TECHNICAL & WILDERNESS

RESCUE

SAR•ROPE ACCESS & RESCUE•USAR/INDUSTRIAL•EXTRICATION•WATER RESCUE•EMS•TACTICAL



ISSUE 88
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We are PETZL.

This is how we see the world.

We are committed to **creating safer places**.
For those who **work and play** in the vertical and dark worlds.
For those who want **to access their own inaccessible** every day.
We are **independent** and completely free to choose our own endeavors.
To maintain **industrial excellence**, paying attention to our impact.
To be pioneers in the pursuit of **perpetual innovation**.
Sharing, educating, building. **Together**.

This is how we see the world.

We are PETZL.



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FRONT COVER
Heli-rescue with a *Kong Lecco* stretcher being attended by a rescuer from the Corpo Nazionale Soccorso Alpino e Speleologico / National Alpine and Speleological Rescue Corps of Italy.-
see ON THE-COVER feature on page 2





CNSAS

Corpo Nazionale Soccorso Alpino e Speleologico National

Alpine and Speleological Rescue Corps of Italy

CNSAS provides the Technical Rescue element for the *Italian Alpine Club* and is a specialised voluntary agency operating officially as a public-service rescue organisation within Italy's national civil-protection system. It was formed in 1954 for mountain rescue with cave rescue added in 1966 so is one of the most technically experienced of world rescue organisations. CNSAS' alpine origins mean it is broadly centred on the Italian Alps in the north of the country where it shares rescue responsibilities with BRD (Bergretttungsdienst). However with plenty of other mountainous areas in Italy and having responsibility for cave rescue, its regional coverage nationally includes the islands of Sardinia and Sicily, the sea cliffs and rugged 'hills' of Liguria and the Apennines down the centre of Italy for high angle rescue and for caves the map below highlights them in grey adding to the dark yellow/ orange upland areas. The organisation operates well outside of these specific areas if requested by a local agency so can often be seen at disasters and major incidents in urban and rural areas.



Upland and Cave (grey) areas of Italy for which CNSAS provides primary and co-response coverage

ON THE COVER



MAIN IMAGE: CNSAS team in Liguria carry out a cliff rescue evacuation near La Spezia of a rock climber. The local team were on scene within 20 minutes and had the climber accessed, treated and packed within an hour and half with a further 30 minutes required for hauling to the cliff top. Rescuers wear the *Kong Leef* helmets pretty much across the range of their disciplines along with *Kong Target* harnesses. *Kong's Lecco* stretcher is standard equipment for CNSAS teams along with the lighter *Kong 911 Canyon* stretcher that we featured in **WSAR** issue 8 (image above-right). Back to Liguria and in this image the stretcher attendant is a doctor (also inset pic below) and in this case is on a prusik-adjustable lanyard to the central rigging plate. The 'assistant' handler is on a separate rope with GriGri adjuster and a second safety to the stretcher. Stretcher bridle adjustment/alignment is via 4x *Petzl Progress* adjusters.The casualty has protective goggles and is safely insulated in the *Kong Lecco*'s integral cas-bag.



Images courtesy of CNSAS – National Alpine & Speleological Rescue Corps

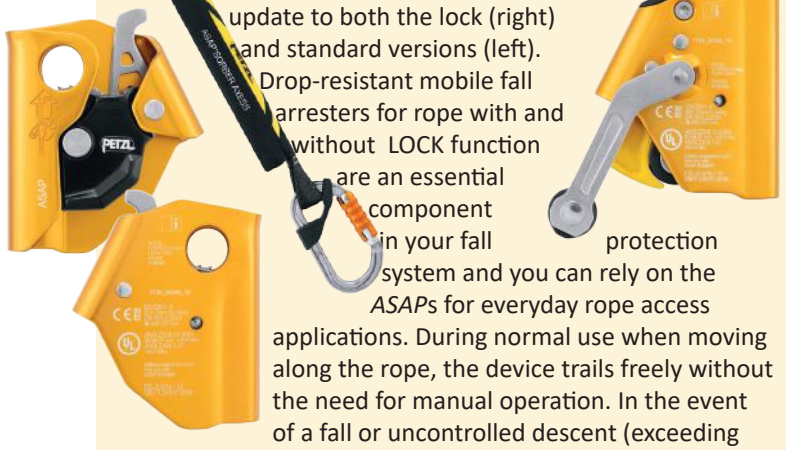
CNSAS PERSONNEL

As at 2026

- 7,155 volunteers, including:
- 235 doctors
- 29 national mountain-rescue instructors
- 28 national speleological-rescue instructors
- 23 avalanche-dog instructors (U.C.V.)
- 10 surface-search dog instructors (U.C.R.S.)
- 10 canyon-rescue instructors

PETZL UPDATES FOR 2026

ASAP® & ASAP® LOCK



The ubiquitous *ASAP* has had an update to both the lock (right) and standard versions (left). Drop-resistant mobile fall arresters for rope with and without LOCK function are an essential component in your fall protection system and you can rely on the *ASAP*s for everyday rope access applications. During normal use when moving along the rope, the device trails freely without the need for manual operation. In the event of a fall or uncontrolled descent (exceeding two meters per second), the device blocks the rope and stops the user. The integrated LOCK function allows the user to immobilize the device in order to reduce potential fall distance. The connection arm makes the system drop-resistant, so passing intermediate anchors is easier, and the safety catches simplify installation on the rope. In rescue scenarios, the ASAP LOCK must be used with the *ASAP'SORBER AXESS* energy absorber.

- Stops falls and uncontrolled descents that exceed two meters per second
- Blocks on the rope even if grabbed during the fall
- Works on vertical, horizontal, or angled rope
- Compatible with ropes 10 to 13 mm in diameter
- Toothed wheel is effective on a variety of rope conditions (frozen or muddy ropes)

Compact and easy to use:

- Easy to install and remove at any point on the rope
- Moves up or down the rope without any manual operation
- Safety catches make the device easy to install and remove from the rope
- Connection arm makes the system drop resistant when passing intermediate anchors
- Integrated LOCK function allows the user to immobilize the device to reduce the potential fall distance and keeps the rope from being blown upwards in very windy conditions

Use in combination with:

- *ASAP'SORBER AXESS* energy absorber for use in two-person rescue scenarios, up to 250 kg
- *ASAP'SORBER* 20/40 energy absorber, for use with a person weighing up to 140 kg

ASAP and *ASAP LOCK* can be used as a back-up belay device in a rope access system or as a primary belay device in a fall-arrest system. The ASAP LOCK is also available in pre-assembled kits for a ready-to-use solution, with ASAP'SORBER AXESS or ASAP'SORBER 20 or 40 and OK TRIACT-LOCK or Bm'D TRIACT-LOCK connectors





SPECIFICATIONS

Rope compatibility: 10 to 13 mm
Certification(s): CE EN 12841 type A, CE EN 353-2, ANSI Z359.15, GB/T 24537, XF 494 : FZL-Z-Q10/13
CE EN 12841 type A [check individual shock absorber/carabiner configuration requirements

WEIGHT: 335g/11.8oz ASAP Lock 190g/6.7oz ASAP
MATERIAL(S): Aluminum, stainless steel, nylon
GUARANTEE: 3 years
COST: ASAP B71: £174 $270 €184
ASAP LOCK B71AL: £228 $360 €230

PANTIN®



The *Pantin*'s update is twofold - the safety catch on the ascender itself is now a permanent feature instead of an optional add-on and more interestingly perhaps, the strap incorporates a ratchet strap (on a pressure pad) to more firmly attach the *Pantin* and do it more quickly and easily.



Designed to make rope ascents faster and less tiring:

- Use in conjunction with CROLL, ASCENSION, or ASCENTREE rope ascenders
- Rope feeds through the device more easily during the first few meters of ascent
- Toothed cam with self-cleaning slot optimizes performance under a variety of conditions (such as frozen or dirty ropes)
- Mechanism is totally integrated into the body of the rope clamp to help prevent snagging
- Catch helps keep the rope in the device during ascents
- Quick and easy setup and adjustment:
- Easy to set up and release with the ratchet buckle system
- Ratchet buckle and ladder strap provide optimal adjustment and fit
- Durable construction:

Stainless steel cam offers excellent corrosion resistance
High-modulus polyethylene strap is abrasion resistant

- Available in right- and left-foot versions

Note: The PANTIN is not an item of PPE.

WEIGHT: 120g/4.2oz **ROPE**: 7 to 13mm
COST: £81 $100 €93

www.petzl.com



Introducing the new BlueWater Ropes

11mm LEP

LOW ELONGATION POLYESTER

The pinnacle of low elongation rope technology. The 100% polyester LEP outperforms every other static rope on the market today by every metric. A superior 3 sigma tensile strength of 7,309 lbf., an average breaking strength of 7,704 lbf. and a 0.9% elongation at 300 lbf. leaves all other competitors behind. A 40 carrier sheath creates a smooth, durable sheath that moves easily through devices and guarantees your toughest jobs get done.

NFPA 2500 (1983) Life Safety Rope - Technical Use

Minimum Breaking Strength:	**7,309 lbf. (32.5 kN)**
Certified Diameter:	**11.0mm**
Elongation @ 300 lbf.	**0.9%**
Elongation @ 600 lbf.	**1.5%**
Elongation @ 1000 lbf.	**2.6%**

BLUEWATER EST 1969

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www.BlueWaterRopes.com
email: info@BlueWaterRopes.com

CMC OUTBACK

Multi-Role, convertible harness

[ED: Our Market Guide this issue features lightweight sit harnesses and this new offering from CMC is included but it deserves additional mention for the modular nature of its construction to create everything from a fully kitted, full body harness to a simple load-bearing waist belt with add on gear loops and pouch. It's good for wilderness but equally good for urban-industrial rescue if you're not hanging around in it for several hours at a time and definitely good for tactical operators].



The harness that redefines backcountry operations. is now available in tactical black. The ***Outback Convertible Harness*** is a lightweight modular system for fast-moving technical teams in remote areas. Tested to EN and ASTM standards, the ***Outback Convertible Harness i***s strong, versatile, and designed for challenging operations in rescue, climbing, caving, tactical, and military. Its patented integration lets users configure the harness for the task at hand and share components in the field. Every team member wears the belt, edge personnel add leg loops, and vertical technicians get the full ensemble.

The ***Outback Convertible Harness*** goes the distance and gets the job done. It's globally certified, highly configurable, and fully featured for demanding conditions.
Note: if you're between sizes or plan to wear multiple layers of clothing, we recommend sizing up for more range in the waist belt circumference.

COMPONENTS

- Sit Harness
- Waist Belt
- Leg Loop Assembly
- Optional Rear Straps
- Chest Harness
- Chest Unit
- Optional Rear Strap
- Chest Ascender Kit
- Chest Ascender
- Ascender Strap
- Stainless Steel Delta Quick Link
- Carry Pouch
- Gear Loop

FEATURES

SIT HARNESS/WAIST BELT:

- Easily donned using the quick-connect Cobra Buckle
- Narrow width of 5 cm (2 in) to fit through most belt loops
- Compatible with a number of Molle attachments
- Comfortable to wear all-day, increases technical readiness
- Leg Loop Assembly
- Patent-pending integration system adds leg loops without opening belt
- Creates a highly stable connection that maintains its position on the body
- Leg loops are closed by quick-connect Cobra Buckles, assembling in seconds
- No need to remove backpack, skis, snowshoes, or crampons when donning
- Aluminum D-Ring is more durable than fabric and fits multiple connections without cross loading
- Optional Rear Straps
- Included with the Leg Loop Assembly for added comfort when hiking
- Rear straps are optional, lightweight, and removable if no longer desired



CHEST HARNESS/CHEST UNIT

- Rapidly integrated without opening the sit harness or other components
- Allows teams to utilize the sit harness until a full body unit is preferred
- Provides additional comfort, security, and features for rope work
- Sternal attachment point for backup systems or heli-ops
- Universally sized to allow sharing between team members in the field
- Easily assembled and adjusted using 3 Cobra Frame Buckles

OPTIONAL REAR STRAP

- Included with Chest Unit for added comfort on rope and hanging suspended
- Rear strap is optional, lightweight, and easily stowed if no longer desired

CHEST ASCENDER KIT

- Quickly installs the lightweight *Kong Futura* Body mini chest ascender
- Certified to CE EN 567 and CE EN 12841/B, compatible with rope 9 – 11 mm
- Kit includes ascender strap and delta quick-link for rapid integration
- Allows technicians to move on the rope without relying on a large team
- Works in combination with other ascent/descent devices for easy progression
- Delivers vertical mobility, hands-free positioning, and self-sufficiency

CARRY POUCH



- Compact, comfortable to carry, and made with water resistant X-50 fabric
- Carries harness components as well as essential gear like carabiners and cord
- Molle compatible velcro straps attach to the Waist Belt, packs, or structures
- Zippered front pocket is sized to fit cell phones, keys, or GPS devices
- Gear loops on each side provide easy access to equipment when roped up



GEAR LOOP

- Essential accessory for organizing and carrying gear on the Outback Harness
- Fast, light, and modular – it quickly attaches to the Waist Belt while it's being worn
- Redundant, closed loop design connects both Buckles for increased security
- Each loop also functions as a gear sling, attaching equipment all-at-once to the harness
- Multiple gear loops can be attached in desired locations for maximum versatility
- Ideal tool for users in rescue, access, mountaineering, tactical, and teaching

CERTIFICATIONS

- EN 12277:2015+A1:2018

www.cmcrescue.com

MAXIMUM COMPACTNESS, MINIMUM WEIGHT:

The MEGAWATT and the FUSE offer numerous application options thanks to their construction and innovative details, especially in complex rescue situations.



MEGAWATT

Discover me!

Universal descender with only 495 g, ergonomic lever, anti-panic function and safety lock allows inserting the rope without having to separate the device from the karabiner.
EN 12841-C, EN 341-2A, EN 15151-1/8 and ANSI/ASSE Z359.4



Discover me!

FUSE

Guided type fall arrester with speed-dependent activator, reduces wear on the rope, runs along incomparably smoothly from the first meter, easy attachment and detachment from the rope without separation from the karabiner.
EN 353-2, EN 12841-A, RfU 11.075, and ANSI Z359.15

www.edelrid.com



NEW Powered STRUT LIFT

ResQJack XDrive Electric Drive Lifting System



Res-Q-Jack have introduced a powered drive module for their *Super X* shores and *Apex* strut ranges which can be easily retrofitted with the supplied conversion kit (available separately for existing strut-users). The *X-Drive* Electric Drive Lifting System—maximizes lift and minimizes effort with 6,000 lbs of power at the push of a button and then provides 14cm/5.5" of lift per minute. Eliminate manual cranking and conserve strength for the life-saving tasks that matter most. Battery-powered for operational efficiency, IP54-rated for dust and water resistance, and built with a rugged PA12 housing and steel/aluminum frame. The *X-Drive* also provides 5 watt of LED close-area lighting when the battery is attached. Choose versions for Milwaukee 18v, *Makita* 18v or *DeWalt* 20v battery systems.

1. **One-Touch Electric Lift Operation**
Push-button electric operation replaces manual cranking, reducing strain and fatigue while preserving responder strength by eliminating repetitive physical effort.

2. **Environmental Durability**
IP54-rated and built with a rugged PA12 housing and steel/aluminum frame for dependable performance in wet, dusty, and demanding field environments.

3. **Compatible with Multiple Batteries**
X-Drive is compatible with the following battery models (not included): *Milwaukee* 18V, *Makita* 18V, & *Dewalt* 20V.

4. **Magnetic Hold to Jack**
A strong magnetic connection keeps the *X-Drive* secure to the jack unit, to prevent accidental drops, and ensure a tight fit during deployment.

5. **Integrated LED Lighting**
When a battery is attached, integrated 5-watt LED work-area lighting activates, providing clear visibility for operation in low-light and dark environments.

6. **Return to Manual Cranking**
The X-Drive can be quickly pulled from the jack, allowing transition between electric drive operation and manual cranking as needed. The conversion kit is used to reinstall the handle when returning to manual operation.
The conversion kit is included when purchasing a jack with *X-Drive*. Existing *Super X* and *Apex* users purchasing *X-Drive* will need to purchase the conversion kit separately.

See our **USAR BUYERSGUIDE** for details of the full *Res-Q-Jack strut and shore* ranges.

SPECIFICATIONS	X-Drive
BATTERY OPTION	Milwaukee M18 18v
BATTERY OPTION	Makita LXT 18v
BATTERY OPTION	DeWalt Max 20v
LENGTH	32.4cm / 12.75"
WIDTH	9cm / 3.56"
HEIGHT	23.2cm / 9.15"
LIFT FORCE	26.7kN / 6000 lbf / 2721kg
LED LIGHTS	YES - 5-watt
WEIGHT (exc battery)	4.8kg / 10.7lb
WEBSITE	https://res-q-jack.com


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www.firstlook.net


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HARNESS BLEED CONTROL KITS







[*ED: not particularly new products but good examples of purpose-made kits that we have long been keen on for rescuer needs as well as casualties. A casualty in need of this kit will probably have bled out long before the arrival of a rescue team but any rescuer operating dangerous cutting equipment whether it be at a vehicle accident, earthquake disaster response or tree work during storms should have one to hand. These two examples are especially applicable to rescue as they're designed to be worn on a harness or tool belt, and feature extending lanyards that ensure the kit is not dropped during use. The Reecoil was featured in ARBCLIMBER#28 since the arb industry has led the way in this, following on the heels of Combat Trauma Kits because the chainsaw is far and away the most likely cause of an accident requiring this kit.*]

DEPLOY Trauma Kit

The DEPLOY® Trauma Kit is a compact, easily carried first aid kit, designed specifically for treating massive bleeding. Especially for high risk workers in remote locations.
It contains the essential medical equipment specific to immediately treating a massive bleed. Common to chainsaw injuries or other power tool injuries.

It has a unique patent pending deploy mechanism that allows it to be mounted in an out of the way location (on a harness, tool belt, or hydration pack). And still be accessed FAST in an emergency by simply pulling the deploy tab.



OPEN TAB

If you work at height or in remote locations, where quick access to trauma first aid equipment would be necessary in the event of an accident. The DEPLOY® Trauma Kit is the fast-access option. If an accident occurs and seconds count, simply pull the ***deploy tab*** for fast access to life saving equipment.

Designed especially for self application use. If an accident happens involving a massive bleed, you are the first person who can have the biggest impact on your survival. Buying you time for rescue, and to make it to the next stage of care.

The DEPLOY® Trauma Kit is designed to be in addition to a mandatory Workplace First Aid Kit and does not replace it.

- **One-Hand deployable** - for fast access
- **Military issue stop the bleed equipment**
- **Anti-Drop Lanyard**, for using at height
- **Compact** & low profile

CONTENTS

- DEPLOY Outer Pouch
- DEPLOY Removable Lanyard
- DEPLOY Inner Pouch
- DNIPRO Tourniquet (able to be applied one handed)
- Emergency Bandage 4" (Israeli bandage)
- DEPLOY Compressed Gauze
- Blue Nitrile Medical Gloves
- Sharpie Marker Pen
- TacMed- Casualty ID Card
- TacMed- MARCHE / IMIST Reference Card
- TacMed- DRSABCDE / IMIST Reference

Cost: ~£180 / $250 / €210
Web: **https://reecoil.com**

SOVOS Platinum CORE Bleed Control Trauma Kit



Designed to handle life-threatening haemorrhages and provide high-quality medical supplies to meet urgent needs. Packed in a compact, lightweight bag, the *SOVOS Platinum CORE* Bleed Control Trauma Kit from *Stein International* is designed to be worn on a harness for immediate and rapid access. The kit is supplied with a load rated tether and connector.





Featuring easy-open drawstrings and full-length zips, it allows the contents to be fully exposed within seconds. Internal compartments and elastic loops securely hold critical first aid materials, ensuring quick and efficient retrieval. Equipped with a durable carry handle and MOLLE-compatible PAL strapping on the back panel, the pack can be easily attached to harnesses or belts etc. ensuring it is always within reach when needed.

The *SOVOS Platinum CORE* kit is compact enough to be worn on a harness daily.

The term "Platinum 10" highlights the critical first 10 minutes after a traumatic injury or medical emergency. This window of time is vital for swift and efficient action by first responders, emergency personnel and potentially the casualty themselves to improve survival rates and minimise long-term harm through controlling major bleeds and stabilising injuries.

The *SOVOS Platinum* kits enable trained first aiders, advanced medical professionals and first responders to deliver lifesaving care during emergencies while awaiting the arrival of the emergency service team.

CONTENTS:
1 x *Platinum CORE* Storage Bag
1 x Load Rated Tether with Connector
1 x SAM XT Tourniquet
1 x 4" FCP Military Emergency Bandage
1 x ChitoSAM Haemostatic Gauze 4” x 4”
1 x 20ml Ampoule Sterile Wound Wash
1 x Medical Marker Pen
1 x Disposable Medical Gloves
1 x De-Contamination Wipes 30cm x 20cm
1 x Emergency Whistle

In extreme cases of haemorrhage further products may be required over and above the items in these kits.

In the UK this kit does not replace the mandatory Workplace First Aid Kits complying with BS 8599-1:2019 . It is not feasible to address every potential scenario involving the use of this product.

Cost £143 ($182 €169exc duty/tax/shipping)

web: www.sovoshelmets.com



KASK helmet updates

SuperPlasmaHD

Quantum Cabrio



New FR Goggles & L-5 POWER helmet torch

Superplasma HD Protection



EYES



FACE

KASK Superplasma HD

The Global Standard for Above-Ground Safety

KASK, the premium designer and manufacturer of head protection, has upgraded the *Superplasma HD* as part of ongoing efforts to optimize its product range and ensure the helmet remains a global icon for safety and performance. By streamlining components and refining production processes, the Italian company has made the *Superplasma HD* more accessible to a broader range of professionals, while maintaining the high standards KASK is known for.

As emergency response teams face increasingly complex operational environments so the need for adaptable, high-performance personal protective equipment continues to grow. Addressing these challenges, KASK has expanded its Quantum Series with two new accessories designed specifically for wildland firefighting and technical rescue professionals: the FR Goggles and the L-5 POWER helmet torch.

Developed as *KASK*'s first dedicated helmet platform for wildland firefighting and technical rescue, the Quantum Series combines advanced protection technologies with a modular design that allows rescuers to configure equipment according to mission requirements.

Reliable Eye Protection in Extreme Conditions

Smoke, airborne debris, ash, dust, and changing weather conditions can all compromise visibility during rescue and firefighting operations. The new FR Goggles were developed to provide dependable eye protection without sacrificing optical performance. The goggles feature a 2 mm fire-resistant polycarbonate lens offering Optical Class 1 clarity. Anti-fog and abrasion-resistant treatments help maintain visibility during prolonged operations, while compliance with EN 166 and EN 170 Category II standards ensures reliable protection against environmental hazards.

ATEX-Certified Illumination for Critical Operations

The new ***L-5 POWER*** helmet torch provides an intrinsically safe lighting solution certified for ATEX Zone 0/20 environments. Delivering 180 lumens with a focused beam reaching distances of up to 106 meters, the IP67 rating torch offers up to 30 hours of runtime from four AAA batteries. Using KASK's new 360° Helmet Mount, the torch can be attached directly to either side of any Quantum helmet, allowing rescuers to adjust beam direction according to operational requirements.

Quantum complies with EN 16471 for wildland firefighting and EN 16473 for technical rescue. The ***Quantum Cabrio*** version also complies with EN 12492 for mountaineering, while the addition of protection panels enables compliance with EN 1385 for canoeing and white-water rescue operations. The helmet features a fire- and chemical-resistant polycarbonate shell paired with a high-density EPS liner that provides comprehensive impact energy absorption. A thermoformed polystyrene covering protects the internal structure while facilitating cleaning and decontamination after deployment in contaminated environments. The helmet incorporates moisture-wicking removable padding, a fire-resistant five-point adjustable chinstrap, and the company's Adaptive Fit system, which dynamically conforms to different head shapes while remaining easy to adjust with gloved hands.

The addition of the FR Goggles and ***L-5 POWER*** helmet torch further demonstrates KASK's commitment to developing comprehensive protection systems that address the evolving needs of modern rescue professionals.

www.kask-safety.com



Safety Standards and Certification

"Worn around the world, ***Superplasma HD*** helmets have become favorites for arborists and those working in other above-ground applications. This already well-regarded collection has now been further enhanced with upgrades in comfort and design."- said Alex Dabelstein, Global Head of Sales of ***KASK Safety***. "The helmets meet a range of safety standards- ANSI Z89.1 and specific clauses of the EN 12492- and have advanced comfort features like moisture-wicking materials, ratcheting fit systems for tailored fits and protected ventilation channels that provide unrestricted airflow throughout the helmet."

The *Superplasma HD* introduces several enhancements that further improve both safety and aesthetics. A key upgrade is the new ANSI Z89.1-2014 HT LT Certification, ensuring that the helmet meets both high and low-temperature requirements, with a wearable range of-22ºF to 140ºF. The *KASK* buckle features a green color-coded design, indicating compliance with the EN 12492 standard. Since 2019 every *KASK* helmet has been tested for rotational impact performance (*KASK* Rotational Impact WG11 Test).

Advanced Materials and Fit

The external shell is made of acrylonitrile butadiene styrene (ABS) that guarantees impact resistance, high penetration protection and resistance to color degradation. The internal shell is made of Neopor® Ccycled® by BASF, an EPS obtained from chemical recycling of plastic waste, with a reduced carbon footprint, ensuring all-around impact absorption. A high-density polystyrene foam that reduces carbon footprint, ensuring the same high quality, performance and safety as eps made from fossil raw material.

