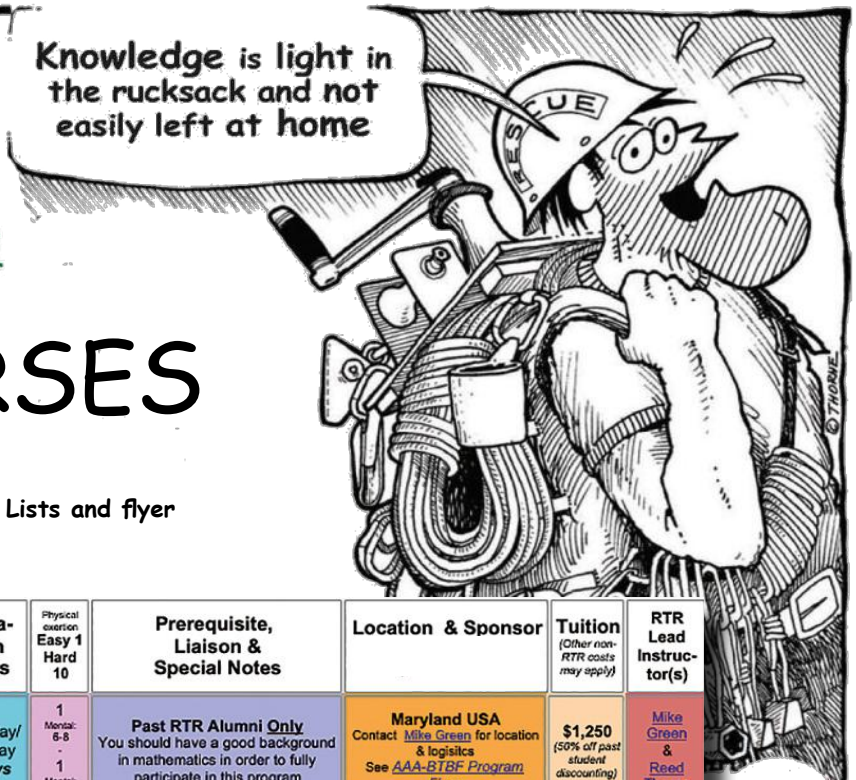
TECHNICAL RESCUE

EMS, EXTRICATION, SAR, AQUATIC, ROPE, DIVE, TACTICAL & USAR

ISSUE 82

Ropes That RESCUE ®Ltd.



2023 COURSES

See website for Equipment Lists and flyer

WORKSHOP or SEMINAR	STATE COUNTRY DATE 2023	TYPE	VENUES	Req. Equip *You will NEED*	Duration Days	Physical exertion Easy 1 Hard 10	Prerequisite, Liaison & Special Notes	Location & Sponsor	Tuition *(Other non-RTR costs may apply)*	RTR Lead Instructor(s)
Advanced Anchoring Analysis & Beyond the Barn Floor Seminars	MD Feb 21-27 2023	"Barn Floor" Physics & Adv. Rigging - Trigonometry Adv. Physics	Classroom and field testing - Classroom ONLY	See AAA BTBF flyer	Tuesday/ Monday *7 days*	1 Mental: 6-8 - 1 Mental: 10	**Past RTR Alumni Only** You should have a good background in mathematics in order to fully participate in this program	**Maryland USA** Contact Mike Green for location & logisitcs See *AAA-BTBF Program Flyer*	**$1,250** *(50% off past student discounting)*	Mike Green & Reed Thorne
Tactical Wilderness Rescue Wkshp	AZ March 12-16, 2023	Rapid Deployment Mnt Rescue	Classroom & Wilderness ONLY	Equip List 7/22	Sunday/ Thurssy *5 days*	7 rough terrain inherent	**No Prerequisite** Concentrates on low and steep angle litter evacuations. Ideal for Rapid Extrication Module Support (REMS) Teams	**Arizona USA** Town of Jerome *See Program Flyer*	**$1,200**	Reed Thorne
Mountain Rescue Workshop	AZ March 18-24 2023	Mountain Rescue	Classroom & Wilderness ONLY	MRW Equip List 7/22	Saturday/ Friday *7 days*	6 some hiking	**No Prerequisite** Prior rope rigging experience and climbing ability are strongly recommended.	**Arizona USA** Town of Jerome *See Jerome Fire MRW Flyer*	**$1,550** *(50% off AZ Volunteer discounting available)*	Reed Thorne
Artificial High Directional Workshop	UT April 17-23, 2023	Arizona Vortex	Classroom Industrial & Wilderness	AHDW Equip List 7/22	Monday/ Sunday *7 days*	6 some hiking	**No Prerequisite** Prior rope rigging experience strongly recommended.	**Utah USA** *Rock Exotica* & *South Dade Metro Fire* *See Program Flyer*	**$1,650**	Reed Thorne
Offset/Highline Rescue Workshop	AZ May 6-12, 2023	General Team Rescue	Classroom Industrial & Wilderness	OHRW Equip list 7/22	Saturday/ Friday *7 days*	4	**No Prerequisite** Prior rope rigging experience strongly recommended	**Arizona USA** Town of Jerome *See Jerome Fire INFO Flyer*	**$1,550**	Reed Thorne
Personal Skills Rescue Workshop	AK June 1-7, 2023	Solo-Semi Solo Rescue	Classroom Industrial & Wilderness	PSRW Equip List 7/22	Thursday/ Wed. *7 days*	8 A lot of "on rope" time	**No Prerequisite** *NOTE: Thes two programs will be run simultaneously* Prior rope rigging experience strongly recommended. Contact Travis Mead	**Alaska USA** Juneau-Captial City Fire & Rescue *See 2022 Program Flyer*	**$1,650**	Reed Thorne & Keith Thorne
Industrial Rescue Workshop	AK June 1-7, 2023	Industrial Rescue	Classroom Industrial & Wilderness	IRW Equip List 7/22	Thursday/ Wed. *7 days*	3				
Mountain Rescue Association SPRING Conference – Flagstaff, Arizona June 9-11, 2023										
Tree Rescue Workshop-Firefighter	CA June 10-16, 2023	Bottom Up Tree Rescue	Classroom & Wilderness ONLY	TRW-F Equip List 7/22	Saturday/ Friday *7 days*	10 tree climbing required	**Prerequisite: Climbing Trees** This program is specifically designed for responding tree emergency personnel in excellent fitness	**California USA** Nevada City *See Program Flyer*	**$1,650**	Keith Thorne & Reed Thorne
Structural-Tower Rescue Workshop	AZ June 24-30 2023	Tower Rescue	Classroom Industrial ONLY	STRW Equip List 7/22	Saturday/ Friday *7 days*	5 some climbing	**Prerequisite: Climbing Steel** Prior rope rigging experience recommended.	**Arizona USA** Town of Jerome *See Jerome Fire INFO Flyer*	**$1,550**	Reed Thorne
Team Skills Rescue Workshop	UK TBA Fall 2023	General Team Rescue	Classroom Industrial and/or Wilderness	TSRW Equip list 7/22	Tuesday/ Monday *7 days*	7 some hiking	**No Prerequisite** Prior rope rigging experience strongly recommended. Liaison: Waldo Etherington	**Bristol UNITED KINGDOM** *REMOTE ROPES LTD* *See Program Flyer*	Contact liaison	Reed Thorne
Mountain Rescue Workshop	NY Sept 18-24, 2023	Mountain Rescue	Classroom & Wilderness ONLY	MRW Equip list	Monday/ Sunday *7 days*	7 some hiking	**No Prerequisite** Liaison: Andrew Bajardi Prior rope rigging experience strongly recommended.	**New Paltz, New York** Mohonk Preserve "Gunks" Old *Program Flyer*	**$1,550** *(50% off NY Volunteer discounting available)*	Reed Thorne
Rope Access Skills Workshop	AZ Oct 2-6 2023	Level 1/2/3 Rope Access	Classroom & Industrial ONLY	RASW-2 Equip List 7/22	Monday/ Friday *5 days*	9	**Prerequisites:** RASW-1: No prerequisite RASW-2: RASW-1 required RASW-3: RASW-2 required or special permission	**Arizona USA** Town of JeromeSee *Jerome Fire INFO Flyer*	**$1,250 Each**	Keith Thorne & Reed Thorne
Tree Rescue Workshop-Firefighter	CA Nov 14-20, 2023	Bottom Up Tree Rescue	Classroom & Wilderness ONLY	TRW-F Equip List 7/22	Tuesday/ Monday *7 days*	10 tree climbing required	**Prerequisite: Climbing Trees** This program is specifically designed for responding tree emergency personnel in excellent fitness	**California USA** Nevada City *See Program Flyer*	**$1,650**	Keith Thorne & Reed Thorne
INTERNATIONAL TECHNICAL RESCUE SYMPOSIUM – Location Unknown. November 2 through 5, 2023										
JEROME ROPE RESCUE RODEO (Rescue Team Competition) – Jerome, Arizona Location Unknown. November 10 & 11, 2023 (Veteran's Day)										

www.ropesthatrescue.com

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CONTENTS

Plenty of Petzl kit on show by French Police CRS operators during complex canyon/gorge rescue training as shown on this issue's front cover. See page 2 for a more detailed description. Also worth checking out Reed Thorne's look at mini pulley systems on p38 of which the Petzl Jag is a fine example. pic by M Lafouche

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WSAR#11
Sister magazine **WILDERNESSSAR** features the EMILY Water rescue drone on the cover, a huge GUIDE to Climbing helmets, a SAR Dog flotation Harness review, swiftwater rescue techniques, drone use by Mountain Rescue and Geo-Location.

Above: In a nod to our forthcoming Extrication book the team look at recently published reports for evidence in favour of rapid extrication versus protracted immobilisation/roof-off extractions **p50**

Above: The Maltese Civil Protection Department are responsible for all fire and rescue tasks and must deal with a variety of urban, industrial and wilderness rescues particularly around the coastal cliffs. Darryl Ashford-Smith describes their training protocols **p10**

ARTICLES not shown as authored are by Ade Scott and the Technical Rescue editorial team.

ON THE COVER

PETZL RESCUE SOLUTIONS

COVER SHOT:

In France, when it comes to rescue operations in difficult-to-access places, many different groups might be called upon to step in – national or military police, firefighters or the Civil Defence. The CRS (Compagnies républicaines de sécurité or Republican Security Corps) have specially trained detachments, highly experienced in accessing and operating in perilous environments and usually assigned or attached to the regional police force or agency responsible for rescue. CRS are often associated with specialist police tasks like riot control and 'highway-patrol' but these specialist mountain rescue officers deal instead with complex rescue situations in this case a combination of rope rescue and water rescue as they carry out an exercise to retrieve an injured person in the Gave River, in the Gavarnie region of the French Pyrenees. Petzl Equipment used in the front cover image is as follows:

- PETZL NEST stretcher (1) which is specifically designed for use in technical environments in both the vertical and horizontal planes as well as being able to be manoeuvred with ease over challenging terrain. With a flat solid base, 8 handles and a fully integrated harness attached to the baseboard securing the casualty for a difficult extraction is easy.

A full English Reeve system is being used for access and egress from the ravine, this system includes:

- PETZL CONNEXION VARIO anchor (2)
- MAESTRO & I'D descenders
- Pulleys- REEVE (3), SPIN L1, SPIN S1 OPEN (4), SPIN S1
- PAW Medium
- RING OPEN rigging (5)
- ASAP LOCK with ASAP'SORBER AXESS back-up
- PARALLEL 10.5mm rope.

This system allows the team to install a full horizontal positioning solution with a vertical lower for dropping into a ravine for a rescue. By integrating the REEVE at the head of the system we have a huge rigging advantage with incorporated pulleys and rigging plate in a single device, when the SPIN S1 OPEN pulleys are added the solution is complete. By using the ASAP LOCKs at the lower pulley there is no need to rig in the additional rope, saving time & equipment during the setup and this solution retains full redundancy.

The rescuer is wearing the lightweight FALCON sit harness with the TOP CROLL S, STRATO VENT HI-VIZ helmet & VIZIR eye protection, this package is specifically designed for use by rescue professionals where weight, comfort, ergonomics & durability are built in from the design phase.

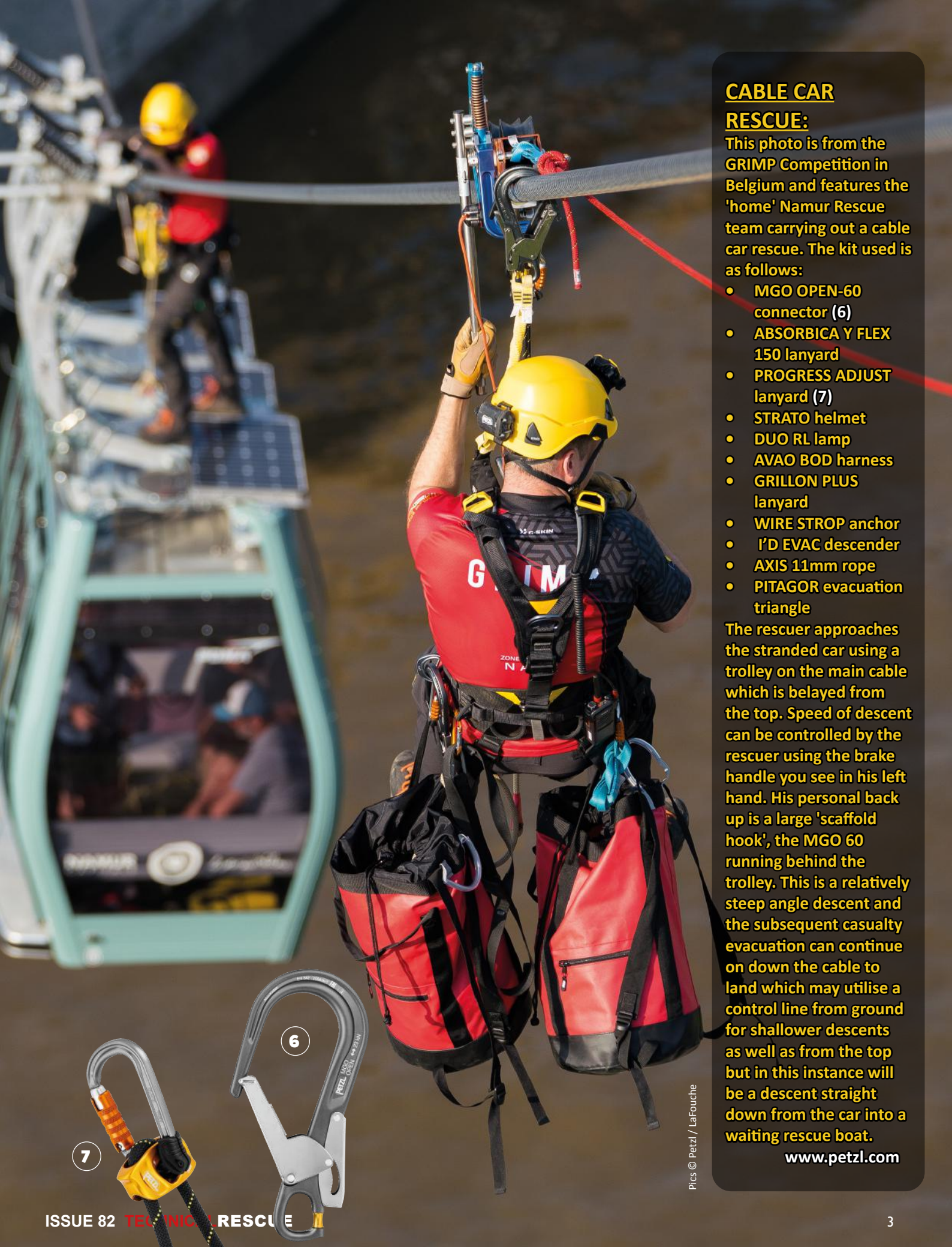
CABLE CAR RESCUE:

This photo is from the GRIMP Competition in Belgium and features the 'home' Namur Rescue team carrying out a cable car rescue. The kit used is as follows:

- MGO OPEN-60 connector (6)
- ABSORBICA Y FLEX 150 lanyard
- PROGRESS ADJUST lanyard (7)
- STRATO helmet
- DUO RL lamp
- AVAO BOD harness
- GRILLON PLUS lanyard
- WIRE STROP anchor
- I'D EVAC descender
- AXIS 11mm rope
- PITAGOR evacuation triangle

The rescuer approaches the stranded car using a trolley on the main cable which is belayed from the top. Speed of descent can be controlled by the rescuer using the brake handle you see in his left hand. His personal back up is a large 'scaffold hook', the MGO 60 running behind the trolley. This is a relatively steep angle descent and the subsequent casualty evacuation can continue on down the cable to land which may utilise a control line from ground for shallower descents as well as from the top but in this instance will be a descent straight down from the car into a waiting rescue boat.

www.petzl.com

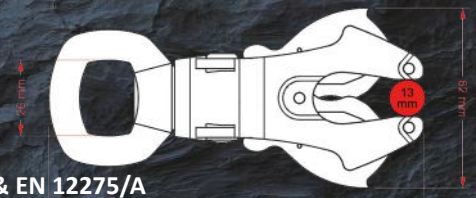


Pics © Petzl / LaFouche

PRODUCTS – ROPE STUFF

KONG FROG 360 with 'TEXTILE FRIENDLY' SWIVEL

The Frog connector is Kong's family of quick connecting, auto-closing, totally encapsulating clips which includes the **Cable** with carabiner eye, the non PPE **Mini Frog** and the **Frog Quickdraw** with a directly attached short sling. They all operate with a side released depressed between your thumb and fore-finger. The latest version is the **FROG 360** which incorporates a "textile friendly" swivel. It allows direct connection with textile elements and the creation of no-twisting lanyards. Thanks to the innovative automatic closing system of the gates, it allows a quick and safe directional connection. Made in Italy!



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EQUIPMENT THAT EXCEEDS

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Cascade Rescue litters are purpose-built to function as a patient packaging and patient movement system that exceeds the expectations of rescue professionals. Our NFPA Steel Litters and UL Certified Litters are ideal for difficult access and confined space rescues. Built in the USA, competitively priced, and manufactured by a company that has been in business since 1962. Our Professional Series Litters are what rescue professionals require in demanding technical rescues.

Rescues can be dangerous. **It's best to get gear from a company who understands that.**

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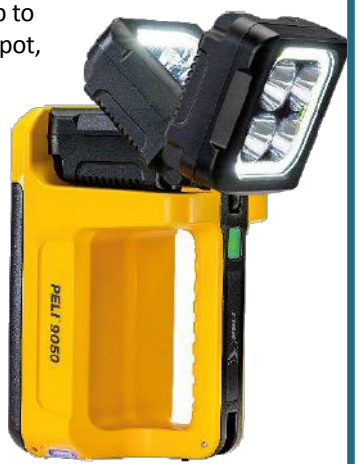
FLEXIBLE OUTPUT LED AREA LIGHTING

The new Peli™ 9050 LED is the first model in the industry that can be powered by a flexible battery system that can run on Li-ion battery packs, AA Alkaline or AA NiMH cells. The quick-change battery system provides the user with continuous lighting via rechargeable 7.4V Lithium Ion battery packs, or up to 16 AA Ni-MH / Alkaline batteries. With a light output of up to 3369 lumens there is a choice of Spot, Flood, or Spot & Flood combined, without the need for diffusers or attachments. This compact utility light is one of the brightest and most innovative LED lighting tools available, with extensive features providing industrial professionals with incredible versatility.



Designed to stand on end, the 9050 features a 112.5° tilting head to angle the beam exactly where required. A sure grip handle provides a comfortable and non- slip grip with an extra large space to accommodate gloved hands. With a battery level indicator, the Peli 9050 also has rear tail-lights with dedicated switch and adjustable colours (Green, Blue, Red). The Peli 9050 is waterproof with an IP67 rating, so can be used even in the worst wet conditions.

It has been designed to serve professional users in a diverse range of industries including Search and Rescue, Fire Services, Utilities, Rail, Police and more.

The addition of the versatile power pack ensures the user always has a backup, should the rechargeable batteries run low whilst in use at a critical time. The ability for the 9050 to switch between a dedicated flood, and a high power search spot beam provides the user with a multitude of possible applications in just one compact and lightweight LED unit.

www.peliproducts.co.uk

AUSTRALIAN first in water rescue drones

A new world-first drone will help save lives and reduce human risk in dangerous water rescues. Designed and created by Brisbane aerospace company Aeromech, the "drone" – known as SARGOTM (Search and Rescue Go) – is an unmanned surface vehicle (USV) that is set to revolutionise the way search and rescue operations are performed in life-threatening conditions.

Aeromech Director and the Australian inventor of SARGOTM, Joe Bryant, says there's nothing else like it on the world stage.

"The difference with SARGOTM is that it is a USV designed specifically to be dropped from search and rescue aircraft to land safely on top of the ocean's surface using a parachute. It can then be operated remotely to transport a payload of life-saving cargo to a stricken vessel or to people stranded in the water," said Joe, an aerospace engineer.

"The overall design and capabilities of SARGOTM are different to anything else on the market currently deployed by Marine SAR and Coast Guard aircraft. Existing products delivered by a fixed winged aircraft must be dropped directly to a target and cannot be navigated remotely, which makes their delivery method limited and inaccurate.

"That's why SARGOTM is a very exciting development for the rescue services."

SPECIFICATIONS

DIMENSIONS:	**Length 996mm**
	Height 292mm
	Width 286mm
PAYLOAD BAY:	**350 x 180 x 180mm**
WEIGHT:	**<15kg**
RANGE	**+/- 5km**
ENDURANCE:	**<2hrs**
SPEED:	**5-7 knots**
WEB:	**www.aeromech.com.au**

In 2021, Aeromech responded to an Expression of Interest from the Australian Maritime Safety Authority (AMSA) looking for a remotely operated vehicle that could be dropped from an aircraft and land on water – and so the idea for SARGOTM was born.

Noakes Group CEO Sean Langman said the vessel maintenance company, located in Sydney, was impressed by SARGOTM, in particular its design, capability and potential. "We believe SARGOTM has the potential to change the way we address search and rescue operations, both domestically and internationally," he said. "SARGOTM is a product that can fill the gap that currently exists within the search and

rescue market. We will continue to support Joe wherever possible, supporting young Australian companies that show initiative and innovation to ensure the lives of those at sea have access to technology such as SARGOTM," he said.

The SARGOTM uses two Electric Motors to power the unit. It uses these two motors to provide variable thrust to allow it to steer. Our strategy was the less moving parts the better from a maintenance and reliability perspective.

Aeromech was one of the successful recipients of the Queensland State Government Ignite 8 commercialisation fund announced in April 2022 to support the commercialisation and export of SARGOTM. Aeromech designs and builds SARGOTM in Brisbane, and is looking to continue to test and develop it further to market and export the product overseas in 2023.
"The beauty of SARGOTM is that it will not only save lives and keep rescuers safe, but also puts Australian manufacturing on the world stage, while also creating new jobs," said Joe. "We want to be part of the revival of Australian manufacturing of high-quality products that are used all over the world to better it – and SARGOTM is our first step in doing that.

The patented SARGOTM design makes way for Aeromech's second Australian-manufactured product, SEEKER, a USV designed to provide above and underwater surveillance, which is due to be released in early 2023.

HUMAN SHIELD

[ED: This is the VinZent by German company Bast-Ing Gmbh and it's one of those cross-over products we keep mentioning. This has come in for ARBCLIMBER magazine as a Forestry protection measure against falling branches either when working in a storm or working beneath a climber. However, it strikes us that this could have similar and varied uses for rescuers either operating in a similar way during a storm or having to work in an exposed location where there is risk of impact from falling debris – for instance an unstable cliff or a shaft in rope rescue or a building in USAR operations. Such a shield could provide protection for the rescuer and an exposed casualty? In the image below, imagine that the chainsaw is a face-up casualty on the ground during a storm or beneath a crumbling cliff.

The VinZent is named for the patron saint of forestry workers (in case you wondered) and we naturally asked about the impact rating to which we were told: "[It has been] tested by an EU – Certificated Institute. They have thrown an 11kg/24.2lb Iron rod from 5.6m/18.4ft into the [neck area] of the user of the VinZent. The VinZent adsorbed 86.6 percent of the vertical energy.

The aluminium of the VinZent was only slightly deformed and the user would have survived the "accident". It weighs 5.8kg/12.76lb and has an integrated, padded shoulder harness system with top grab handle and padded waist to comfortably carry that weight. We also asked about the holes in the peak above the head which would seem an obvious weak point and might allow a vertically falling branch or pole to enter and would certainly allow debris (in their case woodchips from the chainsaw above but might be something flying off the nasty looking tornado in this background shot) and water to run in and down the back.....The answer is simple – visibility to look up and keep an eye on the arborist in the tree. There is enough room in that part of the shield to allow a helmeted head to rotate back and get a view through those holes.

