

Topic for Discussion!

Building Extrication Standards & Training –

Report by *Len Watson and Simon Smith*



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Document for Discussion Building Extrication Standards & Training –

ABSTRACT

To become part of this discussion it is necessary to be aware of the history of vehicle extrication rescue. Extrication rescue is relatively new and with the on-going developments in vehicles and new technology it is likely to continue as an emerging science for some time to come.

The emergence of Crash Rescue has grown in two separate areas. Emergency Medical Services in the form of pre-hospital trauma care and as technical Extrication, the physical action of cutting someone free of the wreckage. EMS has mainly evolved around roadside involvement rather than in-vehicle trauma care and Extrication Rescue around the technical application of cutting and spreading tools to dismantle the vehicle.

The report establishes the importance that road-kill has as the 9th leading cause of death in the world today. The prediction for 2020 is that it will become the 3rd leading cause of death and disability. Currently road kill takes more than 1 million lives annually and with the understanding that for each death there are at least several seriously injured victims, most needing extrication from their predicament and long stays in hospital and rehabilitation, it is a mammoth problem. Little, if anything, has been done to improve the situation since mid 1990. There is also a serious cost implication of up to 2% of gross national product. The current health, social and economic impact, on predominantly previously fit young persons, makes this issue a major public health challenge for the 21st century

This document gives a descriptive account of the current state of rescue in the developed world and pinpoints various failings and shortfalls in rescue preparedness, training and delivery. The necessary ingredients for all the extrication evolutions and the various platforms that are available for e-mastering as suitable e-Learning programs are discussed, as well as 'hands-on' delivery and cross-platform training.

It highlights the need for effective cross-platform training between the emergency services and the collection of relevant data from the crash site for structured study and audit.

In viewing the statistics and research programs that are currently available, the report strongly suggests setting up a national structured study that draws from the interaction of both pre-hospital medical and technical rescue. We are led into this area of discussion with insight into a simple icon led database where default data is automatically added along with the relevant time as the relevant icon is depressed.

The necessity to audit proficiency and performance, and measurements in relation to end outcomes are vital to establishing a core-standard for Crash Rescue. The on-going notion that Crash Rescue isn't flawed must be addressed. Not only does it cost human lives and unspeakable suffering, it's tantamount to pouring money down the drain. What greater incentive can Crash Rescue have –

SAFE LIFE, SAVE SUFFERING, SAVE MONEY !

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Document for Discussion

Building Extrication Standards & Training –

Report by Len Watson and Simon Smith

This document for discussion has been inspired by people like the late Robert Walmsey, London's Helicopter Emergency Medical Service (HEMS), John Olshanski, Dr. Vic Calland, Len Watson and numerous others who have devoted considerable time and effort to create a cross-platform training solution to instigate a suitable standard for vehicle extrication rescue. These people have consistently shouted the odds that in civilised society it is unacceptable for emergency services to offer a performance inferior to what it could be, especially when it is only a matter of restructuring existing resources and inviting the peers of rescue to set out, oversee and set up a mechanism of controls for Audit. To become involved in this discussion it would seem appropriate that we share a little more about the development of rescue to-date, so that we are fully aware where we are coming from and hopefully prevent making the same mistakes that we have in the past.

Potted History

Vehicle design

In the not too distant past, in the 50's and 60's, fire services were rarely called to a vehicle crash to perform a rescue. At that time it was a mixed affair where the fire department was only called for fire or where the victim could not be manipulated free of the wreckage. In the late 60's into the 70's motor car design began to change. The rigid chassis gave way to the monocoque shell. Initially this was more pronounced in Europe and the result, in terms of rescue, was soon seen as an increase in entrapments and a growing frustration when trying to release entrapped victims.

Fire service involvement increased, mainly because they carried heavier equipment (although somewhat basic) to affect some kind of release and also had the team-trained disciplined personnel more in tune with hostile environments.

Medical intervention in the 70's and 80's

In the UK, Ambulance personnel were trained to the lesser standard of 'Technician'. They did not have the skill level to meet the new demands placed on them. In those times an 'entrapment' meant that the occupant was actually pinned in the wreckage. Otherwise they could be removed somewhat unceremoniously and then taken to the nearest hospital. These victims fell within the 'grab and handle' or 'scoop and run' category. The casualty who was actually pinned within the wreckage needed a different approach and history is full of unsavoury rescues; often bantered around mess room tables and recorded in Gavin Weightman's book 'Rescue' - a History of Britain's Emergency Services'.

Way back in the late 70's a pioneering doctor, Ken Easton, who after been called to attend many entrapment crashes and identifying an underlying need, set up the British Association For Immediate Care (BASICS) in the UK. These vocational Doctors were to respond immediately to all trauma and health care emergencies at home, in the street or wherever they may be needed.

The need for heavy rescue

The need for heavy rescue capability had to be addressed. With the best intentions in the world ambulance crews and police wasted much time attempting rescue and, only when they admitted defeat, would they call upon

the fire service for assistance. Firefighters, being the last to enter the equation knew the buck was to stop with them as there was no other emergency agency to call upon. Early inventories grew from a range of garage tools, pry bars, hacksaws, pulling equipment and hot cutting. Although somewhat unsuitable and less than what was required, this mixed affair was to continue for over two decades.

The early 80's saw the introduction of prototype power hydraulic rescue equipment. The hydraulic double acting spreader hijacked the name 'Jaws of Life' following in the footsteps of Hurst's hydraulic rescue spreader first used at NASCAR around 1976.

The mid 80's to the 90's saw the most amazing spread of power hydraulic rescue equipment, especially in the UK, Netherlands and Germany where front-line fire trucks were equipped with hydraulics. This was backed up by dedicated rescue vehicles carrying a comprehensive compliment of power hydraulics, air lifting units and a wide range of ancillary equipment.

The advance of the Paramedic

Compared to South Africa and the United States the introduction of the Paramedic program was slow in Europe. The main reason for this can be put squarely at the front door of entrenched views, totalitarian attitudes of a repressive management regime left behind as road-side experience rapidly changed and car-user road kill increased.

Initially technicians were trained in infusion and intubation as Pre-Hospital Trauma Life Support (PHTLS) was seen as an American institution and not really necessary. In time, attitudes changed and the PHTLS wheel, re-invented to suit UK interests, was finally embraced. Widespread acceptance began around 1988 and with the new and extraordinary deployment and availability of power rescue equipment, the UK emergency services were ready to embark upon an extraordinary adventure, one that was to have remarkable significance.

Fire Departments and Extrication

The Extrication Challenge and manuals of extrication.

