2011 EMERGENCY SERVICES FOUNDATION SCHOLARSHIP RECOMMENDATIONS

"Rapid extrication of time critical patients involved in motor vehicle accidents"

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Executive Summary

Firstly I would like to thank the Emergency Services Foundation for the opportunity to undertake this study which has proven to both expand my personal knowledge and identify a range of initiatives that I hope will be introduced into my organisation and adopted state-wide.

Through this scholarship I intend to increase the capability and capacity of the four combating agencies under emergency management for road accident rescue in Victoria.

I also wish to demonstrate through my research that a standardised approach to training; response; and equipment across the state of Victoria is very beneficial to a time critical patient involved in a vehicle collision.

RECOMMENDATIONS

OPERATIONS

- Review the roles and requirements of four rescue providers in Victoria
- Produce one document for road rescue operations in Victoria
- Reduce initial response times for road rescue intervention
- Investigate options for a rescue operator on the Helicopter Emergency Medical Service (HEMS) to enhance rescue response to rural areas
- Implement district road rescue trainers to provide all training, assessments and response for road rescue in their district across all 4 rescue providers

TRAINING

- Investigate having road rescue and trauma seminars for emergency services and health professionals in Victoria
- Inter disciplinary training between police, fire, ambulance, and rescue providers for road rescue
- Basic trauma training for all emergency services personnel
- Road rescue trainers to deliver lectures on road rescue to emergency services, health professionals and external clients
- Enhanced level of medical training for district road rescue trainers and rescue officers
- Enhanced rescue training for Air ambulance MICA and MICA paramedics

RESEARCH AND DEVELOPMENT

- Conduct a comprehensive trial between standard and rapid extrication techniques
- Expand research and development to maintain latest rescue techniques for new car technology

OUTCOME

The elimination of boundaries and ensuring the closest trained and best equipped rescue unit regardless of agency responses – WILL SAVE LIVES.

INTRODUCTION

Over the past 10 years I have undertaken a fire fighting role starting as a volunteer fire fighter and staff Operations Centre Officer with the South Australian Country Fire Service (SACFS) before moving to Victoria and joining the Melbourne Metropolitan Fire Brigade (MFB) as a career firefighter and the Country Fire Authority (CFA) as a volunteer.

During this time as a rescue operator I have attended numerous serious injury and fatal road accidents; this combined with personal tragedy has caused me to have a strong interest in the dynamics of road rescue and trauma.

This interest has led me to research worldwide best practices for road rescue extrication from which I identified Europe as the world leaders in road accident rescue innovation, in particular Norway with its rapid extrication techniques and Nottinghamshire with its Special Rescue Teams.

It is important to note that in Victoria four emergency services are responsible for road accident rescue. In the metropolitan fire district it is the MFB and outer metropolitan and country areas it is zoned either CFA, Victorian State Emergency Service (VICSES) or volunteer rescue squads based out of Echuca-Moama and Shepparton. These services are governed by the Emergency Management Act and defined by municipal boundaries.

I wish to make it clear that I approach all of my research and recommendations from a time critical patient point of view.

This report will feature the three phases I undertook on my Emergency Services Scholarship (ESF) and will conclude with three focus areas of recommendations for road rescue in Victoria.

Phases

- Norway – Rapid Extrication techniques
- Netherlands – Holmatro rescue equipment
- United Kingdom – Nottinghamshire Special Rescue Teams.

Recommendations

- Operations
- Training
- Research and Development

AIM:

My aim for the Emergency Services Foundation scholarship was to research, investigate and develop methods to expand the current extrication techniques and improve extrication times for patients who have been assessed as being time critical.

I intended to investigate and observe how emergency services cooperate in Europe using the latest techniques, knowledge and equipment in the field of road accident rescue and pre-hospital care.

Through my research I propose to develop initiatives that increase the capability and capacity of the four road accident rescue controlling agencies under the current emergency management arrangements in Victoria.

I also wish to highlight the benefits of a standardised approach in training, response, and equipment used in road accident rescue across all first response emergency services such as Police, Fire and Ambulance would greatly assist time critical patients.

Road rescue response times may vary between urban and rural areas but the standards for extrication and specifically the extrication time should not differ between the two geographical locations if the same training and techniques are implemented across the state of Victoria.

The Victorian community should have confidence they will receive the best possible outcome if involved in a serious vehicle accident regardless of where the accident occurs. My research will display how this is achievable through standardised response and extrication techniques resulting in rapid transport to a major trauma facility in Victoria.

I also aim to prove that by eliminating service boundaries and ensuring the closest trained and best equipped rescue unit regardless of agency responses – WILL SAVE LIVES.

BACKGROUND

When the term the ‘‘Golden Hour’’ was first introduced in 1961 by R. Adams Cowley, rescue services tended to believe that it referred to the period of time between arriving on scene at a motor vehicle accident to placing the casualty in the ambulance, rather than ‘‘crash to knife’’ time.

In addition to the “golden hour” the United Kingdom adopted a concept of the ‘‘Platinum Ten Minutes’’. This was proposed as the ideal extrication time, as it was realised that time had to be allowed for transit and emergency department assessment. As a result pressure from trauma surgeons was placed on the ambulance service and road rescue providers to make extrication times quicker to assist in improving the survival rate of patients.

In Victoria the minimum standard for response time for a road rescue crew in a urban area is 20 minutes and in a rural area 40 minutes which takes into account the dispatch, turnout, travel time and arrival on scene. By using these standard times set out in the Road Rescue Arrangements for Victoria, it makes it nearly impossible for road rescue crews to extricate and Ambulance Victoria to transport a patient to a major trauma facility within the golden hour, thus significantly lowering the chance of a positive outcome for time critical patients.

Every person involved in a serious vehicle accident does not need to become a fatality, the more research into extrication techniques and the better prepared emergency services become will create a greater chance of part or full recovery for a critically injured person. This will not only save a huge emotional toll placed on Victorian communities but also a large financial burden that is associated with any vehicle collision.

The 2011 road toll for Victoria was 287, the lowest number of deadly crashes on record. Of the 287 fatalities 158 were in regional Victoria and 129 in metropolitan Melbourne.

In partnership with all emergency services, Government and other stakeholders it is acknowledged that improvements should continue to be developed surrounding both community education and emergency services response tactics to achieve a further decrease not only in the road toll but also in the often forgotten number of serious injuries that occur everyday.

Emergency services in Victoria must continue to focus on the research and development to improve the way they conduct themselves and approach road rescue and trauma. In every collision there is a human influence, whilst this is still a factor in the future collisions will always occur. Although technology has improved this often gives the public and first responders a false sense of security. Patients are now surviving the collision impact but becoming a fatal statistic through long on scene times during response, extrication and transport to definitive care.

