

Ett koncept för taktisk analys av räddningsinsatser

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Räddningsverket

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Detta föredrag lyfter fram och diskuterar ett koncept för taktisk analys av räddningsinsatser. Konceptet bygger på att det taktiska problemets fyra dimensioner; i) identifiera räddningsproblem, ii) utforma insatsmål, mål- och resurshierarkier samt samordna dessa, iii) förutse händelseutvecklingen, samt iv) hantera social interaktion och upplevelser; på vart och ett av de tre påverkande parametrarna; a) syftet med räddningstjänsten, b) skadans art, samt c) de samlade resurserna; för varje tidssteg under räddningsinsatsen. Konceptet ger därvid en metod för hur räddningsinsatser kan analyseras ur taktisk synvinkel. Metoden ställer upp ett antal frågor vilka sammantaget ger en bild av räddningsinsatsens taktiska utformning.

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A CONCEPT FOR TACTICAL ANALYSIS OF FIRE FIGHTING OPERATIONS

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Abstract

This paper discusses a concept for tactical analysis of fire fighting operations. The concept applies the four dimensions of the tactical problem; i) identification of the rescue problem, ii) formulate objectives, objective hierarchies, resource hierarchies and their coordination, iii) predict development, and iv) coordinate personnel and resources at the response; to each of the three parameters; a) the purpose of the rescue service, b) the nature of the accident, and c) the available resources; for every time-step during the operation. This concept of tactical analysis sets out a method to analyse operations from a tactical point of view. The method states a set of questions that defines the tactical lay-out of an operation.

Introduction

An accident that occurs, normally generate some kind of response from the society. In the case of a fire this response would normally be from a fire department. The out-come of this response is dependent on a variety of factors, of which the commanding process plays a fundamental role. Several descriptions, theories and models of the commanding process exists, having different approaches to this process. But still, some similarity can be identified in these descriptions, theories and models, similarities which shows that the commanding officer is the key to the outlining of the operation, and that he or she has specific areas and/or responsibilities to consider. When outlining an operation it is of outmost importance for the commanding officer to be aware of what affects the situation he or she is working in and his or her possibilities to control this situation. A way to improve the outlining of operations is to analyse accomplished operations in order to find parameters that are important to the outlining of operations. To make the result of such analyses compatible, it is necessary to have a method that is applicable to all fire fighting operations.

Background

Studies on the role of the fire ground commander, e g Brunacini, /2/, states that the fire ground commander is the individual with overall responsibilities at the site of the accident. With no, or multiple, command, operations will break down in seven predictable areas; action, command and control, coordination, planning, organization, communications and safety. Brunacini also identifies the following command functions of the fire ground command;

- assumption, confirmation and positioning of command,
- situation evaluation,
- initiation, maintenance and control of the communications process,
- identification of the overall strategy, development of an attack plan and assignement of units,
- development of an effective fire ground organization,
- reviewing, evaluation and revising the attack plan and

- providing continuing command, transferring command and terminating command.

Among the responsibilities of the fire ground commander the following can be distinguished

decision making,

command and control, and

review and evaluation.

A common used model to describe this (continuing) process is, /6/;

The commanding officer is the key to the outlining of the operation, including the tactical lay-out. The commanding officer has to coordinate the resources in accordance with the purpose of the operation and the nature of the accident. The tactics of the operation can in some sense be identified as the chosen course of action to structure an unstructured situation.

To make a comparison with the military, Clausewitz, /3/, stated that tactics is the theory on the use of the armed forces in combat. In our case with a fire, tactics would then be the theory on the use of the resources during a fire fighting operation.

Grimwood, /5/, defines tactics as "the art of manoeuvring forces in contact with the enemy (fire)" or "the employment of troops (firefighters) on the battlefield (fireground)"; "matters relating to lower levels of the corps (fire force) are tactical". The employment of companies, crews, teams, etc, on site, relates to tactics. They make up the battleplan (operation), which in turn must conform to strategic policy.

