



RAPID UNIT FOR FAST ACCESS TO
A SCENE OF ACCIDENT

By Deborah Georgsson
Master Thesis from Lund Univeristy
Industrial Design / LTH
Department of Design Sciences
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In 2005 there were 18 500 accidents in the traffic in Sweden. 26 459 people got injured and 440 people died due to the traffic accidents.

When accidents in the traffic happens the one thing that makes the greatest difference in the outcome is the fast arrival of anyone from the Blue Light Organization (BLO) to the scene of accident (SoA). Minutes makes difference. Fire fighters, ambulance nurses and police are the three parts in the BLO. Today there is a need of a role that arrives first at SoA, provides the rest of the BLO with information in order for them to prepare and plan their actions on the SoA. Also this role need to start the rescue mission immediately in order to save lives. The role presented in this report to cover these needs is called Rapid Unit (RU), which consists of a experienced senior fire fighter with additional basic medical education and basic security guard education.

ABSTRACT

In order to arrive fast to the SoA the RU needs a flexible and fast vehicle, a motorcycle with special designed stowages where the equipment to the role will be stored.

The RU also needs to be able to send live streaming pictures from the SoA to professionals within the BLO in order to prepare them to the scene they will arrive to. Therefore a special camera is designed to meet the special requirements there is to the role of the RU.

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BACKGROUND

In this chapter the background for the project is introduced. An introduction to the Blue Light Organisation (BLO) and their structure will be presented here.

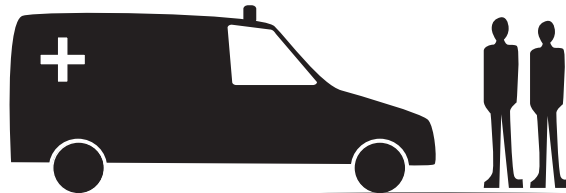
BACKGROUND

General

In Sweden the rescue service works in the same way which ever municipality you look into. Apart from the police that is governmental ruled, the fire department and the ambulance service is run by the municipality. How much money the fire department and ambulance service are budgeted each year is up to the city. The cost has to cover all the employees salary and purchase of new tools and vehicles. The only restrictions regarding what kind of tools each fire department and ambulance service are allowed to buy and use are that it has to fulfil the Swedish laws of protection. In some areas in Sweden the ambulance service is a private run service that the city council has out source.

Most of the time there is a good communication between end users of the tools and vehicles when new purchases are made. Based on reports and statistic regarding accidents and fires the person in charge of the budget and purchases decide what tools and vehicles are needed. The vehicles that are used in the ambulance fleet are exchanged every 3-5 years. The fire trucks has a longer life span.

Ambulance nurses



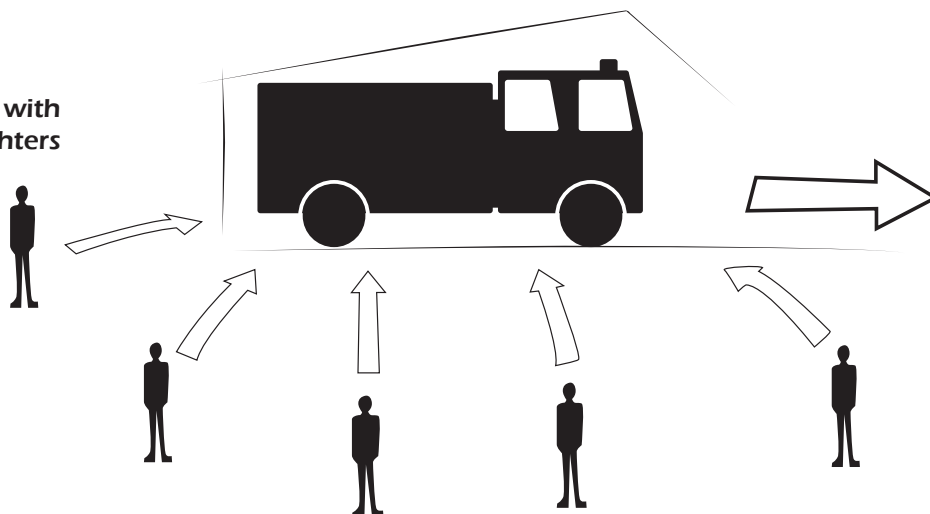
Ambulance nurses always travel two in each ambulance. In Helsingborg with 123 000 inhabitants there are three ambulances but during the weekdays there are two extra vehicles from the municipality neighbor Höganäs (23 000 inhabitants) helping out.

Main fire stations with full time firefighters



Full time firefighters. Five firefighters stationed at the fire station for the whole working hours ready to leave on a turnout. They are allowed to work out while they are on duty, still the demand is always that when an alarm sounds they have to be on the way within 90 seconds. The fire station is strategically placed so that the fire force can reach 90% of the community they are sat to cover within 10 minutes.

Small fire station with part time firefighters



Part time firefighters. This setup is the common structure at smaller villages where there is few turnouts. The staff unit does not have to consist of as many as five members and is on call 24 hours/day during their working time. Some part time firefighters are working at ordinary jobs and that is fine as long as they can be at the fire station within the required time on a turnout. When an alarm sounds, they have to leave everything they are doing and be at the local fire station within two minutes. When everyone is gathered they leave together from the fire station. The requested vehicles has to be out from the station and on it's way within five minutes.

Turnout procedure

When an emergency call is made to the Emergency Call Centre (ECC) the operator asks questions in order to find out the what kind of emergency it is and the magnitude. At the ECC the operator has a list of criteria at hand to determine what kind of unit they shall order and how many.

From the fire department the operator have four different standard units to choose from; Fire Unit, Rescue Unit, Altitude Unit and Chemical Unit. The Fire Unit has the task to put out fires. A Rescue Unit can be order both to a scene of fire when it is suspected that there are people trapped in the fire. So the first priority is to rescue the victims, when the scene has been cleared the Rescue Unit turns into a Fire Unit to put out the fire. The Rescue Unit can also be sent to a traffic accident scene in order to cut a victim loose from a car. A Rescue Unit is always ordered when people are involved and need to be rescued, hence the name. It is the same group of people that can take on the different tasks the emergency situation demands. This is possible since the tools that are needed for the two units are always fitted onto the fire truck.

When the Altitude Unit is ordered the firefighters has to bring the ladder vehicle from the fire station. A Chemical Unit needs more preparation since other uniforms with different protection features from the ordinary fire fighter uniform are used.

After the ECC has made a decision on what kind of unit to send out, an order is placed to the nearest fire department and ambulance station. The alarm sounds and the number of ordered units are on their way. During the transportation to the SoA the firefighters and ambulance nurses get more information regarding the accident, how many people that may be injured and other information that the operator at the ECC has gathered from the persons placing the emergency call. This information is information on third hand and there is a risk that important details are lost on the way.

CONCLUSION

Providing the right information from the SoA to the ECC are initially the most important task of it all in a rescue mission. What ever unit you analyze within BLO they are crucially depended on arriving to the SoA as fast as possible with the right equipment and the right knowledge for the specific situation as is on the SoA. To be at the SoA as early as possible to scan the area, provide the injured with life supportive help and be able to send information back to ECC and/or the arriving units within the BLO on the SoA are highly demanded within BLO.



BRIEF

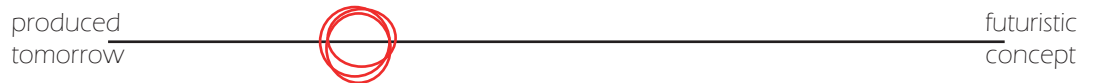
The brief for this project was not set at the start. As my knowledge and understanding about all the different parts of the area of interest grew, the brief became clear.

BRIEF

Design a system that provide fast access to the scene of accident (SoA), both physical and visual, in order to make the following rescue action more efficient and to enable a greater feeling of comfort and security for the victims.

GOAL

The goal for this project is that it should be able to be produced in the near future.



This product shall be able to be a reality within 3-5 years. Because of this the product can not be to conceptual, but instead rely on technology that exists today or that are in the final stage of development.

DELIMITATION

In this report I have chosen to focus on the rescue tasks regarding traffic accidents. To cover the whole working area of the firefighters would be a too great challenge. Still, the outcome of the project shall not be limited to only function in situations of traffic accidents.

TARGET GROUP

This project can be of value for the decision makers within the BLO. It can also be of interest for the end user, in this case firefighters and ambulance nurses.

GEOGRAPHICAL AREA

The background study for this project has taken place in the city of Helsingborg, Sweden.

Helsingborg is the 8th largest city in Sweden with 123 000 inhabitants. The city has three main fire stations, Berga Brandstation, Gåsebäck Brandstation and Bårslövs Brandstation. There are also three smaller part time stations in Allerum, Mörarp and Vallåkra. This makes Helsingborg a good example of a general BLO organisation in Sweden.

PROJECT SCHEDULE

To really understand the possibilities and restrains of the BLO a lot of time was disposed for the background research. In order to communicate the end result in a good and easy way the model making and illustrations were given time focus in the end of the project.

Appendix 1



**RESEARCH
& FIELD STUDY**

To be able to better understand the rescue units within BLO several field studies were performed. As the brief of the project became more clear a field study at a motorcycle fair also was conducted to get a better overview of what vehicles that could come in focus for the project.

EMPIRICAL & THEORETICAL STUDIES

The project started with a study and analyse of the context and everyday work of the firefighters. To be able to fully comprehend the field of rescue work the project from the beginning involved a lot of studies of empirical cases and surveys already made for the BLO organization and governmental institutions. This in order to understand the macro economical cost for accidents and to be able to know the skills a person within the BLO have after completed education to secure societies and the governments demand on the BLO employees. When analysing statistics over different situations of accidents the aim for this project was more clear, since traffic accidents involves material rescue actions but also the more human side to the scene where an interaction between the rescue forces are necessary.

Also field studies were conducted in order to gain a better understanding of the rescue units within BLO. As the brief of the project became more clear also a visit at a motorcycle fair was made to get a better overview of what vehicles that could come in focus for the project.

Early in the process an interview with an active firefighter was conducted in order to get an overview of the firefighters tasks in a rescue mission like a traffic accident scene. The interview also covered information regarding the basics in decisions making within the fire department. The conclusion of this meeting was that it was not enough to only focus on the fire brigades tasks, since a traffic accident scene involves more professionals. Therefore there will below follow the conclusions from interviews with the mainly involved units within a traffic accident situation. The questions to the different functions are to be found in Appendix 3.

FIRE STATION



During the field study at the fire station I got the chance to get a more in depth understanding for the firefighter profession.

Firefighters are usually first on a scene of accident (SoA) and therefore focused on the first rescue actions, bringing the persons involved in the accident to a secure place away from the immediate accident scene if necessary and stopping the danger on the scene, e.g. a fire or leaking of gas from the involved vehicles.

On the station a thorough description of the tools they are using and vehicle was given and hands on testing were also a part of the field study. Over all the weight of the tools were surprisingly heavy. The development of safer cars effects the tools the firefighter has to use to cut the roof of a car. This means that the tools have to be extremely heavy duty and therefore the weight increases. Also the new safety door for apartments can create problems for the firefighters when forcing entry to a home that is on fire.

I got to do a physical test that every firefighter has to do each year to be cleared to keep working as a smoke diver. With full uniform including ski mask and helmet plus a 25 kg heavy oxygen tube carried on the back I was supposed to walk in the speed of 5,5 km/hour in a 8 degree angle for 6 minutes on a tread mill. Since the test is performed by every firefighter in duty, with different walking speed depending on their age, it was not hard afterwards to realize that the physical demands is harder and harder to achieve the older the person gets. Many firefighters doesn't work all their way to pension of 60 on the field. Many senior firefighters are changing to more administrative work when they are around 50-55 years old due to the physical demands.

Further interviews were conducted regarding the firefighters own view of their work and different situations they can be facing. The answers were supposed to enlighten the context where firefighters operates in. This in order to be able to narrow the field study down further to pinpoint the eventual unfulfilled needs in the rescue process .



AMBULANCE SERVICE



In order to get a full picture over the Rescue Unit a visit at the Ambulance station was also conducted. Both the fire- and the ambulance brigade operates under severe time pressure. Seconds counts when the bell rings.

When firefighters focus on the more basal rescue actions, the ambulance team is totally concentrated on the humans involved and their injuries. The persons in the ambulance are well educated persons, usually with a nurse degree with further education in emergency nursing. In Sweden to become a nurse it takes a three year education on university level. There could also be the case when the ambulance driver is not an educated nurse, but since 2005 all new employees has to have a nurse degree. This because the need for both persons in the ambulance to be able to give medical treatment. Both are involved at the scene of accident, but only the nurses have the right to give medical treatment.

When arriving to a scene there is immediately a management team setup for the situation. This team involves:

- * One fire brigade officer
- * One policeman
- * One ambulance paramedical person

This team have the responsibility for the operative work and decides what actions that has to be taken and in what order.