It is our responsibility as emergency services to provide the highest level of response and care to the community.

NORWAY

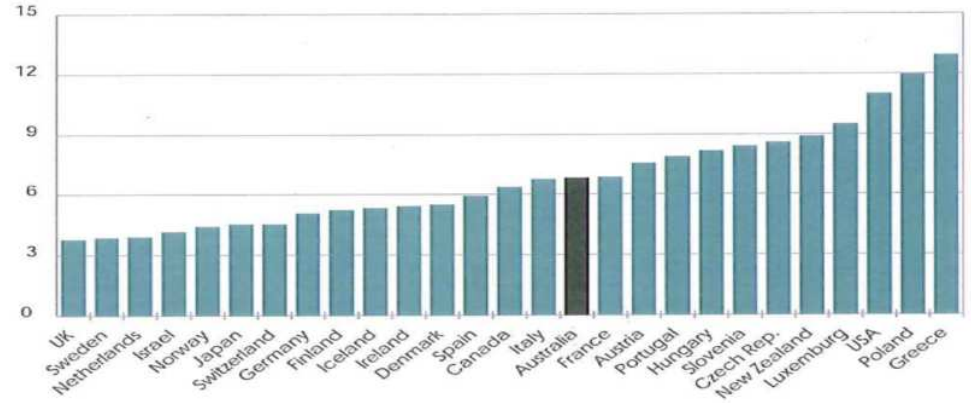
PHASE 1: Rapid Extrication

During my initial stages of research into Rapid extrication techniques I discovered a unique technique that is widely used at all time critical vehicle collisions in Norway.

Trauma surgeons from the Ulleval University hospital in Norway challenged the Norwegian Air Ambulance over 10 years ago to significantly reduce their on-scene time at vehicle accidents. To achieve this, a new approach and cooperation from the Fire Brigade, Ambulance and Police services in Norway had to be established. As a result old techniques from the 1960/70s were revamped and new tools adopted to bring extrication times down to 10 minutes.

The thought process behind rapid extrication is simple: **Save time = Save life.**

Figure 2: Road fatality rates per 100,000 population among OECD countries, 2009



In Figure 2 above Australia's road fatality rates per 100,000 population is clearly shown to be double that of the countries I visited on my research tour. The United Kingdom, Netherlands and Norway are amongst the leading countries in road trauma and extrication with the lowest fatality rates as a result of this high standard.

These new techniques ensure extrication is complete in the shortest possible time by reversing the forces of the accident in the extrication process. The aim of the quick release method is to pull the deformations out using winches at the point of impact, simultaneously using rescue tools for opening doors and strategically cutting / spreading in a certain order and system.

Patients who are trapped and especially where it has been identified that it was a high-energy impact will often have concealed injuries. Norwegian studies showed that uncontrolled bleeding and hypoxia are the main causes of mortality. As a result if the patient cannot be operated on or the full extent of injuries cannot be identified the patient must be transported to a major trauma facility as quickly as possible. Long extrication times and damage to the vehicles can make it more difficult for paramedics to administer the appropriate acute care thus the entrapment is the main delay for the transport to definitive care and why changes to the extrication techniques were required.

Rapid Extrication Technique

Extrication of entrapped patients from car accidents takes time. To save time a new technique based on reversing the forces of the original crash by anchoring the rear of the vehicle and pulling the steering wheel and the front window pillars forward with chains or slings was developed. An experimental trial of extrication of volunteers from car wrecks after frontal / oblique impacts was trialled resulting in significantly quicker extrication times using the new rapid technique. Avoiding uncontrolled movements in the wreck using the rapid technique was no more difficult than the standard technique