The removable inner padding, in quick-drying fabric with moisture-wicking technology, ensures breathability with ten air intakes that maximize airflow for all-day comfort. To enhance fit and comfort, *KASK* has introduced a longer chinstrap which offers three adjustments points, making it suitable for larger head sizes. The polyester longer chinstrap for a wider range of face shapes and sizes, offers a personalized fit with 3 adjustment points. The *Up & Down* system is a size adjustment system made of 3 components working together for a comfort fit (size from 51 to 62 cm.) that ensures stability as the wearer moves.

Integrated Protection

In terms of design, the helmet now features black aesthetic details, including headlamp clips, the headband, padding, slot caps with debossed lettering, and an anti-intrusion mesh, all unified in a sleek black finish. Like all *KASK* helmet collections, *Superplasma HD* can be equipped with *KASK* eye, face, and hearing protections, as well as badge holders and weather protections, thus guaranteeing a wide range of configurations and allowing for easy customisation.

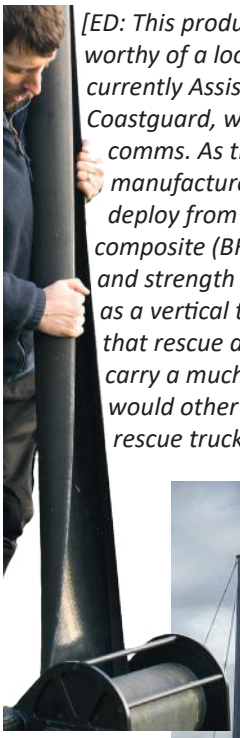
www.kask-safety.com



LIGHTWEIGHT, MULTI-ROLE MASTS



lighting, imaging, detection and range extension for LOS drone systems. The *System 75* mast (left) is more compact and simpler for elevating light top loads. It is ideal for the rapid deployment of communications and surveillance technology including anti-drone systems, optics, thermal cameras and radio systems. Deployed and recovered in minutes with minimum personnel, the mast is maintenance-free and contains no moving parts to jam or freeze. Developed initially for the military, they are weather-resistant and recoverable even when iced up, the mast retains operability in the harshest environments. All *Rolatube* mast systems have exceptionally low packed volume. The System 50 mast systems pack into soft bags of just 170mm x 250mm x 180mm (6.6 x 9.8 x 7") and weigh from as little as 2.0kg (4.4lbs).



[ED: This product has been recommended as worthy of a look by our own Rich Hackwell, currently Assistant Chief Officer of UK Coastguard, where they are used for field radio comms. As the name suggests, Rolatube manufactures collapsible masts that deploy from a compact, flat roll of heavy duty composite (BRC-see inset box) and gain height and strength as it is unrolled and then reformed as a vertical tube. The advantages of this are that rescue and disaster response teams can carry a much smaller and lighter package than would otherwise be the case. Even urban fire-rescue trucks that are always trying to save space might find this more space and weight-saving than conventional lighting masts. These may also see increasing use as UAV line-of sight extenders as well as for a more conventional increase in radio comms range. System 100 (8 &10m/26-32.8ft) model is shown in the hand and being unfurled above left with a System 50 (2, 3 & 4m/6.5, 9.8 & 13ft) shown in the hand on the right.]





Smart BRC Composite Technology Explained

BRC (Bi-Stable Reeled Composite) is a lightweight structure made from multiple layers of reinforced composite materials, typically glass-reinforced polypropylene. The reinforcement angles within each layer are carefully engineered to create its unique bi-stable properties.

BRC belongs to a family of structures known as Slit Tube Engineered Members (STEMs). Like a tape measure, a BRC becomes rigid as it unrolls. However, unlike conventional STEMs, BRC is stable in both its rolled and deployed states.

Traditional composite and metal STEMs store significant energy when rolled and must be physically restrained to prevent rapid, uncontrolled deployment. This characteristic has historically limited their use outside specialist industries such as aerospace.

BRC overcomes this limitation by remaining fully stable when rolled and when deployed as a tube. It also deploys in a smooth, controlled manner, making it safer and more practical for a wide range of design solutions and commercial applications.

This low-energy rolled state provides an additional advantage: components can be integrated directly into the composite structure. Rolatube has leveraged this capability to develop BRC products that incorporate rollable electronic systems, including RF antennas, electrical conductors and lighting arrays.

BRC's unique combination of stability, compact storage, controlled deployment, and integrated functionality unlocks new opportunities for STEM technology across multiple industries.

Strength and Stability in Challenging Conditions

Rolatube's System 50 mast series is one of four series, the others being System 75 (4m to 7m), the System 75 Double Tube for heavier loads, and the System 100. All are able to withstand 62mph winds when properly guyed. These lightweight and fast-erecting masts are used for comms,





Integrated features & accessories



The mast's top cap includes a 30mm spigot mount for fitting of top loads. All *Rolatube* mast systems are supported by a range of accessories for attaching equipment and providing additional setup options and are available in a range of colours including camouflage.

www. rolatube.com

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WRS international
Water Rescue Duffle

[*ED: This bag is in our 'WATER RESCUE' section but in reality it is just as suitable to all forms of rescue because the features designed to aid water rescuers like ventilated pockets, wet pocket and ground tarp all lend themselves to any rescue kit that is simply wet and/or mucky! We have a lot of Duffles in our GUIDE to RESCUE DUFFLES and this would certainly seem to be one of the best yet introduced in terms of features - we can't yet vouch for it's durability as it is a recent introduction but WRS international don't bother introducing something unless it's worthwhile.*]





The *WRS Duffel Bag* is a purpose-built gear solution designed specifically for Water Rescue Technicians. Engineered from hard-wearing fabric for long-lasting durability, this bag is built to handle the demands of intense operations and years of service. Featuring three main compartments, it provides dedicated storage for wet, dirty, and dry equipment, with two fully ventilated sections and mesh vents to keep gear fresh between uses. For versatility and comfort, the WRS Duffel Bag comes equipped with removable rucksack straps secured by quick-release G-hooks, making it easy to carry over long distances. Reflective markings, including a high-visibility logo and stripes, ensure enhanced safety and recognition during night operations—making this the ultimate bag for rescue professionals.

OUTER MATERIAL:	450D Ripstop Polyester + TPU coating
PROTECTIVE MATERIAL:	1680D Dobby with PU Coating
LINER:	Polyester
VOLUME:	90L + 10L (100L)
REFLECTIVE:	WRS branding
COMPARTMENTS:	3 + document pocket.
DIMENSIONS/WEIGHT:	70 x 42 x 35cm 1.5kg
FEATURES:	Removable Shoulder Straps
TECH:	Scannable RF ID Chip.
	WARRANTY: 3 years



www.wrsinternational.com

NRS VECTOR PFD with RECCO®





The *NRS Vector* PFD with *RECCO*® technology combines groundbreaking advances in fit and construction with modern rescue technology to create a better-fitting, better-performing life jacket for whitewater safety and rescue. Two RECCO®reflectors enable location by RECCO-equipped rescuers.

- Winner of the 2026 Paddle Sports Show Product of the Year
- Orbit Fit System™ layers multiple pieces of lightweight closed-cell foam cut to precise specifications to create a unique, flexible, pre-curved shape that effortlessly conforms to your body.
- The NRS Every Body Design philosophy combines innovative technologies that reimagine how a PFD fits and performs, eliminating the need for men's and women's specific models.
- Graded Sizing takes into account the appropriate amount of flotation needed for individual body types resulting in a better-fitting, more comfortable life jacket for all.
- Wrap-around foam panels with AirMesh lining and wide, padded straps increase protection and comfort.
- 1.5" quick-release rescue belt with an aluminum attachment ring.
- Continuous, interconnected webbing creates internal harness for max security in live bait scenarios and grabbing by shoulders.
- Compartmentalized, zippered, drop-down clamshell front pocket with sewn eyes & ring organizes essential on-person gear.
- An additional dual-entry, zippered pocket holds a flip line or skull cap for fast retrieval.
- Features two easy-release carabiner attachment points for cowtail rescue systems and attachment points for safety essentials such as whistle, knife, lights or strobe.
- SOLAS reflective accents increase visibility in low-light conditions.
- Hand warmer pocket = 4-way stretch double-knit polyester lining - soft against the skin; doubles as webbing or gloves storage.
- Strap garages and deliberately placed lash tab reduce snag points.
- Sustainable construction-recycled ripstop nylon shell & recycled nylon inner that protects PVC-free Ethafoam shims.
- Pullover design features aluminum buckle adjustments on shoulders, sides and waist to secure the life jacket and customize the fit.
- Silicone-coated inner waistband helps hold the PFD in place when swimming.
- RECCO handheld detector operates up 80m LoS, 100m from a Heli
- Design Flotation/Buoyancy: M/L: 75N / 7.6kg 16.75 lbs
  XL/XXL: 80N / 8.1kg 18 lbs
- User Weight minimum 40kg 88lb
- USCG type V
- COST: $330 (£260 & €301 currency conversion exc VAT/Duty etc)

www.nrs.com/rescue

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ROV Technology for Critical Underwater Searches

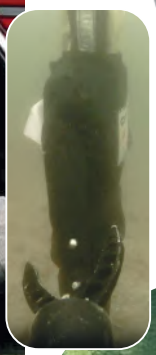
- Front & Rear HD cameras
- 7 vectored motor system
- 1,000' operating depth
- Speeds up to 3.5 knots
- 15.6" LCD display monitor
- 12.1" LCD touchscreen Control Monitor

JW FISHERS



NC Fire Dept chooses Blueye X3 for water rescue/recovery







Battalion Chief Ryan Walsh and Captain Adam Stuart have spent years responding to emergencies on and around Falls Lake, a 12,000-acre reservoir where roughly 80 percent of the Wake County portion lies within the Northern Wake Fire District. For a department responsible for about 175 miles of shoreline, that's a lot of water to watch, especially during busy summer months filled with boating, fishing, and camping. In many cases, their responses turn into recovery operations rather than rescues. Doing those operations well means searching thoroughly, finding answers quickly, and keeping divers out of the water until there is a reason to send them in. However, their tools have been limited. Using side-scan sonar mounted on a boat gives the crew a rough picture from the surface, but identifying targets still takes time, manpower, and divers working in almost no visibility. In murky freshwater, a sonar mounted at the rear of a boat can only narrow a search area so far. After watching a neighboring agency operate a different underwater drone, the Northern Wake team decided they could do better. They researched the options, tested them, and chose the *Blueye X3*. The unit will be the first *Blueye ROV* used by a fire department in the United States.

"*We don't want to have to keep tying up resources that are needed for public safety to find one body in a lake, but how do you tell a family that they're not worth all that investment? So we put the investment in smarter technology, and we can use our people to their fullest potential to be able to recover that body quicker*".

- Ryan Walsh, Battalion Chief, Northern Wake Fire Department.

Their new ROV system combines different payloads for optimal S&R operations:

- *Oculus M750d* forward-looking multibeam sonar for locating targets in murky water
- *Reach Alpha Gripper* for recovery operations
- *Blueye GPS* and *DVL A-50* to document position and where searches have been conducted

TRAVELED 4,000 MILES TO TRAIN IN NORWAY

A *Blueye* ROV can be operated by anyone with no formal training, but Northern Wake wanted more than that, and sent Walsh and Stuart to learn everything they could from *Blueye* directly. For both of them, the 4,000-mile trip was about understanding the equipment well enough to train the rest of their crew back home in North Carolina, and make a difference to the citizens they serve. Over three days in early May, the guys went through classroom sessions and hands-on diving exercises together with *Blueye*'s Senior Technical Sales Engineer Trond Larsen. Getting to learn the technical basics of the drone, how to best operate the sonar and positioning systems, and how to service it in the field. Training did not only stay in the classroom and lab. Trond took the officers out for three training dives in realistic environments. First in the controlled conditions of the *Blueye Shorelab* at Dora in Trondheim, then out at the Baklidammen reservoir, and finally in the harbor beside the office. On that last dive in the harbor, the training turned into a realistic diving operation for the officers. The local fire department were out in the harbor training as well, but had trouble locating their rescue manikin. The perfect opportunity for Stuart and Walsh to test their newly learned skills. Using the sonar they quickly located the manikin, then used the X3 and gripper to recover and bring it up to the surface. It was the same task they will face at home, carried out with the same tools they will use. And they did it all in minutes. The inset picture above shows the *Blueye X3* ROV camera-view.



Ryan Walsh getting to know the Blueye App interface and how to operate the in-app sonar function.



Map of Falls Lake showing the Northern Wake Fire District service area. Falls Lake, the Northern Wake Fire District service area and their 4 stations, covering roughly 80 percent of the Wake County portion of the lake.

THE MURKY CHALLENGE

"Conditions at home will be harder. In the freshwater of Falls Lake, which turns murky after heavy rain, the ROV camera only helps once the drone is close to the object. We spend a lot of time, a lot of manpower, and a lot of resources trying to locate a drowning victim. Our boats become our sonar imaging and the quality is less than ideal".

- Ryan Walsh, Battalion Chief, Northern Wake Fire Department.

The department's boats already carry side-scan sonar, but it reads from a fixed position at the surface, and it only tells them so much. That's where the multibeam sonar on the X3 will be a game changer. Rather than a fixed downward read, the operator can aim, sweep, and move it across the seabed with the drone.

"We can manipulate the sonar itself and really give a good sweep. We can cover so much lake bed quickly. It really narrows down our search area and allows us to be more efficient. On Falls Lake, a search may begin with only a rough last-known location. Instead of immediately deploying divers into low-visibility water, the team can first search with the X3 and sonar, investigate any targets the sonar picks up, and narrow the area before sending in divers. That new reach matters a whole deal when the water is too murky for divers or the ROV camera. A shape can be ruled in or out from a distance, then approached and the camera can confirm it. This keeps divers out of the water until there is a clear reason to send them in. The camera is only going to get you so far. Being able to put the sonar into play and really identify targets, to get close enough to identify with the camera, is going to be huge for us."

- Ryan Walsh, Battalion Chief, Northern Wake Fire Department.

A NEW WAY TO COLLABORATE

During the dive at the Baklidammen reservoir, Ryan Walsh monitored the operation through *Samsung Galaxy XR* while Adam Stuart piloted the ROV. As Stuart searched the lake-bed with the *X3* and sonar, Walsh viewed the live video and sonar feed in real time, helping identify targets and coordinate the search. Together they located and identified objects on the lake-bed in murky conditions similar to those they face at Falls Lake. For public safety teams such as the Northern Wake crew, this setup shows how the operator and observers can navigate together and share situational awareness during an operation without crowding around one single screen or device.

Back in North Carolina, the two officers carry different responsibilities. As Battalion Chief, Walsh will coordinate the program and keep the wider crew up to speed. Stuart, as a Captain, will operate the drone day to day and train the team around him. The department is already looking past Falls Lake. Retention ponds, farm ponds, and smaller lakes within an hour's drive would be just as suited to use the ROV. The department says its *Blueye ROV* unit, named *NWSUB4*, is the first *Blueye X3 ROV* used by a fire department in the United States. *NWSUB4* will go into service alongside Boat 4, the department's new 24-foot BayRider, out of the New Light Road fire house.

For Northern Wake Fire Department, the goal is clear. Equipping their team with the ROV is about increased efficiency and effectiveness, providing closure to victim families, and reducing the wait that comes with calling in outside dive support. The *Blueye ROV* does not replace the boats, the divers, or the training. It helps the crew use them more effectively, and the difference it makes in location and recovery of victims could be measured in hours.

www.blueye.com



WHEN RESCUE KNIVES GO BAD

by Dr. Steve Glassey PhD

Dr Steve Glassey has been teaching swiftwater rescue for almost 25 years and is a registered assessor for the International Public Safety Qualifications Authority (IPSQA) for swiftwater rescue. Steve is a Higgins & Langley recipient, a PADI Public Safety Diver™ and specialist advisor (expert witness) to the New Zealand Coroners Court.



The case for improved knife management and enhanced first aid kits in WATER RESCUE

Ask any swiftwater technician what lives on the front of their PFD and most will point to the knife without hesitation. We carry them religiously. We tell students they're life-saving kit. And most of us have never once used one in anger — the blade is far more likely to peel fruit or open a bottle at the end of the day than to free somebody from a rope. So it's worth asking a slightly uncomfortable question: ***how often does the knife save the rescuer, and how often does it turn on us?***

I've spent a good while looking into one incident that answers that question in the bluntest way possible. On the last morning of a swiftwater technician course on the Catawba River in Western North Carolina, 12 October 2025, a young firefighter, Noah, was playing the victim in a par-buckle recovery. Feet downstream, back to the raft, two rescuers hauling him over the tube by his shoulder straps. Textbook. Then his river knife came out of its sheath, stayed attached by an elastic tether, and laid open his neck. It missed the big vessels by a whisker. One more centimetre and this would have been a fatality investigation, not a case study.





A SENSIBLE DECISION THAT NEARLY KILLED HIM

Here's the part that should keep us all honest: nothing Noah did was unusual. He mounted his knife high on the chest because that's where most rescuers carry theirs and 'monkey see, monkey do' as he put it. His original sheath had already failed once, dumping the blade during the surface-water session. Some paddlers prefer to stow their knives in a pocket, but in public safety the shoulder mount is the most common: mounting it externally means it can be easily checked, especially when PFDs are shared between users. And Noah wasn't alone. On one course Ethan knew of, half the students reportedly lost this same model of knife from its sheath in a single day. So he did the rational thing and added an elastic tether to stop losing the blade. And that tether is exactly what turned a lost knife into a projectile on a leash. Free of the sheath but still tied to him, the blade had nowhere to go but a tight radius around his own head and neck.

Whether the current swung it into him or the stretched tether recoiled and snapped it back, the result was the same. He'd rather have lost the knife downstream and never seen it again. Wouldn't we all, in hindsight.

THE THREE THINGS THAT STACKED UP

Strip the incident back and it's three ordinary practices layering into one catastrophe:

1. High-chest mounting — great for two-handed access and instant buddy checks, terrible for keeping a loose blade away from your carotid. Ironically, Noah's PFD had a manufacturer-designed mount low on the abdomen. The informal norm beat the design intent.

2. Marginal sheath retention — a little thumb-tab that a stray hand, a bunched drysuit or a gunwale can defeat. Sheaths sold for 'fast draw' often can't pass a serious bump-release test.

3. The elastic tether — the counter-intuitive villain. In moving water, stretch plus sudden release equals kinetic energy, confined to your torso. Losing kit is cheap. This wasn't.

STOP THE BLEED®, IN THE WATER

The reason we're reading a case study and not an obituary is haemorrhage control. Noah first thought he'd snagged a rope — a hot, tight feeling round the neck — and asked to be let go so he could self-rescue. It was only when his finger went into the wound on the second check that reality landed. His instructor, Ethan, dropped the scenario instantly, dragged him to a concrete boat ramp for footing, and put fingers straight into the wound. He described having to use what was effectively a chokehold to keep pressure on while moving him — an ugly trade-off between airway, pain and bleeding that he made in seconds. Another course member sprang into action, fetching *QuikClot*™ — a haemostatic (bleeding-control) product that speeds up clot formation — which was then packed into the wound (a

rather more sensible choice than a tourniquet for a neck injury). The gods were smiling on Noah that day, too: a Burke County EMS supervisor responded to the scene and was able to administer a unit of blood — a capability still uncommon across US EMS systems.

What we can (hopefully) actually agree on is there is genuinely no consensus on the perfect rescue knife or its stowage — read any forum and you'll find a hundred strong opinions and very little data. But strip away the tribalism and most experienced hands agree on a short list:

- ***carry one***
- ***suit it to conditions***
- ***make it accessible single- handed from either side***
- ***keep it usable in cold water***
- ***keep it away from your neck***

Kill the elastic tether. Sort out sheath retention so it takes a deliberate action to release. And if you carry a knife, carry a bleed control pack, because the most likely thing that blade cuts is a human, not a rope.

Worth remembering, too, that a knife is far from ideal for cutting exposure suits and exposing an injury in the first place. With wet, cold hands and a casualty to protect, shears do the job with far less chance of adding a second wound to the one you're trying to treat. And whether it's an unfortunate case of knife gymnastics gone wrong or something far more mundane, immediate riverside haemorrhage control is a must-know for rescuers. More than just knowing it, they need immediate access to the lifesaving aids that go with it. Think about the clock: the average time to bleed out from a major haemorrhage is just three to five minutes. Can you get back to the truck, dig the first aid kit out, run it to the water and get it on the wound inside that window? Yeah, right. You need a bleed kit the moment the victim hits the shore, which means you carry one on you, not wait for one to arrive.

Here's the opportunity, though. For most of us in swiftwater rescue, first aid is not the ceiling; many of us already hold pre-hospital emergency care certifications. That means there's nothing stopping us from becoming 'Stop the Bleed' instructors and driving the messaging ourselves, especially given that roughly 40% of trauma deaths worldwide are attributable to bleeding. And the risk is only growing: vehicle-related flood incidents are on the rise, while manufacturers increasingly fit laminated glass in side and rear windows, glass that resists the breaking tools rescuers and occupants rely on, and that can inflict serious lacerations when it does shatter. The tragic case of a Texas man who bled out on 4 July 2025 after cutting himself on glass while saving his family during a flood. Though not vehicle-related, underscores how quickly a trauma victim can bleed out, and the critical need for immediate access to bleeding control.

SUGGESTED

STOP THE BLEED® KIT FOR SWIFTWATER USE
(to be mounted on PFD)
- STOP THE BLEED® tourniquet
- STOP THE BLEED® Haemostatic gauze
- Nitrile examination gloves
- Medic shears
- Vacuum-packed in plastic



ED: *The knives below ARE NOT INVOLVED IN THIS INCIDENT, however they do show one of the features to look out for - a positive sheath lock They are both fixed blade and shown without their lanyards which should be breakaway not paracord which will hold (snag) your entire bodyweight. The Tekno knife on the right has a single slide-button release which by itself could easily be rubbed against the side of the craft on entry/exit and allow release of the blade. However, in this case, it also has a second 'latch' that rides along deep plastic serrations on the knife's handle to limit easy release of the blade. The NRS knife on the left has a two finger release similar to a giant Fastex buckle. It requires both side to be pressed simultaneously and is unlikely to release the blade accidentally. These are just two examples of the many release mechanisms for fixed blade knives some better than others. Obviously this is not an issue with folding knives but these are generally not carried as the 'first-attack' knife because they are not instantly available to make the cut. However, some might argue that knives like the venerable Ken Onions folding knife by Kershaw with it's sprung blade, only require a quick thumb movement to release the blade but is otherwise virtually impossible to release accidentally.*

Noah walked away — scarred, but alive — and that outcome owes as much to fast, decisive haemorrhage control as it does to luck. The lesson isn't that rescue knives are the enemy; it's that the way we carry, secure, and think about them has drifted on habit rather than evidence. A blade positioned for habit and peer conformity, a sheath that lets go too easily, and a tether that turns a lost knife into a loaded one — none of these were reckless choices, and that's precisely the point. Standard procedure, nearly killed a young firefighter on a routine training course. So review your own PFD *before* the next course or deployment, not *after* the next incident: consider its location, make the sheath release deliberate, ditch the elastic tether, and carry a bleed kit you can reach in seconds. We owe our students better than 'monkey see, monkey do' and we owe it to ourselves to make sure the kit we carry to save lives never becomes the thing that takes one.

Acknowledgement: Thank you to Noah Pressler (survivor) and Ethan Wrinkler (instructor) for agreeing to be interviewed and for sharing their account of this near-fatal incident.

STOP THE BLEED ® is an official program of the US Department of Defense, For more information about the program, visit *DoDStoptheBleed.org* or *https://stopthebleedcoalition.org*
*there are four tourniquets approved for use by the STOP THE BLEED ® program and two Haemostatic gauze products approved for use. Visit the websites above for details.

Note: The specific make, model, and manufacturer of the equipment involved have been withheld; this account is intended to raise a general safety point, not to criticise any particular product.

AUTONOMOUS VEHICLES

by Rich Denham & Nick Appleton



TECHNICALRESCUEmagazine
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



Context and Guidance for Rescuers at Casualty Extrications involving Autonomous Vehicles

1. INTRODUCTION

Whilst Connected and Automated 'self-drive' Vehicles (CAVs) are already working in some areas of the United States and China, they are not fully operational on UK roads as of mid-2026. However, it is anticipated that they will be launching commercially in London during the late summer/autumn period, with pilot scheme operators *Uber/ Wayve* and *Waymo* now actively preparing trials. Initially and for safety, a human driver will be behind the wheel, but fully autonomous CAV's without human operators have been operating in Phoenix since 2020 with the *Waymo* taxi service and in China since 2021 with *Baidu Apollo* vehicles. Britain and Europe have been more circumspect in certifying autonomous vehicles with trials in several countries but nothing concrete until a broader UK approval in the second half of 2027.

CAUTION

This article is for general familiarisation purposes only, and definitive information, including Incident Management Protocols, will only be available from the operator active in your area or jurisdiction. UK reference materials are in production by the pilot scheme operators, and these will be used for subsequent formal training. US emergency services are already dealing with some of the unique challenges of driverless vehicles. We can't even say that there is one less casualty (in vehicles with no driver at all) because that position in the vehicle is now filled by an additional passenger.

DEFINITION

A CAV can be described as a vehicle equipped with sensors, computing systems and control mechanisms that allow it to perceive its environment and operate under remote human supervision, safely undertaking navigation, steering and other vehicle controls in line with a customer's destination requirement. This is referred to as a Class 4 vehicle because it does still have some human oversight, albeit it remote from the vehicle. Class 5 vehicles are entirely driverless and operate on their own Ai-based cognisance with no deferring to a human controller other than in pre-specified and programmed circumstances. The five classes are:

1: All functions dictated by human driver
2: Some autonomous functions, cruise and lane control etc.
3: Human driver oversees full or partial autonomous controls
4: Driverless but can have human remote control/intervention
5: Entirely Driverless and controlled by the vehicle/Ai


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CONTEXT

CAVs are innovative, and because they introduce new technologies , related hazards, and consequent operational challenges that differ significantly from existing vehicles, the emergency services – and especially firefighters - need to be fully prepared to deal with them BEFORE they are deployed commercially.