The Extrication competition was born in Canada in 1985. As a friendly event between a few local fire departments, rescue crews competed in two 20 minutes scenarios to extricate a trapped mannequin. The event proved so successful that they decided to run it again the following year and invited fire departments from across the border in the US to participate. The word spread and the competition grew year by year to encapsulate all North America as an international event. In 1989, alongside the National Fire Show at the National Exhibition Centre, the first extrication challenge was launched with tremendous acceptance in the UK.

Set up as a charity by Mike Akers, John Drudge and Len Watson, the Car User Entrapment Extrication Society (CUEES) held the first World Extrication Competition at the British Fire Service College in 1992. The ideal of bringing together teams to compete and share a platform of ideas, techniques and evolutions was extraordinary and very useful and beneficial to all that participated or attended the event. The extrication challenge was here to stay and was destined to spread to Australia and South Africa in the coming years.

The first manuals on extrication began to appear around 1990, which helped to guide and consolidate techniques and evolutions. All but one of these manuals were written by ordinary fire-fighters and privately resourced. The

experience was at grass root level and extrication rescue was and still is experience led. So much so that even today, virtually all manuals, videos, e-books and CD's are written and produced by vocational individuals and not by fire departments or Governments.

The influence of tool companies

The competitions and Manuals went some way towards redirecting the bad influence of rescue tool companies who were quick to set up their sales people come demonstrators as trainers. The techniques they invariably used were to expound the best virtues of their tools and, without real-world experience, were not necessarily best practice with regard to the rescue of a casualty. These poor techniques over-spilled into common usage and the phrase '*why let the casualty get in the way of a bloody fine rescue*' was born.

Tool companies and many fire departments conveniently ignore many of the real issues that arise and without exception; all are guilty of not collecting data and measuring end outcomes for evidence of 'best practice'.

Structured study

In 1991 the Helicopter Emergency Medical Unit (HEMS) in London conducted the first, and to my knowledge the only research, into actual extrication rescue and in-vehicle pre-hospital trauma care. From April 1991 to June 1993 information was collected at 737 incidences and, drawing from 90 case histories of significant entrapment, retrospectively analysed.

Published in 1996 (Elsevier Science) the conclusion showed that rapid access, primary survey and stabilisation, prior to a controlled release was the advocated method. Proper assessment, primary survey and successful resuscitation of the casualty depend on realistic rapid access to the patient. In most cases this was best done by primary roof removal and the report goes on to discuss the preferred methods of gaining access to patients and protocols and methods of controlled extrication.

The study stated that any extrication, without advanced life support techniques, such as intubation or insertion of chest drains should be completed within 30 minutes. In 50% of our case studies this standard was not achieved. This established a definite need for more exact extrication training, preferably combined interactive training for the fire service, paramedical and medical crews – see full report, visit the following link www.resqmed.com/VehExResTraumaCare.pdf.

Probably the most sustained myth is the misconception, held by many, that the average extrication time is only 15 minutes. It has even been quoted and diagrammatically shown as part of the Golden Hour. Honestly, what planet are these people on? It can only mean that they have included 'walking-wounded', which are the vast majority of the injured, into the equation. It just reinforces the necessity for valid audit when measuring entrapments and the seriously injured.

Interactive Cross-Platform Training (The Team Approach)

The HEMS study was used to structure 'Interactive cross-platform training' and it was introduced as part of the 'Special Skill' training for the London Fire Brigade's Rescue Units. Unfortunately it was abandoned in 1999 to make way for the new fire house. Now only available on a seminar footing interactive cross-platform training for the 'Team Approach' is still considered ahead of its time. The e-Book that accompanies the seminar 'Crash Rescue – Vehicle Extrication Rescue and In-Vehicle Pre-Hospital Trauma Care' was published

in November 2005 and is now widely available through any good bookshop (ISBN – 978 0 9550551 6 4) or on-line at www.resqmed.com/Crash_Rescue.htm

Fire departments have been slow in structuring advanced training and interaction between the services. Even where the paramedic program is in-house within the fire department, little is done to create and consolidate best practice. Apart from 'Crash Rescue' there is no other publications available on the subject. Crash Rescue informs the Paramedic what they can reasonably expect from the attending fire/rescue service and similarly Firefighters are made aware of how they can best assist medical intervention at the roadside.

In filling a need, fire departments in the UK have adopted the 'Team Approach' but only in its simplest form. More like 'an apple a day keeps the doctor away'; this token gesture leaves much to be desired and only goes to slow down the process of achieving true professionalism in this field. The big problem is that the mystique of invasive medical intervention is too awesome for the fire service to contemplate and extrication rescue too manual and incomplete for the medical profession. In real terms it appears the whole matter has been left in the hands of those who know too little about the subject and senior managers, whose role so removes them from the operational scene, do not know how best to advise their trainers.

This problem has also become the dogma of competition. The adage *'if it isn't broke, don't fix it'* aptly applies here. Keeping it safe and simple gives it the KISS of death and only goes to stagnate the whole concept of the 'Challenge'. Extrication rescue is far too important a matter to be glossed over. Over the years the extrication challenge has continued without much change and, what started as a wonderful idea, has just become a game. Unfortunately this 'game' overflows into the real world.

In a decent civilised society the misfortunate victim must be afforded best value and the 'Team Approach' must not be relegated to a token minimum-standard.

Training Schools, Academies and Vehicle Extrication Publications

Knowledge is the key here. The extrication manuals have gone some way in addressing the rescuers' needs. However, in recent years vehicle technology has transcended all boundaries making it very difficult and costly to keep improving the information available. Unbelievable as it seems, far too often the 'manual' writer's work is plagiarised and infringed and, for the most part, undermined in fire service student hand-outs that don't even give the minimum courtesy of referencing the source.

Fire training schools and academies rely heavily on extrication publications. Their instructors' usually inherit handed down training programs and, to their credit, try to improve things by putting their own slant on them. Unfortunately most try to re-invent the wheel and have no compunction in borrowing from intellectual copyright for their low budget training courses. 'Number crunching' is probably the greatest failing, where 'all' is delivered in a 40-hour 'tick-box' training program. Many fire departments offer a meagre 16-hour program while some provide no training of any consequence whatsoever.

The problem of squeezing everything into a 40 hour program is that it only allows for a sub-standard platform of information and proficiency to be imparted. This is pretty much transparent and is tantamount to an open admission that 'extrication' needs only minimal observance, which of course

leaves us with the absurd situation, whereby the twain of technical and medical rescue never meets.

In all the fire departments and academies that we have visited, we have rarely seen an extrication training program that resembled any sort of structured standard to cater for the real needs that exist. Most programs are unsubstantiated, except for borrowing from the published extrication manuals which, in time, have had their evolutions tried and tested on the streets, which goes some way towards corroborating them. Collection of performance data and audit are unheard of and of course, 'nothing ever goes wrong and all rescue is wonderful and there is no need for data collection and audit' – facetious; yes, but what a ludicrous situation for rescue to stagnate in.