The firefighters, if they arrives first to the scene, usually takes the first actions, stop the immediate danger and, if the situation makes it possible, bring the persons to safety. In some cases the persons can't be moved from the accident scene. Such situations can be when a vehicle is so demolished that the persons involved can't be moved without a severe risk of serious injuries or danger to their life. In most cases these kind of situations are a teamwork between the brigades. An example could be when a person is stuck in a demolished vehicle and the firefighters have to cut parts of the involved transportation construction apart in order to get the person out from it. When the fire brigade focus on the work of making it possible to carry out the injured human, the ambulance team focus on the persons physical health and survival, giving him/her pain relieve if necessary and making sure that back and neck are in a fixed position.



ECC

The local Emergency Call Centre (ECC) in Helsingborg, Sweden, is located in the same building as one of the three fire stations in the city. Here they not only receive emergency calls for fires and accidents from SOS Alarm, they also handle alarm, e.g. fire alarm, from both public and private buildings that has paid for that service. For alarm codes used by SOS Alarm please see Appendix 2.

In Region Skåne, the southern part of Sweden it is the private owned SOS Alarm AB that is in charge of all the emergency calls that are placed to the alarm telephone number 112. When an emergency call is received to SOS Alarm, the local ECC will be listening to that call and is able to ask questions via the SOS Alarm operator to the caller. By doing so the ECC operator can get as good information as possible in order to plan what units within the rescue service that will be considered to the task. The ECC operator has a clear view over where the emergency vehicles are located, using GPS system in all vehicles.



STOCKHOLM TWO WHEEL FAIR- ÄLVSJÖ

In February 2007 the “Two Wheel”-fair in Stockholm were visited as a phase in the project. The reason for this field execution was the chance to see the newest models of fast small vehicles, all gathered in the same spot to make it easier to compare and analyse advantages and disadvantages. During one day a range of ATV's, motorcycles, scooters, mopeds and bikes were studied and evaluated with the BLO's needs in mind. The fair made it possible to view the sizes, the limitations, advantages and in general the semantic of different shapes and design. And also to evaluate different kinds of vehicles.

The fair also gave possibilities to study different models of motorcycles within the police organization, that is the organisation within the BLO that mainly uses that kind of vehicle. Being able to view different brands and different year models within an already existing BLO solution of a more flexible vehicle gave valuable input for narrowing further down the project.



CONCLUSION

The result from the field studies was very useful in order to determine what tools and information that is needed on a SoA. Through the interviews it became clear that any visual information prior to the arrival to the SoA is of great value for both the firefighters and ambulance nurses. Since minutes makes difference all possibilities to shorten the starting track of the rescue mission is of greatest value. To be able to reach the SoA, speed and flexibility are two key words, and the field study at Stockholm "Two Wheel"- fair gave a lot input of the vehicle market today and a good base for evaluation.



CONCEPT

RU - Rapid Unit
A person, the tools and a vehicle

Evaluating the conclusions from research, field studies and interviews led to a concept of a small and fast rescue unit that would be able to get to the SoA as soon as possible. A one person unit on a fast vehicle that when on site could send visual information to the rescue vehicle that is arriving behind. The size of the vehicle would be important since a smaller vehicle enables access through narrow passages and makes it possible to take short cuts and go where a fire truck, ambulance or passenger car can't go.

In order to evaluate what demands that the tools mentioned above should have a functionality analysis is hereafter presented.

FUNCTION ANALYSIS

Overall System

Save life	H
Minimize personal injuries	N
Minimize psychological stress	D
Minimize material damage	D
Put out fires	N
Provide feeling of safety	D
Provide feeling of control	D
Collect information	N
Send information	N
Give feedback to victims	D
Understand the situation	N
Share information to colleagues	N
Take care of victims	N
Enable fast arrival	N

Video camera

Send visual information	H
Receive visual information	D
Be durable	N
Enable easy usage	D
Enable fast detachment	D
Provide stop in information flow	D

Add On Stowage

Carry necessities	H
Hold siren	N
Hold blue light	N
Enable good visibility	N
Hold detachable tool cases	N
Keep price low	D
Durable material	N
Easy to recycle	D
Easy to mount	D
Easy to maintain	D

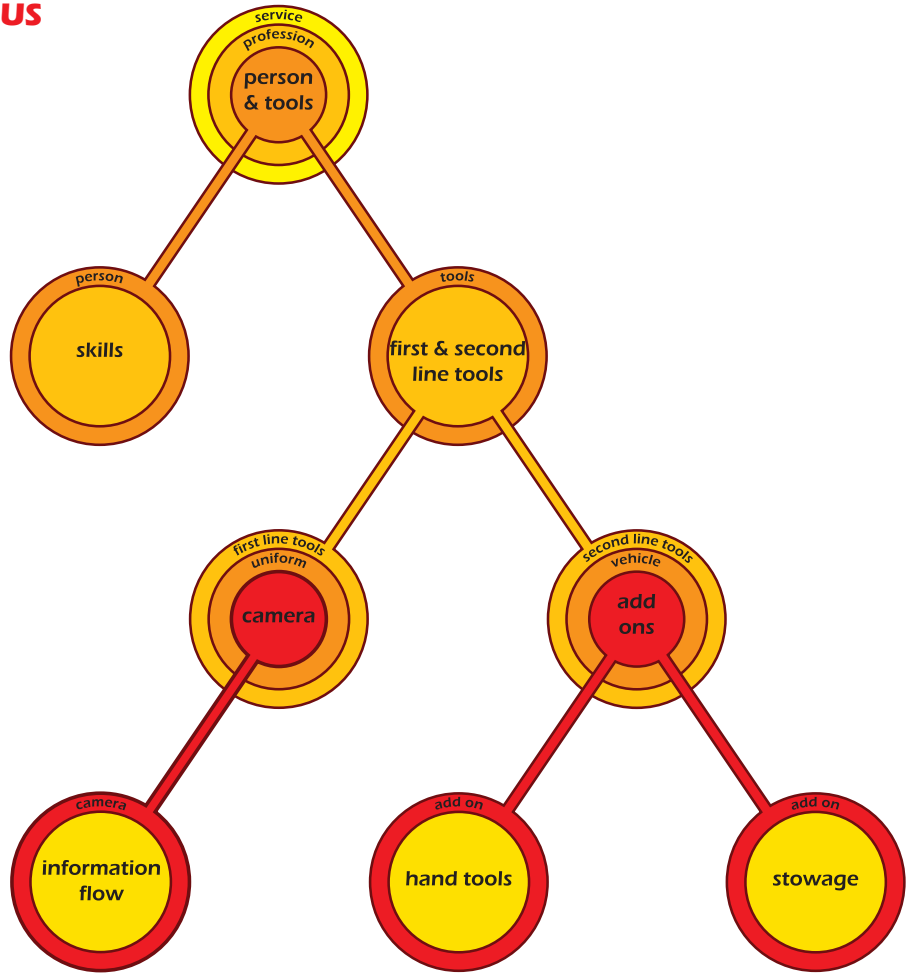
EXISTING VEHICLE EVALUATION

By evaluating the existing vehicles and equipment of the BLO today shows the gap between the functionality analysis and what is available today in the organization.

CAN BE DONE BY :	FIRE TRUCK	AMBULANCE	POLICE MC
TODAY?			
- Prepare the BLO by sending visual information via camera	No	No	No
- Put out fire using fire extinguisher	Yes	No	No
- Quickly get an overview over situation	Yes	Yes	Yes
- Determine the state of injured	No	Yes	No
- Make traffic aware of accident	Yes	Yes	Yes
- Secure the accident scene	Yes	No	No
- Seal of the accident scene from insight	No	No	No
- Give information to victims involved	Yes	Yes	Yes
- Give support to lightly injured victims	Yes, but not a priority	Yes, but not a priority	No
WITH SMALL ADJUSTMENTS?			
- Prepare the BLO by sending visual information via camera	Not fast enough to site	Not fast enough to site	Yes
- Put out fire using fire extinguisher	Yes	Yes	Not enough space
- Quickly get an overview over situation	Yes	Yes	Yes
- Determine the state of injured	Yes, with education	Yes	Yes, with education
- Make traffic aware of accident	Yes	Yes	Yes
- Secure the accident scene	Yes	No	No
- Seal of the accident scene from insight	Yes	Yes	Not enough space
- Give information to victims involved	Yes	Yes	Yes
- Give support to lightly injured victims	No	No	No

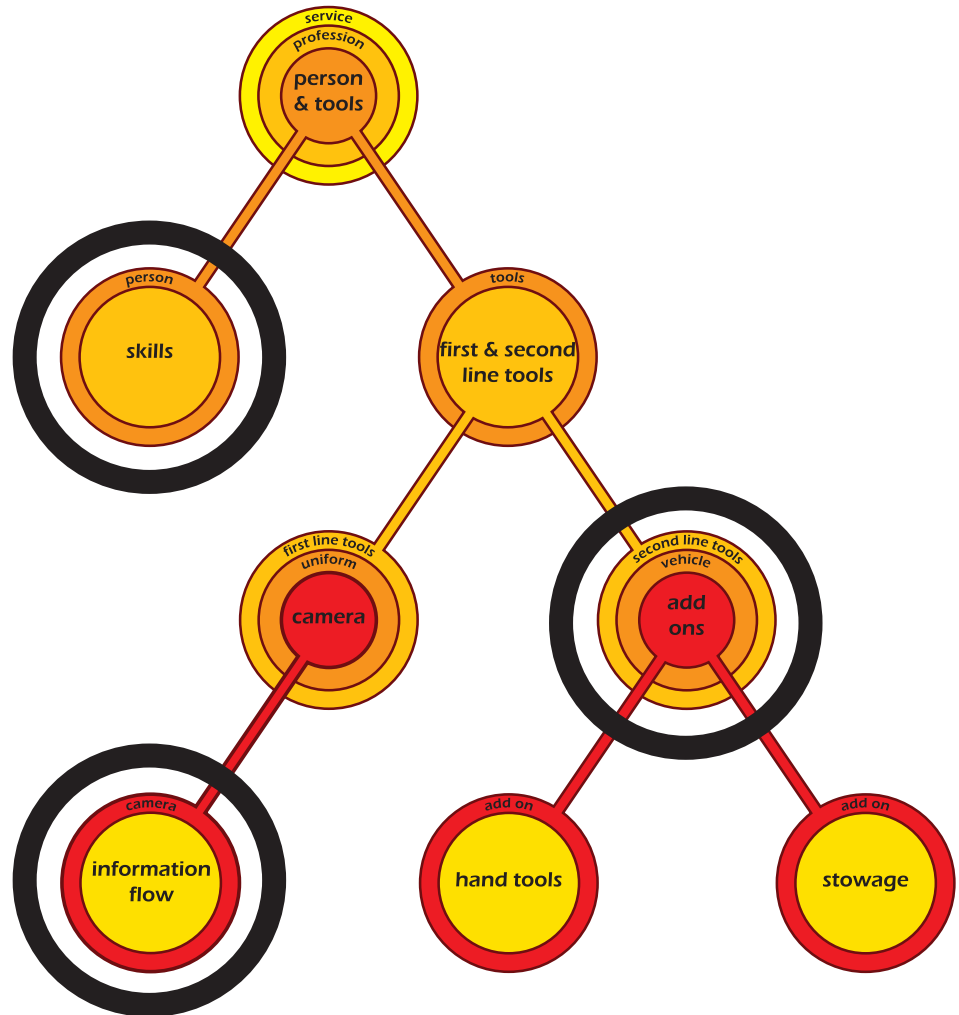
RU

DESIGN FOCUS



Because of the size of this project some delimitations were forced to happen. Trying to cover the whole service, the concept in depth were not possible due to time restrictions. To be able to get an overview over the different sections of the service the individual parts were split up. The inner core of the service is the profession, and to be able to carry out the profession there is a need of a person and the tools. Splitting up the person and tool segment and continue to do so through out the service led to a graphical overview as above.

RU



To convey the general idea of this project the decision was made to focus a little bit more on three parts; the professional, the video camera and add on system for the vehicle.

THE PROFESSIONAL

To be able to handle the different situations that this professional is going to face the person needs both great knowledge from rescue missions on a SoA as well as basic medical knowledge for life upholding activities. The professional is not suppose to have the medical skill as a nurse since the position not is meant to be a replacement for the ambulance but an additional resource to the rescue team focusing on the basic life upholding tasks on a SoA. Important to point out is that this role will not be included in one of the five unit member on the fire station, this service will be integrated in the rescue system as an additional resource. The person for this position will also need basic security guard education in order to have the authority to turn curious people away from the SoA. A basic security guard is under the direct supervision of the police, and need not as much education as the more extensive guardian role does.

Due to that it is advisable that the person has a background as a firefighter with 10-15 years of experience who has had additional education as a basic security guard and in the fields of medicine and psychology to better handle traumatized people. A firefighter with 10-15 years of experience in the line of profession has a lot of knowledge regarding rescue missions. Since this position will be first on an accident scene, there will be a lot of physic pressure on such a person. Therefore an employee for this position is most likely to have seen many different situations and therefor can be prepared to what is to expect and more objective can handle out of the situation. A firefighter with less experience may not have seen severe accidents in the extend this profession needs. Since this person will be the first to arrive to the scene it will always be this roles obligation to see the whole extend of the accident. An older and more experienced firefighter possesses the ability to handle most kinds of situations, and has the experience to process the impression afterwards.