Because of the pioneering nature of this situation, related legal requirements and government guidelines have been enacted, and while you should check what the legal position is in your own area, in the UK this is as follows:

Legal Requirement – Information Sharing

The Automated Vehicles Act 2024 is predominantly concerned with the regulation of the CAV industry and does not refer directly to liaison with the emergency services.

Incidentally, in London its transport authority (Transport for London) will regulate all organisations planning to run CAV trials, and this process involves significant information sharing (link: see end of article).

Government Guidelines – Incident Planning

However, in the accompanying UK Govt Guidance 'Self-driving vehicle pilot scheme: information for first responders', under the section entitled 'First responder involvement pre-deployment' (link: see end of article), states that before a pilot deployment, operators are encouraged to engage with local first responder organisations. Government expects this interaction to lead to the development of a Joint Incident

MANAGEMENT PLAN.

Government Guidelines – Training Expectation

This states that Government '… anticipates that piloting organisations will provide first responders with relevant training'.

It goes on to say that this is to provide information on any differences that a (pilot) CAV may present to first responders in comparison to non-automated vehicles.

Generic CAV Characteristics

The following is informed by operator training materials currently in use in the United States:

IDENTIFYING A CAV

A blue body colour will likely be used in London (currently white in the US) , and there will be superstructure additions to the roof and sometimes to the wings/fenders

Wayve Ford Mustang Mach-E and *Waymo's Jaguar i-Pace* (notice the less prominent AV sensor mounts)











Above is *Volkswagen*'s autonomous version of their *California/ Buzz* while on the right is the Chinese *Zeekr* also used by *Waymo*. Note that the *Mix* variant of this has even larger side doors with no B-post at all. This *Waymo* version of the *Zeekr* highlights the huge amount of room that is being incorporated into these vehicles; a far cry from a South African minibus taxi incident with up to 20 occupants crammed into an old Nissan van conversion!

STRUCTURE

CAV's will generally have the same physical structure as any contemporary Electric Vehicle (EV), and as trials end and they launch onto roadways, a part of the operator familiarisation process will include relevant structural details. These vehicles offer much more space for rescuers to operate and there may well be fewer entrapments from shell or component intrusion - in fully autonomous there may not even be a steering wheel to contend with.

AUTONOMOUS DRIVING SYSTEM

A CAV gains its information via externally mounted sensors and also from remote links – vehicle-to-cloud communication and vehicle-to-infrastructure (V2I) systems - and processes all of these using internal computing hardware located in the boot/trunk.

HIGH VOLTAGE BATTERY SYSTEM

Given EV CAV's, rescuers will face the typical potential hazards associated with high-voltage battery packs, including energised components even after a crash, the risk of thermal runaway and hidden cabling that can complicate space creation efforts.

Also note that in a CAV there will be a second 12v battery, likely in the boot/trunk or underneath the rear seat, the function of which is to back-up the autonomous computer control system only, and does not, for example, power restraint system actuation. So while a CAV system requires the EV protocols used in general electrical vehicle incidents by your organisation(further information can be found in the previous TR Mag, issue 87, Electric Vehicle Incidents link: see end of article) it will also require the CAV specific procedures detailed overleaf.

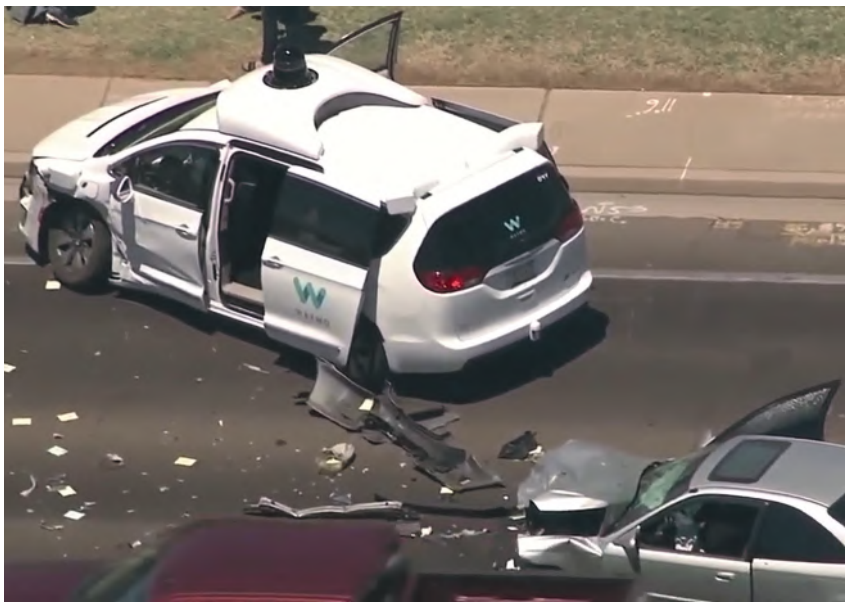


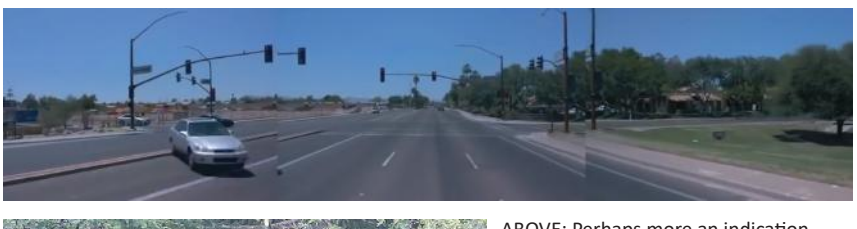
CAV moving on a roadway: To ensure safe interaction with emergency vehicles during general road use, the CAV uses its sensors to identify them in three separate ways; by their appearance, lights and sirens.

If it detects that these are active on an emergency vehicle behind it, it is programmed to pull over and stop when it finds a safe place to do so. Once stopped, it remains stationary either temporarily as the emergency vehicles pass, or indefinitely if they pull up behind it.

COLLISION RESPONSE

An AV is capable of detecting that it was involved in a collision. In that event, if the vehicle has not already halted, it will brake until it comes to a full stop and immediately notify the operator's remote assistance staff.







ABOVE: Perhaps more an indication of CAV vehicle quality than any fault, this incident in Chandler Arizona in 2018, in the early days of Autonomous Taxi testing was the fault of the small *Honda* which had swerved into the *Waymo* trying to avoid another vehicle. The second image shows the Honda moments before impact as seen by *Waymo*'s on-board (forward) cameras. The quality of vehicles selected by these driverless taxi firms is having a lot to do with the severity of incidents and the protection of passengers - these are all ultra-modern vehicles with ultra modern passenger safety features and crash protection so incidents like these are more likely to see any second vehicle involvement as the more likely in need of rescue.
On the left is one of several Tesla incidents that are not necessarily fully autonomous but the vehicle shell is the same - emphasising just how survivable these vehicles make a crash - here walking away from a a 100ft cliff fall. The less crammed interiors may also lead to far fewer tight entrapments.

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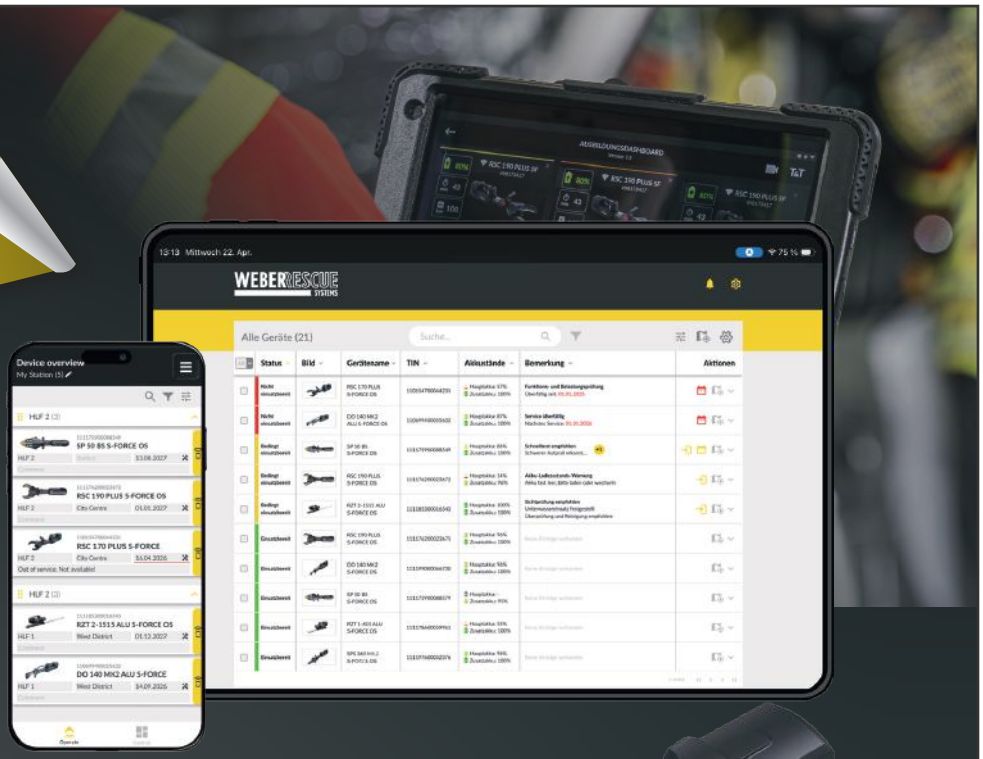
- call 999/911 if the circumstances warrant.
- despatch a crewed roadside assistance unit if needed, in order to provide on-scene support for passengers and/or first responders.

Note that a CAV will react differently depending on the nature of the collision. In the event that an airbag is deployed, its electric propulsion system will be disabled and its doors will unlock.

The operator's remote assistance staff will have protocols for interacting immediately with any vehicle passengers and ultimately speaking with emergency personnel in the event of the vehicle being pulled over or involved in a collision. It will achieve this by providing information through in-vehicle speakers, on the in-vehicle displays, and communicating or through in-vehicle telecommunications capabilities.

Additionally CAVs approaching an

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incident may not interpret emergency scenes correctly, creating risks such as failing to recognise cordons, misinterpreting hand signals and not yielding appropriately to emergency vehicles Studies on emergency-vehicle manoeuvring in relation to autonomous traffic highlight these challenges.

CAV STATIONARY AT INCIDENT

The following passage assumes that when approaching and then working in and around a crashed vehicle, a responder will utilise the relevant safety protocols of their organisation throughout. The following additions specifically relate to CAV.

APPROACHING A CRASHED CAV.

At an incident scene, damaged sensors or other equipment may cause a CAV to move spontaneously, reacting to rescuer or rescue vehicle movement. Because of this responders should approach from either side and out of the front or rear wheel's direction of travel, but still be aware of the potential need for rapid evasive movement.

Therefore safe and rapid immobilisation a CAV at an incident is essential.

Note that the vehicle should not drive autonomously while any of the following are true:

- Any airbags have deployed
- Any door is open
- The vehicle is in Park

So on reaching the vehicle and especially where airbags have not deployed, open a door immediately, to prevent autonomous movement, and force entry if necessary to achieve this. Then keep at least one door open until the CAV has been de-activated. Simultaneous with vehicle approach and given that a CAV may be operated with or without passengers (or they may have left or even been ejected), on arrival at scene, another rescuer should:

- Carry out a visual inspection of the occupant area of the vehicle.
- Call the dedicated number to speak with an operator representative, to verify the number of occupants that they have listed for that vehicle, and if there is a shortfall, to initiate a search for the (potentially) missing persons. Also where necessary, the representative can be asked to unlock the doors and also roll-down windows remotely.

Finally AV's can roll regardless of autonomous driving state, and wheels should be chocked to prevent this movement.

DEACTIVATING AUTONOMOUS DRIVING MODE

Once the AV is immobilised a rescuer can enter the vehicle onto the 'drivers' seat – this may first require casualty extrication – and assuming no compromise of the controls, deactivate autonomous driving mode.

To achieve deactivation, it will be necessary to first contact the operator. This can be done by calling the dedicated number mentioned above or activation of the in-vehicle call by pushing any of the disengage buttons on the steering wheel.

The rescuer would identify themselves and request that the operator staff authorize the vehicle for manual mode. They would then follow their instructions as to locating emergency stop controls, using these to disable the propulsion system and finally, to confirm when the vehicle is fully powered down. (for example process, see Waymo link at end of article).

Note that the UK pilot-scheme Guidance stresses the need for the standardisation of shutdown procedures across vehicle models and also between operators and automatic calling of emergency services.

SPACE CREATION AND CASUALTY EXTRICATION

CAVs have the same generic features as non-CAV EVs, with similar reinforced structures, high voltage cable runs and battery placements, which will restrict tool-intervention point selection when creating the space necessary to enable safe extrication. So once the vehicle has been stabilised and the power source deactivated, space creation and general casualty extrication can be undertaken in line with your established EV protocols.

CONCLUSION

CAVs are a new development for emergency services personnel to adapt to and deal with, including the challenges of unpredictable movement, high-voltage systems, sensor-driven behaviours, access difficulties, and after the pilot schemes conclude, the absence of a driver. Accordingly UK guidance and current research both emphasise the need for standardised procedures and specialised training before CAVs become widespread. While not inherently dangerous, indeed far safer than most of their human counterparts, their introduction process is at the tipping point where they're now widely accepted and commercial introduction spreads exponentially. Ultimately they must be approached with EV protocols plus CAV specific procedures but for CAVs expect more pedestrian incidents than vehicle and expect high survivability rates for occupants. This article serves as a general introduction, but emergency services will need to liaise with local operators to create the specific Incident Management Guides that will provide the common standard with which to safely manage CAV related incidents.

FURTHER READING

- UK Govt 'Guidance: Self-driving vehicle pilot scheme: information for First Responders' (Published 31 March 2026) *www.gov.uk/government/publications/self-driving-vehicle-pilot-scheme-information-for-first-responders/interacting-with-self-driving-vehicles-first-responders*
- Transport for London CAV Trials: *tfl.gov.uk/corporate/publications-and-reports/connected-and-automated-vehicles*
- TechnicalRescue magazine #87 *www.rescuemagazines.com*
- A review of first responders and autonomous vehicles *www.sciencedirect.com/science/article/pii/S2352146525005319*
- Waymo AV Introduction video and powerpoint *www.waymo.com/firstresponders*

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Artificial Intelligence in SAR...

....Not just for drones



Pic by Aleksei Gorodenkov

by **Roland Curll** NSW Police Rescue - Australia

Roland is a 22 year veteran of Police Rescue in NSW Australia responsible for rope rescue, extrication, SAR, trauma-care and swiftwater rescue in the Illawarra region south of Sydney. This huge region incorporates Wollongong, Shellharbour, Port Kembla and Kiama with significant coastal cliffs plus the Upper Nepean river basin with remote bush, forest, canyons and waterways.

You can't go anywhere these days without hearing about Ai (Artificial intelligence) and yes, artificial intelligence is used in the world of search and rescue and yes, we are going to persevere with a lower case 'i' for the acronym version of Ai otherwise it looks like we're talking about our mate Alan. But when people hear about Ai and search and rescue, what instantly comes to mind is drones and image analysis. Drones have become the norm in all forms of rescue and fire service operations from search to water rescue to firefighting. They have given rescuers a revolutionary new string to their bows and for relatively little cost - the equivalent capability for anything other than a casualty/rescuer winch or landed delivery, was a helicopter. Some heli-services may be cursing the use of drones while others will be relieved that their time is better resourced for trauma and difficult rescues.

One instance is the use of the drone's InfraRed (IR) imaging where AI is used to quickly scan this footage and identify images that could be people. But drones are not the only way Ai is being used in search and rescue. A lot of Ai is happening using satellites and computers to help command systems make positive decisions in a much faster way. But

...in the absence of comms and power failures, Ai is likely to be your most reliably present team member.

this is not a fiendish plan to replace rescuers, it is to help rescuers make sense of complex situations and speed up decision making, perhaps even provide a greater degree of risk identification and mitigation. For example, search managers can now more quickly narrow down their search area, rule out the peripheries that can suck so much time and resources in fruitless searches and concentrate human resources so that the missing person can be found more quickly, this can be the difference between a rescue or a recovery.

Ai systems can be used to analyse terrain, process satellite imagery, and also to model human behaviour. This helps to answer questions like, where is this particular missing person most likely to be given their age, experience/skills, state of health etc. and which search areas should be prioritised?

ASSISTING SEARCH MANAGEMENT

SAR operations involve gathering information manually from dispatch personnel, studying maps, and receiving information from teams in the field to help build a picture of the situation so decisions can be made how to respond. Ai is starting to speed up this process.

What used to be one piece of information being dealt with individually, is now linked together by Ai to create a continuous workflow. This can influence the search plan almost immediately. AI can assist with repetitive tasks and data gathering that can quickly fatigue or overwhelm a human operator. This allows the search manager to focus on leadership and strategy. Large scale searches involve many different resources; local and regional ground teams, K9 units, aircraft, drone operators and technical rescue teams. Ai can gather all the clues coming in from all manner of separate teams, plot them instantly on a map and discern patterns almost instantly in comparison to human collators. Changing information prompts Ai to adjust probability models accordingly and suggest new priority search areas. This will help search managers refine their plan faster.

When AI prioritises search areas, maps can be digitally sent to the mobile devices of the search teams in the field, so they are updated in real-time during a search. Updated briefings can also be sent to the search teams in the field in real-time as the search operations progresses.

Many searches involve a last known position (point-last-seen) and based on information gathered, a search radius is drawn around the last known position. Ai can look at terrain difficulty, vegetation, and typical human decision making patterns to quickly narrow down the search area. Experienced rescuers can do this too but Ai will do it in a fraction of the time and not all of your most experienced assets are necessarily available and on-scene at the outset of a search. This is perhaps one of the most overlooked advantages of Ai - in the absence of comms and power failures, it is likely to be your most reliably present team member, it doesn't get ill, doesn't get tired, doesn't have a bad day after a rough night or a rough night after a bad day and doesn't need to be rotated out through exhaustion or diminished efficiency. It's not all good of course, as already mentioned above, it needs power just the same as a rescuer and it can make mistakes, just like a tired rescuer but for different reasons. The question of what happens when comms fails will affect real time interaction and updating of satellite imagery, asset location or external agencies interaction but, like a rescuer, it does have a degree of autonomy that allows it to operate in a 'bubble' so to speak, as a piece of stand-alone software loaded onto your field-laptop, it can still interpret the limited data available to it at any given scene, it just can't access the myriad of online resources and snippets it would otherwise be using to perform its tasks.

With adequate comms, Ai can scan real time satellite imagery (for those that have access to this type of technology) and look for any anomalies. It can determine which is the easiest access for rescue teams to access the terrain, it can do this in seconds rather than a rescuer scanning detailed maps or elevation changes and hazards or potential hazards in the case of flash floods for example but it is still best used in conjunction with a human, familiar with the terrain who can confirm that the access being recommended is indeed the best option. This kind of Ai prompt to a rescuer still saves a lot of time, ruling out most of the peripheral options that might otherwise sidetrack the planning.

AI TO SIMULATE THE LOST PERSON

'Lost person behaviour' has been used in search and rescue for decades. It looks at things like statistics based on past search operations to help a search manager determine areas of probability and which priorities to consider. This is still a valuable resource, but Ai can help by simulating how a missing person might move through specific terrains. Such experimentation is/was being performed by the University of Glasgow in the UK using Ai can help identify several possible directions of travel, but it can still leave the search manager with a very large area to search. However, a large amount of these directions of travel could lead to the same location, such as a valley. This is similar to the old search management technique of considering the path of least resistance.

Ai can also help to determine the distance a missing person could travel over a specific amount of time. This process was used long before Ai, for example, walking on flat ground is easier than walking through thick vegetation, or up a steep hill. Ai can calculate this more realistically and determine how much energy would be used to move through this terrain. As mentioned earlier, it may also make faster assessments of terrain elevations and hazards that might disrupt that more obvious path/route.

Whereas a traditional search model might determine several directions of travel, Ai might narrow this down to only two directions of travel which reduces the search area. This might help in tasking of a hasty team but does not replace the judgement of an experienced search manager and in ensuring that those less obvious paths aren't dismissed altogether because the Ai determinations are only a pattern of likelihood. Nothing can be exact because human behaviour is too unpredictable to be definite which is why the question is always "where would MOST people end up" NOT where would *EVERYONE* end up if they were lost.

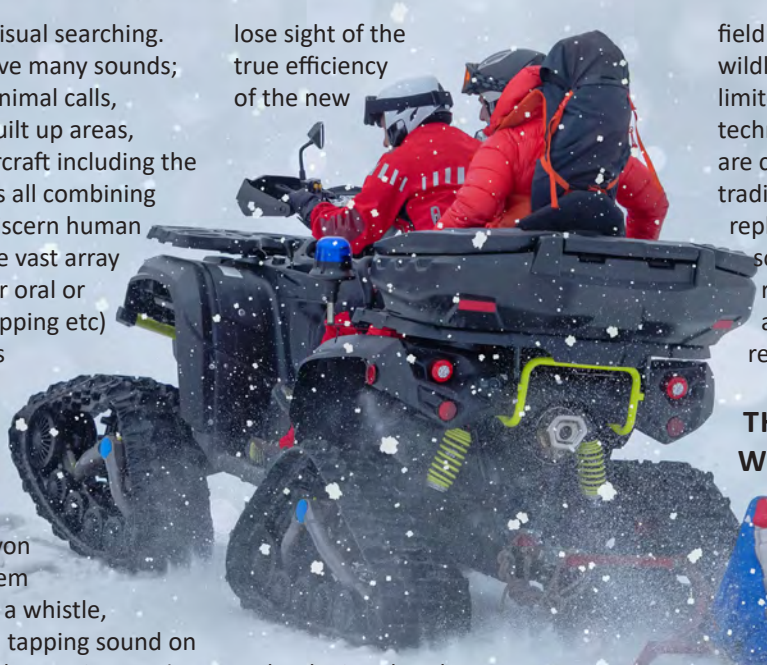
Ai DETECTING HUMAN DISTRESS SIGNALS

Some search areas can involve thick vegetation which makes it difficult for search teams to locate missing persons. Thick canopy can also make it difficult for aerial searches, or if the missing person is hidden under some type of cover. This is why rescuers call out to missing people, because even though they may not be able to see them, they may be able to hear them. Unfortunately, it may be difficult to hear them due to distance, terrain, injury/fatigue and because you cannot expect rescuers to be listening everywhere at once.

Ai creates algorithms and works with sensitive microphones to identify specific sounds, even in noisy environments. This type of technology was originally used to monitor wildlife and listen for specific animal calls but can now be applied to likely search areas for continuous monitoring and may end up detecting

a presence missed by visual searching. The search area can have many sounds; winds, flowing water, animal calls, thunder and in more built up areas, industry, cars/trains/aircraft including the rescuers' own air assets all combining to make it difficult to discern human sounds. Ai can learn the vast array of human sounds either oral or by actions (tapping, clapping etc) and filter out all sounds that don't match.

One scenario where this would work, is a hiker who has fallen into a canyon. The canyon makes it difficult for them to be seen but blowing a whistle, calling out, or making a tapping sound on rock could be detected by an Ai acoustic system in the broader vicinity. These sound detection systems could be set up on a permanent bases in wilderness areas where it is common for accidents to happen. The system could detect an accident and notify the rangers.



Pic by Daniel Chetroni

It can also be used to monitor radio traffic during rescue operations. For instance, Ai can record the voices from communications and automatically type it into the rescue log so that accurate records are maintained with less effort. This could also read the communication reports and determine what pieces of information should be considered as a matter of priority.

In large disaster-type scenarios such as floods, wildfires or earthquakes, this information can be organised automatically to help maintain a clear picture of the operation.

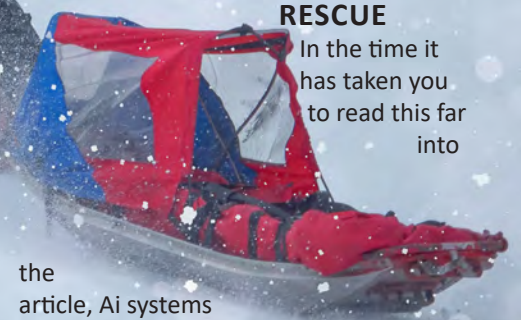
REAL-WORLD TESTING

Some of the mentioned Ai advantages sound futuristic but is very much here-and-now with real-world testing underway everywhere- all the time! In Europe there is an Ai project looking not at what Ai can do in a search but testing how accurate it actually is and how it compares to traditional search management planning methods. We are all so busy talking about all the things that Ai can and will be able to do, we can lose sight of the true efficiency of the new technologies already being used and instead take for granted that this is an improvement to the way things were. Well, they are for the time being but self-learning technology does have the capacity to end up 'over-thinking' things and perhaps become more of a hindrance than a help but as of 2026 it is helping search and rescue teams develop faster and more accurate search management plans.

In New South Wales, Australia, cameras with Ai capability are placed along coastal areas that are considered dangerous. For instance, areas where fishermen are regularly washed off the rocks into the ocean. We've mentioned this in **TECHNICALRESCUE**'s **WATER RESCUE BUYERSGUIDE** - ***Surface Rescue ROV***s where the Ai is trained to recognise if someone is struggling in the water and automatically alert an operations centre and perhaps launch the ROV immediately. This type of Ai technology could also be used in the wilderness, such as at popular rock climbing locations where the camera and Ai can recognise if a climber has had a fall or is injured, it would then automatically alert a mountain rescue team. This could substantially reduce response times.