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MALTESE

By Darryl Ashford Smith

Careful pre-planning in the use of turntable ladders/hydraulic platforms ensures that loads remain well within limits. This is especially important when the platform is at a low angle and long extension as it is here because this is the weakest load-carrying position.

Darryl is currently a Scottish Mountain Rescue Training Support Officer, a veteran of USAR in the London Fire Brigade, has served as the Team Leader in the London Fire Brigade's Rope Rescue Competition Team and is currently a Rope Rescue Assessor in the United Kingdom Rescue Organisation.

ROPE RESCUE

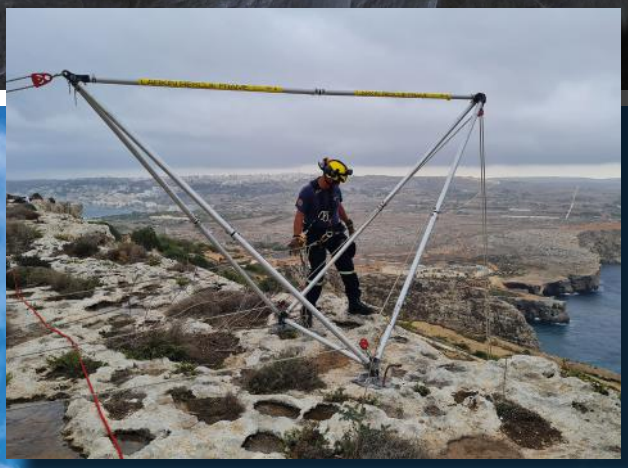
Not the most exciting of subjects where rescue is concerned but this article sets out to explore the background systems and documentation that may need to be considered to have everything in place for operational rope rescues to take place that are safe, efficient and well managed. Without the behind the scenes preparatory and facilitation work in place, organisations may leave themselves at risk. These include safety of personnel, financial and reputational risk.

The Maltese Civil Protection Dept will be used as an example however, the systems and processes discussed may equally be utilised in other organisations with a responsibility for rope rescue. The Civil Protection Department (CPD) of Malta, a small island in the Mediterranean has a number of rope rescue teams strategically located to cater for a mixture in type of incidents but predominantly dealing with the cliff areas that many tourists frequent throughout the year. Like other rope rescue teams they are also multi-disciplinary also having firefighting and USAR as a capability.

The CPD(M) have recently undergone a process of reviewing and developing their processes in order to ensure that they have everything in place to support their rope rescue capability. The areas evaluated are as follows:

- TRAINING
- EQUIPMENT
- DOCUMENTATION
- PRE-PLANNING
- KEY PERSONNEL
- PEER REVIEW

Training for most consists of initial training, maintenance of skills and Continuous Professional Development. A formal training program needs to be established which details when and what training is carried out. The frequency and types of incidents that the team is likely to be mobilised to plays a big part in how often training takes place.



The Maltese Civil Protection Dept operates in urban, industrial and remote locations using Larkin Frames and Turntable Ladders to provide extra reach on cliffs.

A high risk or complex rescue that may occur infrequently may need a reasonable amount of training whereas a system of work that is used frequently at incidents may need less training as the skill is maintained operationally. Continuous Professional Development can be described as forms of training engaged in to develop and enhance the abilities of the learner. It should enable them to enhance their knowledge and skills and proficiency throughout their career. It can be delivered in various forms such as e-learning programs, conferences, workshops and other events. Continuous Professional Development in rope rescue may comprise of enhancement of skills and knowledge, the opportunity to test new equipment or new procedures. It is very beneficial to use the opportunity to access training from outside the organisation so that it does not become insular and allows development utilising the experience of others or in slightly different areas as many differing rope specific disciplines interlink. As there are no specific standards for rope rescue in Malta (like many other countries), The CPD opted to put their technicians and instructors through the International Technical Rescue Association (ITRA) system. This assisted them in assessing their technicians and instructors against a comprehensive set of outcomes and demonstrates that they are doing everything they can to at least have standards where none exist. The above enables all of the CPD rope rescue personnel to be registered with the ability to evidence what training and assessment they have done as well as a system of progression through to Instructor and Assessor.

EQUIPMENT

The equipment used by teams must again, be based on the risk and the types of incidents that the team is likely to attend. The CPD tried a number of new items of equipment in their review which were used in the locations and types of rescues that they mobilise to which was important as it is no use renewing equipment that hasn't been tried and tested as it would be used operationally. Compatibility is very important to consider when teams are multi-disciplinary and many rope rescue teams, not unlike the CPD also have USAR, confined space and water rescue capabilities. As part of the review, Turntable Ladders used as artificial high directionals were explored. It was highlighted that as a risk reduction measure, the use of a Turntable Ladder for rope rescue systems may be favourable in some of the cliff areas that The CPD respond to. Careful risk analysis took place as using them can bring their own hazards. The CPD have two different types of Turntable ladder so training took place using both. With systems like these, proof of concept must take place so that personnel are familiarised with the use of their equipment in a specific way or scenario and know that it will work when needed operationally.

DOCUMENTATION

Having documentation is essential and there are several specific areas that need to be covered in order to have written material that supports the capability. Not having documentation on the risk, capability, systems of work, safety and how it will be facilitated will again, put personnel and the organisation at risk. The CPD have opted for two separate documents, a Guidance Note and a Training Note. It is essential that the documentation is presented in such a way that it will be read. All too often notes are created that don't offer readability and contain too much or irrelevant information. The Guidance Note covers the overarching information and created

to be read by all those within the organisation that have anything to do with the rope rescue capability directly or indirectly;

Definitions (describing the actual risk and CPD specific capability)

- Operational Risk Assessments (the known hazards with associated risks and control
- Measures common to the incidents likely to be attended and the work carried out)
- Safe System of Work (a general list of how work will safely be carried out)
- Sequence of events (common to most rope rescue incidents attended)
- Operational considerations
- Initial, intermediate and end of incident actions.

The Training Note has been created for those directly involved in rope rescue training or operations and covers the following;

- Standards and conduct of training (including use of live casualty protocols)
- Equipment (summary of equipment used, maintenance, record keeping and stowage)
- Knots, anchors and rigging
- Working at height systems
- Systems analysis
- Mechanical advantage systems
- Vertical, diagonal and horizontal rescue systems
- Working at height with equipment.

It is often difficult to decide how many differing systems rope rescuers should be taught and practise to enable them to provide an adequate capability. Knowing too little may limit the knowledge base to take account of a wide range of incidents. Trying to teach and maintain skills of many systems can cause confusion and result in skill fade where teams are stretched already with other work as many rope rescue teams do not normally carry out that function as their sole capability. Having established and recorded principles that cover all of the systems that may be used is the key as they can be applied when the situations vary. The CPD were introduced to vRigger as part of enabling their Instructors to develop clear and accurate images of rope rescue systems for them to use in documentation and presentations. vRigger is reasonably priced software that allows the user to create rope rigging systems on their PC. It allows images to be created using an array of equipment normally used by rope rescue teams and allows them to be configured as dictated by the user. The images created can be saved and pasted into documents or presentations. Angles and force calculations can also be viewed.

The suite of documentation also includes these Checklists:
Initial Briefing Checklist – It is well known that even critical information can be missed when things get busy at an incident so a briefing checklist has been created which covers the task, priorities, key roles, plans, key areas, communications, resources and safety.

Instructor Training Preparation Checklist – When conducting more involved or larger scale training such as scenario based training or exercises, there may be a considerable amount of preparatory work to carry out. This Checklist covers the before, during and after actions that require to be carried out
Instructor Training Briefing Checklist – Used in conjunction with the above, this Checklist covers the briefing points for Instructors, other training staff and students. Included are actions on safety events, key personnel, hazards & safety, exercise parameters and a debrief
Rope Rescue Instructor Assessment – Used to evaluate an Instructor delivering training
Rope Rescue Supervisor Assessment – Used to evaluate a Rope Rescue Supervisor during a training scenario/exercise.

Without the above documentation, Team members, Instructors and Supervisors will not be working to the same systems with individualisations always creeping in. Standardisation is key to uniformity of tried and tested practices, safety, good communication and management.

PRE-PLANNING

The CPD Rope Rescue Teams are busy, have a number of different risks and attend a wide range of commercial, industrial and rural incidents. Being an island that attracts large numbers of tourists throughout the whole year, one of the greater risks is the cliff areas which surround or are part of access to viewing points, beaches or other swimming or leisure areas. Because of this, the team have trends in the type and location of incidents they attend. Another factor is the use of social media and how even single posts from influencers can increase the numbers of visitors to specific sites which may increase the numbers of incidents. The image above is of the Coral Lagoon which has seen a vast increase in the number of tourists resulting in an increase in incidents with those mimicking the influencers by jumping in, but being unaware of the dangers of exiting the lagoon which is through the cave, out into the open sea then a short climb up a very sharp cliff edge. When the sea is rough they are unable to exit and in need of rescue. Many rescue teams in tourist areas will know and experience the same effect. Because it is a known site, specific rescue plans can be prepared in advance. For this site, CPD Rope Rescue Supervisors evaluated the following:

- Vehicle access and parking (bearing in mind it can get extremely busy in high season)
- Minimum equipment requirements
- Incident management considerations
- Anchor points (part of the equipment required for this risk was a Larkin Frame so anchor holes can be pre-drilled in position)
- Compatibility of rope rescue procedures and equipment with that used in the water
- Liaison with partner agencies that have a responsibility for water rescue
- Systems of work, plans and alternative plans
- Transportation of casualty from the scene.

Again, proof of concept must take place so that personnel are familiarised with the systems and equipment they will use.

KEY PERSONNEL

Instructors – The CPD recognised that it is important to have key personnel when it comes to rope rescue training and operations. It was identified that Instructors are required that are not only trained and experienced in rope rescue as technicians but also assessed to deliver rope rescue training specifically. The group form an important part of the development of the capability by constantly carrying out research and development on their risks and the systems they use as well as the Instructors as individuals. They assist in each other's development by means of peer review (see below).
Supervisors – Also recognised was the need for Rope Rescue Supervisors to be established. Having this specific role at an incident is critical to the safety and smooth running of the incident. Some organisations rely on the incident commander carrying out this role which may be feasible with small scale simple incidents however, the supervisors role is different than that of the incident commander as the supervisor should plan and supervise the activities of the rope rescue team while the incident commander manages the scene and operations as a whole which may involve much more. Doing both at anything other than a simple incident is a risk.

PEER REVIEW

Some organisations/individuals seem to struggle with peer review as they may feel threatened that they might be caught out. If peer review is carried out as it should be, it will assist in maintaining standards and improving the performance of teams and individuals which assists in providing credibility as an organisation and as an individual. As mentioned above, it is beneficial for the rope rescue instructors/supervisors to carry this out within their own group as they know the standards and what is expected. For equal, fair and valid peer review to take place, the outcomes should be based on the current standards and should not be an off the cuff evaluation but one that has agreed outcomes and an agreed method in how it will take place.

SUMMARY

Hopefully the above highlights some of the necessary areas that need to be considered as part of your rope rescue capability. It is worth ensuring these things are in place as if a safety or other event should occur where it was found that these systems weren't in place, it could end up costing so much more in risk to personnel, finance and organisational reputation. Organisations (professional and voluntary) still get caught out without having the necessary systems and processes in place.
Don't be one of them!!!

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'HYDRAULIC' BATTERY TOOLS pt2

Part 1- Combi-Tools
Part 2 Cutters
Part 3 Spreaders
Part 4 Rams
Part 5 Special Tools

DEDICATED CUTTERS

Our title picture shows a great demonstration of how versatile some battery tools have become, in this case the Holmatro Pentheon series with full underwater cutting capability. It's not quite so good as a water safety promotion with a fine example of what NOT to wear when working in or near water, a non-buoyant firefighting tunic that probably weighs a ton and a half when wet. Even waist-deep water is a hazard if this firefighter suffers a medical event or is incapacitated in some way. For the purposes of this article we're going to pretend that this tunic is one of a new generation with integrated self-inflating life jacket that only inflates upon full immersion not when doused by a fire hose.

Do not try this with most battery tools!

This is the second in our series on battery tools and this time covers perhaps the core tool of any rescue range, dedicated cutters. Part one was on combination tools and those are all cutters as well as spreaders so you should also refer to that selection of battery tools in considering what you need of your cutter and whether the versatility of the combi-tool is more advantageous than the generally greater cutting performance of a dedicated tool. If you include the 50 combi-tools in your shopping list of potential cutting tools you have over 120 models to choose from. These are all direct-connect battery systems. Although we have mentioned Libervit's batteries and underwater prowess, their tools have not been included because they are regular hose-fed hydraulics that operate from a battery driven pump. Bear in mind that most hose-fed hydraulic tools can be run from hoses to a battery-powered hydraulic pump but that's a whole different GUIDE!

We included a detailed background to battery tool systems in part one so we won't duplicate too much of that here but we have provided a little more information in some columns so some headers will differ from the first part.

BLADE DESIGN

There was a time when the only game in town for cutter blades was the parrot-beak, fully curved blade. This parrot beak was generally preferred in the specialist cutter blades because it grabs and holds difficult to cut, harder bar material rather than spit it out as a scissor-straight blade might. However, straight blades quickly edged into the market alongside parrot-beak blades partly because combi-tools mostly need to be straight blades to accommodate spreading tips and partly because a serrated or scalloped blade was introduced to help grip hard bar materials rather than perfectly straight shearing blades. We don't see quite so much of the pivot-point notch design that we see in hand-held pliers and multitools where the strongest part of the jaw, deep into the mouth of the tool, has a notch for cutting harder wires but they are an obvious

CORRECTION from part 1

Weber *are listed as German, which is correct but the rescue division should more accurately be listed as Austrian. Weber also asked us to point out that their* ***Smart-Force*** *series has underwater capability with the addition of a cover to their Milwaukee batteries, so this would also be relevant to their* ***Smart-Force*** *Combi Tools in part 1.*

presence on TNT's models which we have listed as a straight blade. Some appear to have an obvious rebate or curve near the blade union but this can be more indicative of the blade's design requirement to rotate around a wide hub than a hard-bar cutting notch. Nevertheless, as with all blades, the highest strength is closest to this union with strengths for cutting dropping off significantly as you get towards the tips. You would therefore always try to cut hard materials within the first quarter of the blades length. Again, don't forget that many combi tools have detachable spreader tips and can therefore be used as dedicated cutters so it is worth reviewing models in part 1 of these GUIDES to determine if your operational needs can be met by a combi-tool. But we mentioned last time that modern car materials are taxing cutters more than spreaders and this will be a prime reason for choosing a dedicated cutter over a combi- the sheer grunt to be able to cut the toughest of materials.

Unlike combi tools with spread extensions, cutting blades tend to be a solid forged lump of hardened steel so, though smaller in size than a spreader, they're not necessarily lighter. *Weber/Genesis* blades are unusual in having cut-away holes in their cast blades which does make them lighter and may, as we surmised last time, improve visibility of the materials around the cut.

Holmatro were the first to evolve the curve blade, first by extending the curve rather than being semi-circular and then by mimicking a spanner head and extending the front part of the curve into a straight, shearing section – this enables 'pre-cutting' of the section, especially sheet metal to ease the resistance once the material is pulled further into the high strength curve section. We now see blades that look

BATTERIES & BACKPACKS

The game-changer in battery tools was the improvement in off-the-shelf Lithium ion batteries engineered for trade tools like saws and drills. *Ogura* were the first to cotton onto this over 30 years ago utilising the *Makita* platform and we now see many tools still utilising trade batteries, particularly *Milwaukee*, because they are tough, inexpensive, readily available and service many tools in addition to your cutting/spreading rescue gear – eg. reciprocating saws and impact drivers. *Holmatro* initially got into battery tools using the *DeWalt* 24v platform but soon realised that the unique requirements of rescue gear in terms of fitting into tight spots and withstanding water and dust ingress would benefit from a bespoke battery. Their semi-circular wrap-around battery is engineered to streamline the tool as it sits around the barrel, and operate to the specific requirements of the motor. *Lukas/Hurst, Powerhawk, ResqTec* and *Libervit* also use bespoke batteries. The key feature though is the ability of *Holmatro, Lukas* and *Libervit* tools to not only be waterproof, they can operate entirely underwater and even swap out batteries underwater on *Holmatro* and *Lukas/Hurst* tools. There are waterproof covers for some trade batteries like Makita and Milwaukee and Weber Hydraulik uses such a system on their *Smart* range to make them waterproof but this is an adjunct, albeit a less expensive option, rather than integral waterproofing. Modern Lithium ion **batteries DO NOT have an infinite life**, they will all provider somewhere between 100 discharges/recharges to over 500 and much more for the highest quality. It is worth seeking this information when choosing a tool range.

BACKPACKS are a means to provide much improved duration and taking the weight off the tool in-hand and this is something we've been fans of since the start. *Powerhawk* first used this concept in the 90's though it was more out of necessity at that time because it used a 12v car battery, in fact any old car battery including the ones at the scene of an accident via long 'jump' leads so you would never be short of power supply options (this is still the case with the *Legacy P16* but their later models can also use a smaller bespoke battery).
Resqtec and *Libervit* are so far the only two in our sector to go with a hardened backpack but *Makita* (right) also has them for rescue tools using that platform. In fact they have two different types which highlight the way things might go – the integrated enlarged battery cell in a backpack as with the green *ResQtec* below and a multi-battery carrier in this case using batteries in series. *Libervit* tools were the first to really tackle underwater use but are NOT included here because they are not direct-attach batteries; they have a hydraulic/electric backpack which is a principle that ALL regular hydraulic tools could use and indeed many do. *Weber* for instance has a hydraulic backpack powered by M28 batteries (pic below-left) but **all of the primarily hydraulic tools, even where powered by battery backpacks, are larger and heavier than their direct-connect battery counterparts**.
Libervit's B.A.S. backpack battery (right) seems to have replaced their original hardened backpack and is now housed in a cordura pack. As a lead-connected backpack the BAS is fairly typical size-wise- perhaps wider than most because of the hydraulic pump element at 280x230x390 mm /11x9x15.5". They also have a large battery/hydraulic package for use underwater – their *M38* but it weighs 22kg/45lb. Two giant companies known to rescuers are *Husqvarna* and *Stihl* which many rescue agencies use for recip and quick-cut/circular saws and chainsaws. They not only have their own bespoke battery systems they also have excellent backpacks. The downside of all of these bespoke systems is the increased cost and availability compared to off-the-shelf batteries but there is no doubting their high quality and fitness for specific purposes.
The rescue sector can be rightly proud to have led the way in underwater battery tools. We will see more long-duration back-pack options in the coming years and there will be a time when submersible, direct-connect batteries will be the norm.

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more like a straight front section feeding into a straight rear section rather than curved. The angled junction of the two straighter blade sections still acts to capture the material being cut and force it deeper into the stronger section of blade. Because the difference between a straight-curve blade and a straight blade with less curve is mostly quite subtle we've described all such two-shaped blades as ***Str-Curve*** in our tables and these are now the norm across most product ranges. The traditional full curve parrot beak is still evident in 'legacy' models and in some smaller hand-drill style cutters but very much a minority design and most of those listed in our table as 'Curve' like the *TNT Rescue* models, are actually a much elongated curve rather than semi-circle. *Weber* have introduced blade 'inserts' with their '*Plus*' range allowing you to swap out the most abused sections of blade – this may provide significant savings and is something we will likely see more of. *Holmatro* further describe their own jaw design as 'inclined' because most of their tools have cutting jaws that are angled downwards by 30 degree. This is a useful feature even though it has yet to adopted by others, because it allows the tool to rotate further without 'trapping' the operator and gives increased access options where the body of the tool might otherwise inhibit placement of the cutting head. Which brings us to.....

ROTATE HEAD and/or HANDLE

This incline in the *Holmatro* tool is their permanently configured answer to improved access while their handle wraps around entirely allowing 360° use. Some have fixed handles that don't go all the way round but give about 270° of access like the *Power Hawk* above right which does have a 360° rear handle but the front handle uses two handle bars to add versatility rather than a full 360° wrap. Others have addressed access problems by allowing the handle to be rotated so that it doesn't get in the way of a specific cut as with *Scorpe, Weber* and *Amkus* models or by having the jaws rotate as with the *Power H awk P16X* and *Resqtec PW4*. Another original proponent of the rotating head is the *Ogura* tool with its electric drill power-unit. The original variant, the *HRS* had a hose (now direct connection to the powerhead) that allows 360° rotation of the head but the later *RP* models (pic above) are fixed to the power unit but have a rotating front handle.

LED LIGHTS

Even though all helmets can have a headlamp attached and many have a light as an integral feature, they are often situation so that cutting in restricted spaces puts the cutting area into shade rather than illuminating it. The first tp introduce LEDs into their rescue tools was *Holmatro*, with most manufacturers now following suit. Some, like the *Amkus* on the left have embedded LEDs into the handle while others like the *Weber* are embedded in the rear housing. If your tool doesn't have on board lighting you could simply retrofit a small LED torch/ flashlight to the handle or barrel with a strap or zip-tie.

SIZE MATTERS

We mentioned in part one that contrary to our expectations and preferences when battery tools first arrived that the length and bulk would be reduced, they weren't. One or two models that started down the 'stubby' versus 'long' route like the *Power Hawk* and subsequent P4 *Resqtec* continued to evolve that line of tools to provide a modern option and the hand-drill design has continued as a separate branch but for the most part, all of the conventional cutting, spreading and combi-tools went on to be a very similar size and look as the hose-fed versions except with a battery stuck on somewhere. *Holmatro*'s new mini-cutter which has a similar cutting head to most peddle cutters shows how a battery can create a very useful self-contained tool that can go anywhere although peddle cutters have long been run from short extensions without any problems because they were only ever operating in the footwell. This new model can be used in any area of a vehicle or for

DEDICATED BATTERY CUTTERS

building entry or railing cutting etc. It's a high-cutting power option that can virtually be carried in a vehicle glove-box.....if you had a really, really big glove-box.

NOISE

Something we didn't elaborate on in part 1 was the noise generated by battery tools. We said and often say, that there is very little noise associated with battery tools as compared to a petrol engine or, in the case of hydraulics, a petrol/gas generator. When a battery tool is NOT being used there is virtually no noise, no background tick-over or the continuous quite loud noise of a fuel-driven generator, even the so called whisper-pumps. But when the tool is operating there is a noise, often a high-pitch whirr that increases with workload. As an example, *Libervit*'s large backpack battery with hydraulic pump generates 48 dB, the *Lukas/Hurst 799* = 69 to 74 Decibells and Holmatro's *MiniCutter* =74. Those aren't bad – compared to a 32cc chainsaw at around 80 to 103dB and of course, the petrol chainsaw continues to generate a relatively high noise even on tick-over.

LEFT: The Weber Smart-Force range uses a battery cover on the rear to keep its Milwaukee 18v battery waterproof

WiFi & DIAGNOSTICS

Most modern tool batteries already show charge status – usually with a line of green LEDs but many do much more. Some, like *Holmatro,* have a hard-wired diagnostics capability where the tool is linked to a laptop to assess live diagnostics, live performance data, maintenance and testing. This can be done in the field but is generally a post-incident task undertaken back on-station. Others use a mobile or WiFi app to connect remotely to a 'Smart' phone, device or wrist-monitor. *Weber*'s range of *E-Force* models has a *Smart-Force* variant which uses app-management. *Lukas/Hurst E-Connect* variants have mobile connectivity that allows their tools to be monitored for status, performance and inventory but they have also taken things a step further with an integrated dashboard on the handle to give real time information and *Libervit* have a wrist-mounted screen for tool monitoring.

IN THE FOLLOWING TABLES.....

The tool length, width or height and weight are all WORKING spec so they **include the battery**. Many companies quote figures without the battery so at first glance seem lighter but when added has a significant affect on both the physical size and weight of a tool when in use. As with all cutting and spreading tools, the largest or highest figures are not necessarily the best for the job. Cutting and spreading strengths vary radically from the tips to nearer the fulcrum or union. The cutting codes for CE and NFPA certification given below are by far the BEST way to gauge the true abilities of a tool.

All force figures are given in KiloNewtons and US (short)tons

Any use, feature, accessory or component that is inherent in the tool is shown as a solid coloured square ■■■■

If it's an option it is shown as an outline square □□□□

A circle ● in the 'USE' columns indicates that this feature is only partially present and/or is OK for that purpose but not ideal.

A model variant is shown in cyan and any features or specifications that differ from the standard are also in cyan or will have a cyan outline to a black or orange square ■■.

TOOLS-IN-RANGE: refers to the other types of tool available in this specific series of tools using this specific battery type.

■= Cutter ■= Spreader ■= Ram ■= Special Tools

ORIGIN: The company's home country, not necessarily the country of manufacture which is indicated by an inset flag or two equally sized flags if the tool is made in both countries as is the case with Holmatro's Pentheon.

