
- the measures that can be executed at different times and locations,
- the time needed to initiate a measure,
- the speed at which a measure can be executed in relation to the destructive sequence,
- the time required to execute and gain an effect from the measure, and
- the sustainability of the unit for a particular measure and situation.

The aspect of unit capacity then leads on to issues such as the number of measures that can be executed. In addition it can sometimes be the case that with a certain amount of equipment, the speed of progress can be increased by applying two units to the same task, working together.

In the execution of some tasks it is principally the unit's original equipment that determines the sustainability. It is beneficial that the provision of extra equipment for the unit can take place without the unit needing to stop work. This demands that the material resources can be divided and that delivery is initiated in good time. To achieve this initiation it is necessary to be able to identify the problem and conclude upon the requirement at an early stage. Equipment is sometimes kept in a stores. Distribution of this then should occur quickly enough for it to reach the applicable incident site or sites so as to avoid the disruption of measures that are being executed. In some cases ready compiled, mobile stores that can be quickly transported to an incident site thus avoiding the need to plan and acquire the equipment during the course of the emergency are the best solution. The amount of equipment required in a mobile stores of this type should, depending on the degree of damage, increase the sustainability of units to the extent that special measures can be taken to provide them with further equipment. To execute such measures the command organisation must be configured so that it can predict and carry out measures over and above those planned for. The configuration must go sufficiently quickly to allow for a prediction and compiling of equipment before the previously planned for provision is exhausted and a delay in the execution of measures results instead. Even if it is not always possible to compile the necessary information before hand, it is important that the command organisation is familiar with the capacity situation. This information is fundamental to being able to initiate the provision of equipment in time.

Each unit should be defined in advance. It is not normal to create new units, in terms of definition, at an incident site. Since it is important that the various parts of the organisation understand each other, and confusion could occur if the concept of units is changed during the course of an operation, this should be avoided. On the other hand two units can carry out a task together, or one unit can carry out several tasks. A degree of flexibility is also needed as, depending on the risk situation,

it may be necessary to reconfigure units. A unit is, then, not a permanent entity, but can be configured and defined to suit the immediate situation. If some form of permanent or temporary change occurs in the risk situation, for example, through a threat of some kind, the reconfiguration of units should perhaps be considered. This can, for example, be done by splitting a unit into smaller ones or by combining several units to form a larger one. The formation of units can, for example, be based on the most common types of incidents. A problem can sometimes be solved very easily, by, for example, providing an appropriate vehicle for the purpose with the applicable crew at a suitable location. In order to maintain flexibility during an ongoing operation, it must be possible, as necessary, to combine units to execute a common task. It also needs to be possible to detach personnel from a unit so that they can work individually. The configuration of units must be founded on manageability and personnel safety plus the flexibility needed to provide the best possible assistance. Consequently it is important to remember that it is not for the sake of the unit itself that at particular formation is decided upon. Units are defined and exist primarily on the bases of the normal risk situation in the municipality.

In some cases several vehicles may proceed to an incident site to provide versatility even if there are not sufficient personnel to man all the functions. Along with alternative configurations there should also be a plan for an easy return to the original forms.

It can, for practical reasons, be best to hold a unit together, for example, in a relieving situation. This means that when a sector is allocated to a unit during an ongoing response operation, the unit takes over from and relieves an equivalent unit. In major operations, this kind of setup presents the opportunity to manage large resources on purely logistical grounds, but it can also be the case that the resource availability rules out this type of working method.

For the aim of a unit configuration to be best achieved, the unit should be independent in some way. A suitable basis for this is the expectancy that a task, of one or more measures, could be executed relatively independently. It is the concrete execution of the task that one would expect to be carried out independently. This would then have the effect of easing the work load on the next level up of command. It also implies that a member of the unit must be made responsible for distributing work within the unit.

Labour legislation would then also have to be taken into account. When configuring such units, then, it is also necessary to weigh up the extent to which a work leader can also contribute to the practical work of fighting the destructive sequence. It must not be to an unreasonable degree, for either a unit leader or for the next level up, where responsibility for several units lies.

Sometimes the term *leader units* is applied also, i.e. units with the task of leading. A leader unit can then be thought of as a part of the organisation with the certain type of task, primarily, to lead. The main difference between the tasks of a leader unit and other units is that leader units coordinate and direct the work of the other units. This would include, for example, setting goals, distribution of tasks, coordination of work, processing information from further a field and forward planning. In addition it should include reflection over the role of the unit itself, in relation to other measures, units and the situation. Note that the work that leader units carry out can vary considerably, depending on, among other aspects, their limitations in time and space, and the degree of resolution in the flow of information.

Several units often work together during response operations. Since they are then working on the same destructive sequence, their work must be coordinated. They sometimes have totally different tasks to carry out. On other occasions units need to be combined on the grounds of routine and equipment, to enable a task against a particular destructive sequence to be executed. Close cooperation in the formation of the task or tasks is then required. Neither the configuration of units nor their different work methods must be allowed to delay the execution of measures. The ability to combine units also makes it possible to use them on a broader basis. Their configuration is, actually, the starting point for how the command organisation can, reasonably, manage the resources. The municipal structure for providing rescue services is sometimes confronted with situations which call for tasks that it has not carried out previously. It then requires the capacity to implement work methods that will achieve this, and perhaps overcome established working patterns that are incompatible with the situation at hand. Flexibility is fundamental to the configuration of units and the allocation of tasks to units.

Tasks

Units are allocated tasks and execute one or more measures. It is the units that directly affect the course of events at the incident site, on the basis of the assistance need. When a certain resource (part of a unit, a unit or a combination of units) executes one or more measures this is done on the basis of one or more allocated *tasks*. From a command perspective, a task is simply the activity that a resource carries out to achieve a goal. The allocation of these is decided upon and they are distributed to the units.

For a task to be carried out it must defined:

- What is the purpose of the task?
- What shall be done?
- Where shall it be done?
- How much time is available?
- What resources shall be used?
- How shall it be done, depending on the form of control (management by objectives or management by detail)?

The contents of a task exist at different levels of detail, depending on, for example, from where in the organisation they are being perceived. It is not always the case that all the parts need to be specified. In many cases it is essential that the person allocated the task is aware of its purpose, but not always. In cases where a commander possesses special knowledge on the execution of a task, this knowledge should be included in the distributed task information.

The effective use of resources

There is of course a great need for the effective use of resources in connection with emergency response operations. On the basis of the characteristics of the damage, the type of object and the resource capacity, it is necessary to meet the assistance need that has arisen in the best possible way. This is where tactics enters the picture – to make the best possible moves with respect to the prevailing conditions.

Most of us have in some connection needed to consider tactics. If we say that something was tactically done, it is usually taken as a compliment, meaning that something was well or cleverly carried out in a certain situation. On the other hand it can have

negative connotations and then imply some form of manipulation. Tactics is also referred to within the Swedish Armed Forces – tactics in different forms of combat.

But tactics can be more down to earth and basic than that. It is often used in connection with sports and sporting events. We act tactically differently in different situations, most noticeably in group activities and games. We can also talk about tactics in connection with, for example, chess or other board games. The majority of board games have their origins in war games, to the purpose of training commanders to think strategically and tactically. The various pieces on a chess board can only be moved according to specific rules, i.e. as prescribed by set patterns. The pieces have different tasks in the game and the players have to use their pieces in the best possible way, by optimally combining their different characteristics. Sometimes pieces must be deliberately forfeited, i.e. lose or risk the loss of some pieces to achieve a higher goal. It is the long term goal that matters, to win the game. Computer games also involve many interesting tactical and strategic aspects which allow players to train their tactical and strategic thinking and approach. See for example Kylesten & Söderberg (2000).

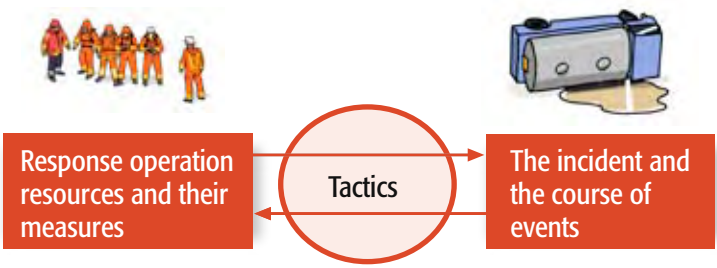
Tactics can be considered as doing the right thing at the right time. There are many similar definitions based on military operations. These include the ability to use units to carry out or support combat (Chief of the General Staff, 1995). With regard to emergency response operations the tactical task can be defined as deciding upon the prioritising of the distribution of resources, the planning and coordination of measures, and the procurement of the requisite resources (Home Office, 2000) Tactics can also be defined as the actual measures that are to be executed at the right time and place. The challenge here, then, is to identify the requisite measures and initiate, coordinate and execute them.

A definition of emergency response tactics, i.e. tactics in connection with response operations, which has been applied in Sweden in recent years, states that emergency response tactics can be seen as patterns of thought and action to, on the basis of the end goal of preventing or limiting damage or injury to people, property or the environment, achieve as good a result from the operation as possible (Fredholm, 1990). According to Fredholm the choice as to tactics is based on several general conditions resulting from the immediate situation.

Example 17

A BA firefighter unit is allocated a task. The allocated task can, for example, be specified as follows:

- The purpose is to prevent an extensive fire.
- The job at hand is to cool the combustion gases.
- Enter via the sales department from Storgatan and look for the connection that, according to our information, goes to the stores.
- The time aspect in this instance need not be stipulated. The task shall be implemented immediately and continue until it is completed or until an alternative task is allocated.
- The available resource is the unit comprising three firefighters and a pump operator (unit x), nozzles, hoses, pump, water and breathing apparatus. The latter seldom or never needs to be specified in this type of situation.
- Details are generally dependent on the form of control, management by objectives or management by details.



Tactics are the link between the applied resources and the incident, where the relationship between the resources and the incident creates a cause and effect condition that is, in addition, dynamic.

These include

- tactical problems
- ideal solutions,
- situation,
- coordination,
- material and structural basis
- routines
- skills and quiet knowledge,
- regulations and manuals, and
- education and training.

When, for example, the resources at an incident site are used, initiated, coordinated and executed, different kinds of measures are executed. There are significant connections between, on the one hand, the fire brigade crew and the measures that are initiated, coordinated and executed and on the other hand the damage and its development. We can also say that measures are combined in *tactical patterns*, which vary depending on, among other things, the circumstances of the situation and the capacity of the resources. Different results can be achieved from the operation by forming these patterns in different ways, i.e. their dependence on one another, the order in which they are applied and where they are applied. The formation is, naturally, also determined by the purpose of the operation and the results that are expected from it. This reasoning applies irrespective of the time and space involved, for example, for the distribution of resources between several simultaneous ongoing response operations. Also here it is necessary to take into account the purpose of the rescue services generally, the purpose of the specific operation and the expected outcome.

The result of an operation is therefore determined by the separate measures that are applied, how well or not they are carried out and the order in which they are initiated and executed, i.e. the formation of the pattern. Svensson (2002) points out that some tactical patterns appear to have an inherent forgive-

ness factor to compensate for incorrectly initiated or executed measures. This enables the measures, in some cases, to be remedied during the course of the operation. Even if a wrong or less suitable measure is applied, or if such is carried out in the wrong or in an inadequate way, there is still the opportunity to adjust for this during the course of events, by applying further measures, for example, or by breaking off the unsatisfactory measure. This reasoning applies also in the case of several simultaneous ongoing response operations. However, the time and space frame for the problem will then be completely different - extended in time and expanded in space. Continual assessment and adjustment of the resource capacity in relation to the level of preparedness, risk situation and response operation corrects any imbalance in the system. That something is not as it should be on occasion does not prevent correction. The problem is perhaps more a question of identifying the error.

If during an individual response operation there are sufficient resources to execute several measures simultaneously, for example, combustion gas ventilation at the same time a searching for victims in a limited area using BA firefighters, the measures must be coordinated so that they complement one another. The execution of a measure must not be allowed to have a negative effect on another measure, unless this is advantageous in the short or long term. In the same way if a measure to provide combustion ventilation is to be executed as well as BA firefighting, they must be coordinated as the former relies on mechanical ventilation (applying pressure to the area of the fire) in combination with the entry into the building of BA firefighters. The combustion gas ventilation is only a part of the measure. It is often necessary to combine a measure of this type with others to achieve the best possible result. There are many separate measures that are based on many others and which in turn create good or poor conditions for successive ones. It is the ability to describe and process the dynamics of the situation, i.e. the time and space dependency that exists between the damage development and the capacity of resources, that forms the basis of the total resource management. Note also that it is necessary to be able to manage the dynamics of the whole system, including, for example, the dynamic relationship (in terms of, among other things, competition and resources) that may exist between different response operations.

Complex systems

Here we can introduce the concept of the *complex system*. Among other aspects, the complexity of a system is determined by (Agrell, 1988):

The size of the system. Many involved personnel, measures and in some cases organisations cause several, sometimes counteractive, processes to run simultaneously. The size aspect can relate to a geographic or a time aspect, i.e. a large area or a long time.

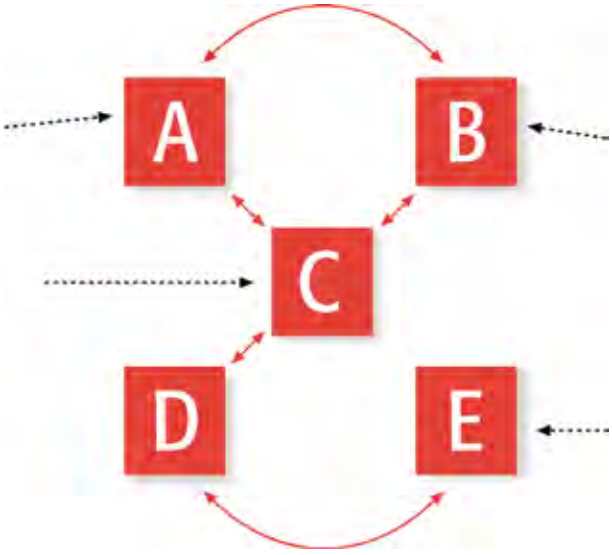
Interdisciplinary connection. The system is interdisciplinary, i.e. the involvement of several branches of science are required to address the problem. These may entail technology, social science and humanism.

High order. There are many variables in the system. Conditional variables describe the conditions in the system at any point in time. The different parts of the system have different conditional variables for describing the conditions in their particular parts.

Feedback loops. Information in various parts of the system is forwarded to other parts. For example, knowledge gained on the results of different working methods influences the choice of working method (in a certain situation).

Delay. There is a dynamic (i.e. time dependent) connection between the quantities in a system and there is often a degree of sluggishness in a certain measure and the effect that measure can have.

Non-linear relations. Non-linear links exist between the quantities in the system. This means, among other things, that quantities are not always directly dependent on other quantities, which results in the course of events in the system being in principle impossible to predict.



Several measures (resources or units) are combined in a tactical pattern with varying configurations in time and space, depending on the prevalent conditions (Svensson, 1999).

Stochastic elements. Shortage of information on how various parts of the system integrate demands statistical description of the links between the quantities.

Common conditions for complex systems are

- inherent insensitivity to change, i.e. they are relatively sluggish,
- sensitive points in the system, i.e. points where a small variation can have a significant effect on the system, and
- conflicting short and long term effects.

The pattern that the measures combine in is the connection between the separate measures and the responses (connections between parts and the whole). A consequence of this is that the tactical complexity is low if only a single measure is initiated and executed. The dynamics of the process is then easier to handle. There is always a degree of dynamics, since even a single measure must be inserted in the right place and at the right time in order to be effective, for example, in the case of a fire in a rubbish bin, which can be handled with a hand fire extinguisher. The tactical complexity is also low if several measures are initiated and executed consecutively. An example of such would be a traffic accident (single vehicle accident) in which certain measures

must be executed primarily to facilitate the medical response by medical personnel, i.e. the fire brigade works with the release of passengers from the vehicle. Time can be crucial in such cases.

We can differentiate between *dynamic* and *static incidents and accidents* (Fredholm, 1995). A dynamic incident or accident develops and changes with time, partly because of its inherent dynamism and partly because of measures that are initiated, coordinated and executed. A fire is a typical example of a dynamic incident. The tactical complexity in this case is in some respects greater. A static incident or accident on the other hand undergoes no change after it has occurred, apart from medically. A traffic accident is an example of such. The tactical complexity is here not as great. In the event of a dynamic incident or accident, such as a fire, the damage situation changes continuously, partly because of the measures that are taken but probably above all because of the dynamism of the fire itself. The tactical complexity is then greater. Moreover we can differentiate between stable static and unstable static incidents and accidents. A stable situation is characterised by all the relevant elements at an incident site being in a state of secure equilibrium. There is little or no risk of an instantaneous increase in the damage caused. An unstable situation is characterised by an insecure equilibrium. Instantaneous change could occur, i.e. within a very short time.

Standard operating procedures

Standard operating procedures present the opportunity to establish the conditions for obtaining and maintaining control at an early stage in a response operation. They create the conditions necessary to execute response operations safely. Generally speaking they concern defining who shall do what, where it shall be done and how it shall be done. They make if possible for the applied resources to activate and start up a response operation even if the commander cannot for some reason allocate tasks. Standard operating procedures create a feeling of security, but they should be applied with a degree of caution. If they are going to be established, they should be based on the most common types of response operations, such as, for example, traffic accidents or flat fires.

In more formal terms we can define a *standard operating procedure* is a set of directives that stipulate a standard working method at an incident site. Their purpose is primarily to increase the effectiveness of the units involved. The measures executed at an

incident site should in many cases, but not always, be executed in compliance with some form of standard operating procedure (Cook, 1998 and Brunacini, 1985 and 2002). There are, however, a number of factors to take into account.

Standard operating procedures are documented routines to the purpose of standardising common types and combinations of measures so that they may be executed in the same way repeatedly and perhaps above all so that response operations can be initiated quickly and effectively. They should above all be applied during the initial stages of a response operation, to kick start the work at the incident site. But they can also be applicable when the operation has been underway sometime. This is rather dependent on, among other things, the tasks to be carried out being of a rather routine nature.