Fig 1

Driver is entrapped in vehicle

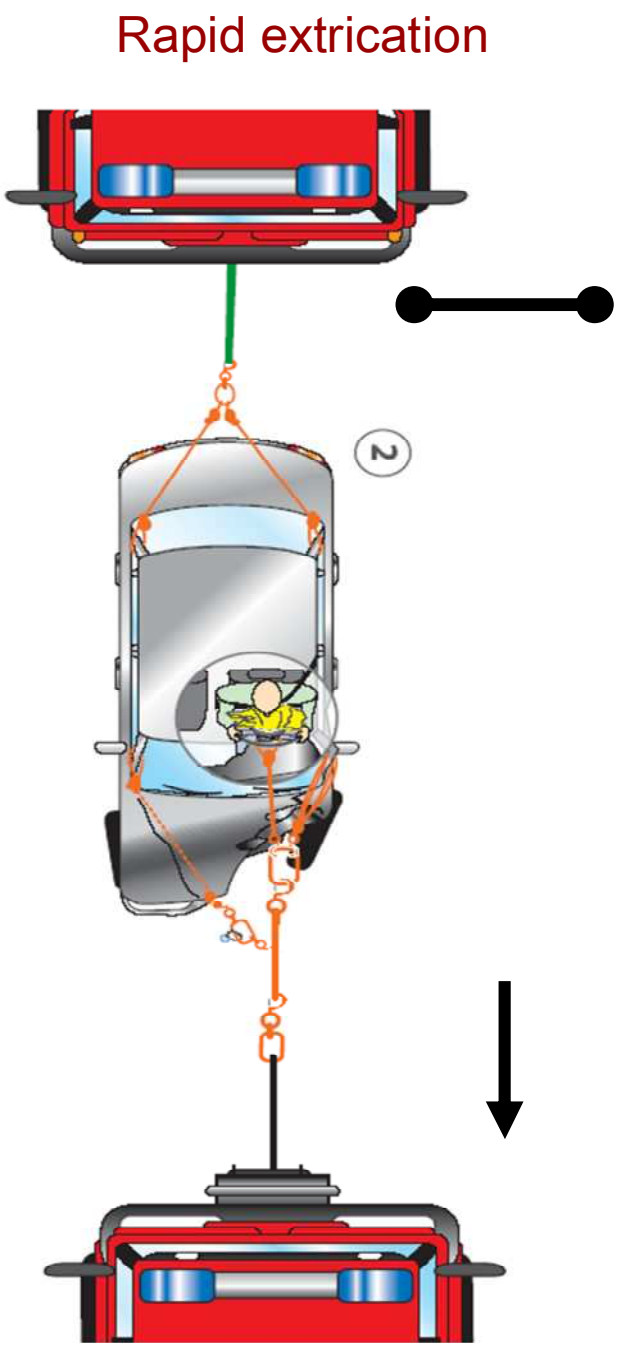


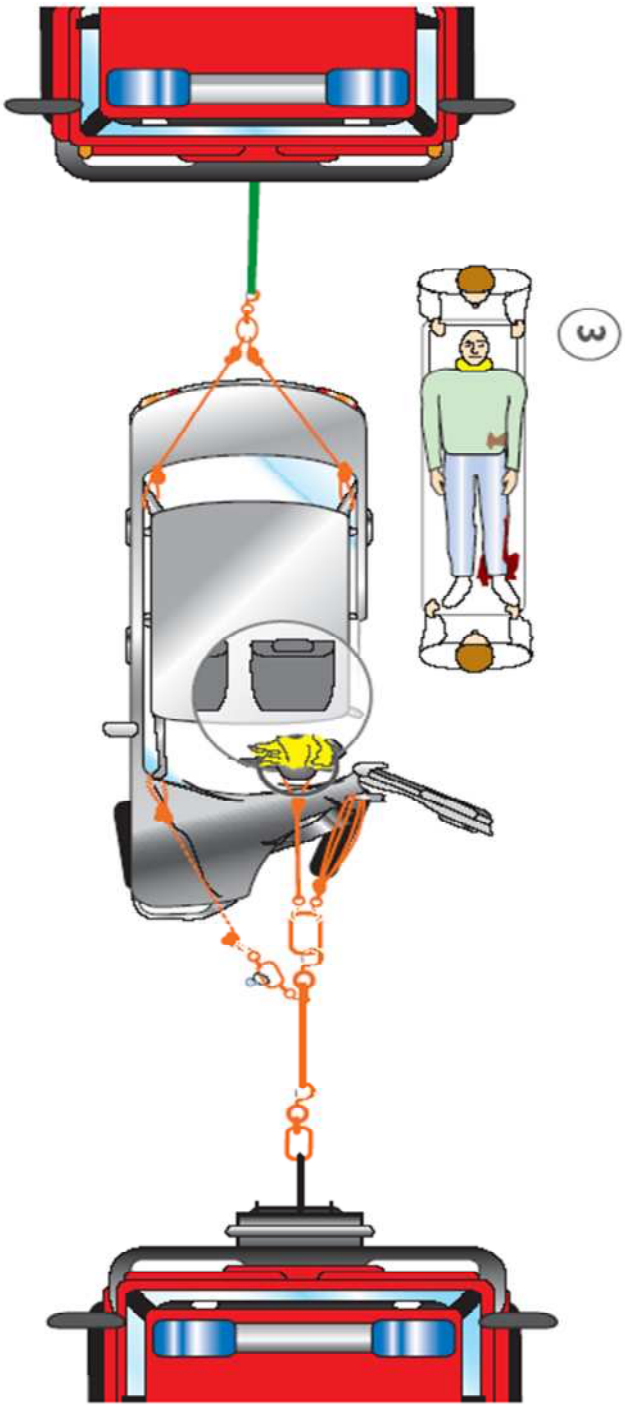
Figure 2 shows the standard configuration used in the rapid extrication technique.

The rapid extriction technique systematics are:

- Pull the steering column so the patient is relieved or released, also the A-pillar until it is in approximately the original position.
- Use the spreader to open left door.
- Cut left A-pillar high and down (just above the channel).
- Continue on the right side, but in the opposite order: Cut the A-pillar high, then use the spreader to open the door.
- Then cut the A-pillar close to the channel.
- Use single chains or a chain sling through both C-pillars via a strap back to a fire truck, pillar or something similar. This gives a better stability.
- If the car doesn't have C-pillars you may use the rear axle, spring perch or tow bar.
- One chain around the steering column, out through the front glass.
- One chain twice around left A-pillar as low as possible.
- The chains gathered in the hook of the winch. The chain coming from the steering column must be a bit more tightned than the one from the A-pillar.
- When the paramedic inside the vehicle has taken care of spine management they will let the rescue officer know they are ready to proceed. The rescue officer will then coordinate with both the winch operator and the paramedic inside the vehicle.
- The rescue officer will signal for the tention to be placed on the chains and will signal for winching to continue until the patient is released or the paramedic notifies him to stop winch operations.

Driver is extricated

- Once free the patient is loaded onto an awaiting stretcher and transported to a trauma hospital.



The first 10 minutes are crucial at any vehicle collision scene and the rapid extrication techniques take the following into account:

- 30 second primary survey to determine if patient is time critical or non critical;
- Identify life threatening conditions and intervene if needed;
- Rapid extrication of time critical patients;
- Rapid transport to major trauma facility; and
- Early warning for emergency departments.

The Fire Brigade is the primary rescue provider in Norway. Upon arrival at any road accident incident they always park their vehicles in a position to ready themselves for a rapid extrication if required. This proves to be a great time saving exercise at the same time it improves scene safety and traffic management. It is important to remove all civilian and emergency vehicles (police and ambulance) that are not required for the rapid extrication and allows the fire brigade 20 metres on both sides of the wrecked vehicle to perform rapid extrication without complications.

To ensure the extrication of time critical patients is done in the quickest and most practical time Norway have trialled and proven the use of winches in vehicle relocation. Any vehicle that is involved in a collision can often come to rest off the roadway, become entangled and wedged against or under an immovable object. Current practice has rescue operators attempting to carry out the extrication of the entrapped patient whilst the vehicle is still in its original crashed position.

The Norway practice is to relocate the vehicle using winching techniques with the patient still entrapped. These vehicle relocation techniques are used in the following scenarios to ensure the best outcome for the time critical patient:

- Relocate the vehicle/s back onto the roadway or track;
- Relocate vehicle/s by pulling apart from other vehicle/s involved;
- Relocate vehicle/s by pulling away from poles, trees, barrier and walls.

If a vehicle is less than 1500kg it can easily be righted manually on site to begin extrication. Remembering if rescue crews carry out any of these methods they must at all times ensure the patient is stabilised and being cared for during the relocation to maintain protection from further injury.

These actions can be viewed as aggressive and unnecessary by rescue operators but the reality in the current road rescue environment is that there is too much time spent on scene. There is a lack of understanding on the important issues surrounding the patient's survivability which means the extrication process is unnecessarily prolonged with the rescue operators believing that they are assisting the patient. Evidence gathered over 10 years of rapid extrication in Norway suggests extrication based on the health professional's primary survey at the scene will best determine the type and speed of the extrication.

Norway's major trauma facilities found only 17% of suspected spinal injury patients actually presented with a spinal injury with varying degrees of severity. The greatest fear of the medical and rescue services is an entrapped patient with a spinal injury, when this occurs the patient has to be extricated based on their medical condition not the physical entrapment.