From a macro economical perspective there is a great advantage to use firefighters as the foundation for this new profession since it gives the older firefighters a chance to stay within the force even after the appearance of minor injuries. A firefighter has to be in top condition to be able to carry out all the tasks that is expected from them. The strain on their body is greater than in many other professions and it is not rare that a firefighter is forced to retire many years prior to the age of retirement at 60. Some of the firefighters move up to a higher post where the physical demands are slightly lower but those positions are not enough in numbers to meet the demand of the number of firefighters. Many of the firefighters are replaced to an administration position within the city. The RU is a possibility for the BLO to keep the senior experience and competence within the force. The physical demands on the person are still high for this service, but not as tough as it is for an active firefighter.

Considering the tasks this person will perform that is of greatest importance, saving lives, one alternative solution could be that this position is possessed by an ER doctor, also well exposed to different accident victims. An ER doctor can quickly get an overview at the SoA with focus on the victims. He/she can determine what state the people are in, prioritize the victims by their grade

of injury. Still, an experienced firefighter has the skills to quickly analyze and evaluate the entire scene, not just the injured people. There could be situations that needs to have an experience from how the accident scene could develop from calm to life threatening within seconds. That overview an firefighter has. Also, the knowledge that an ER doctor possesses are very extensive and in most cases not directly applicable to the SoA where the main focus to the victims is much more of a basic nature, e.g. stop the bleeding and to uphold the respiratory functions. Therefore a more compact education focusing on emergency medical care on a SoA can be applied to this role.

The person for this position will also get basic security guard education in order to have the authority to turn curios people away from the scene of accident. A basic security guard is under the direct supervision of the police and need not as much education as the more extensive guardian role but will fulfill the needs of this position.

Volunteering or outsourcing the service are two aspects that has been taken under consideration. The advantages about having volunteers is among other things the fact that it wouldn't cost as much as employing an experienced firefighter full time. The volunteers could be strategically picked so that they create a well placed pattern over a city. The disadvantages are the aspects regarding keeping the high standard of the service and being able to rely on the function. There would also be the question of maintaining the vehicle and the tools so that they keep the desirable high standard. Outsourcing would be a better suggestion than volunteers, this would guarantee a high level of standard. Today there are already some part of the rescue service on outsourcing, e.g. the national ECC and in some cities the ambulance service. There can be a risk when outsourcing to many parts of the rescue service since it drains the core organization of knowledge and therefor the suggestion will be that for a fast and small rescue unit should stay within the same care as the fire department.

THE VIDEO CAMERA

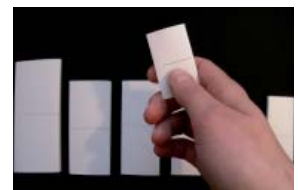
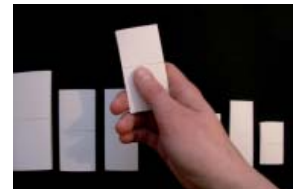
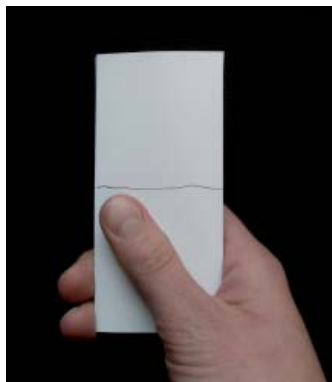
The video camera is one of the most important tools the RU will use. With it the visual information about the SoA can be shared with everyone involved in the rescue mission. It enables the other people in the rescue unit to prepare the task that lays ahead.

There are a few different possibilities when it comes to sending images in real life. One could be using an Unmanned Aerial Vehicle (UAV) to collect and send the information. An UAV enables a wide range of footage of the SoA and could even imply a lower cost than employing a person for the task. Still there is the important aspect of feeling comfortable as a victim. Having an unmanned machine hovering above and nearby will not give as much comfort as an experienced member of the rescue service. And since the RU wouldn't just be focusing on sending visual information the importance of having a professional presence makes a small device that collects and sends visual information that the RU can carry is a good compromise.

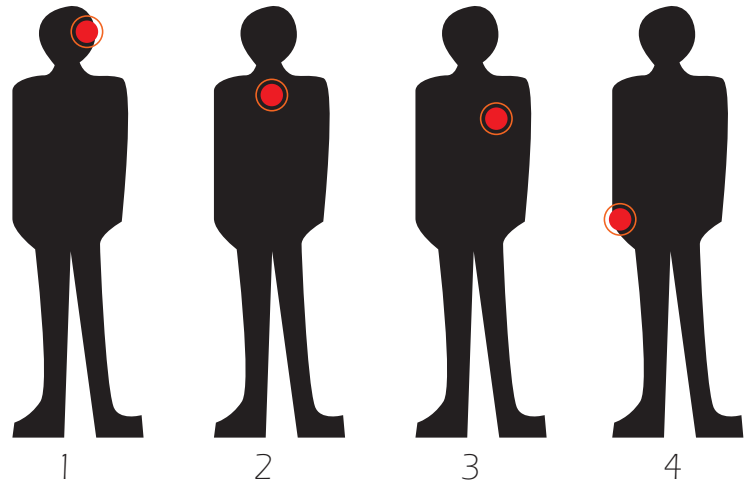
In general the idea is to keep the design of the video camera as simple as possible. The video camera does not need multiple functions, it needs to send images in real time and there are many available technologies on the market today that would be able to handle the information needed. Placing it on the uniform enables the RU person to always send information. It should also be easy to take off and easy to grip if a closer recording or recording in difficult angles are needed.

Size evaluation

Using simple mock-ups the size of the camera was evaluated. It is important that the video camera is big enough to enable a good grip when detached, even when wearing gloves but still small enough not to be a disturbing feature on the uniform.



Position evaluation



1 Attached to the head of the RU. This gives the recipient of images the possibility to easily follow what the RU is looking at. The problem is that the camera would probably point out from the head, making it impossible to use in narrow spaces, and risking to get the camera stuck somewhere and fall of. If the RU needs to put a helmet on the camera could be hard to combine with that. It is also important that nothing is shielding the face when approaching the victim to be able to infuse the feeling of trust.

2 Centred on the chest. Good position in height, stability. Can be a problem to attach the camera right in the centre on the uniform considering a zipper or opening of the jacket.

3 Off-centered on the chest. Good position in height, stability. Easy to reach with one hand when detaching the camera. Since it is easier to reach with the right hand when placed on left side of chest, the RU has to release the right hand from the gas handle if riding an ATV, trike or motorcycle if there would be any reasons for the RU to detach the camera during riding the vehicle..

4 On hand. No stability. The images would be very difficult to follow when the RU has arrived to the SoA.

THE INFORMATION FLOW

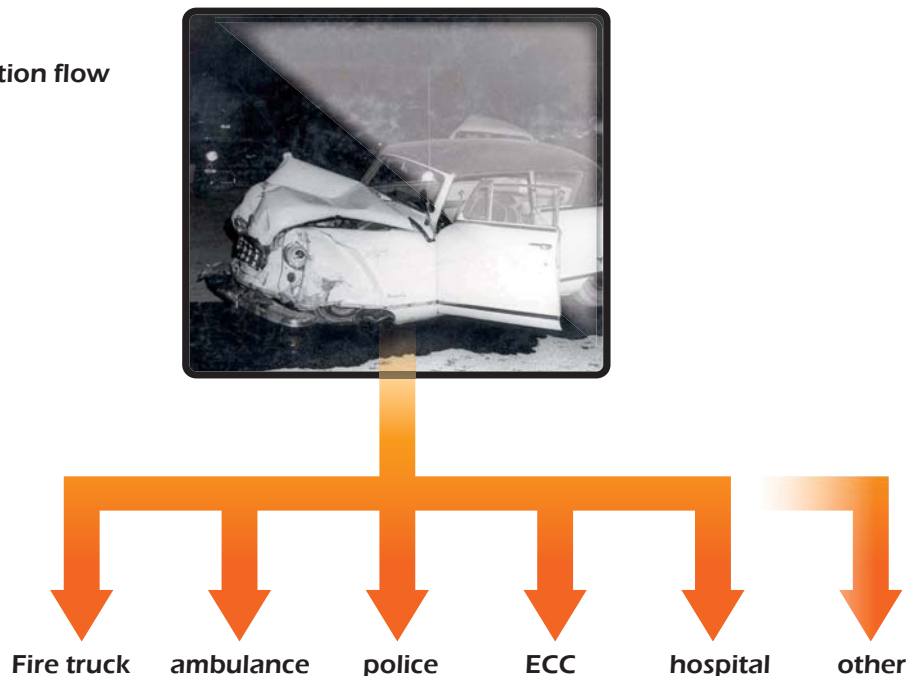
The RU can share the visual information with not only the fire truck and ambulance that is arriving, the information should also be able to be shared with the police, the ECC and any hospital in the region.

In Sweden the Swedish Emergency Management Agency (SEMA) is constructing RAKEL, a new digital radio communication system used by organisations dealing with public order, public security or public health. Examples of users is: Police, Coast Guard, the Swedish Customs Service, Local Rescue Services, Emergency Health care and Ambulance Services, Armed Forces, Local and Regional Crisis Management, Swedish Prison and Probation Service and the Swedish Radiation Protection Authority. By using this existing communication tool the visual information can easily be integrated into the system and shared with any of the involved parties.

The rescue vehicles that are in use today are fitted with computer screens that has the capability to show the visual information that a video camera would send.

There is a lot more to be researched regarding the information flow, that itself could result in an own project and therefore will not be treated any further in this report.

Possible information flow



THE VEHICLE

Being the first person on the SoA demands a vehicle that will be both flexible and accessible. It has to be able to get through in most of the situations, and environments and should be handled by one person.

Today there are many vehicles that can meet those demands or at least some of them. Therefore a study over a few of the most common vehicles were made where the positive and the negative sides were evaluated.

Possible vehicles



Car

- + Fast
- + Stability
- + Safety
- + Can be heavily loaded
- + Need only ordinary driving license

- Big



ATV

- + Fast
- + Stability
- + Can be heavily loaded
- + Need only ordinary driving license

- Wide
- Safety
- No shield from rain



Trike

- + Fast
- + Stability
- + Can be heavily loaded
- + Need only ordinary driving license

- Wide
- Safety
- No shield from rain



Motorcycle

- + Fast
- + Narrow
- + Is being used by police

- Stability
- Need special driving license
- Can't be heavily loaded
- Safety
- No shield from rain



Shielded moped

- + Shielded from rain
- + Narrow

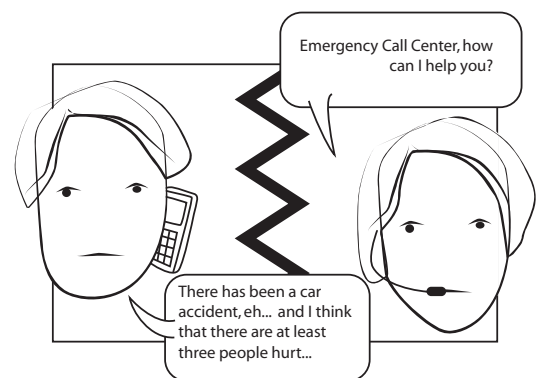
- Not fast enough
- Can't be heavily loaded

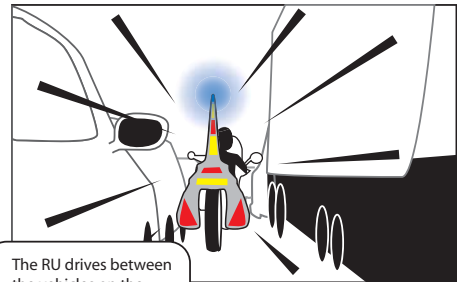
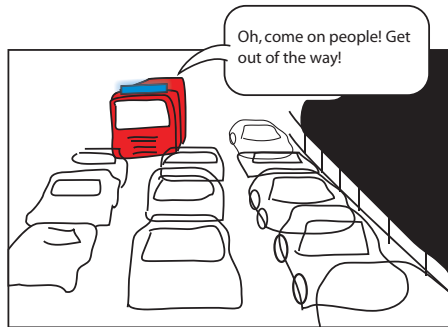
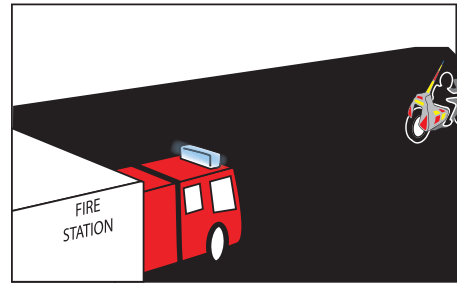
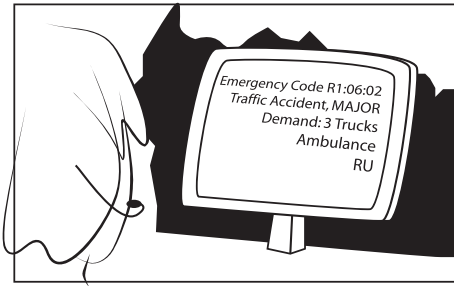
The vehicle - motorbike

When evaluating the different vehicles, the one that met the above mentioned criteria best was the motorbike. A motorbike enables fast access to the accident scene. In 2005 there were 18 500 accidents in the traffic in Sweden. 26 459 people got injured and 440 people died due to the traffic accidents. Every minute counts when it comes to saving life. Dan Wargclou, teacher and instructor at the School of Räddningsverket (Firefighter academy) in Skövde, underlines in the introduction of his book Rescues at Traffic Accidents - Cars, the importance of "Don't let any time go to waste!". One or two persons can arrive to the accident scene two minutes before the fire trucks and ambulance and have the tools and knowledge to save some ones life and minimize the damage.