It is of primary importance that standard operating procedures are documented. Undocumented standard operating procedures can be difficult to verify, exercise and remember.

Through writing them down one is often forced to reflect over them and ensure that they can be applied to various types of situations. Standard operating procedures must also be officially accepted and approved. A formally approved standard operating procedure should have been processed in such a way that all those involved are given the opportunity to consider it and forward points of view. When they are officially approved it should also be possible to assess operations on the basis of them. Standard operating procedures must be integrated into the organisation so that they can be used by all the relevant personnel. Otherwise it will not be possible it apply them as intended.

Standard operating procedures often call for more thought and reflection than one would first imagine. To create an understanding and acceptance of their suitability they should be compiled locally and based on local conditions. A standard operating procedure must also be founded on, among other things, certain dimensional incidents. It is not enough, then, to copy or adopt in some way a configuration that has been compiled by another organisation. It must relate to the local organisation and be based on its assets in terms of, among others, resources and competence, but it should also take into account the normal risk situation within the municipality. There is no point, for example, in having a standard operating procedure for a response operation for the 16th floor in a block of flats, if there are no such buildings in the

Example 18

The rescue service in Allmänsta has received an alarm concerning a traffic accident in which a car has been driven off the road at high speed into a tree. The fire brigade is working together with medical care personnel to release the trapped driver. The incident is static and work is primarily being carried out according to standard operating procedures.

However, the driver's condition suddenly deteriorates. The medical care personnel inform the fire brigade of this, and the decision is made to deviate from standard operating procedures. All the efforts are now focussed on freeing the driver as quickly as possible, which perhaps means not using the best or safest method.

Neither the static situation nor standard operating procedures override decisions taken on the grounds of professional judgement, which, among other things, take into account the real time situation.

municipality. The compilation of standard operating procedures requires a degree of involvement by all affected parties. When developing a standard operating procedure, it is important to bear in mind that it also has to function in a broader context. It is rare or never the case that a single standard operating procedure is applied. Normally several procedures are applied simultaneously or perhaps in combination with other measures for which there is no, or no suitable, standard operating procedure. They must also be

compiled so that they can be applied to a broad scope of situations, in which it is possible to execute different types of measures in a similar way. Standard operating procedures must not be permitted to succeed or infringe applicable regulations or directions.

Most importantly, they must not replace or out weigh decisions taken on the basis of professional assessment or the capacity to lead in a particular situation. Even though there is a wide choice of standard operating procedures available, it is always necessary to assess the suitability of the selected procedure for the situation at hand. One should bear in mind that a standard operating procedure is always a compromise.

Standard operating procedures need, naturally, to be trained for thoroughly. For this to function they have to have been compiled through a joint effort and formally accepted and approved by the organisation. Generally speaking, then, if new procedures are to be compiled, sufficient time must be provided for training. In addition it is important that they take into account the safety measures that apply for a building or installation. Such measures can include fire cell divisions, retaining barriers, shut-off valves and alarm systems.

When a standard operating procedure is compiled, therefore, one must ensure that all three parameters - object, damage and resources are carefully considered and accounted for.

Principles for the effective use of resources

To configure response operations, to make assessments and proceed tactically, i.e. to use resources in the best possible way in relation to the situation is probably the most difficult aspect of emergency response work. It is fundamental to the tactical configuration of response operations that they are based on assistance needs, flexibility and safety (for rescue service personnel and third parties). In other words measures shall be executed to the purpose of addressing the assistance need, which demands flexibility, adaptation and safe application.

It is only through a conscious, active approach that a destructive course of events can be changed for the better. Otherwise there is the risk of rapidly landing in the position of only being able to react in response to what is happening instead of to what is, to a greater or lesser degree, likely to happen. In the extreme this can result in parrying, when it is no longer possible to obtain and maintain control.

A tactical approach is based on acting through taking and holding the initiative. The starting point is to obtain and maintain control. It is only through the application of resources that achieving a conclusive outcome is possible. These resources must be coordinated in order to achieve the best possible effect, either at a particular incident site, and then perhaps through measures, or in a more overall perspective in which resources need to be distributed, for example, between several simultaneous ongoing operations. Leadership is an important tool when it comes to using these resources and measures effectively.

Establishing the goal of the operation or operations lays the ground for active intervention and influence over the course of events.

It is through applying resources and measures that the destructive sequence is affected, the risk situation confronted and the emergency preparedness production accounted for.

A tactical approach is, then, called for which encompasses all of these aspects.

The scale of operations varies with time and space within a single response operation. The variation depends on, among other things, the changes in assistance needs at different times and places within affected area, the increase in resources and the configuration of the organisation. It is no easy task to direct the complete configuration of a response operation through applying separate tactical concepts. Something that from one perspective appears to be an offensive action can from an overall perspective appear less offensive if, for example, the complete assistance need is not accommodated. So configuring the work concerns establishing goals for operations and tasks in different perspectives in such a way that each person involved in the operation knows what is expected of them.

On the basis of the concept of a *measure*, then, a discussion can be taken up as to what the purpose of measures are with respect to a certain part of the assistance need. At the same time the total tactical configuration must be taken into consideration. A single measure is inherently always offensive as it concerns activity to achieve a goal. A measure can, for example, concern taking care of a victim in different ways. It could also concern combating a destructive sequence (with the use of equipment), moving valuables out of danger or preventive activity to protect a threatened area. Therefore to talk in terms of offensive or defensive measures is meaningless.

Tactics concerns applying measures in patterns to address various parts of the assistance need, in time and space. The pattern of action shall be configured so as to obtain and maintain control on the basis of the conditions that may be created due to resource availability over a period of time and the dynamics of the assistance need.

An assistance need can be graded, given a value in different parts and also be defined in other ways in time and space. Different measures can then be executed in different ways for these various parts, and it then becomes necessary to weigh up the capacity of the resource against the gain expected of the measure. This sometimes results in small resources providing significant value through, for example, creating the conditions for victims to become involved and evacuate a building or area. Another example would be when a measure is taken, over a period, to facilitate the execution of other measures. Through ventilating combustion gases, for example, from a burning building the conditions are established for trapped people to survive for a longer period, increasing the possibility of rescuing them. In some cases such measures require relatively small resources, yet much can be gained through them. Their low resource requirement means also that they can often be applied in the interim while waiting for further resources to arrive. The removal of valuable art from a threatened room or building would be another example. Removing the art is an offensive activity, even if it does not contribute to saving the building. It is worth mentioning here also that things that would perhaps appear to be of little or no value to the outsider can be of very significant sentimental value to the victim. Much of significance, then, may be rescued with limited resources.

In addition to the care of victims, measures are applied to address the destructive sequence, the affected environment or the affected object in different ways. Measures can be taken, for example, to diffuse the threat of further injury or damage, by, for example, eliminating the threat of explosion by removing gas bottles which could perhaps become affected by heat at a later stage. They could also concern reducing the probability of the threat materialising by, for example, hosing down the front of a building on the opposite side of the street from a burning building.

Certain measures affect the physical damage situation more directly, which is important with consideration to the fact that the sooner the chain reaction of a destructive sequence is broken,

the better. By shooting water into the actual fire the destructive sequence is directly affected in this way. This action would also probably reduce the intensity of the blaze, causing a reduction in, for example, the spread of hot ash and heat radiation. Besides the intensity of the fire being reduced or it extinguished totally, the risk of it spreading to surrounding buildings is also reduced. Sometimes the resources required to reduce the effect of the destructive sequence can be minimal. A full suit firefighter could, for example, by closing a valve, reduce or completely prevent an emission of chemicals thus avoiding the formation of a gas cloud. Obviously considerably more resources would be required to evacuate people in the risk zone should such a cloud form. Closing off extensive risk areas in many cases calls for large resources.

The dynamics of the situation itself can also be taken advantage of in the tactical configuration of a response operation. In addition to the physical destructive sequence the reactions of people involved can also play a part in the inherent dynamics of the situation. Good provision of information can result in advantageous activity on the part of the victims. Inherent dynamism can for example be employed when resources are short and while waiting for additional resources to arrive. It could also concern a fire that spreads with varying intensity in different parts of a forest, for example, meaning that efforts in certain areas can temporarily be reduced and the resources concentrated to fight the then more intense areas. The construction of buildings affects the configuration of a response operation also. In an attic fire in a block of flats with a concrete framework it may be advantageous to let the fire burn in a controlled form since an attempt to extinguish it could result in excessive water damage. This entails allowing the fire to take its course, to a certain extent, rather than attempting to influence it. Measures must be taken, however, to ensure that the fire does not spread in any way within the building or to surrounding objects. In addition a measure of issuing information may be required to explain and justify the reason for this line of action.

The configuration of a total response operation can vary in character in time and space. In situations where the capacity of the resources to execute measures exceeds the need, all the necessary measures can be applied simultaneously. If the resources are available to rescue all the victims and stop a chemical discharge at the same time as other pending threats are covered, the whole operation can be based on high expectations. In such cases when exces-

Example 19

There is a fire in a carpentry factory in Närby. A pumping appliance and a hose carrier are at the incident site. The fire is fierce and threatens both the production area of the factory and two neighbouring houses. The resources at the site are not sufficient to tackle the fire directly. But there is the possibility of applying other measures with both short and long term effects. Among other things a filing cabinet containing valuable information was removed and welding bottles were moved from a nearby building.

sive resources are available, it may be prudent to divide them in order, as an example, to construct fire breaks at the same time as other resources work on extinguishing the fire. This requires, however, that the transfer of resources from one measure to another is justifiable in terms of value rescued. This kind of approach also provides freedom of action for handling an alternative development if initial measures fail to have the desired effect. If it is not possible to extinguish the fire relatively quickly, there are, in this example, fire breaks which will prevent or delay the spread of the fire. Another example could be where an organisation's ample resources allow for the rescue of victims to take place at the same time as fighting the fire.

When resources do not permit necessary measures to be applied simultaneously, prioritisation with regard to what shall be done and in what order is called for. It may then be necessary to confi-

gure efforts in different ways for different parts of the assistance need. Sometimes the configuration of the total effort needs to be oriented towards limiting the degree of damage done, by focusing a large proportion of the resources on a specific part of the destructive sequence. An attic fire that is spreading from one to a neighbouring building can, for example, be limited by dispatching BA firefighters to one of the attic areas. Fighting a fire in this way can require considerable resources for the specific purpose, even if the total operation is oriented towards limiting the spread of the fire to the neighbouring building. Another way of limiting the fire could be to hose down the outer walls of the threatened parts of the building. This way of applying resources requires that only a small proportion of the resources needs to be allocated to the task, but can be sufficient nevertheless. What needs to be weighed up is the resource expenditure and the effects of different measures, but the negative effects that may be caused in the form of, for example, water damage must also be accounted for in the equation. When there is a shortage of resources, it may only be possible to prevent the spread of a fire in a certain direction or perhaps even only delay its spread. In an overall perspective certain measures may be executed to save something in a part of the damage zone at the same time as a burning building is left to burn. Only parts of the destructive sequence can then be tackled directly.

Which and to what extent resources are applied is determined by the choices available in the particular situation, the nature of the assistance need and the dynamics of the situation. Demands on the tactical configuration of the operation are also based on the resource availability for a certain period in relation to the need for measures during that same period. Consequently, for example, if resources are sufficient, the whole of an affected area can be tackled at the same time. An excess of resources allows for freedom of action, which makes it possible to rescue several aspects of value simultaneously. The availability of adequate resources provides the opportunity to execute measures for which the outcome is uncertain. As additional resources can lengthen the sustainability of the operation if initial measures are ineffective, some excessive use of resources can be justified to quickly attempt to repair the consequences of the ineffective measures. A measure that is not fully successful may even restrain negative development while the provision of additional resources is underway. Adequate resources also provide not only the opportunity to execute

measures with uncertain effect but also to prepare for an alternative approach. One should, however, be careful not to waste resources on obviously ineffective measures. An inadequate increase in resources increases the need for tactical prioritising. And then the application of measures of uncertain outcome is not justifiable, as other important measures are called for. In such a case any possible additional resources will probably not arrive within the time necessary to initiate the important measures. One should, therefore, largely consider limiting the further expansion of the damage being caused, rather than applying measures in areas that are probably beyond saving.

The rapid acquisition of available resources at the initial stages of a response operation results in a decrease in the damage caused. In the case of a response operation one should strive to turnout resources as early as possible in order to get on top of the destructive sequence in the shortest possible time. The gathering of resources creates, in addition, a degree of freedom of action in executing the response operation.

There should also be a provision for reallocation of resources, i.e. to reconfigure the operation, both within a single response operation and between several simultaneous, ongoing operations. Through, from the beginning, clearly identifying and defining the problem or problems that are to be addressed at the incident site or sites, and being aware of the assistance need and the capacity of resources, it is possible to avoid undesirable developments that call for the redistribution of resources.

Measures can be applied in time and space in various ways. When it comes to rescuing victims, measures can be executed directly - releasing trapped passengers in a vehicle, for example. Less direct measures for rescuing people can be to affect the destructive sequence in order to create favourable conditions or through issuing different forms of information to the general public. In terms of incidents & accidents as physical phenomena, measures can be applied to assist victims not currently affected but nevertheless threatened or against factors that could cause problems in the future. It could also concern measures against the direct physical damage.

It is now possible, on the grounds of the discussion above, to establish a number of general principles for the effective use of resources, which can provide the bases for the tactical configuration of response operations.

Example 20

Extensive resources have responded to an alarm concerning a carpentry factory in Närby. Thanks to the measures taken by the resources at the site initially, it was possible to limit the fire to a wood store. At the beginning of the response operation it was not feasible to execute measures with uncertain effect. While waiting for resource reinforcement from Allmänsta, urgent work was carried out in preparation for a subsequent, effective effort. The production area was pressurised using a fan, an extensive water supply system was built up and a water cannon was set up to protect surrounding buildings.

Measures were taken to create favourable conditions for the execution of other measures later.

- Configure the operation as a total entity and as a pattern of measures, based on the dynamics surrounding the assistance need.
- Adequate resources and early increases in resources provide for freedom of action.
- Distribute resources and select measures on the basis of the balance between resource capacity and the expected results of the measures.
- The rescue of people is more important than the rescue of the environment and of property.
- Take into account both direct and long term consequences.
- Apply measures to save value that is not presently affected.
- Apply measures with a specific resource to enable the resource subsequently to be used for further measures.
- Do not always use all the resources just because they are available.
- Delay the extent of the damage being caused to the purpose of gaining time.
- Apply measures to the purpose of achieving effect locally.
- Create continuity in activities to the purpose of obtaining and retaining control in the short and long term.
- Take advantage of the inherent dynamics of a situation and the inbuilt conditions in objects.
- Rescue people or property by moving them.
- Rescue people, property or the environment by tackling the cause of damage.
- Focus and apply measures against crucial points or phenomena.
- Apply measures against the whole cause of damage or the object.
- Reduce threats and diffuse risks through measures against the cause of damage.
- Take into account the need for a high tempo.
- Take into account the need for a large degree of flexibility and mobility, in time and space.

These principles naturally would not apply to all types of situations. But by combining them optimal tactical patterns can be established on the basis of what is achievable in a certain situation. It is important that measures are applied on the grounds of a damage development assessment in relation to the increase in resources, both with regard to the type of resources and resource availability.

What is achievable must be judged from case to case. Through conscious decision making, a tactical approach can be applied to configure an operation as a unit of measures. When measures for the assistance need are executed in a pattern, the collective measures take over control the destructive sequence. On the basis of the above reasoning, it is possible, subsequently, to establish various patterns for the tactics of the organisation as a whole. The possibilities for a single municipality to execute more than one response operation at a time can be limited. This aspect should be addressed through different forms of coordination and cooperation between the municipal structures for providing rescue services in neighbouring municipalities. The unimpaired use of resources through administrative restrictions allows for rapid increases in resources for response operations. The short distances between resources in, for example, large urban areas also allows for them to be increased quickly. One must, however, bear in mind that even if resources are in some ways limited, it is, despite this, always possible to execute certain measures. Even if the municipal structure for providing rescue services constitutes just one person, there are still measures that can be executed, irrespective of the situation. All types of units, no matter their size or general configuration can be of significant tactical worth. Tactics concerns using resources in the best possible way, irrespective of the structure of the resources.

One conclusion that can be drawn from this discussion is that response operations, one or several, that are not managedwithin a relatively short time and applying relatively simple means have a tendency to be unsuccessful, even if the tactics applied, in terms of approach, are in themselves, good.

Managed here implies, in the first place, establishing a plan for the execution, but also the practical handling of the incident or accident, its course of events and the emergency response operation, i.e. the patterns of thought and action. This is often a question of, at a relatively early stage, establishing a plan of how to obtain and retain control, through applying resources and measures in relation to the situation and the assistance need. And it applies to both the

Example 21

The municipal structure for providing rescue services in Allmänsta has received an alarm concerning a fire in a flat. On arrival it is apparent that the fire has spread via the eaves into the attic. However, the property has well functioning fire safeguards. There is a firewall on each side of the building and the roofing frame has a high fire resistance classification.

The municipal structure for providing rescue services decides on the goal of limiting the fire to the attic space. The present resources are inadequate for quickly extinguishing the fire, which means that the, as yet, unaffected parts of the attic will become affected and cannot be saved.

Measures are applied to the fire walls in order to reinforce their effect and establish control. Through opening a hole in the roof construction and applying mist spray, the combustion gases in the attic space are cooled. The property is evacuated and BA firefighters check the flats on the top floor for fire spreading down from the attic. The operation is configured primarily to prevent the spread of the fire. Measures are applied, however, to meet various parts of the assistance need. The mist spray is a measure aimed at directly influencing the destructive sequence. The measures to reinforce the firewalls are oriented towards increasing the likelihood of the firewalls withstanding the effect of the fire. These measures are applied to parts of the building that are not yet affected in order to avoid a potential problem.

execution of a single response operation and the system as a whole, for example, for emergency preparedness production and the assessment of the risk situation, potential threats etc.

Good tactics and clear goals for the operation in relation to the dynamics are fundamental to how the work at an incident site functions and to what can be achieved. If sound tactics are applied and the command system is solid and functional, complex response operations using both basic and advanced means can be executed and good results obtained. But it is important to remember that without resources control cannot be gained and retained.