'Safe and Fast Extrications Incorporated' has an interesting web site that exposes the current deplorable state of affairs in the state of Wisconsin USA where it states – "What extrication training is currently required by the state of Wisconsin? NONE !" It beggars belief that in the foremost country in the developed world, which is known for its bizarre history of litigation, that Wisconsin's fire departments can practise extrication without fear of a mal-practise suit.

Only a year or so previous, John Olshansky, founder of 'Safe and Fast Extrications Incorporated' teamed up with the Wisconsin Medical Institute to develop and formulate an advanced training program only to have his budget withdrawn after just one year. How can they identify a need and set the ball in motion and then withdraw support and shelve the project almost in the same breath – *for more information visit www.besafeinc.org*

The importance of Crash Rescue

The 9th leading cause of death in the world today is road accident injuries and the prediction for 2020 is that they will become the 3rd leading cause of death and disability. Currently road kill takes more than 1 million lives annually and with the understanding that for each death there are at least several seriously injured victims needing extrication from their predicament and long stays in hospital and rehabilitation. Little, if anything, has been done to improve the situation since mid 1990. There is also a serious cost implication of up to 2% of gross national product. The current health, social and economic impact, on predominantly previously fit young persons, makes this issue a major public health challenge for the 21st century – *drawn from 'Fast Changing Challenges' available as a free download, visit www.resqmed.com/FastChangingChall.pdf*

'Fast Changing Challenges' gives an in-depth insight into new developments and technologies and the implications they have on rescue and preparedness training. It discusses the essentials of future preparedness and computer based training. Later in this discussion we will visit the essentials of technical extrication techniques and evolutions, so it would be good for you to visit the site mentioned above and avail yourself of the new developments contained within that document.

Emergency Medical Services (EMS) and Extrication

There is no requirement anywhere in the world to deliver interactive training for vehicle extrication and in-vehicle trauma care. Len Watson, a rescue veteran of some 30 years says *"I can state categorically that there is a vital need for cross-platform training. I have witnessed the unsavoury side of rescue and seen first hand the needless scourge that inappropriate action and lack of direction, places on misfortunate victims".*

The divide between technical and medical rescue is so great that all of the paramedical textbooks available carry little or no interaction. Apart from 'Crash Rescue' Vehicle extrication rescue and in-vehicle trauma care – 2005 ISBN 978 0 9550551 6 4 – visit www.resqmed.com/Crash_Rescue.htm and Vic Calland's 'Safety At Scene' (ISBN 978-0-9551319-0-5 or on-line at www.resqmed.com/Safety_At_Scene.htm), all paramedical books are undermined by the absence of any extrication information including 'scene safety' and 'risk assessment'.

Are we doing enough to redirect this situation? We will answer that question after you have read the following -

Consider this typical crash rescue scenario – Two family cars in collision, one has overridden the centre line on a bend and met a vehicle coming in the opposite direction. The vehicles meet in a one o'clock, front off-centre impact. Intrusion into the passenger cell on one of the vehicles is extreme mainly because the front longitudinal was avoided in the impact and offered no resistance to bodywork deformity and passenger cell intrusion. The front road-wheel has been ripped off and the steering geometry and suspension forced back into the footwell. Windscreen pillar and front doorpost intrusion has reduced the front door opening to virtually nothing and jamming the rear door on the crash damaged side.

For the purpose of this discussion I will leave you, the reader, decide who will be first to arrive on scene and from that perspective consider the immediate actions that should be taken. In all, there are three casualties in the two vehicles. Traffic has come to a standstill and the roadway has become congested.

On initial approach it is painfully obvious which vehicle suffered the greater insult. Although you can smell petrol there are no visual signs of any leakage. The occupant of the lesser damaged vehicle has already escaped the car and is standing by the side of the road in a state of emotional shock but, at that moment in time, looks none the worse for his ordeal and is capable of speech. He is being attended to by other motorists who stopped to render assistance.



The lady passenger in the other vehicle is heavily built and crying out in pain and distress but has no visually apparent injuries. The driver is motionless pinned in his seat with his head slumped forward. His breathing is noisy and laboured and he is bleeding profusely from the top of his forehead. Both front airbags have deployed. It is evident that the driver's airbag has burst open and some deployment residue still lingers within the interior of the car.

Q. 1 - At face value, who is most in need of immediate medical attention?
Q. 2 - Where a chin lift or jaw push and c-spine manual immobilisation fails to adequately improve the impaired airway, what can be done 'technically' to assist the paramedic, a) intubating, b) performing a surgical airway, c) decompressing the chest?

Q. 3 – What significance does the burst airbag have?

Q. 4 – Can you give the paramedic an accurate time frame for performing the following procedures –

- a) Windscreen glass removal
- b) Roof flap or complete roof removal
- c) Forced door removal and ramming to ease restrictions on the casualties breathing.

Q. 5 - Can you describe a 'best practice' rapid extrication for this scenario whilst the paramedic maintains adequate airway perfusion and O² management



*Doctor performing a surgical airway via the windscreen opening
– This approach gives the added advantage of catering for right and left handed practitioners*

If rescuers can't or struggle to answer these questions what realistic hope has the casualty got? If we are to be serious about saving life, training standards have to encompass a cross-platform appreciation, not only in terms of crash-rescue proficiency but also performance.

Is it too much to contemplate that poor rescue performance can lead to a casualty's demise or a worsening in their condition? How can rescuers be sued for mal-practise when their trade is so obscured by mystique and excused by saying that *'no two accidents are alike'*, when in actual fact they can be collated under specific categories? Make no mistake, the excuse mongers are guilty of undermining the progressive development of rescue. It is in such crashes (depicted here) that 50% of casualties lose the battle for life. Obviously some are beyond redemption but many could be saved with a higher degree of excellence in rescue.

NOW - Are we doing enough? Of course not, especially when we consider that all it would take is initiative and redirection, and a lot of hard work. What do you think?

For further information on this topic, read - *The Mystique of the Golden Hour and the 'Platinum 10' concept* – www.resqmed.com/GoldenHourPlatinum10.pdf

Statistics - Collection and Structuring of Information

In most developed countries their Departments' Of Transport collect crash statistics. In the UK, the 'Department for Transport Local Government and Regions' correlate and publish yearly 'Road Accidents Great Britain – The Casualty Report'. Why they call it The Casualty Report is misleading as the information has very little to do with casualties. Statistics of this nature have little to offer the study of entrapments other than to give overall figures for the car users' all encompassing 'road kill', 'serious injury' and 'slight injury' categories.