The focus on spinal injuries has meant that emergency services care for the spine but do not treat or extricate the patient based on their other injuries both presenting or internal. These serious and potentially fatal injuries cause patients to bleed out and / or arrest whilst remaining trapped.

Although Victoria has some of the world's best MICA paramedics both on the road and in the air ambulance they are limited to what they can do for a patient who is trapped for a prolonged period. Unfortunately the only people that can save these patients are the trauma surgeons at the Victorias major trauma hospitals. It's important for emergency services to understand that a time critical patient is exactly that – Time Critical.

There are 4 people at any rapid extrication that have key roles to carry out:

Treating Paramedic

- Stay by or with patient;
- Determine if critical or non critical and provide ongoing assessments;
- Patient intervention and safety;
- Provide information and assurance to patient;
- Report to medical leader; and
- Communication with rescue officer.

Rescue officer

- Establish rescue command;
- Determine rescue requirements from patient provider based on patient primary assessment;
- Deploy rescue resources as required; and
- Command and control all movement during rapid extrication.

Rescue tool operator

- Operate hydraulic rescue equipment during rapid extrication;
- Pop front doors and clamp A pillar using spreaders; and
- Make cuts in the A pillar ready for winching.

Winch operator

- Position vehicle in preparation for winching;
- Operates winch during rapid extrication; and
- Follows commands of the rescue officer.

Key Observations

- Scene command standards reflected the time and success of the extrications;
- Defined roles and duties were predetermined to save time and confusion at the crash scene;
- Relocating vehicles can be done safely using correct techniques;
- Patient condition is determined quickly once on scene to implement the most appropriate extrication plan;
- Time critical patients can be extricated and ready for transport within the first 10 minutes of the rescue and paramedic units arriving at the crash scene.

TAS Course

BACKGROUND:

TAS translates to "Interdisciplinary Emergency Medical Cooperation".

A major incident has occurred when incident location, severity, type or number of victims require extraordinary resources. Major incidents are complex by nature and their unexpectedness favours an "all-hazards" approach. Since rescue capacity varies within systems, a major incident for a rural emergency service may not apply to a larger urban emergency service. Rapid access to advanced major incident management have proven to optimise resource use and improve patient outcome.

Major incident management involves responders from multiple rescue services and it traverses geographical and jurisdictional lines. Further, it involves multiple tasks such as leadership, preparation, risk-evaluation, triage, treatment and transport. Structuring and standardising these initiatives seems essential given the multitude of responders. In the absence of a consistent and interoperable national system for major incident management in Norway, the Norwegian Air Ambulance Foundation developed Interdisciplinary Emergency Service Cooperation Course (TAS). This is a no-cost training concept for all emergency services throughout the country. Since the TAS program was initiated in 1998, approximately 15,500 professionals have participated. The TAS-courses has gradually evolved and the principles for disaster health education as proposed by World Association for Disaster and Emergency Medicine have successively been adapted. Major incidents require systems that allow providers to follow their daily pattern of behaviour: the "doctrine of daily

routine". The TAS-concept train local inter-disciplinary cooperation and focus on simple field-friendly techniques.

In Norway I was hosted by Jan Einar Anderson the national TAS course coordinator for the Norsk Luft Ambulanse (NLA). The NLA which translates to (Norwegian Air Ambulance) has been delivering the TAS courses since 1998 to all municipalities of Norway.

The course promotes cooperation between all emergency services including:

- Ambulance and health resources;
- Fire; and
- Police.

The TAS 3 course includes the following content.

- Objectives; old methods saves lives;
- Role of the police at the scene;
- Energy and damage mechanics, health care reviews;
- Communication, coordination and management;
- Practical demonstration- necessary equipment in the recommended standard setup;
- Safety in cars - design, old and new technology;
- HSE - Certification of equipment ;
- Theoretical and practical exercises (tabletop models, interior and exterior);
- Difficult rescue - the movement of cars - on the roof and side - the use of the winch / manual force (outside);
- Heavy vehicle rapid extrication;
- TAS OPEN (Optimised Patient Evacuation Norway);
- Mass Casualty exercise involving Bus;
- Closing exercises.

During the extrication process the trauma victim is at high risk for additional injuries or aggravation of existing lesions. Improper handling during extrication with poor concern and knowledge of the ongoing resuscitation process may increase the time spent at the scene and expose the patient to unnecessary risks. Studies have reported a significant number of neurological injuries that appear to be a result of the extrication process or of inadequate immobilisation during patient transport. Recent work also underlines the need for appropriate and situation adapted Advanced Life Support (ALS) procedures to improve outcomes after pre-hospital trauma resuscitation.

The training focuses on enhanced liaison between medical and technical team members to optimise synchronisation of operations. The course consists of both theoretical lectures and practical training in different crash scenarios. The complexity of the scenarios increases throughout the course and different extrication techniques and strategies are practised. Both the times to extrication and on-scene times were reduced during the course. Intervention and handling of the patient were also improved, in terms of early recognition of medical and technical risks and reduction of the time of no therapy.

All Participants receive training in the quick release, interoperability communications and interaction by means of theoretical and practical group work over the two days. The course focuses on small to medium sized disasters.

Through these rapid extrication techniques the Norway emergency services are preventing deaths through timely appropriate pre-hospital care and prompt transport to specialist trauma care.

I attended a 2 day TAS 3 course in Kongsvinger, a large country centre town near the Swedish border. The first day crews focused on the area of Rapid extrication which they have all done before so was more like a refresher course using various different scenarios. During the scenarios they implemented different order of arrival on scene to ensure any emergency service could make the same rapid assessment and size up of the scene and provide primary care no matter what the arrival order was. The rapid extrication exercises went reasonably well with some minor problems identified. These problems were incorrect techniques and lack of leadership, these were only seen as problems because of the high level of standard the Norwegian Air Ambulance trainers have and all patients were extricated using both rapid extrication and standard techniques within 20 minutes from time of arrival.

Training is always the best environment to learn and develop individual learning. It was highlighted during these exercises that the rapid extrication technique is to be utilised as another tool in the rescuers toolbox and should be considered for use for time critical patients trapped in a vehicle. Rescue operators must be proficient at their tool work and standard extrication techniques which are used in conjunction with the rapid extrication technique are still required and make it so successful. The problems identified were minor but highlighted the cooperation required between different agencies and the need for an understanding of a common methodology.

The second day of the TAS 3 course is dedicated to learning about large vehicle and multi casualty incidents. The participants are shown how to perform a rapid extrication on a large vehicle such as a prime mover or bus. As part of this a large scale bus crash scenario is setup and the TAS OPEN methods learnt are employed where emergency services have 30 minutes to extricate and triage all patients accordingly.