9. Organising and managing emergency response operations

Managing one or more simultaneous emergency response operations is a very complicated process when considering all the elements involved. In order to create a context for discussion it is necessary to simplify and combine or generalise many phenomena, processes, regulations and other aspects that constitute the leadership of response operations. The section describes a model for a command system. It is based on a system approach – the whole is greater than the sum of the constituent parts. The system, then, is considered as a collection of parts, where the relationship between them is at least as important as the parts themselves.

The model provides for viewing the various elements from different perspectives, without losing the total overview. This means that it can be used to assist in the configuration of the organisation, to show how authority is allocated between individuals and how through this, an organization can be built up. The model can also assist individuals in one and the same organisation to understand their roles in the context, to speak the same language and, on the grounds of the situation at hand, create a flexible and goal oriented organisation. Note that this concerns a basic model only. Its practical application then calls for reflection and adaptation. The model is in the first place intended for use by municipal fire brigades.

Command activities

Command can be considered as a consciously applied influence on a system consisting of people and technology, through, among other things, continual planning, execution and follow-up (Swedish Rescue Services Agency, 1998a). Command involves the management of a number of activities. To fulfil the demands and expectations that are placed on those in command, they are

required to:

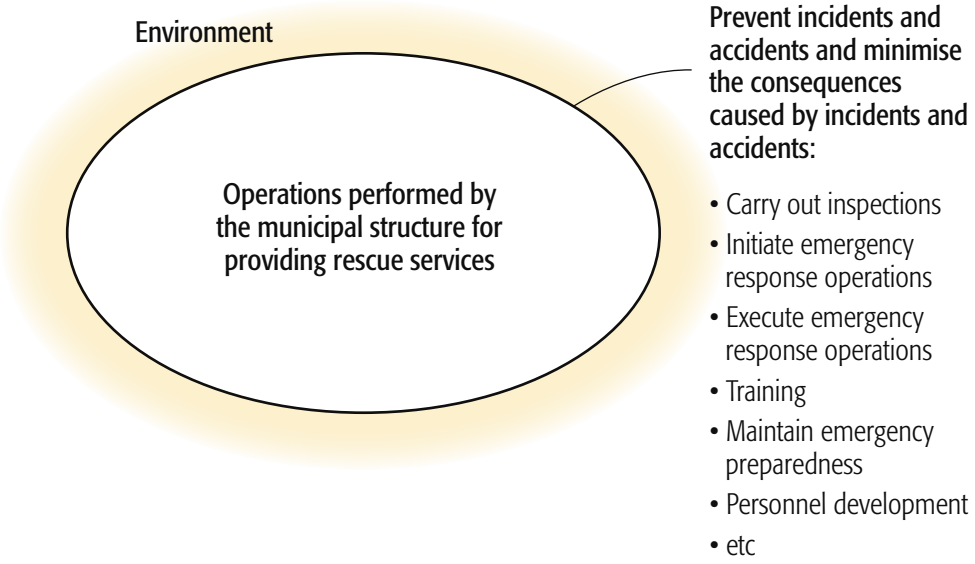
- determine the way,
- show the way,
- establish prerequisites,
- follow-up and adjust.

To *determine the way* means to decide upon the orientation and in what way the work shall be carried out and development steered, what shall be achieved and how tasks shall be prioritised. To *show the way* entails, among other things, clarifying this orientation and justifying the approach by dividing the general goal (the primary aim) into part goals, and then to communicate this. To *establish prerequisites* concerns, in various ways, establishing the economic, structural and resource conditions required to execute the process decided upon and, therefore, the practical tasks that it is made up of. Establishing conditions also includes creating a structure, and organising work on the basis of the orientation decided upon. To *follow up and adjust* entails, among other things, continual supervision of how the work is being carried out and what it is achieving in relation to the goal and, as necessary, adjust to compensate for deviation. It also concerns being aware of how conditions in the surroundings are changing and adjusting the work as necessary to adapt to these.

These *command activities* describe the work a commander has to carry out, irrespective of his or her level in the organisation. Note that these various activities are not considered as entities started, finished and concluded. They are processes that are continually underway and a commander may have several in progress at the same time.

Operations and turn-out services

The municipal structure for providing rescue services continuously runs some form of societal *operation*. This is based on the Civil Protection Act and concerns preventing and limiting personal injury and damage to property and the environment. The municipal structure for providing rescue services is granted certain powers to enable it to fulfil its obligations in this area. These are based on society's needs for civil protection and the protection of societal functions. Operations are oriented towards the prevention of incidents and accidents and when they, despite these efforts, occur, towards minimising the

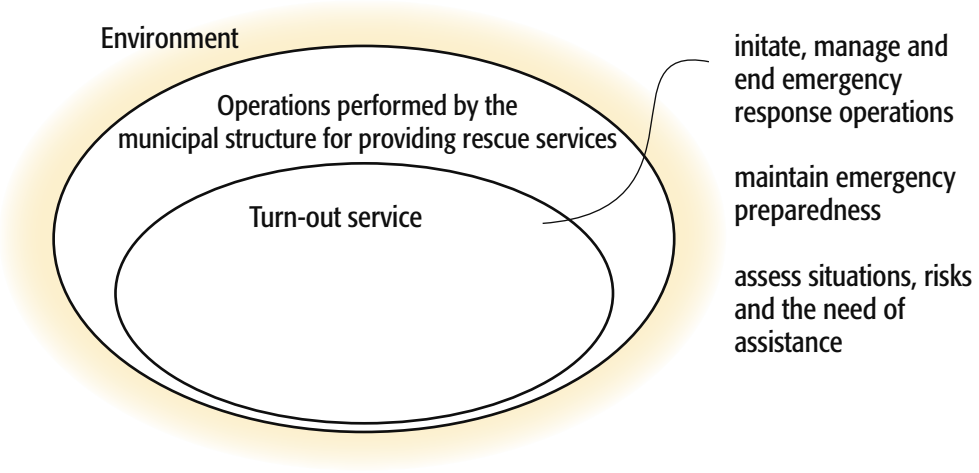


Operations performed by the municipal structure for providing rescue services.

degree of injury and damage caused. Other activities carried out within the framework of the total operation are inspections, the initiation and execution of emergency response operations, educational activities, personnel development and the maintenance of emergency preparedness production.

Even if the model is based on municipal rescue services, this does not exclude the organisation from carrying out tasks in a crisis management system, even if section 2 of the Civil Protection Act (2003:778) is not met. The intentions of this book are applicable in this context also.

The terms of reference here are the work that is carried out in connection with incidents or accidents or the obvious threat of them. A prerequisite is naturally also that this primarily concerns municipal fire brigades, i.e. that the legal definition of a municipal fire brigade is met. This part of operations we will refer to as the *turn-out service*. The turn-out service is then a part of the total area of operations the municipal structure of providing rescue services is responsible for. Note, however, that the turn-out service does not only concern the initiation and execution of response operations. *Emergency preparedness production*, i.e. the capacity to maintain a certain level of preparedness for conceivable situation developments and potential incidents and accidents is also included. The turn-out service must



The turn-out service is one of a range of operations performed by the municipal structure for providing rescue services.

continually assess the situation and requires an insight into the circumstances concerning ongoing response operations, assistance needs and emergency preparedness production, as well as information on, among other things, road blocks, public gatherings, events or other types of actual, accepted or planned risk situations, threats and events which in different ways could affect the probability of or consequences for an incident or accident.

Turn-out services must be structured so as to function under almost any circumstances, irrespective of internal or external influences. This, not least, because it is often under insecure circumstances or circumstances that are difficult to ascertain that they are needed or need to function in. Because of the nature of the problems involved in protection and rescue, the municipal structure for providing rescue services is sometimes confronted with unpredictable situations. Operations must be configured so that they can deal with any situation that may arise. They must in the first place be configured on the basis of the assistance need. Anyone falling victim to an incident or accident needs help from the municipal structure for providing rescue services, and it is on the basis of this assistance need that the turn-out service must adapt and execute its operations.

Turn-out services encompass all the components needed to satisfy an assistance need, including technology, competence, etc. as well as *command*. It is through leadership that turn-out operations are administered and controlled.

Fundamental to being able to administer and control turn-out operations is, in the first place, recognition of the system, its configuration in a particular municipality and where system limits are set.

Once the system has been identified and the limits established, it is necessary to determine the technical and personnel resources the system has at its disposal. Here it is necessary to determine what the system can manage and what types of situations it is expected to work in; in addition some form of analysis or assessment of the primary risk situation is required. *System limits* define the scope of the total responsibility with regard to, in this case, turn-out services.

Dimensions to take into account when defining a system. From Agrell (1988).

Dimension	Scope of the dimension
Function	What is the object of the system? What is the purpose? Whose interests shall it protect? How is the quality of the system judged?
Resources	What facilities does the system have at its disposal to meet its obligations?
Environment	What circumstances does the system need to adapt to?
Measures	What activities are carried out within the system? What is the purpose of each of these activities? How does the purpose of these activities align with the goals of the total operation? How is the quality of the activities judged? Does the quality align with that applicable to the total operation?
Ledning	How is the system controlled? How are resources distributed to the activities and by whom? How is the operation adapted to suit changes in internal and external conditions?

The command system

The *command system* is the part of the turn-out service that administers allocation of authority, resources, etc. and which controls the turn-out service. Consequently we shall here leave the turn-out service as a whole and focus on the control of the system. The command system encompasses, among other aspects, leadership, labour legislation, decision-making, technology, norms and procedures. In other words everything that is necessary for a command system to function.

The command system constitutes the tools necessary for effective control of the system. These tools, to a large extent, concern knowledge. Through defining the command system on the grounds of the need for leadership and the demands and requirements of the situation, it is possible to allocate authority to individuals on a reasonable basis. The task here then is to leave no gaps in the command structure, or allocate responsibility that is too small or too great for the individual in question.

Command system levels

The purpose of the command system is to, with the help of resources, effectively provide the best possible assistance in different types of situations. The resources must be managed in such a way as to accommodate both short and long term needs and demands. The command system must be able to fulfil the expectations placed upon it as a whole, by both the system itself and parties outside it. As a step towards defining a method for handling such expectations, we can, within the framework of the command system, identify three general *system levels*.

- to execute tasks,
- to execute emergency response operations, and
- to provide municipal emergency services.

Note that the levels are not a description of the organization of the system. They are a part of the model and they can help us find a way to satisfy internal and external demands, expectations, needs etc, when configuring the organisation.

The system level, *to execute tasks*, is based upon the need for the system to be able to carry out one or more measures simultaneously or consecutively with respect to the assistance need. A task, then, is made up of one or more measures. Note that at this level there is a high degree of dynamism between the measures and

the assistance need. There is normally, within the framework of a single response operation, a need to group resources to make them manageable, to the purpose of fulfilling parts of the assistance need. It is then it becomes necessary to apply, among other things, measures to show how the resources should be grouped. It can also be necessary to carry out several tasks, simultaneously or consecutively.

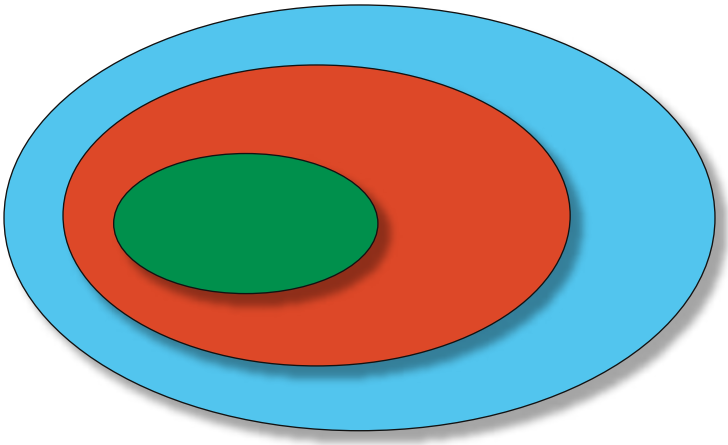
The system level, *to execute tasks*, is organisational and covers the command of organisational elements in the execution of allocated tasks.

The system level *to execute emergency response operations* entails the command of single emergency response operations. The level is based on the prerequisite that the system is able to satisfy the total assistance need in connection with an emergency or the imminent danger of such by carrying out one or more tasks simultaneously or consecutively. Responsibility here is legally grounded on the Civil Protection Act (2003:778), which points out the importance of clear, expedient leadership of emergency response operations and of their effective execution. This system level therefore corresponds to the response operation perspective.

The system level to *provide municipal emergency services* encompasses the management of the total turn-out operation. The aim here is to be able to execute one or more simultaneous response operations, maintain emergency preparedness production, meet the total assistance need and monitor the risk situation. This system level is also legally grounded on the Civil Protection Act (2003:778), with reference to the overall responsibility for turn-out operations.

Decision domains

It is possible, within the framework of the command system, to define different *scopes of authority* in both time and space. A scope of authority entails a degree of responsibility and the right to make decisions on issues or problems within that scope of the authority. The organisation allocates authority, while the individuals who are given it take responsibility on the basis of it. We will now refer to such a scope of authority as a *decision domain*. Decision domains refer to the authority that has been allocated, i.e. the types of issues, problems or information the domain has the authority to administer and can influence, either directly or indirectly.



The scope of authority of the decision domains covers the actual engagement, in terms of:

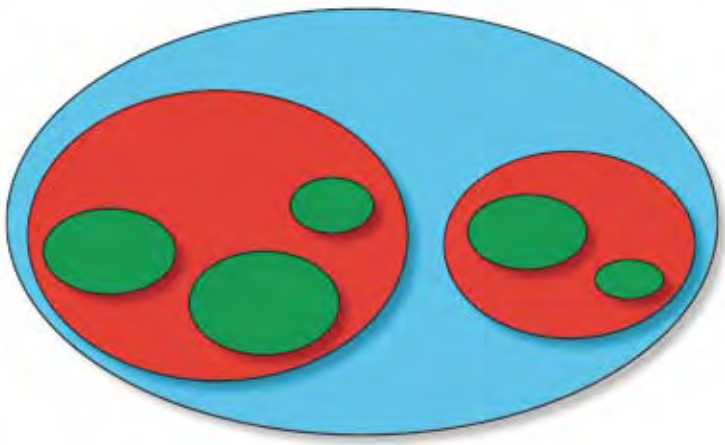
- Available time
- Available space
- Issues at hand
- Problems
- Information
- Direct or indirect influence
- etc

Decision domains, defined by the scope of authority.

If we then relate the discussion on decision domains to system levels, we can identify three types of decision domains. We can then for each of these describe the responsibilities of the individual receiving the authority. It is also through the decision domains that we link the command system with the individuals that manage the system. For the individual (commander) the decision domain entails a degree of authority, tied to time and space.

The decision domain at the system level to provide municipal emergency services is referred to as *system command*. The decision domain associated with the system level to execute emergency response operations is referred to as *operational command* and the decision domain at the system level to execute tasks, *task command*.

It must be possible to manage all the decision domains. And, moreover, system command must be administered continually, 24 hours a day, 365 days a year. Operational command arises when a response operation is initiated, and task command comes into play when tasks are going to be applied, within the framework of the response operation. Decision domains form parts of each other and cannot be lifted out of their context. Task command is a part of operational command and operational command is a part of system command. Note that this refers to the grouping of decision domains. If several response operations are being executed simultaneously, each response operation is managed by its respective decision domain, operational command. These are then parts of the decision domain, system command. In a corresponding way several tasks can be carried out simultaneously within the framework of a single response operation. These will then be



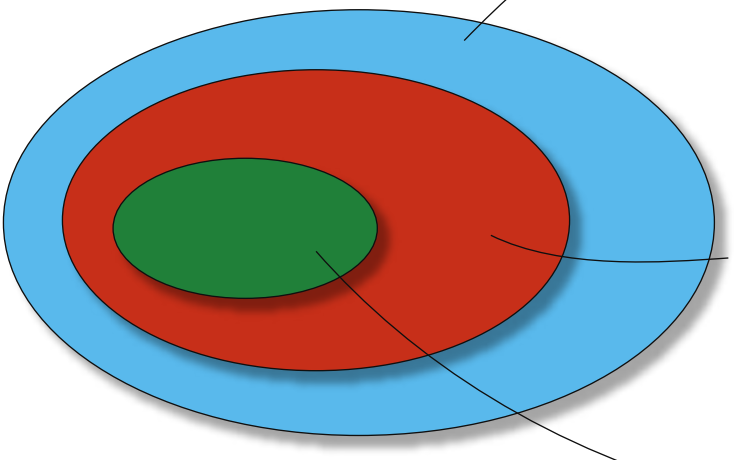
Decision domains form parts of each other and cannot be lifted out of their context.

managed by the respective decision domains, task command. And the task command domains are part of the operational command domain.

There is also a degree of hierarchy in the relationships between the decision domains.

If, for example, several response operations are being executed simultaneously, each with an incident commander who manages his or her own decision domain, operational command. These respective domains are at the same system level and consequently have equal status in the hierarchy. It is the decision domain, system command, which manages and decides over them. In the same way it is the decision domain operational command which decides over the decision domains, task command. In situations where task command occurs to different extents, it is the covering decision domain that administers the imbalance between the task command domains below it.

It is possible to an extent to identify the contents of each type of decision domain – system command, operational command and task command.



The contents of decision domains.