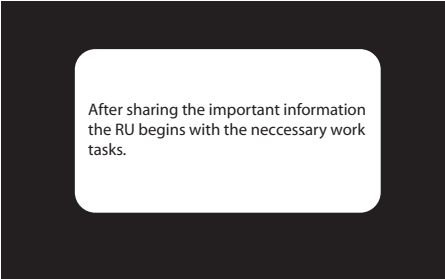
The weather can be an obstacle if you were to drive a motorbike. Still statistics are telling us that over 60 % of all the accidents in Sweden happens on dry road, 20 % on moist or wet road and 20% during other conditions like snow and ice. This shows us that the use of a motorbike is a good solution even due to the weather conditions in Sweden. This is also confirmed by Sören Johansson, a motorcycle police at the Helsingborg Police Force. He prefers using the motorcycle when ever he is on duty, except when there is snow and ice on the roads. He says that the motorcycle enables him to be at a SoA long before the other units from the Police Force.

The scenario below shows a typical situation where the motorbike is superior to the other evaluated vehicles:





The RU drives between the vehicles on the jammed road



The motorbike

Since a motorcycle can be divided in different segments, e.g. dual sport-, off-road-, cruiser- and sport bikes motorbikes, there has to be a choice made what kind of motorcycle that will be used for the RU. This to know how to use the composition of the motorbike for the design of the RU's add-on packages. This add-on package has to fit special tools and also needs to have blue-light and sirens.

In order to fully meet the needs for the RU a totally new motorbike could be designed. The benefits would be a highly integrated motorbike build for the specific situations that an RU could come in. The negative side would be the cost of developing, producing and maintaining such a motorbike, since the volumes would be very small and the usage of standard solutions on such a motorbike would be very low.

To use an already existing motorcycle would mean that the total cost would be significant lower than a own developed motorbike. Also there would be an existing service organization with reasonable service times due to well known and standardised technology.

To minimize costs it would be an idea to use a already existing motorcycle within the BLO. Most common is the police motorcycle. The police have a contract with BMW even though they are looking at other motorcycles for evaluation, now for instance Honda ST 1300. To be able to synchronize both the police and the RU motorcycle fleet could reduce costs for the BLO.

Still, the needs for the police force and the RU are quite different. The police force need strong, fast motorbikes that can, if needed, take up a chase on the motorway. The RU needs a motorcycle that can be driven in many environments, is flexible and can come through in narrow passages and carry the necessary tools.

To choose a motorcycle model for the RU it also is important to pick from a segment that conveys the right signals, both to the society and to the victims. Compared to the police motorcycle that conveys power, speed and respect, the RU's motorbike need to reflect reliance, safety and trust. When police motorbikes usually comes from segments near to sport bikes, the RU's motorbike would need to be more flexible, more like a dual sport motorcycle.

Choosing one specific model has both positive and negative aspects. All needed equipment, e.g. add-on stowage will be possible to optimize better from a design point of view if a specific motorbike is chosen. The measurements are fixed and known. Still the chosen motorbike could be replaced by a later and different model with different measurements by the producer.

To use a range of motorcycles will also have advantages and disadvantages since the equipment attached needs a more universal solution that will risk that it doesn't look to fit for the motorbike and also risk the balance. Colliding designs, and the add on stowage is forced to be more blend. A good solution would be to pick a range of motorbikes that have a similar design language in order for the RU's equipment, such add-on stowage, to be adapted without a lack of usability and design. Hereafter three motorbikes will be shown that meets the discussed criteria.

Compare

They motorcycles come from the segment dual sport motorbikes and represent a form language that meets the demands of an RU's motorbike. They are flexible, and have a design language that will make it possible to standardize the equipment for the motorcycle, e.g. add-on stowage. They are all well known brands with an extended service organization and in a preferable price range.

Name Suzuki V-Strom 650 ABS

Price	€ 8,550
Capacity	645 cc
Gearbox	6 speed
Maximum torque	60 NM/6,400 rpm
Fuel tank capacity	22 litres
Weight (dry)	194 kg
Length	2290 mm
Width	840 mm
Seat height	820 mm
Ground clearance	165 mm
ABS brakes	Yes



Honda XL 650 V Transalp

Triumph Tiger 1050

Price	€ 7,500	€ 11,250
Capacity	647 cc	1050cc
Gearbox	5 speed	6 speed
Maximum torque	-	100 NM/ 6,250 rpm
Fuel tank capacity	19 liter incl. 3 in reserve	20 litre
Weight (dry)	191 kg	198 kg
Length	2260 mm	2110 mm
Width	920 mm	840 mm
Seat height	843 mm	835 mm
Ground clearance	192 mm	-
ABS brakes	No	No, a Triumph Tiger 1050 with ABS is € 11,800



THE TOOLS

Looking at what tools that are used today by the BLO laid a foundation on what the RU is to bring to the SoA. It was important that the user wouldn't be a stranger to the tools in order to reduce the time for the person to be introduced to the work.

From the wide range of tools that are used by the BLO a first cut was made to limit the amount, focusing on tools that are most frequently used in traffic accidents.



Small first aid kit size: W 285 x H 195 x D 120 mm.

To be able take action regarding slightly injured victims. This is not replacing the ambulance in any way, but since the ambulance nurses are focusing on the severe injured people first, this kit will enable care giving in a much smaller scale. For example, a bruise or small cut. Here is an example of what the first aid kit could contain:

- 01 Triangular Bandage 1 pc
- 02 Adhesive Tape 2 rolls
- 03 Multi Utility Scissors 1 pair
- 04 Emergency Blanket 2 pcs
- 05 Combined Pad 1 pc
- 06 Gauze Swab 2 pkts
- 07 PVC Gloves 5 pairs
- 08 Eye Pad 1 pc
- 09 Cold Pack 1 pc
- 10 Safety Pins 10 pcs
- 11 Adhesive Strips 20 pcs
- 12 Butterfly Plasters 4 pcs
- 13 Adhesive Plaster, KN 4 pcs
- 14 CPR Face Shield 1 pc
- 15 Cleaning Wipe 4 pcs
- 16 Soap Wipes 2 pcs
- 17 Antiseptic Wipes 2 pcs
- 18 Alcohol Wipe 2 pcs
- 19 Filming Dressing 2 pcs
- 20 Tweezers 1 pc
- 21 Rayon Ball 1 pkt
- 22 Elastic fabric plaster 8 pcs/bag
- 23 First aid dressing 2 pcs
- 24 Bandage 2 pcs
- 25 PVC Bag 1 pc



Fire extinguisher **size: Ø 115/ h 390**

In traffic accidents the average number of usage of a hand held fire extinguisher is 31,75 times per year in Helsingborg and 66,75 times per year in Malmö. This can be compared to the usage of foam from the fire truck that was used only 2 times per year over a period of eight years in Helsingborg and 7,6 times per year over a period of eight years in Malmö. The damage from a fire in a vehicle can be minimized with the usage of a fire extinguisher in an early stage.



Turbo Flares **size: Ø 197/ H 41**

An emergency road flare to make the traffic aware of the accident. It consists of highly visible LED lights that will be visible in 360 degrees directions up to 40 km from the air, 8 km on the ground and will last for about 100.000 hours of life. This product is more secure and sustainable to use than incendiary flares since there is no risk of fire and no toxic fumes or flammable materials and the flare can be used during many years of normally usage. The flare will also keep its functionality even in storms and wet weather and will still be in function if a vehicle hits it. The Turbo Flare uses Hi-Output LEDs as light source and runs for over 80 hours on 4 AA battery.



Defibrillator

A defibrillator is a very important part of the equipment for the ambulance nurses and the fire fighters. There is an ongoing project within the fire department in Sweden today to make every fire fighter able to use a defibrillator in order to “kick-start” a heart in between CPR. The idea is that the new kind of defibrillators shall be a permanent tool not only in the ambulance but also in the fire truck. This enables more people to save life. There are several different kinds of “easy-to-use” defibrillators on the market today, from the most simplest that are supposed to be placed in public areas like offices and work places to more complex, still easy, products. The defibrillator for the RU is the smallest there is on the market today, a SAMARITAN® PAD Public Access Defibrillator.

Bubble wrap **size: 150 x 200 mm**



Bubble wrap is used by the fire department for insulation and protection of victims. In a traffic accident the victims are wrapped in bubble wrap for protection when the vehicle has to be cut open to get the victims out. Bubble wrap is used prior to a blanket for several reasons. First, it gives the victim a chance to see through the bubble wrap in order to follow the work. Even though the sight isn't clear the victims can discern what is going on and will not be surprised by any action. Secondly, there is a strong mental aspect not to use a blanket to cover a victims body and face. This is by many heavy associated to pulling a blanket over a dead body. Third, the bubble wrap is easy disposed after usage. No need to wash, just throw it in the bin.



Soft teddy toy

This is used by the ambulance for distraction for young children. It is an easy way of connecting with children and interact with them.

Knife

To use in many situations on the SoA, e.g. cutting lose a person that are stuck in a car belt.



Extra Emergency blankets

Extra Emergency blankets can be used not only as a heat blanket, but also as a way to screening off parts of the accident scene from bystanders.

Trimonopods for screening off accident scene with extra Emergency blankets

One of the many things that people in accident feel stressed about is the fact that other people are gathering around to watch. With a simple solution an extra emergency blanket can be used to seal off the accident scene from insight.



On the market today there are camera mono pods in carbon fibre which enables a strong and still lightweight construction. Other mono pods have a stand build in to be unscrewed from the mono pod and gives the mono pod the possibility to stand on it's own. With this in mind, there are good possibilities to produce a new type of stand that combines some of these properties. Lightweight, extendable and freestanding mono pod to attach an emergency blanket to. The emergency blanket has to have air holes cut in it so that the construction doesn't fall over in a breeze. There is a possibility to produce specific emergency blanket only for the screening off purpose with specific fabric that let the air through, however that wouldn't be either cost- nor space efficient.



Above shows an authentic scene of an accident where the injured is exposed for all to see.
To the right the same scene with the trimonopods and emergency blanket witch enables a feeling of privacy for both the victim and rescue personnel.



CONCLUSION

In order to provide fast access to the scene of accident (SoA), both physical and visual, and to make the rescue action more efficient as well as enhance a greater feeling of comfort and security for the victims the conclusion is to focus on three parts in the role of the RU, a vehicle, a video camera and the tools needed to be able to perform on the SoA. The motorcycle is superior by its flexibility and since 80% of all traffic accidents happens on surfaces that a motorcycle can be manoeuvred on, it seems as the best choice of a vehicle for the RU. A robust and easy managed video camera are to be designed that meets the demand of the RU service. Finally there will be a need for a stowage for the equipment the RU need to bring along on the motorcycle to the SoA. The stowage need to be designed in order to meet the flexibility of the RU role as well as they need to be able to fit on several motorcycles in order not to lock the RU service to one specific model of motorcycle.