America's Bureau of Transportation Statistics offers a lot more of the same. Again their Fatal Accident Reporting System (FARS) helps us little except what we can glean from the vehicle type, restraint system used, seating position, time taken to hospital and time of crash to time of death. The category 'Injury severity' has been broken down into elements that have no bearing other than perhaps 'died prior to accident' -

Element Values:

- 0 No Injury
- 1 Possible Injury
- 2 Non-incapacitating evident Injury
- 3 Incapacitating Injury
- 4 Fatal Injury
- 5 Injured, Severity Unknown
- 6 Died Prior to Accident
- 7 Unknown

ETSC – European Transport Safety Council

ETSC, a Brussels-based independent non-profit-making organisation founded in 1993, provides an impartial source of expert advice on transport safety matters to the European Commission, the European Parliament, and Member States. It maintains its independence through funding from a variety of sources including membership subscriptions, the European Commission, and public and private sector support for various activities.

ETSC claim to identify and promote effective measures on the basis of international scientific research and best practice in areas which offer the greatest potential for a reduction in transport crashes and casualties.

ETSC have brought together over 30 international and national organisations concerned with transport safety in its [membership](#) which includes national transport safety, research and technical bodies; national transport user groups, and insurance organisations, and members of the European Parliament chair its Main Council. In 15 technical [working parties](#) it brings together internationally renowned experts from across EU Member States to forge consensus about research-based safety priorities. Unfortunately, in all these bodies, the corner stone of 'technical rescue' and 'cross-platform intervention' has no expert voice.

In one of the many reports '*Reducing the severity of road injuries through post impact care*', they claim it will have a very important bearing on the future of motor vehicle accident rescue in Europe. They strongly recommend it as

appropriate reading for all rescuers who wish to be part of the exciting and new developing phase of rescue in the 21st century.

In the conclusion of the report it is pronounced –

- Data should be collected within countries which is useful for auditing the performance of EMS
- For post-impact care analysis, information is needed on injury severity preferably using the Abbreviated Injury Scale (AIS)
- Numerous case studies have suggested that both in the pre-hospital and hospital phases a proportion of blunt trauma deaths could be avoided
- Equally, poor quality post-impact care could be leading to avoidable morbidity.
- Outcomes of survivors needs to measured

Under the heading “*Chain of help to patients injured in road collisions*” the report points out the help needed for victims of road traffic collisions from bystanders to emergency pre-hospital rescue and paramedic intervention and the delivery of hospital trauma care, rehabilitation and physiological care. It then goes on to address these headings in more detail.

Under the heading “Pre-hospital rescue” they recommend that all firefighters be trained in the provision of basic life support techniques. The same recommendations would also apply to police officers. Furthermore, they stated that close cooperation between firefighters and pre-hospital care providers for entrapment situations was essential – “wonderful news”!

The report also asks the question ‘could the statistical variation over time in member states be attributed to changes in the differences or organisation and effectiveness of post impact EMS?’ Although no conclusion could be drawn, it did recognise that some differences in the effectiveness of EMS may be contributing to these results.

Although this report was published in 1999 it has had little impact on the emergency services so far and, with no foreseeable plan of action, the immediate future holds little promise.

Road Accidents Great Britain – The Casualty Report

Now known as Road Casualties Great Britain, this report is published annually. Information is gathered by the police and although not very pertinent to our discussion, certain statistics can be used to show a very interesting argument.

From a different perspective, analysis of UK statistics show that the car-user fatality rate dropped significantly by 32% between 1989 and 2003. In this time period there were no major changes in crash worthiness, road engineering, policing or policy and airbags and speed cameras hadn’t entered the equation at that time to account for such a dramatic downturn. However, as already broached upon in this document, there was clearly a major improvement in rescue capability, both in EMS and technical rescue, within this time frame.

From 1993 – 2003 the car-user fatality again saw an overall increase of 6% of which the vast majority were drivers. In fact the driver fatality rate increased some 14% in this timeframe which really casts a shadow over the value of the steering wheel airbag – further information, visit www.resqmed.com/SRSerspective.pdf

The car-user fatality rate had reached an all time peak by 1989. A very significant reduction is shown between 1989 and 1993 in the table under -

All car-user fatality rate by year 1989-2003 - RAGB/RCGB The Casualty report														
1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
2,426	2,371	2,053	1,978	1670	1,764	1,749	1,806	1,795	1,696	1,687	1,665	1,749	1,747	1,769

Although the car-user fatality rate has again increased since 1993, it cannot be explained even when weighted against the increase in car ownership and road miles travelled. As a matter of interest SRS and speed cameras were not introduced into the UK until after 1993.

All car-user serious injury rate by year 1989-2003 - RAGB/RCGB The Casualty report														
1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
27258	26749	23340	23146	21161	22127	21710	22239	21394	19980	18681	18054	17675	16981	15522

Although the serious injury rate has continued to decrease, we should be aware that this category includes all patients that attend hospital no matter how minor their injuries are and that the critically injured are hidden within this figure. In view that the fatality rate and entrapments have increased, can we then assume that the critical injury rate has also increased?

We can honestly stand alongside other colleagues and say we worked and witnessed the 1989 -1993 improvement. In our travels we found that the collective consensus amongst other rescue professionals certainly supports the possibility that the effectiveness of post impact EMS and technical rescue capability had indeed contributed to this change.

CIREN - Crash Investigation Recording and Engineering Network

The US National Highways Traffic Safety Administration created the CIREN project for the purpose of pursuing multi-disciplinary research into serious crash injuries. Seven medical centres with class 1 trauma facilities across the US and some motor manufactures have collaborated to analyse crashes in a bid to improve crash prevention, injury treatment and rehabilitation.

Their case inclusion criteria for data collection are to minimal and inappropriate, and as such insufficient to offer anything that could be considered useful when looking at interactive rescue, best practice and performance. To see how the 'big boys' operate, one would imagine that technical rescue and EMS have nothing to learn from each other that would help reduce death, disability, human suffering and economic cost.

Unfortunately, as always, with the best intentions in the world the CIREN program has forgotten one of the cornerstones. The key contributors to the agency's studies are from medical and engineering backgrounds. Technical rescue does not feature in anyway, let alone the interaction between technical and medical rescue.

Structured Studies and Papers

There are very few structured studies and written papers in relation to vehicle extrication rescue and even fewer on the interactivity of technical and medical intervention at the roadside. Ask yourself, with all the monies and effort that is spent on the committees, agencies and projects, EMS and Fire Departments – why is that?

- Is it that no one realises that entrapments, whether victims are pinned in situ or confined in the wreckage because of the severity of their injuries, are actually treated in-vehicle while they are being extricated?
- Is it that no one actually realises that many victims die needlessly because of poor rescue performance, resource and medical dexterity?

We jointly hold the belief that rescuers and their peers think that they are doing their best but honestly, rescue is in disarray and really needs to be structured into an interactive cohesive force. This must include all the emergency services including drivers and first-aiders. Yes, it must be considered necessary that all drivers and first-aiders hold a valid Basic Trauma Certificate. Of course this cannot happen without first setting a standard.