System command

- Define the role of the organisation
- Define the framework of response operations (aim of operation, resources, time, geography)
- Supply of resources over time to ongoing response operations
- Preparedness in relation to the risk situation and need of assistance

Operation command

- Determine the goal of the operation
- Decide on and allocate tasks to various organisational elements
- Coordinate the execution of the response operation

Task command

- Manage the organisational element in the execution of allocated tasks
- Coordinate the execution within the organisational element

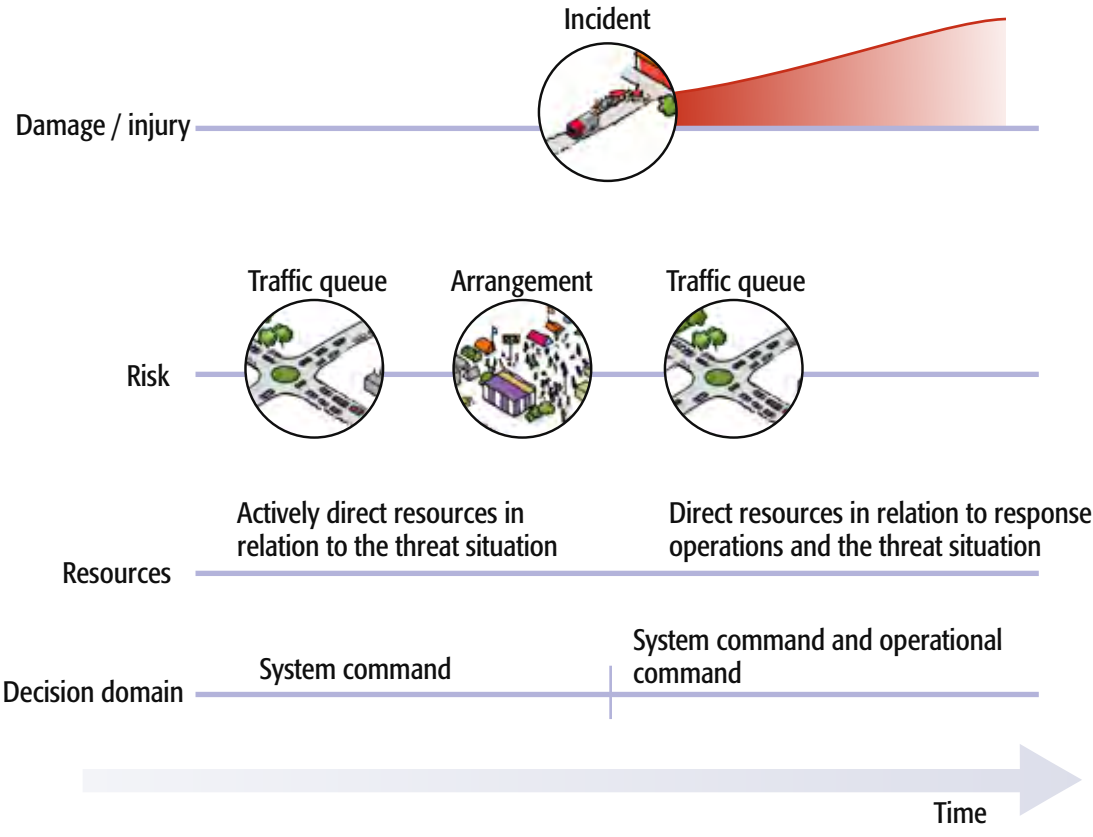
System command

Within the decision domain *system command*, the definition of the organization's role is continually updated in relation to the situation at hand and to the operations of other organisations. This role in the municipal structure for providing rescue services is based naturally on applicable rules and regulations, but also on social and professional valuation, ethics and morals, the work culture within the organisation and not least its proficiency. The roles of other organisations also have a bearing on how the organisation should be configured. The fire brigade is one of many societal services that citizens come into direct contact with in various situations, not least in connection with emergencies. It is therefore important that the position the fire brigade fills is configured in relation to the roles of the other entities playing a part in the situation. Since circumstances change continually, the system needs to adapt its activities, and therefore its role, to suit, also continually. Therefore system command must regularly redefine the entire organisation's role in relation to the situation and to the other relevant organisations in the community. Such

System command must actively weigh up the risk situation with respect to emergency preparedness and any possible ongoing response operations.

decisions concern how the total organisation shall work and policy with regard to general direction.

The situation that the role is defined in constitutes, among other things, a carefully considered and sectioned emergency preparedness production. *Emergency preparedness production* refers to the activities that, among other things, establish a certain degree of preparedness in the form of personnel and other resources so that in the event of accidents and emergencies, it is possible to proceed to the incident site and provide the necessary assistance. The situation also includes the risk and threat situation that applies - a total appraisal of the risks, threats and assistance needs - a form of continual risk appraisal, in which the probability and consequences of potential incidents are weighed up. In addition the situation can at any time include one or more ongoing response operations.



The decision domain system command must be active 24 hours a day, 365 days a year.

System command shall also initiate and define the framework for an emergency response operation, in terms of the *aim of the operation*, resources, time and geography, as well as ensure that the total assistance need is met, with regard to a single response operation and in general terms (including potential assistance needs). The aim of the operation describes in basic terms the goals of the system in executing emergency response operations.

Defining response operations also encompasses managing the provision of resources over a period of time for ongoing operations, which entails, among other things, the planning, procurement, allocation and distribution of resources. Moreover, system command is responsible for coordinating and prioritising ongoing response operations or response operations with emergency preparedness production.

Since system command is responsible for, among other things, the administration of emergency preparedness production, risk situation appraisal and the provision of resources for ongoing operations, it has to be active continuously.

System command shall, as other decision domains, be based on a *tactical approach*, i.e. the optimal use of available resources in relation to the ongoing incident, emergency preparedness production and prevailing risk situation. An active system command makes it possible to quickly adapt to changes in the risk situation, have well balanced emergency preparedness production, execute ongoing response operations effectively and ensure that the assistance need is met. A tactical approach to system command is then based on, among other aspects, active and continuous application and a balance between the needs of emergency preparedness production, the risk situation, ongoing response operations and the total assistance need.

By way of conclusion then, the decision domain system command entails continual redefinition, assessment and decision-making concerning the role of the entire organisation in relation to the situation and the other organisations in the community. System command's duty is thus, in different ways and in different forms, to initiate emergency response operations, appoint incident commanders and to define and provide frameworks for responses in terms of response intent, resources, time and geography. But primarily, system command shall ensure that the total need for assistance is satisfied. A significant part of the work of system command is also to ensure that the system as a whole functions as a part of the community's total crisis command system. This means, among other things, continual cooperation with other organisations.

Operational command

The decision domain *operational command* is responsible for the ongoing operation on the basis of the framework, in terms of the aim of the operation, time, resources and geography that is given by system command. Operational command, however, must follow the instructions and guidelines issued by system command. On the basis of this, the operational command shall decide on the *goal for the operation*, i.e. the goal for the individual emergency response operation.

From here operational command decides upon the measures to apply to achieve the goal of the operation decided upon. And on the basis of the measures, operational command then allocates tasks to the various organisational elements appointed to execute the response operation. The organisational elements can be sepa-

Example 22

In Allmänsta municipality the fire chief is responsible for the decision domain system command. This is normally handled through a fire chief being in preparedness. The fire chief in preparedness decides upon the aim of the operation. System command should, among other things, ensure that each individual response operation meets its assistance need. If this is not the case, the aim of the operation can be revised.

If a second simultaneous response operation is carried out, system command is responsible for the balance between the two. This can be handled, for example, through resource distribution or through phasing the aims of the operations.

rate units or formations of units, such as sectors. It is important that these are configured and possibly grouped in such a way as to facilitate the management of the response operation.

It is also the responsibility of operational command to ensure that the tasks allocated to the organisational elements are completed. This may, for example, entail issuing directives and instructions of a practical, executive character or that are otherwise necessary for the coordination of work at the incident site. It can be said that helping the organisational elements to carry out the tasks through coordination of their work is a central part of the work of operational command. Operational command can therefore be considered as that part of command that continu-

ally strives to coordinate the work of the organisational elements. This also includes ensuring that they do not work against each other, but rather, either together or independently, work towards accomplishing the common goal of the operation. The tasks must also, obviously, be configured to meet the actual assistance need on the basis of the course of events.

It is essential that operational command processes information on the situation and plans for the continuing operation in terms of time and space. It must therefore be aware of what is happening in the close surroundings, continually analyse the strengths and shortcomings of resources and be ever aware of the situation with regard to opportunities and threats. The various changes in the course of events, occurring naturally or as a result of the measures taken, affect in one way or another the subsequent work at the incident site. The work that is carried out in the event of emergency response operations must therefore be continually adapted to suit the changing situation, and operational command must continually follow up the results of work carried out by the various units.

It is also possible, naturally, for operational command to combine efforts with other organisations that may be involved in the work in different ways or that can contribute to helping victims in some way. As society's various organisations that normally work in these areas are answerable to different legislation, advantage may be gained for each other's organisations through coordination or contribution with different expertise to overcome the various problems that may arise.

Emergency response operation work must of course be oriented towards maximum effectiveness in relation to the assistance need for the individual response operation. Activity is based on an active approach to the problems that may arise. Consequently it is not sufficient to respond to events that have occurred; the work in the decision domains must be oriented towards dealing with various problems and issues before they arise. Operational command must, then, work with a time horizon that stretches ahead of immediate needs.

The decision domain operational command primarily decides on the goal of the operation, and decides upon and allocates tasks to the organisational elements that are involved in the response operation. This includes coordinating the work that these organisational elements carry out. As well as, as necessary, issuing

Example 23

There is a bomb threat at the department store in Allmänsta. In connection with this, the police have identified a suspicious bag and are working on disarming the supposed bomb inside it. There is an immediate threat of the bomb exploding and causing a range of different types of damage. Because of this the municipal structure for providing rescue services is also at the incident site and is planning for a possible explosion. At the same time, then, as this is a police operation it is also a rescue service operation. The different organisations operate on the basis of different legislation, but they cooperate with each other and create the conditions necessary for each to execute their respective operations.

directives and instructions of a practical, executive character or that are otherwise necessary for coordination of the work at the incident site.

Operational command is also responsible for organising the incident site in the best way possible to accommodate the assistance need. In addition it also decides which ethical, practical and not least legal measures can reasonably be applied at the incident site.

In conclusion then we can say that the decision domain, operational command, is responsible for the execution of the response operation, on the basis of the framework provided by system com-

mand. This framework includes the aim of the operation, time, resources and geography. Within the framework, operational command decides upon the goal of the operation and the measures to be applied. It then allocates tasks to and coordinates the organisational elements.

Example 24

The municipal structure for providing rescue services has received an alarm concerning a fire in a flat and is implementing an emergency response operation. There are several casualties at the incident site and a considerable need for assistance. The medical service has also been called out and is attending to a number of casualties. Consequently, at the same time as this is a rescue service operation it is also a medical service operation. The different organisations cooperate and create the conditions for executing their respective operations.

Task command

The decision domain, task command, manages an organisational element in the execution of an allocated task. To manage the execution of a task entails ensuring that a number of measures are applied to tackle the destructive sequence or in some way meet the assistance need. Depending on, among other things, the form of control, the following aspects need to be addressed when a task is allocated.

- What is the purpose of the task?
- What shall be done?
- Where shall it be done?
- When shall it be completed?
- What resources shall be used?
- Possibly, how shall the task be executed?

Example 25

An emergency response operation is being executed and the incident commander is operating within the decision domain operational command. On the basis of the aim of the operation set by system command, operational command forms the goal of the operation. The most important aspect is that the assistance need is met as well as it possibly can be.

A further incident occurs and a second incident commander is appointed to the resulting response operation. This incident commander operates within a second decision domain operational command. This incident is completely different from the first: the decision domain is working on a longer time basis and with more space, more complexity, and a much greater flow of information. Consequently more personnel are required to manage the decision domain.

Example 26

A traffic accident has occurred in which an articulated tank lorry carrying petrol has collided with a car and has tipped over. A variety of measures are necessary. The incident commander has decided on a number of tasks and has given instructions and guidelines to several parallel task command decision domains. One decision domain is responsible for freeing the car, another for stabilising the tractor unit and semi-trailer with regard to fire, and a third for sealing minor leakage from the tank.

It is usually necessary to coordinate the various measures. Part of the work of task command is consequently to coordinate the work within the organisational element for the execution of allocated tasks.

This must be done in accordance with the decisions, instructions, guidelines or directions issued by operational command (the goal of the operation) and here also a degree of adaptation is often required in order to satisfy the situation. On the basis of the information provided by operational command, task command must organise itself in such a manner that the tasks allocated to it can be executed as effectively as possible.

Every task has a decision domain task command allocated to it.

Primarily task command manages the organisational element of the execution of the tasks that are allocated by operational command. In some cases, however, the situation requires that task command be handled in different degrees of resolution. In such cases the superior task command decision domain allocates tasks to subordinate task command decision domains. Task command can then be arranged in terms of different degrees of resolution and hierarchical levels.

In conclusion then, we can say that task command manages and coordinates an organisational element in the execution of an allocated task. If necessary several task command decision domains can be created. Task command can then operate with different degrees of resolution and it is the need for command that steers this set up.

Role logic

The appointment of roles at an incident site must be uniform and clear. When authority is transferred from one commander to another, the definition of roles can become indistinct. It is, then, necessary to have a well prepared plan for the allocation of roles, tasks and authority. These should align with the roles, tasks and authority that normally exist in the organisation. The conditions for work in connection with emergency response operations are established at a time when no actual operation is underway.

Role logic requires that the expectations placed on each individual at different times are so similar that it is reasonable to expect the person concerned to cope adequately with them under the circumstances. In other words the expectations placed must be logical with respect to the individual and the circumstances. But role logic also entails that these reasonable role expectations for individuals should be similar for one and the same person during different phases of, for example, an emergency response operation. The limited capacity of people should therefore be compensated for through shared decision-making. A certain set of roles for a commander should create reasonable and logical criteria for what can be expected of him or her. The criteria then on which expectation is based should, for different situations, be generally the same, in terms of perspective, how concrete they are, the task content and the time scale. One cannot expect, for example, a commander, normally of a relatively small unit of say

five firefighters, to suddenly take on a position as commander of five units, each of five firefighters. The perspective is very different, tasks are allocated in a different way, the time scale is extended and the information flow is different.

With an expansion of operations, through, for example, an increase in geographical area or complexity in some other way, there is a big risk of people landing in situations or being forced to handle situations with a degree of resolution they are not trained for. For the individual, the development of the command system should go more or less unnoticed and only be felt as an improvement in the command work at the incident site.

The role is, naturally, associated in different ways with an individual and the personality of the individual dictates how a particular role is applied by them in the actual situation. If corresponding roles are allocated to two people, each will apply their role in their own way, which can lead to the results being very different. Roles are also affected by the situation. An individual's understanding of how well they will be able to handle a particular role in a situation can vary considerably, which is another good reason for applying role logic. A person must have a realistic perception of his or her ability to cope with a situation and feel secure in his or her role in a particular situation.

People try also to take on roles that suit them, which means that if one attempts to allocate a person an unsuitable role, the person will adapt it to suit their own ways. This can quickly have a detrimental effect on the whole organisation, as some areas of responsibility or authority will not be accounted for.

Since work at an incident site is for the firefighter an everyday situation, the demands and expectations placed on a person and their respective roles should be as similar as possible with regard to the work at an incident site and work when there is no actual response operation underway. A role that a person is appointed does not perhaps fall in line with the general consensus, conscious or unconscious, of how the group would allocate roles, for example, with more or less explicit group norms. This can create shortcomings in the role logic and demonstrates how important it is to combine command and leadership.

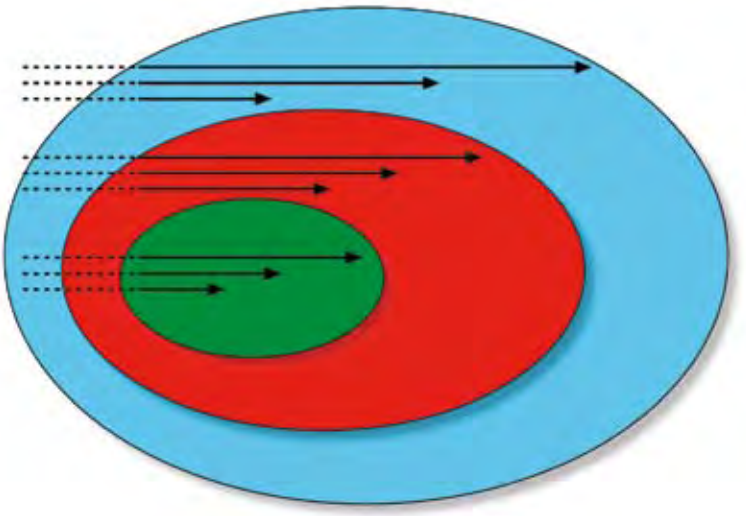
Time scales

A time scale, in this context, can be defined as the period between the point in time when a situation is perceived up until information is gained about the results of the measures that are taken (Swedish Rescue Services Agency, 1998b). A time scale is not just a measure of how far planning in advance stretches. It is also a measure of reaction speed from impression or information, via assessment to decision (Swedish Rescue Services Agency, 1998a). The time scale, quite simply, describes the period for which certain information, decisions or authority is applicable and within what period follow-up from executed measures and such is received. Each decision domain must be able to handle several different time scales, but a superior decision domain limits the lengths of the time scales a subordinate domain can handle.

Each decision domain must be able to handle both long and short time scales. The short time scale concerns being able to handle the prevailing situation. The long time scale concerns planning for the future, visualising the consequences of the present situation. This, depending on the decision domain, can concern potential events taking place in five minutes, five days or perhaps even further into the future. That this is a sliding scale between short and long time perspectives can, for example, mean the requirement of continual awareness of potential developments from the present time up until a certain time in the future or the occurrence of a specific event. The ability to handle different time scales is also an important aspect of a tactical approach.

Short or long time scales are not evaluated in any way. We cannot say that it is better with long time scales than short, or vice versa (Swedish Rescue Services Agency, 1998a). Each decision domain has its time scales, and it is the needs and demands of the situation that determine their suitability and validity. A long time scale in one situation can be short in another. Four hours can, for example, be a long time in the case of a traffic accident or a short time in the case of a major forest fire.

Time scales are not only forward reaching. A decision domain must also take past events into account, and, obviously, ongoing events. In the same way as for the future, this can, depending on the decision domain, concern occurrences that took place five minutes, five days or even longer ago. And also in the same way as for the future, the past must be accounted for on a sliding scale



System levels and time scales

and again here it is, among other things, the situation that determines the length of the scale.

Longer time scales set limits for shorter ones. Short time scales cannot cover events stretching further into the future than the longest time scales within one and the same decision domain. Time scales in subordinate decision domains also cannot be longer than the longest time scales in the decision domains above them. If such should occur for some reason, the work of the subordinate decision domain cannot really be considered to be in line with the work of the decision domain above it. The subordinate decision domain cannot, in this situation, with certainty handle its authority and there is an obvious risk of the system being reactive and only being able to handle the current situation. It is important that superior decision domains are able to broaden their horizons and handle longer time scales than the domains under them. System command must be organised and run in such a way as to not restrict the time scales of operational command, and operational command must be organised and run in such a way as to not restrict the time scales of task command.