COST: As usual, this is clearly an official secret within the industry. This is because the cost of one tool is vastly different to the cost of multiples that they sell to entire fire services. But this is the same situation for virtually every piece of equipment we ever have in TECHNICAL RESCUE where we always quote the single item cost on the understanding that any bulk purchase will of course be a lower figure. We did have a price for TNT in the US as the only one with the confidence to quote a price but even those have been withdrawn. As a rough guide, you were looking at $8-12,000 for single tool (with battery & charger) but that varies hugely...not cheap! And the batteries are an expensive consumable as well – eg. a Milwaukee M28 5Ah battery can cost you £/$/€200-300 though individuals could purchase through Amazon etc. and save a packet! Had we had any prices they would have been a rough guide only & include local taxes/VAT. They would have varied with exchange rates, extra taxes etc. We usually round up to the nearest Pound£/US Dollar$/Euro€. Cost is usually for basic model with included accessories indicated by a solid square in the appropriate column (optional extras being an outline square).

WEIGHT IN HAND: Refers to the operational weight that the rescuer experiences in using the tool so it includes any on-board batteries but not backpack batteries and not necessarily any extras like clip-on lighting or different tips blade inserts.

WEIGHT of BATTERY: is for the default battery supplied or preferred by the manufacturer. Those that use 'off-the-shelf' brands like Milwaukee and DeWalt may well be able to use either higher Ah models for greater capacity/duration or lower Ah for decreased cost and perhaps weight but less duration.

BATTERY DURATION & RECHARGE TIME: Work-time or duration is much trickier as it depends on the resistance of the material being cut/spread/squeezed, the temperature, the age of the battery and even how meticulously you follow the recharge guidelines. Consequently some won't quote a figure at all and others are generous to say the least – consider most to be the absolute maximum with minimal workload. Tools last much longer carrying out hundreds of short duration cuts like the Genesis figure of <45mins compared to a few really long and hard cuts like Homatro's minimum 11minute figure in like-for-like cutting/spreading their battery will match the highest time given by others cutting smaller and lighter materials.

Recharge time can be more specific though it varies wildly between basic and high speed chargers. The time shown is for the charger supplied or preferred by the manufacturer and may give a time-range if referring to different types of charger.

DIMENSIONS: The Length by width by depth/height of tool ready to store on the truck and/or ready to work. This will be with jaw closed which makes the tool longer and narrower. Height is the 'thickness' of the tool off the ground if you lay the tool down and is usually dictated by either the handle or the battery if it is top-mounted.

CUT FORCE: Is the maximum *theoretical* force possible but not quoted by all because the EN and/or NFPA classifications cover this more accurately. Indeed, one or two manufacturers flat-out refuse to quote it because they feel it is a misleading figure. Our figures are in kN (KiloNewtons) and US (Short) Ton. A US (short) ton = 2000lb so you can easily convert the figures in the table to lb (more accurately lbf) by doubling the figure we have and adding 3 zeros. There are 1.10 US short tons to a UK ton and to the metric ton (or tonne).

CUT OPENING: The maximum distance the cutter blades will open but don't forget that this does not equate to the material that can be cut as the max opening provides the least power. Check out the round bar cutting figure for more accurate interpretation of cutting prowess.

ROUND BAR: According to NFPA (and/or EN cut classifications) (see table on page 33) this is the max size of round bar that can be cut as a prescribed material with a specified Rockwell Hardness so that all tests are comparable.

ROTATE HEAD/HANDLE: Either the blade or the handle can rotate for better access to the cut or the handle will extend around the tool by 180, 270 or 360° to allow it to be used in any position.

LED LIGHTS: Integral lighting from the handle or housing to illuminate the area being cut/spread.

WiFi DIAGNOSTICS: ■The tool and/or battery are linked to a mobile device to manage functions, servicing and inventory or ■=can be hardwired to a laptop etc. for diagnostic analysis

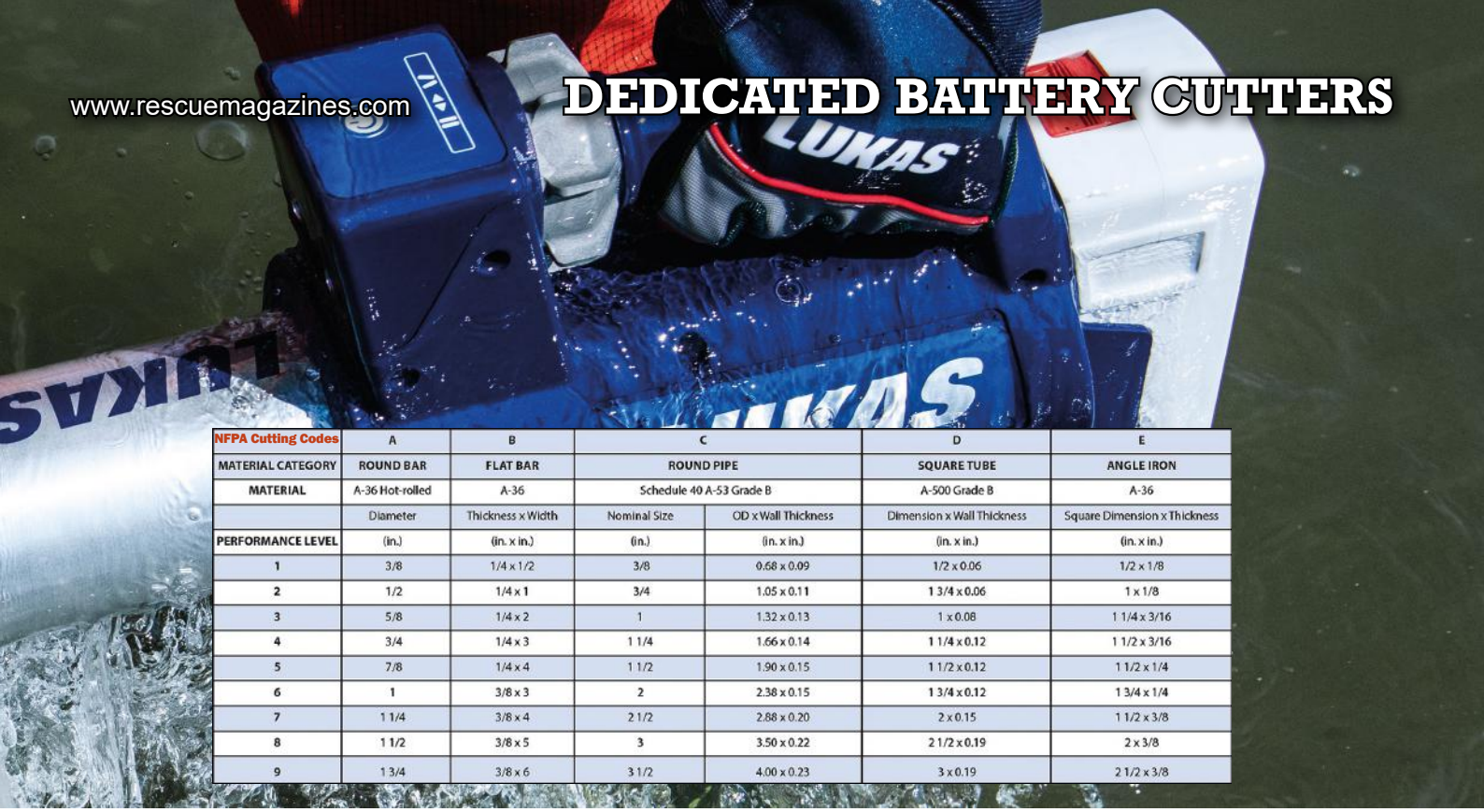
IN-WATER-CAPABLE: The tool/battery can be used underwater **TOOL/BATTERY IP**. Ingress protection for dust (first number) & water (second number) – IP54 resists water splashes, IP57 & 67 withstand inundation to 1metre, IP58&68 deeper than 1metre. Trade batteries like Milwaukee are not waterproof and tend not to quote an IP number because they are dependant on the tool to create an effective seal. Specialist batteries like Holmatro and Lukas are watertight (IP68) but you can safely assume that regular trade batteries are no more than IP54 so they are splashproof but certainly not submersible.

The Lukas & Hurst E3, E3-Connect, Lukas EWXT and Holmatro Pentheon series of tools are all fully sealed against water immersion with batteries that can be changed under water. The Lukas/Hurst E3 & E3 Connect can even use a salt water battery that can be swapped under fresh and salt water. On the illuminated 'dashboard' present on E3 and E3 connect models (pic below) a wavy sea symbol indicates when the saltwater battery is on board. Note the EWXT model shown in the main picture does not have the full 'dashboard' of the E3/E3 Connect. Weber's Smart range uses a waterproof cover on their 18v Milwaukee battery and top-right is their on-board dash. Libervit have used battery tools in sea water for years and even have full WiFi management including this handy Wrist-mounted monitor with 30m range, but their tools require a remote battery/hydraulic pump backpack attached via lead rather than a battery attached directly to the tool.

IMAGES NOT TO SCALE	MODEL SERIES VOLTAGE	COMPANY	TOOLS IN RANGE	ORIGIN	COST inc tax / VAT	WEIGHT IN HAND inc BATTERY(IES)	WEIGHT DEFAULT BATTERY	BATTERY Ah OPTIONS	BATTERY DURATION RECHARGE TIME
	**ION ic650 Compact** 54/60V	**AMKUS**			N/A	23.7kg 52.3lb	1.2kg 2.6 lb	DeWalt FlexVolt 6Ah 9, 12Ah	10-15mins 60mins
	**ION ic700** 54/60V	**AMKUS**			N/A	25.6kg 56.6lb	1.2kg 2.6 lb	DeWalt FlexVolt 6Ah 9, 12Ah	10-15mins 60mins
	**ION ic750** 54/60V	**AMKUS**			N/A	26kg 57.3 lb	1.2kg 2.6 lb	DeWalt FlexVolt 6Ah 9, 12Ah	10-15mins 60mins
	**F180-2P BO** 54/60V	**EDILGRAPPA**			N/A	22.5kg 10.2lb	1.4kg 3lb	DeWalt FlexVolt 9Ah	10-25mins 60mins
	**F150N-E** 54/60V	**EDILGRAPPA**			N/A	22.3kg 10.1lb	1.4kg 3lb	DeWalt FlexVolt 9Ah	10-25mins 60mins
	**F130-N-T30** 18/20V	**EDILGRAPPA**			N/A	13.1kg 28.8lb	0.6kg 1.3lb	DeWalt FlexVolt 5Ah	10-15mins 60mins

NOTES: COST: Approx, INCLUDES local tax/VAT OTHER TOOLS IN RANGE: = Combi = Spreader = Ram = Special Tools

DEDICATED BATTERY CUTTERS



NFPA Cutting Codes	A	B	C		D	E
MATERIAL CATEGORY	ROUND BAR	FLAT BAR	ROUND PIPE		SQUARE TUBE	ANGLE IRON
MATERIAL	A-36 Hot-rolled	A-36	Schedule 40 A-53 Grade B		A-500 Grade B	A-36
	Diameter	Thickness x Width	Nominal Size	OD x Wall Thickness	Dimension x Wall Thickness	Square Dimension x Thickness
PERFORMANCE LEVEL	(in.)	(in. x in.)	(in.)	(in. x in.)	(in. x in.)	(in. x in.)
1	3/8	1/4 x 1/2	3/8	0.68 x 0.09	1/2 x 0.06	1/2 x 1/8
2	1/2	1/4 x 1	3/4	1.05 x 0.11	1 3/4 x 0.06	1 x 1/8
3	5/8	1/4 x 2	1	1.32 x 0.13	1 x 0.08	1 1/4 x 3/16
4	3/4	1/4 x 3	1 1/4	1.66 x 0.14	1 1/4 x 0.12	1 1/2 x 3/16
5	7/8	1/4 x 4	1 1/2	1.90 x 0.15	1 1/2 x 0.12	1 1/2 x 1/4
6	1	3/8 x 3	2	2.38 x 0.15	1 3/4 x 0.12	1 3/4 x 1/4
7	1 1/4	3/8 x 4	2 1/2	2.88 x 0.20	2 x 0.15	1 1/2 x 3/8
8	1 1/2	3/8 x 5	3	3.50 x 0.22	2 1/2 x 0.19	2 x 3/8
9	1 3/4	3/8 x 6	3 1/2	4.00 x 0.23	3 x 0.19	2 1/2 x 3/8

STORED **DIMENSIONS** LENGTH WIDTH DEPTH inc battery	**CUT** CLASSES EN CLASSIFICATION EN CUT CAPACITY NFPA CLASS	THEORETICAL **CUT** FORCE t= US short ton	**CUT** OPENING ROUND BAR	**WORKING** (HYDRAULIC) PRESSURE	BLADE TYPE	ROTATE HEAD/HANDLE	LED LIGHTS	WiFi DIAGNOSTICS	IN-WATER-CAPABLE TOOL/BATTERY IP	NOTES	WWW.
863mm 221mm 241mm 34" 8.7" 9.5"	- - - A6 B8 C6 D8 E7	N/A	147.3mm 5.8" 25mm* 1"	700 Bar 10.2K psi	Str-Curve	- 360°	■	-	- n/a	*as per NFPA A6	amkus.com
829mm 221mm 294mm 32.7" 8.7" 11.6"	- - A7 B8 C7 D9 E8 F4	N/A	147mm 5.8" 31.75mm* 1.25"	700 Bar 10.2K psi	Str-Curve	- 360°	■	-	- -- n/a	*as per NFPA A7	amkus.com
856mm 221mm 294mm 33.7" 8.7" 11.6"	- - - A8 B9 C7 D9 E9 F4	N/A	178mm 7" 38.1mm* 1.5"	700 Bar 10.2K psi	Straight	- 360°	■	-	- n/a	*as per NFPA A8	amkus.com
832mm 262mm 300mm 32.75" 10.3" 11.8"	J BC180-J-22.5 - -	871kN 98t	185mm 7.3" 24mm 0.95"	700 Bar 10.2K psi	Str-Curve	- 180°	■	-	- n/a		edilgrappa.com
777mm 274mm 244mm 30.6" 10.8" 9.6"	H BC150-H-20 A6 B5 C6 D7 E7	394kN 44.3t	147mm 5.8" 30mm 1.2"	700 Bar 10.2K psi	Str-Curve	- 180°	■	-	- n/a		edilgrappa.com
679mm 245mm 388mm 33.9" 10.8" 15.3"	F AC130-F-13 -	330kN 37.1t	130mm 5.1" 24mm 0.95"	550 Bar 8K psi	Curve	- 180°	■	-	- n/a		edilgrappa.com

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	MODEL SERIES VOLTAGE	COMPANY	TOOLS IN RANGE	ORIGIN	COST inc tax / VAT	WEIGHT IN HAND inc BATTERY(IES)	WEIGHT DEFAULT BATTERY	BATTERY Ah OPTIONS	BATTERY DURATION RECHARGE TIME
	TP10 18/20V	EDILGRAPPA	■ ■		N/A	8.5kg 18.7lb	0.6kg 1.3lb	DeWalt FlexVolt 5Ah	10-15mins 60mins
	ALL9 E-Force 28V	GENESIS RESCUE			N/A	26.3kg 58lb	1.4kg 3.2lb 1kg 2.3lb	Genesis/ Milwaukee 5Ah*	<45min 90mins
	C195 SL3-NXTGEN E-Force 28V	GENESIS RESCUE	■ ■ ■		N/A	20.6kg 45.4lb	1.4kg 3.2lb 1kg 2.3lb	Genesis/ Milwaukee 5Ah*	<45min 90mins
	C236 SL3 NXTGEN E-Force 28V	GENESIS RESCUE			N/A	23.5kg 51.8lb	1.4kg 3.2lb 1kg 2.3lb	Genesis/ Milwaukee 5Ah*	<45min 90mins
	Mass Transit Cutter 109.104.0 E-Force 28V	GENESIS RESCUE			N/A	23.4kg 51.5lb	1.4kg 3.2lb 1kg 2.3lb	Genesis/ Milwaukee 5Ah*	<45min 90mins
	PENTHEON PCU60 28V	HOLMATRO			N/A	25kg 55.1lb	1.5kg 3.3lb	Holmatro PBPA287 7Ah	11-30mins 60mins
	PENTHEON PCU50 28V	HOLMATRO	■ ■ ■		N/A	21.5kg 47.4lb	1.5kg 3.3lb	Holmatro PBPA287 7Ah	11-30mins 60mins
	PENTHEON PCU40 28V	HOLMATRO			N/A	19kg 41.9lb	1.5kg 3.3lb	Holmatro PBPA287 7Ah	11-30mins 60mins
	PENTHEON PCU30CL 28V	HOLMATRO			N/A	15.3kg 33.7lb	1.5kg 3.3lb	Holmatro PBPA287 7Ah	11-30mins 60mins
	MIni-Cutter CCU10 18V	HOLMATRO	-		N/A*	4.9kg 10.8lb	0.4kg 0.9lb	Holmatro CAS 2Ah	<70 cuts 30mins
	S 799 E2 25.2V	HURST (IDEX	■ ■ ■		N/A	26.2kg 57.6lb	1kg 2.1lb	Hurst 5Ah	30-60mins 90mins

NOTES: COST: Approx, INCLUDES local tax/VAT OTHER TOOLS IN RANGE: ■= Combi ■= Spreader ■= Ram ■= Special Tools

DEDICATED BATTERY CUTTERS

STORED **DIMENSIONS** LENGTH inc battery	WIDTH	DEPTH	**CUT** CLASSES EN CLASSIFICATION EN CUT CAPACITY NFPA CLASS	THEORETICAL **CUT FORCE** t= US short ton	**CUT OPENING** ROUND BAR	**WORKING** (HYDRAULIC) **PRESSURE**	BLADE TYPE	ROTATE HEAD/HANDLE	LED LIGHTS	WiFi DIAGNOSTICS	IN-WATER-CAPABLE TOOL/BATTERY IP	NOTES	WWW.
1034mm 40.7"	264mm 10.4"	143mm 5.6"	- - - -	233kN 26.2t	52mm 2" n/a	550 Bar 8K psi	Straight	- -	-	-	- n/a		edilgrappa.com
1029mm 40.5"	298mm 11.7"	241mm 9.5"	- - - A9 B9 C9 D9 E9	N/A	260mm 10.2" 45mm 1.75"	700 Bar 10.2K psi	Str-Curve	- 360°	4	-	- 54	*15Ah powerpack also available	genesisrescue.com
898mm 35.4"	236mm 9.3"	241mm 9.5"	- - - A8 B9 C7 D9 E9 F4	N/A	185mm 7.3" 38mm 1.5"	700 Bar 10.2K psi	Str-Curve	- 360°	4	-	- 54	*15Ah powerpack also available	genesisrescue.com
994mm 39.1"	260mm 10.2"	241mm 9.5"	- - - A7 B8 C6 D8 E8 F5	N/A	210mm 8.3" 32mm 1.25"	700 Bar 10.2K psi	Str-Curve	- 360°	4	-	- 54	*15Ah powerpack also available	genesisrescue.com
743mm 29.3"	205mm 8"	241mm 9.5"	- - - A4 B3 C5 D6 E6	N/A	120mm 7.3" 19mm 0.75"	700 Bar 10.2K psi	Straight	- 360°	4	-	- 54	*15Ah powerpack also available	genesisrescue.com
969mm 38.1"	236mm 9.3"	241mm 9.5"	K CC205-K-25 1K 2K 3K 4K 5K A9 B9 C9 D9 E9 F4	1765kN 198.4t	205mm 8.1" 47mm 1.9"	720 Bar 10.4K psi	Str-Curve	- 360°	6	■	□ 57 57	Inclined blade angle. Stepless speed increase	holmatro.com
892mm 35.1"	270mm 10.6"	274mm 10.8"	K BC165-K-21.5 1K 2K 3K 4K 5K A8 B8 C7 D9 E9 F4	1389kN 156.2t	182mm 7.2" 41mm 1.6"	720 Bar 10.4K psi	Str-Curve	- 360°	6	■	□ 57 57	Inclined blade angle. Stepless speed increase	holmatro.com
832mm 32.8"	270mm 10.6"	300mm 11.7"	I BC165-I-19 1I 2I 3I 4J 5J A7 B7 C6 D7 E8 F3	764kN 85.9t	170mm 6.7" 36mm 1.4"	720 Bar 10.4K psi	Str-Curve	- 360°	6	■	□ 57 57	Inclined blade angle. Step less speed increase	holmatro.com
811mm 31.9"	270mm 10.6"	288mm 10.8"	G BC150-F-15.3 1H 2G 3G 4F 5G A5 B5 C5 D6 E4 F3	549kN 62t	170mm 6.7" 36mm 1.4"	720 Bar 10.4K psi	Str-Curve	- 360°	6	■	□ 57 57	Inclined blade angle. Step less speed increase	holmatro.com
554mm 21.8"	154mm 6.1"	92mm 3.6"	B AC59-B-4.9 1D 2D 3C A4 B3 C2 D4 E4	220kN 24.7t	59mm 2.3" 22mm 0.9"	720 Bar 10.4K psi	Straight	- 360°	1	-	20 54	Inclined blade angle. *Battery included	holmatro.com
1025mm 40.4"	281mm 11.1"	269mm 10.6"	K CC 200 K-26,2 1K-2K-3K-4K-5K A9 B9 C9 D9 E9 F5	1310kN 147.25t	204mm 8" 45mm 1.8"	700 Bar 10.1K psi	Str-Curve	- 270°	2	-	- 54		jawsoflife.com

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	MODEL SERIES VOLTAGE	COMPANY	TOOLS IN RANGE	ORIGIN	COST inc tax / VAT	WEIGHT IN HAND inc BATTERY(IES)	WEIGHT DEFAULT BATTERY	BATTERY Ah OPTIONS	BATTERY DURATION RECHARGE TIME
	S 788 E2 25.2V	HURST (IDEX			N/A	23.6kg 57.6lb	1kg 2.1lb	Hurst 5Ah	30-60mins 90mins
	S 377 E2 25.2V	HURST (IDEX			N/A	20.3kg 44.7lb	1kg 2.1lb	Hurst 5Ah	30-60mins 90mins
	S 799 E3/E3connect 25.2V	HURST (IDEX			N/A	26.5kg 58.3lb	1.6kg 3.5lb	Hurst 9Ah 5Ah	<60mins 150-100mins
	S 789 E3/E3connect 25.2V	HURST (IDEX			N/A	24.1kg 53lb	1.6kg 3.5lb	Hurst 9Ah 5Ah	<60mins 150-100mins
	S 378 E3/E3connect 25.2V	HURST (IDEX			N/A	20kg 44lb	1.6kg 3.5lb	Hurst 9Ah 5Ah	<60mins 150-100mins
	S 799-Beast E2 25.2V	LUKAS (IDEX)			N/A	26.5kg 58.3lb	1.2kg 2.7lb	Lukas 9Ah 5Ah	30-60mins 75-150mins
	S 788 E2 25.2V	LUKAS (IDEX)			N/A	23.8kg 44lb	1.6kg 3.5lb	Lukas 9Ah 5Ah	30-60mins 75-150mins
	S 377 E2 25.2V	LUKAS (IDEX)			N/A	20.5kg 45.1lb	1.2kg 2.7lb	Lukas 9Ah 5Ah	30-60mins 75-150mins
	S 312 E2 25.2V	LUKAS (IDEX)			N/A	20kg 44lb	1.2kg 2.7lb	Lukas 9Ah 5Ah	30-60mins 75-150mins
	S 799 E3/EWXT/ E3connect 25.2V	LUKAS (IDEX)			N/A	26.5kg 58.3lb	1.6kg 3.5lb	Lukas 9Ah 5Ah	<60mins 150-100mins
	S 789 E3/EWXT/ E3connect 25.2V	LUKAS (IDEX)			N/A	24kg 52.8lb	1.6kg 3.5lb	Lukas 9Ah 5Ah	<60mins 150-100mins

NOTES: COST: Approx, INCLUDES local tax/VAT OTHER TOOLS IN RANGE: = Combi = Spreader = Ram = Special Tools