Fredholm made in 1990 a study on rescue tactics, /4/. The results of this study have since then been frequently used in Swedish training of higher ranking fire ground commanders. The study identifies four dimensions of the tactical problem:

Identification of the rescue problem;

Analyse and structure the situation you find yourself in. Define the need of technical measures (technical problems). Define the need of resources (resource problems). Define the need of execution (command, organisation and coordination problems). Follow up and analyse the changing situation.

Formulate objectives, objective hierarchies, resource hierarchies and their coordination;

Formulate concrete and realistic objectives in relation to developments and the resources (both those immediately available and those available in time).

Predict development;

Advance the development of the situation in space and time, as a basis for decision making. This includes both the event itself and the availability of resources.

Coordinate personnel and resources at the response;

Organise leadership, ie get a number of people to act collectively in accordance with an overall intention.

From this point of view, Fredholm states, "rescue tactics" is the comprehensive name given to the concrete form taken by work in the problem dimensions, above. Rescue tactics provides a model for thinking and acting to obtain the best possible results according to the over-riding intention to prevent and limit harm to people, property and the environment.

The Swedish Rescue Services Agency, /6/, stated the following definition of rescue tactics, on the basis of Fredholms works:

Rescue services tactics is how the operations on the site of the accident are outlined, in order to reach as good a result as possible. During the outlining, considerations should be taken to the purpose of the rescue service, the nature of the accident and the available resources.

By this definition of rescue tactics, there are mainly three parameters that affects rescue tactics, as follows;

- the purpose of the rescue service,

laws, rules, agreements, moralities, ethics etc,

- the nature of the accident,

the cause of the accident, its spread and development etc,

- the available resources,

how the rescue force is put together, the competence of the personnel, available technique, fire protection measures (for example structural or informative measures) etc.

The rescue tactics of the operation can be identified as the chosen course of action to structure an unstructured situation. An unstructured situation can also be described as a problem or a chain of problems that needs to be solved.

At a fire ground problems of different dignity or at different levels occurs or develops, before, at or after the arrival of fire fighting personnel. Some of the problems are identified, immediately or after a time-period, and some of them are never identified.

These problems, whether they are identified or not, are of different nature and can be said to be caused by aspects related to the purpose of the rescue service, the nature of the accident and the available resources. The problems that occur are usually solved immediately after (or short after) they have appeared, during a relatively short time-period, at the scene of the accident.

At the end of a fire and rescue operation, the out-come can be seen as the result of the operation, where the result, of course, also will be affected by the problems that occurred during the operation.

Different accidents, accidents or events may often seem similar to one another. But when considerations are taken to the purpose of the rescue service, the nature of the accident and the available resources, they may vary quiet significantly.

Stated here, fire and rescue operations very often are outlined according to practice or "tradition". This way of outlining of operations often seems to work very well. Still, it may lead to an outlining of an operation that;

- don't take full advantage of the available resources,
- is "illegal", if not all relevant regulations and restrictions are considered or
- don't reflect all possible changes in the situation, which might lead to dangerous situations if the accident develops in an unpredicted way.

To reflect the outlining of a fire fighting operation, including variations, critical events and problems that occurred during the operation it is necessary to break down the operation in some systematic way, in other words: to analyse the operation. An analysis is to understand a situation at a level where it is possible to break down the knowledge of this situation into its parts and from this find ways of thinking. Describing word for this may be separate, identify, classify, categorize, distinguish, acknowledge.

If such an analysis is not carried through, which usually not is the case, there are no possibilities to reflect the outlining of operations. Criticism to fire fighting operations will then be of a more shallow kind and will only result in comprehensive statements. This kind of "non-learning" gives a large possibility for problems that seems similar to occur during different fire fighting operations, and that training and education of personnel is based on "intuition" or on what is interesting at the moment, and not on what is necessary to train or learn or necessary to develop.

Problem

The problem can be extended from above, and should read as follows.

Analyse the operation from a tactical point of view, in order to find a systematic method that describe ways of thinking and behaving to obtain the best result at an incident according to the over-riding aim to save life and prevent or limit accident to property and the environment.