Many rescue teams are cautious about adopting this type of technology too quickly, which is totally understandable because systems that work in a laboratory may not work so well in the field. Harsh weather, unpredictable wildlife and natural phenomena and limited signal reception can all upset technology. And that is why Ai systems are currently designed to assist with traditional search teams rather than replace them. It may not be able to solve every problem in search and rescue, but AI is starting to become a valuable tool in the search and rescue operators 'tool kit'.

THE FUTURE OF Ai IN WILDERNESS SEARCH AND RESCUE



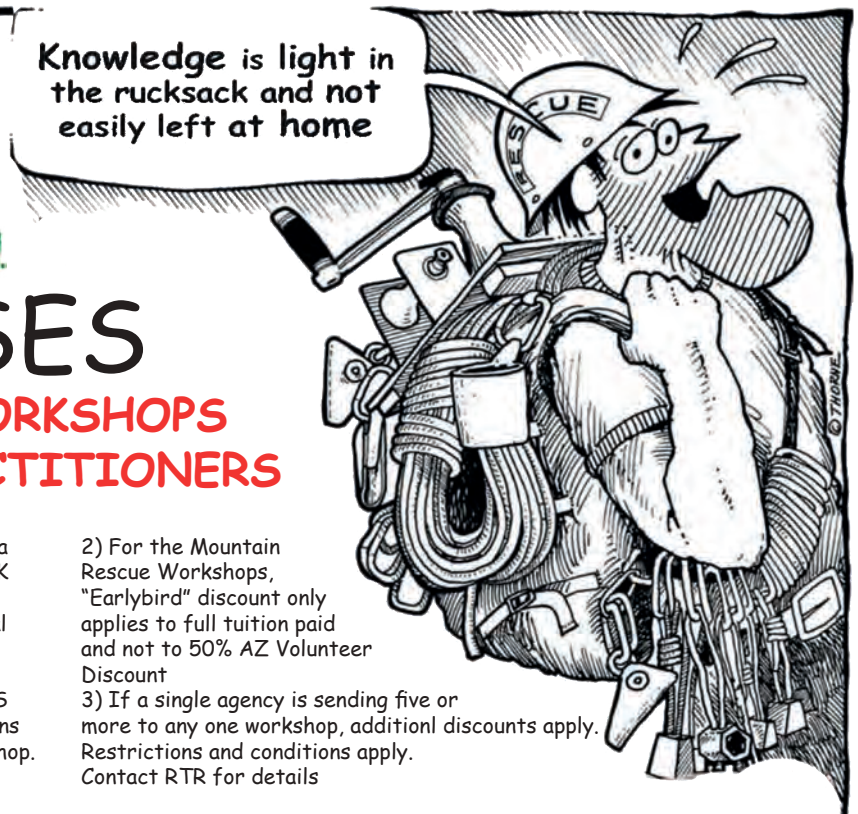
In the time it has taken you to read this far into the article, Ai systems worldwide will have learnt and improved in some way - it's a comforting and scary thought.

Not so long ago, this technology would have been called 'futuristic'. Now, it is in every day use and being adapted and improved all the time -we are already firmly 'in the future'.

Remote areas, unpredictable weather, limited communications, and terrain complications can limit the capability of these Ai systems. As satellite communication improves and portable devices become more capable, the use of Ai will become even more widespread and the degree of trust and reliance will increase. Old hands will be waiting for a chance to say 'I told you so'.

The human element remains the centre of search and rescue operations because Ai cannot entirely replace the judgement and experience of a human search manager who understand the realities of these operations. We cannot afford to have Ai replace the core search and rescue skills - we have to continue to operate teams and services on the basis that we could lose the undoubted efficiencies of Ai and other technology at any moment.

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3) If a single agency is sending five or more to any one workshop, additionl discounts apply. Restrictions and conditions apply. Contact RTR for details

WORKSHOP	STATE COUNTRY DATE FLYER	TYPE	VENUES Classroom-Wilderness or Industrial	Req. Equip You will NEED	Dura-tion Days	Physical exertion Easy 1 Hard 10	Prerequisites Program Liaison & Special Notes	Location & Sponsor Open links for Program FLYERS!	Tuition $200 "earlybird" discount for full payment up to 90 days before start date (1)	RTR Lead Instruc-tor(s)
Team Skills Rescue Workshop	CO May 2-8, 2026	General Team Rescue	Classroom Industrial & Wilderness	TSRW Equip list 7/22	Saturday/ Friday 7 days	5 some hiking	Prerequisite: Rope Experience Prior rope rigging experience strongly recommended. Liaison: Lee Brown Phone: (720) 323-0802	Colorado USA Mountain View Fire Dept. CO See CO Program Flyer	$1,750 $200 "earlybird" discount See above	Reed & Keith Thorne
Artificial High Directional Workshop	UT May 10-16, 2026	Arizona Vortex	Classroom Industrial & Wilderness	AHDW Equip List 7/22	Sunday/ Saturday 7 days	6 some hiking	Prerequisite: Rope Experience Prior rope rigging experience strongly recommended	Utah USA Rock Exotica & South Davis Metro Fire See Utah Program Flyer	$1,750 $200 "earlybird" discount See above	Reed & Keith Thorne
Team Skills Rescue Workshop	TX May 28-June 3, 2026	General Team Rescue	Classroom Industrial & Wilderness	TSRW Equip list 7/22	Thursday/ Wed 7 days	4 some hiking	Prerequisite: Rope Experience Prior rope rigging experience strongly recommended. Liaison: Joshua Craft Phone: (806) 340-9740	Texas, USA Randall County Fire, TX Palo Duro Canyon State Park See Randall Program Flyer	$1,250 Register with Randall Co Liaison	Reed & Keith Thorne
Team Skills Rescue Workshop	VA Sept. 19-25 2026	General Team Rescue	Classroom Industrial & Wilderness	TSRW Equip list 7/22	Saturday/ Friday 7 days	4 climbing stairs	Prerequisite: Rope Experience Prior rope rigging experience strongly recommended. Liaison: Amy Burnette Phone: (804) 912-0995	Virginia USA Chesterfield Fire & EMS See VA Program Flyer	$1,750 $200 "earlybird" discount See above	Mike Green & Reed Thorne
Personal Skills Rescue Workshop	MD Sept 26-Oct 2, 2026	Solo-Semi Solo Rescue	Classroom & Industrial ONLY	PSRW Equip list 7/22	Saturday/ Friday 7 days	9 rope climbing required	Prerequisite: Climbing Rope Prior rope rigging experience strongly recommended. Students should be in excellent physical fitness	Maryland, USA Union Bridge Fire Dept. Contact Instructor Mike Green for location & logisitcs	$1,750 $200 "earlybird" discount See above	Mike Green & Reed Thorne
Tree Rescue Workshop-Firefighter	CA October 12-18, 2026	Bottom Up Tree Rescue	Classroom & Wilderness ONLY	TRW-F Equip List 7/22	Monday/ Sunday 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 TRW-F Program Flyer	$1,750 $200 "earlybird" discount See above	Keith & Reed Thorne
Offset/Highline Rescue Workshop	AZ Aug 29-Sept 4, 2026	General Team Rescue	Classroom Industrial & Wilderness	OHRW Equip list 7/22	Saturday/ Friday 7 days	6 hiking required steep terrain	Prerequisite: Rope Experience Prior rope rigging experience strongly recommended.	Arizona USA Town of Jerome See Town of Jerome Flyer	$1,750 $200 "earlybird" discount See above	Reed Thorne
Tactical Wilderness Rescue Wkshp	AZ October 20-26, 2026	R.E.M.S. Rapid Response	Classroom & Wilderness ONLY	TWRW Equip List 7/22	Tuesday/ Monday 7 days	7 rough terrain inherent	Prerequisite: Rope Experience Concentrates on low and steep angle litter evacuations. Ideal for Rapid Extrication Module Support (REMS) Team Instructors	Arizona USA Town of Jerome See TWRW Program Flyer	$1,750 $200 "earlybird" discount See above	Reed Thorne
2027										
Mountain Rescue Workshop	AZ April 17-23, 2027	Mountain Rescue	Classroom Industrial & Wilderness	MRW Equip List 7/22	Saturday/ Friday 7 days	6 hiking required steep terrain	Prerequisite: Rope Experience Prior rope rigging experience and climbing ability are strongly recommended.	Arizona USA Town of Jerome See Jerome Fire MRW Flyer	$1,700 (50% off AZ Volunteer discounting available)(2)	Reed & Keith Thorne

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SHELLMET / HOTAMET

a helmet made from sustainable scallop shells?



by Charlotte Ina Sterland



Shellmet (or *Hotamet* in Japan), is the brand name for helmets made by a company currently creating protective helmets using bioplastic made from scallop shells. There is not yet a helmet specifically for the rescue market but their development schedule includes an EN357 version later this year and a 'safety' version which we assume will be an EN12492 version in 2027. The concept however, is proven and fascinating.

Scallops are an essential part of marine ecosystems. From the Pacific Ocean, to the North Sea, scallop populations remain essential both as food for fish and birds and through acting as filters of bacteria and micro-organisms for seawater. Organisations like The Nature Conservancy, who act globally to protect sea life, through projects like 'Reef Builder' are campaigning to bring back scallop and oyster populations where trawling and overfishing have lead to reduced numbers and a reduction in ocean biodiversity.

Projects like *Shellmet* not only provide industrial use for scallop shells once they become ocean debris, but also reduce the reliance on oil based plastics normally used to create helmets.

We've taken a closer look at the helmets; not only speaking with the company to understand how they are made, but testing their look and feel ourselves.









HOW DID SHELLMET COME TO BE?

In 2021, the export market for waste scallop shells from fisheries in Sarufutsu (in Hokkaido, Japan) ceased, and the storage of a potentially vast number of shells became a problem for villagers. Researchers looking to solve the problem created Shellstic, a bioplastic created from the calcium carbonate shells as a way to make productive use of a byproduct of their fishing industry.

HOW ARE SHELLMETS MADE?

The scallop shells are crushed into a fine powder, before being made into pellets. These pellets are then poured into a mould and made into a helmet shape. The design uses biomimicry, with a ribbed shell shape on the helmet, resembling the shape of a scallop shell. This helmet shape is thought, by the manufacturer, to be 30% stronger than flat helmet designs. According to the team who have developed Shellmet, upcycling marinę debris is one of the key motivations behind the product. They believe that 30% less CO2 is used in helmet manufacture using this scallop bioplastic than through traditional plastic helmet production.

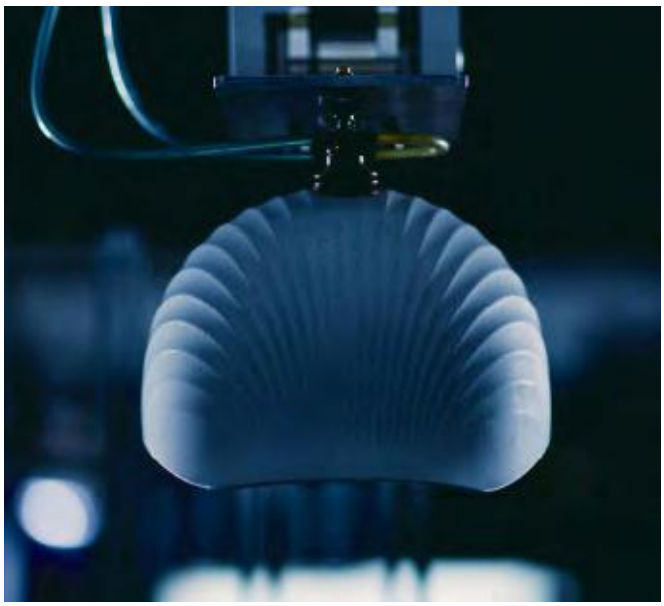
I asked *Shellmet* about the manufacture process and how scallops shells are turned into bioplastic. According to, Tetsuya Bambara at *Shellmet*, 'the bioplastic scallop shell material is produced by pulverising the shells—whose primary component is calcium carbonate ($CaCO_3$)—and compounding this powder with a polymer resin. Rather than being a bioplastic formed through a single chemical reaction, it is best described as a composite material consisting of an inorganic filler and a polymer matrix. Therefore, it does not have a single chemical formula, and its properties can be adjusted depending on the base resin and formulation'. He says, 'This approach is not limited to scallop shells and can also be applied to other types of shells, such as oyster shells. However, due to differences in crystal structure and impurities, the formulation and processing conditions need to be optimised for each material.



WHAT OPTIONS ARE AVAILABLE?

Colours available are currently coral white, sand cream, deep black, ocean blue and sunset pink. The weight of the main helmet is, on average 400g./0.9lb The helmet fits head sizes 53-62cm/21-24.4" and is adjustable with a strap. Helmets are generally designed to be unisex and this one can be worn by all adults and most teenagers. The current RRP is £38/$50, and it is available from the Shellmet website, shipped from Japan.

The look of the helmets is elegant and more interesting than a lot of helmets. The scallop shell lines draw attention to the head and perhaps to its fragility and need to be protected as the scallop's did before being 're-purposed' to a human head. This is in contrast to many modern helmets in which the futuristic or militaristic designs convey a degree of invulnerability that can make the wearer complacent. The resemblance to a shell might therefore remind people of just why the head needs to be protected.



HOW DOES IT FEEL?

The *shellmet* has a comfortable fit when the strap is fully tightened allowing the head to sit in it snugly. The straps themselves are a side click-in attachment, and the straps tighten using a normal length adjuster, with side adjustments which can be brought closer or further from the head. It's fine to fit a sunhat/cap under the *shellmet*. The visor offers some in built sun protection all the way around the head too. It is slightly heavier than some of the *Petzl* helmets (roughly twice), which is noticeable but the extra width also offers sun protection which some people value highly. (Especially round the ears and sides of the face, which can make a huge difference for those who would wear a cap for visibility, but which does not give protection around the sides of the face).

WHAT STRENGTH SPECIFICATIONS HAVE SHELLMETS BEEN MADE FOR?

'In terms of material strength, we aim to achieve a level comparable to commonly used helmet materials such as ABS and polycarbonate, while incorporating shell-derived material to enhance rigidity and environmental performance. That said, final properties depend significantly on formulation and design,' says Bambara.

'The inner foam is designed with impact absorption in mind for falls at speed, and the straps are engineered to meet relevant safety standards. *Shellmet* is tested to the standard EN1078:2012+A1:2012. This is the standard for cycling, skateboarding and roller skating. While this is not currently at the climbing specification of EN12492, *Shellmet* say they are working on a search and rescue specification model.'

HOW DOES THIS MATCH UP TO SEARCH AND RESCUE REQUIREMENTS?

Some of the more popular helmets from brands like *Kask* and *Petzl* are certified for both cycling and climbing, with impact absorption requirements, from falling objects encountered in climbing to angular impact absorption in cycling accidents (foam inner layer), and these are popular with many people. We ask Bambara where *Shellmet* stands on helmets for climbers..

'In terms of search & rescue and climbing applications, resistance to falling objects is a key consideration. Our current model is primarily designed for cycling use, but we are actively considering optimising the shell rigidity and structure depending on the intended application'. 'For impact resistance against falling objects: the current model meets cycling safety standards and has passed the required impact tests, demonstrating sufficient performance for its intended use. However, for more localised and higher-energy impacts—such as those encountered in climbing—there is still room for further optimisation in the design. We will continue to refine the product based on specific use-case requirements.'

I ask whether any companies have taken on using *Shellmet* over other helmets yet. Bambara says, 'the helmets are already being introduced to general users and adoption is gradually expanding. In Japan, for example, the delivery company *Wolt* has adopted our helmets in the Hokkaido region, where they are being used in actual delivery operations'.

There is also currently an increasing risk of earthquakes in the region, and *Shellmets* may be available for all residents in the case of natural disasters.

SUSTAINABILITY

The manufactures of *Shellmet* make the point that a *Shellmet helmet* can be crushed and used as building material, or put back into making another *Shellmet*, when the helmet has finished its life span. This increased recyclability is an added advantage of the use of shells. It's not something we're aware of being available with any other helmet manufacturers currently.

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Lightweight (≤1kg/2.2lb) SIT HARNESS



What makes a harness suitable for Wilderness SAR (and in some cases tactical/Law Enforcement) as distinct from urban-industrial rope rescue and rope access harnesses? Well, if you respond to your incident in a road vehicle and can get pretty close - possibly nothing because you won't be concerned with weight and bulk and may well wear an all-singing and dancing, maximum padded full body harness. But if you have to negotiate miles of wilderness on foot, in terrible weather; hot, wet, freezing and include clambering and climbing then you will want something very much smaller and lighter whilst still maintaining some comfort and common rescue features. Further to this, tactical operators want low vis colours and low bulk/weight because it may well be fighting for space in the pack with weaponry and ballistic protection. Most of these harnesses are actively marketed as suitable for rescue but we have also included some tactical (see the 'BLACK EQPT GUIDE for a full list), professional quality canyoning harnesses plus some uni size 'group' harnesses from the sport sector of the key manufacturers. 'Group' harnesses have been included because they are light, very robust and easy to don as well as being uni-sized - all traits that a team or victim harness should meet. For instance, at the bottom of the page are the new *Petzl Tetrax* and *Pandion* series which are padded and unpadded respectively and the *Pandion Stainless* as distinct from the adjacent *Steel* and *Steel Lite,* is designed to 'withstand humid or salty environments' although that only appears to be due to stainless buckles rather than treated or marine grade webbing. Nevertheless, this would be of particular interest to coastal teams and those operating in the tropics. There are however, literally hundreds of tactical and sport climbing and outdoor-centre harnesses that could be just as applicable. Indeed some 'rescue' or 'tactical' harnesses listed here are simply climbing harnesses with a different colour or name. Canyoning harnesses like the fantastically named *Uguaza III* from *Edelrid* have been included because these are now pretty technical climbing harnesses built to withstand wet and rubbing on wet rock. The PVC seat can be removed/replaced so if it's total weight remains low enough to be included in this particular Guide they are well worth considering. In fact, it's surprising that these aren't more widely used by water rescuers where their activities coincide with rocky banks and rope-work. They have a degree of padding, attachments points and webbing protection that we don't see in caving harnesses but would seem ideal for multi-role in remote environments? Standards are a slight issue for both canyoning and group/adventure harnesses because they currently only meet sport standards but any 'fit-for-purpose' analysis should address that.



This GUIDE is concerned with sit harnesses (US Class II) that ***weigh a kilo or less (2.2lb)*** because we had to draw the line somewhere between a lightweight SAR harness and any other rescue harness. One or two, like the *Edelrid Vector Hip* only just fall outside of this with their smallest model a kilo and some grams. We have included caving harnesses but there is little or no deliniation between a sport caving and pro model. Full body harnesses are also a separate Guide but many of these climbing sit harnesses can be used in conjunction with a lightweight chest harness to meet EN361 as a full body harness and some have their bespoke chest harness option that fits specifically that harness. Industrial harnesses need to be full body to comply with the required EN361 standard (apart from arborist harnesses which are still base-configured as sit-harnesses). You can see In the pictures opposite the difference between a 'lightweight' SAR harness, a team/victim harness and a







LEFT: SPOT THE DIFFERENCE? Intended for the sport/group/centre markets but applicable as a team/casualty harness: LtoR: ***Petzl Tetrax*** with padding and gear attachment points. ***Pandion Stainless*** with stainless steel buckles and gear loops.**Pandion Steel** with steel buckles and gear loops.
Not shown is a **Pandion Steel Lite** with no gear loops.

WEIGHT SIT HARNES







IMAGES- Title image: ***CMC Ranger*** harness for rescuers - very light weight but with full, thermo-formed padding and gear loops. Right: ***CAMP Air Rescue Evo***, NOT included in this guide but typical of modern, integrated sit and chest harnesses for helicopter operations with a multi-attachment strap for attaching at differing heights and attaching an underslung victim or equipment.

ABOVE-LEFT=LIGHWEIGHT MOUNTAIN/ CLIMBING HARNESSES

Far-left: ***PETZL Falcon Mountain*** is one of 3 variants of this long-standing lightweight design for rescuers. The ***Mountain*** uses a light, double-D buckles and a simple front belay loop for main attachment - this style is common in climbing for tying in and using belay devices but offsets most technical descenders by 90 degrees. Left: ***EDELRID Wing Universal*** is a one size-fits-all, simple harness using quick-clip buckles used more as a team harness that anyone can use than a casualty harness





LEFT= HEAVIER ACCESS & RESCUE HARNESSES

Far-left: ***PETZL Astro*** shown as a contrast to the 'lightweight' harnesses. It's a more urban/industrial oriented harness using multiple D-ring attachments points including pole-strap(side) D's. This is, however, much lighter than traditional work harnesses and consequently more likely to be considered by technical rescuers even in more remote settings. left: ***EDELRID Vector Hip*** is another access-oriented harness with attachments and fittings making it at home with technical hardware but again, pretty light at just over a kilogram. Weight and bulk is reduced by using textile side-D's instead of metal.

LEFT= CANYONING HARNESSES

Very much two ends of the spectrum with canyoning harnesses - highly equipped and padded like the ***Kong Target Canyon*** far right or minimalist like this ***Simond Maskoon Club*** (unpadded version of the *Maskoon*) a budget harness for *Simond* now sold only through the French sporting chain *Decathlon* for ~£$€30 whereas the ***Kong Target Canyon*** costs 3 or 4 times more. As with sport climbing harnesses there are a huge number so we have stuck with key companies with a professional track-record. The *Petzl Canyon Guide (right)* has multiple main attachment options.







BELOW-LEFT= CAVING HARNESSES

Far Left: This French ***Aventure Verticale Muruck***is a typically minimalist caving harness, they are almost always polyester and often with protective sleeves around the legs if not the waist as well. Front tie-in for a *Maillon* or three-way loading carabiner. Not the most comfortable but stripped down out of necessity for tight spaces and serious abrasive abuse.

BOTTOM= RAPID DONNING, UNIVERSAL FIT HARNESSES

Right: ***CMC LifeSaver*** is the original self-stow victim harness with colour-coordinated leg loops and visible main attachment eye which all fits into a bag you can clip to your own harness-ironically, too heavy for this Guide!

Left: ***CMC Pronto Evac*** is their modernisation of the *Lifesaver,* a lighter, slightly more comfortable version which retains different coloured leg webbing to ensure you clip the right buckle halves to each other. Usable as a team harness but as a victim harness the big central eye is easy to clip into in a rush. Note that this one does not have a rear leg loop riser making it quicker to do but potentially less comfortable than similar harnesses like the ***Kong Indiana Fast*** that does have rear leg-loop support.







fully loaded access & rescue harness. We show the *Edelrid Vector Hip* and the *Petzl Astro* as representative of the lighter but more urban/industrial-oriented rescue harnesses. These have side (pole-strap) Ds - in webbing and alloy, ventral hard rings connections (2 in the case of the *Astro*), loads of gear attachment points and accessories and super wide padding at the back of the waist and the leg loops. There are many others that are more heavily configured and weigh up to 3kg/6.6lb that you can find in our full Guide to RESCUE HARNESSES. Because of the weight reductions achieved by modern harnesses, there is now a fine line between what can and cannot be considered to be a 'lightweight SAR' harness. *CAMP* might argue that their *Liberty* harness is just as suitable for wilderness rescue as the *Vector Hip* since it is only 100 or so grams heavier but as previously mentioned, we had to draw the line somewhere and these larger 'lightweight' models will take up more space in your pack and have more material to get wet and for mud and grit to stick to.

This Guide covers the first four of these 5 broad categories of lightweight harnesses:

1. **OPERATOR/CLIMBING** ◆ Harness - a sized climbing harness with gear attachment and often a reasonable though minimal amount of padding suited for wilderness or remote area use.
2. **TEAM/CASUALTY** ◆ Unisize harnesses -One-size fits all harness that anyone in the team can grab but usually intended as a casualty harness with no padding, few or no gear attachment points, fast-clip (Cobra-style) buckles or simpler buckles but colour-coded legs (and attachment eye) to pull on rapidly. Always best to add a chest harness or simple long sling as a fig-8 to ensure the casualty stays upright.
3. **CANYONING** ◆ Harness - often padded and with many more attachment options than a pure caving harness but always features a PVC seat running from the waist belt to the bottom of the leg loops so provides a lot of protection. The *Kong Target, Petzl Canon Guide* and *Edelrid Iguazuu III* for instance are padded, have multiple gear loops, sewn eyes and two main frontal attachments. However, since the pvc seat provides support for the leg loops if you detach to use as a climbing harness you would need to add a simple cor/elastic or webbing loop to act as a a makeshift lep-loop riser.
4. **CAVING** ◆ Harness - unpadded and as no-frills as a harness gets - designed to be dragged around in wet, dirt and grit and still cope with vertical rope work.
5. **AERO** harnesses (NOT INCLUDED) - Used as a combination sit and chest section with different height attachment points to the winch or long haul of a helicopter. The chest section can sometimes be removed leaving a sit harness with what could be used as a long pick-off strap with a range of attachment options as long as the hardware and harness are rated for such loading.