DESIGN CONCEPT

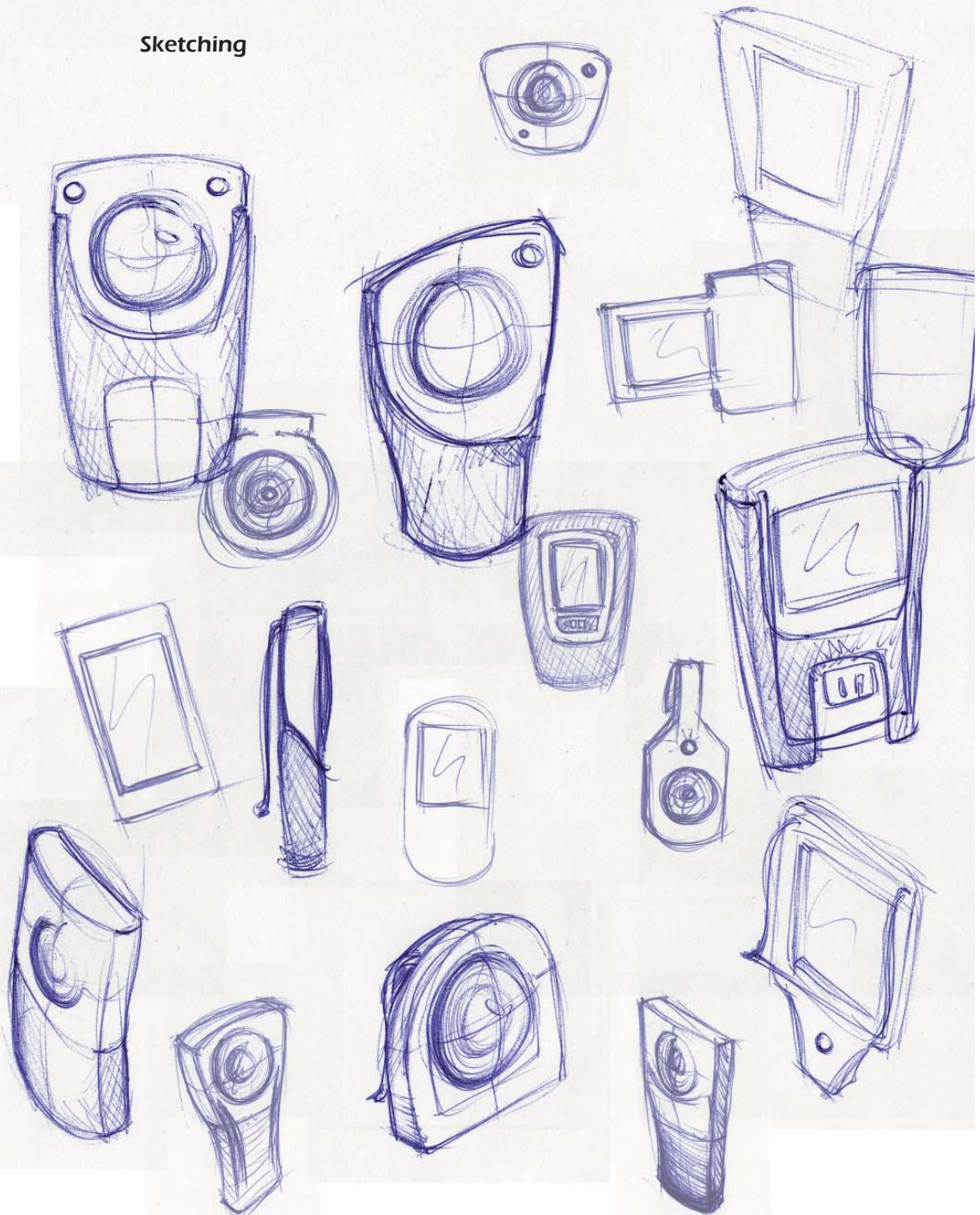
For the design concept the focus was to collect inspiration for the video camera and also some guide lines to the design of the stowage for the tools. Sketching and modelling with the positioning of the tools within the stowage was made.

CAMERA

Inspiration



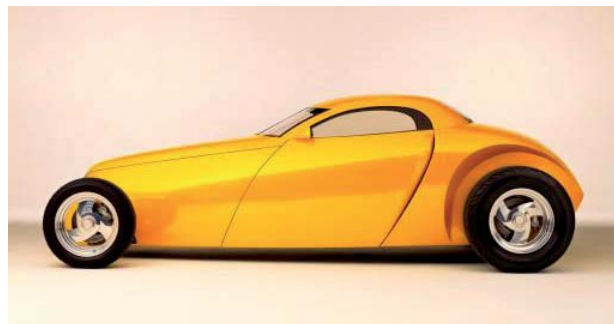
Sketching



ADD ON STOWAGE

Inspiration





Inspired by shapes and colours that convey speed, strength and flexibility.

Guidelines

The add on package has to fit special tools and also needs to have blue-light and sirens. It has to be able to detach some of the stowage parts with its contents in order to attend the victims but still keep the vehicle at a distance for safety reasons. Parking a small vehicle like a motorcycle close to the accident scene can be a risk if the traffic detects the blue-light and warning signs to late and accidently crashes into the motorcycle.

Keeping the siren and blue-light integrated in one structure together with the stowage has several advantages. First, the vehicle will have less components sticking out from the vehicle allowing them to brake. This has been a problem with the BMW police motorbikes in Sweden. The vehicles were only fitted with separated parts and the motorbike were not restyled/rebuild to fit the needs. Meanwhile the brand new police motorbike from Honda has gone through a makeover where the end result for example has blue light integrated in the rear mirrors and special designed hard cases to fit the equipment they need.

Also, having everything that is needed in one structure makes it easier to install on the motorbike. Less components means less working hours when installing and maintaining. Collecting all the electronics in one place, you only have to install one unit instead of single components. One electric cord from the panel to one place.

Based on the research some information was collected as guidelines for the design of add on stowage.



On this already existing model for fire extinguishing, the siren is placed above the drivers head without being to loud and causing injuries to the drivers hearing.

The Swedish rescue service uses red and yellow reflector stripes to their vehicles.



In Sweden, but also abroad, the police organization uses blue and yellow reflector stripes. Here the placement of the reflector stripes on an existing police motorbike are to be seen.

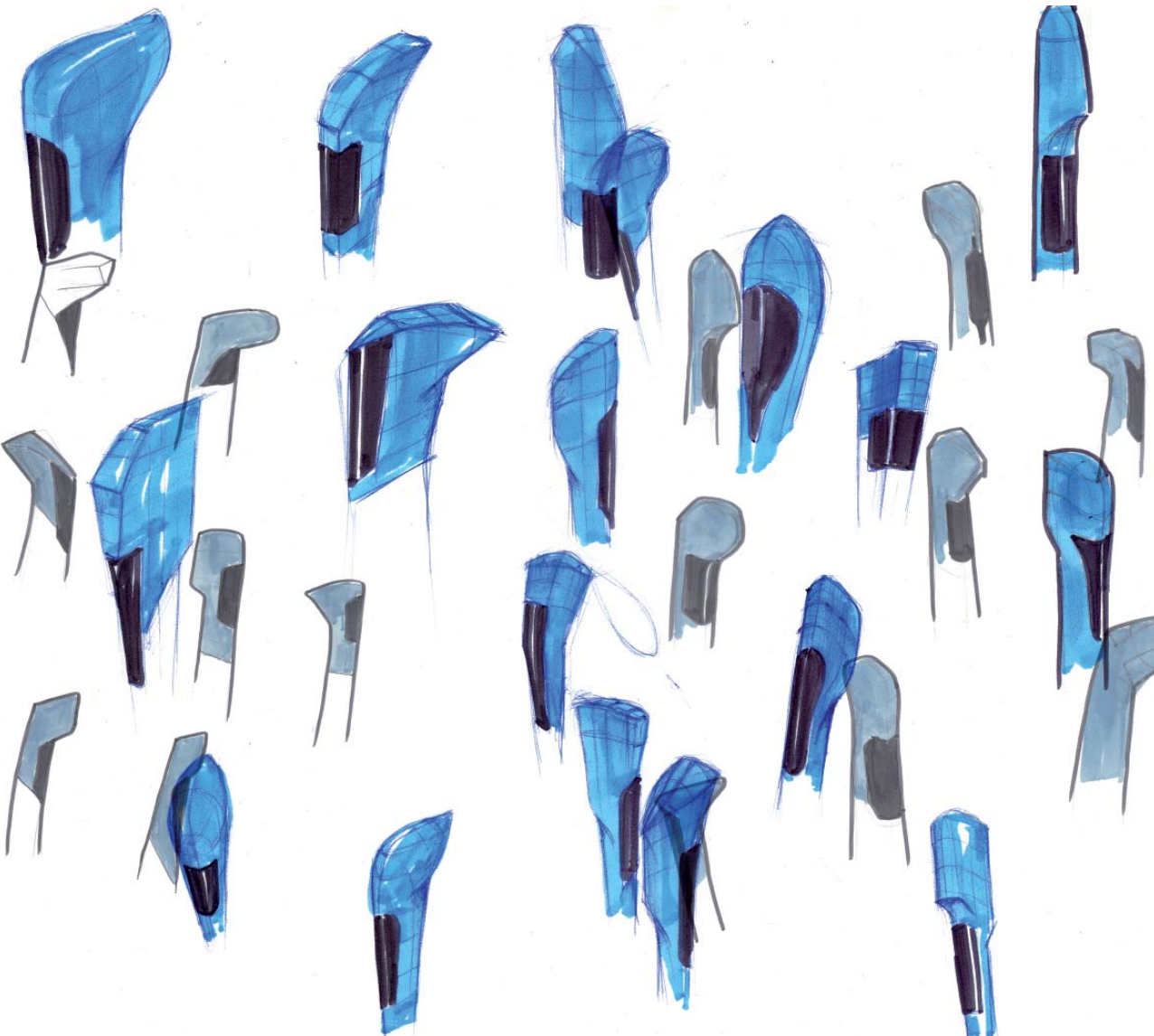
An example of bad stowage that involves to many loose parts

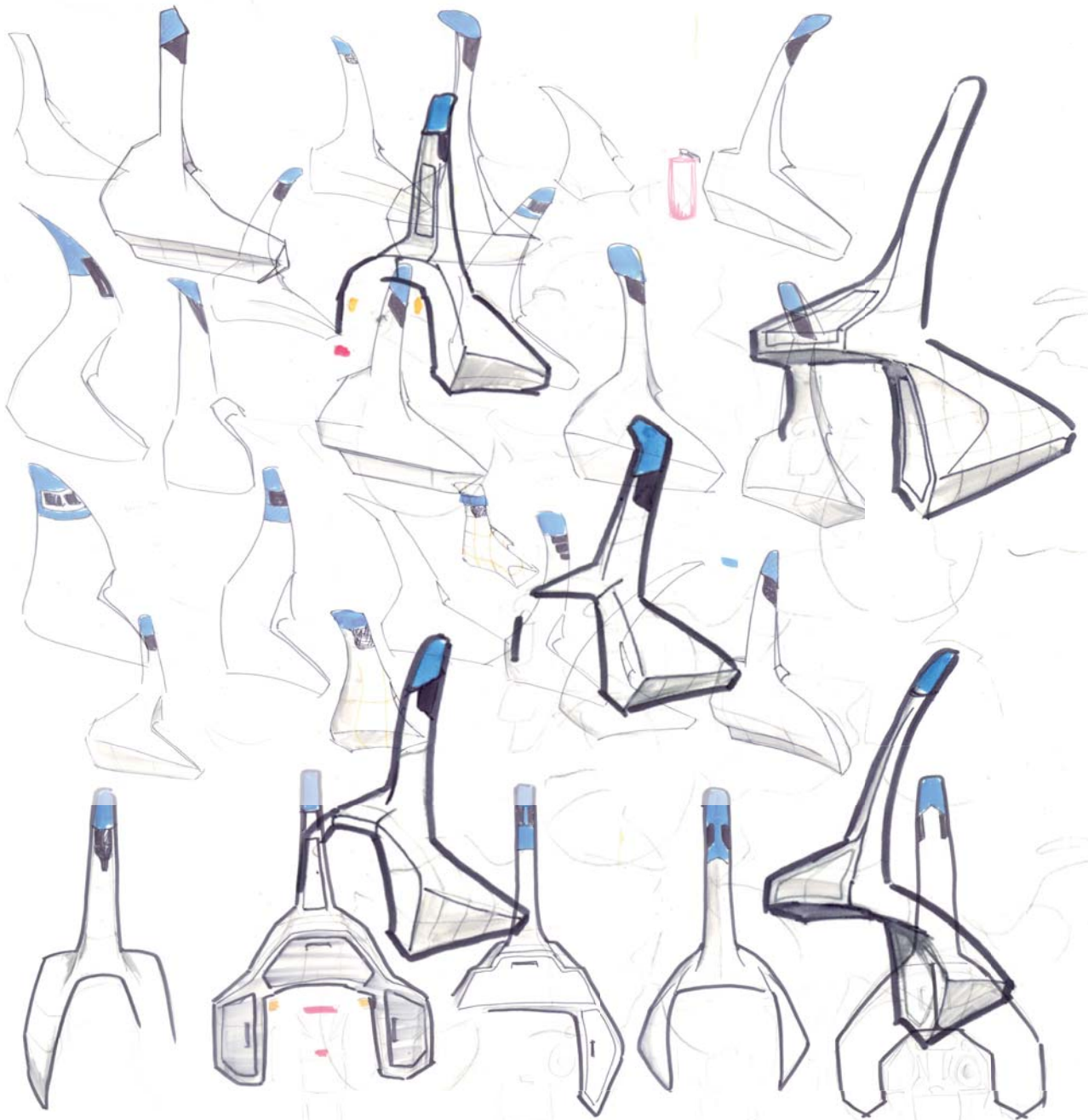


A view of the size and placement of the blue light on an existing police motorcycle.