Discussion

During an operation, and especially during the outlining of an operation, the commanding officer have several aspects to consider such as laws, rules, agreements, moralities, ethics, the cause of the accident, its spread and development, how the rescue force is put together, the quality and the quantity of the personnel, available technique, fire protection measures etc. As stated by the Swedish Rescue Services Agency these aspects can be put in the comprehensive form; a) the purpose of the rescue service, b) the nature of the accident and c) the available resources. This gives a simple method to structure different concrete aspects of an operation, and still keep these different aspects recognizable. The three parameters are the comprehensive forms of what affects the choice of tactical lay-out of an operation.

During the tactical outlining of the operation the commanding officer needs to analyse, evaluate and structure the situation and to define the need of action. From these needs the commanding officer has to formulate concrete and realistic objectives. Finally he or she has to follow up and analyse the changing situation. This is a continuous process that the commanding officer usually not is aware of, but still it exists.

The four dimensions of the tactical problem; i) identification of the rescue problem, ii) formulate objectives, objective hierarchies, resource hierarchies and their coordination,

iii) predict development and iv) coordinate personnel and resources at the response; gives the framework of what the commanding officer has to consider and to work with.

During an operation significant time-steps (or periods in time) can be distinguished. Such significant time-steps can be identified by events, such as turn-out, arrival at the scene, a flashover or the end of the operation, that is something that changes some of or all of the conditions in the situation. This event will or should cause some kind of action or chain of actions during the operation, such as driving to the scene, initial fireattack or venting procedures.

$t=0 \ t_1 \ t_2 \ t_3 \ \dots \ t_n$

alarm event #1 event #2 event #3 event #n

action #1 action #2 action #3 action #n

time-step (#1) time-step (#2) time-step (#3) time-step (#n)

The time-axis above gives an overview of the idea of time-steps. An event on the axis is usually only one significant event, but an action on the axis below may also be a chain of actions. A time-step is identified by such an event followed by such an action (or chain of actions), as described.

On the basis above the following can be stated;

The concept of tactical analysis is to apply the four dimensions;

- **identification of the rescue problem,**
- **formulate objectives, objective hierarchies, resource hierarchies and their coordination,**
- **predict development,**
- **coordinate personnel and resources at the response,**

to each of the three parameters;

- **the purpose of the rescue service,**
- **the nature of the accident,**
- **the resources,**

for every time-step during the operation.

This concept describes a way of thinking when breaking down an operation at a tactical level, in order to find parameters that were important to the outlining of the operation.

A tactical analysis should then be to analyse a fire and rescue operation from a tactical point of view, in order to find a systematic method that describe ways of thinking and behaving to obtain the best result at an incident according to the over-riding aim to save life and prevent or limit accident to property and the environment.

The prime purposes of this tactical analyse should be to:

show improved results from fire and rescue operations by increased tactical awareness and increased tactical behaviour,

point out parameters that are essential to the out-come of the operation, and to

find general methods to outline fire and rescue operations.

As an example on an appropriate level of concern, the following questions can be set up for a fire fighting operation. Included are also some explanations and/or descriptions on each question. These questions can not exist as separate questions, but must be considered as parts of a greater whole. When analysing an operation the answers usually can not be found in a sequence. All possible options for each question should be taken into consideration, and not only those that were used during the operation.

On the purpose of the rescue service

What was the purpose of the operation?

The purpose of the operation is defined by laws, rules, agreements, moralities, ethics etc, applied to the actual situation. The purpose of the operation is the overall intention of the operation. It sets out the strategy (the strategic plan) during the operation.

- What needs did this purpose set out?

The purpose of the operation will in some cases set out some fundamental needs that have to be fulfilled, needs such as cooperation with other organisations.

- When(, where) and how were the purpose, and the needs set out by this purpose, achieved?

Irrespective of the purpose was achieved by one decisive event or by a decisive chain of events, this or these events should be described in order to identify what led to this event or chain of events.

What objectives did the purpose, and the needs set out by this purpose, generate?

On the basis of the purpose of the operation, one or several objectives normally needs to be set up. If no objectives exists, the operation most likely will develop on an ad hoc basis.

- What happened during achievement of the objectives?

When working at the scene to fulfill the objectives (taking actions), this may cause changes in the situation (events) that affects the lay-out of the operation.