Example 27

During an attic fire in a large block of flats, the decision domain task command is tackling the problem of preventing the fire from spreading to an adjoining building. Information on this problem has not reached the incident commander who is responsible for the decision domain operational command. Task command will soon have problems coping with the situation in the attic as operational command has not provided it with sufficient resources over time. Task command is, here, working on a longer time scale than operational command, which will inevitably result in operational command - working on the shorter time scale - failing to supply task command with sufficient resources.

System command, in its place, cannot afford to wait for, for example, situation reports. Some things must be dealt with only on the basis of weak indication, on longer time scales.

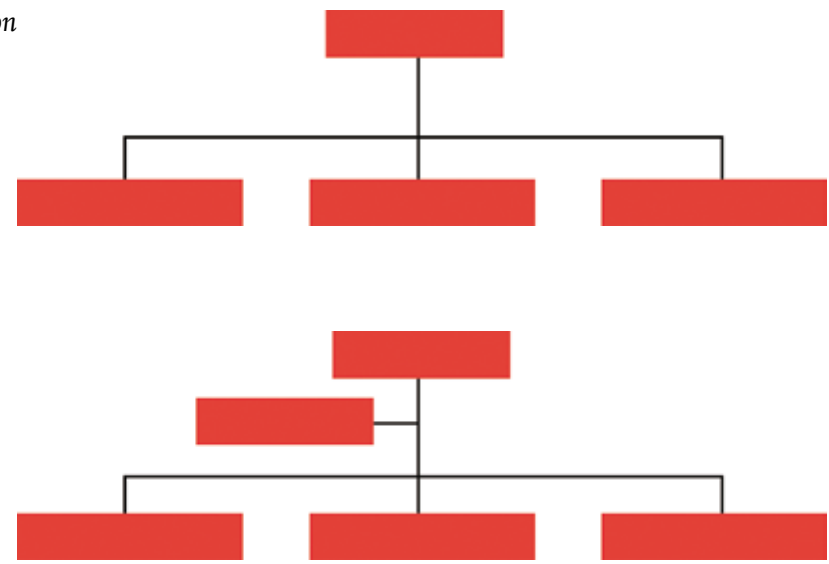
Organisation

The organisation and how one chooses to organise oneself is the term used for what is actually the command system. The organisation is, in other words, that which is seen from the outside and that part of the command system that affects us in a more physical way.

Within organisation theory the term *organisation* has two meanings, a concrete meaning referring to methodical coordination between individuals and groups with a common interest, and a more general meaning referring to a company's or an administration's operational structure. Most organisations have an obvious hierarchical configuration with distinct demarcation between superior and subordinate levels in order to legitimize and facilitate decision making, the allocation of tasks and control (Bolman et al. 1995).

Turn-out operations usually adopt a line organisation or a line staff organisation. Through these types of organisations, distinct channels are created for the flow of information, and the allocation of authority is often easy to define. This structure, however, places considerable demands on all involved in terms of cooperation on, among other things, the tasks to be conducted and the distribution of resources.

Line organisation and line-staff organisation.



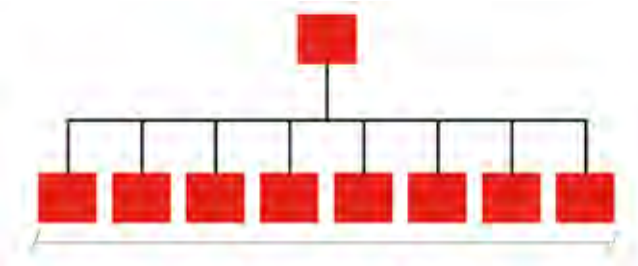
In a line *organisation* each employee has only one manager. The purpose of this is to obtain the clearest possible order channels, i.e. a channel via which a certain type of information is conveyed. This form of organization, however, requires that the different managers are willing to cooperate (Bruzelius et al. 2000).

In a *line-staff organisation* the overall specialist role of staff is emphasised, partly as a provider of information on which, in our situation, the Chief Officer can base decisions and partly as a provider of expertise generally within the department. It is easy, in this role, to find oneself in an unproductive position between superior interests, the departments to be supported and one's own expert knowledge.

The creation of an organisation, also provides the practical conditions for placing decision domains in a context. Put more simply, the organisation is the tool we use to allocate authority between the various individuals involved in turn-out operations. And it is also in this context that we can talk of shared decision-making.

Command capacity

Command capacity concerns the system's capacity to handle itself in relation to its working environment. It is important to remember that the system is managed by people, who also manage the various decision domains, and that there is a limit to how many problem or issues an individual can cope with at any one time. This places demands on how emergencyresponse operations are organised. Within organisation theory, the concept of the breadth of an organisation in relation to its depth is related to, and usually referred to as *span-of-control* (Johansson, 2000). It is, however, not so easy to establish on a permanent basis a configuration for an organisation. It must be possible to adjust the span-of-control to suit the situation. In principle one can say that the higher the demand placed on interplay or need for control between superior and subordinate levels, the greater the need to reduce the span-of-control (i.e. reduce the number subordinates per superior). That is to say that the more independently subordinates can work, without the need for continual supervision and interplay with the commander, the greater the opportunity for increasing the span-of-control. In favourable conditions one refers to a maximum span-of-control of between 7 and 9.



Span-of-control. From Räddningsverket (1998a).

As a commander one should continually ask oneself if one is coping with the decision domain and the situation and if the organisation is adapted to suit the need, demands and expectations that are set. If a higher commander in a difficult situation adapts the organisation to suit his or her needs for a manageable span-of-control, there is a risk of subordinate commanders being left with spans-of-control that are too big. Adjustment to manageable spans-of-control must be applied to the whole organisation. In order for leadership to be effective the command system must match the situation. So, the greater the number of potential occurrences in the situation, the greater the degree of variation the command system must be able to handle.

The capacity to manage the situation can never be better than the perception of the situation. By continually gaining information on events the ground is created for being able to act and adapt the command capacity to match the problems to be solved and the measures to be taken. In the types of changing situations that incidents and accidents imply, the organisation must continually adapt to suit the situation. It is important that the adaptation is arranged from the bottom up, i.e. that the structure is reconfigured from the ground upwards. A commander should not reduce his or her span-of-control by passing tasks downwards in the organisation. This is not the same as delegating tasks. Delegation passes down through the organisation, but reduction in spans-of-control must be done by restructuring upwards.

Here we can refer to the need for interaction. By this we mean the need to, for example, exchange information and divide tasks between two levels. Generally a reduced need for interaction between two levels of command improves conditions for increasing span-of-control without harming the effectiveness of the organisation. The best ways of reducing the need for interaction are (Swedish Rescue Services Agency, 1998a):

- increased capacity for independent management at all levels in the organisation.
- increased delegation,
- well defined tasks for the units in the organisation,
- good cooperation between subordinate units, and
- limitation of continual follow-up.

A commander's capacity to manage many directly subordinate commanders is also governed by their competence, their use of language and the time scales they are working with. If the superior feels that the subordinate commanders, as a group, are working with similar time scales and handling problems of similar type and size, he or she can increase his or her span-of-control. A maximum value for span of control in a particular situation cannot though be stipulated as so many variables are involved.

Decision domains can, in practical terms, be based on *sectors*, an incident site being organised through division into such sectors. Sectors can be based on the need to complete a certain type of task or maintain a particular function, such as water supply or the decontamination of personnel and victims. They can also be based on geographic division of an incident site, for example inside, outside, roof, north side or between the lake and the road to the east of the lake. These forms can also be combined within the framework of a single emergency response operation, which is perhaps the most common. The formation of sectors is one way of increasing command capacity in the system, through distributing certain tasks or responsibility to different individuals.

For the decision domains system command and operational command, command capacity can be increased by providing staff. In the case of decision domain task command, the command capacity can be increased in several ways. A common way is to increase the number of decision makers and through this divide the decision domain task command into several decision domains. Task command can then be handled in different degrees of resolution. Different organisations work under different conditions which place a variety of demands on the organisations and make it necessary for them to develop a work method based on these conditions. Role logic comes into play here and the scaling up of operations must occur on the basis of this.

The provision of a command *staff*, increases the command capacity of the organisation. The staff can, for example, work with follow-up, personnel issues, coordination, reports, documentation, assessment or compiling information for the bases of decisions. But it could also carry out the practical implementation of a decision or a plan. Through this, commanders can delegate the routine issues or aspects of more executive character and concentrate on their central tasks such as decision making. When a command

Example 28

A traffic accident has occurred in which an articulated tank lorry carrying petrol has collided with a car and rolled over. A variety of measures are called for and several units are involved. A form of sector division has occurred. Each sector commander is managing his or her respective decision domain task command. Dividing a sector with clear and well separated areas of responsibility in time and space increases the command capacity. The decision domain operational command delegates the more detailed aspects of the work and thereby increases its own capacity to deal with the longer time scales and overall problems.

By appointing a command staff the command capacity can be increased still further. Aspects of executive character or qualified judgement are left to other individuals and operational command can focus on balancing assessments and making carefully considered decisions.

staff group is formed or appointed one should bear in mind that its members do not have the authority to make decisions other than of a purely executive character. The role of the staff is to support the commander. The staff then increases the command capacity by relieving the commander.

Staff work is team work often carried out in stressful situations and therefore needs to be based on simple, established procedures. The following conditions should have been established and defined, and the Chief of Staff and staff members alike should be familiar with them.

- The organisational positions of the staff members.
- The commander the group of staff is appointed to support (who the staff belongs to).
- The type of management this commander exercises, i.e. his or her system level.
- The tasks that, at this level of command, rest with the staff.

Effective staff work calls for the division of work, cooperation and an understanding of and insight into the purpose of the staff and its tasks. The commander leads the staff by, among other things, setting goals, division, control and follow-up. Staff work is marked by objectively and decisively illustrating all the factors that can affect the decision of the commander and by loyally executing the decisions taken by the commander.

The command staff of a particular decision domain should not also be the command staff of a decision domain subordinate to it. For example, the command staff for the decision domain system command should not be engaged within the decision domain operational command. Being a member of a command staff involves, among other things, having a high degree of loyalty to the decisions made by the individual who is ultimately responsible for the decision domain. Dividing staff between several decision domains creates a conflict of interest for the staff members.

When command capacity is changed, one must be careful not to worsen the management by, for example, adding personnel that are not required or forming a group of staff that is more of a burden than a help. The command system and the structure formed through it are there, naturally, to facilitate the work of meeting the assistance need. The quality of command is often reflected in the result of the emergency response operation.

A flexible approach to meeting the need for assistance

In order to meet the assistance need in a flexible way in different types of situations, the organisation must be reformed and adapted continually. It is often formed on the basis of set plans and pattern of delegation. This is, of course, a question of pragmatics and is often necessary, but at the same time the organisation must have a degree of flexibility so that it can handle any assistance need that may arise. It is very unlikely that any set configuration can always be optimal for all the different situations that arise. It is possible, however, through competence and common, well developed basic values to create favourable conditions for improving flexibility in the organisation.

The organisational solution at an incident site is always a compromise between that best suited for meeting the assistance need as opposed to that for serving the needs of the response operation itself. It must be formed under stress on unstable grounds or by applying a prepared plan. It can therefore be necessary to continually adjust the organisational solution. One must also be aware of the fact that a solution that suits the organisation is perhaps not good at all with regard to the object or the damage, or vice versa. The need for adjustment during the course of a response operation can be caused, for example, by imbalance or inconsistency between decision domains. In addition the organisational solution may be based on demands and needs stemming from within the organisation. Even when an incident appears routine, safety aspects can call for a relatively complicated organisational solution.

The organisation largely reacts to signals that it receives from its working environment. These signals, about, among other things, the assistance need, are taken up by the decision domains task command or by individuals in the organisation and must then be passed up to higher decision domains. From here the higher decision domains control and adapt the functions of the system on the basis of the signals about the assistance need. The system is controlled from above whereas the signals are sensed at the bottom and passed up from there. It is also important that the system adapts itself to solving the situation at hand, not its own problems. The organisation must quite simply be totally based on the assistance need to be met. System command must also on the basis of its own intelligence gathering ensure that the assistance need is totally fulfilled.

Example 29

The municipal structure for providing rescue services has received an alarm from an industrial company, where a stacked storage warehouse is on fire. According to information received, the sprinkler system is operating, limiting the fire and to a large extent preventing its spread. Nevertheless it is necessary to enter the building for extinguishing work.

Because of the character of the building (large) and its contents (complicated stores configuration), the decision is made to send in two BA firefighters, one from the back and one from the front. In addition because of the long distance to the actual fire once inside the building, it is decided that each BA unit shall have a protective group and an ensured, separate water supply.

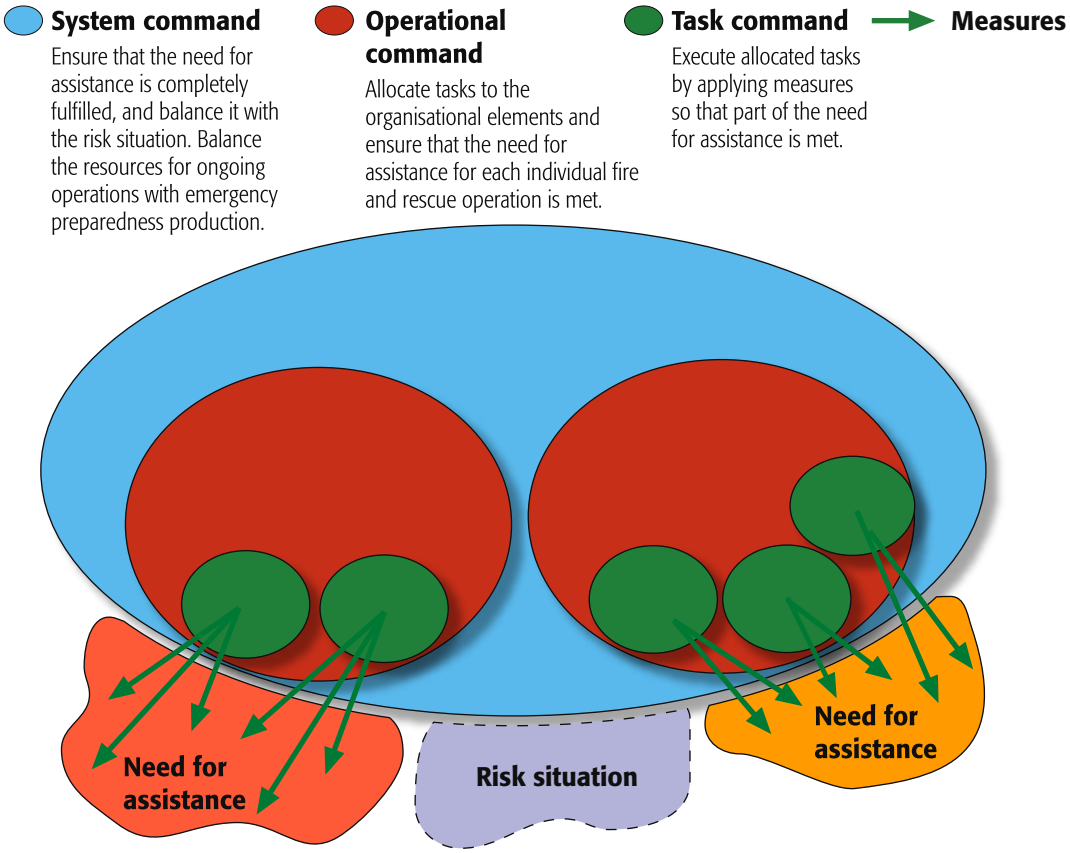
Despite, then, the quite basic technical aspects of the situation, a rather complicated organisational solution is called for.

For an organisation through flexibility to meet an assistance need under ever changing conditions, it must have an active system command, partly because some form of preparedness is continually being produced and partly because it is an activity in itself to initiate a response operation. Here we can take up *emergency preparedness production*; this refers to activities that include, among others, establishing a certain degree of preparedness in the form of personnel or other resources so that in the event of emergencies, one is able to proceed to the incident site and provide some form of

assistance. Emergency preparedness production is therefore an aspect that system command has to work with continually. As a basis for this work, system command should continually strive to gain and process information, i.e. a form of intelligence gathering, as well as working with long term follow up of operations. Note that emergency preparedness production can be changed in several ways. One way is to change the ready time, another is to increase or reduce the number of personnel engaged and a third is to move units. It is also possible to change functions in the organization, for example, by providing various types of special units. System command has therefore to decide upon and coordinate preparedness and response operation frameworks, which among other things include time, space and resources, as well as balancing the needs of any possible ongoing operations for assistance needs, risk situations and preparedness by, for example, dividing and transferring resources.

Conditions for system command work, i.e. from an administrative perspective, include, among other things, the initiation of changes and development work within that organisation. The modification work that is implemented affects the emergency preparedness production of the system in different ways, as well as the execution of response operations. The task includes taking responsibility for the future, and consequently the system needs to sense what is happening around and about the organisation. This involves ongoing analysis of the inner strengths and weaknesses of the organisation and of being aware of its working environment with regard to opportunities and threats. The task can involve working on a visionary basis, balancing that which is being done just now with that which may need to be done later. The analysis of completed emergency response operations can give an indication of needs with regard to investment in equipment or training or how the structure of the municipality has changed and how building technology solutions can affect the execution of operations.

System command, then, needs to take into account developments in the working environment and how these affect response operations. An important aspect of this is to analyse and evaluate just how the assistance need is met. It is among other things through such analysis and evaluation that system command, for example, with the help of aim of the operation, influences the work in order to ensure that the assistance need is fulfilled.



The need for assistance must be met and assessed from the standpoint of all the decision domains.

The decision domain system command has the authority to initiate response operations and needs to be operative on an ongoing basis. It is, though, only when a municipal emergency response operation is initiated that an incident commander is appointed. The decision domain operational command acts therefore by order of the decision domain system command and must comply with the directions and instructions that system command with its overall responsibility issues. Through these directions and instructions system command shows operational command the way. It is these that are referred to as the *aim of the operation*.