Standardisation, Measurement and Audit

Moving forward and establishing standards

Before we can establish standards we need to break down extrication rescue into its basic elements. This also needs to include the elements of cross-platform training, the essentials of technical and medical rescue interaction. These elements must be complete as they will be the core foundation that will allow rescue teams to safely and proficiently meet their obligations when called to the crash site.

The essentials of basic extrication

All rescuers must be able to recognise the likely risks, implement appropriate control measures and function efficiently as a team. You may say *'but we do that already!'* Of course we have all heard these words before, but if they are without foundation, they are just words and realistic evidence based 'best-practice' procedures are not likely to exist, no matter how cleverly worded the documentation.

Take a fresh look at new developments in vehicle technology and then tell me that your training adequacy prepares you to fully recognise and understand the risks involved? If you don't understand the exact risk, how can you implement appropriate control measures? And if you have never been taught to disconnect or cut SRS wiring (where the battery cannot be disconnected), or to cut away the ¼ panel on a 2dr car or convertible (third door conversion), or forcibly reverse or remove a seat incorporating undeployed seat mounted pretensioners and/or airbag, how proficient and safe are you likely to be when called upon to do so?

If you were to sit down now and list all the extrication evolutions you need to be proficient in, for all vehicle types, to contend with all the different accident categories, and then devise and write training programs or a manual to suit, how far would you get and how long would it take? Extrication has grown immensely as a subject and, with each new design, steel strengthening, composite component and safety innovation it gets more complicated month by month.

Think of all the implications that have arisen with new safety features over recent years. Think how the acquisition of new equipment, such as up-rated power hydraulics, air lifting units, stabilisation props etc., and the realisation of how many different ways they may be used - e.g. to lift or tilt a truck off a car on a hill or gradient and the shortfall in training and published documentation.

The 'person under' turn out to a train incident in a subway requires specialist training. But there again how often would that be. Well that depends on where you serve. The London underground gets 'one-under' nearly every day. How about the New York or Tokyo subway? By now you must be aware of the enormity of the problem.

So let us look at the issues in a new light. This document has not been written to deride existing training programs, nor does it wish to suggest that they be

thrown in the bin. We are fully aware that most have been build and measured on the back of operational experience. However, the contents of existing training programs really do need to be re-examined with a fresh approach and a degree of expert input.

Building Today's Training Programs

When building an extrication training standard, the first area we need to consider is the 'HOW', 'WHAT' and the 'DELIVERY'. There are several platforms that today's training programs can be packaged in. The question of HOW we select the correct or best platform is where we must begin. All of the pros and cons must be considered and this opens up a whole new world beyond the limited aspects of Microsoft's PowerPoint. The prospect of e-Learning has come of age and with it, all the advantages that it offers. This requires a fuller understanding of what's on offer and a more in-depth view on the subject can be accessed at – www.resqmed.com/eLearning.pdf

Whether the software is to be used in-house or it is decided to out-source the whole affair, will be determined by how complicated the software is to program. It is nearly always more expensive to hire the skill level in, particularly as several areas of expertise will be necessary in the mastering of product e.g. programming, graphics, video editing, voice-overs etc. Where stand-alone set up and executable programs are to have an electronic self-assessment and monitoring facility embedded, the standard of programming will need to be much higher.

The question of WHAT we are going to build the 'standard' on supposes that we are in possession of all the correct ingredients. Perhaps we believe we can perceive this from the law of expedience and experience. But how much can we properly assume? Most important of all, where experience is lacking, we have to decide whether in fact we have a reasonable right to assume anything. Whether we can claim any ability to know or to what extent we know; whether we are capable of assessing or advancing the scope of the present training framework will be very much in question especially where there is no evidence to base it on.

There are a lot of new productions on the market and it is only prudent to view what is available prior to entering into the costly and time wasting affair of producing sub standard products. Empire building and regeneration of what already exists has a notorious reputation within fire departments. In every fire service in the world the evidence of this is plainly seen.

By now one thing should be abundantly clear to developers of in-house training programs. Without sufficient 'hands-on' operational experience, research and corroboration, the credible information will not be there to build safer working practices.

The established books, manuals, videos and electronic programs on extrication rescue have the credibility of 'valued judgement'. For the most part they are the sum aggregate of concrete whole experience, empirically observed, risk assessed, illustrated and described. To meet the increased complexity of new vehicle technology and safety systems, these productions have gone well beyond the normal lengths of fire department research and inquiry. They certainly outweigh any in-house production that we have seen.

One thing is certain, today's program developers will need to be extremely knowledgeable and well practised in technical rescue and the adverse effects that each technique and evolution can hold, both for the entrapped casualty

and rescuers alike. They can only ever hope to follow in the footsteps of the originators of extrication rescue and as such, at much greater expense and time wasting, 're-invent the wheel'. Also be warned, the producers of technical manuals, books and bespoke electronic training programs will, in future, vehemently protect their intellect and copyright. Overstepping the boundaries of prudence to go beyond the limits of discretion to justify an end result can only have a detrimental outcome and be seen for what it really is.

DELIVERY - The most amazing advantage with electronic training is the way it can be constructed, stored and delivered. Trainers' presentations can be designed for interactive electronic board application and/or large screen projection. Perhaps, more important, productions can be designed for 24/7 intranet and internet training with electronic self-assessment that can measure student intake on a 100% of 'need-to-know' content, print certificates and relay results directly to the on-line managers desk. Continual personal development and assessment can be performed to the highest standard with virtually no cost implication or down time at station level.

Moreover, electronic information centres will allow immediate access to vital data, whether at the training academy, station/fire hall, exercise yard or at the roadside will be immaterial.

To what extent can the commercial providers of electronic training combine symbiotically with the rescue environment in order to bring about constructive change? All the areas I have mentioned are already available, if you shop around, and the commercial world is very adept at giving the customer exactly what they want. However, the real issue would seem to hang on the quality and reliability of information that is passed on to the program developer.

Personal Development, Operational Experience and Trainer Selection

So far, from what is out there and what seems mainly due to limited resources, extrication training in general offers limited scope and content fails to meet 'user needs' in sufficient depth for many occasions met on the street. Trainers are, for the most part, responsible for the development of the 'extrication' programs they teach. Both 'classroom' and 'hands-on' training is heavily influenced by their own experiences and inherited programs, which tend to be over simplified or conviction based on erroneous presumptions, fail to keep abreast of new developments and cannot hope to redirect bad practices.