Sketching

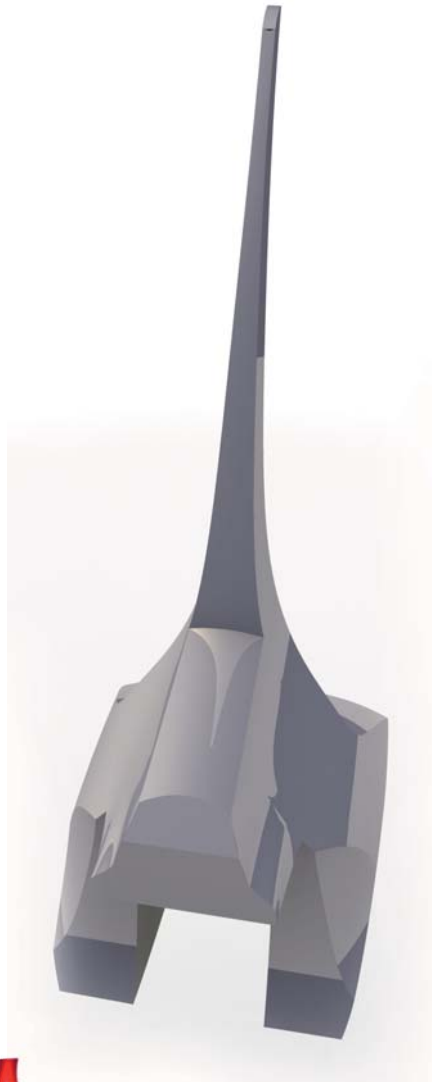




Positioning of tools



Turbo Flares



First Aid kit
Defibrillator
Tri-Monopods
Soft Toy



Fire Extinguisher
Bubble wrap



Right side when packed with tools

Left side when packed with tools



CONCLUSION

The design was held within the frames of space and the equipment that has to be carried on to the motorbike. The form language was based upon a combination of the inspirational pictures and the design and limits of the motorbike. The guidelines played a big part in how the final concept looked like. Regulations like the reflector stripes used in BLO organization limited the visual ways the final solution could take.



FINAL CONCEPT

Final concept - flexible concept

The concept that will be presented hereafter shows the main equipment that the RU person needs in order to fulfil the requirements of the role that was set up in the brief for this project.

POSSIBLE WORK FLOW

Analysing the scene

Area security

— Need to make others aware?

— Need to put out any fires?

Possible workload

— Need for more vehicles from the BLO?

Focusing on victims

Physical damage

— Does anyone need CPR?

— Is anyone bleeding heavily?

— Is anyone close to state of chock?

— Are there any children?

— Is there any need to screen off part of the accident scene?

 Yes

 No

 The positive consequence



THE VIDEO CAMERA

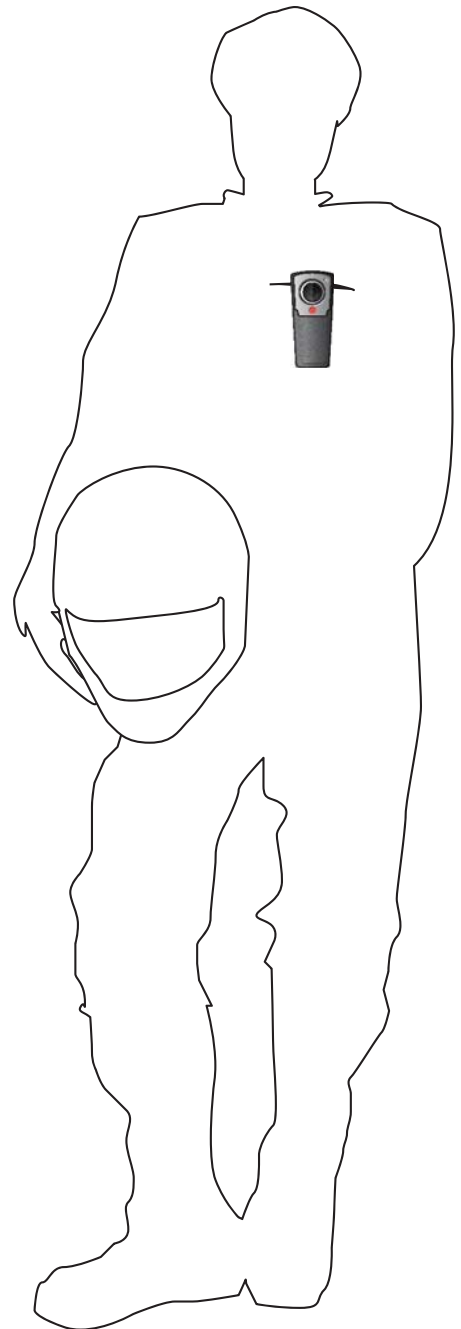


SIZE: H 100, W 45/36, D 15 MM

The camera is operated from the ECC making the RU focus on the tasks that has to be performed. In the top right corner on the front side there is a LED light for lighten up the area that is being video taped if needed. Below the camera lens an indicator makes both the RU and the victims aware of that the camera is transmitting information.

In the back there is the viewfinder screen and also a pause button. Pressing it once quickly the LED light on the front turns on and holding the button down stops the transmission temporarily if needed.

On the backside there is also a clip to fasten the video camera to the uniform allowing the RU to detach and attach the video camera to the uniform for different situations and angles.

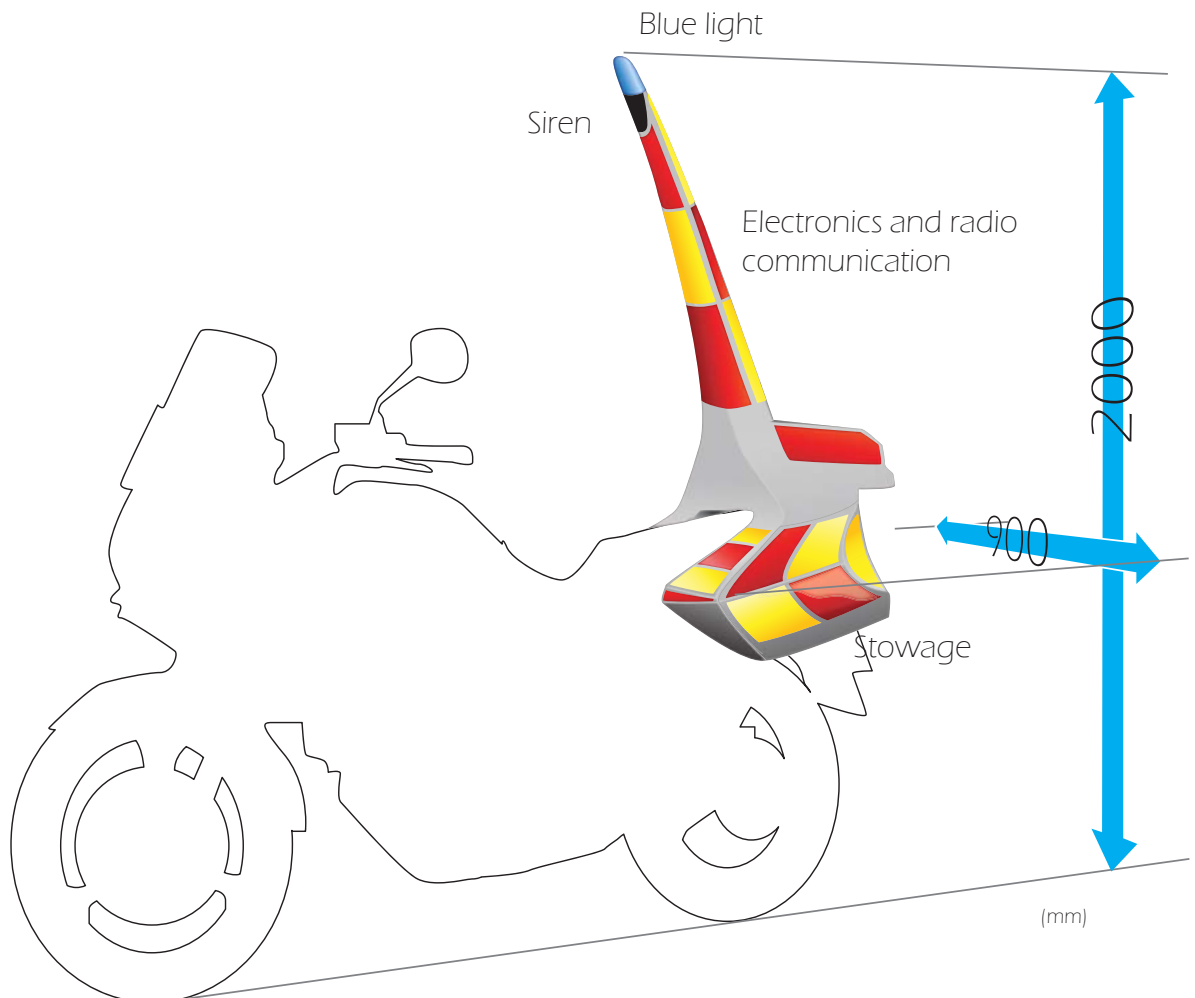


THE ADD ON STOWAGE



The stowage is designed to convey a number of different aspects such as speed, safety and authority. It also have to look as it is a part of the motorcyle hence the integrated design.

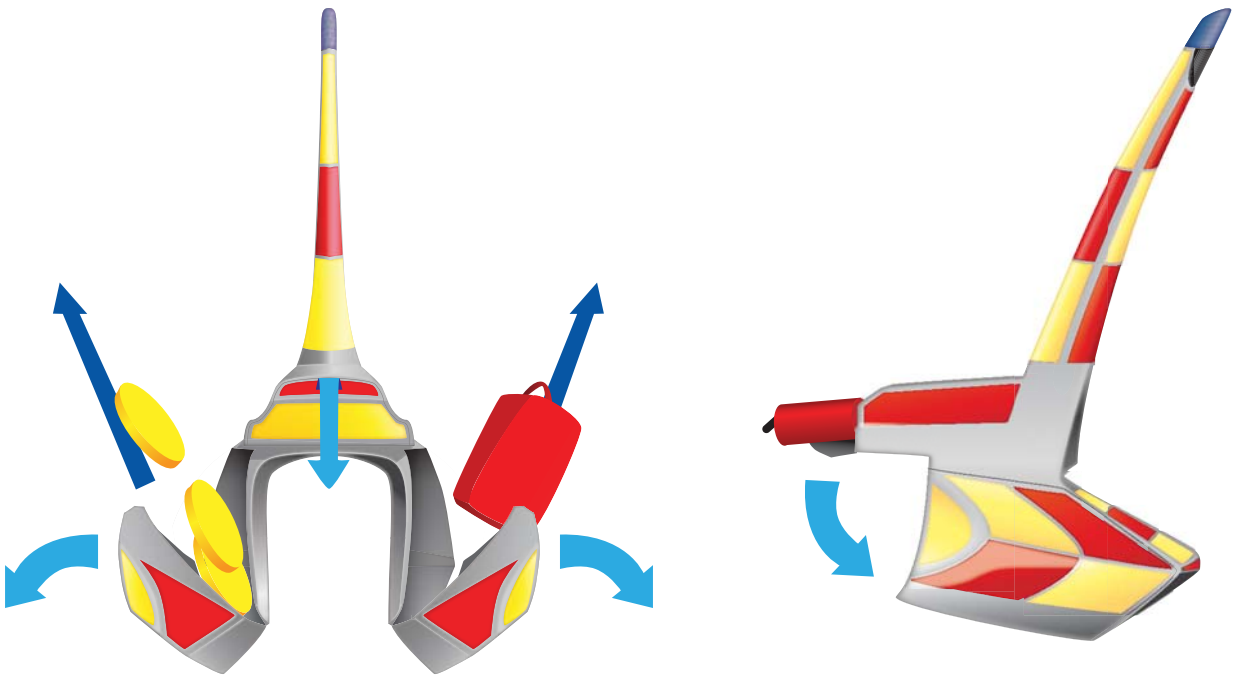
With the blue light and the siren placed high up it will be most visible and the sound from the siren has a wide angle of spread without disturbing the driver of the motorbike. In the stem all the electronic devices are placed and organized in a way not to change the weight balance of the motorbike.