Operational command retains its configuration throughout the whole operation. There is, however, always the possibility of there being several ongoing operations. Situations can arise for example in connection with forest fires or other types of seasonal events

such as floods or festivals. Traffic accidents can also be seasonal. In cases where several response operations are implemented, these are executed by separate operational command entities. Operational command is responsible for the direction of its response operation *(goal of the operation)* as well as the allocation of tasks to the organizational elements that are attached to the operation in different ways. This work includes coordinating the tasks carried out by the organisational elements at the incident site. These elements have to be continually adapted to match and meet the need for assistance and operational command is authorized to carry out this adaptation. Consequently it must continually throughout a response operation follow up and check that the goal of the operation is being achieved. If the situation calls for it, the goal can be revised at any point.

As the fire chief has ultimate responsibility for operations, he or she must be in a position to affect the outcome of the operation with respect to the assistance need without formally changing the command structure. At the same time the incident commander must be allowed sufficient space to form the operation. The incident commander forms the concrete goals. The fire chief should avoid getting involved in too much detail.

The incident commander, then, normally forms the operation in the basis of the aim of the operation that is given by the fire chief for that particular situation. There is permanent but not too specific legislation guiding the aim of the operation in terms of the rescue of people, property and the environment. The incident commander forms the operation on the basis of these guidelines and the availability of resources. It is often the case that the aim of the operation needs to be revised when the operation fails to gain control of the situation relatively quickly, and the allocation of resources leads to a prolonged reduction in preparedness. A revision to the aim of the operation, in order to ensure that the complete assistance need is met, can also be the result of a command visit.

One must be aware of the different grounds for evaluation and situation specific prioritisation. Certain general criteria that a prospective incident commander can apply and which the response operation should be based on are established through taking up such grounds in advance.

With the help of common grounds for evaluation, then, a common perspective of the various roles prevalent to response

Example 30

The starting point for Allmänsta municipality is that victims of incidents and accident shall be offered assistance. The damage caused to property and the environment shall be minimised. On this basis, goal of the operation can, as an example, be formulated as follows:

The goal of the operation is first to search through the department store for the missing persons and second to evacuate the district. The fire shall then be limited to the third floor.

operations is in turn created, and in tune with this the opportunity for various individuals to compensate for each other on a temporary basis, for example, with an extra heavy workload. Lack of common grounds for evaluation and a common perspective of the various roles can result in imbalance in the capacity to lead. If a particular decision domain fails to function, there is the risk, for example, of close by decision domains going in and compensating for it, or of the function simply being omitted from the operation.

When several response operations are in progress simultaneously, cooperation between them is often advantageous. Such cooperation could, for example, concern possible needs and therefore competition for certain limited resources, even if the allocation of resources is primarily the responsibility of system command. It

can be the case, when there are several simultaneous operations underway, that one of the operations needs to be corrected from the point of view of system command, if, for example, there is an imbalance between the likelihood of the respective operations achieving their goals. In such a case a conflict of interests or rather competition for resources could arise. Another example could be that system command becomes aware that a single response operation is falling short of meeting the assistance need in a particular situation. System command can then, as part of maintaining the direction for the whole system, affect the goal of the operation

Example 31

During an emergency response operation the incident commander assesses the resource requirement prior to a relief takeover. The fire chief sees that the incident commander, perhaps due to tiredness, is underestimating the situation. The fire chief then acts by planning for additional resources, talking to the incident commander about the needs and making sure that it is understood that the aim in extinguishing the fire remains and that considerable effort is called for in order to achieve this aim. The result is that a higher goal must be met, which the fire chief contributes to by providing additional resources. Through clarifying or possibly revising the aim of the operation, system command can influence the response operation. The fire chief should also, perhaps, consider whether the incident commander should be relieved.

by, for example, deciding on resource allocation to the operational command, bringing up the fact that the need for assistance for the situation has not been met or through revising the aim of the operation. System command then follows up and checks that the system as a whole is in line with the set plan.

When resources are being allocated between several response operations, a number of parameters must be considered; some of these are:

- the function of the resource in relation to the need for assistance for the respective operation,
- the function and placement of the resource in relation to the risk situation,
- the number of resources engaged in the respective operation,
- the effectiveness of the resource for the respective operation, and
- expenditure of resources with time for the respective operation.

System command can is some cases need to establish conditions for a takeover of control of several simultaneous destructive sequences. It can then be necessary to separate the respective objects of several simultaneous operations. Because of the competition for resources under such circumstances, it may be necessary to prioritise resources in such a way that the actual take over of control of the respective response operations must take place, for practical and resource reasons, at different times. The degree of preparedness may also need to be phased, which could result in it varying with time. Having fixed degrees of preparedness beforehand does not provide for being able to handle the variation in situations that may arise in the system, especially if several incidents occur at the same time.

One of the tasks of system command, then, is to actively and in good time balance ongoing response operations, the risk situation and preparedness, for example by creating, dividing and moving resources.

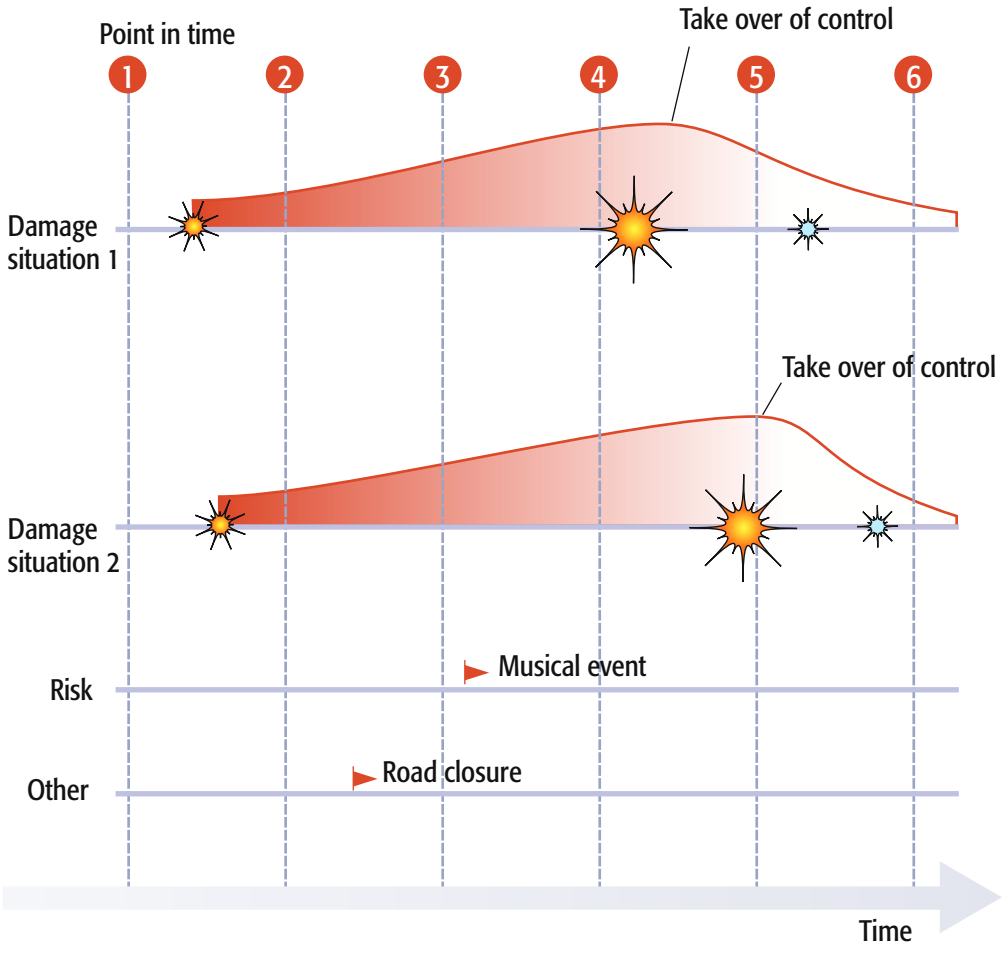
The decision domain operational command decides upon and allocates tasks to the decision domain task command. The connection between the applied resources and the actual need for assistance is very direct and obvious for task command. It is here that fire brigade personnel come into direct contact with the victims, the property damage and/or environmental damage, and it

is here that the fire brigade applies its personnel and equipment to physically meet the assistance need.

When operational command allocates tasks to task command, this mainly concerns what shall be achieved, what shall be done, possibly how it will be done, within what time and with what resources. This has to be placed in a context. When a task is placed in a context, it has to be broken down, for example, with respect to geography. Task command must be able to organise itself so that the allocated tasks can be executed.

Three general decision domains are defined above, all of which are parts of each other. But in some cases it can be necessary to divide areas of responsibility still further.

The development over time of several simultaneous incidents and threats. System command can influence the situation by arranging for the takeover of control to occur between damaging events.



The model described in this section does not prevent this. On the contrary, it adequately provides for it. This aspect falls in line with what is explained above as span-of-control, i.e. that each individual only has to take on a limited amount of responsibility in time and space. This entails that task command can be viewed in various degrees of resolution. The allocated task can in some cases be so extensive that it has to be organisationally expanded, divided up further and handled by several task command entities.

To handle the assistance need flexibly, a flexible command organisation is required and a variety of working methods may need to be used. A large response operation is normally divided up into sectors of some type. In some cases these sectors need to be grouped under a common command function lying between the individual sectors and operational command so as to increase command capacity. These groups can be referred to as *expanded sectors*. Through making it possible for an operation to have several expanded sectors each containing several smaller sectors, the conditions are established for balancing span-of-control at all organisational levels. Several parallel commanders can be appointed for the respective expanded sectors or incident site, to the purpose of relieving higher decision domains and creating the conditions for increased command capacity.

In a situation with, for example, relatively extensive limitation lines in connection with a forest fire, several sectors can be grouped into a single expanded sector. Task command is then operational in a further degree of resolution at a higher level of abstraction. The role content for the decision domain task command concerns therefore even in this degree of resolution:

- leading an organisational element in the execution of a task, and
- coordinating work within the organisational element.

What happens is that both the scope of the resource, i.e. the organisational element, and the geographical scope of authority are expanded. It should be pointed out that operational command needs to ensure the coordination of work between the expanded sectors. Command work can for another assistance need also be formed so that all the sectors are managed by a single commander positioned between the sectors and operational command, an Incident Site Officer. This should only be implemented if it improves command work. The important point is that there is flexibility in

Example 32

During a fire in a department store in Allmänsta, a BA firefighter has been allocated the task of entering a storage area which is on fire. From inside the stores the group shall cool combustion gases to prevent aggravation of the fire.

At the same time the situation has escalated, demanding extra resources and an expansion of the reorganisation. The above task, however, remains to be carried out. A number of significant limitation lines have been formed involving several similar tasks.

The task issued by the incident commander to the commander for such a limitation line could be:

- Prevent the fire spreading in an easterly direction.
- This is to be done by establishing a limitation line between Storgatan and Drottninggatan.
- The time aspect is also here not stipulated, but the task shall be implemented immediately.
- Units x, y and z can be used.
- The work shall be oriented towards increasing the resistance of or reinforcing dividing sections.

Note also that within the framework of this division of the task (to establish the limitation line) a previous task allocated to, for example, BA firefighters, may still be applicable.

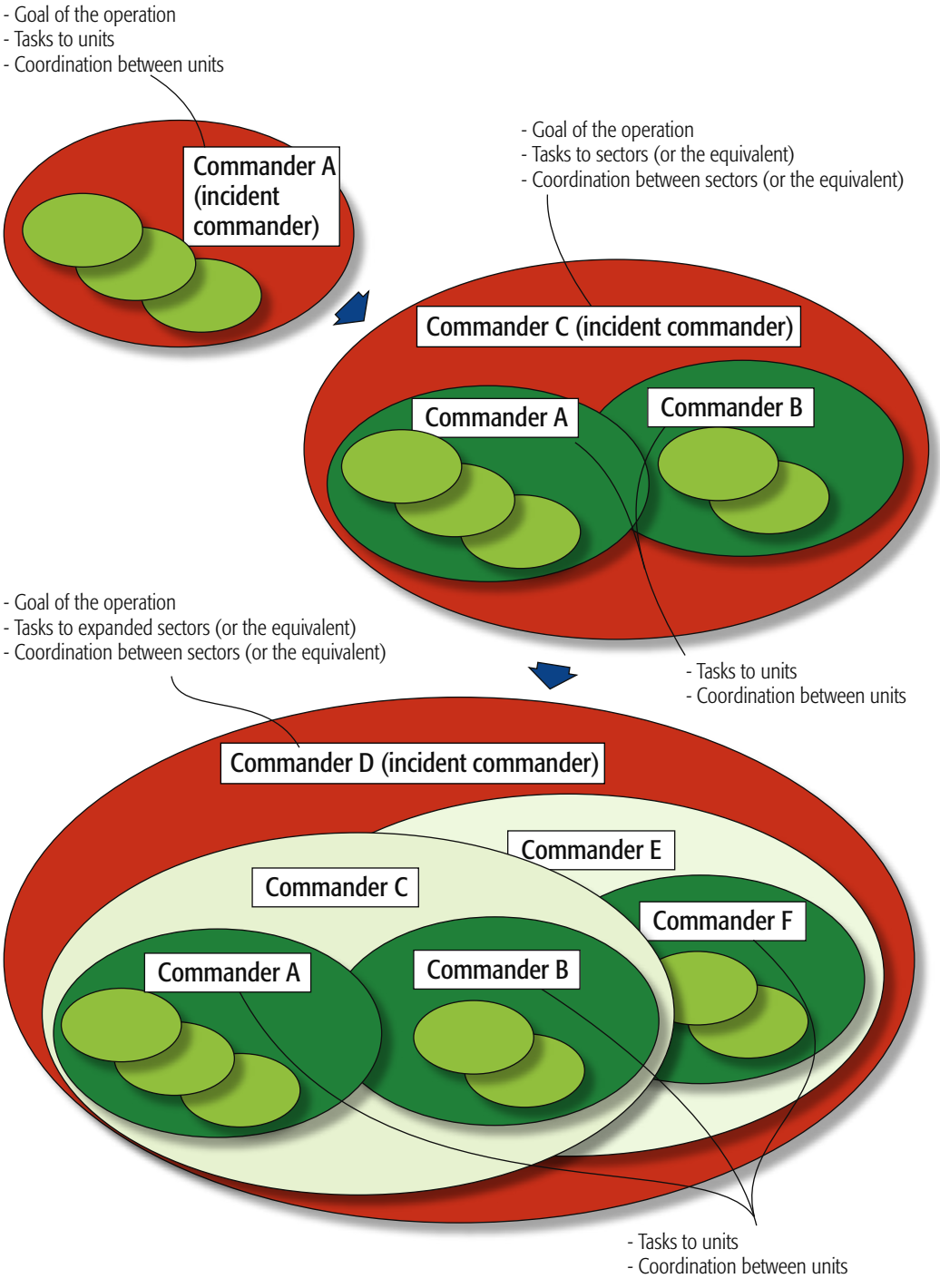
the role content within the configuration of the organisation. The work of the Incident Site Officer can include one or more of the points below:

- Decide upon the task content for the sectors or equivalent, for the execution of the task
- Decide upon the resources allocated to each task
- Coordinate sectors (adjustment of execution time, geography, resource disposition and method)

Sometimes a single Incident Site Officer has only the third point to consider, sometimes the second and third and sometimes all three. These points can be broken down still further and parts of them included. The important thing is that no tasks are missed. It should also be noted that the situation can easily arise where an individual forms a bottleneck in the system, especially if all the information flow is being channelled via him or her. Consequently it is no goal in itself to have a, or several, Incident Site Officers or the equivalent.

It should only be implemented if further command capacity is required, and it is important to take into account both span-of-control and role logic.

In the event of very large incidents, within the framework of one and the same response operation, there may be several affected areas each with one or more incident sites. When an emergency response operation is expanded, i.e. when the organisation handling the situation grows, the authority allocated to manage goal of the operation moves up in the organisation. A future, superior, commander may therefore within his or her decision domain to handle goal of the operation. In principle the remaining authorisation for the decision domains task command remains as described above as role logic. If additional units are required, more task command decision domains are created, on the basis of, among other things, span of control and role logic. Neither operational command nor system command is divided up further. Goal of the operation thus always belongs to the decision domain operational command and aim of the operation to the decision domain system command. If additional command capacity is needed for these decision domains, staff is increased. Note, however, that system command and operational command should not have the same staff.



Emergency response operations are expanded, goal of the operation is moved up and several decision domains task command are created. Role logic and span-of-control must also be taken into account.

Example 33

It has been a rainy summer and there has been extensive flooding in Allmänsta municipality. Because of the need to maintain a degree of emergency preparedness, meet the need for assistance generally and execute emergency response operations, the system command has decided to prioritise the upkeep of basic societal functions and the rescue of victims.

At present several units are engaged pumping water from private property (housing). A traffic accident between two cars occurs and the decision is quickly made to stop the pumping operations and address the needs of the accident – rescue of people is prioritised and the pumping out of private housing is not considered a basic societal function. It is also important to uphold a degree of emergency preparedness for potential incidents.

At the same time the municipal structure for providing rescue services receives indications that a central tele-station is under the threat of flooding. This is a basic societal function that should be prioritised. A response operation is also implemented to address this need. Note that the goal of the respective operations will be different. Among other aspects, the time scale of the traffic accident operation will be shorter than that of the tele-station.

When the organisation grows and the response operation is escalated, individuals remain in the same organisation and retain the same position in it, due to, among other things, role logic. On the other hand aspects such as the authority to handle goal of the operation or other elements in the scope of the decision domains are transferred in the organisation as it grows.

In this way and with the help of the model that is explained above, the organisation can be expanded on the basis of the need posed by the individual situations, and the system becomes flexible in its handling of response operations, assistance needs, risk situations and emergency preparedness production.