To explain this remark - trainers are usually selected from junior officer ranks and because, at the individual fire station, they experience only limited operational involvement, the sum aggregate of their experience can be quite minimal. Even after 15 years of operational service, and particularly where personnel serve on a three or four shift system, experience will still be limited. Additionally, Officer development downtime for training courses etc., will also subtracts from experience and, in their managerial capacity, they are not likely to gain as much 'hands-on' familiarisation with rescue equipment as the 'grass-roots' firefighter. There is also a degree of 'pot luck' where the individual is on leave and 'misses-out' when the jobs come in.

Of course some stations are busier than others and staff that ride the dedicated rescue vehicles are likely to gain additional experience. But even this can be diluted where RV crews are limited in size and constantly changed around. There is also the question of the equipment inventory carried on first due/front line appliances. Limited availability of hydraulic rescue tools can seriously undermine a crew's performance. Although a combination tool can

be used to cut and spread it cannot be considered a serious contender as a *'one tool does all'*. Without going into all the ramifications, where 'first due' power hydraulics is limited to a combination tool, a crew's performance will be seriously curtailed, particularly at the more serious entrapment. Valuable time lost in the mobilisation of the RV can seriously damage a casualty's health and obviously the familiarity with a full range of power hydraulics and ancillary equipment is then suspect.

This again brings us back to preparedness training, revision and continuation training and the information built into training programs.

Training Program Content

In creating a suitable extrication standard it is essential to offer a realistic core of foundation information with appropriate bibliography and reference sources. To a large extent core foundation is already available in the existing bone-fide manuals, e-books and other ICT programs. Unfortunately, cross-platform interaction is quite another matter.

To have a fuller understanding of core content it is necessary to break vehicle extrication rescue into its essential elements and separate them into what is suitable for the 'classroom' and, what actually needs to be taught in 'hands-on' practical sessions and cross-platform training.

Elements of extrication core content

- 1 Standard operating procedures**
 - National or local highway/freeway procedures

- 2 Safe tool operation, testing, care and maintenance**
 - Power Hydraulics
 - Air lifting units
 - Jacks & Jacking
 - Ancillary equipment

- 3. Scene assessment and management**
 - Outer and inner circle
 - Risk management
 - Extrication logic (Methods of entrapment release)
 - Words of command (Technical and medical)

- 4 Vehicle Dynamic Risk Assessment (DRA)**
 - Vehicle Types
 - Vehicle construction (All types)
 - Vehicle technology (All vehicle types)
 - Crash categories and vehicle deformity (All vehicle types)
 - Mechanisms of injury (All crash categories and relevant vehicle types)
 - Risk control measures
 - Risk assessed options
 - Risk critical information

- 5 Vehicle stabilisation**
 - Securing the vehicle
 - Battery disconnection
 - Unable to disconnect the battery
 - On-road and off-road
 - Vehicle on-its-side

- Vehicle on-its-roof
- Vehicle in precarious position
- Hybrid vehicle

6 **Glass management**

- Glazing types
- Glass installation
- Glass management

7 **Gaining entry and Forcible entry**

- Immediate access (Upright, on-side, on roof and precarious position)
- Rapid access (Upright, on-side, on roof and precarious position)

8 **Extrication Evolutions**

Upright vehicle

- Gaining initial entry
- Door forcing and removal (with roof on)
- Side removal (Upright 4 door car/hatchback with roof on)
- Side removal (Upright 2 door car/hatchback with roof on)
- Roof removal (Complete, flap-back, flat-forward & side flap)
- Dash relocation (Dash-roll, dash-lift, & steering relocation)
- Forced seat adjustment and removal

Vehicle on-its-side

- Gaining initial entry
- Glass management
- Roof fold-down
- Roof removal
- Steering wheel relocation
- Forced seat adjustment and removal

Vehicle on-its-roof

- Gaining initial entry
- Glass management
- Door forcing and removal (inverted)
- Side removal (Inverted 4 door car)
- Side removal (Inverted 2 door car/Hatchback)
- The Clam - Strategic cutting and ramming (Inverted 4 door car)
- The Clam – Inverted strategic cutting and ramming (Overturned 2/3, 4/5 door car/hatchback)

In all 'hands on' extrication training sessions it is essential, on every occasion to stabilise the vehicle and conduct vehicle risk assessment, and use all aspects as a measurement of on-going student performance. With basic training completed and only where the competency criteria are met should cross-platform training commence.

Converting newly acquired information and extrication skills into an effective team activity needs a definite planned and directed approach with expert input. If we are going to measure the significance of this perception, what parameters and criteria are we to set? And if we do not, what can be expected from the outcome? – It could be a case of the ignorant seeking the unknown.

Cross-platform training

Measurement is vital to our enquiries. 'Hands-on' cross platform extrication training needs to be directed in manageable portions. For this to be possible session briefs must focus on the relevant aspects and the Team directed in the specific actions to perform that area of the brief only and then stop and await the next briefing.

The importance of this can be easily measured e.g. - Think of the Doctor in the initial stages of an extrication who needs to perform a surgical airway at the earliest possible moment; consider how valuable it would be for him to measure the various positions in the upright vehicle, car on-its-side or car on-its-roof. While he is doing this, see if he is comfortable with the noise level, the available lighting and movement in the vehicle. Now dimensionally expand the equation into all the relevant aspects of extrication and aggressive and invasive resuscitation, monitoring and in-vehicle patient care. As this is on-going, let him give his expert input as to what he found most conducive and measure it to, or add to, previous direction in the session briefs. All is vitally material to our enquiries, empirical observations and corroboration to ensure that our cross-platform training is indeed best practice.

Cross-platform training objectives for the rescue team should really include the elements of extrication and in-vehicle trauma care –

Objectives (Medical Personnel)

Participants will be able to –

- Explain the injury patterns associated with –
 - Head-on
 - Front ¼ oblique
 - Side-on
 - Roll-overs
- Explain the three logic for crash rescue
- List all relevant vehicle types
- List extrication evolutions for
 - Head-on/front ¼ oblique
 - Side-on
 - Vehicle on-its-side
 - Vehicle on-its-roof
- Equate the three logic of rescue to cater for PHALS procedures, patient packaging and removal
- Explain the correct approach for in-vehicle casualty assessment and treatment for –
 - Upright Vehicle
 - Vehicle on-its side
 - Vehicle on its roof
- Control in-vehicle PHALS procedures, patient packaging and removal in-line with extrication evolutions for –
 - Upright Vehicle
 - Vehicle on-its side
 - Vehicle on its roof

Objectives (Technical Rescue Personnel)

Participants will be able to –

- Carry out scene assessment and vehicle risk assessment
- Implement the appropriate risk control methods
- Perform vehicle stabilisation for –
 - Upright Vehicle
 - Vehicle on-its side

- Vehicle on its roof
- Explain the three logic for crash rescue
- Gain immediate access for initial entry
- Perform basic airway management and C-spine manual immobilisation
- Efficiently perform technical rescue to cater realistically for in-vehicle patient resuscitation, stabilisation, packaging and removal from –
 - Upright Vehicle
 - Vehicle on-its side
 - Vehicle on its roof
- Correctly hand over scene responsibility to meet the obligation of ‘duty of care’