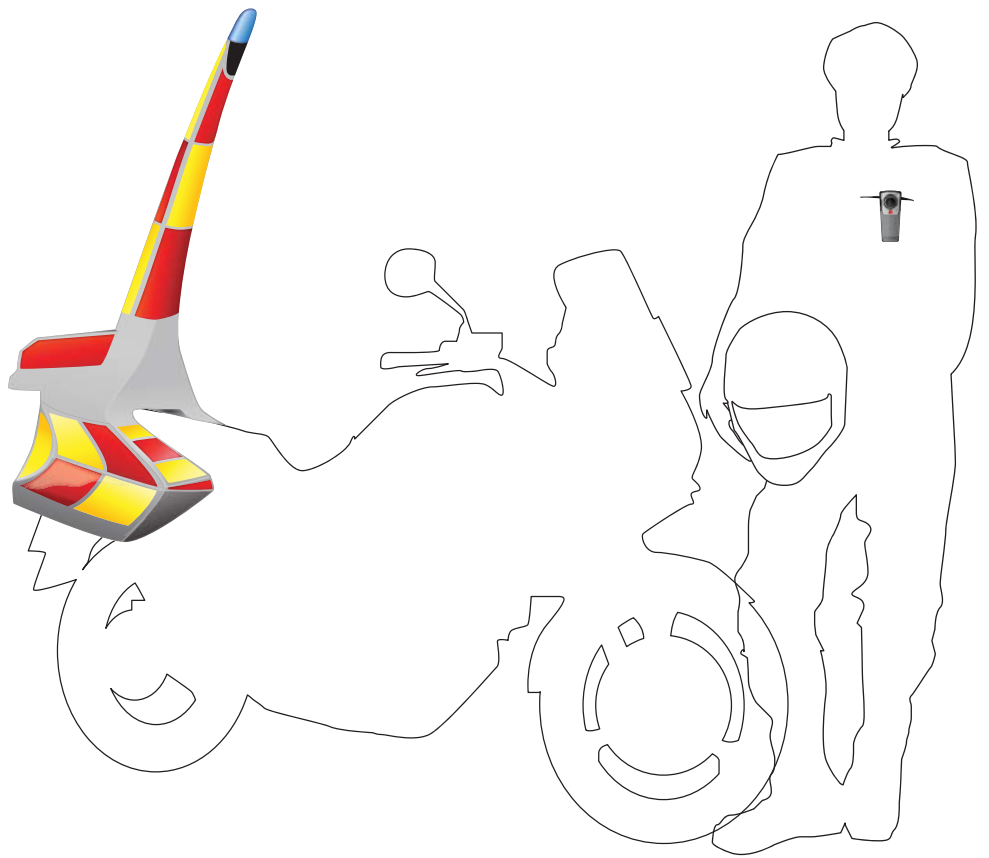
Rear-, front- and side view of the add on stowage.

The side stowage are opened outwards to make the tools more easy to access. In order to put less strain on the back and shoulders of the RU person, the angle for the fire extinguisher is slightly tilted. Instead of being forced to pull up and out the fire extinguisher, it slide out downwards.



CONCLUSION

There are of course more possibilities than the above presented for the RU role when it comes to the equipment. With the live experience of this role maybe additional equipment will be needed. However, to meet the demands for this role in order to provide fast access to the scene of accident (SoA), to make the following rescue action more efficient and to enable a greater feeling of comfort and security for the victims the concept above will fulfil these requirements.





PRODUCTION & LOGISTICS

In this chapter a theoretical estimation of the production and logistic solutions for the different tools in the RU's role is presented. The solutions are built upon assumptions and should be applied as a framework, When this project proceeds there may come up better or more suitable ways of solving these issues.

PRODUCTION

Add on stowage

The stowage shall be moulded in different sections that will be assembled together to one solid unit.

Video camera

The camera can be produced either by one of the well known electronic brands that is present on the market today but more preferably by a specialized manufacturer of electronic equipment for stressed environments. One example of this is Login AB in Helsingborg, a manufacturer of such devices for extreme environments.

MATERIAL

Add on stowage

A bio composite that has the properties:

- Strong
- Mouldable
- Light
- Preferable price range
- If crashed, no sharp pieces

Video camera

A strong bio composite material that will have the feature of being solid but at the same time light. The kind of material that today are used for electronic devices within BLO or the military service.

LIFE CYCLE

Add on stowage

Today the different vehicles in the BLO are exchanged between every third to every fifth year. It is important that the tools they use are working correctly and therefore the budget allows the city council to update their fleet of vehicles quite often. The RU's add on system will preferably have a life cycle of approximately five to seven years, still the vehicle can be exchanged within that period of time if necessary. Since the stowage consists of different modules e.g. cases that can open, these will independently be exchangeable if needed. Depending on the material it will at the most be recyclable.

Video camera

The electronics will be to the most extend recyclable. The bio composite parts shall also be to the very extend recyclable.

SAFETY

Personal

The users safety always has the highest priority within the BLO. This is the same in the RU. The uniform has to live up to extremely high standards, covering both safety on the road and on the SoA. For example the suit has to be non-flammable, flexible and preferably lighter than the fire fighters uniform. The world of motor sport, where e.g. rally or road racing motorcycles suits that has to perform in extreme situations are good examples of how to find manufacturers and materials to the RU's suit.

COSTS

Add on stowage

The initial cost to the stowage is producing the tools for moulding. By planning the production and using scale of economics when producing the modules the unit cost will decrease. Specifying the cost here is hard to do since it so much depends on how long the series are and where the manufacturing takes place.

Video camera

The discussion above regarding scale of economics are to be applied to the video camera as well. Since the functionality here are very similar to already existing devices for recording, preferably some electronic can be adopted from existing solutions and by this cut costs.

INSTALLATION

Add on stowage

The installation is supposed to be done by professionals, since there is a lot of complexity regarding the installation, for example the electronics and safety. There is also reflector stickers that has to be properly attached in order for the motorcycle to be noticed. These reflector stickers are the same kind as the fire trucks and ambulance uses on the vehicles.

SERVICE

Add on stowage

Ordinary and daily maintenance is done by the RU, like changing light bulbs on the add-on system and washing.

In case of more extended service to the motorbike and the add-on equipment this is to be contracted with a minimum of retail chains of motorcycles in order to gain a better contract and hold down the costs.

Video camera

Since the video camera includes high technological electronics, all maintenance and repair has to be performed by the maintenance organization that the manufacturer recommend.

LOGISTIC

Add on stowage

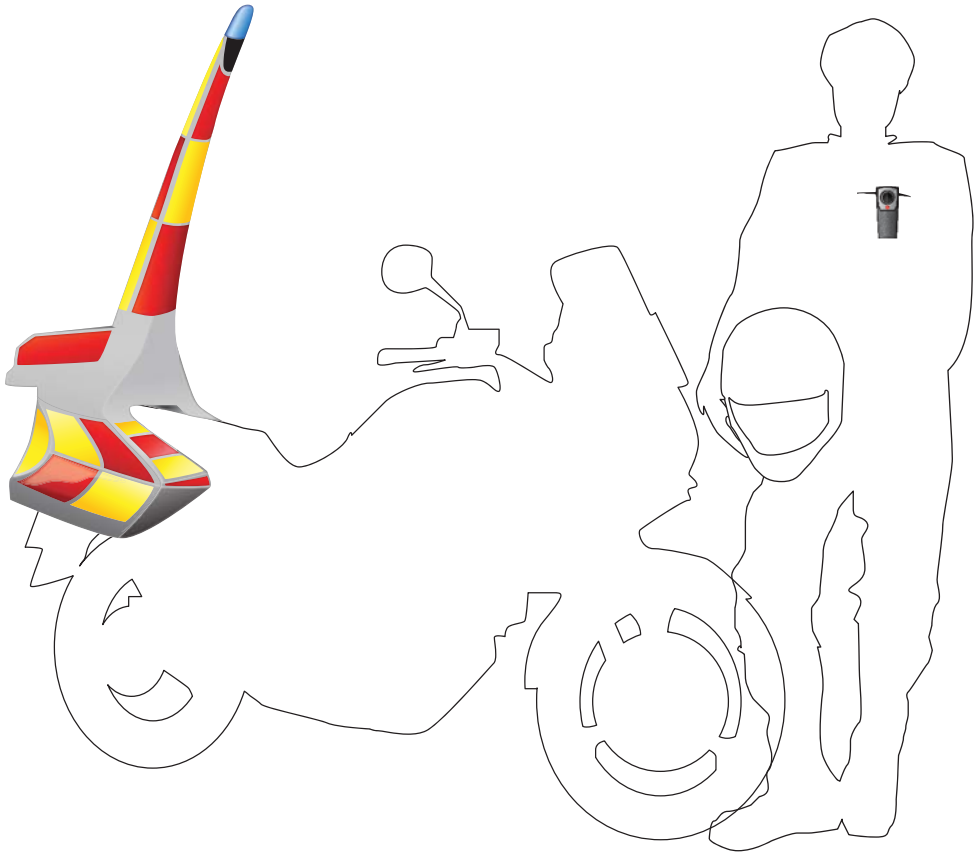
Since the add-on equipment has to be installed by a professional as already mentioned, and by, also as mentioned, only few retail chains, the shipment from the manufacturer has to go to the retailer that will attach the modules to the motorbike. Transportation shall be what suits the distance best between the manufacturer and the retailer that will install the unit on the motorbike.

Video camera

The video camera can preferably be sent to the local BLO organisation directly with the appropriate transportation method there is with the distance in mind.



CONCLUSION



This project started by the aim to:

“Design a system that provide fast access to the scene of accident (SoA), both physical and visual, in order to make the following rescue action more efficient and to enable a greater feeling of comfort and security for the victims.”

The result to this is a new role within the BLO that is called the Rapid Unit (RU) that consists of a person, a motorcycle with attached equipment in stowages and a video camera that can stream live pictures from the SoA. One more criteria was set up to this project, and that was:

“This product shall be able to be a reality within 3-5 years. Because of this the product can not be too conceptual, but instead rely on technology that exists today or that are in the final stage of development.”

All technology that the RU uses are live today in different shapes, both video cameras and stowages adjusted for motorcycles are things that already exists today. Both the manufacturing and organizations to manufacture, assemble and maintain the equipment are present today on the market. The organization that will incorporate the role of RU is also functioning today namely the BLO organization. A main question is if the BLO organization sees a need for such unit as the RU. Hans Ivarsson, Catastrophe and Emergency Planning Chief Physician for the southern Sweden strongly believes that a RU role as presented in this master thesis is a very good tool considering today's development of the traffic situation. He sees a great need for the RU in a near future.

Moreover, during the process of this project it became clear that the rescue service in Båstad have dedicated the squad leader to arrive first at a SoA as the “First action person” (Första insatsperson) with help of special equipped cars to provide a fast access to the SoA and start the rescue mission in order to save time and save life.

The RU presented in this report can be viewed as the “next step” in this process by dedicating a full time role to this and give the person a more flexible tool. By the statements above the conclusion is to be drawn that the RU is needed and is in line with how the BLO could work in a near future.

ACKNOWLEDGEMENT

The author of this report is very grateful to the following for their help in the creation of this project:

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David Georgsson

SOURCE

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INTERVIEWS

Daniel Lantz, age 46, full time firefighter

Martina Johansson, age 23, firefighter and ECC operator

Sören Johansson, age 48, MC police

Hanna Björklund, age 30, social worker

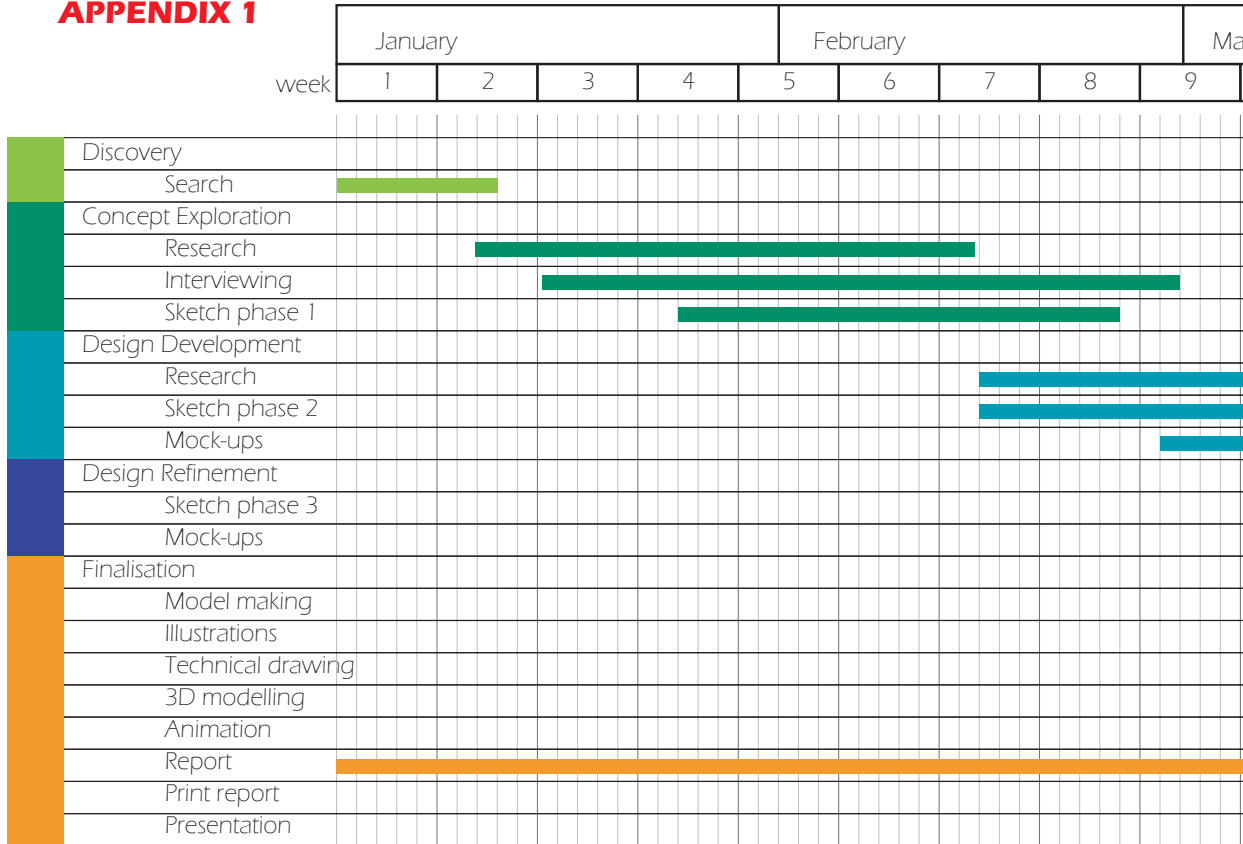
Lina Manninge, age 29, teacher

Hans Ivarsson, Catastrophe and Emergency Planning Chief Physician

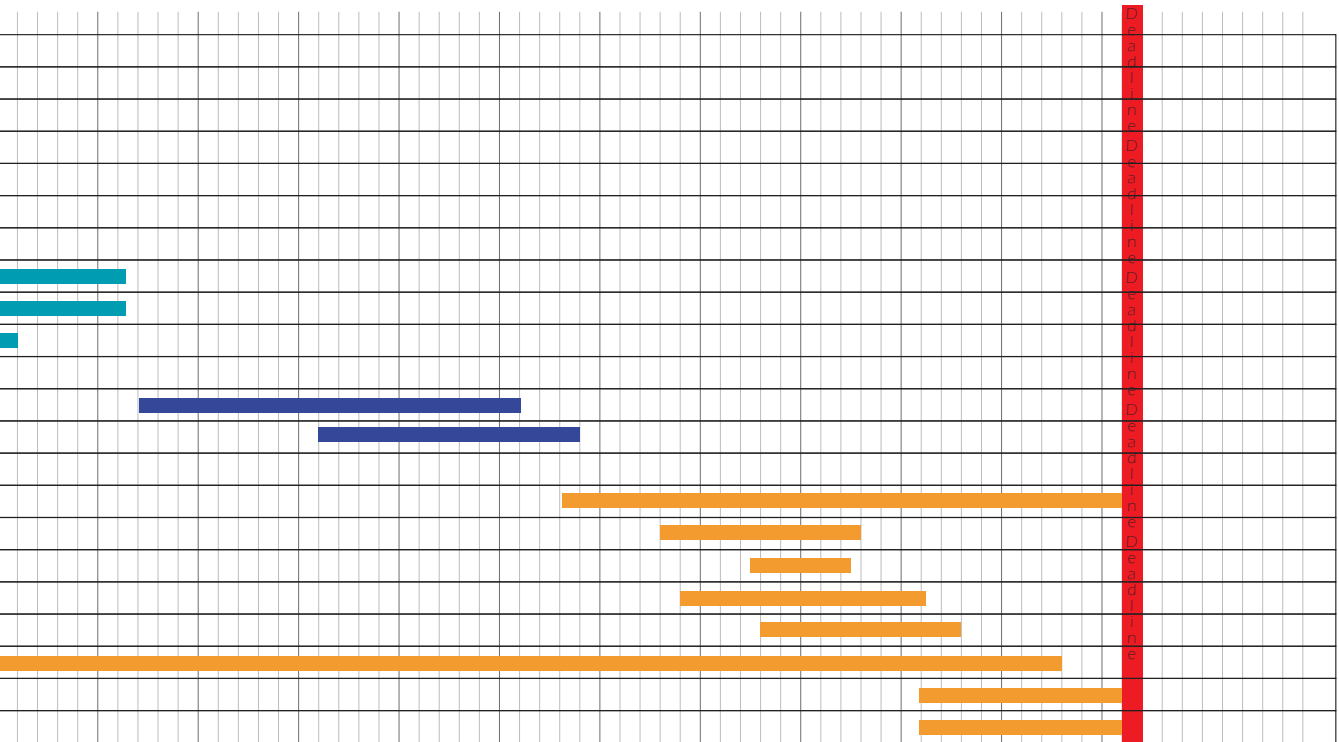


APPENDIX

APPENDIX 1



March				April				May				
10	11	12	13	14	15	16	17	18	19	20	21	22



APPENDIX 2

R1.01

R1.01.01 House
R1.01.02 Multiple family house
R1.01.03 Smaller extend
R1.01.04 Garage/ Parking house
R1.01.05 Basement
R1.01.06 Garbage room
R1.01.07 Stair house
R1.01.08 Attic
R1.01.10 Nursing home, day
R1.01.11 Nursing home 24 h
R1.01.12 Kindergarten/ School
R1.01.13 Hotel
R1.01.14 Public premises
R1.01.15 Department store/ Fair
R1.01.16 Industry high risk factor
R1.01.17 Industry
R1.01.20 Church
R1.01.21 Castle/ Manor
R1.01.22 Farm
R1.01.23 Underground
R1.01.24 Military
R1.01.25 Power plant
R1.01.28 Soot fire
R1.01.30 Other

R1.02

R1.02.01 Grass
R1.02.02 Forest
R1.02.03 Container
R1.02.04 Container free standing
R1.02.05 Garbage dump
R1.02.08 Camping spot
R1.02.10 Crop field
R1.02.11 Reed
R1.02.12 Peat bog/ Swamp
R1.02.13 Shooting range
R1.02.30 Other

R1.03

R1.03.01 Major
R1.03.02 Minor
R1.03.03 Bus
R1.03.06 Dangerous goods
R1.03.07 Flammable goods
R1.03.10 In tunnel
R1.03.16 Combine harvester
R1.03.30 Other

Fire Building

House
Multiple family house
Smaller extend
Garage/ Parking house
Basement
Garbage room
Stair house
Attic
Nursing home, day
Nursing home 24 h
Kindergarten/ School
Hotel
Public premises
Department store/ Fair
Industry high risk factor
Industry
Church
Castle/ Manor
Farm
Underground
Military
Power plant
Soot fire
Other

Fire Outdoors

Grass
Forest
Container
Container free standing
Garbage dump
Camping spot
Crop field
Reed
Peat bog/ Swamp
Shooting range
Other

Fire Vehicle

Major
Minor
Bus
Dangerous goods
Flammable goods
In tunnel
Combine harvester
Other

R1.06

R1.06.01 Jammed
R1.06.02 Major
R1.06.03 Minor
R1.06.04 Other vehicle
R1.06.05 Person hit
R1.06.06 Dangerous goods
R1.06.07 Flammable goods
R1.06.08 decontamination
R1.06.10 In tunnel
R1.06.16 Traffic route
R1.06.30 Other

R1.07

R1.07.01 Person hit
R1.07.02 Vehicle hit
R1.07.03 Passenger train
R1.07.04 Goods train
R1.07.05 Fire
R1.07.06 Dangerous goods
R1.07.07 Flammable goods
R1.07.10 In tunnel
R1.07.30 Other

R1.09

R1.09.01 Person hit
R1.09.02 Vehicle hit
R1.09.03 Collision
R1.09.05 Fire
R1.09.10 In tunnel
R1.09.30 Other

R1.10

R1.10.01 Crash happened
R1.10.02 Crash assumed
R1.10.03 Danger for crash
R1.10.04 Hijacking
R1.10.07 Other vehicle
R1.10.07 Other

R1.11

R1.11.01 Fire
R1.11.02 Aground
R1.11.03 Collision
R1.11.04 Capsizing
R1.11.29 Distress signal
R1.11.30 Other

Traffic Accident

Jammed
Major
Minor
Other vehicle
Person hit
Dangerous goods
Flammable goods
decontamination
In tunnel
Traffic route
Other

Train

Person hit
Vehicle hit
Passenger train
Goods train
Fire
Dangerous goods
Flammable goods
In tunnel
Other

Tram

Person hit
Vehicle hit
Collision
Fire
In tunnel
Other

Aviation

Crash happened
Crash assumed
Danger for crash
Hijacking
Other vehicle
Other

Ship

Fire
Aground
Collision
Capsizing
Distress signal
Other

R1.12

R1.12.01
 R1.12.02
 R1.12.03
 R1.12.04
 R1.12.07
 R1.12.29
 R1.12.30

Boat

Fire
 Aground
 Collision
 Capsizing
 Wind surfer
 Distress signal
 Other

R1.14

R1.14.01
 R1.14.02
 R1.14.03
 R1.14.04
 R1.14.05
 R1.14.06
 R1.14.07
 R1.14.08
 R1.14.09
 R1.14.10
 R1.14.29
 R1.14.30

Life-saving

Drowning
 Diving accident
 Jammed
 Locked up
 Stuck in elevator
 Difficult position
 Wind surfer
 Electricity accident
 Jump off-threat
 Ambulance assistance
 Distress signal
 Other

R1.15

R1.15.01
 R1.15.02
 R1.15.30

Animal-saving

Major
 Minor
 Other

R1.16

R1.17.01
 R1.17.02
 R1.17.03
 R1.17.04
 R1.17.30

Oil damage

On land
 In watercourse
 In harbour
 At sea
 Other

R1.18

R1.18.01
 R1.18.02
 R1.18.30

Flooding

In building
 Out in the open
 Other

R1.19

R1.19.01
 R1.19.02
 R1.19.03
 R1.19.04
 R1.19.07
 R1.19.30

Dangerous goods

Major
 Minor
 Gas
 Radioactive
 Flammable goods
 Other

R1.20

Nuclear power plant

R1.22

Extinction help

R1.23

R1.23.01
 R1.23.02
 R1.23.03
 R1.23.30

Automatic alarm

With deal
 Without deal
 Elevator
 Other

R1.24

R1.24.01
 R1.24.02
 R1.24.03
 R1.24.04
 R1.24.30

Slide

Major
 Minor
 Jammed
 Trapped
 Other

R1.25

R1.25.01
 R1.25.02
 R1.25.30

Storm/ Snow

Injury
 Hindrance
 Other

R1.26

R1.26.01
 R1.26.02
 R1.26.03
 R1.26.30

Threat

Bomb scare
 Sabotage
 Own central
 Other

R1.29

R1.29.01
 R1.29.02
 R1.29.03
 R1.29.05
 R1.29.30

Examination

Smell of smoke outdoors
 Smell of smoke, building
 Smell of gas
 Fire
 Other

R1.30
 R1.30.01

Other
 Telephone line down

R2.30
 R2.30.01
 R2.30.02
 R2.30.03

Other
 Residual value
 Service
 Water transportation

Commander alarm

Commander Chief alarm

Level 1

Level 2

Level 3

APPENDIX 3

Questions to Fire squad leader (FSL):

- How long does it take to get to the SoA with fire trucks versus FSL car .
- What role does the FSL car play?
- When to use the FSL car?
- What tools are in the FSL car?
- What kind of alarms do you receive?
- Are there any statistic over the type of turnout and alarms?
- What is the firefighters tasks?
- What is the FSL's tasks?
- Who arrives first at SoA?
- Who arrives last at SoA?
- How do you treat the victims at SoA?
- Does the firefighters get any psychological education?
- How does the victims react at the SoA?
- Do you have any follow up with the victims afterwards?
- Have it sometimes been any problems with the accessibility to SoA?

Questions to ECC operator:

- What criteria is valid on different alarms?
- How do you decide what vehicles that should go out on different alarms?
- What decides how many vehicles that should be sent out on an alarm?
- Do you feel there is a need for another kind of vehicle to send out sometimes?
- Is there any alarms that is to small to send out a big fire truck on?

Questions to a motorcycle police:

- When is the police motorcycle used?
- What is the benefit of using a motorcycle in a turnout?
- What is the disadvantages?
- Does the different seasons affect the use of the motorcycle in a turnout?
- What motorcycles are used in the police force?
- Are there any off road motorcycles in use within the police force?
- Are there any specific model of motorcycle that are more suited to city traffic?
- What equipment are to be find at a police motorcycle?

Questions to a victim in a SoA:

- Please describe the situation of SoA.
- How did you feel before the fire squad arrived?
- How did you feel after the fire squad arrived?
- Who arrived first at SoA, a fire truck or a FSL car?
- Was it easy to understand who was in charge of the rescue mission?
- Did you receive enough information of the procedure?
- How did you feel about the follow up?
- Did you miss anything in the procedure at SoA?

Questions to ambulance nurse:

- What kind of education in psychology have you received in your profession?
- Where does the alarm from SOS go to?
- Please describe what happens when you receive an alarm.
- Do you have any time limits like the fire squad, like be rolling within 90 seconds?
- Who's in charge over the emergency vehicles?
- How are you organized inside the ambulance?
- What does it use to look like when you come to a SoA?
- Are there any rescue organizations already there?
- What kind of alarms do you go on to?



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