DEDICATED BATTERY CUTTERS

STORED **DIMENSIONS** LENGTH	WIDTH	DEPTH inc battery	**CUT** CLASSES EN CLASSIFICATION EN CUT CAPACITY NFPA CLASS	THEORETICAL **CUT FORCE** t= US short ton	**CUT OPENING** ROUND BAR	**WORKING** (HYDRAULIC) **PRESSURE**	BLADE TYPE	ROTATE HEAD/HANDLE	LED LIGHTS	WiFi DIAGNOSTICS	IN-WATER-CAPABLE TOOL/BATTERY IP	NOTES	WWW.
1000mm 39.4"	266mm 10.5"	281mm 11.1"	K - 1K-2K-3K-4K-5K A8 B9 C8 D9 E9 F4	1100kN 123.6t	200mm 7.8" 42mm 1.6"	700 Bar 10.1K psi	Curve	- 270°	2	-	- 54		jawsoflife.com
934mm 36.8"	237mm 9.3"	281mm 11.1"	I - 1I-2J-3I-4J-5J A7 B8 C7 D7 E8	650kN 73t	206mm 8.1" 33mm 1.3"	700 Bar 10.1K psi	Curve	- 270°	2	-	- 54		jawsoflife.com
963mm 37.9"	265mm 10.4"	253mm 10"	K - 1K-2K-3K-4K-5K A9 B9 C9 D9 E9 F5	1310kN 147.25t	204mm 8" 45mm 1.8"	700 Bar 10.1K psi	Str-Curve	- 270°	2	■	■ 68 58	Hurst E3 range is waterproof &Can use EWXT IP68 battery. 5Ah battery reduces length by 20mm	jawsoflife.com
939mm 37"	266mm 10.5"	253mm 10"	K - 1K-2K-3K-4K-5K A8 B9 C8 D9 E9 F5	1100kN 123.6t	205mm 8" 42mm 1.6"	700 Bar 10.1K psi	Str-Curve	- 270°	2	■	■ 68 58	Hurst E3 range is waterproof &Can use EWXT IP68 battery. 5Ah battery reduces length by 20mm	jawsoflife.com
880mm 34.6"	235mm 9.25"	253mm 10"	I - 1I-2J-3K-4J-5J A7 B8 C7 D8 E8 F4	760kN 85.4t	202mm 7.9" 33mm 1.3"	700 Bar 10.1K psi	Curve	- 270°	2	■	■ 68 58	Hurst E3 range is waterproof &Can use EWXT IP68 battery. 5Ah battery reduces length by 20mm	jawsoflife.com
1025mm 40.4"	281mm 11.1"	269mm 10.6"	K CC 200 K-26,2 1K-2K-3K-4K-5K A9 B9 C9 D9 E9 F5	1376kN 155.7t	204mm 8" 45mm 1.8"	700 Bar 10.1K psi	Str-Curve	- 270°	2	-	- 54		lukas.com
1000mm 39.4"	266mm 10.5"	281mm 10.1"	K - 1K-2K-3K-4K-5K A8 B9 C8 D9 E9 F4	1100kN 123.6t	200mm 7.7" 42mm 1.6"	700 Bar 10.1K psi	Curve	- 270°	2	-	- 54		lukas.com
934mm 36.8"	237mm 9.3"	281mm 10.1"	I - 1I-2J-3I-4J-5J A7 B8 C7 D7 E8	650kN 73t	206mm 8.1" 33mm 1.3"	700 Bar 10.1K psi	Curve	- 270°	2	-	- 54		lukas.com
917mm 36.1"	237mm 9.3"	281mm 11.1"	I BC 160 I - 19,3 1I-2J-3I-4J-5J A7 B8 C7 D7 E7	680kN 76.4t	160mm 6.3" 35mm 1.4"	700 Bar 10.1K psi	Curve	- 270°	2	-	- 54		lukas.com
963mm 37.4"	265mm 10.4"	253mm 10"	K - 1K-2K-3K-4K-5K A9 B9 C9 D9 E9 F5	1376kN 155.7t	204mm 8" 45mm 1.7"	700 Bar 10.1K psi	Curve	- 270°	2	■	■ 68 58	All Can use EWXT IP68 battery which is standard on the EWXT range, EWXT does not have on board dashboard	lukas.com
939mm 37"	266mm 10.5"	253mm 10"	K - 1K-2K-3K-4K-5K A8 B9 C8 D9 E9 F5	1100kN 123.6t	205mm 8.1" 42mm 1.6"	700 Bar 10.1K psi	Str-Curve	- 270°	2	■	■ 68 58	All Can use EWXT IP68 battery which is standard on the EWXT range, EWXT does not have on board dashboard	lukas.com

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IMAGES NOT TO SCALE	MODEL SERIES VOLTAGE	COMPANY	TOOLS IN RANGE	ORIGIN	COST inc tax / VAT	WEIGHT IN HAND inc BATTERY(IES)	WEIGHT DEFAULT BATTERY	BATTERY Ah OPTIONS	BATTERY DURATION RECHARGE TIME
	S 378 E3/EWXT/ E3connect 25.2V	LUKAS (IDEX)			N/A	20kg 44lb	1.6kg 3.5lb	Lukas 9Ah 5Ah	<60mins 150-100mins
	S 788 EWXT 25.2V	LUKAS (IDEX)			N/A	23.8kg 52.4lb	1.6kg 3.5lb	Lukas 9Ah 5Ah	<60mins 150-100mins
	S 312 EWXT 25.2V	LUKAS (IDEX)			N/A	19.7kg 43.3lb	1.6kg 3.5lb	Lukas 9Ah 5Ah	<60mins 150-100mins
	RP-C160 18v	OGURA			N/A	14.7kg 32.4lb	1/ 1.36kg 2.2-3lb 3lb	Makita 5/6Ah*	<12mins 55-120mins
	HRS931/ HRS-932 Shear Head 18v	OGURA			N/A	3.9kg 8.6lb +6.2kg +13.7lb	1/ 1.36kg 2.2-3lb	Makita 5/6Ah*	<12mins 55-120mins
	HRS941/ HRS-932S 'Stubby' Shear Head 18v	OGURA			N/A	4.2kg 9.3lb +5.7kg +12.5lb	1/ 1.36kg 2.2-3lb	Makita 5/6Ah*	<12mins 55-120mins
	P16 Legacy PowerBlade 12v or 16v LiGHT	POWERHAWK TECHNOLOGIES			N/A	*21.4kg 47lb	*4.5kg 9.9lb 15.9kg *35lb	Powerhawk 12.4Ah LiGHT 33Ah 12v	>30mins <120mins <15hr
	P-16X PowerBlade CS-1602LW 7.5/12v	POWERHAWK TECHNOLOGIES			N/A	22.1kg 48.7lb	1.36kg 3lb	Powerhawk 7.5Ah or any 12v source	>30mins <120mins
	P-16X Shredder Blade C1604 7.5/12v	POWERHAWK TECHNOLOGIES			N/A	21.1kg 46.5lb	1.36kg 3lb	Powerhawk 7.5Ah or any 12v source	>30mins <120mins
	P-16X Curved Blade C-1601 7.5/12v	POWERHAWK TECHNOLOGIES			N/A	21.6kg 47.5lb	1.36kg 3lb	Powerhawk 7.5Ah or any 12v source	>30mins <120mins
	P-16X Hatchet Blade C1603 7.5/12v	POWERHAWK TECHNOLOGIES			N/A	20.5kg 45lb	1.36kg 3lb	Powerhawk 7.5Ah or any 12v source	>30mins <120mins

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DEDICATED BATTERY CUTTERS

STORED **DIMENSIONS** LENGTH inc battery	WIDTH	DEPTH	**CUT** CLASSES EN CLASSIFICATION EN CUT CAPACITY NFPA CLASS	THEORETICAL **CUT FORCE** t= US short ton	**CUT OPENING** ROUND BAR	**WORKING** (HYDRAULIC) **PRESSURE**	BLADE TYPE	ROTATE HEAD/HANDLE	LED LIGHTS	WiFi DIAGNOSTICS	IN-WATER-CAPABLE TOOL/BATTERY IP	NOTES	WWW.
880mm 34.6"	235mm 9.25"	266mm 10.5"	I - 1I-2J-3K-4J-5J A7 B8 C7 D8 E8 F4	760kN 85.4t	202mm 8" 33mm 1.3"	700 Bar 10.1K psi	Str-Curve	- 270°	2	■	■ 68 58	All Can use EWXT IP68 battery but it's standard on the EWXT cutters	lukas.com
937mm 36.9"	266mm 10.5"	253mm 10"	K - 1K-2K-3K-4K-5K A8 B9 C8 D9 E9 F5	1100kN 123.6t	200mm 7.9" 42mm 1.6"	700 Bar 10.1K psi	Str-Curve	- 270°	2	-	■ 68 58	enhanced upgrade of the E2 series	lukas.com
858mm 33.8"	235mm 9.25"	253mm 10"	I BC 160 I - 19,3 1I-2J-3I-4J-5J -	680kN 76.4t	160mm 6.3" 35mm 1.4"	700 Bar 10.1K psi	Curve	- 270°	2	-	■ 68 58	enhanced upgrade of the E2 series	lukas.com
591mm 23.3"	256mm 10.1"	182mm 7.2"	- - - 1I 2D 3F 4F 5G	738kN 83t	160mm 6.3" 32mm 1.26"	N/A	Str-Curve	360°360°	■	-	- -	*EU uses 5Ah, US tends to use 6Ah	ogurarescuetools.com
303mm 11.9" +382mm +15"	111mm 4.4" 186mm 7.3"	272mm 10.7" 104mm 4.1"	- - - -	98kN 11t	100mm 3.9" 32mm 1.26"	N/A	Curve	360° -	-	-	- -	Heads swap out in seconds. Cutter, Spreader etc. attach via short hose or direct to the powerhead. 941 for US market. All heads interchangeable between power units	ogurarescuetools.com
328mm 12.9" +328mm +12.9"	111mm 4.4" 130mm 5.1"	273mm 10.7" 104mm 4.1"	- - - -	78.4kN 8.8t	26mm 1" 32mm 1.26"	N/A	Curve	360° 270°	-	-	- -		ogurarescuetools.com
659mm 27"	254mm 10"	279mm 11"	- - - A3 B6 C3 D5 E6	93.4 to 200kN 10.5-22.5t	250mm 10" 25mm 1"	No Hydraulics	Straight	70° 270°	-	-	- -	Original version. Only in support of existing purchases. Accepts all blades as per P-16X below *Wt = battery+ controller	powerhawk.com
659mm 27"	254mm 10"	279mm 11"	- - - PENDING	93.4 to 200kN 10.5-22.5t	250mm 10" 25mm 1"	No Hydraulics	Straight	70° 270°	-	-	- -	interchangeable Cutter,spreader and combi heads. *Both P16&P16X can use a regular 12v car battery or any 12v power source with relevant adapter.	powerhawk.com
635mm 25"	254mm 10"	279mm 11"	- - - PENDING	>311TkN 35t	108mm 4.25" PENDING	No Hydraulics	Straight	70° 270°	-	-	- -		powerhawk.com
610mm 24"	254mm 10"	279mm 11"	- - - PENDING	133.4TkN 15t	125mm 5" PENDING	No Hydraulics	Straight	70° 270°	-	-	- -		powerhawk.com
559mm 22"	254mm 10"	279mm 11"	- - - PENDING	200.2kN 22.5t	76mm 3" PENDING	No Hydraulics	Straight	70° 270°	-	-	- -		powerhawk.com

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IMAGES NOT TO SCALE	MODEL SERIES VOLTAGE	COMPANY	TOOLS IN RANGE	ORIGIN	COST inc tax / VAT	WEIGHT IN HAND inc BATTERY(IES)	WEIGHT DEFAULT BATTERY	BATTERY Ah OPTIONS	BATTERY DURATION RECHARGE TIME
	**P4W EDD** 43.2V	**RESQTEC**			N/A	20.6kg 45.3lb	1kg 2.2lb	Resqtec 2.6Ah	<45mins 60mins
	**G4W EDD** 43.2V	**RESQTEC**			N/A	15.9kg 35lb	1kg 2.2lb	Resqtec 2.6Ah	<45mins 60mins*
	**G6C EDD** 43.2V	**RESQTEC**			N/A	20.3kg 44.8lb	1kg 2.2lb	Resqtec 2.6Ah	<45mins 60mins*
	**G6W EDD** 43.2V	**RESQTEC**			N/A	20kg 44lb	1kg 2.2lb	Resqtec 2.6Ah	<45mins 60mins*
	**Cutter SC** 28v	**SCORPE**			N/A	18.9kg 41.6lb	1kg 2.2lb	Milwaukee 5Ah M28	<45mins 90mins
	**Cutter MC** 28v	**SCORPE**			N/A	21.6kg 47.5lb	1kg 2.2lb	Milwaukee 5Ah M28	<45mins 90mins
	**ESLC-29 Storm Surge** 18V/20v	**TNT RESCUE**			N/A	24.4kg 53.75lb 24.76kg 54.6lb	1.1kg 2.4lb 0.6kg 1.3lb	Milwaukee 8/9Ah M18 DeWalt 9Ah FlexVolt20	87mins 10-15mins 60mins
	**EBFC-320 Storm Surge** 18V/20v	**TNT RESCUE**			N/A	28.8kg 63.6lb 29kg 63.9lb	1.1kg 2.4lb 0.6kg 1.3lb	Milwaukee 8/9Ah M18 DeWalt 9Ah FlexVolt20	87mins 10-15mins 60mins
	**ESLC-24D Storm2** 28v	**TNT RESCUE**			N/A	21.5kg 47.5lb	2x 1kg 2.2lb	Milwaukee 2x 5Ah M28	<90mins 60mins
	**ESLC-27D Storm2** 28v	**TNT RESCUE**			N/A	22.5kg 49.7lb	2x 1kg 2.2lb	Milwaukee 2x 5Ah M28	<90mins 60mins
	**ESLC-29D Storm2** 28v	**TNT RESCUE**			N/A	24.4kg 53.8lb	2x 1kg 2.2lb	Milwaukee 2x 5Ah M28	<90mins 60mins
	**EBFC-320D Storm2** 28v	**TNT RESCUE**			N/A	28.6kg 63.1lb	2x 1kg 2.2lb	Milwaukee 2x 5Ah M28	<90mins 60mins

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DEDICATED BATTERY CUTTERS

STORED **DIMENSIONS** LENGTH inc battery	WIDTH	DEPTH	**CUT** CLASSES EN CLASSIFICATION EN CUT CAPACITY NFPA CLASS	THEORETICAL **CUT FORCE** t= US short ton	**CUT OPENING** ROUND BAR	**WORKING** (HYDRAULIC) **PRESSURE**	BLADE TYPE	ROTATE HEAD/HANDLE	LED LIGHTS	WiFi DIAGNOSTICS	IN-WATER-CAPABLE TOOL/BATTERY IP	NOTES	WWW.
705mm 27.75"	271mm 10.7""	274mm 10.8"	E BC153E-20.6 1G 2E 3F 4F 5H A6 B5 C5 D6 E6	543kN 61t	153mm 6" 26mm 1"	No Hydraulics	Straight	61°-	☐	-	- 54	3x interchangeable heads/blades. Rear handle option. *Also 28Ah power-pack. Jaw recess (reach)= 118mm	rescue.resqtec.com
767mm 30.2"	236mm 9.3"	228mm 9"	F BC156F-15.9 1H 2F 3G 4F 5G A6 B6 C6 D7 E6	554kN 62.3t	156mm 6.1" 30mm 1.2"	N/A	Curve	- 360°	☐	-	- 54	*Also 28Ah powerpack. Jaw recess (reach) = 128mm. *Charger has been enhanced from pt1	rescue.resqtec.com
868mm 34.2"	251mm 9.9"	235mm 9.25"	H CC200H-20.3 1I 2J 3H 4H 5J A6 B7 C6 D7 E7	1102kN 124t	203mm 8" 34mm 1.3"	N/A	Curve	- 360°	☐	-	- 54	*Also 28Ah powerpack. Jaw recess (Reach) =150mm. *Charger has been enhanced from pt1	rescue.resqtec.com
854mm 33.6"	268mm 10.5"	235mm 9.25"	H BC185H-19.9 1I 2J 3H 4J 5J A6 B7 C6 D7 E9	1052kN 118t	185mm 7.3" 34mm 1.3"	N/A	Curve	- 360°	☐	-	- 54	*Also 28Ah powerpack. Jaw recess (Reach) = 150mm *Charger has been enhanced from pt1	rescue.resqtec.com
925mm 36.4"	222mm 8.7"	248mm 9.8"	G BC/160-G-18.9 - -	493kN 55.4t	160mm 6.3" 32mm 1.26"	700 Bar 10.2K psi	Curve	- 360°	4	-	- 54		scorpe.net
944mm 37.2"	232mm 9.1""	248mm 9.8"	I BC-185-I-21.6 - -	781kN 87.8t	180mm 7.1" 35mm 1.4"	700bar 10.2K psi	Curve	- 360°	4	-	- 54		scorpe.net
838mm 33"	267mm 10.5"	297mm 11.7"	- - - A8 B9 C9 D9 E9 F5	1256.4kN 141.2t	178mm 7" 38mm 1.5"	722 Bar 10.5K psi	Curve	- -	4	-	- 54	TNT prices include 2 batteries and Dual Rapid charger. Cut Reach 129mm/ 5"	tntrescue.com
909.7mm 35.8"	267mm 10.5"	300mm 11.8"	- - - A9 B9 C9 D9 E9 F6	1424kN 160t	257mm 10.12" 45mm 1.75"	722 Bar 10.5K psi	Curve	- -	4	-	- 54	TNT prices include 2 batteries and Dual Rapid charger. 5.5" cut reach	tntrescue.com
798mm 31.4"	267mm 10.5"	241mm 9.5"	- - - A6 B5 C7 D7 E6	528.4kN 59.4t	127mm 5" 0mm 0"	722 Bar 10.5K psi	Curve	-	2	-	- 54	ALL Spec is for 2 batteries but Can operate on one. Cut Reach 82.4mm/ 3.24"	tntrescue.com
815mm 32.1"	267mm 10.5"	241mm 9.5"	- - - A6 B7 C7 D7 E7	528.4kN 59.4t	193mm 7.6" 0mm 0"	722 Bar 10.5K psi	Curve	-	2	-	- 54	ALL Spec is for 2 batteries but Can operate on one. Cut Reach 100.6mm/ 3.96"	tntrescue.com
826mm 32.5"	267mm 10.5"	241mm 9.5"	- - - A8 B9 C9 D9 E9 F4	1256.4kN 141.2t	177.8mm 8" 38mm 1.5"	722 Bar 10.5K psi	Curve	-	2	-	- 54	ALL Spec is for 2 batteries but Can operate on one. Cut Reach 129mm/ 5"	tntrescue.com
879mm 34.6"	273mm* 10.75"	178mm 7"	- - - A9 B9 C9 D9 E9 F6	1424kN 160t	228.6mm 8.6" 45mm 1.75"	722 Bar 10.5K psi	Curve	-	2	-	- 54	ALL Spec is for 2 batteries but Can operate on one. Cut Reach 140.4mm/ 5.53"	tntrescue.com

FEATURES: ● = PARTIAL FEATURE ☐☐☐ = Option N/A = info Not Available/not given BLADE Str-Curve=Straight section ahead of curve

IMAGES NOT TO SCALE	MODEL SERIES VOLTAGE	COMPANY	TOOLS IN RANGE	ORIGIN	COST inc tax / VAT	WEIGHT IN HAND inc BATTERY(IES)	WEIGHT DEFAULT BATTERY	BATTERY Ah OPTIONS	BATTERY DURATION RECHARGE TIME
	**RSC 170 E-Force3** 1102148 28V	**WEBER RESCUE**			N/A	18.1kg 39.8lb	1kg 2.2lb	Milwaukee 5Ah M28	<45-80mins 60mins
	**RSC170+ E-Force3** 1102149 28V	**WEBER RESCUE**			N/A	19.2kg 42.2lb	1kg 2.2lb	Milwaukee 5Ah M28	<45-80min 60mins
	**RSC 190 E-Force3** 1102150/ 28V	**WEBER RESCUE**			N/A	20.6kg 45.3lb	1kg 2.2lb	Milwaukee 5Ah M28	<45-80mins 60mins
	**RSC 190+ E-Force3** 1102150 28V	**WEBER RESCUE**			N/A	21kg 46.2lb	1kg 2.2lb	Milwaukee 5Ah M28	<45-80min 60mins
	**RSC200 E-Force3** 1102152 28V	**WEBER RESCUE**			N/A	24.8kg 54.6lb	1kg 2.2lb	Milwaukee 5Ah M28	<45-80mins 60mins
	**RSC F7 E-Force3** 1102153 28V	**WEBER RESCUE**			N/A	26.9kg 59.1lb	1kg 2.2lb	Milwaukee 5Ah M28	<45-80min 60mins
	**RSC 170 Smart-Force** 1101547 18V	**WEBER RESCUE**			N/A	19.1kg 42lb	1.1kg 2.33lb	Milwaukee 8Ah/12Ah M18	60/90mins 45-83mins
	**RSC170+ Smart-Force** 1101548 18V	**WEBER RESCUE**			N/A	20.1kg 44.2lb	1.1kg 2.33lb	Milwaukee 8Ah/12Ah M18	60/90mins 45-83mins
	**RSC 190 Smart Force** 1101549 18V	**WEBER RESCUE**			N/A	21.7kg 47.7lb	1.1kg 2.33lb	Milwaukee 8Ah/12Ah M18	60/90mins 45-83mins
	**RSC 190+ Smart Force** 1101550 18V	**WEBER RESCUE**			N/A	22.8kg 50.1lb	1.1kg 2.33lb	Milwaukee 8Ah/12Ah M18	60/90mins 45-83mins
	**RSC200 Smart Force** 1101551 18V	**WEBER RESCUE**			N/A	25.7kg 56.5lb	1.1kg 2.33lb	Milwaukee 8Ah/12Ah M18	60/90mins 45-83mins
	**RSC F7 Smart Force** 1101553 18V	**WEBER RESCUE**			N/A	27.7kg 60.9lb	1.1kg 2.33lb	Milwaukee 8Ah/12Ah M18	60/90mins 45-83mins

NOTE: COST: Approx, INCLUDES local tax/VAT OTHER TOOLS IN RANGE: = Combi = Spreader = Ram = Special Tools

DEDICATED BATTERY CUTTERS

STORED **DIMENSIONS** LENGTH	WIDTH	DEPTH inc battery	**CUT** CLASSES EN CLASSIFICATION EN CUT CAPACITY NFPA CLASS	THEORETICAL **CUT FORCE** t= US short ton	**CUT OPENING** ROUND BAR	**WORKING** (HYDRAULIC) **PRESSURE**	BLADE TYPE	ROTATE HEAD/HANDLE	LED LIGHTS	WiFi DIAGNOSTICS	IN-WATER-CAPABLE TOOL/BATTERY IP	NOTES	WWW.
889mm 35"	236mm 9.3"	241mm 9.5"	I BC166I-18.1 1J 2K 3I 4J 5J A7 B8 C6 D8 E9 F4	N/A	175mm 6.9" 32mm 1.25"	700 Bar 10.2K psi	Str-Curve	- 360°	4	-	- 54	All E-Force tools can convert to hose	weber.com
889mm 35"	236mm 9.3"	241mm 9.5"	I BC166I-19,2 1J 2K 3I 4J 5J A7 B8 C6 D8 E9 F4	N/A	175mm 6.9" 32mm 1.25"	700 Bar 10.2K psi	Str-Curve	- 360°	4	-	- 54	All E-Force tools can convert to hose. Plus version has enhanced blade inserts	weber.com
920mm 00"	236mm 9.3"	241mm 9.5"	K BC187K-20,6 1K 2K 3K 4K 5K A8 B9 C7 D9 E9 F4	N/A	185mm 7.3" 38.1mm* 1.5"	700 Bar 10.2K psi	Str-Curve	- 360°	4	-	- 54	All E-Force tools can convert to hose	weber.com
969mm 36.2"	236mm 9.3"	241mm 9.5"	K BC187K-20,6 1K 2K 3K 4K 5K A8 B9 C7 D9 E9 F4	N/A	187mm 7.4" 38.1mm* 1.5"	700 Bar 10.2K psi	Str-Curve	- 360°	4	-	- 54	All E-Force tools can convert to hose. Plus version has enhanced blade inserts	weber.com
987mm 38.9"	300mm 11.8"	241mm 9.5"	K CC201K-24.8 1K 2K 3K 4K 5K A9 B9 C9 D9 E9 F5	N/A	200mm 7.8" 45mm 1.75"	700 Bar 10.2K psi	Str-Curve	- 360°	4	-	- 54	All E-Force tools can covert to hose	weber.com
1049mm 41.3"	295mm 11.6"	241mm 9.5"	K CC268K-26.9 1K 2K 3K 4K 5K A9 B9 C9 D9 E9 F7	N/A	300mm 11.8" 45mm 1.75"	700 Bar 10.2K psi	Str-Curve	- 360°	4	-	- 54	All E-Force tools can convert to hose	weber.com
889mm 35"	236mm 9.3"	228mm 9"	I BC166I-18.1 1J 2K 3I 4J 5J A7 B8 C6 D8 E9 F4	N/A	175mm 6.9" 32mm 1.25"	700 Bar 10.2K psi	Str-Curve	- 360°	4	■	□ 68 68	All E-Force tools can convert to hose	weber.com
889mm 35"	236mm 9.3"	228mm 9"	I BC166I-19,2 1J 2K 3I 4J 5J A7 B8 C6 D8 E9 F4	N/A	175mm 6.9" 32mm 1.25"	700 Bar 10.2K psi	Str-Curve	- 360°	4	■	□ 68 68	All E-Force tools can convert to hose. Plus version has enhanced blade inserts	weber.com
936mm 36.8"	236mm 9.3"	228mm 9"	K BC187K-21,7 1K 2K 3K 4K 5K A8 B9 C7 D9 E9 F4	N/A	185mm 7.3" 38.1mm* 1.5"	700 Bar 10.2K psi	Str-Curve	- 360°	4	■	□ 68 68	All E-Force tools can convert to hose	weber.com
936mm 36.8"	236mm 9.3"	228mm 9"	K BC187K-22.8 1K 2K 3K 4K 5K A8 B9 C7 D9 E9 F4	N/A	187mm 7.4" 38.1mm* 1.5"	700 Bar 10.2K psi	Str-Curve	- 360°	4	■	□ 68 68	All E-Force tools can convert to hose, Plus version has enhanced blade inserts	weber.com
1003mm 39.5"	297mm 11.7"	228mm 9"	K CC201K-25.7 1K 2K 3K 4K 5K A9 B9 C9 D9 E9 F5 F3	N/A	200mm 7.8" 45mm 1.75"	700 Bar 10.2K psi	Str-Curve	- 360°	4	■	□ 68 68	All E-Force tools can convert to hose	weber.com
1064mm 41.9"	297mm 11.7"	241mm 9.5"	K CC268K-27.7 1K 2K 3K 4K 5K A9 B9 C9 D9 E9 F7	N/A	300mm 11.8" 45mm 1.75"	700 Bar 10.2K psi	Str-Curve	- 360°	4	■	□ 68 68	All E-Force tools can convert to hose	weber.com

FEATURES: ● = PARTIAL FEATURE □■■ = Option N/A = info Not Available/not given BLADE Str-Curve=Straight section ahead of curve

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PIRATE'S
A YOUNG PERSON'S GUIDE TO....