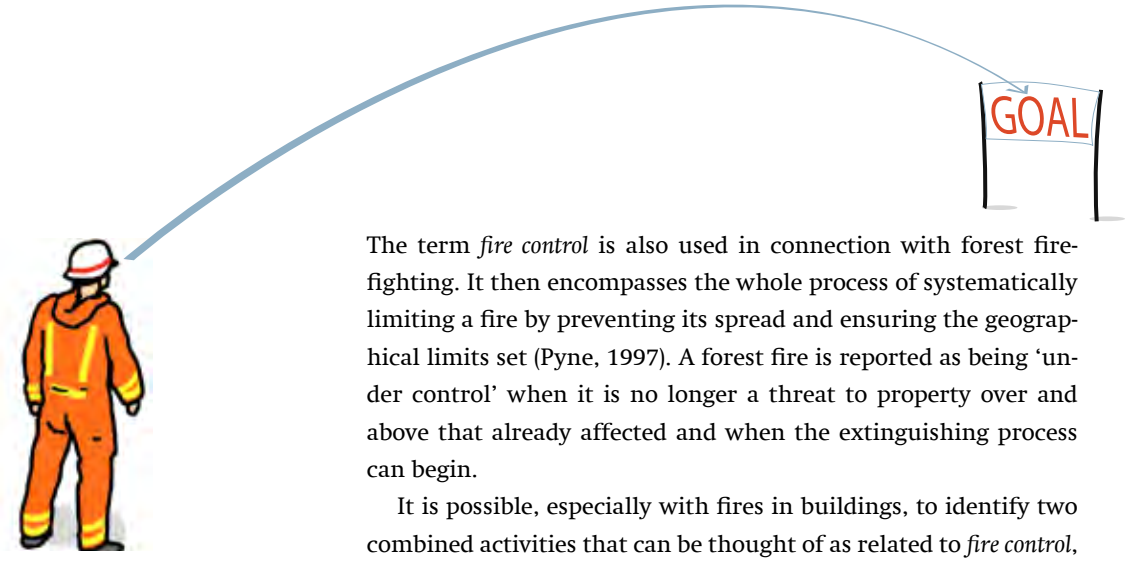
10. Gaining and maintaining control

The purpose of an emergency response operation is to restore order to a chaotic and disorderly situation. The intention should be to affect the whole course of events on the basis of the goals and intent of the emergency response organisation, where these goals and intentions must, naturally, be based on both the assistance need for the individual situation and the assistance need as a whole. This is to say that the course of events at an incident site must be steered in some way. If, for example, there is a fire and a number of injuries at an incident site, the intention can be to care for the injured and extinguish the fire. It is necessary to try to envisage some kind of course – in thought and action – that results in the injured being cared for, the situation generally being tackled and the course of events at the incident site following the envisaged course.

One should reason in this way irrespective of the decision domain one belongs to. Weighing up and balancing must go on continually so that the course of events is steered and takes the desired direction. For system command this can mean, for example, that a balance has to be found between response operations, emergency preparedness production, assistance need and risk situation within the municipality, and a method found to, by applying resources, effectively handle the situations that may arise due to the risk situation. Emergency preparedness production involves, for example, the transfer of resources or the increase or reduction of a resource at a particular location.

Control

To clarify and describe the perceived development of the course of events, we can use the term *control*. American literature uses the term *fire control* to, among other things, describe a coordinated operation consisting of the efforts made to protect people, property and the environment from fire (Routley, 1991).



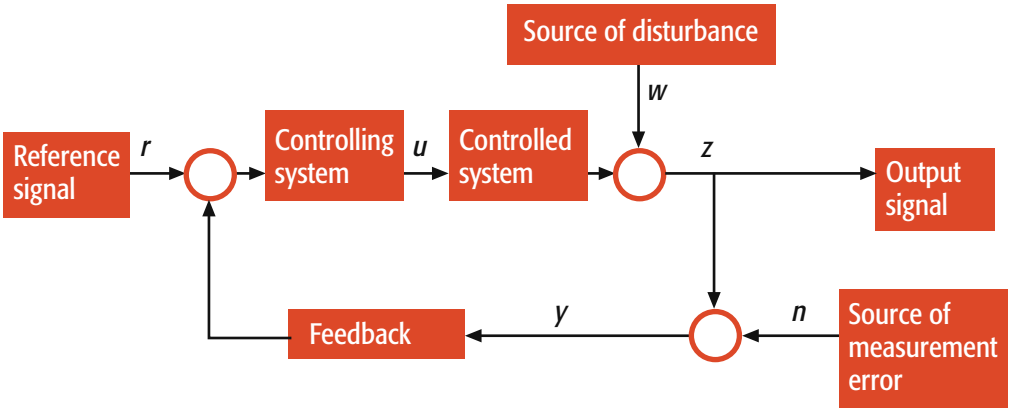
The incident commander is responsible for setting the goal of the operation and ensuring that the response operation stays oriented towards achieving it.

The term *fire control* is also used in connection with forest fire-fighting. It then encompasses the whole process of systematically limiting a fire by preventing its spread and ensuring the geographical limits set (Pyne, 1997). A forest fire is reported as being 'under control' when it is no longer a threat to property over and above that already affected and when the extinguishing process can begin.

It is possible, especially with fires in buildings, to identify two combined activities that can be thought of as related to *fire control*, confinement and extinguishing. When a fire is reported as under control, this usually indicates that it is no longer spreading and that the remaining fire can be fully extinguished using the resources at the incident site. That a fire is under control does not mean, then, that it has been totally extinguished, but that the risks and the problems involved have been overcome (Brunacini, 1985 and 2002). This places certain demands on the commander to judge correctly when the situation is 'under control'. The commander's understanding of the situation can be crucial to this judgement. One can also reason in a corresponding way when it comes to other types of incidents. That an incident or accident is under control means that its further spread has been stopped and that the major risks and problems have been overcome, or that there is good reason to assume that this will be the case within a reasonable period (Payne et al. 1996 and Heikkilä et al. 1993).

In every day language, control is considered as the ability to get something to perform as it is expected to, as well as to unerstand how it is done. Control has a physical component – to influence the actual course of events – and a psychological component which concerns understanding – how the decision maker/commander forms mental images or simulates various courses of events menally so as to be able to understand different situations, results etc.

To control something dangerous normally means preventing it from becoming more dangerous or escalating. The term control can in some contexts take on a negative connotation in that it indicates manipulation. In our context it means to, in various ways, handle a certain type of situation. This is naturally to good



The general control problem states that: In a given system (S), with available measurement signals (y), the input signal (u) determines so that the output signal (z) follows the reference signal ®, under the influence of disturbance signal (w), measurement error (n) and system variation (i S), and that the input signal is held within reasonable limits.

purpose and the aim is to offer assistance to people in dangerous situations.

Within control theory, from which the term control is taken, the general control problem is described as to determine input, based on output, such that the tracking of the reference signal is maintained. Control theory is most commonly applied to process control and automation, but it can also be used as a metaphor, i.e. as a figurative expression, which is the case here. In the above figure, for example, the goal of the operation can be the reference signal (r), that which is to be achieved. The output signal (z) is the ongoing result at the incident site, i.e. the actual course of events at the incident site. The input signal (y) is the information that contiually comes from the incident site, for example, in the form of situation reports or visual impressions. The input signal is affected by a number of disturbing elements, disturbance signals (w) and measurement errors (n) such as poor situation reports, inadequate grounds for evaluation or poor light conditions. In addition the system that shall be affected (the incident, s) will have inherent variation that can be difficult to identify and directly influence, such as technical shortcomings in the construction or other inbuilt faults.

In principle, control theory concerns how one gets a process to handle another process so that the controlled process proceeds in the desired manner. Consequently control involves a degree of information exchange. An emergency response operation is a process aimed at controlling another process (Brehmer, 2000). By using equipment such as pumps, hoses and nozzles to shoot water into a fire, the fire is extinguished and the surroundings cooled down. The complete chain with the pump,

hose and nozzle as well as the water supply is considered as a process with the purpose of transferring water from one place to another. And through applying this process another totally separate process is affected, a fire, which is principally a chemical process in which energy is transformed from one state to another. Control theory can then be used to analyse and develop the functionality of response operations. It has also been used in connection with military operations, by Worm 1998, among others. The overall purpose of executing municipal emergency response operations is to gain and maintain control (Svensson, 1999).

Conditions for control

Control is based on fulfilment of four general conditions (Brehmer, 2000):

1. Goal condition - there must be a goal.
2. Observation condition - it must be possible to determine the status of the system.
3. Change condition - it must be possible to change the status in this system.
4. Model condition - there must be a model of the system.

Note that the criteria for gaining and maintaining control do not necessarily require that the incident is resolved. It is sufficient that there is a strong possibility of this, that it is clear why and how it should be resolved, that there are adequate resources available and that the result of applying the resources is understood etc. Conscious or calculated risks are included in gaining control. There is perhaps, for example, the risk of a fire spreading in a building, but even if this should happen, it is still possible to have control as this could be a calculated risk. The reasoning is based, though, on the assumption that the assistance need is met.

Goal condition

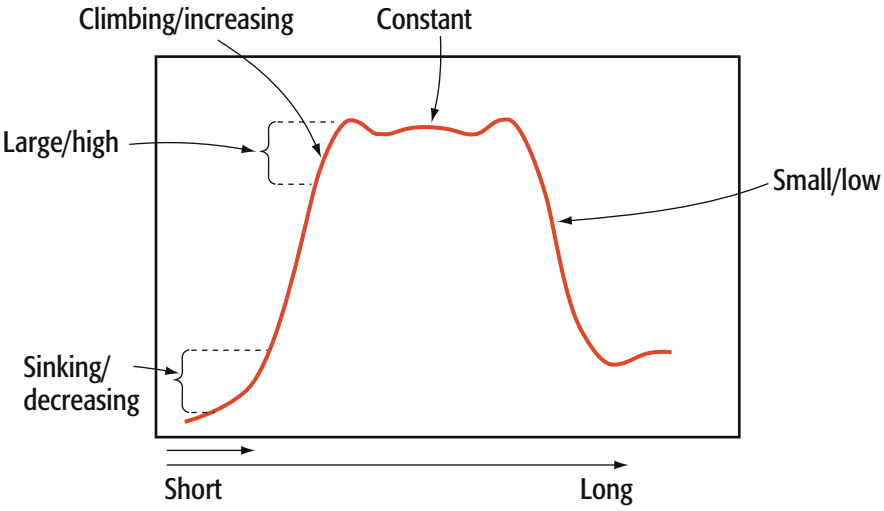
The goal condition includes an overall (concrete) goal as well as part goals and broken down goals for separate measures and combinations of measures. The formulation of such goals depends on, among other things, the decision domain considering the problem. An overall goal related to the system domain system command may be to handle certain types of incidents while

others are more or less ignored, depending on, for example, the risk situation in the municipality at the time. A goal for decision domain operational command may be to limit a fire to part of a building. An overall goal for the decision domain task command could be to raise a ladder and rescue a person at a window within a certain time, naturally before it is too late since the problem is viewed with regard to the assistance need in the situation. When it comes to operational command, the goal condition can normally be equated to goal of the operation. For system command the goal condition can normally be equated to aim of the operation. The goal of the operation is then a part of the aim of the operation.

The goal must be realistic, both in relation to the resources available and the development of a separate incident or the risk situation in the municipality. It is easy for goals to become unrealistic because it is easy to over estimate the capacity of resources or because an unclear picture of, for example, the time constants for various measures, i.e. how long it takes to execute a particular measure and how long it takes for it to take effect. In a corresponding way it can be easy to over estimate the capacity of the whole system, perhaps because such basic needs as rest and refreshment during a long term operation have been forgotten.

Observation condition

The observation condition entails the capacity to determine the status or condition of the system, such as the capacity of a certain piece of equipment at or for a certain time, or how an incident is developing along with the parameters that are steering it. How this status is seen or described is naturally dependent on the decision domain from which the problem is being considered. It is often beneficial, however, to be able to quantify the condition, for example by setting an absolute value for temperature, flow or resource capacity generally, even if it may be sufficient to know if the particular status is high or low, large or small, increasing or decreasing. Observations with regard to, for example, availability of extinguishing water, or whether a fire is spreading or is limited to a specific cell can be required in order to determine the status of the system. But an observation could also be an awareness of the events planned by the municipality that could affect the risk situation. It maybe so that extensive contact with other organisations is called for to incorporate information they have that could possibly affect the municipal risk situation, also from a rescue service perspective.



Example of how the conditions of a system can be described and related to one another.

Physical obstacles, geographic conditions or the fact that an individual can only observe and process so much information can limit the possibility of meeting the observation condition. But in contrast to military operations, in which the course of events depends on human activity, the course of events at an incident site can be predicted by applying the laws of physics that are applicable to it. In other words it is often possible through logical reasoning and with basic knowledge or experience of how different types of incidents develop and the effects different measures have, to make reasonable predictions for likely developments at incident sites and with regard to risk situations. It should be possible to make equivalent predictions from the standpoint of any of the system levels. In the case of higher, overall decision domains, it may be necessary to let other organisations carry out such evaluations and predictions. An example of this can be weather observations and metrological forecasts, including assessments of the risk of flooding, fires etc.

The observation condition also includes access to information on the system, which can appear different depending on the system level it is seen from. While at the incident site and while travelling to the incident the commander is bombarded with information. His or her cognitive capacity then works to transform this information, a process usually referred to as 'decision-making'.

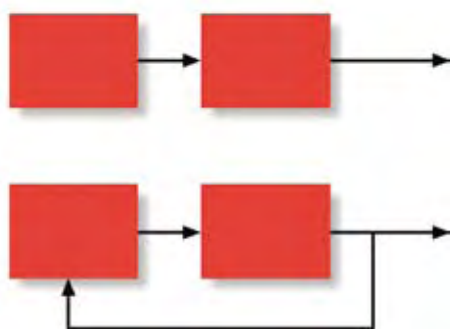
Information, experience, knowledge and cognition are fundamental components in this process.

We talk of cognitive systems that constitute both people and machines. Cognitive systems work by using knowledge of the system itself and its working environment in the planning and modification of the activities that are carried out (Hollnagel et al. 1983). This cognitive system is also an adaptive system, i.e. a system that adapts itself, to an extent automatically, to its surroundings.

Change condition

It must also be possible to influence the status or condition of the system; there must be a change condition. The use of resources, measures or combinations of measures is fundamental to this condition in all the decision domains. Consequently knowledge of the capacity of resources and the effects of different measures and tactical patterns is important with regard to the influence condition. The inbuilt dynamics of the system can cause changes to occur quickly or slowly, either as a result of applied measures, tactical patterns or of their own accord. Emergency preparedness production is here a way to actively and at an early stage influence the status of the system. Maintaining a certain level of preparedness makes it possible to meet the risk situation, and emergency preparedness production includes a plan for meeting the risks. When an incident occurs and an assistance need arises that leads to an emergency response operation, the plan is put into action. From being a plan, then, with – control through feedforward – the system becomes a system with control through feedback (Brehmer, 2000). This happens when the flow of information increases and several (relevant) signals are received from the system, i.e. when the observation condition, to a greater or lesser degree, begins to be met.

In some cases the information from the system is insignificant or even non-existent. Control must then be applied through feedforward. In order to influence the response operation at as early a stage as possible it is necessary in some instances



Control via feedforward; to act as planned or via feedback; to act on the basis of the situation, free from Brehmer (2000).

Example 34

The municipal structure for providing rescue services receives an alarm concerning a fire in a flat. There is a general lack of information and initially there is no choice but to prepare in accordance with a set plan, feedforward. So while underway to the incident a basic plan is prepared, by, for example, initiating certain standard operating procedures that are general for flat fires.

On arrival it can be seen that the fire is in a terraced house flat and that there is a threat of the fire spreading to other flats via the common attic space. More information has become available, through feedback, and the original plan for the operation must be revised.

to work from indications since the status of the situation is as yet unknown. The situation is then handled on the basis of experience, and if this is insufficient, problems can arise, since the lack of experience makes it difficult to ascertain the effect of the measures that are being applied.

Model condition

In order to gain and maintain control the model condition must also be met. This can be a mental model of the system with different grades of abstraction for describing the relationship between different parts of the system. Or it can be a more physical model that describes the actual (physical) conditions, such as how much foam is required to extinguish a particular area of fire. The model condition, then, also calls for extensive knowledge of resource capacity and the effect of various measures or combinations of measures. The models vary, naturally, depending on, among other things, the decision domain describing them. In the case of system command, it is necessary, among other things, to create a model of how the ongoing response operation and risk situation are developing as well as how this affects emergency preparedness production. This can lay the ground for being able to influence response operations at an early stage by managing the collective resources so as to create as good a preparedness cover as possible and provide the ongoing operation with the resources required for control. The control aspect is significant, then, at both the individual response operation level and the more overall level. At the task command level the model is, as one would expect, a more concrete description or picture of the course of events, which includes resources, damage and object.

Degree of control

Control can also be described as how actions are decided upon and executed, where the degree of detail and function modality, i.e. degree of possibility to influence the system through a particular function and at various system levels, plays an important role. On the basis of this four characteristic degrees of control or modes of the function in the system can be identified (Hollnagel, 1993):

1. Scrambled control. At this level the incident horizon is limited to the present, meaning that past activity and future possible outcome are not taken into account. The choice of a subsequent action appears to be random and only one goal at a time is considered.

2. Opportunistic control. The incident horizon contains one measure/activity that is chosen to match the present situation and with only minimal consideration for long term effects. Previous activities are taken into account to some extent in that the next one is chosen to match the previous one, but feedback is not always put to good use.

3. Tactical control. Here the effects of a measure are taken into account in the light of what has previously been executed. The next activity/measure is chosen (to a degree) with care, based on plans and with consideration for its potential effect. More than one goal is considered.

4. Strategic control. At this level the decision maker/commander is fully aware of the course of events and makes careful plans for handling the situation, which requires the initiation, coordination and execution of special activities/measures. The incident horizon encompasses both the previous activities and future developments, even if the number of stages that can be planned for may be limited, even for experts.

Scrambled and strategic control represent two extremes, while opportunistic and tactical control modes are the most commonly applied degress of control. The purpose of using these control levels is mainly to be able to describe how the execution of different activities changes between them, depending on both the outcome of activities and measures, and the time available.