TAS OPEN uses the same goal as rapid extrication SAVE TIME-SAVE LIVES.

Their main goal is for people to be more efficient on scene by implementing:

- 1 patient = 1 stretcher
- Utilising the stretcher and bubble-wrap to prevent hypothermia
- Use of everybody on scene while paramedics treat patient/s
- Triage
- Right patient, right hospital, right time

An integral part of the NLA services are education programs that are provided to external clients. I attended one of these programs at the Konnerud School on the outskirts of Drammen city.

Their school program begins with a rapid extrication. A vehicle is dropped from a crane to replicate an impact of 80-100km/h. This of course immediately got the attention of all audience members. Drama students then play the role of entrapped patients. Every emergency service is involved in a real time rapid extrication scenario with the patients being loaded into an air ambulance. On completion each emergency service involved makes a presentation to the students about road trauma, their specific roles and the preventative measures that should be taken to stop the road toll in Norway.

NLA deliver further training beyond the TAS 3 course to the leadership groups in every emergency service. I attended the police training centre in Stavern for a lecture to the newly promoted police commanders whose role is scene commander at any vehicle collision in Norway.

Key observations

- The TAS courses are run with the intention of training all emergency services to the same standard country wide to ensure consistency and best practise is delivered at an incident;
- Having one governing agency deliver all the TAS courses meant one course was delivered not agency specific courses that varied in protocols and procedures. This saved any confusion toward roles and responsibilities at the scene of a vehicle collision;
- Each agency attending the TAS course gave everyone an insight into the operation of a vehicle collision scene as a whole which led to greater understanding and knowledge of each agencies tasks and what they involved;
- It was important for NLA to run further training with agency scene commanders as part of their promotional courses to ensure they remained consistent and updated throughout their career and different leadership positions.

The NLA core business is providing air ambulance support throughout Norway. They operate out of strategically placed bases with a crew configuration of 3; a pilot, rescue man and doctor.

The pilots are very experienced often coming from a military background. Their skills and precision is evident when they safely manoeuvre and land on roadways, steep mountains and ravines as close to accident scenes as possible.

The rescue crew member's role on the air ambulance is to provide all rescue elements that may be required at an incident and provide medical support to the doctor. The rescue crew member is an experienced rescue operator and provides support at a vehicle collision if the extrication has not been completed upon their arrival. In such a case they can establish from the air crew doctor what the requirements are for the extrication and formulate a rescue plan with the rescue officer. This is to ensure the most critical patients are attended to in a timely manner and adequate air and road ambulance resources are responded.

The doctor on the air ambulance is an experienced anaesthetist who is trained in medical emergencies outside the normal hospital environment. They are from the major trauma facilities in Norway and spend time in both the hospital and the air ambulance to maintain an equal skill set and knowledge.

I spent a full shift with the Air ambulance crew based in Lorenskog near Oslo. They have both an EC135 and EC145 Eurocopter at their base with 2 full crews of 3 on standby at all times. They have a Mercedes Benz vehicle which can be used for road rapid response. Due to their location being close to Oslo they can respond into the city, major freeway systems and tunnels rapidly without the need for the air ambulance. This is also a contingency plan for bad weather or grounding of the air ambulance, they are still able to respond the doctor and rescue crew member to the scene to assist at any time.

Key observations

- NLA operated both smaller Eurocopter and larger sea-king helicopters this gives them greater flexibility and the capability to response to both metropolitan and country incidents. The type of aircraft used will be determined by the incident with regards to location, access, number of patients and conditions. etc;
- The NLA are dispatched to incidents at the same time as road crews to ensure a rapid response for time critical patients. If determined not to be required they are stood down. Norway emergency services are dispatched on a worst case scenario to ensure no time is lost in response or waiting for specialist services;
- The rescue crew member on the NLA air ambulance is highly trained in critical patient extrication. Due to the possibility of the NLA crew being the first on scene the rescue crew member can immediately provide advice, operator assistance or scene command at an extrication to ensure the best patient outcome.

THE NETHERLANDS

PHASE 2: Holmatro Rescue Equipment

The Holmatro Group was founded in 1967 and has been manufacturing and supplying high-pressure hydraulic equipment and systems for specialised industries around the world since.

The Holmatro Group has two main business units:

- **Holmatro Rescue equipment** manufactures high-pressure hydraulic equipment and systems for fire & rescue departments and special tactic teams (navy, army and police).

- **Holmatro Industrial equipment** has four product ranges:

    - Lifting
    - Cutting
    - Foundry
    - Marine Hydraulics

Holmatro has been supplying Victoria's rescue services with equipment and training for many years. They are considered a world leader in rescue equipment constantly designing devices to assist with rescues involving new / modern vehicles

New car safety technology whilst creating safety for drivers / passengers and other road users can hamper rescue efforts especially in terms of gaining access to and the extrication of patients. With time being a critical factor it is vital that all road rescue crews are provided with the appropriate equipment and appropriate training.

New cars are using ultra high-strength steels such as Boron. This type of steel is often found in A and B pillars, roof rails, rocker panels and door collision beams. The nature of this steel makes it difficult to cut, bend or remove. Other challenges include inbuilt safety systems such as airbags, seatbelt pre-tensioners, anti-lock braking systems (ABS), traction control systems (TCS), electronic stability control (ESC) systems and speed limitation devices all of which have the potential to disrupt rescue attempts.

As part of my research I wanted to investigate not only the new equipment designed to overcome these new challenges but also to see and hear firsthand about Holmatro's latest tools and innovations. To achieve this I visited the Holmatro Rescue Equipment head office in Raamsdonksveer, where I met with the Asia-Pacific manager Antoon Burgers.

Holmatro's Asia pacific manager Antoon Burger (Left) and myself (Right)

From the moment I arrived in Amsterdam the Holmatro group were extremely helpful and accommodating. Mr Burgers and I had numerous in depth discussions about current rescue operations and the future requirements for Victorian road rescue providers. This was a two way street – I learnt their direction and thoughts for the future while they received direct client feedback which Mr Burgers said would assist their research and development, marketing and servicing teams to enhance the level of product service.

I received a personal guided tour of the Holmatro factory with Mr Burgers at which time he explained in great detail the processes Holmatro go through from the concept stage to the final product ready for use / export.

I was very impressed by the detail and professionalism showed throughout the factory, the attention to detail in the processes of building and testing the equipment proved why Holmatro are world leaders in rescue equipment. Holmatro have a dedicated research and development team that test new designs and technology in both tools and training.

New product showroom in Holmatro's head office, Rammsdonksveer

At the conclusion of my tour I was taken to the vehicle testing area where I was able to test and offer some evaluation on some of Holmatro's latest rescue equipment. It was very apparent that they were attempting to keep up with the vehicle industry.