PULLEY SYSTEMS part9

JIGGER (MINI) PULLEY SYSTEMS..

by Reed Thorne
Ropes that Rescue AZ, USA

ABOVE: The slow evolution of the AZTEK which we called the "set of fours". The small jigger pulley system kept getting smaller and smaller so that it became a very compact unit. It started with the original double pulleys from Rock Exotica (blue) then Petzl made the Gemini (fpurple-top system). The first milled version was made by Rock Thompson but was slightly too large for our liking. The final non-anodized version is on the bottom and became the final production model as per the CMC version (inset above).

In parts 1 through 8, we have concentrated on pulley systems to do lifting work and also those that hold things and keep them from moving. In review, we want both types to make a viable rope system whether for rescue or rope work of some kind. This time we're looking at special and quite separate adjust accessory jigger systems. Jiggers are small, self-contained multi-sheave pulley systems usually packaged as a complete kit in a carry/deployment bag. There seem to be hundreds glutting the market today and one need only review **TECHNICALRESCUE** magazine issue 69 to see that if, maybe not "hundreds", there certainly are enough to fill a large super market shopping cart.

Jiggers have been used for many years in various industries including seafaring and pirating as you can see from the title shot and are known by a variety of names. Dave Allport of Troll may have been the first to commercialize their use for rope rescue in the 80's with his stainless yacht-pulley CPS or Casualty Pulley System but this was not the high-strength systems of today. A higher strength system that I am familiar with is the electric and telephone linemen use of a common jigger called a 'set of fours' (SOF). That simply refers to a set of two-blocks on either end of a simple block and tackle (a simple pulley system). They use these mostly in electric and telephone distribution pulling a power or phone service into a house by themselves. It is therefore an adjunct set of blocks for doing work often without the aid of a second person. This yields an ideal mechanical advantage of 4:1 cd (change-of-direction) or a 5:1 simple pulley system which is normally enough for one guy to handle. They are light weight and easy to handle. And of course, since they are carried up a pole or ladder, they need to be. So, a smaller cord is needed to keep these little machines compact and not too unwieldy. Some manufactured jiggers now available have higher MA (mechanical advantage) values but the baseline is really what we mentioned above. Higher MA jiggers involve more sheaves on the pulleys on either end and so must be more compact which consequently requires a smaller diameter rope which in turn makes it harder to grasp. Gripping ability on a smaller rope is not to be taken lightly. Too small a diameter and this in turn is harder to get the job done regardless of the higher MA. Stick with a rope you can comfortably grasp like 8, 9 or even 10mm (although that is quite large). I personally prefer 8mm host rope in my jigger.

The jigger should have a good defeatable ratchet within it. The ratchet is what holds the tension in the jigger so that it acts as a progress capture. Most jiggers have a mechanical progress-capture ratchet on one end and not the other. The technology for these is amazing and developing rapidly as we've seen several multi-sheave, auto-locking models just in the past few years from the likes of Petzl, SMC, CAMP, Kong, CT and Rock Exotica, however, they are somewhat expensive compared to basic pulleys and prusiks. Consequently, there are several jiggers which use an asymmetrical prusik hitch (meaning, it holds best in one direction but is easy to release under load) contrasted with hardware-driven options that have a ratchet on each end so you have a choice as to where to place it based on the work to be done. In rescue (solo and semi-solo) it is

ABOVE: An edgeman working under an Arizona Vortex SA-Frame using both ends of the AZTEK. The personal side is used to restrict travel with a Purcell prusik to the rear/left to protect him from falling off the edge. The other end (system side) is being used with SOF to temporarily elevate the slack belly line during the edge transition. Photo from Bristol, UK TSRW workshop in 2022.

desirable to keep the ratchet away from the casualty so that they cannot reach up and inadvertently release the rope-cord. There are still other jiggers which make use of the remaining rope in your kit to provide a fixed rappel/abseil line or give you travel restrict options at the edge of exposure. In the photo above, both ends of this jigger are used at the same time. This is the concept that evolved into the ***Arizona Technician's Edge Kit*** simply known as ***The AZTEK.***

Many rescuers today find the AZTEK (with opposite end travel restrict option) so useful in their personal protection and in carrying out work that it invariably gets carried in a dedicated position on their harness or thigh at all times.

WHAT TO CARRY AND WHAT TO NOT

Four important essential maxims for a carried piece of equipment on your harness should be simplicity, efficiency, non-specialized and lightness/size.

- **Keep it SIMPLE**

Always default to the simplest common denominator to perform the given task. A good example of this is a pulley on the harness. I always carry one or possibly two (one is a progress capture pulley). They are great friction reduction items great for redirecting a pulling force or effort and definitely worth the space on the harness.

- **Keep it EFFICIENT**

Make sure that the system is going to make the best use of your efforts. Can you use the other opposite side of the jigger?

Can you change the ratchet location to suit what you are doing?

• **Keep it NON-SPECIALIZED**

Use equipment that can multi-task and is not specialized. Jiggers, again, are used in many different places in rescue.

• **Keep it LIGHT/SMALL**

Too much mass will slow you down. Go light. Even for fire fighters performing bottom up rescues (like on towers) having a light piece of equipment will save energy as you climb.

What does all of this mean? If you ARE going to carry things like a small jigger or anything else you deem "essential" on your harness, make sure that it will foot the bill with a multiplicity of uses. When I perform a kind of 'triage' of the things that I need to carry, I usually end up with the same few, trusted, versatile items that I know will get me out of trouble and the jigger is definitely at the top of the list along with a safety knife, a means of ascending and a first aid kit.

Why a Jigger?

Understand that on most rudimentary rope rescues or rope access jobs, you do not need to take up several inches of your valuable harness to carry it. I like to strap a horizontally oriented pack to my right thigh so it takes up less space and gives easy access to both ends. Contrast this double-pouch rectangular pack with the standard AZTEK deployed from the top of a regular tubular bag. To me, not falling off the edge is an essential part of a jigger's role where the opposite end is used for travel restrict or edge restraint. We designed this horizontal pack (pic Right shows the AHS-Rescue AZTEK system with 50ft of 8mm cord) with a double-ended zip and separate compartments within it to house the 'system' and 'personal' elements of the AZTEK which can be used separately or simultaneously. Getting back to the original question, the jigger has become an integral part of our rigging in so many ways. In fact, in so many ways that we have given to numbering them to keep track of the usage.

ABOVE: A bottom up solo rescue of a casualty (right) in full ascent mode. Jigger being used to lift and remove climbing equipment before descending to floor.
BELOW: Delta guyed gin pole using three AZTEK at 120˚ angles. Photo from Llangollen, Wales, AHDW workshop with R3 Safety & Rescue in 2022.

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AZTEK | SYSTEM

- Switches from a simple 4:1 (with a change of direction) to a simple 5:1.
- Color-coded asymmetrical prusiks are rope friendly and can be released under light tension.
- Use AZTEK for pick off, load release hitch, high-directional guyline, litter attendant tether, litter scoop, edge restraint and much more.
- AZTEK System length ranges from just 9" to over 13'.
- Features high-efficiency ball bearings and machined aluminum parts.

AZTEK Kit includes:
AZTEK PULLEYS
6mm PRUSIKS (2)
50' 8mm STATIC CORD
44" 6mm PURCELL PRUSIK CORD
PRO OR STANDARD BAG

COLOR CODED

EDGE RESTRAINT

LOW TENSION RELEASE

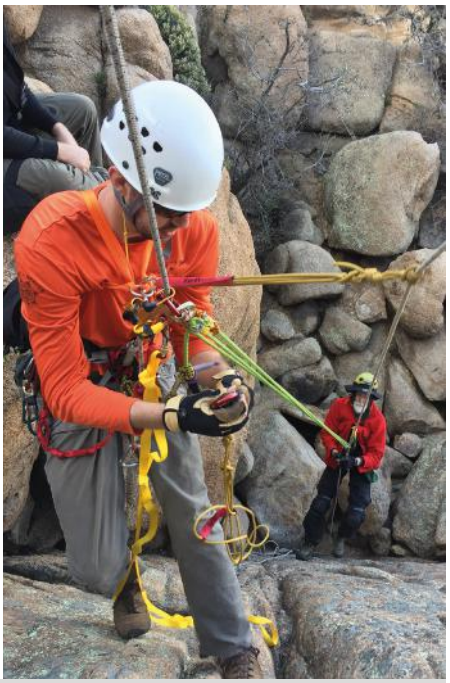
50' CORD LENGTH

SWIVEL CONNECTION

The AZTEK kit can be configured as a 4:1, 5:1 or 12:1 with the use of an additional pulley.

EDGE RESTRAINT

MIN LENGTH 9" (22.8cm) — < WIDE RANGE OF OPERATION > — MAX LENGTH 13' (4m)

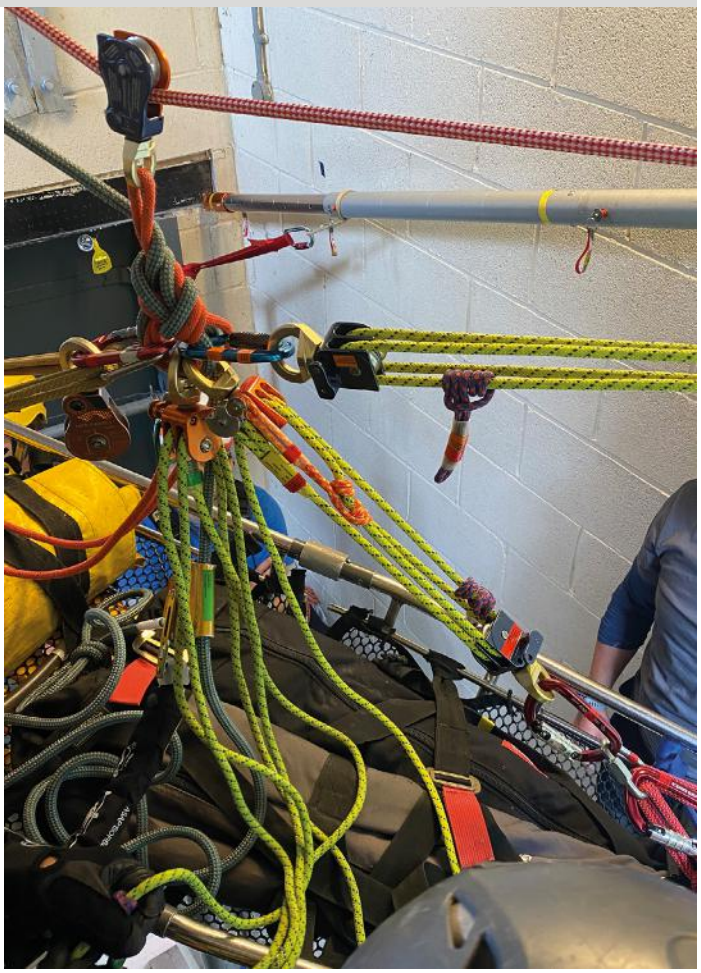


ABOVE-LEFT: A Los Angeles Dept of Water & Power lineman standing on an aerial ladder uses an AZTEK high on a ower line to lift 2 men off the conductor using both prusiks (blue as the ratchet and orange as the haul grab) for an 11:1 complex mechanical advantage. Similarly, a 12:1 compound pulley system (noted 3:1 x 4:1) can be had by simply turning this one around end to end.
ABOVE-RIGHT: A SAR tech member using a 4:1cd AZTEK with orange ratchet engaged to perform a solo pitch toe rescue. This technique is a very demanding rescue indeed using an inch worm climb and haul method to lift the casualty in 12' lifts until they reach the top.
BELOW: Rescuers using several AZTEKs to negotiate a litter horizontally on a tracking line offset. Photo from Llangollen, Wales, AHDW workshop with R3 Safety & Rescue in 2022.

The AZTEK

The new double-ended AZTEK evolved slowly within the Sedona Fire District where its use became entrenched in the towering sandstone cliffs of Oak Creek Canyon. The Purcell as a shock limiter/absorber was borrowed from Arnör Larson of *Rigging for Rescue*. Both the Purcell from British Columbia and the *AZTEK* from Arizona are historically accurate and inclusive of

BELOW: Linemen using several jiggers to transfer a mannequin across the bottom of a transmission tower.



[1] A new 36KN AZTEK Omni® pulley has been designed by Reed Thorne and manufactured by Rock Exotica of Utah.

ABOVE: RTR instructor, Keith Thorne (top), watches a pick off of a firefighter 'casualty' from a power transmission line using an AZTEK from a rescuer using a tracking line offset. Photo from RTR Offset Highline Rescue Workshop at Western Area Power Admin. At Eleverta, California 2017.

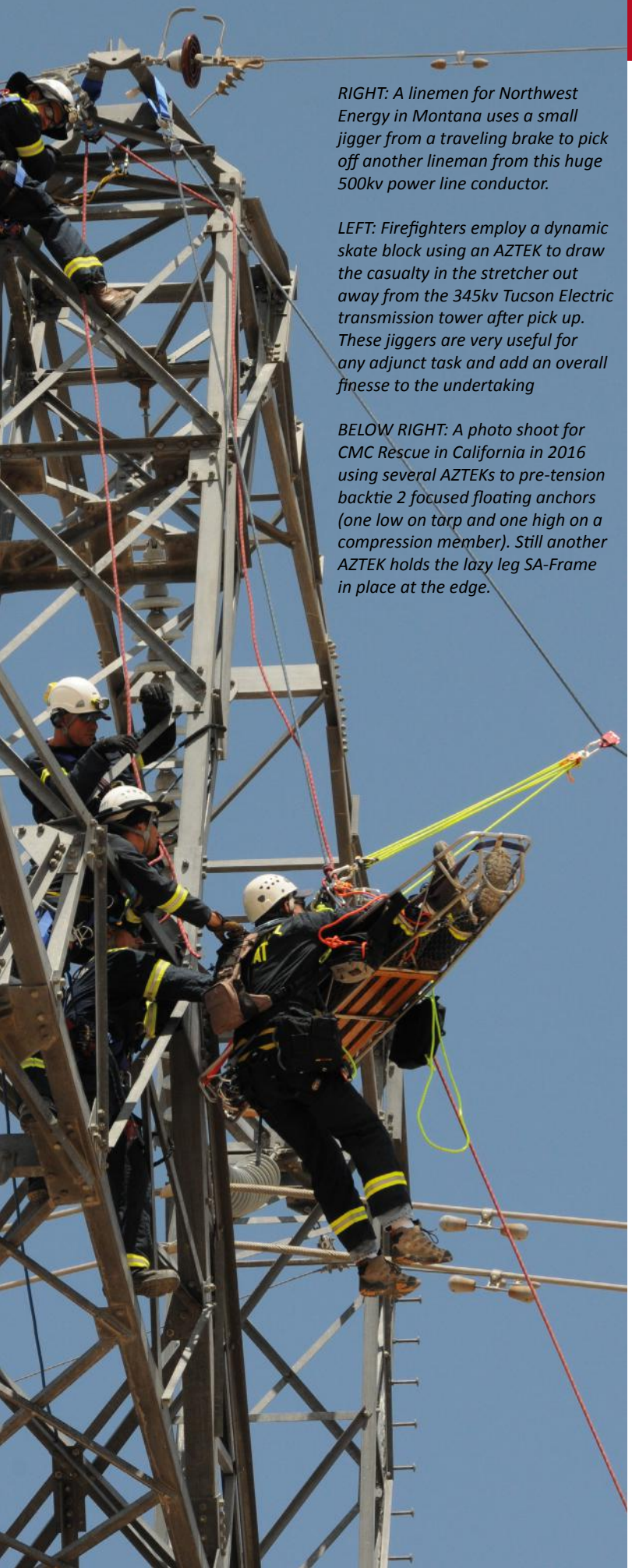
their respective origins. I would like to see these terms become the norm since there is some lack of commonality in terms within rope rescue today. Certainly, it is noted that the edge kit on its own or the jigger pulley system on its own is no big deal (like the Purcell is a prusik back onto its doubled self) and not in need of a name. But the inclusion of the travel restrict/edge restraint element and reverse reeve SOF included in one kit is noteworthy. The early *AZTEK* SOFs used any high efficiency double pulley we could get our hands on and the blocks were reeved "reverse", again, like linemen do it, to prevent twisting in use. Special pulleys milled from high strength aluminum 'blocks' were later designed in 2007 by the author and *Rock Exotica* and appropriately named *AZTEK Omni Blocks*[1] due to the introduction of a much needed swivel at the top of each.

...***continued on page 48***.

RIGHT: A linemen for Northwest Energy in Montana uses a small jigger from a traveling brake to pick off another lineman from this huge 500kv power line conductor.

LEFT: Firefighters employ a dynamic skate block using an AZTEK to draw the casualty in the stretcher out away from the 345kv Tucson Electric transmission tower after pick up. These jiggers are very useful for any adjunct task and add an overall finesse to the undertaking

BELOW RIGHT: A photo shoot for CMC Rescue in California in 2016 using several AZTEKs to pre-tension backtie 2 focused floating anchors (one low on tarp and one high on a compression member). Still another AZTEK holds the lazy leg SA-Frame in place at the edge.



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Diameter:	11mm
Tensile Strength:	9,447 lbf. (42 kN)
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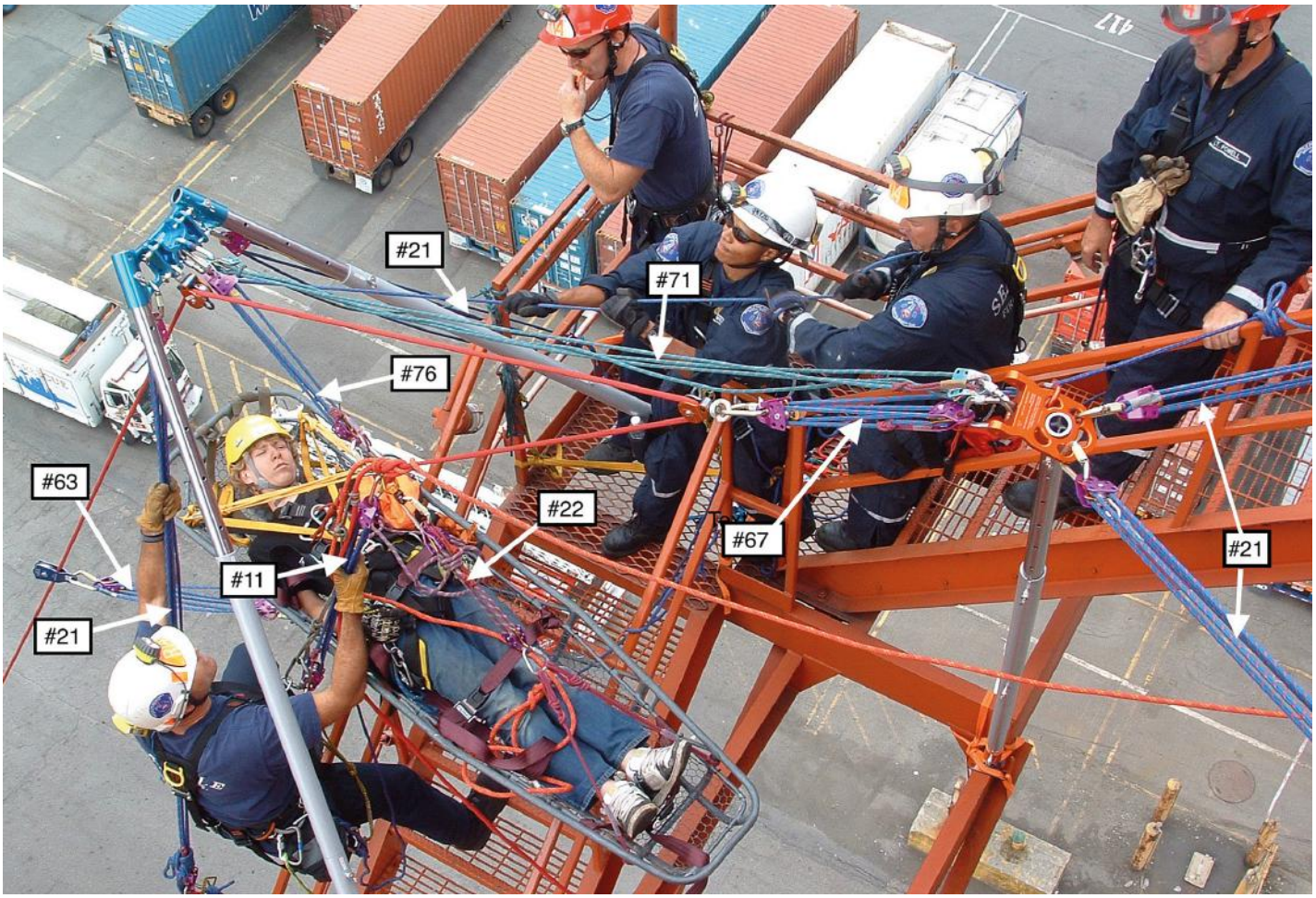

ABOVE and BELOW: Members of Seattle Fire Rescue 1 (Ladder 7) working high on a port crane use 9 separate early AZTEKs to solve difficult rescue problem with RTR instructor, Keith Thorne as casualty. RTR has developed numbers for each use. Photos: 2005.

- *Far right: Guying the gin poleAZTEK Use #21*
- *Between the gin pole and A-FrameAZTEK Use #71*
- *Differential block at gin pole-AZTEK Use # 67*
- *On litter foot end jigger-AZTEK Use # 22*
- *On litter attendantAZTEK Use #11*
- *Transfer AZTEK being clipped by FF above- AZTEK Use # 76*
- *Front two guys on A-Frame-AZTEK Use #21*
- *Skate block jigger far left-AZTEK Use #63*

TOTAL: Nine AZTEKs

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SPECIFICATIONS

APEX 1.5 Single Swivel Pulley

Model #:	NFPA165120
Material:	Aluminum, Stainless Steel
Finish:	Anodized, Blue/Grey
Dimensions:	5.8" x 2.9"
Weight:	10.8oz (306g)
MBS:	38kN
WLL:	9.4kN
Rope size:	up to 13mm
Sheave Major Diameter:	2.0"
Sheave Tread Diameter:	1.5"

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ABOVE Los Angeles Department of Water & Power tower transmission linemen use an AZTEK jigger to rescue another linemen in a line cart off the conductor mid span. Line carts as shown are used for placing spacers on multiple conductors and for doing repairs mid span on power lines. LEFT: Waldo Etherington, an adrenaline "junkie", lowers out of a hot air balloon in Dorset, UK at 1,000' off the ground on an AZTEK SOF with the other end as a safety. No helmet, but of course, what would a helmet do for him?

Pulleys used should be of the best quality bearing and rated for two person loads if the SOF is intended for that purpose. Now, as rope fiber technology advances, we have been using the *AZTEK* made with *Technora* host rope, *Technora* Purcell and *Technora* ratchet prusiks for durability and cut resistance. Nylon cuts extremely easily but *Technora* does not. *Technora* kits cost more, but the trade off is safety and confidence in your equipment.