There have always been helicopter/winch crew harnesses but these ultra-light, aero harnesses with the tell-tale high-back/low profile chest harness, lightweight sit harness and attaching multi-point webbing only really started cropping



LIGHTWEIGHT SIT HARNESSES





up this century. Now, all have a similar appearance and design regardless of manufacturer: a sit and chest harness con-joined by an elaborate permanent and height-adjustable attachment 'sling' stretching from the main attachment eye to the harness section like the *CAMP Air-Rescue EVO* above. *CMC*'s new *Outback* discussed in this issue's PRODUCT NEWS is a completely modular system that aims to bridge the divide between a sit harness and an aero harness. All of the key elements can be separated and donned from the waist belt onwards without taking anything off. The waist belt fits regular trouser lops and can have leg loops, chest harness and multi-attachment/ascender strap added from it's handy *Molle* compatible pouch. You can also pre-load 2-tier gear loops and attach them around the waist belt when needed, the large size will fit up to 6 gear loops. It sounds like something that should have been around in at least the 1990s but it hasn't been, at least not with this level of strength and standards adherence but it is now. The full system makes it suitable for helo work so it's also listed in our Aero-Harness Guide in the **ROPE EQPT BUYERS GUIDE**. Talking of *Molle*, this was developed largely for the military but we see it on various types of rescue gear these days and at least one company, *SAR Products* in the UK (used to be *Troll Safety,* Britain's founding rope access/rescue company), use *Molle* panels on the rear of two harnesses (*Raid* right)to allow customisation of attachment including pouches.

A first aid pouch would be an obvious need but we don't see this option on rescue harnesses with the frequency that we do with arborist harnesses which speaks to the danger of working at height with a powerful cutting tool!

ONE SIZE FITS-ALL HARNESSES are victim or fast-donning 'team' harnesses - anyone on the team can grab one and use it for safety and full vertical loading (rope-rescue) albeit with quite limited degrees of comfort. Extremely versatile because they will also fit any evacuee you need to rescue up to quite large sizes. We used Jim Frank's original *CMC Lifesaver* Harness for decades from the 80's and 45 years later, not much has changed - they still sell the *Lifesaver* virtually unchanged but their latest model with wide quick-clip buckles is more comfortable (or as comfortable as a simple web harness can be). *Yates, 321* (from the late, great John Yates) is a modification of the *CMC Lifesaver* and the original rapid-donning firefighter harnesses pioneered by the French as pompier belts with a simple lanyarded hook for safety that Jim Frank later expanded upon with stowed/drop-down, colour-coded leg loops. The colour-coding ensures the rescuer is able to quickly fasten the victim or his/herself if needing to evacuate a scene rapidly. Ironically, the *CMC Lifesaver Victim* harness is NOT in this guide because it weighs 1.3kg/2.9lbs thanks to all of its steel clips and D-rings so you will find it in the rope rescue harness guide but *Yates 321* is only 1kg because it has alloy fast-clips





on the legs while maintaining the snap-clip of the *CMC Lifesaver* Harness (shown on the title pages which could easily be the same picture from their 1990 catalogue!). CMC's latest model, the *Pronto Evac*, has all fast-clip *Cobra* buckles that you simply need to locate and push into place to lock securely. The *Yates 321* is worn as a belt with the leg loops stowed in a pouch on the front. Best to add chest support for a casualty evacuation.

IN THE FOLLOWING TABLES:.....

INTENDED USE: Manufacturers intended end-user(s):

- ◆ = **WILDERNESS CLIMBING** SAR/Climbing, Rock climbing, Mountaineering, short term suspension
- ◆ =**CANYONING/WATER RESCUE** - More for working around rocky/water environments using rope systems than in-water swimming but a robust, well equipped and padded climbing harness with a PVC protective seat.
- ◆ =**CAVING**- Mostly unpadded with twin main attachment eyes for a semi-circular maillon or 3-way loading carabiner. Not quick donning and often more basic buckles that won't come undone when continually rubbed against.
- ◆ =**TEAM/CASUALTY** - Unisize Team/Victim harness - robust construction, quick and easy donning some are padded and comfortable enough for rescuer use some are just for casualty use (with a chest adjunct) or for a rescuer to grab from a team pack because it's better than nothing = ●.
- ◆ = **RESCUE & ROPE ACCESS** dedicated rope rescue and rope access for longer duration suspension with full padding and numerous gear and life-support attachment points Generally more urban-industrial than wilderness.
- ◆ =**TACTICAL** includes Law Enforcement - low-viz, low bulk but with adequate load-support and gear options
- ◆ = **THEATRICAL** Film/Theatre stunts, safety and 'flying' needing to be low viz and low bulk for use with costumes

COST: Approximate. Includes local taxes, generally rounded up to the nearest Pound£, US Dollar$ or Euro€ £$€=currency conversions only - no duty/shipping etc

ORIGIN: country of the company selling the item, not necessarily the same as the place it is made which is shown as an inset flag where we know.

WEIGHT: The basic harness with no accessories

WAIST & LEG SIZES: The number of size options available - usually listed by the manufacturer as S, M L etc. together with the smallest to the largest sizes so that you can tell if one of their sizes will fit you.

STANDARDS:

■ =**EN12277** & ■ =**UIAA** pertains to mountaineering and Rock Climbing (primarily from a sport point of view) where the front/ventral attachment is tied into for climbing rather than direct carabiner attachment but fall factors should otherwise be kept below FF0 for normal rescue activities.

■ =**EN813** pertains to suspension from a rope in a more rope access /work at height and urban rope rescue point of view

NB: **MAX (or TESTED) LOAD:** is the minimum load to pass EN813 (120kg) rather than a physical load limit. The strength of attachments eyes will be a higher figure with pole-strap D rings normally around 15kn and central (ventral) attachments eyes up to 30kN but webbing or stitching will give out first.

■ =**EN358** relates to work positioning and restraint and is usually defined by having side (pole strap) D-rings but not necessarily fall arrest

■ =**EN361** relates to fall arrest and is not relevant to sit harnesses unless combined with a chest harness indicated by brackets around the pink square (■). This would probably apply to most but not always sought or shown. Some Aero harnesses may comply as they have an integrated (detachable) chest section.

■ =**ASTM** specifically **ASTM F1772-17** for climbing and rescue harness including sit-only harnesses so it is especially relevant here.

■ =**NFPA** A non-government organisation adopted by the US fire-rescue industry with a raft of highly relevant standards that also cover harnesses; in this case defined as **class II** (sit harnesses).

■ =**Canada** - no specific standard for sit harnesses, only full body harnesses so Canada adopts US ASTM, UIAA and EN12277

■ =**AUS/NZ** - similarly no specific standard for sit harnesses so Australia and New Zealand also use US ASTM, UIAA and EN12277

■ =**ANSI Z359** An industrial standard for full-body harnesses so not relevant to stand-alone sit harnesses unless used in conjunction with a chest harness. However, **ANSI Z133** can be applied to arboricultural sit harnesses but currently if ever, applied to rescue harnesses.

■ =**EAC** - EurAsian conformity requirement for some of the old USSR countries like Armenia, Kyrgystan, Kazakhstan plus sanctioned states.

■ =**Chinese Safety**- China is a vast market and for a change, some items, especially helmets from the likes of Petzl and MSA Gallet, and Petzl harnesses, go the other way and are imported into China in which case, ironically, relevant safety standards need to be met.

WEBBING MATERIAL: Either nylon or polyester and only of concern to cave rescuers (historically) or industrial rescue teams operating in an environment in which chemicals might weaken the material (in their case acids affecting nylon)

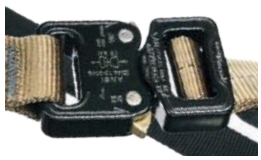
BESPOKE CHEST HARNESS ATTACH: The harness ***has specific attachment points for a chest harness*** which can be from any manufacturer if the eyes align properly or they may be situated for that manufactuer's own bespoke chest harness.

WAIST & LEG BUCKLES: The type and location of buckles which may be 1 or two on the waist and only ever in metal, rather than plastic and only ever one per leg loop.

1) **3-bar plate**. The most basic style of securing is a single buckle with webbing passed under the first bar, over the middle bar, under the third bar and locked off by going back over the whole buckle and down through the gap next to the first bar. We don't see these any more in professional harnesses.



2) **FAST-CLIP** - a clip-in technical buckle like the ***Cobra*** with two finger release of a 'male' from a 'female' receiver.



3) **Double & triple HOOK** buckles pioneered by *Petzl* but variations in use with *Edelrid* and others. Hooks onto the opposing side rather than clipping into 'Cobra' style but is a push button release followed by manual unclipping when load is released. This Petzl buckle uses a roll-bar on the catch-side to adjust the webbing length.



LIGHTWEIGHT SIT HARNESSES



3) a traditional, auto-locking **ROLL-BAR** with a rotating cylinder (often with a textured grip surface) or a sliding 'pin' across which the webbing passes/adjusted and is then secured by a vertical bar/plate. Yates and others call this a *cam-lock* buckle - pic right- but there is a specific buckle with a camming action (eg. PFD QRS and some load-securing straps) so this can be confusing



4) **DOUBLE D** (also called a **2-BAR/3-BAR**) which is a smaller plate trapping the webbing against a larger back plate when tension is applied but can otherwise be pulled through for adjustment. This type is now usually fixed like *Petzl*'s *Doubleback* and the *CAMP* buckle pictured but originally, the smaller front plate 'floated' allowing it to pass through the larger plate when rotated 90 degrees or so (and not under any load) like this *Fixe* version. In the early days this did cause problems when the top plate was forced sideways to release the belt but that risk is now fully mitigated. Regardless of type, the buckle may be located in the middle or on one side or there may be a buckle situated to both sides of the central attachment eye.





MAIN ATTACHMENT EYE: There are 4 types



- **belay loop** or **web loop** as we have called it, which is often bypassed in rock climbing by the rope tied directly around the waist belt and leg loop union. A traditional belay or web loop tends to orientate modern hardware poorly with a carabiner attached.
- metal **D ring** which orientates hardware 90° from the traditional belay loop. A metal D-ring is the hardest wearing but adds weight.
- **two webbing eyes** that meet in the middle to be connected by a semi-circular *Maillon* or one of the limited number of 3-way loading carabiners. Most often seen on caving and ascending harnesses.



- **Webbing eye** mounted widthways like this *Petzl Pandion* but is sometimes reinforced for use as a grab handle on team/victim and tactical harnesses like the *Yates RESCUE* (right) as well as being the connection point for descender/ ascender/rope attachment.





REAR BELAY: A Load bearing eye on the back of the harness which can be used for an edge restraint / rear belay. **BEWARE of non-load bearing equipment attachment points in this part of the harness.** Some arborist harnesses use colour coded anodizing to indicate the load bearing components for full-bodyweight loading and those intended only for equipment - this would be a very good system to adopt across all harnesses

POLE STRAP D's FOLD FLAT WEB: Load-bearing side attachments - usually for pole straps for structural climbing but can be lateral restrain attachments. Fold flat is a metal eye that will fold back flush with the belt rather than sticking out as a snag hazard. WEB is a low profile, heavily reinforced webbing eye sometimes rotated 90° so can be used as a tool holster like the Singing Rock harness opposite-top.

GEAR LOOPS SEWN EYES: Traditional horizontal loops for attaching or 'racking' multiple carabiners and attached kit. Most are reinforced or 'sheathed' to hold their shape and make clippng easier. Sewn eyes are single attachment points which can have a carabiner clipped in as a collection point as used to be the case before *CariTools* were invented. Load to ~ 5kg.

CUSTOM GEAR CORD EYES: multiple thread points along the top or bottom edge for small diameter cord to make gear loops to suit your own racking preferences. The eyes in the harness above are tougher than the average and can be used to attach a *CARITOOL* style clip or thread cord for customised gear loop.

BASIC HOLES/EYES RINGS: includes *Molle* sections and are otherwise random holes that you can use to create attachment points not already covered by sewn eyes and gear loops

CARI-HOOK EYES TOOL LOOP: A specific, vertically sewn section of waist belt webbing to accept a *Cari-tool* hook which securely holds equipment in one place which is easily stacked and/or detached from the hook. A tool loop is a holster orientated so that you can drop in an axe or hammer and far more useful than its infrequent appearance would imply. However, you can use an add-on holster or drop the handle through a suitably sized carabiner or web loop.

ATTACH FIRST AID or EQPT POUCH: usually rear mounted but able to hold a minimalist first aid kit (inc Trauma dressing & CAT) and/or kit like ascender straps, emergency sling or soft rope pro etc.(NOT inc. kit)

WAIST BELT & LEG LOOP WEBBING PADDING: The width of webbing and the max height of padding - often an indication of comfort and hang-time

REAR LEG RISER: DETACHABLE: (**Drop-Seat**) means that it can be detached from the waist belt (not necessarily from the leg loops) usually with a *Fastex*-style plastic buckle but some can be unthreaded from their ladderlock style buckle if you have more time to spare. **ADJUST** In burnt orange means the leg loop straps can be adjusted for length

RFID CHIP: an inventory and inspection tracking measure (eg. NFC chip) either built in to the harness ■ or as an integral or stick-on option □

OTHER COLOURS: Colour options aside from the colour shown

WARRANTY: Usually 1 to 3 years (if at all) with service life being between 5 and 10 years for all webbing harnesses subject to inspection and wear.

Details, prices and specifications can change so consult the continually updating version of this article in our **ROPE EQUIPMENTBUYERSGUIDE**

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IMAGES NOT TO SCALE
COST: Approx, inc local tax/VAT
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●●etc=Partial or OK but not ideal
OPTION= ☐☐☐ ~=Approx
INTENDED USE(s):
◆=WILDERNESS CLIMBING
◆=CANYONING/WATER
◆=CAVING
◆=UNISIZE TEAM/VICTIM
◆=URBAN ROPE RESCUE & ACCESS
◆=TACTICAL
◆=FILM/THEATRE
STANDARDS: EN12277=■ EN813=■
EN358=■ EN361=■ UIAA=■
ASTM=■ NFPA=■ ANSI=■ EAC=■
Canada=■ AUS/NZ=■ China=■








	COMPANY	AVENTURE VERTICALE	AVENTURE VERTICALE	AVENTURE VERTICALE	AVENTURE VERTICALE
	MODEL VARIANT	MAZERIN II	MURUCK	TECNIBAT	FAST CANYON COMFOR
	PRODUCT NUMBER	AVCA04	AVSP01	AVSP02	AVES05CA AVES05CO
	ORIGIN	■	■	■	■
	INTENDED USE	◆◆◆	◆◆◆	◆◆◆	◆◆◆
	COST inc VAT/tax conv-only	£90 $160 €106	£63 $86 €75	£94 $121 €96	£60 $72 €65
	WEIGHT	670g/1.47lb	600g/1.32lb	765g/1.7lb	550495g/1.22lb
	WAIST SIZES	4 sizes75-150cm/29.5-15.1"	4 sizes75-150cm/29.5-15.1"	4 sizes 75-150cm/29.5-15.1"	4 sizes75-150cm/29.5-15.
	LEG SIZES	4 sizes 40-100cm/15.7-39.4"	4 sizes 45-90cm/17.7-35.4"	4 sizes 35-90cm/13.8-35.4"	4 sizes 55-100cm/21.6-39.
	STANDARDS (with chest harness)	■	■	■	■
	WEBBING MATERIAL	Nylon	Nylon	Nylon	Polyester
LIFE CRITICAL	BESPOKE CHEST HARNESS	-	-	-	-
LIFE CRITICAL	WAIST BUCKLE	3-Bar	3-Bar	3-Bar	Double D
LIFE CRITICAL	WAIST ADJUST	One side (rear)	One side (rear)	One side (rear)	One sided
LIFE CRITICAL	LEG BUCKLE	3-Bar	3-Bar	3-Bar +3-Bar on Sit-Strap	Double D
LIFE CRITICAL	MAIN ATTACHMENT EYE	Reinforced Double Eyes	Reinforced Double Eyes	Reinforced Double Eyes	Reinforced Web Eye
LIFE CRITICAL	REAR ATTACHMENT (BELAY)	NO	NO	NO	NO
LIFE CRITICAL	POLE STRAP D's FOLD FLAT/WEB	NO	NO	NO	NO
GEAR ATTACH	GEAR LOOPS SEWN EYES	4-5 (1-2x sliding)	2	2	1 2
GEAR ATTACH	CUSTOM GEAR CORD EYES	2	-	-	-
GEAR ATTACH	OTHER HOLES/EYES RINGS	-	-	-	-
GEAR ATTACH	CARI-HOOK EYES / TOOL LOOP	1	-	-	-
GEAR ATTACH	FIRST AID or EQPT POUCH	-	-	-	-
WAIST	WAIST PADDING TYPE	PVC*	NONE*	NONE*	PVC*
WAIST	WAIST BELT WEBBING	43mm/1.75"	43mm/1.75"	43mm/1.75"	43mm/1.75"
LEG	LEG LOOP WEBBING	28mm/1.1"	43mm/1.75"	43mm/1.75"	43mm/1.75"
LEG	REAR LEG RISER LENGTH ADJUST	Detachable PVC Seat	Fixed, elasticated	Detachable webbing	Detach. Seat Fixed, elasticate
EXTRAS	RFID CHIP	NO	NO	NO	NO
EXTRAS	OTHER COLOURS	On Request	On Request	On Request	On Request
EXTRAS	WARRANTY	3 years	3 years	3 years	3 years
	NOTES	(some stockists list this as 645g) *PVC is the seat but there is optional waist padding available	*optional waist padding available	*optional waist padding available	*PVC is the seat but there is optional waist padding availab as per COMFORT climbing harness version which is also available without padding as the FAST
	WEBSITE	aventureverticale.com	aventureverticale.com	aventureverticale.com	aventureverticale.com

LIGHTWEIGHT SIT HARNESSES










	AVENTURE VERTICALE	AVENTURE VERTICALE	ALP DESIGN	BEAL	BEAL
	PEIRA CANYON	ROXIM	AVALON	DRAGON	SHAOLIN
	AVCA03CA	AVES10	AVES10 & 9T0073x	BP101BK0xx	BHPSH.1
	£65 $98 €84	£60 $66 €57	£88 $142 €104	£135 $160 €145	£110 $130 €140
	720g/1.6lb	430g/0.95lb	322-392g/00oz	896-960g/1.8-2.1lb	682-790g/1.5-1.74lb
1"	4 sizes75-150cm/29.5-15.1"	4 sizes75-150cm/29.5-15.1"	3 sizes 60-120cm/23.6-47"	2 sizes 68-125cm/26.7-49.2"	3 sizes 60-140cm/23.6-55"
4"	4 sizes 55-100cm/21.6-39.4"	4 sizes 55-100cm/21.6-39.4"	3 sizes 40-75cm/15.7-29.5"	2 sizes 42-70cm/16.5-27.5"	3 sizes 42-70cm/16.5-27.5"
	■	■	■	■ (■)	■ (■)
	Polyester	Nylon	Nylon	Nylon	Nylon
	-	-	■	■	-
	Double D	Double D	2x Modified 3-Bar	Modified Roll Bar	Modified Roll bar
	One sided	One sided	Double Sided	Double Sided	Double Sided
	Double D	Double D	Modified 3-Bar	Modified Roll Bar	Modified Roll Bar
	Reinforced Web Eye	Reinforced Web Eye	Double Eyes	Alloy D-ring	Web Eyes & Alloy Ring
	NO	NO	NO	■	■ (Not clearly marked)
	NO	NO	NO	■	■
	2 -	1	2 2	4 6	5 6
	-	-	-	-	-
	-	-	*2 -	- -	- -
	-	-	- 2	- 2	4 -
	-	-	*■	-	-
	PVC*	NONE*	Thermo-form	Stiched foam	Thermo-Form
	43mm/1.75"	43mm/1.75"	~28mm/1.1"	50 & 25mm/2&1"	*38mm/1.5"
	43mm/1.75"	43mm/1.75"	~28mm/1.1"	25mm/1"	*25mm/1"
ed	Detachable PVC Seat	Fixed, elasticated	Fixed (detachable but not quick)	Detachable webbing	Detachable, elasticated
	NO	NO	NO	NO	NO
	On Request	On Request	both colour options shown		
	3 years	3 years	3 years	1 year	1 year
le	*PVC is the seat but there is optional waist padding available	*optional waist padding available	*plastic eyes above and below waist at rear - 1 for chest harness, 1 can be for first aid or accessory pouch.	Rear webbing divides into two for added support of the padding	*Uses laser cut webbing to match waist and leg loop widths so is touted as stronger than regular fixed size webbing. Clear ID Panel. Aero-compatible with chest section
	aventureverticale.com	aventureverticale.com	alpdesign.com	bealplanet.com	bealplanet.com

IMAGES NOT TO SCALE
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●●etc=Partial or OK but not ideal
OPTION= ☐or ☐ or ☐
INTENDED USE(s):
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◆=CANYONING/WATER
◆=CAVING
◆=UNISIZE TEAM/VICTIM
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	COMPANY	BEAL	CAMP	CAMP	CMC
	MODEL VARIANT	BARRANCO	ENERGY TEAM	TOPAZ II GROUP III	OUTBACK
	PRODUCT NUMBER	BHBAR	3563	3215 3216	202xxx
	ORIGIN	■	■	■	■
	INTENDED USE	◆◆◆◆◆◆	◆	◆◆	◆◆◆
	COST inc VAT/tax conv-only	£59 $75 €66	£45 $60 €56	£5450 $7266 €6860	£325 $329 €360
	WEIGHT	615g/1.35lb	322-354g/11.4-12.5oz	620g/1.36lb	620-660kg/00lb
	WAIST SIZES	1 size 60-100cm 23.6-39"	2 size 60-110cm/23.6-43.3"	1 size 60-110cm/23.6-43.3"	4 sizes 74-114cm/29-45"
	LEG SIZES	1 size 45-72cm 18-28"	2 size 45-70cm/17.7-28"	1 size 38-70cm/15-27.6"	4 sizes ~40-105cm/16-41
	STANDARDS (with chest harness)	■■	■■	■■	■■
	WEBBING MATERIAL	Nylon	Polyester	Polyester	Nylon
LIFE CRITICAL	BESPOKE CHEST HARNESS	-	-	-	■
LIFE CRITICAL	WAIST BUCKLE	Double-D	Double-D	Double-D	Cobra Fast-Clip
LIFE CRITICAL	WAIST ADJUST	One side	Central Double Sided	Central Double Sided	Central Double Sided
LIFE CRITICAL	LEG BUCKLE	Double-D	Double-D	Double-D	Cobra Fast-Clip
LIFE CRITICAL	MAIN ATTACHMENT EYE	Reinforced Web Eye	Web Eye	Web Eye	Alloy SRT D-ring
LIFE CRITICAL	REAR ATTACHMENT (BELAY)	-	NO	NO	NO
LIFE CRITICAL	POLE STRAP D's FOLD FLAT/WEB	-	NO	NO	NO
GEAR ATTACH	GEAR LOOPS SEWN EYES	1 -	2 -	2 1	☐≤6* -
GEAR ATTACH	CUSTOM GEAR CORD EYES	-	-	-	-
GEAR ATTACH	OTHER HOLES/EYES RINGS	- -	- -	- -	- -
GEAR ATTACH	CARI-HOOK EYES / TOOL LOOP	- -	- -	- -	- -
GEAR ATTACH	FIRST AID or EQPT POUCH	-	-	-	-
WAIST	WAIST PADDING TYPE	NONE	Thermo-Form	Thermo-Form	Stitched Foam
WAIST	WAIST BELT WEBBING	38mm/1.5"	33mm/1.3"	45mm/1.75"	38mm/1.5"
LEG	LEG LOOP WEBBING	38mm/1.5"	33mm/1.3"	45mm/1.75"	38mm/1.5"
LEG	REAR LEG RISER LENGTH ADJUST	Detachable Seat	Detachable thin webbing	Fixed, elasticated	Detachable webbing
EXTRAS	RFID CHIP	-	-	-	NO
EXTRAS	OTHER COLOURS		☐		☐
EXTRAS	WARRANTY	2 years	3 years	3 years	1 year
	NOTES	Removable PVC seat. Individual serieal numbering and ID tag/pouch	Colour option is yellow stitching/ trim for the larger size with red (shown above.) as the smaller size.	Padding is moveable around the waist belt GROUP III is an unpadded, single gear loop version, Wt: 390g Cost: $60	Modular system with separate waist belt, leg loops, and optional chest harness, multi-loop/ascender strap, Molle carry pouch and *2-tier gear loops which can be pre-loaded with gear before attachment t harness
	WEBSITE	bealplanet.com	camp.it	camp.it	cmcpro.com

LIGHTWEIGHT SIT HARNESSES



	CMC	CMC	CMC	EDELRID	EDELRID
	RANGER LIGHT	RANGER QUICK	PRONTO EVAC	IRUPU	IGUAZU III
	20238x	20239x	202320	749200011380	749190142270
	£280 $285 €325	£320 $324 €365	£160 $170 €185	£00 $125 €85	£155 $250 €180
	790g/1.7lb	879g/1.9lb	808g/1.78lb	706g/00lb	905-962g/2-2.12lb
	3 sizes 66-122cm/26-48"	3 sizes 66-122cm/26-48"	1 size <157cm/<62"	1 size 60-120cm/23.6-47"	2 sizes 65-105cm/26-41"
	1 size 51-102cm/20-40"	1 size 51-102cm/20-40"	1 size ~51-102cm/20-40"	1 size 45-75cm/17.7-29.5"	2 sizes 49-70cm/19-28"
	Nylon	Nylon	Nylon	Nylon	Nylon
	-	-	-	- -	- -
	Roll-bar	Roll-bar	Cobra-Style Fast-Clip	Double D	2x Double D
	Double Sided	Double Sided	One Side	One Side	Double Sided
	Roll-Bar	Cobra Fast-Clip	Cobra-Style Fast-Clip	Double D	Double D
	Alloy SRT D-ring	Alloy SRT D-ring	Reinforced Web Eye	Reinforced Web Eye	D-Ring + Web Loop
	(13kN)	(13kN)	NO	NO	NO
			NO	NO	NO
	2 -	2 -	- -	2(sml) 4 (lg) -	2(sml) 4 (lg) -
	-	-	-	-	-
	- -	- -	- -	- 2	- 2
	- -	- -	- -	2 -	2 -
	-	-	-		
	Thermo-Form	Thermo-Form	NONE	Sliding Thermo-Form	Thermo-Form
	44mm/1.75"	44mm/1.75"	44mm/1.75"	44mm/1.75"	44mm/1.75"
	25mm/1"	25mm/1"	44mm/1.75"	44mm/1.75"	44mm/1.75"
	Fixed webbing	Fixed webbing	NONE	Detachable Seat	Detachable Seat
	NO	NO	NO		
	1 year	1 year	1 year	-	-
			Designed for ski-patrol/ski-lift or gondola rescue	Intended for the group/ rental market and as such is a minimalist but robust option. Dyneema protection on web eye and wear-indicator webbing. Replaceable tarp seat	Highly competent climbing harness with seat detached and perhaps add a cord or light web belt as a makeshift rear leg-loop riser.
	cmcpro.com	cmcpro.com	cmcpro.com	edelrid.com	edelrid.com