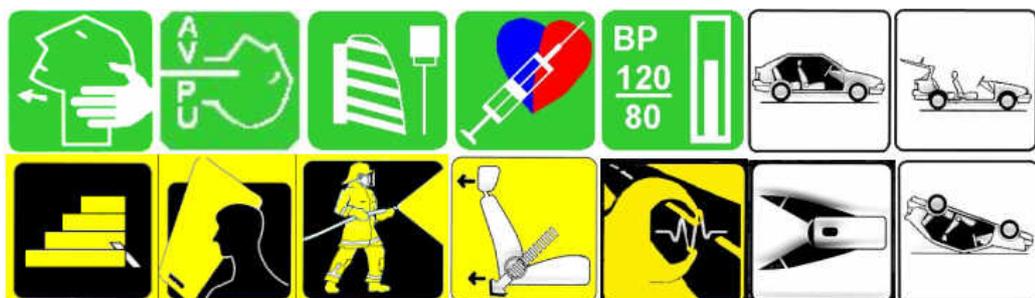
Cross-platform training can also be used to measure rescue technicians’ proficiency and in-vehicle medical performance. More importantly, it can be used to measure team performance on the street and valid feedback used to enrich the interactive program. End outcomes can also be used to audit its progress but, of course, this can only happen where data is collected and analysed.

Rescue Analysis, Performance, Proficiency and Audit

The collection and sharing, study and research of information are vital to the development of rescue. When sharing information it is not really satisfactory to merely share it within the myopia of a single fire service but to open it up to national access; international access would be even better. All e-Training programs should be linked to such a facility. One such study site can be accessed at <http://www.resqmed.com/Study.htm> where you can register for their monthly ‘Rescue – News Letter’ which helps to keep up with current events, trends and developments.

The information that needs to be collected must be of value and it is therefore necessary to set criteria and parameters for your data bank. Some medical databases already exist but none feature the collection of extrication information. An interactive database, built around both technical and medical rescue, would be quite easy to program but of course this would become an exasperating task to attempt to achieve some sort of cohesive approach to log what is actually needed.

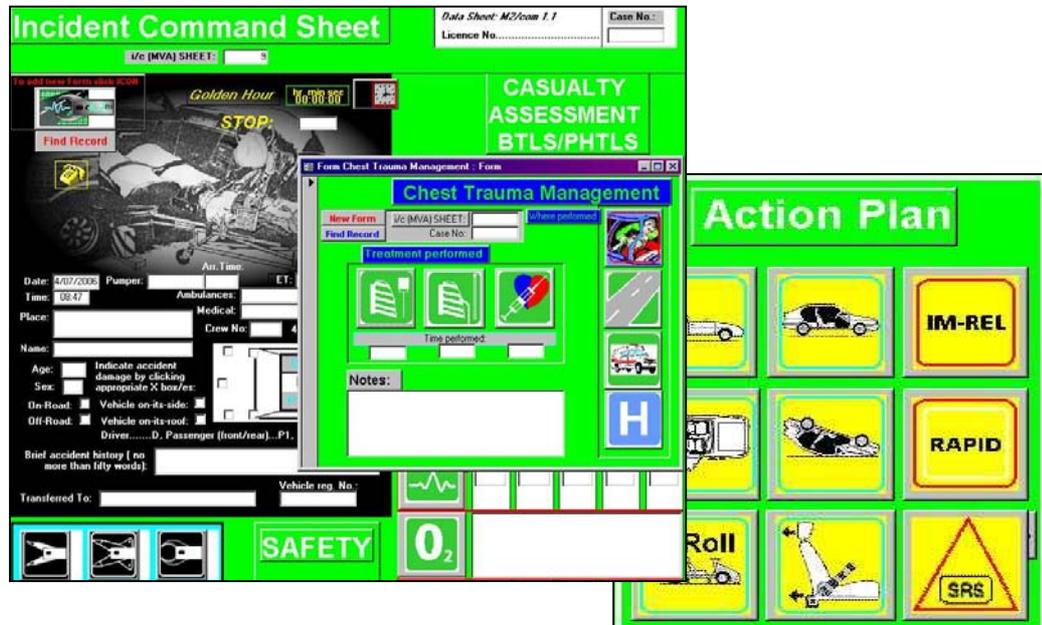
resQmed was involved in the writing of an ‘MS Access’ database around 1994 where Dick Spalding and Len Watson developed the ISIR (incidence sequence icon recognition) system to create input buttons.



SIR (incidence sequence icon recognition)

Each icon when depressed would open up the appropriate sub-form where appropriate data input icons could be used to enter the relevant information. It proved a very efficient and exact method for entering timed data.

These buttons were pretty much self-explanatory and only needed a minimal user guide. Multi lingual, they mainly did away with much of the need for text input boxes. Date and time could also be recorded when each button was depressed. Pre-written defaults, combo and list boxes made the database quick to complete as the user became familiar with the program and instantly translatable. For example, although the default note was originally in French or any other language for that matter the ISIR button coding would remain the same and the 'wizard' function used to quickly transcribe to the appropriate language.



Europe is not the only area of the world that could benefit from such a collection system, India, Pakistan, practically the whole of Asia; anywhere where different dialects are spoken.

What is actually recorded as data is vitally important. Not just the basic essentials that are necessary to label case-histories, time of call, time of arrival etc, but the actual detail of the rescue in terms of timed extrication evolutions and medical intervention, along with casualties 'on-going' SATS that will help to monitor Teams performance. Medical data is already being collected but, from what I have seen, it is without 'on-going' input and completely avoids the collection of vital entrapment and extrication information.

Performance and proficiency

Without the collection of appropriate information how can we ever begin to analyse the performance and proficiency of our Rescue Teams? There seems to be a taboo, a *'leave well alone'* attitude that doesn't want to face up to the unacceptable face of rescue; that fault line, the needless scourge that takes a sizeable percentage of crash victims, previously fit young individuals and denies them excellence in rescue.

Outside of experience, who has the right to question a Team's performance let alone their proficiency? Even those with experience can be short sighted, especially where they exaggerate their encounters and especially where they fail to analyse their performance in terms of safety, efficiency and casualty outcomes.

Audit - Measurement in relation to end outcomes

The nearest measurement to end outcomes rests with the medical profession. Purely as a part of medical enquiry some ambulance services collect data that has a bearing on trauma care. Even so ETSC, as mentioned earlier in this document, finds it difficult to draw any worthwhile conclusion as to the positive effects of post accident pre-hospital care. And how could they, as they have no way of knowing the effects of technical rescue and in-vehicle trauma care other than the realisation that a delayed transfer to hospital withheld definite care. One can only debate that without extrication the casualty would remain trapped and, where the rescue initiative is poor, casualties will suffer.