Rescue operators will unfortunately always be behind the vehicle industry technological advances. This is forcing rescue operators to develop and modify existing techniques to extricate entrapped patients from vehicles.

I had the opportunity to view and trial a newly developed New Car Technology (NCT) cutter that was significantly stronger and faster than the current tools we use. This continuing development Holmatro has in their NCT cutters will keep rescue operators world wide in close pursuit of engineering developments used in new vehicles.

Another way Holmatro is assisting rescue operators is by producing rescue tools that make the extrications quicker and safer. The recently relesead Extendo ram XR 4360 was on trial at the Holmatro factory during my tour and I was able to test its performance on a modern vehicle. The concept behind this tool is its ability to extend the ram to the desired length in a single movement of a secondary shaft so the ram is set in place immedialetly creating a safe working platform to push off and make the ramming action faster.

I learnt a lot from my visit to Holmatro that can be brought back to Victoria. Our state was one of the last in Australia and the world to run a fleet of heavy rescue vehicles. These vehicles mostly operate on power take off (PTO) truck mounted hydraulic lines. This was an interesting discovery to note that Victoria was the focus

of the rescue worlds attention as to why we were one of the last to operate in this manner.

Holmatro provided me with so much more than just a rescue equipment supplier. Their depth of knowledge and development is something I want to highlight to the Victorian Emergency Services.

They provide valuable and highly professional training in road rescue extrication and this is something we should use in future training opportunities. Utilsing the information and knwoeldge from the Holmatro research and development team wouold help our learning and strive to build a stronger relationship with companies like Holmatro to ultimately reach the goals of rapid extrication.

UNITED KINGDOM

PHASE 3: Specialist Rescue Team

Nottinghamshire Fire and Rescue Service (NFRS) have implemented various forms of rescue equipment and rescue units to make their extrications easier and more time effective. By having specialist rescue teams and specialist rescue vehicles in their fleet they can maintain outstanding rescue coverage within their municipality.

I believed it was important to gain an insight into their organisation. This fire and rescue service has adopted and modified many different aspects of road accident rescue and now highlights to other areas and jurisdictions why they are considered the world's best practice in patient extrication.

NFRS have developed and implemented two Special Rescue Teams (SRT). These teams are intended to perform rescue duties only. The SRT is used to rescue people and animals from situations which require specialist skills / training and techniques because the circumstances are more complex or unusual.

The Specialist Rescue Team (SRT) was formed following a review of Nottinghamshire Fire & Rescue Service's response to non fire related emergency calls. This review was prompted following a change in legislation surrounding the Fire & Rescue Services Act 2004, which gave Fire & Rescues a statutory duty to respond to `rescue related incidents.

The team attended over 650 emergency calls in 2009 and over 700 in 2010 offering Specialist Technical Rescue assistance to local fire crews. The majority of the incidents the team attend are Road Traffic Collisions but their full duties include –

- Road traffic collisions involving particularly large or heavy vehicles, or multiple vehicles;
- Rescue from height using ropes;
- Water rescue;
- Animal rescue from water, ditches or vehicles;
- Confined space rescue;
- Industrial Accidents;
- Collapsed Buildings;
- Assist the Ambulance Service with Bariatric Persons.

The team operate from two strategic locations.

- Highfields Fire Station located near central Nottingham covers the Southern regions. This station has full time staff comprising NFRS Specialist appliances along with normal general purpose pumpers.

HIGHFIELDS FIRE STATION

- Tuxford Fire Station is located in the North of the County and was a part time fire station with a single general purpose pumper until April 2011 when a new station was built to house the full time SRT and two rescue vehicles. This relocation gave the NFRS better coverage of the north and good access to the major motorways in the area.

TUXFORD FIRE STATION

The SRT currently has 44 members divided into four shifts. These specialists do not attend fires, however all the members of the SRT team are competent and experienced Fire-fighters that have completed adequate time carrying out normal fire fighting duties in their careers.

Each member of the team holds external accredited competencies in -

- Swift Water Rescue Technician;
- Rescue Boat Operator;
- Rope Rescue Operator;
- Animal Rescue Operator;
- Advanced first aid and shoring.

The SRT has four dedicated appliances and a Rigid Hulled Inflatable Boat (RHIB). These include two Specialist Rescue Units (SRUs) which carry the majority of the specialist equipment, and two Rapid Response Units (RRUs) which carry an 'initial response' level of equipment. These have been specifically-designed to meet their needs.

The SRUs carry a significant amount of specialist equipment such as heavy rescue cutting equipment, inflatable pathways, the RHIB, hydraulic and wood shoring equipment, dedicated animal rescue and advanced rope rescue equipment.

Specialist Rescue Units

The depth and breadth of skill the SRT members possess and have developed means they are considered highly specialised and elite amongst their peers. This creates a situation where they are constantly looked upon to share their knowledge and experience with their firefighting colleagues. They also work with various external agencies such as the Nottinghamshire Police, Mines Rescue and Hazardous Area Response Team (HART).

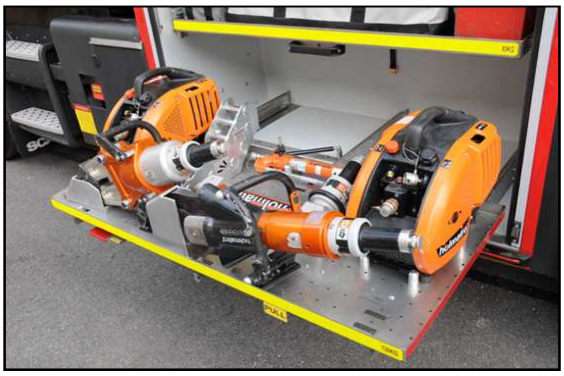
In Nottinghamshire I spent time with Seth Armstrong, Equipment Officer for the Nottinghamshire Fire and Rescue Service. Mr Armstrong is a well respected and long time member of the United Kingdom Rescue Organisation (UKRO) and for many years has competed, assessed and instructed on many UK and world road rescue events. He has been awarded best team leader and best team at both the UKRO and

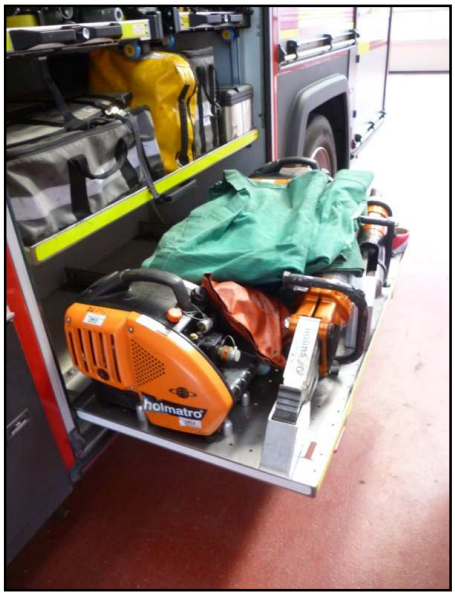
World Rescue Organisation (WRO) competition events. Due to his expertise and achievements he was seconded to write the UK Fire and Rescue Service on road rescue manual. This manual is used for all road rescue training and creates a standardised approach for the Fire Services when responding to road traffic collisions (RTC) throughout the UK.