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	COMPANY	EDELRID	FIXE	FIXE	FIXE
	MODEL VARIANT	WING UNIVERSAL	LINUS	CANYONING	ESPELIO
	PRODUCT NUMBER	000	H61009	H62009	H51009
	ORIGIN				
	INTENDED USE	◆◆◆●	●◆	●◆◆	●◆◆
	COST inc VAT/tax conv-only	£160 $195 €184	£32 $80 €60	£41 $85 €60	£33 $78 €50
	WEIGHT	750g/1.65lb	410g/14.5oz	460g/1lb	435g/15oz
	WAIST SIZES	1 size 65-105cm/26-41"	1 size 70-120cm/27.5-47"	1 size 00-120cm/00-47"	1 size 65-105cm/25.6-41
	LEG SIZES	1 size 49-70cm/19-28"	1 size 55-70cm/22-27.5"	1 size 00-90cm/00-35"	1 size 49-70cm/19.5-27.5
	STANDARDS (with chest harness)	■■	■■	■■	■■
	WEBBING MATERIAL	Polyester	Polyester	Polyester	Polyester
LIFE CRITICAL	BESPOKE CHEST HARNESS	☐-	- -	- -	- -
LIFE CRITICAL	WAIST BUCKLE	Edelrid Triple Hook + Rollbar	Double-D	3-Bar	3-Bar
LIFE CRITICAL	WAIST ADJUST	Double Sided	One Side	One Side	One Side
LIFE CRITICAL	LEG BUCKLE	Edelrid Dbl -Hook	Double-D	3-bar	3-Bar +3-Bar on Sit-Strap
LIFE CRITICAL	MAIN ATTACHMENT EYE	Web Loop	Reinforced Web Eye	Reinforced Web Eye	Reinforced Double Eyes
LIFE CRITICAL	REAR ATTACHMENT (BELAY)	NO	NO	NO	■ D-ring
LIFE CRITICAL	POLE STRAP D's FOLD FLAT/WEB	NO	NO	NO	NO
GEAR ATTACH	GEAR LOOPS SEWN EYES	4 -	1 -	1 -	3 -
GEAR ATTACH	CUSTOM GEAR CORD EYES	-	-	-	-
GEAR ATTACH	OTHER HOLES/EYES RINGS	- -	- 2	- 2	- 2
GEAR ATTACH	CARI-HOOK EYES / TOOL LOOP	- -	2 -	2 -	2 -
GEAR ATTACH	FIRST AID or EQPT POUCH				
WAIST	WAIST PADDING TYPE	Foam	NONE	NONE	NONE
WAIST	WAIST BELT WEBBING	44mm/1.73"	45mm/1.77"	45mm/1.77"	45mm/1.77"
LEG	LEG LOOP WEBBING	44mm/1.73"	45mm/1.77"	45mm/1.77"	45mm/1.77"
LEG	REAR LEG RISER LENGTH ADJUST	Detachable, elasticated	Fixed, elasticated	Detachable Seat	Seat/Sit strap
EXTRAS	RFID CHIP	■	NO	NO	NO
EXTRAS	OTHER COLOURS	■			
EXTRAS	WARRANTY	-	3 years	3 years	3 years
	NOTES	Indicator webbing - shows red when worn through	CANYONING is a disinct canyoning model based on the *Linus* rather than a simple seat retrofit	CANYONING is a disinct canyoning model based on the *Linus* rather than a simple seat retrofit	
	WEBSITE	edelrid.com	fixeclimbing.com	fixeclimbing.com	fixeclimbing.com

LIGHTWEIGHT SIT HARNESSES



	KONG	KONG	KONG	KONG	LACD
	INDIANA CANYON	INDIANA FAST	ROGER	TARGET CANYON	EASY EXP
	8C0670 8C0670001KK	8C0670FAST	8C989xxxxxx	8C064xxxxxx	1099
	£5056 $8395 €5565	£80 $135 €88	£92 $121 €108	£151 $190 €175	£28 $42 €32
	380635g/13.4oz1.4lb	500g/1.1lb	595-670g/1.3-1.5lb	830-880g/1.8-1.9lb	497g/1.1lb
	1 size 60-120cm/23.6-47"	1 size 60-120cm/23.6-47"	3 sizes 60-130cm/23-51"	2 sizes 68-130cm/26.7-51"	1 size 58-132cm/23-52"
	1 size 42-66cm/16.5-26"	1 size 42-66cm/16.5-26"	3 sizes 40-78cm/16-31"	2 sizes 45-80cm/17.7-31"	1 size 30-76cm/12-30"
	Polyester	Polyester	Nylon	Nylon + PVC seat	Polyester
	- -	- -	- -		
	Double-D	Cobra style Fast-Clip	2x Double D	Double 3-bars	Modified Double D
	One Side	One Side	Double Sided	Double Sided	One Side
	Double-D	Cobra style Fast-Clip	Double D	Modified Double D	Modified Double D
	Reinforced Web eye	Reinforced Web eye	Web Loop	Reinforced Web Eye	Web Eye
	NO	NO	■ Web Loop	NO	NO
	NO	NO	NO	NO	NO
	1 -	- -	5 2	4 6 (+2 top waist*)	1 -
	-	-	-	-	-
	- -	- -	- -	- -	- -
	- -	- -	- -	- -	- -
	NO	NO	NO	*■	-
	NONE	NONE	Lined foam	Lined foam	NONE
	44mm/1.75"	44mm/1.75"	38mm/1.5"	38mm/1.5"	44mm/1.75"
	44mm/1.75"	44mm/1.75"	25mm/1"	38mm/1.5"	44mm/1.75"
	Elasticated,fixed Seat	Elasticated,fixed	Elasticated, detachable	Detachable Seat	Detachable, elasticated
	NO	■	■	□	NO
	3 years	3 years	3 years	3 years	2 years
	CANYON= same harness with detachable protective seat instead of rear leg -loop risers. Colour coordinated leg-loops and main attachment eye for easier donning		Rear waist belt divides into two to spread load across several inches rather than just the 38mm webbing.	detachable protective seat. Front attachment has reinforced web eye with descender 'quickdraw' plus web strap beneath to help hold an ascender *Maillon* clip around waist belt.2x multi-role clip points top of belt inc first aid kit.	
	kong.it	kong.it	kong.it	kong.it	lacd.de

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	COMPANY	MISTY MOUNTAIN	MISTY MOUNTAIN	MISTY MOUNTAIN	MTDE
	MODEL VARIANT	CHALLENGE TACTICAL	MILROC	CADILLAC TACTICAL	AMAZONIA II PICOS
	PRODUCT NUMBER	000	000	000	B6121 B6150
	ORIGIN	■	■	■	■
	INTENDED USE	◆◆◆	◆◆◆◆◆	◆◆◆	◆◆◆◆
	COST inc VAT/tax conv-only	£6476 $85100 €7588	£110 $146 €129	£220 $290 €255	£7588 $125135 €94101
	WEIGHT	368-490g/13-17.3oz	454g/1lb	474-604kg/1-1.35lb	645890g/1.42lb
	WAIST SIZES	3 sizes 56-142cm/22-56"	1 sizes 56-122cm/22-48"	6 sizes 61-114cm/24-45"	1 size <112cm/<44"
	LEG SIZES	3 sizes 35-117cm/14-36"	1 sizes 35-117cm/14-36"	6 sizes 45-76cm/18-30"	1 size ~45-70cm/16-28"
	STANDARDS (with chest harness)	■	■	■	■
	WEBBING MATERIAL	Mil-Spec Nylon	Mil-Spec Nylon	Polyester	Nylon
LIFE CRITICAL	BESPOKE CHEST HARNESS	- -	- -	- -	- ☐
LIFE CRITICAL	WAIST BUCKLE	Roll-Bar	Roll-Bar	2x Modified Double-D	3-Bar
LIFE CRITICAL	WAIST ADJUST	One Side	One Side	Double Sided	One side (rear)
LIFE CRITICAL	LEG BUCKLE	Roll-Bar	Roll-Bar	Modified Double-D	3-Bar
LIFE CRITICAL	MAIN ATTACHMENT EYE	Reinforced Web eye	Reinforced Web eye	Web Loop	Reinforced Double Eyes
LIFE CRITICAL	REAR ATTACHMENT (BELAY)	NO	NO	NO	NO
LIFE CRITICAL	POLE STRAP D's FOLD FLAT/WEB	NO	NO	NO	NO
GEAR ATTACH	GEAR LOOPS SEWN EYES	- -	1 1 (rear haul loop)	6 1 (rear)	4 (Dyneema)inc 1 moves
GEAR ATTACH	CUSTOM GEAR CORD EYES	-	-	-	-
GEAR ATTACH	OTHER HOLES/EYES RINGS	- -	- -	- -	-
GEAR ATTACH	CARI-HOOK EYES / TOOL LOOP	- -	- -	2 -	-
GEAR ATTACH	FIRST AID or EQPT POUCH	NO	NO	NO	-
WAIST	WAIST PADDING TYPE	NONE	NONE	Thermo-Form	NONE
WAIST	WAIST BELT WEBBING	50mm/2"	44mm/1.75"	25mm/1"	44mm/1.75"
LEG	LEG LOOP WEBBING	50mm/2"	44mm/1.75"	50mm/2"	26mm/1"
LEG	REAR LEG RISER LENGTH ADJUST	Webbing, fixed	Webbing, detachable	Elasticated, detachable	fixed - to Sit Strap not waist
EXTRAS	RFID CHIP	NO	NO	■ NO	NO
EXTRAS	OTHER COLOURS	-	■ ■	■ ■ ■	-
EXTRAS	WARRANTY	Ltd Lifetime	Ltd 5 year	Ltd 5 year	3 years
	NOTES	Challenge Tactical - all-black and not in small. Challenge main attachment is colour-coded for size - small=brown, std=blue, large =black			*Amazonia* best for tight-spaces. Also a variant called VERONIA =£75/€84 695g. PICOS = best of 3 for long ascents listed as 930&845g in their webshop? Removable PVC reinforcement on legs and butt/sit strap.
	WEBSITE	mistymountain.com	mistymountain.com	mistymountain.com	mtde.net

PIGEON MOUNTAIN INDUSTRIES EST. 1976

ROPE & EQUIPMENT

FOR YOUR VERTICAL WORLD

11 mm Extreme Pro™ (G) Rope

MBS = 42.9 kN

Unicore® technology

Sheath – 100% Polyester

Core - 100% Nylon 6

NFPA 1983: 2017 (G)

MADE IN THE USA

UNICORE® TECHNOLOGY FOR YOUR SECURITY



PMIROPE.COM

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◆=CANYONING/WATER
◆=CAVING
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◆=TACTICAL
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	COMPANY	**PETZL**	**PETZL**	**PETZL**	**PETZL**
	MODEL VARIANT	**ASPIC**	**FALCON**	**FALCON ASCENT**	**FALCON MOUNTAIN**
	PRODUCT NUMBER	C96	C038DAxx	C038EAxx	C038FAxx
	ORIGIN	■■■	■■■	■■■	■■■
	INTENDED USE	◆◆●◆◆	●◆◆◆	◆◆	◆●◆
	COST inc VAT/tax conv-only	£108 $150 €125	£150 $290 €180	£198 $290 €233	£163 $240 €194
	WEIGHT	395*-510g/13.9-18oz	900-945g/2-2.15lb	800-830g/1.8-1.83lb	670-700g/1.5-1.54lb
	WAIST SIZES	1 size 74-120cm/29-47"	3 sizes 65-120cm/00-47"	2 sizes 70-120cm/27-47"	2 sizes 70-120cm/27-47"
	LEG SIZES	1 size 50-75cm/19.7-29.5"	3 sizes 44-65cm/17-25.6"	2 sizes 47-65cm/17-25.6"	2 sizes 47-65cm/17-25.6"
	STANDARDS (with chest harness)	■ (■)	■■■■■	■■■■■	■■■■■
	WEBBING MATERIAL	Polyester	Polyester	Polyester	Polyester
LIFE CRITICAL	ATTACH CHEST HARNESS	-	■	■	■
LIFE CRITICAL	WAIST BUCKLE	2x Double-D(*DoubleBack*)	2x Roll-bar (*DoubleBack+*)	2x Roll-bar (*DoubleBack+*)	2x Double-D
LIFE CRITICAL	WAIST ADJUST	Double Sided	Double Sided	Double Sided	Double Sided
LIFE CRITICAL	LEG BUCKLE	Double-D (*DoubleBack*)	Roll-bar+Hook (*FAST LT*)	Roll-bar+Hook (*FAST LT*)	Double-D
LIFE CRITICAL	MAIN ATTACHMENT EYE	Web Loop	Alloy D-ring	Reinforced Double Eyes	Web Loop
LIFE CRITICAL	REAR ATTACHMENT (BELAY)	■	■	■	■
LIFE CRITICAL	POLE STRAP D's FOLD FLAT/WEB	NO	■*	■*	NO
GEAR ATTACH	GEAR LOOPS SEWN EYES	4 -	5 4	5 4	4 4
GEAR ATTACH	CUSTOM GEAR CORD EYES	-	-	-	-
GEAR ATTACH	OTHER HOLES/EYES RINGS	- -	- -	- -	- -
GEAR ATTACH	CARI-HOOK EYES / TOOL LOOP	2 -	- -	2 -	2 -
GEAR ATTACH	FIRST AID or EQPT POUCH	NO	NO	NO	NO
WAIST	WAIST PADDING TYPE	Thermo-Form	Thermo-Form	Thermo-Form	Thermo-Form
WAIST	WAIST BELT WEBBING	38mm/1.5"	38mm/1.5"	38mm/1.5"	38mm/1.5"
LEG	LEG LOOP WEBBING	25mm/1"	25mm/1"	25mm/1"	25mm/1"
LEG	REAR LEG RISER LENGTH ADJUST	Elasticated, detachable	Elasticated(detachable but not quick)	Fixed (detachable but not quick)	Elasticated(detachable but not qui
EXTRAS	RFID CHIP	☐	☐	☐	☐
EXTRAS	OTHER COLOURS		■		■
EXTRAS	WARRANTY	3 year	3 year	3 year	3 year
	NOTES	*395g without the removable padding. Can be fitted with chest section for AERO-use.	Described by Petzl as being for 'suspended' rescue. Leg loop buckles have quick attach hooks. * can convert to metal ring (option). Black version cost £$€10 more	Described by Petzl as being for ascent (eg cave rescue). Leg loop buckles have quick attach hooks. * can convert to metal ring (option)	Described by Petzl as being for climbing rescue
	WEBSITE	petzl.com	petzl.com	petzl.com	petzl.com

LIGHTWEIGHT SIT HARNESSES

				
				
PETZL	**PETZL**	**PETZL**	**PETZL**	**PETZL**
PANDION STEEL/LITE CANYON CLUB	**PANDION STAINLESS**	**TETRAX**	**ASPIR LITE**	**CANYON GUIDE CLUB**
C29S / C29SL C86	C029CBxx	C082AA00	C41 C41A	C086BAxx
£5368 $90165 €6380	£65 $100 €76	£70 $105 €72	£7550 $10080 €8860	£174 $330 €205
530g/1.2lb	530g/1.2lb	515g/1.1lb	*395510g/1.1lb	870-920g/1.9-2lb
1 size 51-120cm/20-47"	1 size 51-120cm/20-47"	1 size 58-120cm/22.8-47"	1 size 58-110cm/22.8-43"	2 sizes 65-95cm/26-37"
1 size 31-75cm/12.2-29.5"	1 size 31-75cm/12.2-29.5"	1 size 35-75cm/13.7-29.5"	1 size 35-65cm/14-25.6"	2 sizes 40-75cm/16-30"
Polyester	Polyester	Polyester	Polyester	Polyester & *HMPE legs
-	-	-	-	-
StSt Double-D(*DoubleBack*)	StSt Double-D(*DoubleBack*)	2x Double-D(*DoubleBack*)	2x Double-D(*DoubleBack*)	StSt Double-D(*DoubleBack*)
One Side	One Side	Double Sided	Double Sided	One Side
StSt Double-D(*DoubleBack*)	StSt Double-D(*DoubleBack*)	Double-D (*DoubleBack*)	Double-D (*DoubleBack*)	StSt Double-D(*DoubleBack*)
Reinforced Web eye	Reinforced Web eye	Reinforced Web eye	Web Loops vert + horiz	D-Ring, Web eye & metal pin
■	■	■	NO	NO
NO	NO	NO	NO	NO
1(+☐) -	3 -	3 -	2 -	4 -
-	-	-	-	-
- -	- -	- -	- -	- -
1- [11]	2 -	2 -	2 -	- -
NO	NO	NO	NO	
NONE	NONE	Thermo-Form	Thermo-Form	Thermo-Form
38mm/1.5"	38mm/1.5"	45mm/1.77"	45mm/1.77"	44mm/1.75"
38mm/1.5"	38mm/1.5"	45mm/1.77"	45mm/1.77"	44mm/1.75"
Elasticated,fixed TPU Seat	Elasticated,fixed	Elasticated,fixed	Elasticated, detachable	Elasticated, detachable
☐	☐	☐	☐	☐
■				
3 year	3 year	3 year	3 year-	3 years
Colour-coded leg loops, tie-in and extra grip web ends for easy, rapid donning. STEEL LITE =515g & no gear loops CANYON CLUB=same harness with TPU seat instead of leg loop risers.Seat will retrofit any *Pandion*	Colour-coded leg loops, tie-in and extra grip web ends for easy, rapid donning. STAINLESS version for salty and humid environments. STEEL buckles version=£47 STEEL Lite =515g & no gear loops	Colour-coded leg loops and tie-in for easy, rapid donning. Moveable (sliding) padding	*Lite has less padding	CLUB is unpadded version with green seat *HMPE=High Modulus Polyethylene with Thermoplastic polyurethane (TPU) abrasion cover
petzl.com	petzl.com	petzl.com	petzl.com	petzl.com

IMAGES NOT TO SCALE
COST: Approx, inc local tax/VAT
£$€=currency conversion only
●●etc=Partial or OK but not ideal
OPTION= ☐☐ ☐ ~=Approx
INTENDED USE(s):
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◆=CANYONING/WATER
◆=CAVING
◆=UNISIZE TEAM/VICTIM
◆=URBAN ROPE RESCUE & ACCESS
◆=TACTICAL
◆=FILM/THEATRE
STANDARDS: EN12277= EN813=
EN358 = EN361 = UIAA=
ASTM= NFPA= ANSI= EAC=
Canada= AUS/NZ= China=








	COMPANY	PETZL	PETZL	PMI	PMI
	MODEL VARIANT	AVEN	SUPER AVANTI	BACKCOUNTRY	PIT VIPER
	PRODUCT NUMBER	C013AAxx	C012AAxx	SG51271	SG510xx
	ORIGIN				
	INTENDED USE	◆◆◆◆	●◆◆	◆◆	◆◆
	COST inc VAT/tax conv-only	£84 $225 €130	£82 $160 €85	£50 $63 €58	£92 $117 €108
	WEIGHT	465-520g /1-1.1lb	410-450g/15-16oz	473g/1.44lb	454-476g/1-1.06lb
	WAIST SIZES	2 sizes 60-102cm/23.6-40"	2 sizes 60-105cm/23.6-41"	1 size 66-142cm/26-56"	1 size 69-140cm/27-55"
	LEG SIZES	2 sizes 42-72cm/16.5-28.3"	2 sizes 42-72cm/16.5-28.3"	1 size 46-84cm/18-33"	1 size 51-76cm/20-30"
	STANDARDS (with chest harness)				-
	WEBBING MATERIAL	Polyester & *HMPE legs	Polyester & *HMPE legs	Polyester	Nylon
LIFE CRITICAL	BESPOKE CHEST HARNESS	-	-	-	-
LIFE CRITICAL	WAIST BUCKLE	3-Bar	3-Bar	Double-D	-
LIFE CRITICAL	WAIST ADJUST	Rear Side	Rear Side	One Side	Combi Waist & Legs
LIFE CRITICAL	LEG BUCKLE	3-Bar	3-Bar	Double-D	Roll-bar
LIFE CRITICAL	MAIN ATTACHMENT EYE	Double Eyes	Reinforced Double Eyes	Web Loop	Reinforced Double Eyes
LIFE CRITICAL	REAR ATTACHMENT (BELAY)	NO	NO	NO	NO
LIFE CRITICAL	POLE STRAP D's FOLD FLAT/WEB	NO	NO	NO	NO
GEAR ATTACH	GEAR LOOPS SEWN EYES	4 -	2 -	2 -	2 -
GEAR ATTACH	CUSTOM GEAR CORD EYES	-	-	-	-
GEAR ATTACH	OTHER HOLES/EYES RINGS	- -	- -	- -	- -
GEAR ATTACH	CARI-HOOK EYES / TOOL LOOP	- -	- -	- -	- -
GEAR ATTACH	FIRST AID or EQPT POUCH	NO	NO	NO	NO
WAIST	WAIST PADDING TYPE	Sliding Thermo-Form	NONE	Stitched foam	NONE
WAIST	WAIST BELT WEBBING	44mm/1.75"	44mm/1.75"	44mm/1.75"	44mm/1.75"
LEG	LEG LOOP WEBBING	44mm/1.75"	44mm/1.75"	44mm/1.75"	44mm/1.75"
LEG	REAR LEG RISER LENGTH ADJUST	NONE	NONE	Elasticated,fixed	NONE
EXTRAS	RFID CHIP	☐	☐	NO	NO
EXTRAS	OTHER COLOURS				
EXTRAS	WARRANTY	3 years	3 years	1 year	1 year
	NOTES	*HMPE=High Modulus Polyethylene with Thermoplastic polyurethane (TPU) abrasion cover	*HMPE=High Modulus Polyethylene with Thermoplastic polyurethane (TPU) abrasion cover		Leg loops covered by abrasion guard
	WEBSITE	petzl.com	petzl.com	pmirope.com	pmirope.com

LIGHTWEIGHT SIT HARNESSES





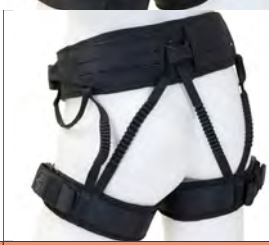



RIDGEGEAR	ROCK EMPIRE	ROCK EMPIRE	ROCK EMPIRE	ROCK EMPIRE
APPROACH	SPEEDY CANYON	BELT EQUIP	BELT EQUIP LOCK	CANYON PLUS
RGH12	1172 1337	CUE021	CUE002	1043
£55 $71 €65	£4362 $5478 €5072	£129 $169 €150	£155 $205 €180	£89 $115 €120
473g/1.44lb	665 572g/1.51.3lb	665-761g/1.5-1.7lb	769-824g/1.7-1.8lb	835-870g/1.8-1.9lb
1 size 66-142cm/26-56"	1 size 57-100cm/23-40"	1 size 70-130cm/27-51"	1 sizes 70-130cm/27-51"	2 sizes 67-110cm/26-43"
1 size 46-84cm/18-33"	1 size 43-71cm/17-28"	1 size 46-75cm/18-29.5"	1 sizes 46-75cm/18-29.5"	2 sizes 48-66cm/19-26"
Polyester	Polyester	Nylon	Nylon	Nylon
-	-	-	-	-
Double-D	Roll-Bar	Double-D	Cobra Fast-Clip	2x Roll-Bar
One Side	One Side	Double Sided	Double Sided	Double Sided
Double-D	Roll-Bar	Double-D	Cobra Fast-Clip	Roll-Bar
Reinforced Web Eye	Reinforced Web Eye	2x Web Loops	2x Web Loops	Alloy D-Ring
NO	NO	NO	NO	NO
NO	NO			NO
2 -	1 -	6 -	6 -	2 -
-	-	-	-	-
- -	- -	- -	- -	- -
- -	2 -	2 -	2 -	- -
NO	NO	NO	NO	NO
NONE	Thermo-Form	Thermo-Form	Thermo-Form	Thermo-Form
45mm/1.77"	44mm/1.75"	44mm/1.75"	44mm/1.75"	45mm/1.77"
45mm/1.77"	44mm/1.75"	44mm/1.75"	44mm/1.75"	45mm/1.77"
Elasticated,fixed	Elasticated,fixed Seat	Elasticated,fixed	Elasticated,fixed	Elasticated,fixed
NO	NO	NO	NO	NO
1 year	2 years	2 years	2 years	2 years
Colour-coded leg loops and tie-in for easy, rapid donning.	CANYON= detachable PVC seat instead of rear leg-loop risers	Reflective trim	Reflective trim	
ridgegear.com	rockempire.com	rockempire.com	rockempire.com	rockempire.com

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STANDARDS: EN12277= ■ EN813= ■
EN358 = ■ EN361 = ■ UIAA= ■
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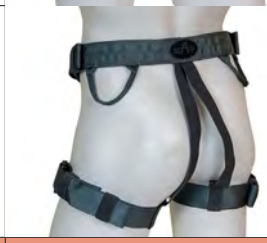