Other parameters that can influence the control level are the number of simultaneous goals that are set, available plans, understanding of the incident horizon and the condition at execution level (depending on the decision domain). Note that these control modes are theoretical constructions. In reality the degree of control varies continually, but, nevertheless, each can apply in each of the decision domains. Control modes are, then, not tied to a particular decision domain, and consequently within the framework of a single domain, one can work on the basis of scrambled control just as well as strategic control. Note also that the degree of control is then tied to a time scale and that the longest scale for a particular decision domain cannot be longer than the longest time scale in the overall decision domain. Variations in degree of control occur therefore within one and the same decision domain.

Transitions between different control modes can depend on, among other things, the quantity of information available or that can be processed. Both the stress the decision maker is subjected to and span-of-control will influence the way in which information is processed. Through increasing command capacity, one can both avoid undesirable transitions between control levels and guide decision domains into a certain control level my improving the processing of information.

The aspects of feedback and feedforward can also be of significance in the interaction between competence and control. Opportunistic control is normally compelled by feedback. This makes the indication of feedback crucial, i.e. that correct signals and relevant information are received from the system. In an equivalent way strategic control is compelled to a large extent (but not only) by feedforward, on the basis of shortcomings in information about the system. Generally speaking, the greater the degree of competence, the greater the likelihood of control being maintained in the system in both the short and long term, irrespective of the decision domain. There is also, naturally, a connection between control and available time and through this also space.

New technology has enabled flexibility through providing decision makers as individuals at the measures level with a large number of functions and alternatives for executing tasks under different conditions (Sarter et al. 1995). This means that more knowledge is required than previously of, among other things, how the system functions in different conditions and at different

control levels/function areas as well as how to handle new alternative means in different types of situations. The emphasis lies therefore, as before, on knowledge and an understanding of the effects of different types of measures.

Control and decisions

Control is also tied to decision making through the cognitive processing of information. According to Klein (1998) expertise and competence are extremely important for decision making in naturalistic environments. Important aspects of decision making in such environments are an understanding of the dynamics and characteristics of the situation (Orasanu et al. 1992a). Tengblad (2000) writes that decision making at a higher system level exercises control through influence and that this is related to an ability to reach consensus on a particular plan. At lower system levels control is often based on a more direct form of influence over the system to be controlled.

Here we can relate to what is known as cognitive control, which is a type of intellectual control, and how control is maintained through creating mental images of a situation and how to deal with it. As discussed above emergency response tactics are patterns of thought and action. Cognitive control is then part of the thought process.

Cognitive control can, irrespective of the system level from which the control problem is considered, be seen as having three levels: experience based, regulation based and knowledge based control (Rasmussen, 1983 and 1992). Experience based control is characterized by the ability to act unconsciously under familiar circumstances through an inner dynamic model of the outside world. This is typical for an expert, who has the capacity to draw conclusions and act on the basis of his or her experience. This experience does not necessarily need to be based on similar situations. Regulation based control entails a conscious use of regulations in familiar situations. These can be empirical, based on previous, similar situations. But they can also be formal, taken from or based on the culture that applies within the system at a certain level (known as company culture). This type of activity can be taken as a form of feedforward control. Knowledge based control entails the transformation or conversion of knowledge, in this case of the effects of various measures, especially in relation to the course of events at an incident site. Here a practical plan is developed based on the explicit goal which is in turn based on an analysis of the current situation.

This type of control can be taken as a form of feedback control.

When a plan is implemented, the type of control is changed, from control through feedforward to control through feedback (Brehmer, 2000). And when this happens, the initiation of different measures must be matched to the effect on the course of events. It is here that the use of resources and the initiation, coordination and execution of measures becomes dynamic, which is very apparent during the execution of emergency response operations.

The bottom line is that only through initiation, coordination and execution of measures at an incident site can the course of events be affected, and it is during the execution of response operations that control problems become most evident.

Control and decision domains

In order to effectively decide on measures and the use of resources, and for the system as a whole to work towards gaining and maintaining control, the complete command system must be characterised by a tactical approach. The basis for this is that the purpose of a command system is to allocate and control the use of resources in relation to the assistance need. In the case of incidents and accidents this concerns, among other things, resources being allocated in such a way that control of a destructive sequence as a physical phenomenon is achieved as quickly as possible. All decision makers in the command system must in different ways act and work towards the optimal use of resources. Here this concerns allocating resources in time and space on the basis of their capacity in relation to the destructive sequence over a period, and that then becomes a question of degree of resolution of resources, depending on the decision domain. Different decision domains, then, handle resources in different ways – system command in a more overall way and task command in more detail.

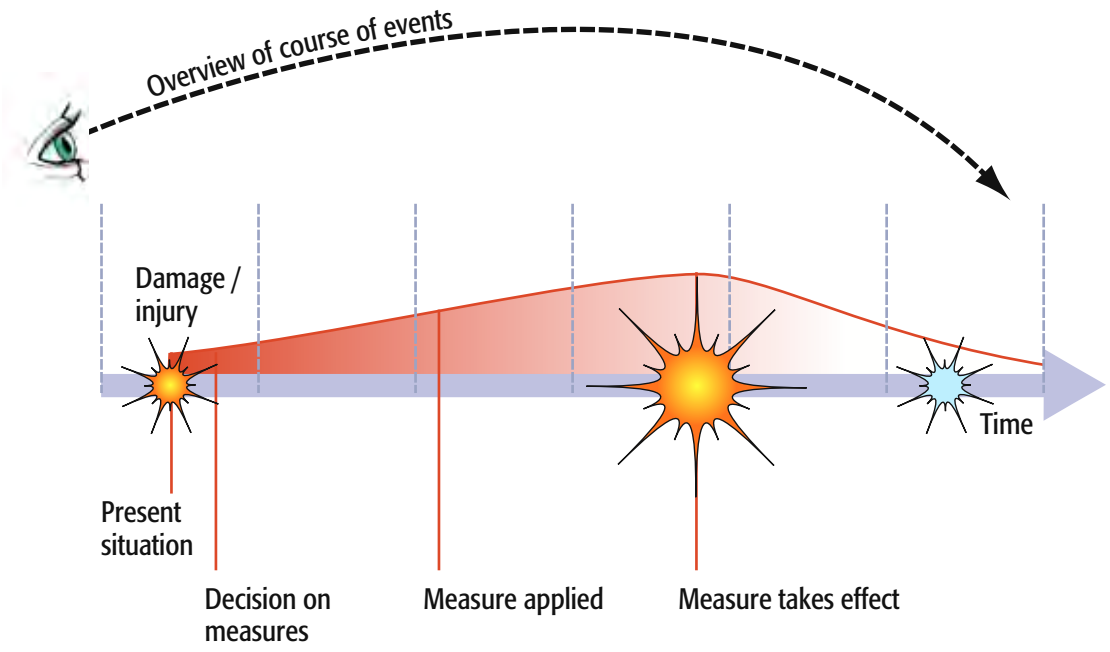
For example, a tactical approach within task command can mean that a BA officer is tactical in his or her choice of method for tackling the situation. The standard operating procedure perhaps says that the BA firefighter should search through a flat in an anticlockwise direction. However, in this situation it is thought that there might be a person in a bedroom to the left of the entry door, and a firefighter is therefore instructed to search in a clockwise direction. Such tactical decisions must be taken for each situation – there is no solution that can generally be considered as 'best'.

In a corresponding way, for example, a commander in system command works with emergency preparedness in the municipality to maintain it at a certain level, even when several response operations are being executed simultaneously. This may, for example, entail transferring resources in order to meet a possible need for additional resources at one or more ongoing operations, or ensuring that the conditions are met for a response operation to maintain control for a certain period. Through such concentrated efforts emergency preparedness can be set at a higher level in order to meet a known threat situation on a later occasion. This is also a tactical approach; resources are allocated with respect to time and space, on the basis of capacity and in regard to both the destructive sequence and the total assistance need within the municipality or the equivalent. But this differs from the BA firefighter example above, in that it occurs on the basis of a different degree of resolution in how resources are handled, and the degree of detail and information flow. It concerns, then, irrespective of the decision domain, the allocation, in time and space, of resources on the basis of capacity, the destructive sequence and the assistance need. Control must be gained and maintained, as much in the event of a routine call-out as a major disaster, for the system as a whole and for every individual emergency response operation.

Tactics can be described as a form of design, as knowledge intensive work that creates symbols, a way of thinking. The creation of an organisation can be said to be the link between the tactics (the way of thinking) and the actual use of resources. A plan or idea is realized, put into action. An organisation must be established on the basis of the resources, including human resources in a certain social context, which are applied to meet an assistance need. In other words the command system must match the assistance need that is the result of the incident or accident or the current risk situation.

Control, anticipation and concluding

In connection with the type of dynamic event that an emergency response operation often is, it can be difficult to ascertain the need for different measures in good time. There is a considerable risk of measures being initiated too late in relation to the course of events. Command work can be incident steered, meaning that the work is oriented towards tackling clear, obvious problems in the short term. Configuration of the command organisation and



Control entails creating models, being able to visualise the whole course of events and then applying the right measure at the right time in order to achieve the goal. The overall purpose of executing emergency response operations is to gain and maintain control.

orientation of both the individual response operation and the system at large are not sufficiently fast or effective.

It is necessary in dynamic situations, and sometimes only on the basis of unclear indications or indistinct signals, to take, or at least initiate, measures before the problem arises. In addition, ability is required to reflect over the more transparent patterns in the course of events, as well as those that are difficult to gain an overall view of. Even signals indicating possible developments in the situation need to be evaluated. Depending on the context, different terms are used to express an ability to take measures before the problem arises. 'Proactivity' and 'to act instead of parry' are examples of these. This is also what control through feedforward concerns – to act on the basis of a plan without having received any concrete signals on the actual course of events. When it comes to finalising a response operation, this must be based on solid grounds. To act only on the basis of indications in this situation can result in resources being withdrawn too soon.

The capacity to read a course of events needs to permeate the culture of the organisation. This is a part of tactical approach - to in an anticipative manner handle variations in the risk situation

before a concrete assistance need arises. This also means that the various phases within the perspective of the Civil Protection Act – before, during, after – become all the more interwoven.

Unforeseeable events occur sometimes and for various reasons in connection with emergency response operations. These come as somewhat of an operative surprise. No matter how well prepared one is, one should always be aware that something totally unexpected can happen. In such situations it is easy to adopt expressions such as 'a very special situation', 'unbelievable' or 'we were not equipped to cope with a situation like this'. Nevertheless, incidents that are unbelievable or at least could not be anticipated occur. Even if an organisation in itself is not in terms of resources dimensioned for a particular type of incident, it can be beneficial to occasionally mentally prepare oneself for such surprises. It could be good to go over ways of approaching and dealing with an unusual situation irrespective of its character. Human beings are equipped with a defence mechanism to help us cope with apparently unreasonable external stimuli. It can be necessary to compensate for these natural patterns by forming different procedures in an organisation. It could be advantageous, for example, in some cases to set someone the task of broadening their horizons and thinking in different terms – a form of constructive test. A staff member could, for example, be set such a task. A higher command level always has the responsibility of testing the system.

A commander needs to be anticipative and able to deal with alternative courses of events. This involves, among other things, being able to lengthen the time horizon of command work. In addition it is necessary to be able to reflect over alternative methods at the same time as activities are following a particular course. And these alternative methods for forwarding the operation must be considered while managing the current course of events. A form of action preparedness may also be required to redirect an operation or apply an alternative method of tackling the situation.

In this context we can talk of conclusive action. The term conclusive implies the fulfilment of the assistance need in a specific situation – to bring it to a conclusion. For example, to gain and maintain control are elements of a conclusion. From the perspective of system command, conclusion concerns gaining and maintaining control of the destructive sequence and forming well balanced and phased emergency preparedness management for the current risk situation and the significance of that which is under threat.

Example 35

During a response operation for a fire in a department store in Allmänsta, work has been continuing for some time. Control has not yet been gained, partially due to the complexity of the building. Firefighters have reported that the fire has spread up through the building and that it is difficult to get within range of it. In addition a visit by the fire chief has resulted in an enquiry as to whether the goal of the operation is achievable. Several neighbouring properties are threatened and a contingency plan is now being contemplated. On the basis of what is known about the building, plans are now being made for, among other things, new limitation lines and firefighting methods, as well as a redistribution of resources. The decision domain operational command reaches an agreement on this with system command, which is already planning the acquisition of additional resources from a neighbouring municipality.

When the revised plan is to be implemented, the incident commander gathers the sector commanders together to inform them of the new arrangement. They also discuss how personnel will receive the news.

The revised plan is being initiated because it is felt that the present goal of the operation will perhaps not be achieved.

It soon become apparent that, thanks to the revised plan, much of the building could now be saved.

Conclusive action in connection to a specific response operation concerns forming concrete goals for meeting the assistance need, for example through gaining and maintaining control of a chemical discharge. Planning for conclusive action by, for example, staff entails compiling suggestions as a basis for a decision on how to conclude the operation, which is a form of overall assessment. This planning is also aimed at lengthening the decision maker's time scale, i.e. to gain time, and includes the identification and assessment of possible courses of events, and the planning and conclusion of one or more of these.

Command work also includes the constructive testing and assessment of possible conclusive actions. This entails testing the capacity of the complete system: testing the capacity of the specific operation to conclude the situation, identifying threats and new possibilities, identifying alternative and, in some cases, highly unlikely but nevertheless possible developments, as well as assessing the validity and consequences of alternatives. The command work as such should also be examined. Does the command organisation and the work it does measure up to the problems that have to be solved and the assistance need that is to be met?

Sometimes the 'what if' scenario is applied. In some cases it will be necessary to execute alternative methods, not only plan for them. It should be pointed out that the constructive testing of a conclusive action should not be performed by the person who formed it, since it is unlikely that a person testing his or her own ideas will reject them. In a small organisation it can be difficult to have the necessary personnel resources for this, which then makes it important to have a critical approach to ones own operation and decision making.

In connection with conclusive action, especially when one for various reasons needs to execute alternative methods, it is important to reflect over how this affects both the execution of response operations and the command of municipal fire brigades at large. There are, for example, connections to the relationship between commanders and subordinates:

- What happens in the group when alternative solutions are implemented and in essence redirect the response operation?
- How does the organisation deal with the disappointment and lack of substantiation that can arise when the direction etc. is changed?

- How is the group/individual affected by not being permitted to carry out a previously allocated task?

Being anticipative and having a tactical approach are two important bases for, in a flexible, fast and effective manner, dealing with situations in which people are in need of assistance. But one should always bear in mind that the anticipative handling of different types of situations can have an effect that is not always easy to foresee. Time is often a crucial factor.

In conclusion ...

Emergency response operations are more complex than one would think on first impression. The work in connection with them must, primarily, be based on the assistance need. Then, on the basis of assistance need, various measures are applied to the purpose of providing assistance. There are resources available, and these have to be organised and managed purposefully, irrespective of whether a single or a combination of response operations is concerned. The various types of decisions that are taken, by various individuals, must be well-grounded and take into account resources, damage, object and assistance need generally.

A considerable amount of knowledge is required in order to manage this. This knowledge needs to cover such aspects as labour legislation, the affects of management on individuals and groups, how stress affects an individual's behaviour and decision making, as well as knowledge of courses of events in time and space. It is through knowledge that the conditions are created for gaining and maintaining control, and it is through a tactical approach that the situation is best managed, irrespective of the decision domain concerned.

A tactical approach is based on using resources as effectively as possible with consideration for the assistance need, the dynamics of the situation, time and space, and the requirements of the situation generally, to the purpose of gaining and maintaining control. In addition, the culture of the organisation and how, among other things, command is handled and exercised influence the means of meeting the assistance need. The question of gaining and maintaining control has to be dealt with by each decision domain in such a way that the situation is managed in an anticipative manner, so that the situation at hand can be concluded. The individuals involved in a response operation must have a tactical approach to achieving the goal, and the system must, to different degrees, be flexible and autonomous. A tactical approach lays the ground for action preparedness for alternative courses of events and the opportunity to, in addition to managing ongoing response operations, also cover the risk situation and emergency preparedness production.

The organisation must be able to adapt itself to different situations with different degrees of dynamism, as well as to the different phases of courses of events. It must also be manned in such a way that the expectations placed on the individual are reasonable and logical. The command system is the tool for providing purposeful and effective emergency response operations. Unexpected situations must also be dealt with, which is made possible by the fact that the system can also work anticipatively to different extents, depending on, among other things, the decision domain and the situation. With the help of aim of the operation the direction of operations can be steered, influenced and transformed. In a corresponding way the work at incident sites can be influenced by setting clear goals for operations. A single response operation as much as several simultaneous operations must aim to pull in the same direction. The direction is set from above, but the signals which determine this must be based on the assistance need. The aim is to provide those in need in an emergency with the best possible assistance.

When a command organisation is created leadership, style of leadership and group norms are fundamental and will affect the results of emergency response operations. Through the commander adopting a suitable leadership style – depending on, among other things, the situation – he or she can serve as an example, inspiring and motivating subordinates to do the right things. As necessary, commanders can also correct or guide ongoing operations or measures, by, for example, supporting or confronting their personnel. This is also connected to the form of control, where management by details is more closely tied to conventional management and leadership development is more closely tied to management by objectives.

The municipal structure for providing rescue services is made up of individuals with different demands, expectations and needs. The way in which they are grouped affects the conduct of these individuals in different ways, in different types of situations. Decision domains provide the individuals with the authority to handle certain problems or issues. These decision domains exist in a context together with other decision domains. Leadership entails being part of and managing a social context, which is prevalent also to emergency response operations.

The purpose is to meet the assistance need connected to an emergency or the impending danger of one.

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Emergency response operations are complex. The work in connection with emergency response operations must be based on the need for assistance. There are resources available which must be managed and applied expediently. Decisions must be based on solid evidence and take into account resources, damage, injury, the object and the assistance need in general. Making them demands knowledge and experience. The purpose is to meet the needs for assistance resulting from incidents or accidents, or the impending danger of such.

Tactics, command, leadership presents, discusses and exemplifies the experiences of municipal rescue services and the results of scientific research from many different perspectives. This book is principally aimed at management staff in municipal structures for providing rescue services. It is primarily oriented towards education activities within rescue service agencies but is also applicable to active rescue service personnel and other interested parties.

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