The original yachting pulley versions of mini-pulley systems had three key uses bearing in mind that this was in the 80s and 90s...
1) To transfer the weight of a casualty during an on-line pick-off where the load was not expected to exceed a single bodyweight plus kit, which was just as well because the system attached to the rope via a toothed chest ascender.
2) Attached to the central rigging plate of a stretcher system and to the end of the stretcher to allow the angle of the stretcher to be adjusted, for instance in negotiating a narrow chamber.
3) Work positioning. Either to allow the stretcher handler to adjust position relative to the stretcher or when in the work vicinity on a vertical or low angle face to allow rapid altering of work position up and down over a 3 or 4 foot (1m) area depending on the length of cord.

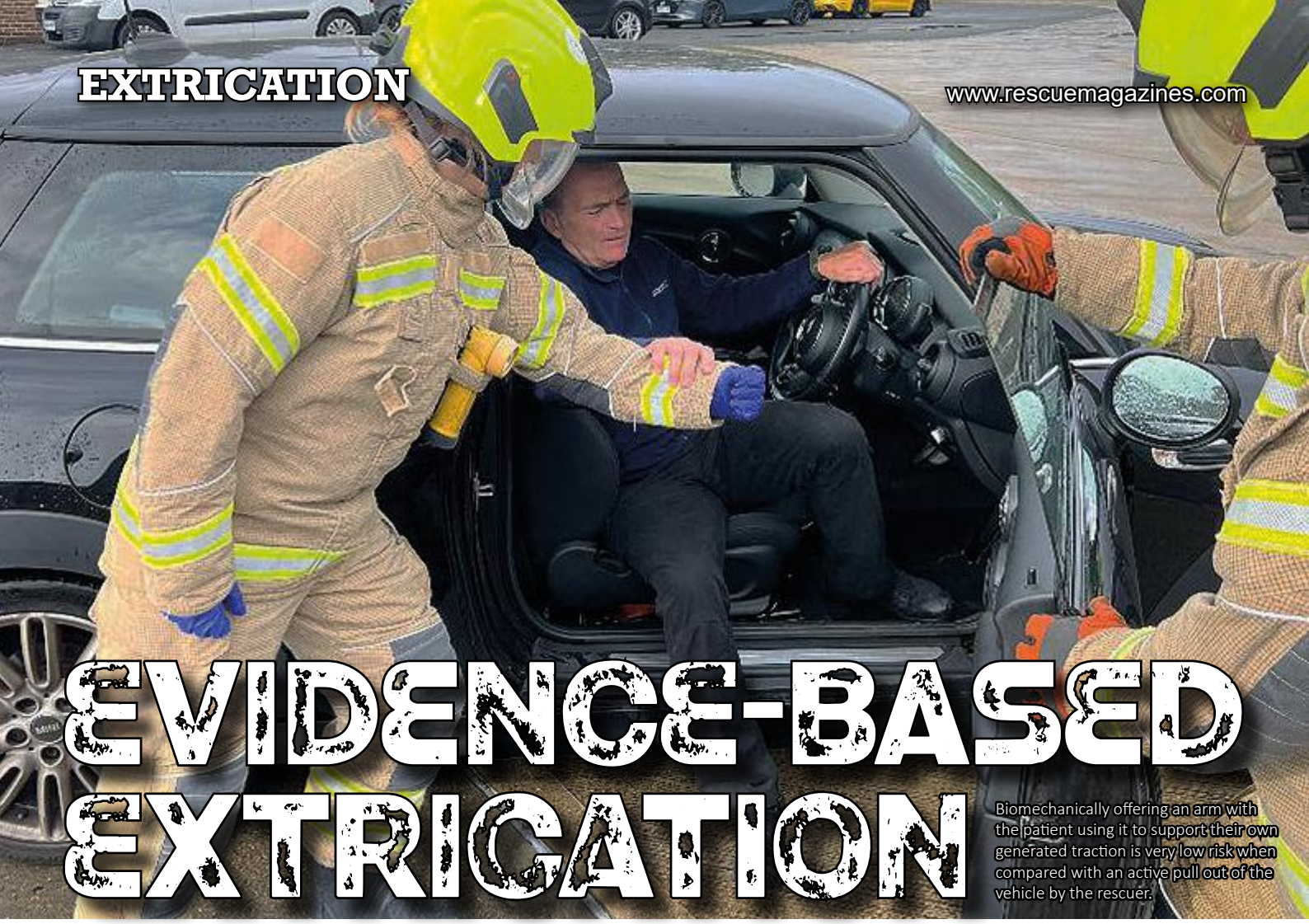
Once lightweight yachting pulleys were superseded by mini alloy pulleys capable of holding full rescue loads, the possible uses multiplied exponentially. Versatility was further expanded by making use of the tail of the pulley system rope such that there are now well over 145 uses for the full AZTEK system only some of which are shown here. Read the all-important captions for each photo.

Often, in a team of twelve personnel, all carrying an *AZTEK pack*, each and every kit is used in the system someplace. Having this versatile tool on the harness also allows the rescuer to pass knots easily, correct disoriented equipment under load, transfer loads, and establish dynamic fixed brakes. With the SOFs as the pick off unit for solo and semi-solo rescues, rescuers can decide on multiple options which allow versatility depending on all important circumstances dictated by the particular rescue.

Dynamic fixed brakes (a fixed friction appliance/hitch in series with the SOFs) and dynamic traveling brakes (a traveling friction appliance in series with the SOFs) add immeasurable versatility to the rescue system. In some instances, the personal end is used in tandem with the SOFs end as a shock absorbing lanyard safety to the victim.

CONCLUSION

I think one can inevitably see that the inclusion of multiple small pulley systems adjunct accessory jiggers in the cache is worthwhile. Those can invariably be taken in the proverbial "wheelbarrow" to an incident or job site and made available for rigging. But, again, remember that to have one of these more useful jiggers populating the valuable real estate on your thigh or waste is an investment in ascertaining your personal safety and usefulness in a rescue operation. Going solo with a personal jigger or semi-solo with two personal jiggers on each will get the person hanging or in trouble to the hospital or safety sooner.



EVIDENCE-BASED EXTRICATION

Biomechanically offering an arm with the patient using it to support their own generated traction is very low risk when compared with an active pull out of the vehicle by the rescuer.

RAPID REMOVAL VS SPACE-MAKING

by **Rich Denham & Nick Appleton**

TRm Extrication Editors:
Veteran London Firefighters and instructors, Rich is now consulting and training in Europe and Latin America and Nick is a lead instructor at Babcock PLC under contract to London Fire Brigade

INTRODUCTION

Researched evidence on which to base informed extrication strategies has long been needed and now, with the recent rolling publication of nine freely available, ground breaking pieces of original research published by a team led by Dr Tim Nutbeam, and part of the work of the EXIT (Extrication in Trauma) Project – this has at last become available. The main conclusion of this research taken as a whole is that rescuers should reduce extrication times by recognizing that the absolute movement minimization approach (MMA), brought on by a historic focus on potential damage to the spinal cord was never justified, and that this approach should instead be replaced with an emphasis on rapid self or assisted extrication (where medically appropriate) and where this is not possible, the creation of minimum safe space by which the trapped person can subsequently self-extricate, or be extricated by rescuers focussing on the minimization of time rather than movement. Note that this article constitutes only our summaries and we very strongly recommend that you read all nine of the open-source reports (see the numbered full list at the end of this piece) in full for proper context and to draw your own conclusions.

Also, for consistency with the terminology in the reports, we will use the medical term 'patient' here – rather than 'casualty', and also Motor Vehicle Collision (MVC) – rather than Road Traffic Collision (RTC).

GENERAL CONTEXT

The research found that by the early 1990's in the UK, in addition to patients being trapped by the accident deformed vehicle, they were now recognised as being potentially trapped by the suspicion of injury; this was the beginning of MMA, the current standard approach to extrication. This is perhaps best illustrated by two quotes from contemporary fire and rescue service (FRS) documents:
'*The presence of spinal injury must be assumed with any sudden acceleration and deceleration accident*' and
'*With an unstable fracture or dislocation of the spine, displacement of as little as one millimetre may be enough to compress, pinch or shear the spinal cord*'.

This current standard approach to extrication of trapped patients prioritises an absolute MMA which the research found contributed to prolonged extrication times, which in turn delays patient access to time critical medical care. However, the research challenges this approach with evidence demonstrating the relative rarity of unstable spinal column or spinal cord injury, compared to other time-critical injuries. In addition, biomechanical studies – admittedly in healthy volunteers – have demonstrated that rescuer-applied extrication techniques cause more spinal movement than self-extrication, further questioning the current approach. Taken together, these findings show the potential for safe but reduced extrication times and the consequent benefits to the casualty that these would offer.

It is important to note that this does not rule out the benefit of minimum safe space creation and board extrication which will still be necessary in many cases – rather that, given this new evidence, there is a need to reconsider the current approach to extrication and the new and potentially quicker strategy options available for its achievement.

THE REPORTS

To develop this theme further, we will now consider briefly at all nine reports listed at the end of this article, summarising the conclusions of each. Note that for definitive objective information, it will be necessary to consult the individual studies listed and linked at the end of this article.

a. Spinal movement during four extrication methods

This study (**1**) can be seen to stand alone and has particular implications for the selection of extrication strategies and related space creation options, assessing as it does spinal movement in healthy volunteers during three rescuer extrications (photos above).

The passive driver patient is removed on a board:

Photo I: rearwards after roof removal

Photo II: laterally in wide space created by a B-post rip

Photo III: Rapid Removal laterally through the narrower space of the front door

....and comparing the results with....

Title Photo: Self-Extrication, where the patient leaves the vehicle with minimal or no assistance

A core finding of this study was that 'Current operational practice favours techniques that are time consuming and do not result in the smallest possible patient movement—they do not achieve their intended objectives and as a result their use should be urgently reconsidered'

Looking purely at the process of removing the healthy volunteer from a car, the self-extrication option caused the smallest spinal movement and gave the quickest complete extrication (less than 10 seconds). The three assisted extrications between them were largely the same; all resulting in greater spinal movement and longer (50-70 seconds) extrication times. The significant reduction in spinal movement of self-extrication is of course to be welcomed, as is the approximate 60 second extrication time advantage, although the real time-consumer at any MVC is space creation, very much an area of focus for the FRSs when they need to go beyond the manual opening of doors. Note that the times quoted do not include the time to prepare (the space creation phase) for the extrication itself: for example, the study found that the average total time for a roof-off extrication is 30 minutes. Consequently, the report concluded that self-extrication – where feasible – was the preferred option and if assisted or rescuer extrication was necessary, then the most rapid method of space creation and extrication should be delivered.

b. Injury patterns and outcome data for Trapped Patients

There were two studies under this general heading, the first comparing trapped and non -trapped patients (**2**).

The background to the research was the observation that current extrication methods are focused on the prevention of secondary spinal injury through MMA, a time-consuming approach where patients will likely also have time-critical – and spinal cord perfusion threatening – injuries.
With some resonance the research stated that spinal cord injuries were rare in both trapped and un-trapped patients (0.71% of all extrications). However, trapped patients had a higher mortality rate than un-trapped patients and also greater injury severity scores, with time critical worse vital signs and significant blood-loss related injuries, including the pelvis.
It concluded that any benefit of MMA is outweighed by the additional time taken and that evidenced based improved extrication strategies should be developed to allow for the expedient (timely) management of life-threatening injuries.
The second such report looked at an analysis specifically by the sex and trapped status of patients (**3**), to ultimately ensure equity of outcomes, especially with respect to triage, rescue (extrication) and treatment of all patients.
The research found that female patients were more frequently trapped than male patients (15.8% vs 9.4%). It also found that trapped males more frequently suffered head, thoracic and limb injuries, whereas females had more injuries to the pelvis and the spine. However, no difference in mortality was found between female and male patients. With regard to leaving the vehicle without assistance, it was found that females had an increased rate of entrapment; this maybe related to car design, the increased rate of side-impacts leading to entrapment or injury / pain differences. The conclusion stated that future work should incorporate sex-based analyses designed to shed light on the factors that create differential experience and outcomes for women and men involved in MVCs.

c. Factors affecting Self-Extrication

The first of three reports in this section concerned itself with enhancing the current understanding of the potential for secondary spinal cord injury, by use of a new concept – the study of 'Travel' – the cumulative spinal movement associated with any extrication. The authors use the example of 'in-car' application of a cervical collar prior to extrication and also subsequent self-extrication to demonstrate this principle (**4**). The data generated was then re-analysed in conjunction with report (**6**), allowing for calculation of travel in (healthy) volunteers who self-extricated with and without a collar.
Two conclusions were made – that total Travel is similar across self-extricating volunteers with and also without a collar, and that it remains an appropriate option to apply a cervical collar to self-extricating patients when the clinical target is that of movement minimisation.

SELF EXTRICATION IN CONTEXT

Study (**6**) makes the following definition and observation:
'Self-extrication is the process by which a casualty leaves their vehicle (with or without instructions) and completes this with minimal or no assistance from the rescue services. Self-extrication is currently recommended by the Faculty of Prehospital Care of the Royal College of Surgeons of Edinburgh and is featured in the United Kingdom (UK) Fire and Rescue Services (FRS) national guidance for performing rescues. Despite having featured in this guidance since 2017, translation into practice is low, with only 3% of FRS in the UK using self-extrication on a regular basis'.

The second report of the three in this group relates to whether or not the potential for self extrication varies with Age (**5**). The background here was defined by the most rapidly growing segment of the population being over 60, with this group now representing over 50% of the major trauma cases reported in the UK. Older patients may be at increased risk of entrapment through decreased mobility and a propensity to frailty. As a result extrication may be delayed due to rescuer perceptions about the (high) potential for spinal injury in this group and also their (in)ability to self-extricate.

However, the report concluded that whilst patients over the age of 80 are more likely to die when trapped following an MVC, generally older patients are no more likely to have injuries that would hinder self-extrication than younger ones.

Further it stated that 'Self-extrication should be considered the primary route of egress for patients of all ages apart from where it is clearly impractical or unachievable'. It also stated that ' For those patients who cannot self-extricate a minimally invasive extrication approach should be used – providing the patient with the necessary support to extricate from the vehicle with minimal cutting/space creation and using the principles of gentle patient handling'.

The principles of 'gentle patient handling' are mentioned frequently throughout all seven studies and are a vital component of the research's overall thrust for more rapid extrications, and would benefit from greater definition in any future studies.

The aim of the last of the three studies in this group was to evaluate the effect of cervical collars and instructions on spinal movements during self-extrication of healthy individuals from a car, using motion tracking technology (**6**). It assessed this over four different circumstances
i. No instructions or collar
ii. No instructions, but with collar
iii. With instructions but no collar
iv. With instructions and with collar

The main conclusion was that with healthy volunteers, self-extrication with no instructions but with a collar resulted in the smallest spinal movement of the four approaches, also making the observation that the finding of increased spinal movement with instructions was unexpected…suggesting that the smaller movements found when no instructions were given occurred as the test subjects made their own more natural and comfortable way out of the vehicle.

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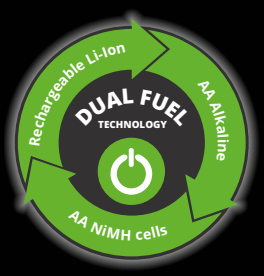

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Finally its states that 'It is unlikely that the movement minimization focus of current extrication techniques achieves its therapeutic goal and may contribute to the excess mortality of patients who are trapped'.

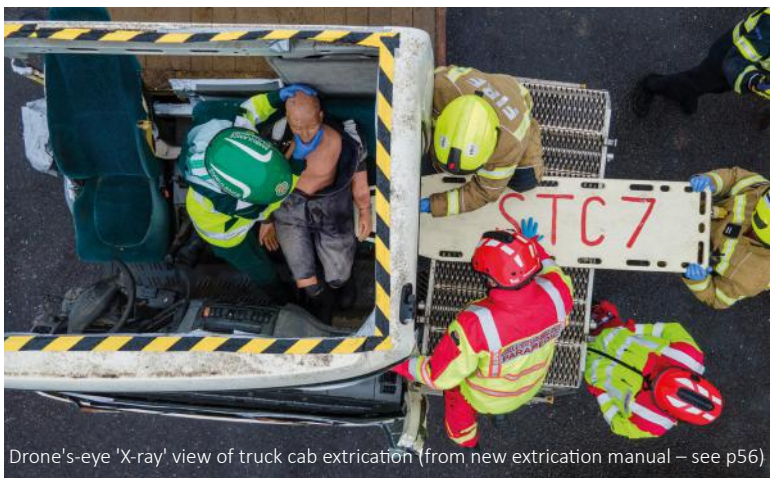
d. Trapped in a Vehicle – The Patient's Experience

This single report (**7**) should be required regular reading for all MVA rescuers, and especially the section on on-scene communication. The plain-language and starkly honest testimony of those who had experienced extrication will tell you everything that you need to know about how to successfully communicate with future patients, and importantly how to meet both their physical and emotional needs.

At the centre of this patient-centred rescue is the 'extrication buddy' and pivotal to their role was communication, to build up a connection with the patient. This was identified to include being in the car with the patient where possible, to explain what's happening, provide companionship and to give reassurance throughout.

The other findings of this study were for the 'buddy' to use clear and accessible lay language, give assurance that the patient's co-occupants (including animals) are safe and to help patients to communicate with their family members, using the patient's own mobile (cell) phones.

Patient privacy is also important and limiting the ability of the public to record events (and subsequently post them on social media) – perhaps via the Police attendance – and by the same token that rescuers and their affiliated organizations should not post photos or video on their own social media groups.



Drone's-eye 'X-ray' view of truck cab extrication (from new extrication manual – see p56)

e. Chain Cabling and Roof off space creations – comparing patient spinal movement during extrication from each

This is the first report that's made an assessment of the Chain Cabling (**8**) 'pull-apart' method of space creation, together with extrication from it. And further compared it with extrication from a car with roof removal.

For those not familiar with Chain Cabling, the study uses a diagram, photographs and detailed wording to explain the technique, although the prime aim is to compare spinal movement between that created space and also the space created in a car with its roof removed.

In terms of the total time taken from start to full egress, an earlier study is cited, which had a median extrication time as 12.5 minutes for chain cabling in a rescue competition environment , as compared to 30 minutes for UK Fire & Rescue Services utilising traditional techniques outside of the competition environment.

It is implicit, however, that the chain-pull was undertaken by a team and equipment specifically assembled to undertake the manoeuvre in a display environment. The study later goes on to say that '… chain cabling is currently delivered routinely by some Scandinavian rescue services and elsewhere in Europe. To facilitate chain cabling in other regions would require a significant investment in training, equipment, logistics and process development. When considering chain cabling in comparison to other more routinely delivered methods of (space creation and) extrication it is hard to justify this investment based upon extrication time or minimisation of patient movement where (if) other quicker, established methods with similar movement profiles exist'.

And with this caveat in mind, the study goes onto conclude that extrication from a car with its roof removed was associated with less spinal movement than from a chain cabled car, in a lateral out through the driver's door extrication on a long spine board, very similar to the 'Rapid Removal' detailed in report (**1**).

f. Establishing a working consensus

This Delphi study (**9**) was informed from the output from all of the other papers, translates the science into tangible operational practice and so is presented last.

It sought and established consensus on an evidence based approach to extrication, and did so amongst the major medical and fire stakeholder organizations in the UK – the National HEMS Research and Audit forum, The Royal College of Surgeons Edinburgh, the College of Paramedics, the Prehospital Trainee Operated Research Network, the National Fire Chiefs Council and the United Kingdom Rescue Organisation – and they have produced a key foundation in this subject area, multi-disciplinary guidance for extrication, which can be found in Table 3 of the report.

Much of what you will read in this guidance will likely be familiar to you, such as the medical and FRS attendance '… should work together to develop a bespoke patient centred extrication plan, with the primary focus of minimising extrication time'

Also that 'An 'extrication buddy' should be assigned to explain the procedure, ensure companionship and provide reassurance to the patient whilst entrapped'.

Other areas of consideration perhaps not so much so, such as '…self-extrication or minimally assisted extrication should be the standard 'first-line' extrication of all patients who do not have contraindications…' and 'When clinicians are not available, rescuers 's should, where necessary, assess patients, deliver clinical care and make and enact extrication plans (including

self-extrication)'. The latter would of course be a matter for individual Fire & Rescue Services/Depts and their respective organizations with clinical governance to take a view on and act accordingly, but also in co-ordination with their peers.
However, what is certain is that the principles in table 3 would make for beneficial reference criteria in any review of your organization's MVC rescue policies and procedures and offer a sound basis on which any future (national) multi-disciplinary guidance could be based.
This study also identified that these principles do have the benefit of minimal financial costs associated with bringing them into practice, the major changes being organizationally rather than equipment based.
In contrast, it was instead anticipated that the main barrier to their adoption would be overcoming the institutional behaviours established through so many years of the MMA based clinical and operational practice.
But ultimately the study concluded on the positive that it had '… demonstrated consensus across a large panel of multi-disciplinary subject matter expert's…..that will provide a key foundation in the development of (national) evidence-based guidance (for extrication at MVCs)'.

OVERALL SUMMARY

Taken together, the reports can be summarised as:

- Multi-disciplinary consensus on evidence-based research should be used to provide common national and multidisciplinary extrication guidelines.
- Minimise entrapment times rather than patient movement
- Handle patients gently, although a focus on absolute (spinal) movement minimisation is not justified
- Have a rescuer dedicated as a 'buddy' for the patient, throughout the extrication
- Self-extrication as a first option, where feasible
- Where rescuer extrication is necessary, get both medical and FRA expertise to the scene as soon as possible

CONCLUSION

The growing importance and influence of these reports can be seen in that in this year's recent National Extrication Challenge in the West Midlands, the United Kingdom Rescue Organization incorporated new scenarios developed to reflect the guidance that runs through all nine studies, that where a patient is able to do so and is aware of their actions, self or assisted extrication is the preferred option.

Using evidence-based research to positively influence the creation of common multidisciplinary extrication protocols and subsequent timely operational plans – including self and assisted extrication – is perhaps a long overdue step, but thanks to Tim Nutbeam and his colleagues this is all now possible and is an opportunity that should be seized enthusiastically by all stakeholders concerned, in the very best interests of the public that we all serve.