	COMPANY	ROCK EMPIRE	SAR PRODUCTS	SAR PRODUCTS	SAR PRODUCT
	MODEL VARIANT	SPELEO D SPELEO	HARRIER II LITE	OPS	HAWK
	PRODUCT NUMBER	2060 1412	H0001L	H0090	H0003 H0004 [all-bla
	ORIGIN				
	INTENDED USE	●◆◆◆	◆◆◆◆	◆◆◆◆◆	◆◆◆◆◆
	COST inc VAT/tax conv-only	£8272 $10592 €9684	*£198 $240 €273	*£206 $249 €284	*£162 $196 €2
	WEIGHT	945796g/00lb	900g/1.98lb	*850g/1.87lb	814g/1.79lb
	WAIST SIZES	1 size 57-100cm/23-40"	1 size 74-114cm/29-45"	1 size 74-115cm/29-45"	1 size 74-120cm/29-
	LEG SIZES	1 size 43-71cm/17-28"	1 size 42-70cm/16.5-27.5"	1 size 44-85cm/17.3-33.4"	1 size 44-85cm/17.3
	STANDARDS (with chest harness)	■	■■ (■)	■■	■■
	WEBBING MATERIAL	Nylon	Polyester	Polyester	Polyester
LIFE CRITICAL	BESPOKE CHEST HARNESS	-	-	-	-
LIFE CRITICAL	WAIST BUCKLE	Double-D	Double-D (Cobra option)	Double-D (Cobra option)	Double-D (Cobra o
LIFE CRITICAL	WAIST ADJUST	One Side	One Side	One Side	One Side
LIFE CRITICAL	LEG BUCKLE	Double-D +DD on sit strap	Double-D (Cobra option)	Double-D (Cobra option)	Double-D (Cobra o
LIFE CRITICAL	MAIN ATTACHMENT EYE	Double Eyes	Web Loop, alloy D-ring+ 2xEyes	Web Loop	Web Loop
LIFE CRITICAL	REAR ATTACHMENT (BELAY)	NO	■	■	NO
LIFE CRITICAL	POLE STRAP D's FOLD FLAT/WEB	NO	NO	■	NO
GEAR ATTACH	GEAR LOOPS SEWN EYES	4 3 -	4 3 (belt loops)	2	4 -
GEAR ATTACH	CUSTOM GEAR CORD EYES	-	-	-	-
GEAR ATTACH	OTHER HOLES/EYES RINGS	- -	- -	2x 12-hole Molle panels -	1x 27-hole Molle p
GEAR ATTACH	CARI-HOOK EYES / TOOL LOOP	- -	- -	- -	- -
GEAR ATTACH	FIRST AID or EQPT POUCH	NO	NO	NO	NO
WAIST	WAIST PADDING TYPE	NONE	Thermo-Form	Thermo-Form	Thermo-Form
WAIST	WAIST BELT WEBBING	45mm/1.77"	45mm/1.77"	45mm/1.77"	45mm/1.77"
LEG	LEG LOOP WEBBING	45mm/1.77"	45mm/1.77"	45mm/1.77"	45mm/1.77"
LEG	REAR LEG RISER LENGTH ADJUST	Sit Strap	Elasticated,fixed	Elasticated,fixed	Elasticated,fixe
EXTRAS	RFID CHIP	NO	☐	☐	☐
EXTRAS	OTHER COLOURS	■		■	■■■
EXTRAS	WARRANTY	2 years	1year	1year	1year
	NOTES	SPELEO has no leg-loop reinforcement and 3-way carabiner not supplied.	All three main attachment options on one harness. * price given is for black version with 2 bar 3 bar buckle only	* weight with standard buckles - can be upgraded * price given is for black version with 2 bar 3 bar buckle only	* price given is for black with 2 bar 3 bar buckl
	WEBSITE	rockempire.com	sar-products.com	sar-products.com	sar-products.co

LIGHTWEIGHT SIT HARNESSES



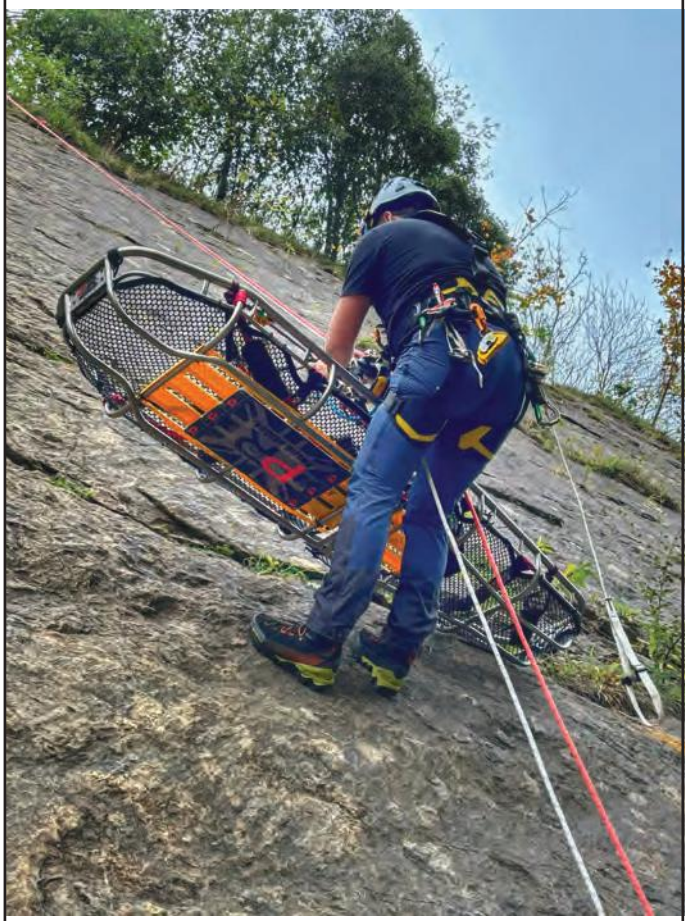





TS	SAR PRODUCTS	SAR PRODUCTS
	BUZZARD	RAID
ck]	H00 18x	H0017xx
24	*£111 $134 €153	*£258 $312 €356
	552g/1.2lb	796-990g/1.75-2.2lb
-47.2"	1 size 74-129cm/29-51"	3 sizes 77-130cm/30-51.2"
-33.4"	1 size 48-82cm/19-32"	3 sizes 50-74cm/19.7-29"
	Polyester	Polyester
	-	-
ption)	2x Double-D	Double-D (Cobra option)
	Double Sided	One Side
ption)	Double-D	Double-D (Cobra option)
	Web Loop	Web Loop
	NO	NO
	NO	NO
	2 -	4 -
	-	-
anel -	- -	- -
	- -	2 -
	NO	NO
n	Breathable mesh foam	Breathable mesh foam
	45mm/1.77"	45mm/1.77"
	45mm/1.77"	45mm/1.77"
d	Elasticated,fixed	Elasticated,detachable
	☐	☐
	1year	1year
version e only		* price given is for black version with 2 bar 3 bar buckle only. Removable waist pad
m	sar-products.com	sar-products.com

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INTENDED USE(s):
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◆=CANYONING/WATER
◆=CAVING
◆=UNISIZE TEAM/VICTIM
◆=URBAN ROPE RESCUE & ACCESS
◆=TACTICAL
◆=FILM/THEATRE
STANDARDS: EN12277=■ EN813=■
EN358=■ EN361=■ UIAA=■
ASTM=■ NFPA=■ ANSI=■ EAC=■
Canada=■ AUS/NZ=■ China=■











	COMPANY	SIMOND	SINGING ROCK	SINGING ROCK	SINGING ROC
	MODEL VARIANT	MASKOON CLUB	URBAN II	TOP PADDED CANYON	CANYON XP
	PRODUCT NUMBER	HAR500	W0022BBxx	C5032BSxx C5029BS	C5030BSxx
	ORIGIN	■■	■■	■■	■■
	INTENDED USE	◆◆◆	◆◆◆◆◆	◆◆◆	◆◆
	COST inc VAT/tax conv-only	£5030 $6440 €6036	£85 $130 €100	£5058 $6475 €6069	£85 $130 €99
	WEIGHT	740g/1.6lb	860g/1.9lb	402502g/14.217.7oz	610-630g/1.34-1
	WAIST SIZES	1 size 70-110cm/27.5-43"	3 sizes 55-130cm/22-51"	1 size 60-120cm/24-47"	3 sizes 70-110cm/2
	LEG SIZES	3 sizes 45-70cm/18-27.5"	3 sizes 45-75cm/18-29"	1 sizes 42-66cm/17-27"	3 sizes 45-70cm/17
	STANDARDS (with chest harness)	■■	■■■	■■	■■
	WEBBING MATERIAL	Polyester	Polyester	Nylon	Nylon
LIFE CRITICAL	BESPOKE CHEST HARNESS	-	■	-	-
LIFE CRITICAL	WAIST BUCKLE	Double-D	Roll-Bar (*Easy lock*-Clip)	Roll-Bar	Roll-Bar
LIFE CRITICAL	WAIST ADJUST	One side	Double sided	One side	One side
LIFE CRITICAL	LEG BUCKLE	Double-D	Roll-Bar (*Easylock*-Clip)	Roll-Bar	Roll-Bar
LIFE CRITICAL	MAIN ATTACHMENT EYE	Reinforced Web Eye	Web Loop	Reinforced Web Eye	Reinforced Web
LIFE CRITICAL	REAR ATTACHMENT (BELAY)	NO	■	NO	NO
LIFE CRITICAL	POLE STRAP D's FOLD FLAT/WEB	NO	*■	NO	NO
GEAR ATTACH	GEAR LOOPS SEWN EYES	2 -	4 4	1 -	1 -
GEAR ATTACH	CUSTOM GEAR CORD EYES	-	-	-	-
GEAR ATTACH	OTHER HOLES/EYES RINGS	1 -	1 -	- -	- -
GEAR ATTACH	CARI-HOOK EYES / TOOL LOOP	- -	*2 *■	- -	- -
GEAR ATTACH	FIRST AID or EQPT POUCH	NO	NO	NO	NO
WAIST	WAIST PADDING TYPE	Detachable EVA	Thermo-Form	Leg Loop Only	Thermo-Form W
WAIST	WAIST BELT WEBBING	38mm/1.5"	38mm/1.5"	38mm/1.5"	38mm/1.5"
LEG	LEG LOOP WEBBING	38mm/1.5"	38mm/1.5"	38mm/1.5"	38mm/1.5"
LEG	REAR LEG RISER LENGTH ADJUST	Detachable Seat	Elasticated,detachable	Elasticated, Fixed	Detachable Sea
EXTRAS	RFID CHIP	-	☐	-	-
EXTRAS	OTHER COLOURS		■		
EXTRAS	WARRANTY	2 years	3 years	2 years	2 years
	NOTES	CLUB is the unpadded version TPU coated seat acts as leg-loop riser connection	*Can be used as a tool holster or pole strap attachment eyes * can also use the 4 sewn (grey) eyes	Also a *TOP* version 366g without leg padding. TOP CANYON has detachable seat in place of rear leg loop risers	Padded waist and more fit than Top Canyo
	WEBSITE	decathlon.com	singingrock.com	singingrock.com	singingrock.co

LIGHTWEIGHT SIT HARNESSES









K	SINGING ROCK	SKYLOTEC
P	DIGGER LIGHT	CT XARRIER
	S0101&B00	G-1173
9	£60 $78 €71	£185 $238 €218
.4lb	550g/1.2lb	970g/2.1lb
8-48"	1 size <110cm/<43"	3 sizes 60-120cm/24-47"
7-27"	1 size 50-80cm/20-31"	3 sizes 45-70cm/17-27"
	Nylon	Polyester
	-	
	Roll-Bar	2xModified Double-D
	One side	Double Sided
	Roll-Bar	Modified Double-D
Eye	2x Alloy Offset Eyes	Web Loop
	NO	
	NO	
	1 -	4 2* (+2 on front of waist*)
	-	-
	- -	- -
	- -	* -
	NO	NO
aist	Leg Loop Only	Thermo-Form
	38mm/1.5"	45mm/1.77"
	38mm/1.5"	45mm/1.77"
t	NONE	Web+Elasticated, Fixed
	-	
	2 years	1 year
accurate on	TOP is the unpadded version	*2x Sewn eyes on sides of waist can hold carabiner as tool-hook. *For attachment of bosun's chair or sit-strap
m	singingrock.com	skylotec.com





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ASTM=■ NFPA=■ ANSI=■ EAC=■
Canada=■ AUS/NZ=■ China=■









	COMPANY	YATES	YATES	YATES	YATES
	MODEL VARIANT	TACTICAL SHIELD	RESCUE	LIGHTWEIGHT ASSAULT	321 LADDERMAN
	PRODUCT NUMBER	208	310	313 320	321
	ORIGIN	■	■	■	■
	INTENDED USE	●◆◆◆	◆◆◆◆	◆◆◆◆	◆◆
	COST inc VAT/tax conv-only	£495 $550 €580	£295 $325 €345	£150 $165 €176	£194 $215 €230
	WEIGHT	1.1kg/2.5lb	546g/1.2lb	680g/2.2lb	1kg/2.2lb
	WAIST SIZES	4 sizes 68-102cm/27-40"	1 size 63.5-127cm/25-50"	1 size 63.5-127cm/25-50"	1 size 66-137cm/26-54"
	LEG SIZES	1 size ~40-110cm/15-43"	1 size ~36-115cm/14-45"	1 size ~36-115cm/14-45"	1 size ~36-115cm/14-45"
	STANDARDS (with chest harness)	■	■	■■ *■	■
	WEBBING MATERIAL	Nylon	Nylon	Nylon	Nylon
LIFE CRITICAL	BESPOKE CHEST HARNESS	-	-	-	-
LIFE CRITICAL	WAIST BUCKLE	2x Roll-Bar (*Camlock*)	Roll-Bar (*Camlock*)	Roll-Bar (*Camlock*)	Snap clip & Roll-Bar
LIFE CRITICAL	WAIST ADJUST	Double sided	Single side	Single side	Single side
LIFE CRITICAL	LEG BUCKLE	Roll-Bar (*Camlock*)	Roll-Bar (*Camlock*)	Roll-Bar (*Camlock*)	*Stab-Lock* Fast-Clip
LIFE CRITICAL	MAIN ATTACHMENT EYE	Web Loop	Reinforced Web eye	Alloy D-ring	Alloy D-ring
LIFE CRITICAL	REAR ATTACHMENT (BELAY)	*■ D-ring+eye+Handle	NO	NO	NO
LIFE CRITICAL	POLE STRAP D's FOLD FLAT/WEB	*■	NO	NO	NO
GEAR ATTACH	GEAR LOOPS SEWN EYES	6 -	1 -	1 -	- -
GEAR ATTACH	CUSTOM GEAR CORD EYES	-	-	-	-
GEAR ATTACH	OTHER HOLES/EYES RINGS	- -	- -	- -	- -
GEAR ATTACH	CARI-HOOK EYES / TOOL LOOP	2 *4	- -	- -	- -
GEAR ATTACH	FIRST AID or EQPT POUCH	-	-	-	-
WAIST	WAIST PADDING TYPE	NONE	NONE	NONE	Only behind waist clip
WAIST	WAIST BELT WEBBING	50mm/2" 127mm/5"	50mm/2" NONE	50mm/2" NONE	50mm/2" NONE
LEG	LEG LOOP WEBBING	50mm/2" 127mm/5"	50mm/2" NONE	50mm/2" NONE	50mm/2" NONE
LEG	REAR LEG RISER LENGTH ADJUST	Elasticated, Detachable	Elasticated, Detachable	None	None
EXTRAS	RFID CHIP	■ NO	■ NO	■ NO	■ NO
EXTRAS	OTHER COLOURS	■ ■	■ ■	■ ■	■
EXTRAS	WARRANTY	1 year 5years	1 year 5years	1 year 5years	1 year 5years
	NOTES	*grab handle on rear together with a small Tri-D-Ring and a large eye below. *Polestrap side eyes might also holster a narrow shafted tool.	*320USN version has contrasting stitching and meets NFPA	*320USN version has contrasting stitching and meets NFPA	Intended as a firefighter belt or vict harness in the style of an enhance French Pompier belts. Colour-coded leg loops
	WEBSITE	yates.com	yates.com	yates.com	yates.com

Details, prices and specifications can change so consult the continually updating version of this article in our **ROPE EQUIPMENTBUYERSGUIDE**

BUILT FOR THE VERTICAL JOURNEY.



GT LITE XT.

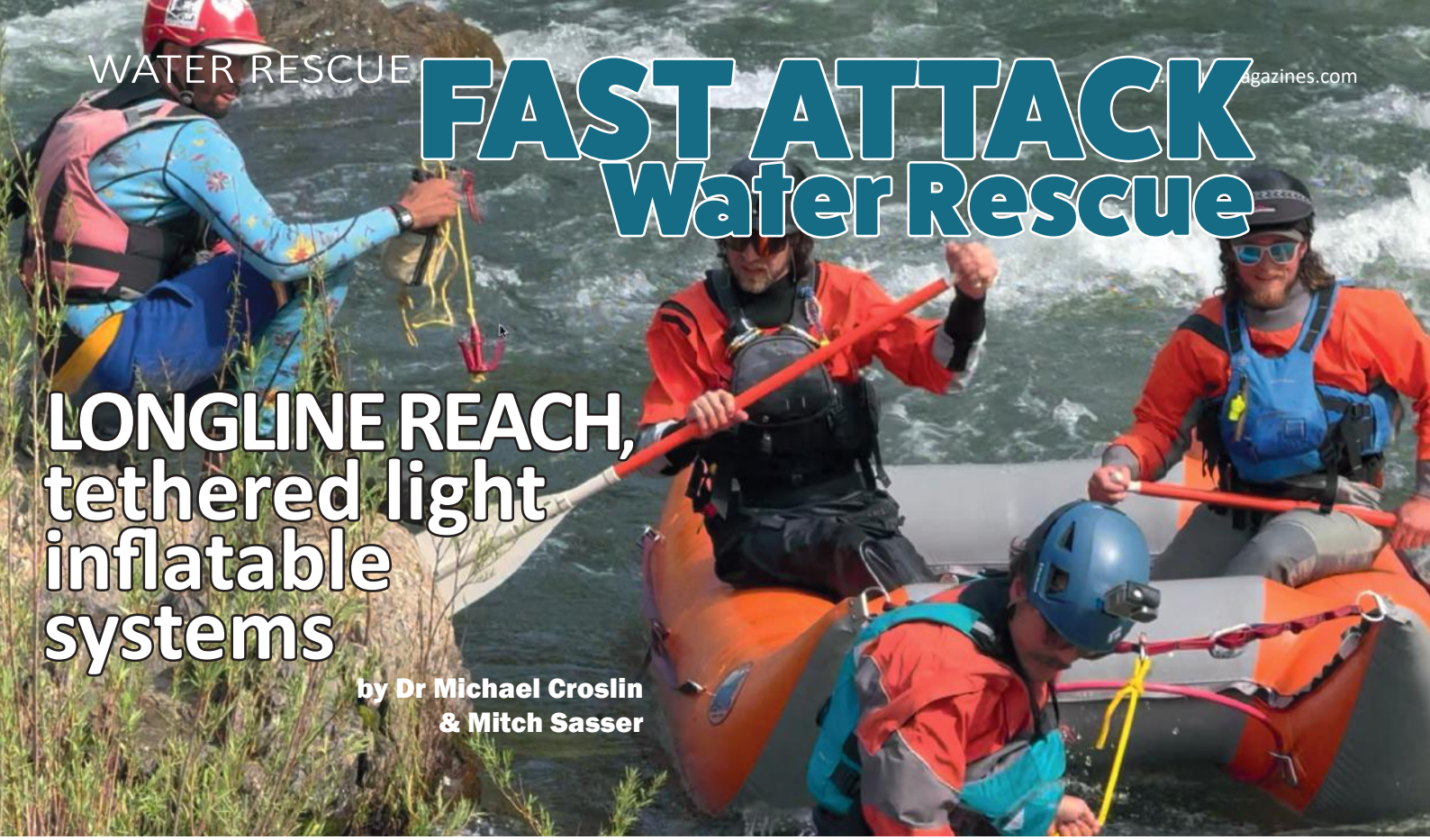
The GT Turbo XT is a full body harness with an integrated Turbochest ascender for the most intensive and complex work at height. Certified according to both ANSI and EN standards. The Turbochest is equipped with wheels to reduce friction on the rope and is easily removable and replaceable thanks to the Thor openable ring. The connection of the sit and chest parts is made with webbing instead of a carabiner for exceptional ventral comfort. The padding uses variable thicknesses and stiffness to provide the right amount of support and comfort for every part of the body.

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FAST ATTACK Water Rescue



LONGLINE REACH, tethered light inflatable systems

by Dr Michael Croslin & Mitch Sasser

MERT Swift 2.0 refers to a strong effort to revise training for professional swiftwater rescuers to reflect, through evidence based research, what actually works in the field to keep rescuers safe. Strong agreement in the professional swiftwater rescue arena and the whitewater professional guiding realm as well as in the Fire Agency and SAR teams is that what we carry is what we use when responding to time sensitive swiftwater emergencies. Swiftwater instructors from every legitimate training organization I am aware of , understand the importance of adding line-capture and a personal carry waist-worn throwbag to their PPE armamentarium and understand the importance of remote standoff connectivity, force multiplication and the essential efficiencies it brings to rope management in swiftwater rescue. So important in fact, it is now a skill-set that must be demonstrated for certification and team status for *CalFire* and State Fire Marshalls Swiftwater training. *Rescue3 International* has formalized its inclusion as well and is and has generated speciality training in its use with 37 instructor trainers trained by Sean Norman following the same guidelines developed for Cal Fire Swiftwater teams.

TERMINOLOGY

MERT=Minimal Equipment Rescue Techniques. *NB: outside of the US, MERT also stands for Medical Emergency Rescue Team and is the trauma response element embedded in a special rescue, heli or military team*

R2 is a configuration for rafting. 2 paddlers(rescuers) in the boat. Raft 2. Rescue should follow the competitive edge in raft racing and competition.R2-R4-R6. R2 is the best configuration for moving in. Light and fast.

In the professional guiding realm, there is a center of excellence forming that has for the last 2 years evolved from a partnership of guides and outfitters, *Tandem Rescate* and *Crossline* doing research and training guides on the Kern River drainage in Calif. Mitch Sasser is head Guide at *Sierra South Mountain Sports* and has taught a series of MERT Swift 2.0 courses there over the last two seasons and will be on going year after year.

The Kern River in California is the #1 river in the US for Swiftwater rescues and drownings in high water years. World class whitewater runs with a major trans-Sierra highway running next to the lower canyon with easy access to the upper canyon and the remote forks of the Kern's 20+ miles of continuous class 4-5+. Outfitters and guides like to rescue their own clients and the Kern river guides community has embraced and adopted the upgrades suggested in this article and the re-set described here. These revisions make team based execution of critical floating rope based interventions in remote areas, possible in small group numbers. This is based on teams separating into smaller groups far away from vehicles and gear caches and is more of a hasty team format or a group of guides running a serious section of whitewater and responding to mishaps in real time.

We focus here on personal-carry PPE and simplified floating rope interventions and tactics so that much more can be done with much less in a fast attack intervention. It starts with repetition of skillsets to develop competency with throwbags AND line capture.

MERT training starts with time-compressed versions of all the revised floating rope-based interventions for personal escape and partner-in- trouble support that trained swiftwater

technicians are familiar with.
These include:

- live bait,
- v-lower,
- foot entrapment,
- airway support
- snag line foot release,
- stainer, kayak pins,
- undercuts,
- recirculating eddies,
- rooms of doom,
- midstream swimmer access and recovery to avoid traumatic swims,
- self rescue remote anchoring,
- Kiwi method routinized by line capture,
- ascending against the current to access,
- enhanced stream crossing techniques that protect rescuers prior to entry.

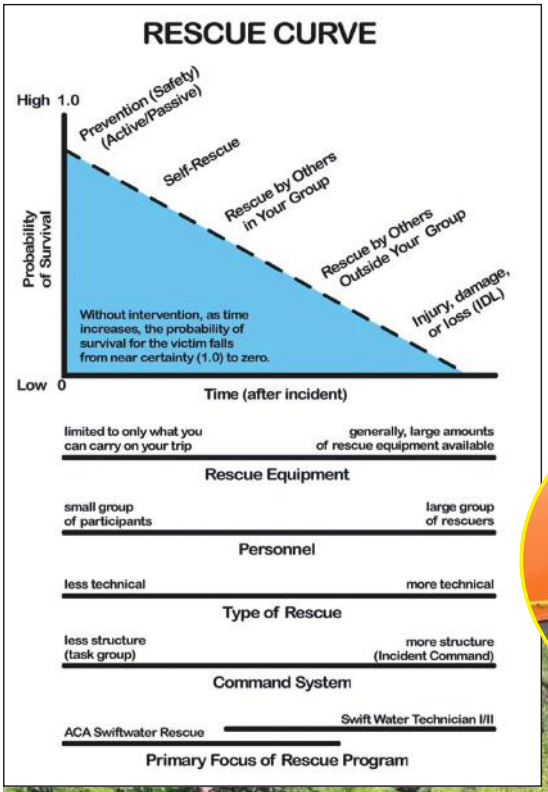


Bankside technicians position a 'ghost' boat to ascend a vegetation line or more dangerous section of water uncrewed. *INSET PIC-Technology can already help in this regard with remote operated water rescue craft and boards able to negotiate currents and rough conditions to reach station. These systems are seeing increased used in less remote settings*]

In essence, access methods and escape methods that reduce risk and increase the options in real time. Students get it. No pun intended. Their motivation to develop skillsets soar and rapid progress is made towards working together as a team. The development is truly remarkable, students are hooked. We then introduce Longline Reach tethered light inflatable systems. The main topic of this article. It is the go to method for fast access that is the apex rescue method for non- motorized safe fast access. Details are important.