Any improvements in the saving of life at the crash site can only be redeemed from the 'fatality rate'. What is done operationally at the roadside can also reflect on post crash survivability and must not be measured merely to the time of arrival at the trauma centre but rather to outcomes in the first 4 to 6 hours in definitive care.

I suspect that audit would quickly differentiate between the various standards of extrication rescue, equipment and preparedness. The proficiency of Rescue Teams would be much harder to evaluate as there are so many different variations and blame can be proportioned on everything including the kitchen sink.

The real deal here is knowing how and where to measure. Even though different vehicles and crash types will have their own degree of difficulty, they can be categorised and measured like against like, in doing so proficiency will be easier to measure. Also the elements of in-vehicle immediate care and rapid extrication or controlled release managements can be systematically logged for analysis and measured against end outcomes.

The thing is, when we have access to such audit, can we continue with the 'no-blame' culture that has allowed Rescue the '*forgiveness of all sins*' in the name of humanity.

Safety and Health, and Litigation

The science of Health and Safety in the workplace and in the home has grown immensely and thought by some scholastics to be out of control. Can we seriously invite such a regime into the world of rescue, particularly as the peers' of Rescue don't know enough about the subject matter themselves, and to condone restrictions under the guise of H&S that could, quite easily, have an undesirable impact upon crash victims seems ludicrous?

Even without the benefit of audit this has already begun to happen. From the disinformation of some 'Rescue Guidelines' produced by the motor industry to would-be expert Trainers, we can now witness a catalogue of instructions that undermine the development of Rescue –

- Always use hard-protection between the tool and the casualty
- Restrictions in the cutting of laminate glass
- Instruction, such as -
 - wait until the casualty is released before administering certain invasive care procedures
 - where the airbag has not deployed, do not use the front passenger's seat for initial casualty administration until the battery has been disconnected

- always disconnect the battery (although, it is common knowledge that on many occasions, it is impossible to disconnect the battery)
- not to use a radio or cell phone within the cabin
- do not place the long spine board over the roll over protection system (ROPS)
- do not to defibrillate in-vehicle
- do not to disconnect or cut SRS wiring

There are many more such restrictions that subtract from the Crash Rescue initiative and ultimate impact on end-outcomes. Who has the right to speculate and enforce such obviously flawed instructions that could possibly be described as negligent and discriminatory against the victim, and who supervises the initiative that allows this to happen?

Amazingly fire departments do not conduct *'time and motion'* studies for extrication evolutions. When asked how long the extrication will take guesswork still remains the order of the day. This tells us that when a Paramedic or Doctor needs to know the approximate time of release so that the casualty's fluid replacement can be estimated or whether or not it is necessary to expedite the extrication process, which can mean twisting and tugging limbs to free them, a rough guess is the best that can be managed.

What a waste of resource when you think of all the vehicles cut up in training; let alone the work done at the roadside. Appreciating the importance of timed evaluations many studies were conducted for the Manual 'RTA persons trapped – Ch 9, Planning the operational commitment'. The study addressed all elements of extrication with the exception of 'footwell entrapment', as this area held too many complications to give a realistic time frame. Based on at least one car a week over a four year period, when the timed evolutions were analysed, it was found that all vehicles studied came within an acceptable margin for each vehicle type when tested for each of the criteria set.

Timed Related Options Rescue Vehicle Inventory		
Operational Involvement (Criteria)	Working Duration (Mins)	Estimated Time Of Release (Mins)
Forced Door opening, side and roof removal (4dr car, 2 dr car, F/H coupe)	7 - 10	*12
Forced Door opening, side and roof removal - 4dr car, 2 dr car, F/H coupe (Accident damaged side)	10 - 15	*15
Etc., etc., etc		

The estimated time of release column was in some instances given additional time so as to ease Doctor or Paramedic frustration when, on the occasion they performed as part of the team, time overran. It also helped to build

confidence and credibility when dealing with the critical casualty. This worked well with the rescue vehicle crew, paramedics and doctors. However, the big problem with all of this was lack of recognition and support at a higher level.

Final Comment

The on-going notion that Crash Rescue isn't flawed must be addressed. Not only does it cost human lives and unspeakable suffering, it's tantamount to pouring money down the drain. What greater incentive can Crash Rescue have – **SAFE LIFE, SAVE SUFFERING, SAVE MONEY!**

Dear Rescuer

When you have read this document I would very much like to hear your comments. You may wish to give this document a rating between 1 – 10 (Poor 1, to excellent 10). The professional rescuers' views are most important to the development of rescue, especially poignant and constructive comments. You may wish to create a list of pertinent questions that we can submit to our readership at large. I look forward to reading your communications and will add your comments under the heading 'Debate' - <mailto:resqmed@enterprise.net?subject=Standards for Extrication Rescue>

Debate. Questions and Answers

Awaiting Your input

Profile – Len Watson



References and further reading:

- Crash Rescue, Vehicle extrication rescue and in-vehicle trauma care – Len Watson – ISBN 978 0 9550551 6 4 – visit www.resqmed.com/Crash_Rescue.htm
- CIREN - Crash Investigation Recording and Engineering Network -
- ETSC – European Transport Safety Council - <http://www.etsc.be/mem.htm>
- Mechanisms of Injury, The Kinematics of Vehicle Crashes and Likely Injury Patterns – resQmed - for more information visit <http://www.resqmed.com/>
- RTC extrication RESCUE – Len Watson – ISBN 978 0 9550551 7 1 – for more information visit www.resqmed.com/RTC_extrication_rescue.htm

- Safety At Scene – Dr. Vic Calland – ISBN 978 0 9551319 0 5 -
www.resqmed.com/Safety At Scene.htm
- Essentials of Immediate Care – John Easton – ISBN 0 443 053456 -
- Vehicle Rescue and Extrication - Ron Moore - ISBN 0 8016 3351 6 – Visit
www.firehouse.com
- Vehicle Entrapment Rescue and Pre-Hospital trauma Care – *ABM Wilmink, L M Watson, G S Samra, A W W Wilson - published Injury 1996. For a free download of the complete document go to –* www.resqmed.com/VehExResTraumaCare.pdf
- Vehicle Extrication - S Kidd & J Czajkowski - ISBN 0 87814 915 5 –
- Vehicle Extrication – A Practical Guide – Brian G Anderson –
pennwellstores.yahoo.net/vehexpracgui1.html
- The Principles of Extrication – IFSTA – ISBN 0 87939 086 7
- The Team Approach issue 1 – Free download -
www.resqmed.com/TheTeamApproach1.htm
 - A + C Spine management
 - The Platinum Ten



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