The Studies

Googling the full title of any report below will generate access to that report in full, or use the links provided. Importantly please see below for the terms of such Open Access, under which we happily comply with the requirement to give appropriate credit to the original authors Omar Bouamra, Jono Bowdler, Brian Carlin, Mike Dayson, Rob Fenwick, Shirin Heidari, Anthony Kehoe, Barbara May, Tim Nutbeam, James Shippen, Jason E. Smith, Willem Stassen, Lee Wallis, Lauren Weekes and Mark Wilson. Please see each report for individual contributions:

(1) Assessing spinal movement during four extrication methods: a biomechanical study using healthy volunteers
https://sjtrem.biomedcentral.com/articles/10.1186/s13049-022-00996-5

(2) A comparison of the demographics, injury patterns and outcome data for patients injured in motor vehicle collisions who are trapped compared to those patients who are not trapped
https://sjtrem.biomedcentral.com/articles/10.1186/s13049-020-00818-6

(3) Sex-disaggregated analysis of the injury patterns, outcome data and trapped status of major trauma patients injured in motor vehicle collisions: a prespecified analysis of the UK trauma registry (TARN)
https://bmjopen.bmj.com/content/12/5/e061076

(4) Maximum Movement and Cumulative Movement (Travel) to Inform our Understanding of Secondary Spinal Cord Injury and its Application to Collar use in Self-extrication
https://sjtrem.biomedcentral.com/articles/10.1186/s13049-022-00992-9

(5) Do entrapment, injuries, outcomes and potential for self-extrication vary with age? A pre-specified analysis of the UK trauma registry (TARN)
https://pubmed.ncbi.nlm.nih.gov/35248129/

(6) The role of cervical collars and verbal instructions in minimising spinal movement during self-extrication following a motor vehicle collision – a biomechanical study using healthy volunteers
https://sjtrem.biomedcentral.com/articles/10.1186/s13049-021-00919-w

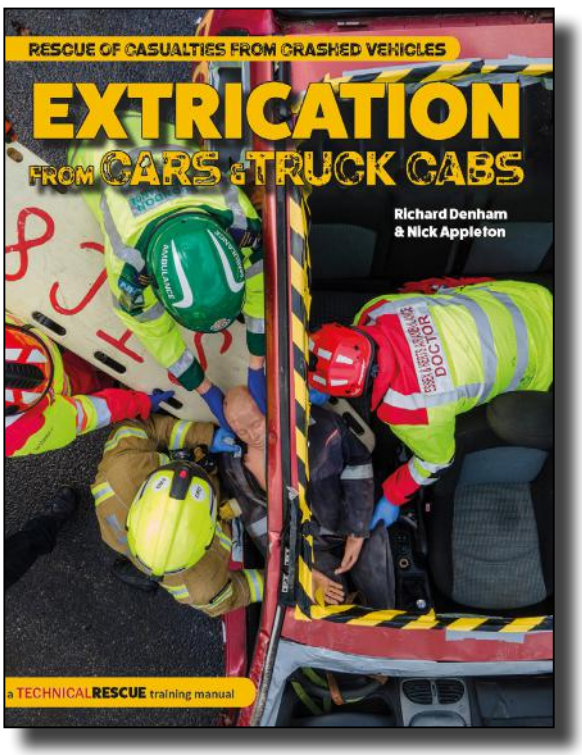
(7) Understanding people's experiences of extrication while being trapped in motor vehicles: a qualitative study
https://bmjopen.bmj.com/content/12/9/e063798

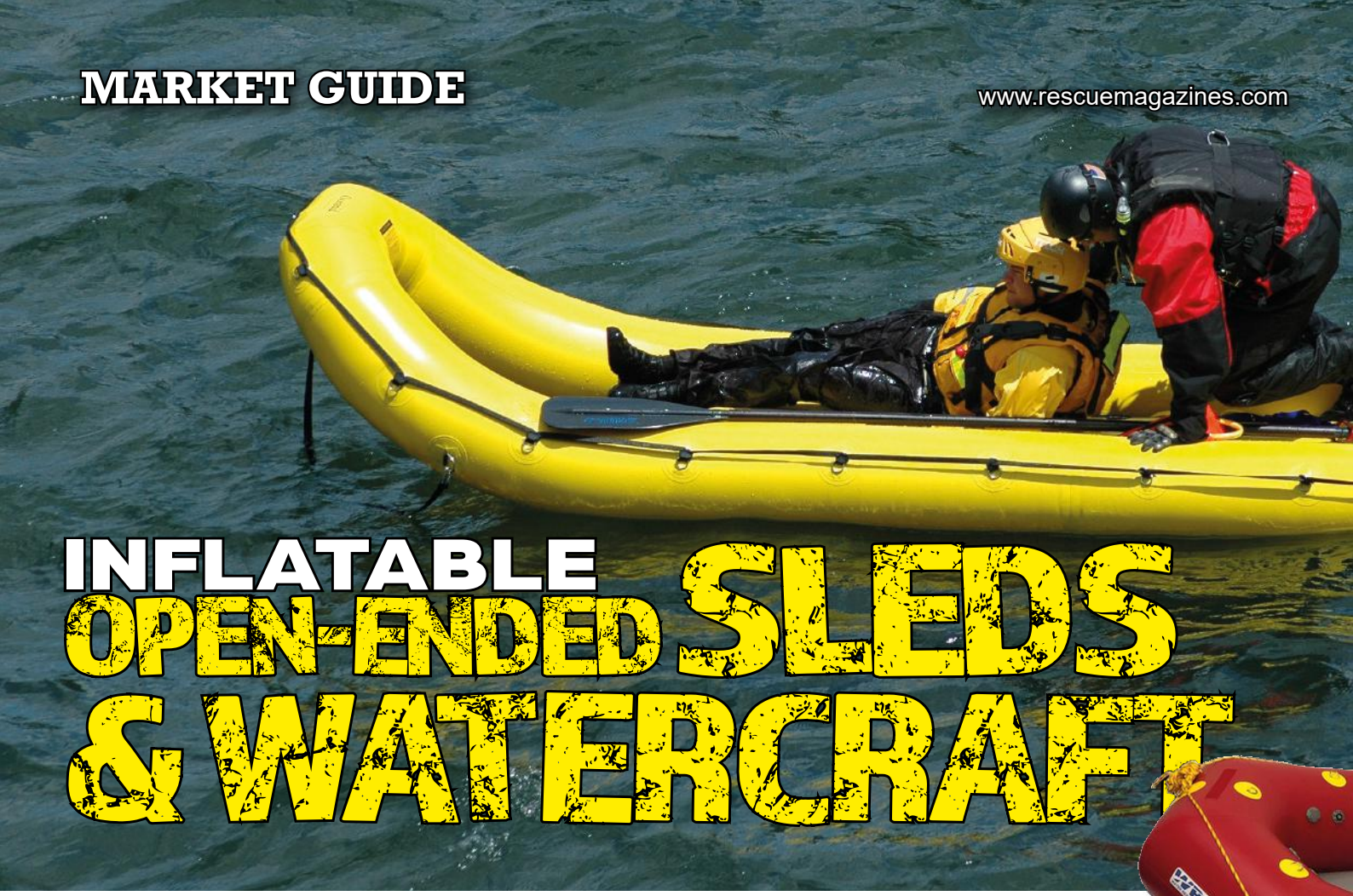
8) A biometrical study to compare spinal movement in a healthy volunteer during extrication, between 'chain cabling' and 'roof-off' methods of extrication
https://www.injuryjournal.com/article/S0020-1383(22)00687-8/fulltext

9) A Delphi study of rescue and clinical subject matter experts on the extrication of patients following a motor vehicle collision
https://sjtrem.biomedcentral.com/articles/10.1186/s13049-022-01029-x

Also note that two EXIT Project videos, outlining much of the research above, together with other related information, is available the UKRO website using this link: **https://ukro.academy/**

COMING SOON. EXTRICATION from Cars & Truck Cabs. After a complete rewrite and reshoot, indeed a completely different direction and now concentrating on patient handling and outcomes following a vehicle accident...





INFLATABLE OPEN-ENDED SLEDS & WATERCRAFT

This is the second part of our GUIDE to inflatable platforms and covers the more 'dynamic' rescue sleds, and open-transom rafts. Some of these are described as 'sleds' some as 'rafts' but in all cases they will have an open ended stern or water-entry opening in the case of the *Oceanid RDC* style rafts. These can be powered though that generally requires some modification like the *RDC* above since the stern is open on all the models in this GUIDE. More often they are paddled as with the MFC Sled on the left or pushed/towed/'punted' over water, ice, mud or sand in order to reach a person in difficulties. Such craft have inflatable sponsons or side-walls and an open back that allows easier ingress into or egress out of the water. These are 'wet' craft and not to be confused with inflatable boats or rafts which are designed to keep the occupants dry-ish. Inflatable sleds and open backed-rafts require the occupants to be fully kitted for potential water entry. Materials were discussed in part 1 and these sleds/rafts are the same materials and construction – incredibly robust welded PVC/TPU or glued Hypalon, often as a Double Wall Fabric (DWF) and drop stitched on the most robust part of these craft, the floor/hull. Given the abuse these things get from ice, gravel, flooded wire fences and brick walls etc. some have extra reinforcing strip along the underside of sponsons like the NRS craft. Failing that, all craft come with a repair kit. As with most things in life, you get what you pay for, so consider the materials, construction warranty and pedigree of the manufacturer and craft before committing to a purchase.

MFC Rescue Sled RS3

The point of the open stern of these sleds is to enable easy loading of a rescuer and/or a casualty and human kick-power if necessary so there is some duplication of the work of the paths we featured in the last GUIDE especially in the larger sizes which are more appropriate for flood evacuation than they are swiftwater. However, unlike flat platforms, sleds have a degree of occupant protection from their sponsons and are designed to be used in fast moving flood water, broad slow-moving flood

images in this article not to scale

MAIN PIC: Oceanid RDC. Invented in 1996 in Washington State in response to a request for a specialist ice-rescue craft, the Oceanid RDC has lately spawned many copies. This image shows the optional transom for mounting an outboard which a number of larger sleds/rafts also offer.

BELOW: The IRB-style WRS Mega Sled

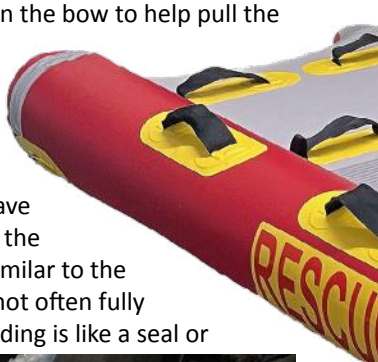
water and /or complex swiftwater and most can negotiate quite narrow channels. This style of craft may sit between the passive platforms and inflatable boats but it actually evolved last and as a consequence of adding a protective sponson like a RIB collar to an inflatable base and in most cases, raising the bow profile slightly. In its simplest form, you can see that this CheckRaft has a 3-sided sponson ratcheted to the deck of the same platform we listed in last issue's GUIDE. Indeed a market leader that rarely gets a mention outside of the manufacturers boardrooms is Henshaw Inflatables, which is yet another UK pioneer that, since the 70's had been making rib collars/ sponsons rather than entire boats. Henshaw either supply their collars or assist in conjoining the two products but you won't see an entire Henshaw boat or craft. They are however, now part of the Wing Group, Bill Wing's inflatable raft company and they certainly DO make water craft.

The two original and distinctly different boat designs in this Guide evolved on opposite sides of the Atlantic – *MFC* in Wales evolved their open-stern Sleds from their inflatable paths while Kris Walker at *Oceanid* in Washington State modified the classic whitewater raft to create the narrow, double-ended *RDC* much lauded by our old mate, the late, great, co-founder of Rescue3 and water rescue oracle Jim Segerstrom. Having been unopposed in the market for at least 15 of its 25 year history, the *RDC* is now copied by most of the major players in inflatables – high praise indeed although Chinese company Yushan Yijia using the trade name *EJIA* have some nerve in not only copying and calling their own model an RDC they even use *Oceanid*'s traditional sunburst advert template and other manufacturer's photos implying it's their product! We haven't included EJIA craft but their range is represented by some companies here and as always, Chinese, Taiwanese and Vietnamese manufacture can be as good as any, they just need to cut out the blatant copying. RDC-Style craft are on p48/49.

The red WRS model on the previous page demonstrates the most obvious hybrid between a platform and an inflatable rescue boat with sponsons/gunwales that are much larger than the *MFC sled*s and with a bow tapered like a boat – contrast this with *CheckRaft*'s and Sit Ltd's ResQRaft's rather less hydrodynamic square 'bow' and you can tell which craft is designed for faster flowing water and which are flat-water evacuation craft. Because the sponsons are quite sizeable on all these craft the inner working space is severely restricted in comparison to the uncluttered surface of a platform so the 51"/120cm width of a 2Tinga RIT for instance equates to only 20"/51cm of working deck width. The narrower beam sleds like the pioneering *MFC Rescue Sled* and the *WRS X-Sled* opposite not only work well in fast moving rivers they are excellent in flooded urban streets and alleyways.

The last style of craft to note is the *Tip-Board* (above-right) which we have included in the *RDC*-style craft table because it can be tipped to approach the casualty as all *RDC*-style craft can and especially for ice rescue. The *TipBoard* could be said to be a true water 'sled' because it has hybridised a flat platform with an IRB sponsons which are sharply angled at the stern to create what, on snow, would be sled/akja push handles or, if driving a dog sled team, handles with which to hang on for dear life. During the rescue of an incapacitated or severely weakened in-water victim, the stern can be tipped backward over the head and shoulders to facilitate easier loading while the rescuer has handy foot recesses from which to perform the lift. As the casualty comes out of the water the rescuer can simply 'fall' back into the craft with the levelling of the craft acting like a lever to assist with the lift or in this case, on ice or mud, a colleague can assist by levering down the bow to help pull the casualty inboard. We see a lot of these rescue design concepts by technical students in particular but they don't often seem to reach it to market so it's good to that Dutch safety company *Honor* have taken this on. Of course in this case, the casualty extraction process is very similar to the Oceanid *RDC* albeit that the bow is not often fully tipped during loading. Most sled loading is like a seal or


Honor TipBoard




Oceanid RDC

penguin getting onto an ice flow only without their degree of momentum. The casualty can assist by swim-kicking at the same time as the rescue hauls them on-board as can be seen in the *2Tinga* pic left.

The shallow rake we see on sleds helps deal with waves but the higher rake we see on craft like the *RDC*, the *ASR155* on the left and the *Tip-Board* above can also allow the craft to negotiate fast flowing water without having tons of water washing over the bow but that's obviously not the case with the open bow beneath the raked bow of the *RDC* designed to allow water through and rescuers to position over an in-water casualty or to slip more easily into the water direct from the floor of craft. The rake also allows the craft to be pushed up against obstacles and in the image below the face of a low-head dam/weir can be searched for an entrapment and the open bow decreases the pressure trying to force the craft away as it instead washes over the craft's floor. High-rake craft will also 'bend' a little at the change of angle to provide an extra few inches of proximity to the target and in the absence of a hole with which to funnel an in-water casualty, the raked solid bow is less inclined to smash an in-water casualty in the head as the two approach each other, possibly closing at speed in a high flow.

VALVES

All of these craft inflate through a valve which may only allow air flow inwards (inlet check valve) so you don't lose air pressure should the valve cap not be in place or the pump/cylinder hose come off during inflation. We have differentiated four types in our tables: Safety or Pressure Relief Valves, 1-Way, 2-Way and Dump valves but for this GUIDE they are mostly 2-Way and PR Valves. Safety or ***Pressure Relief Valves*** like the Leafield A6 refers to its ability to purge air should you OVER-inflate (*Northern Diver* 2-Way and PR Valves shown in the image above). This can be the case particularly with compressed air cylinders so the safety valve will allow air to force its way out of the valve rather than bursting the seams of the craft. A ***2-way*** valve allows inflation and deflation – as in the valve on the left in the image above. Some, like the Leafield A/B/C7 and Halkey-Roberts valve, have a cap and then an interior sleeve that you rotate a quarter or half turn to alternate between inflate and deflate while others have a second screw-off collar beneath a non-return inflation section. When unscrewed, this allows air to exit freely. Deflation needs to be fast so that the craft can be rolled and stowed or moved ASAP ready for the next task so these 2-way valves are doubling as Dump or rapid air expulsion valves which tend not to be present on most sleds, boats and rafts. True dump valves, in the diving sense, can of course a be a push button affair but this is obviously not the case for inflatable craft where they are regular screw-top release if they are present at all. Bear in mind that most craft have more than one chamber so deflation can be a more time consuming process than inflation. Craft like the *Polar75, 2Tinga* and *Wing Ice Skiff* have one-way baffles between chambers that means a single inflation point inflates all chambers. Many craft have both sets of valves sometimes next to each as with the *TiPBoard* and *WRS* and sometimes separate as with the *MFC Sleds* and *2Tinga* Craft where the inflate-deflate valves are located on the ends of each sponson and on the floor. Most valves are designed to use manual pumps and BA cylinders, but some, and especially the dump valves are large enough to use a powered blower or even a vacuum cleaner in reverse. Professional battery blowers are

The WRS X-Sled was the first to introduce a 'stacked' bow where the rake of the sponsons sit above the solid floor providing enhanced protection from water over the bow while increasing protection of the hull in this vulnerable area. WRS are among two or three to have increased deck height from 4 to 6" but they also managed to decrease weight over similar models by 'fusing' rather than glueing the layers.

an excellent idea because they have numerous other uses including cleaning/drying the craft. They are also unlikely to inflate beyond the pressure limit of the seams because they will struggle to push against over-pressure resistance. Basic dump valves can use used for large-bore pipe/hose inflation but air will escape while you try to screw the cap back on. *2Tinga*'s accessory pack shown above, includes a repair kit but also a pressure valve so that you can check the air pressure of your craft exactly and a very useful trigger-gun adapter for a BA line, This goes over the inflation valve and provides very precise start-stop during inflation rather than the more imprecise screwing/unscrewing of a cylinder valve.

LOAD CAPACITIES

Typical load capacities are the same as flat platforms at around 100kg/220lb per square metre on water (more on ice/mud) so for craft about a metre wide you can again gauge their capacity by the length – a 3m sled will take approximately 3 or 4 people. Bear in mind that some have a deeper floor; 6" drop thread instead of 4" and this provides greater capacity per floor area.

'LOAD-BEARING' EYES

Virtually all designs have connection rings that vary in size and strength of attachment depending on their purpose. One or two, like the *TipBoard*, have high strength LIFTING eyes (shown in green in our tables) that enable the entire sled with casualty to be lifted vertically. In some cases handles rather than rings can serve the same purposes. Most craft have medium-size/strength eyes that can be used for towing or positioning of the craft (shown as an orange number) and most have ancillary eyes that are intended for smaller loads such as connecting two craft or attaching equipment. The tow-strength eyes can also be used as tether points for holding position in flowing water.

HANDLES

There are carry handles on all of these models (shown in orange in our tables), these are intended for transport and positioning while the craft is empty rather than for lifting stretcher style though that is possible with one or two of these sleds like the *Oceanid RDC* and we have indicated this in the NOTES. Unlike the simpler platforms, all of these sleds have bespoke handles as distinct from perimeter cord doubling as a handle. Some handles are flat tape, some have solid tubes of ergonomic rubber-like material. Inboard handles (shown in black in our tables) on the floor are to assist in getting on board or for human outboard propulsion as with the *MFC Sled* on the left.

GRAB/PERIMETER CORD

Common on rafts but not so much on the sleds is a cord or webbing that runs around the sponson or, in the case of *SIT*'s *ResQRaft*, down the length of the floor. Cord or webbing is fastened at intervals to provide a something to grab or attach equipment to during the rescue mêlée. On longer models this can add a kg or more to the weight as it tends to be 7 to 10 mm in diameter for better grip and is heavier when wet.

FLIP TAB/HANDLE

This is a tab of webbing or a handle on the underside of the craft to enable it to be more easily righted should it capsize. This tends to be on the broader craft where the sponsons would be out of reach of rescuers in the water but this slimmer RR4 Sled by Northern Diver also has one.

We removed the 'Tactile surface' column that we had for platforms, not because the sled versions don't have tactile surfaces but because we wanted to expand upon the valves for this GUIDE and sleds tend not to be walked on in the same way as a platform although rescuers still may need to stand up to pull a casualty on-board. Sleds tend to be paddled Canadian-style, knelt down. The tactile surface of most flat platforms provides grip when standing up and to lessen the chance of people and things sliding off the top. Sleds are more of a mixture because, while standing and pulling requires better traction it tends to be by wedging your feet against the sponson than by traction so some have slick surfaces to make it easier to slide a casualty onto the craft. NB: SIT Ltd range was still being updated as we went to press, some spec may change. Now three ResQSleds 3, 5 &10m and two ResQRaft 10 & 15m

It is important to reference the key on page 72 in order to fully understand the categories and symbols used in the following tables.

SONAR EMILY

- Easy Operation based Humminbird SONAR
- Real-time imagery for search and recovery missions
- Light weight (17 kg)
- Line of Sight technology
- GPS Accurate Mapping
- Navigation Lights for Night Missions
- Side scan, downward imaging and bathymetry
- SD cards for recording and post-processing
- Autonomy through easy waypoint entry
- SARHAWK Post Mission Processing Software

SWIFT WATER RESCUE EMILY

- Line of sight technology
- Battery powered, jet boat
- Fast and durable, 40 km/h
- Navigation Lights for Night Missions
- Easy to deploy off riverbanks, piers, bridges
- Self-righting technology for strong currents

HYDRONALIX

For UK: info@emilyrobotuk.co.uk
For US: info@hydronalix.com

Images NOT to Scale	MODEL	COMPANY	ORIGIN	COST inc tax / VAT	WEIGHT	LOAD CAPACITY Kg/Square Metre lb/Square Foot	DIMENSIONS L x int/ext Wx H/D PACKED
	**RIT Craft**	**2-TINGA**		**$3600**	**27.3kg 60lb**	**682kg 1500lb**	**370 x 51/120 x 48cm 144 x 20/48 x 19" 46 x 36 x 56cm 18 x 14 x 22"**
	**Craft-Boat Conversion**	**CHECKMATE FLEXIBLE ENGINEERING**		**N/A**	**28kg 61.6lb**	**500kg 1100lb >100kg >67.2lb**	**500 x 106/140 x 25cm 197 x 55 x 10" 90 x 42/50 x 35cm 35.4 x 19.7 x 13.7"**
	**Rescue Sled RS3** WRW0001/01	**MFC INTERNATIONAL**		**>£1350 >£999 >$1755 >$1300**	**15/17kg 33/ 37.4lb**	**240kg 528lb**	**216 x 70/117 x 40cm 101 x 28/46 x 16" 88 x 35 x 30cm 36 x 14 x 12"**
	**Rescue Sled RS5** WRW0002/01	**MFC INTERNATIONAL**		**>£1699 >£1100 >$2210 >$1430**	**17.5/ 19.5kg 38.6/ 43lb**	**400kg 882lb**	**331 x 70/117 x 40cm 130 x 28/46 x 16" 88 x 48 x 32cm 35 x 14 x 12"**
	**Rescue Sled RS6** WRW0169/01	**MFC INTERNATIONAL**		**>£1900 >£1300 >$2470 >$1690**	**18.5/ 20.5kg 38.6/ 45.1lb**	**480kg 1056lb**	**397 x70/117 x 40cm 156 x 28/46 x 16" 88 x 48 x 35cm 35 x 14 x 14"**
	**Rescue Sled RS10** WRW0003/01	**MFC INTERNATIONAL**		**>£3800 >$2500 >$5000 >$3250**	**31/ 35kg 38.6/ 68.2lb**	**800kg 1764lb**	**400 x 120/190 x 56cm 158 x 47/75 x 22" 88 x 55 x 35cm 35 x 22 x 14"**
	**Rescue Sled RS15** WRW0005/01	**MFC INTERNATIONAL**		**>£4200 >£2900 >$5500 >$3780**	**45/ 50kg 99/ 110lb**	**1200kg 2646lb**	**500 x 160/231 x 77cm 197 x 63/91 x 30" 88 x 70 x 52cm 35 x 28 x 21"**
	**RR3**	**NORTHERN DIVER**		**£1069 £1489 €1691**	**22kg 48.4lb**	**650kg 1430lb**	**300 x 70/116 x 30cm 118 x 28/46 x 12" 90 x 40 x 30cm 35.4 x 15.8 x 12"**
	**RR4**	**NORTHERN DIVER**		**£1096 £1765 €1885**	**31kg 68.2lb**	**750kg 1650lb**	**360 x 70/116 x 38cm 142 x 28/46 x 15" 95 x 50 x 50cm 37.4 x 19.7 x 19.7"**
	**RR Max Raft**	**NORTHERN DIVER**		**£1836 €2326**	**37kg 81.4lb**	**1000kg 2200lb**	**300 x 130/200 x 38cm 118 x 51/79 x 15" 130 x 60 x 40cm 51 x23.6 x 15.8 "**

NOTES: **COST:** Approx, INCLUDES local tax/VAT USES/FEATURES: ● = PARTIAL FEATURE and/or OK BUT NOT IDEAL ☐☐☐ = Option

INFLATABLE OPEN-ENDED SLEDS/WATERCRAFT

AIR CAPACITY INFLATION TIME	MAX WORKING PRESSURE	MATERIALS:	INFLATION: INFLATION CHAMBERS	INFLATION: REGULATOR / HOSE	INFLATION: MANUAL/POWERPUMP	LOADING: GRAB/LIFT HANDLES	LOADING: FLIP TAB / GRAB CORD	LOADING: TOW/HD-LIFT/LINK EYES	VALVES: SAFETY PRV / DUMP	VALVES: 1-WAY / 2-WAY	ACC: CARRY BAG/ PADDLES	ACC: REPAIR KIT/ WARRANTY	VIZ: REFLECTIVE/ CUSTOM	VIZ: COLOUR OPTIONS	NOTES	WWW.
1132 L 40cuft 1-3mins	0.2 BAR 3 PSI	PVC. drop-stitch deck	3	☐ ☐	☐ ■	8 0	■ -	2 4 3	-	■ -	■ ■	10 ■	☐ -	■	Note *2Tinga* have a flat platform called a *RIT-Sled* but is not a 'sled' as defined in this article	2tinga.ca
1700 L 60cuft 3-4mins	0.55 BAR 8 PSI	Elastomeric coated nylon. drop-stitch deck	3	☐ ☐	☐ ☐	0 0	- -	6 - 4	- ■	■ -	☐ ■	N/A ■	☐ ■	■	* 6 of these eyes are for joining to another raft or platform NOT towing	checkmateflex.com
530 L 18.7cuft 2-3mins	0.2 & 0.4 BAR 3.25 & 6 Psi	Hypalon TPU drop-thread deck	2	■ ☐	☐ ☐	5 6	■ ?	8 - 4	- ■	■ -	2 ■	2 ■	☐ ■	■ ■	comes with throwline with rubber quoit. Leafield Valves. Optional rear bolster and storage pockets	mfc-international.com
670 L 23.7cuft 3mins	0.2 & 0.4 BAR 3.25 & 6 Psi	Hypalon TPU drop-thread deck	2	■ ☐	☐ ☐	5 6	■ ■	8 - 4	- ■	■ -	2 ■	2 ■	☐ ■	■ ■	comes with throwline with rubber quoit. Leafield Valves. Optional rear bolster and storage pockets	mfc-international.com
710 L 25cuft 3mins	0.2 & 0.4 BAR 3.25 & 6 Psi	Hypalon TPU drop-thread deck	2	■ ☐	☐ ☐	5 6	■ ■	8 - 4	- ■	■ -	2 ■	2 ■	☐ ■	■ ■	comes with throwline with rubber quoit. Leafield Valves. Optional rear bolster and storage pockets	mfc-international.com
2000 L 70.6cuft 3mins	0.2 & 0.4 BAR 3.25 & 6 Psi	Hypalon TPU drop-thread deck	5	■ ☐	☐ ☐	5 12	■ ■	8 - 4	- ■	■ -	2 ■	2 ■	☐ ■	■ ■	comes with throwline with rubber quoit. Leafield Valves. Optional rear bolster and storage pockets	mfc-international.com
3800 L 134.2cuft 3mins	0.2 & 0.4 BAR 3.25 & 6 Psi	Hypalon TPU drop-thread deck	5	■ ☐	☐ ☐	5 16	■ ■	8 - 4	- ■	■ -	2 ■	2 ■	☐ ■	■ ■	comes with throwline with rubber quoit. Leafield Valves. Optional rear bolster and storage pockets	mfc-international.com
approx 630 L 22.2cuft 1 - 3mins*	0.35 & 0.7 BAR 5 &10 Psi	1.2mmPVC or Orca Hypalon drop-stitch deck	3	☐ ☐	☐ ■	4 6	- ■	4 - 7	- ■	■ -	■ ■	2 ■	☐ ☐	■ ■ ■ ■ ■	*Power pump to Hand Inflation time calculated at 50 pump strokes per minute	ndiver-rescue.com
approx 800 L 28.3cuft 1- 3-4mins*	0.35 & 0.7 BAR 5 & 10 Psi	1.2mmPVC or Orca Hypalon drop-stitch deck	3	☐ ☐	☐ ■	4 9	- -	4 - 15	- ■	■ -	■ ■	2 ■	☐ ☐	■ ■ ■ ■ ■	* Power pump to Hand Inflation time calculated at 50 pump strokes per minute	ndiver-rescue.com
1550 L 54.7cuft 1.5-5min	0.35 & 0.7 BAR 5 & 10 Psi	1.2mm PVC drop-thread deck	4	☐ ☐	☐ ■	5 4	■ ■	13 - ?	- ■	■ -	■ ■	1 ■	☐ ☐	■ ■ ■ ■ ■	*Power pump to Hand Inflation time calculated at 50 pump strokes per minute	ndiver-rescue.com