Mr Armstrong took me to the newly opened Tuxton Fire Station where I was given a comprehensive tour. During this tour Mr Armstrong stated they had just introduced changes meaning all general purpose pumpers within the NFRS had received a medium rescue kit and all firefighters had received appropriate training in road rescue. Since the introduction of this initiative the NFRS have had great success and positive outcomes through quicker response times and rescue intervention for entrapped patients. The SRT only respond to an RTC call if it involves two for more vehicles, a heavy truck or the officer on scene requests their assistance.

The Medium Rescue kit on all general purpose pumpers consists of the following: -

- 2 x Holmatro core single line hydraulic pumps;
- 2 x Holmatro core hydraulic lines;
- 1 x Holmatro core cutters;
- 1 x Holmatro core spreaders;
- 1 x Holmatro ram;
- 1 x Holmatro hand pump;
- 1 x Holmatro ram support;
- Glass management; and
- Chocks and blocks.





These appliances carry the normal stowage of a pumper which includes all hand tools, tarpaulins, lighting and safety equipment required for road vehicle collision.

RECOMMENDATIONS

OPERATIONS

- **Review the roles and requirements of four rescue providers in Victoria.**

Victoria currently has four recognised road rescue agencies. Each has its own operating standards, training, equipment, staff, budget, specialist skills and respond based on municipal boundaries or geographical location.

- Metropolitan Fire Brigade
- Country Fire Authority
- State Emergency Service
- Echuca-Moama and Shepparton search and rescue squads

I recommend a review of the current arrangements with the view of simplifying the processes.

"Simply the closest appropriately equipped and trained unit should attend."

I further recommend consideration be given to establishing a dedicated rescue agency through the realigning of current resources and infrastructure from the four agencies.

A single rescue agency simplifies management, budgets, equipment and training ultimately improving service delivery to all Victorians through response consistency.

This could also be reflected in our current Computer Aided Disptach (CAD) system operated by the Emergency services Telecommunications Authority (ESTA). By having no rescue boundaries the CAD system could select the closest most appropriate rescue response, this would include automatic reallocation of rescue resources if the primary rescue was unavailable.

- **Produce one document for road rescue operations in Victoria.**

Victoria's road accident rescue providers the Metropolitan Fire Brigade (MFB), Country Fire Authority (CFA) and State Emergency Services (SES) currently operate under their own standard operating procedures (SOP's).

The state has no single agreed or approved road accident rescue manual providing a standardised approach to all road accident rescues state-wide regardless of agency or geographical location.
This document should be produced by the Office of the Emergency Services Commissioner (OESC) in alignment with the current road rescue arrangements Victoria.

- **Reduce initial response times for road rescue intervention.**

The current restriction associated with agency boundaries and under equipped response vehicles create an unacceptable time delay when dealing with the entrapment and extrication of time critical patients. Through the introduction of rescue pumpers into the Victorian fire services and up-skilling of all staff members including volunteers we would see a dramatic reduction in both response and extrication times.

The current MFB and CFA heavy pumpers with minor modification could carry light or medium rescue stowage. These vehicles have been designed to carry rescue equipment in their original specifications so the cost of fit out and modification would be minimal. These rescue pumpers would create a first response extrication option and significantly reduce patient on scene times, these units would commence rescue operation until the arrival of a heavy rescue unit. All firefighters in MFB and CFA are trained in public safety package PUASAR022A "participate in a rescue operation" and could be converted with further training to obtain PUASAR024A "Undertake road crash rescue".

A further option for Victoria is the introduction of smaller vehicles such as a van or ute in remote rural areas. This could see a dramatic improvement in rescue response times and provide rescue intervention until the arrival of a heavy rescue resource.

- **Investigate options for rescue operator on the Helicopter Emergency Medical Service (HEMS) to enhance rescue response to rural areas.**

European countries and New Zealand have adapted their HEMS equivalent configurations to include a rescue operator. Current Victorian HEMS services operate with a pilot, navigator and a MICA paramedic for medical treatment. By cross training one of these roles or adding a specific rescue operator to the crew would immediately enhance any rescue response. By adding this skill to the HEMS crew it enhances the HEMS capability and capacity on a state-wide basis.

- **Implement district road rescue trainers to provide all training, assessments and response for road rescue in their district.**

The implementation of district based road rescue trainers will ensure all road rescue providers receive the same accredited training and skills creating a common and standardised approached to all rescues. Through providing the same service delivery standard across the state and having staff trained to a competence level, staff members can transfer from rural to metro and vice versa knowing their skills and training are still applicable.

A district trainer would be a paid position. The scope of the position would ensure the district trainer was responsible for all rescue units and personnel within the allocated district.
The district road rescue trainer would provide an enhanced response by personally providing an experienced staff rescue officer who can assume command at a road rescue if required and provide advice and support to road rescue crews on scene.

TRAINING

- **Investigate having road rescue and trauma seminars for emergency services and health professionals in Victoria.**

With the ever growing demands and changes to rescue responses and associated trauma it is vital that Victoria's rescue emergency service providers keep up to date on innovative new techniques, procedures, equipment and general advances in rescue methods and patient treatment. In order to stay in touch with the latest developments in their respective fields information sharing must occur on a worldwide basis.

Victoria enjoys an international reputation of being at the forefront of road enforcement and response. It is very important this is maintained through the hosting of seminars and ensuring representation at other international seminars where the world's best practice can be examined and improvement discovered.

- **Inter disciplinary training between police, fire, ambulance, rescue providers for road rescue.**

Encompassing the all agencies all hazard approach to emergencies through cross training, joint exercises and sharing of agency knowledge will improve rescue responses by ensuring the correct equipment and expertise arrive on scene. Interoperability between responders will reduce time spent on scene and ensure that those who are on scene know and understand their roles and responsibilities but also the roles and responsibilities of the others on scene regardless of agency.

Joint training exercises create an excellent opportunity to gain a better understanding in a controlled training environment of each individual role and would improve and encourage stronger working relationships.