- How was consideration taken to these predictions?

The objectives of the operation must reflect, at least some, possible changes in the situation. It is not desirable to have to change the objectives every time a change in the situation appears. It is therefore necessary to have some prediction of the development.

- How was the operation coordinated considering the purpose and the objectives of the operation?

To get a number of people to act collectively in accordance with an overall intention, it is essential to have a stated purpose of the operation and that objectives of different actions during the operation are known to all involved.

On the nature of the accident

- What was the accident (description, cause, spread, development)?

The commanding officer is working with control of the accident. Without defining the accident he or she doesn't know what he or she is about to control and work with.

- What needs did the accident set out?

The accidents needs to be controlled. This need sets out in what way to do it, by fire fighting or by some other method.

- How was the accident followed up?

During the operation follow up of the accident should be made to reflect any changes in the situation.

What objectives did the accident set out?

These objectives would normally be the main objectives of the operation. These objectives can be identified as the basic tactical aims, i) saving lives, ii) eliminating danger sources, iii) limiting damage, iv) delaying the spread of damage.

- How could the accident develop during achievement of these objectives?

An accident can be either static or dynamic. A dynamic accident changes in time and/or space and will get worse if no action is taken. A static accident do not change in time and/or space once the initial event has occurred.

- How was consideration taken to these predictions?

The objectives of the operation must reflect possible development of the accident, since it is not desirable to change the objectives every time a change in the situation, an event, appears. It is therefore necessary to have some prediction of the development of the accident.

- How was the operation coordinated considering the accident?

The overall intention of the operation must consider the nature of the accident to get everybody at the scene to act collectively towards that accident. The accident and the objectives it set up must be known to all involved.

On the resources

- What resources were available for the operation?

Available resources includes both those immediately available and those available in time. They also include organisational resources as well as technical resources.

- What were the needs of resources for the operation?

There may be needs for resources that are not available at the time. To improve tactical procedures it should be necessary to define such resources that are not available but needed.

- How were the resources followed up during the operation?

It is essential to have control of and coordinate the resources throughout the operation.

What objectives did these available and needed resources set up?

The objectives must consider all available resources. Those resources needed but not available, will restrict the objectives in some sense.

How could the available and needed resources develop during achievement of these objectives?

A change in the situation may create a change in the available or needed resources. Resources that are not available but needed may become available because of some change in the situation. A change in the situation may result in that resources that are available, immediately or in time, will become unavailable.

- How was consideration taken to these prediction?

It is hard to consider resources that are not available, but some considerations should at least be made to the possibility that available resources may become unavailable.

- How was the operation coordinated considering the resources?

During the operation it is the resources the commanding officer has to coordinate, in order to control the accident.

In some cases a breakdown or an alteration of the questions will be necessary, in order to describe the tactical lay-out of the operation. These questions can also be altered into topics which gives a model for the tactical lay-out during an operation.

The way of thinking the concept outlines should also in itself improve the tactical lay-out of operations.

Conclusion

The four dimensions of the tactical problem; i) identification of the rescue problem,

ii) formulate objectives, objective hierarchies, resource hierarchies and their coordination,

iii) predict development and iv) coordinate personnel and resources at the response, as stated by Fredholm, gives the framework of what the commanding officer has to consider and work with. Comprehensive forms of what affects the choice of tactical lay-out of an operation are the three parameters; a) the purpose of the rescue service, b) the nature of the accident and c) the resources.

By an analysis of an operation based on the four dimensions of the tactical problem, applied to the three parameters that affects the outlining, it should be possible to identify problems, possibilities and options that occurred during a fire fighting operation. The identification of such problems, possibilities and options, including variations and critical events, forms the basis for developing new or improved tactical procedures.

It should be possible to analyse any fire fighting operation by this method. The analysis should make it possible to get

knowledge of the significance of a tactical awareness,

knowledge of aspects that affects outlining of a fire fighting operation,

possibilities to improve results from fire fighting operations, and

optimization of resources (considering for example expected number and expected type of accidents).

From a tactical analysis it also should be possible to develop/improve equipment used during a fire fighting operation.

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