N/A = info Not Available/not given INFLATION TIME: Hand Pump/Compressed Air VALVES PRV=Pressure Relief Valve

Images NOT to Scale	MODEL	COMPANY	ORIGIN	COST inc tax / VAT	WEIGHT	LOAD CAPACITY Kg/Square Metre lb/Square Foot	DIMENSIONS L x int/ext W x H/D PACKED
	**X-Sled 115**	**NRS**		**$2495**	**30.5kg 67lb**	**480kg 1056lb**	**366 x 71/122 x 36cm 144 x 28/48 x 14" 85 x 35 x 30cm 33.5 x 13.8 x 12"**
	**Ionic Extreme Sled**	**SAFEQUIP**		**£1700 $2380 €2040**	**23.8kg 52.4lb**	**650kg 1430lb**	**300 x 70/120 x 35cm 118 x 27.6/47 x 14" 90 x 30 x 30cm 35.4 x 12 x 12"**
	**Ionic Titan Sled** SAF38070	**SAFEQUIP**		**£2160 $3025 €2590**	**25kg 55lb**	**500kg 1100lb**	**370*x 70/120 x 35cm 146 x 27.6/47 x 14" 95 x 30 x 30cm 37.4 x 12 x 12"**
	**Ionic Xcel X-Raft**	**SAFEQUIP**		**£3600 $5040 €4320**	**42kg 92.4lb**	**1000kg 2200lb**	**320 x 144/220 x 38cm 126 x 57/87 x 15" 100 x 70 x 45cm 39 x 27.6 x 18"**

NOTES: **COST:** Approx, INCLUDES local tax/VAT USES/FEATURES: ● = PARTIAL FEATURE and/or OK BUT NOT IDEAL □□□ = Option

INFLATABLE OPEN-ENDED SLEDS/WATERCRAFT

AIR CAPACITY INFLATION TIME	MAX WORKING PRESSURE	MATERIALS:	INFLATION: INFLATION CHAMBERS	INFLATION: REGULATOR / HOSE	INFLATION: MANUAL/POWERPUMP	LOADING: GRAB/LIFT HANDLES	LOADING: FLIP TAB / GRAB CORD	LOADING: TOW/HD-LIFT/LINK EYES	VALVES: SAFETY PRV / DUMP	VALVES: 1-WAY / 2-WAY	ACC: CARRY BAG/ PADDLES	ACC: REPAIR KIT/ WARRANTY	VIZ: REFLECTIVE/ CUSTOM	VIZ: COLOUR OPTIONS	NOTES	WWW.
710 L 25 cuft <2mins	0.3 & 0.7 BAR 4 & 10 Psi	PVC drop-stitch deck	3	☐ ☐	☐ ■	- 16	- -	- - 5	- ■	■ -	■ ■	3 ■	☐ ■	■	Design being changed. Armoured underside to sponsons. Leafield valves. * Height does not include 20" rise of the angled bow	nrs.com
860 L 30.4cuft <1min	0.2 & 0.6BAR 3 & 9 psi	'Orca' Hypalon 6" drop-thread deck	3	☐ ☐	☐ ☐	7 4	■	4 - 5	- ■	■ -	■ ■	5 ■	☐ ■	■ ■ ■ ■	Leafield valves. Height does not include angled bow	safequip.co.uk
920 L 34.5cuft <2mins	0.2 & 0.6BAR 3 & 9 psi	'Orca' Hypalon 6" drop-thread deck	3	☐ ☐	☐ ☐	10 4	■	4 - 5	- ■	■ -	■ ■	5 ■	☐ ■	■ ■ ■ ■	* length inc 45cm/18" deck extension. Leafield valves. Height does not include angled bow	safequip.co.uk
1550 L 54.7cuft <2mins	0.2 & 0.6BAR 3 & 9 psi	'Orca' Hypalon 6" drop-thread deck	5	☐ ☐	☐ ☐	8 2	■ ■	2 - 8*	- ■	■ -	■ ■	5 ■	☐ ■	■ ■ ■ ■	Leafield valves. 6" Deck. * D-Ring under deck can provide flip tab	safequip.co.uk

N/A = info Not Available/not given **INFLATION TIME**: Hand Pump/Compressed Air **VALVES** PRV=Pressure Relief Valve

TRAIN IN SAFETY AT THE NEWEST FACILITY IN THE USA

In an increasingly flood-prone world, swift water rescue training is critically important for first responders. specialized training can often be difficult and dangerous to arrange in natural outdoor settings.

In spring 2023,*Fayetteville Technical Community College* (FTCC), already known for its educational and training services to *Fort Bragg*, will open the only indoor swift water rescue training facility on the east coast of the United States.

An 88,000-gallon indoor tank allows for a variety of training scenarios, including different weather, water temperatures, obstacles, and rescue challenges, including simulated rescues at night. Located on FTCC's 30-acre state-of-the-art *Fire & Rescue Training Complex* on Tom Starling Road in Fayetteville, North Carolina.

Learn more https://www.faytechcc.edu/swrtf

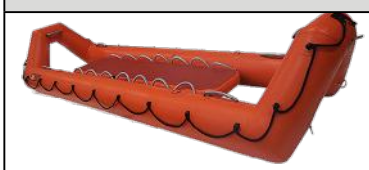
Images NOT to Scale	MODEL	COMPANY	ORIGIN	COST inc tax / VAT	WEIGHT	LOAD CAPACITY Kg/Square Metre lb/Square Foot	DIMENSIONS L x W x H/D PACKED
	**ResQSLED3** ResQSLED5 ResQSLED10	**SIT Ltd**		**N/A**	**20kg 44lb**	**210kg 462lb**	**260 x 70/120 x 35cm 102 x27.6/47 x 14" 80 x 40 x 30cm 31.5 x 15.75 x 12"**
	**ResQRAFT10** ResQRAFT15	**SIT Ltd**		**N/A**	**45kg 99lb**	**950kg 2090lb**	**300 x 120/200 x 45cm 118 x 54/79 x 17.7" 80 x 60 x 50cm 31.5 x 23.6 x 19.7"**
	**Mega Sled**	**WRS INTERNATION-AL**		**£2483 $2667 €2667**	**32kg 70.4lb**	**1000kg 2200lb**	**363 x 87/180 x 52cm 143 x 34/71 x 20.5" 120 x 60 x 35cm 47 x 23.6 x 14"**
	**X Sled**	**WRS INTERNATION-AL**		**£2147 $2300 €2553**	**20kg 44lb**	**350-580kg 770-1276lb**	**355 x 72/122 x 24cm 140 x 48 x 9.5" 100 x 50 x 40cm 39.4 x 19.7 x 15.75"**

NOTES: **COST:** Approx, INCLUDES local tax/VAT USES/FEATURES: ● = PARTIAL FEATURE and/or OK BUT NOT IDEAL ☐☐☐ = Option

INFLATABLE OPEN-ENDED SLEDS/WATERCRAFT

AIR CAPACITY INFLATION TIME	MAX WORKING PRESSURE	MATERIALS:	INFLATION: INFLATION CHAMBERS	INFLATION: REGULATOR / HOSE	INFLATION: MANUAL/POWERPUMP	LOADING: GRAB/LIFT HANDLES	LOADING: FLIP TAB / GRAB CORD	LOADING: TOW/HD-LIFT/LINK EYES	VALVES: SAFETY PRV / DUMP	VALVES: 1-WAY / 2-WAY	ACC: CARRY BAG/ PADDLES	ACC: REPAIR KIT/ WARRANTY	VIZ: REFLECTIVE/ CUSTOM	VIZ: COLOUR OPTIONS	NOTES	WWW.
500 L 17cuft <1min	0.2 & 0.4BAR 3 & 6 psi	'Orca' Hypalon Neoprene-coated 6" drop-thread deck	3	☐ ☐	☐ ☐	4 4	■	4 - 5	- ■	■ -	■ ■	2 ■	☐ ■	■ ■ ■ ■	NB. SIT range updating as we went to press. Spec may change. ResQSled also as 5 & 10m models with 45cm sponsons	sitltd.co.uk
1500 L 53cuft >2mins	0.2 & 0.4BAR 3 & 6 psi	'Orca' Hypalon 6" drop-thread deck	5	☐ ☐	☐ ☐	8 2	■ ■	2 - 8*	- ■	■ -	■ ■	2 ■	☐ ■	■ ■ ■ ■	NB. ResQRaft also as 15m model	sitltd.co.uk
450 L 15.9cuft <1min	0.3 & 0.6BAR 3.6 & 9 psi	PVC. 6" drop-stitch deck	3	☐ ☐	- ■	2 2	■ ■	11 - 9	- ■	■ -	☐ ■	3 ■	☐ ☐	■	Leafield valves. Flap at stern can be lifted to form a 'transom' style water barrier. 8x Velcro loop stow points. Ht=78cm at bow	wrsinternational.com
700 L 24.7cuft >2mins	0.25 & 0.6BAR 3.6 & 9 psi	PVC. 6" drop-stitch deck	3	☐ ☐	- ■	- 15	0 ■	- - 5	- ■	■ -	☐ ■	3 ■	☐ ■	■	* Height does not include 54cm/21"" rise of the angled bow. Leafield valves. EVA floor friction pads	wrsinternational.com

N/A = info Not Available/not given INFLATION TIME: Hand Pump/Compressed Air VALVES PRV=Pressure Relief Valve

Images NOT to Scale	MODEL	COMPANY	ORIGIN	COST inc tax / VAT	WEIGHT	LOAD CAPACITY Kg/Square Metre lb/Square Foot	DIMENSIONS L x int/ext Wx H/D PACKED
	**Rescue Tip Board**	**HONOR-SAFETY**		**N/A**	**22kg 48.4lb**	**500kg 1100lb**	**270 x 50/130 x 70cm 106 x 20/57 x 15.7" 90 x 50 x 40cm 35.4 x 19.7 x 15.7"**
	**RSW Rescue Sled** WR0244	**MFC INTERNATIONAL**		**£2500 $3250**	**31.5kg 69.3lb**	**850kg 1870lb**	**500 x 75/120 x 45cm 197 x 30/47 x 17.7" 80 x 40 x 35cm 31.5 x 15.7 x 14"**
	**Polar 75**	**NAUTIC&ART (CHARGEK inc)**		**$7800**	**32kg 70.4lb**	**1045kg 2299lb**	**440 x 58/130 x 36cm 173 x 23/51 x 14" 152 x 152 x 152cm 60 x 60 x 60"**
	**RR5**	**NORTHERN DIVER**		**£1621 $3000**	**42kg 92.6lb**	**850kg 1873lb**	**470 x 70/140 x 35cm 105 x 28/55 x 13.8" 110 x 60 x 40cm 43x24x15.7"**
	**ASR 155**	**NRS**		**$2995**	**39.5kg 87lb**	**850kg 1873lb**	**470 x 64/125 x 30cm 185 x 25/49 x 12*" 122 x 78 x 33cm 48 x31x 13"**
	**RDC Rapid Deployment Craft**	**OCEANID**		**$4900**	**22.7kg 50lb**	**>909kg >2000lb**	**468 x 56/122 x 30cm 184 x 22/48 x 12" 91.2 x 61 x 30cm 36 x 24 x 12"**
	**Ionic Explorer Sled**	**SAFEQUIP**		**£2250 $3150 €2700**	**22kg 48.4lb**	**>500kg >1100lb**	**460 x 82/142 x 30cm 181 x 32/56 x 12" 80 x 40 x 25cm 31.5 x 16 x 10"**
	**ResQsled Ice** SIT38042	**SIT Ltd**		**N/A**	**27kg 59.4lb**	**N/A**	**435 x 73/133 x 30cm 171 x 29/53 x 12" 80 x 50 x 30cm 31.5 x 19.7 x 12"**
	**SKF-ICE**	**WING INFLATABLES**		**$10000**	**27.3kg 60lb**	**909kg 2000lb**	**472 x 61/122 x 30cm 186 x 24/48 x 12*" 81 x 38 x 41cm 32 x 15 x 16"**

NOTES: **COST:** Approx, INCLUDES local tax/VAT USES/FEATURES: ● = PARTIAL FEATURE and/or OK BUT NOT IDEAL □□□ = Option

INFLATABLE OPEN-ENDED SLEDS/WATERCRAFT

AIR CAPACITY INFLATION TIME	MAX WORKING PRESSURE	MATERIALS:	INFLATION: INFLATION CHAMBERS	INFLATION: REGULATOR / HOSE	INFLATION: MANUAL/POWERPUMP	LOADING: GRAB/LIFT HANDLES	LOADING: FLIP TAB / GRAB CORD	LOADING: TOW/HD-LIFT/LINK EYES	VALVES: SAFETY PRV / DUMP	VALVES: 1-WAY / 2-WAY	ACC: CARRY BAG/ PADDLES	ACC: REPAIR KIT/ WARRANTY	VIZ: REFLECTIVE/ CUSTOM	VIZ: COLOUR OPTIONS	NOTES	WWW.
570 L 20cuft 15-30sec	N/A	N/A drop-stitch deck	?	☐ ☐	■ ☐	11 0	■ -	4 - 1	- ■		- ■	N/A ■	☐ ■	■	Can be purchased with an electric SeaBob hand-held waterjet * with BA cylinder	honor-safety.com
2000 L 70.6cuft 3mins	0.2 & 0.4 BAR 3.25 & 6 Psi	Hypalon TPU drop-thread deck	3	■ ☐	☐ ☐	10 8	■ ?	8 - 4	- ■	■ -	2 ■	2 ■	☐ ☐	■ ■	comes with throwline with rubber quoit. Leafield Valves	mfc-international.com
1100 L 40cuft 20sec*	0.24 & 0.8BAR 3.5 & 12 Psi	40oz Hypalon. drop-thread deck	3	■ ☐	☐ ☐	6 14	■	- 4 6	-	■ -	■ ■	5 ■	■ ☐	■	opening=81x46cm *SIngle inflation point. Height does not include 73° rake	nacorp.ca
1000 L 35cuft 1- 3-4mins*	0.35 & 0.7 BAR 5 & 10 Psi	DWF/PVC drop-stitch deck	3	☐ ☐	☐ ■	6 12	■ ■	- - 6	- ■	■ -	■ ■	1 ■	☐ ☐	■*	*Power pump to Hand Inflation time calculated at 50 pump strokes per minute. *Custom colours	ndiver-rescue.com
960 L 34cuft 1-2mins	0.3 & 0.7 BAR 4 & 10 Psi	PVC drop-stitch deck	5	☐ ☐	☐ ■	■ 32	■ -	16 4 6	- ■	■ -	■ ■	3 ■	☐ ■	■	* Height does not include 24" rise of the angled bow and stern. Armoured underside to sponsons. Can be hoisted under load. Leafield valves	nrs.com
1133 L 40cuft <1min	0.2 BAR 3 Psi	35 oz. PU/PVC coated Polyester (Dacron). I-beam deck	3	■ ☐	☐ ■	0* 18	■ -	26 4 -	- ■	■ -	■ ■	12 ■	☐ ■	■	Halkey Roberts & Incept PR Valves. Can be suspended/ hoisted while loaded. *Perimeter cord 'handles' load= >2500lb/1136kg access hole = 22x40"	oceanid.com
960 L 34cuft >1min	0.2 & 0.6BAR 3 & 9 psi	'Orca' Hypalon 6" drop-thread deck	3	☐ ☐	☐ ☐	12 8	■ ■	14 - 4	- ■	■ -	■ ■	2 ■	☐ ■	■ ■ ■ ■	Leafield valves	safequip.co.uk
1100 L 40cuft >1min	0.2 & 0.4BAR 3 & 6 psi	'Orca' Hypalon. 6" drop-thread deck	3	☐ ☐	☐ ☐	12 8	■ ■	14 - 4	- ■	■ -	■ ■	2 ■	☐ ■	■ ■ ■ ■	Updated from original 'Endurance' model. Load capacity not yet available.	sitltd.co.uk
950 L 33.5cuft >1min	0.3 BAR 4.5 psi	33oz polyester scrim Polyurethane. I-beam deck	5	☐ ■	☐ ■	0 2*	■ -	- - 22	- ■	■ ■	☐ ■	5 ■	☐ ■	■	Price includes Motor transom. *rise of bow/ stern =30". Chambers linked to Inflate as 1 *Grab cord rigged to act as lift and shift handles. Custom colours	inflatablesolutions.com

N/A = info Not Available/not given INFLATION TIME: Hand Pump/Compressed Air VALVES PRV=Pressure Relief Valve

KEY to TABLES.....

Any use, feature, accessory or component that is **inherent** in the product is shown as a **solid coloured square** ■■■■
If it's an **OPTION** it is shown as an **outline square** □□□□
A circle ● in the 'USE' columns indicates that this feature is only partially present and/or is OK for that purpose but not ideal.

ORIGIN: The manufacturer's country, not necessarily the country of manufacture, If we know it's made in a different country there will be a smaller inset flag.

COST: a rough guide only – **includes** local taxes/VAT. Varies with exchange rates, extra taxes etc. Unlike our other GUIDE in this issue, most companies here have given a rough price but in the current economic climate (2022) with so many factors affecting product costs, these prices may be subject to quite radical changes. We usually round up to the nearest Pound£/ US Dollar$/Euro€. We have started to quote a US$figure in orange which is simply a currency conversion to give an idea of price, it is not the selling price in the US which may have import duties etc. to add.

LOAD CAPACITY: Most companies will quote a maximum figure which is much lower than its true capabilities especially if used on mud or ice. Where two figures are given the lower figure will be in swiftwater, the higher figure in flat, low-flow flood water. If you work on 100kg per square metre or 67.2 pounds per square foot you won't tax any of these models.

Northern Divers RRMax Raft

DIMENSIONS: Length by internal width by external width by depth/height from ground. But this may not include the kick of an angled bow or stern. Height is often the width of sponson tube as many floors are suspended rather than having the tube sat on top. The stored dimensions may be size of the bag rather than the rolled or folded sled but it's close enough.

AIR CAPACITY: The volume of air needed to fill the path to working pressure. This doesn't necessarily correlate to the dimensions (which are external measurements) and vary with different thicknesses of material, resistance, internal components etc.

MAX WORKING PRESSURE: the pressure at which the path is pumped up and workable, exceeding of which will purge via the safety valve or burst the seams! The base tends to be a higher pressure averaging 6-9psi compared to the sponsons at around 3-4psi.

INFLATION TIME: The quickest time is via compressed air and where chambers are linked so can inflate from one valve. CA is 2-3 times quicker than electric pump which may be twice as fast as hand/foot inflation. All times are approximate and depend on the temp and how well the path has been packed/unrolled.

INFLATION:

SAFETY PRV/ DUMP VALVE: PRV =Pressure Relief Valve. This safety, pressure relief or auto-purge valve allows excess air to vent as a result of over-inflation or an excessive compressive load. A Dump valve is not really the correct term but in this case means a rapid-deflation valve or simply a wider opening to expel air quickly that can also be a rapid fill option.
1-WAY CHECK /2-WAY: A one way inlet valve that doesn't allow air to escape. A 2-way valve is a joint inflation-deflation valve – usually requiring a twist or unscrewing a top section to switch between inflation and deflation.

LOADING (HANDLING)

GRAB/LIFT HANDLES: LIFT Handles shown in Orange are on the sponsons and for lifting/shifting as well as holding onto. GRAB Handles are in-board and are to self-assisted boarding or for in-water swim propulsion.
FLIP TAB/GRAB CORD FLIP tab or cord to help with righting a capsized craft. GRAB CORD is perimeter cord or lengths of cord for holding on to or attaching equipment and may be webbing or cord.

TOW/HD-LIFT/LINK EYES: metal D-rings and/or web straps and sometime hooks. This can be tricky because some components can easily do the job of two or all three tasks but generally the LINK or connecting eyes are weaker than TOWing eyes and used either to attach equipment or join two craft. TOW eyes can be used for towing, positioning in high-flows and lifting the ***EMPTY*** craft if positioned appropriately. Only HD-LIFT eyes (Heavy Duty LIFT eyes) can be used to lift a fully loaded sled and there are only a couple in this list that are capable. HD-Lift eyes can also be used for towing if positioned appropriately. For live-load lifting these are best used with a load-distributing bridle as you would a stretcher. Double check the manufacturer's definition of 'lift'; most actually mean lifting an EMPTY craft into water, for instance off a dock, before starting the rescue.
FLIP TAB/HANDLE: a means of righting the craft and located on the underside of the floor. May be web, handle or cord

ACC = ACCESSORIES

WARRANTY: Not really an accessory! Shown as manufacturer's warranty but fabric warranty may be separate and approx 5yrs. Shown in YEARS and usually subject to conditions.

VIZ =VISUAL ATTRIBUTES

CUSTOM: Customised Team/Service/Dept decals or printing
REFLECTIVE: As standard ■, or as an option □
COLOUR: Primary colour of shell/frame with an outline secondary colour to indicate trim colour.

DOLPHIN 1

ROBOTIC LIFEGUARD

ZERO RISK FOR RESCUERS

Dimension	119x85x20cm	***Buoyancy***	32kg
Weight	13kg	***Floatability***	150kg
Propulsion	Water-jet thruster	***Max. Speed***	13km/h(8mph)
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INDIA		LIFEGEAR	Om Heera Panna Mall	Mumbai	400102	lifegear.in
HONG KONG		PROTREE	Greenland Garden	Tuen Mun	NT 852	protreehk.com
IRELAND		DONEGONS	Ann Street	Bailieborough	Co Cavan	donegan.ie
JAPAN		ODSK	5513-2 Nishi-machi	Nagano-Ken	396-0026	works-odsk.jp
NEW ZEALAND		TREETOOLS	8a Kerwyn Ave East Tamaki	Aukland	2013	treetools.co.nz
UK South-Central		HONEY BROTHERS	New Pond Road, Peasmarsh	Guildford	GU3 1JR	honeybros.com
UK South Coast		TREE KIT	Unit 3, Building 446, Aviation Business Park	Christchurch	BH23 6NW	treekit.com
UK North East		GUSTHARTS	Milkhope Centre, Blagdon Seaton Burn	Newcastle upon Tyne	NE13 6DA	gustharts.com
UK North West		SKYLAND EQPT	Unit 17 Wheathill Ind.Est. Holt Lane, Netherley	Liverpool	L27 0YA	skylandequipment.com
UK South West		SORBUS INTERNATIONAL	L1- L3, Commerce Park, Marshall Way,	Frome	BA11 2FB	sorbus-intl.co.uk
USA North-East		ARBORTECH SUPPLY	11494 James Madison St	Remington	VA 22734	arbortechonline.com
USA North-East		GAP ARBORIST SUPPLY	835 PA-41	Gap	PA 17535	gaparboristsupply.com
USA East		MOUNTAINTEK	1034 Maple Street	Hendersonville	NC 28792	mountaintek.com
USA North West		WESSPUR	2121 Iron Street	Bellingham	WA 98225	wesspur.com

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