- **Basic trauma training for all emergency services personnel.**

Emergency services personnel in Europe and the United States each receive basic medical trauma training allowing them to perform life saving medical treatment at a trauma incident. In Victoria the Ambulance Service may not be the first to arrive at a scene, so through the provision of training all emergency service personnel to a certain level of trauma treatment is likely to save lives and or reduce the number of serious injuries suffered by patients while awaiting the arrival of medical intervention.

- **Road rescue trainers to deliver lectures on road rescue to emergency services, health professionals and external clients.**

Currently in Victoria there is minimal training between emergency services, health professionals and external clients on road rescue. Formal lectures covering all aspects of road rescue should be delivered to all stakeholders to ensure they all have the most up to date knowledge and understanding of new techniques, methodology and equipment used in road rescue. This will improve the networking and information sharing between key stakeholders while ensuring response consistency throughout Victoria.

- **Enhanced level of medical training for district road rescue trainers and rescue officers.**

Road rescue operations have always been divided into two areas being technical and medical. International practices are merging these two areas to ensure a better outcome for patients. This merging requires all rescue trainers and rescue officers to have a higher level of medical training. This knowledge will allow rescuers to understand and identify patient conditions quicker and adapt extrication techniques in a more timely manner whilst at the same time allowing for the provision of life saving treatment if required at the rescue scene. **This is especially important in country Victoria where resources may be limited due to location**.

- **Enhanced rescue training for Air ambulance MICA and MICA paramedics.**

Ambulance Victoria MICA paramedics responded to all incidents involving serious trauma and most road rescue incidents. By providing these personnel with up skilling and enhanced knowledge of rescue techniques and methodology all MICA paramedics would have a greater understanding of rescue operations which would result in improved extrication and patient intervention.

RESEARCH AND DEVELOPMENT

- **Conduct a comprehensive trial between standard and rapid extrication techniques.**

A number of trials between the current standard extrication techniques and the rapid extrication techniques would need to be conducted over a **6 month** period. These trials would need to occur in both a controlled training environment and also live in the field. Each of the rescue service providers would have to be involved.

- **Expand research and development to maintain latest rescue techniques for new car technology**

Because all vehicle manufactures use different technology and construction techniques nearly every vehicle model is different. Advances in vehicle technology and componentry will always evolve quicker than updates in rescue equipment. Thus having specific information relating to vehicle structures by make and model available via a CAD data dispatch system including diagrams and directions whilst en-route to a rescue collision incident would be very beneficial and again quicken the extrication process and assist in saving lives.

CONCLUSION

I understand and appreciate rescue is an ever changing environment which requires emergency services to work together to provide the community with the best possible response and practice.

The more research and evaluation into these techniques the better prepared the state will become. Improvements in tools, training and techniques will improve critical patient's survival rates but more importantly a decrease in response time through cooperation between Victoria's road rescue providers by deploying the closest available resource would significantly increase survival rates.

Through the ESF scholarship I have been given a great opportunity to gain an insight into something I have a strong interest in and further develop my own understanding and knowledge in this area. Ultimately I intend to share my research and finding with Victoria's emergency services and state government for consideration and implementation. I understand these concepts and recommendations I have forwarded are major changes to the current way of thinking however I believe that lives will be saved.

Patients who receive definitive care soon after an injury have a higher survival rate than those whose care was delayed. By introducing such innovative techniques to the Victorian trauma systems and emergency services we could improve the survival rate for critically injured patients who are trapped in motor vehicle accidents throughout the state.

The techniques that are being used in Norway are a significant and innovative step forward for road rescue providers worldwide. The techniques would be a dramatic and positive improvement to the standards of our current road rescue arrangements in Victoria. The principle behind their rapid extrication practices that "Rapid extrication saves time and lives" should be viewed as a goal for Victoria.

The Norway model is significant to Victoria because similar to us they had a number of services for the same role and it wasn't until all services worked in unison that they achieved the results they have today. The current training and interaction between emergency services is less than impressive and often only occurs at the scene of serious road collisions where there is no time to gain the full understanding of each others roles, responsibilities and techniques. This learning must be carried out in a proactive interdisciplinary training environment to ensure the best possible patient outcome.

REFERENCES

- Road Rescue Arrangements Victoria, Office of the Emergency Services Commissioner, The state government of Victoria, Department of Justice, Melbourne, Victoria, ISBN 0-7311-0953-8

- Lars Wik, Trond Boye Hansen, Kjell Kjensli, Petter Andreas Steen. Rapid Extrication from a car wreck, INJURY Article in Press. 2003 Elsevier

- Extrication of the seriously injured road crash victim, Dr Victor Calland Emerg Med J 2005;22:817–821. doi: 10.1136/emj.2004.022616

- National Road Safety Strategy 2011-2020, Australian Transport Council

- Jan Einar Anderson, TAS 3 coordinator, Norsk Luftambulanse. Various reference material provided in PowerPoint and video

- Specialist Rescue Team, Team Profile and Information Nottinghamshire Fire and Rescue Service.

- www.notts-fire.gov.uk
- www.holmatro.com
- www.norskluftambulanse.no
- www.ambulance.vic.gov.au
- www.tacsafety.com.au
- www.mfb.vic.gov.au
- www.esf.com.au
- www.atcouncil.gov.au

ABBREVIATIONS

- HEMS Helicopter Emergency Medical Service
- MICA Mobile intensive Care Ambulance
- SACFS South Australian Country Fire Service
- MFB Metropolitan Fire Brigade
- CFA Country Fire Authority
- VICSES Victorian State emergency service
- ESF Emergency Services Foundation
- TAS Interdisciplinary Emergency Medical Cooperation
- NLA Norsk Luft Ambulanse (Norwegian Air Ambulance)
- OPEN Optimised Patient Evacuation Norway
- ALS Advanced Life Support
- ABS Anti-lock Braking Systems
- TCS Traction Control Systems
- ESC Electronic Stability Control
- NCT New Car Technology
- PTO Power Take Off
- NFRS Nottinghamshire Fire and Rescue Service
- SRT Special Rescue Teams
- RHIB Rigid Hulled Inflatable Boat
- SRUs Specialist Rescue Units
- RRUs Rapid Response Units
- HART Hazardous Area Response Team
- UKRO United Kingdom Rescue Organisation
- WRO World Rescue Organisation
- RTC Road Traffic Collision
- CAD Computer Aided Dispatch
- ESTA Emergency Services Telecommunications Authority
- OESC Office of the Emergency Services Commissioner
- SOP's Standard Operating Procedures

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- Norwegian Ambulance Service
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