With heavy vegetation, the fastest route out for a search or rescue is a belayed, tethered longline anchored from either shore to a self bailing raft, preferably a frameless cat to R2. Paddle down and along the outside of the vegetation line on a fixed longline controlling the descent ALWAYS from inside the boat. The best rescuers in a raft are guide-level experienced, they can feel the boat, see the boat, know the boat and trust their judgement better than any shore-based supervisor or certified awareness 'brass' who might be calling, running, hauling or otherwise sidetracked in the middle of a dynamic, critical tethered boat rescue in motion. Train your boat crew right, and let them command the boat control. Yes or no go at the start. If a team leader has to micro-manage boat control from shore, your program is doomed. Top tier programs that recruit members with guide level experience understand what we are saying. This is especially true for motorized boat operators. There will come a time when ALL boat operators are trained to place an empty/uncrewed light inflatable on target, when conditions are too high-risk for anyone to be in the boat. Unless you have pre-set containment prior to water entry in serious flood conditions, you will eventually regret not having this capability. Back to the time-compressed clean up plan.

"Tethered boat control" as it is taught in every Swiftwater training manual published to date does not include the revisions we are suggesting here, they are important, field tested and reflect changes that every program should strongly consider implementing into their programs from the very start. These revisions make team based execution of critical floating rope based interventions , all of them currently in training manuals that need to be performed in "airway time"actually possible in small group numbers. The *Rescue Curve* as described by Kaufman (overleaf), is the reality, baseline truth. Programs, agencies, recreational boaters, rafters , kayakers, all river users and emergency responders need to meditate on it. Self rescue first, then teammates, carrying with them everything needed to prevent and respond to anything possible in real time. This includes a serious look at skills development, learning how to compress timelines, and the importance of training together as a team in the field setting. Start with how to place a 'ghost' light inflatable along dense vegetation lines and have it hold station there. It is unmanned and controlled from shore. The picture above shows a crewless 'ghost' boat being lined up for deployment via an upstream line. At the very least this is a lifesaving floating escape platform nearby for victims to escape to. True remote controlled platforms are becoming more common in marine and open water environments and when proven able to deal with congested swiftwater, will see a use with teams that have the capacity to A) afford to purchase and B) have the carry-capacity to get such systems into very remote areas. They have the ability to carry out a rescuer under power or to be sent out to a casualty with no crew and in many cases with two -way comms between rescuer and victim. This can operate without a tether but a tether is often used as a safer means of retrieval should the power system fail or the battery run out. There is even at least one fully inflatable raft with a remote control system. [See the WATER RESCUE BUYERS GUIDE for a full list of the current surface ROV models]. Until then these rope-controlled ghost-boats are not ideal and also need to ensure that the control/retrieval lines do not interfere or become entangled with any operations going on in that area but it's better than nothing.



application.

The majority of true swiftwater emergencies that require fast resolution to prevent bad outcomes can be managed safely with variations of three main rope based interventions, pendulum belays, tension diagonals and Tethered boat systems that rely on strong smaller diameter floating rope based interventions, personal carry, and substitution of multiple large diameter static longlines with a single poly/dyneema 250-300ft ⅜ or 5/16 longline for downriver, or hasty team . For river trips or fire, ems, recreational. Lighter loads, single rope based longline interventions with tethered light inflatables with greater range and faster application., Every team member or guide is trained



Next level capability; we put trained R2 rescuers into the boat. But we do it differently than manuals suggest. Faster, less complicated, safer, more capable and flexible in performance with greater range than any other tethered boat system, 2-4pt, or highline boat on a tether, or variable control point as some refer to it. These are important systems, but they generally speaking rarely save lives.

I was present and part of the original team that designed and tested these systems along with Jim Segerstrom, Marty McDonnel in the early days of Rescue3. We used and tested these systems in the professional setting extensively,. They work, have limited range, require heavy static rope, coordination from shore that can be problematic if your rescue is time sensitive. They sit primarily at the end of the “Rescue Curve”. Important, but very limited in functional fast on how to remote vector to help control where the tethered boat needs to go by adding mechanical advantage from line capture Every Swiftwater program should know and train on how to safely evacuate from outside and inside vegetation lines at high water and during active phase flooding, to do it quickly and as safe as possible. “ It is possible to lower down an inflatable raft down the outside of vegetation lines safely with a trained crew of two rescuers controlling the descent off fixed smaller diameter floating poly/dyneema rope 3/8 in, 200-300ftattached to a rope bag with an integrated, mil spec 2inch tubular anchor strap with a Chouniard type harness closure that attaches around the rear thwart of a frameless cat. [Images above]. This is the main stress attachment to the cataraft, it is pulled through and back-threaded around the thwart, see image.. This allows the crew in an emergency to quick release the raft, rope bag from the system, the rope in the bag will move forward and under a cam strap, or ideally



1/2" BW-HR3
Strong & durable hybird
Polyester/Polypropylene design
5,000 lbf. @ 89 g/m



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Long line vectoring. One of two or three Reach devices deployed from either bank, capture the ascending line and helps keep the rescue raft in tight to the vegetation line to search or recover a casualty

flexible PVC-tube threaded with ¼ inch accessory cord bent into a U shaped containment guide attached between the forward tubes to keep the boat tracking and responsive to setting ferry angles with inner confines of the tubes beyond the cockpit of the frameless cat. This works exceptionally well and allows the R2crew the freedom to power out with slack, free running from inside the boat to run a complex set of moves through a rapid, correcting their ferry angle to cross stout current, cross a river with a line deploying without shore based line management resisting or not keeping up with their progress. Similar to a drone with a spool system that feels no pull as line is deployed freely. If your rope bag can be accessed on both ends, you can no knot around the thwart with the bitter end of the longline. We prefer a quick release thwart strap running through and sewn into bag{custom build|

Again, this gives the boatmen full power and control to R2 to their desired chosen line down stream or to set a ferry angle and power across the channel with the least amount of drag on the frameless Cat. By the way, this is also the safest boat assisted line crossing method when there is no one on the opposite shore, or to move a vectoring rescuer across when deploying a longline initially.

The rear tube anchor strap has a progress capture device attached to it, we have used everything from a *Highnovate Qrab*, a *Safeguard* from *Madrock,* a *GriGri* to a *Munter hitch*. Smaller the better, if its personal carry.

So we have a tethered cataraft set up to free run quickly under R2 paddle power, or it can be lowered backwards with the crew weighting the rear of the boat, one rescuer controlling the belay device the other using draw strokes to help move laterally, this maybe all that is needed to move down a vegetation line, but it maybe necessary to be pulled into the vegetation line to stabilize holding station or to pulled away to move around obstacles. We do this in real time exactly where the vectoring is needed as the boat crew suggests. Here line capture is used, as needed to assist the boat crew holding the desired line

We keep lateral vectoring mobile, and removable, keeping the longline as clean as possible or fellow guides work along the longline deployment, one on each shore to vector when asked for, added or removed.

Again, when an emergency occurs guides are trained to immediately split eddy out river right and left. All have line capture personal carry and have trained in longline management and deployment fast access tactics and know through experience where to position themselves to help vector the boat where it is needed quickly. Pretty much every rescue in the downriver setting can be managed this way with training in airway time, this is not theoretical. Think of live bait , live boat with R2 paddle control on a longline extended 200-300 or more feet downstream with pendulum containment for the boat and crew, and the ability to dump the system and paddle out under free R2 escape.

If possible. we ALWAYS try to approach from shore downstream to upstream, in full PPE attempting to access from below by bushwalking from below to access from shore, this is not always possible as vegetation lines get pushed further out into fast moving current, when rescuers find themselves doing monkey swing must make moves to avoid getting pinned on vegetation. **STOP**. This is where the risk matrix shifts in favor of a tethered light inflatable approach to doing business.





This is where MERT (Minimal Equipment Rescue Techniques) makes sense. [*NB: terminology- outside of the US **MERT** also stands for **Medical Emergency Rescue Team** and is the trauma response element embedded in a special rescue, heli or military team]*. It is the ideal combination of light weight compactable gear that keeps you safe, helps you signal to others, helps you plan and execute escape, allows you to make a connection to your partner, and creates a safety net around what you do in the river.



You will need the following to become efficient with river progression and creating protected systems that can get yourself out of a jam as well as help your team provide a quick simple solution to the problem.

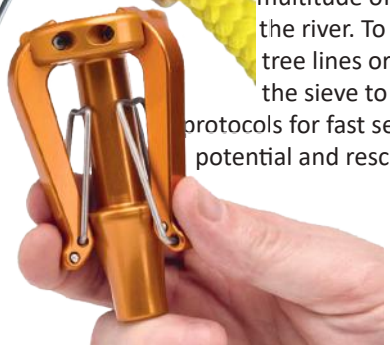


Start out by getting a throw bag system that is waist worn like the *Morice Waist System* far right, comfortable back band for support with features like pockets and make sure the throw bag is deployable separate from your waist belt. Choose a high strength poly spectra or Dyneema blend for your rope. [see the **WATER RESCUE BUYERS GUIDE** for a full range of rescue throwbags and throwlines]

Add the following to your Personal kit:

- 4x locking carabiners. One or two of which can be P*etzl Rollclip* or *DMM Revolver* style carabiner pulleys.
- 2x prusik cords that are compatible with your throw bag line.
- 1-2 Micro Pulley´s - High Efficiency
- 1 tubular webbing 10-12ft
- 1 *Crossline Reach*
- 1 River Knife
- 1 Whistle
- 1 pair of Gloves
- PPE- Helmet, PFD, Thermal Body and footwear.
- 1 200ft Poly Spectra or Dyneema rescue line with a handy transport line bag that is adaptable to the center thwart of a whitewater boat.





With this set-up on each rescuer there is no need to bring down the equipment stash from the Fire truck or even think about running back for it. The key upgrades to standard response equipment are the *Crossline Reach* device (mini rope-grapple) and the 200ft x 8-8.5mm diameter long line to solve all access and manoeuvring needs. in rivers, channels and flooding in rural or urban areas. The truth is once your team has set off into the flooded waters of the night it is critical that each person knows how to effectively utilize their PPE for their own safety, for the team and in the situations where fast attack action is required in all entrapments, pins and unstable scenarios.

In this kit list, the *Crossline Reach* (pics left) is the cornerstone to enhanced techniques. Now that we are into discussing the skill-sets that each of you need to develop with the MERT kit, understand that those who have researched and perfected these methods will be the strongest in-water rescuers. They have put in the hours and have gained the experience to know when to get in the water and when to stay out and use other techniques to keep the individuals and the team safe.

Professional guides on the Kern River in California have learned over hundreds of hours of navigating class 3-5 rapids, how to deal most effectively with a multitude of the most hazardous obstacles in the river. To access around and penetrate into tree lines or to position a platform upstream of the sieve to work from. They have standardized protocols for fast setup on each rapid that has this potential and rescue teams should too.

MID-STREAM ACCESS - KIWI METHOD


Throw past object, let extra rope float downstream


Capture the rope with a *Reach*, retrieve to shore, attach to rescuer


Tensioned pendulum belay & hand-

One individual equipped and trained with MERT and a *Reach* connected to your throw line/bag can capture another throwline from the opposite shore. This establishes a line across a channel in seconds and your range and scope of contact has doubled between the two throw bags. This simple addition to your rescue repertoire has been used by many in SWR for years but remains a fundamental step forward in swiftwater rescue progression that has yet to be taken.

We have covered some of these things in previous articles in **TECHNICALRESCUE** for decades now showing how line capture continues to provide next steps to operating fast attack access options such as looping mid-stream obstacles with throw bags and a *Reach* and then using the loop pivot point mid-stream to either pendulum out to the site or bring the lines back to shore so we can transition into tension diagonal access. We also use the *Reach* for setting up stabilization lines and best of all for all of these procedures is that no rescuer needs to get wet!

One can also throw and place the *Reach* as a remote anchor to the far side of the channel (snagging vegetation or rock) which helps enormously when time matters and there is no way or quick safe way to get another person on the far side to help.



[pic right:] If you or your partner are stuck behind an obstacle, structure or in a room of doom that cuts out line of sight visual contact, use your throw bag as a signal by tossing it out into the current letting it float and dangle downstream of your position. The *Reach* equipped and trained partner will see the signal and clip to it immediately to evolve into extraction.

Line capture also extends our reach out further to capture a line being thrown to a rescuer working their way towards shore through high velocity flows where either the rescuer in the water deploys their bag towards shore for shore-based line capture or the rescuer will have prepared their *Reach* for a close proximity line capture of the throw bag by way of connecting their reach to a flip line or 10-15ft piece of webbing allowing for further extension when throw bags fall short.

Personal use of the *Reach* and your throw bag is also applicable to retrieving or accessing lost or run-away equipment, paddles or boats so we can all avoid a nasty swim. With all of these options just imagine how crossing a swift moving channel has improved for our own safety. Remote anchoring from point A to B and then to C is real and it can greatly improve your confidence and precision for making the move and getting there! Training with these tools as part of your PPE kit will increase your ability to access faster difficult sites in complex moving current. By utilizing these main systems you will also be protected by the character of in-line flow and lateral ease of movement in pendulum crossings, tension diagonals and long line Reach systems. Operations and system choice become more versatile when we have one or two more people on the far side of the river and (personnel-allowing), it is best to have rescuers on both banks early on in the approach, not just deployed on arrival at the scene.

The top tier of Fast Attack Access is a team able to read the current and be equipped with a small, light weight inflatable. In many situations they can paddle over freely knowing that a belay line, tension diagonal or long line *Reach* system tethered onto the boat will keep them out of the water and provide a platform for them to work from.

All this might make it sound as though *Reach* operators don't want to get in the water. Well, that is true in situations where we know that we shouldn't. Don't lose sight of the focus of



over-hand against current


Objective achieved, return by tag-line pendulum

this article - **to more safely access a risky rescue site**. When you do it, do it protected. With a situation where no boat is available a strong swimmer may be necessary. Your normal strong swimmer set-up is protected by the QRS Belt and the pendulum that should swing them back to shore depending on the current. Pre-set vectoring for live bait takes longer to set up especially if you need to vector to the opposite side of the live bait deployment. With a *Reach* you can skip those valuable seconds in communicating to actually accelerating the process into a mid-stream dynamic connection. In the video-strip above, If you are working a one-sided live bait scenario and the pendulum does not finish at shore, a *Reach* can be deployed


Self- lowering towards a sieve using a boat-anchored lowering device on a fixed line.

at a much wider range of contact from shore across the live bait line to clip and vector into shore accelerating lateral progression out of the current.

Let's progress into a situation where you have a *Reach*-equipped thrower on the far side of the channel allowing for capture of a raft or a strong swimmer's live bait line mid-stream creating a V-Lower (Y-Lower) in seconds after departing from shore while aggressively swimming towards the objective. This is one go-to method for access to sieves, pins, undercuts and even strainers where we can see that there is a high probability of getting hands on and in and out with the human power on shore. To do this you need to know the current well enough to recognize if it is too strong for the rescuer suspended in current or too strong for the tenders on shore to manage. Visual


Reach captures the 'lowering' line behind the raft to enable the boat to hold its line close to the bankside vegetation upstream.





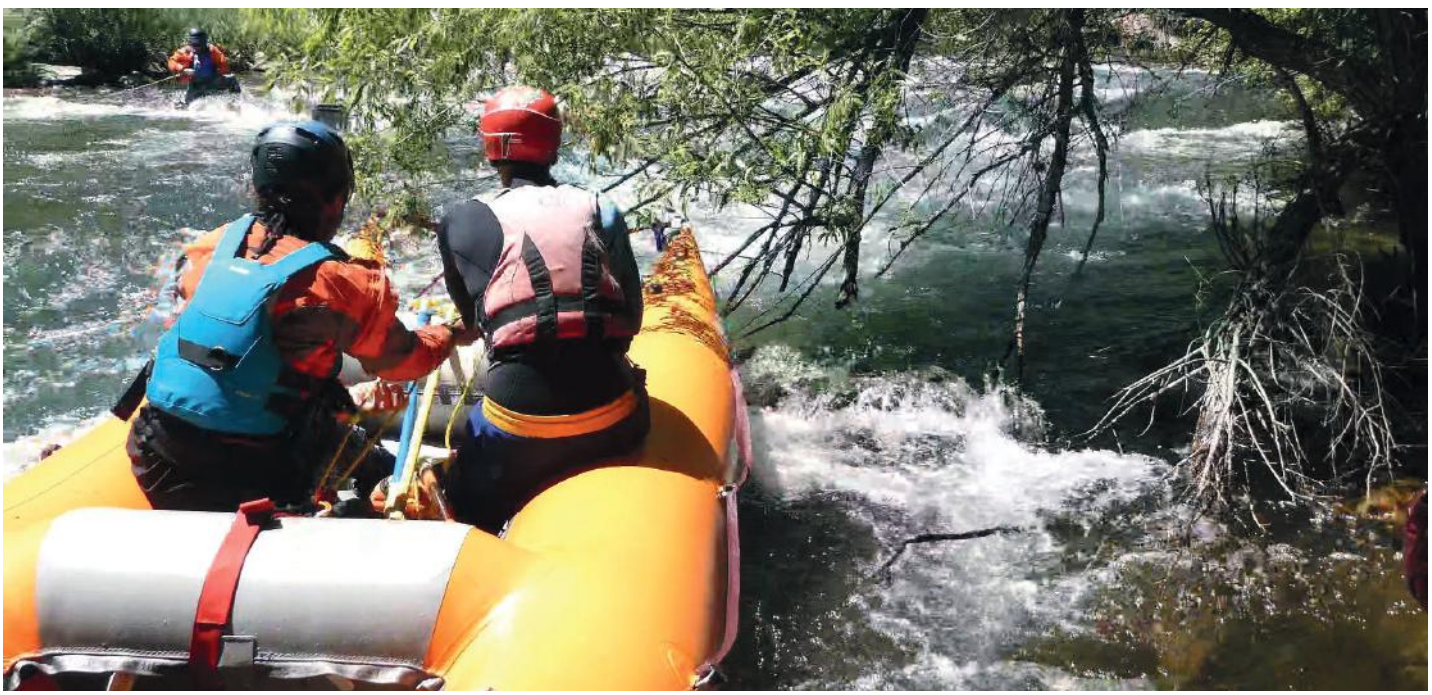
contact with the rescuer is a must. Excellent swimming skills and superior throw bag / *Reach* throw, clip and retrieval for second throw skills are a must.

[Pic above:] In a situation so dangerous that no rescuer should enter the water you need to skillfully utilize the previously discussed long line *Reach* ghost boat system, vectoring a small inflatable out to the site with pure rope management. If the subject is out of the water they may be able to hop into the boat and then you can pull them to safety!

[Pics below] If the subject is in need of hands-on assistance from rescuers, one or two rescuers should be in the boat with paddles. Keep the boat light and always weighted towards the center and rear of the boat so the gloved tenders on shore can haul with ease. Get clear on the fact that Cat boats plane on the surface better than rafts do. Rafts have a lot of friction on the floor and its self baling action. Analyze the water flow and gradient thinking ahead to apply a quick hauling system to ascend out of what you got into.

Don´t panic. All the equipment you need is in the PPE kit we listed earlier. Do not continue to over dimension the equipment or systems in fast attack scenarios. Pendulum swings, tension diagonals and long line reach vectoring are in-line systems with the flow of the current. You are not working against the river but rather with it.

Where shore line travel is limited or challenged by dense vegetation, trees, huge boulders and other debris, the way in is from upstream with the Long Line Reach system. The boat we recommend in these situations is an inflatable paddle cataraft









weighing around 34kg/75lb, no frame or oars needed just the R2 format with paddles. This is best craft for this work possible! Setting up the **Long Line Reach fast attack system** is simple. A higher anchor point upstream and above water level will help keep the first portion of the long line out of the water. It can be anchored on either side of the channel This system depends only on a single shore anchor that can be managed initially in three different configurations.

1. high bank fixed anchor 10ft above water or so, unmanned. Full descent control is with the boat crew and they can ascend against current with pull power in combination with a progress capture device attached to the rear thwart anchor as previously mentioned. The boat crew stacks flaked rope needed to power out on top of engaged belay device once close enough for line capture, then uses the belay device to descend in v-lower format .

2. Manned belay from shore initially with 50-100ft of slack then lock off with munter hitch or no-knot. The boat crew manages descent once slack runs out.

3. In less remote settings with access to heavier equipment from roadside vehicles, EMS/Fire/SAR, can use a *Harkin* Winch system [see ad on next spread] to turbo power full return of boat and crew back towards the anchor even in stout whitewater. This system was devised by Dane DeBoer inventor of the *DD Rescue Sled* [a bespoke winch constructed in the same way as a sport fishing multiplier reel] who collaborated with us to give fast upstream hauling. He uses drill power to haul against the current. This is fast and allows precision control. Very cool.

4. Longline Reach systems are not limited to 250ft on downstream reach. We have tested them out to 450+ even on steep gradient , technical water. This is the most practical, flexible long range tethered boat system that allows one sided fast access with minimal set up time and preset containment for the boat and crew.

5. The boat crew can separate from the longline easily in an emergency and R2 paddle out, or it is often the best route to eddy out. The line capture rescuers will break down and recover the mainline. All other tethered boat systems, 4 point, Highline boat on a tether will, if they fail, drag a rope/rigging nightmare downstream along with boat and crew.



Back to the Long line and once rigged to the boat with boat operator descent/ ascent control they can paddle out into the current at an upstream ferry angle to ferry with the long line connected to the rear thwart and stern facing upstream and trailing behind through the center of the craft while the tenders on shore, who have a portion of the long line, give slack, feeding out the line during the R2 paddle downstream towards the far shore while navigating the rapid. The need for getting out mid-stream or within *Reach* range is to obtain control of the craft by clipping and vectoring the line.



As the paddlers turn downstream from their peel out of the eddy they paddle towards their objective while the far shore will deploy their reach and capture the long line creating the V-Lower midstream. Tenders of the long line on shore will lock off their belay of the line while descent is now transferred over to the boat operators who begin to manage their descent towards the objective. For lateral movement additional Reach operators further downstream can connect to the long line and vector as needed. If the situation is such that you are working on penetrating into a tree line or branches that hang out over the current or are in the current, maintain reach vectoring in order to approach at the best angle.

With the Cat boat and the *Reach*-equipped PPE kits there is nowhere on the river we cannot access! As you begin to train these methods you will be surprised how light and easy it is to manipulate, belay and control these crafts in high velocity currents. Remember you are not in the river you are controlling a system that planes on the surface of the water so the loads are easier on our bodies.

Many thanks to South Sierra River Guides for their help and support with this field research, they spent many days developing their skill-sets, volunteering their time for the common good.



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BATTERY RECIPROCATING SAWS + BLADES

& the latest version of the Milwaukee SAWZALL

A quick history.... long-time readers will know that we've been banging on about battery reciprocating saws for all kinds of rescue uses since the introduction of the higher voltage *DeWalt* saws in the early nineties. If you had to choose just one rescue tool out of hydraulic, cutters, combi's, chainsaws, bolt-croppers etc it would probably be the battery reciprocating saw - while it does most things adequately, usually taking longer, it does some things fantastically well and for its size, weight, cost and versatility of power source, it is hard to beat.

That early *DeWalt* we mentioned was effectively a copy of the original *Milwaukee Sawzall* that came out in '91, but *DeWalt*'s had a 24v battery rather than the original 18v *Sawzall* and this was enough to give us a much more viable option for cutting into vehicles as well as other materials including wood and breeze block or light brick depending on your saw blade. While we were concerned with their applications in technical rescue, US Firefighters quickly adopted them for firefighting- using them to cut the predominantly wooden roofing in order to ventilate smoke from an active fire via PPV fans. This called for an upgrade in blades for multi-material cutting - nail embedded wood. Blades that were quite thin with closely separated teeth for metal evolved into much thicker and deeper, more widely spaced teeth that didn't bend or shatter as soon as the going got tough. Such blades have continued to be modified and improved upon such that the *Milwaukee AX, Torch* and specialist blades from *Lennox* were the ones to be seen with at a fire incident. More on blades shortly. The next big step up was the replacement of Nickel Cadmium batteries with Lithium Ion. Our earlier recip saws and tools from *Milwaukee, DeWalt* and *Makita* using the larger format batteries - M27/27v in the case of *Milwaukee (*and then M28/28v but now discontinued), could now reduce in size back to 18v as batteries improved such that the M18 - 18v (*FUEL*) series from *Milwaukee* took over from and replaced the larger 28v. These are now so efficient they're running hydraulic cutters and spreaders, long thought to be beyond the ability of all but the largest batteries. Without the smaller battery attached, there's not much visual difference between a 2010 model and the one we have been using now for almost 2 years. But there is. Brushless motors are now the norm reducing wear and maintenance and improved seal against wet and dust. Our version doesn't have the *Bluetooth* to wifi management control function of their *One-Key* system but we do have it on a *Milwaukee* electro-hydraulic cutter on which it is of far greater value as it allows remote cutting - not something you'll be doing with the recip saw.

The batteries are of course a key difference - where we were once using a top Ah of 3, 4 or 5, we're now using 8 to 12 and this will continue to increase. The 8Ah option is much lighter and squatter than the 12Ah which adds a whopping half a kilo/ one pound over the 8Ah and is 1cm/0.4" taller and longer so it can have an influence on the tighter spaces that you can get into and still manoeuvre the saw. We use the 12Ah on a chainsaw too and really notice the increase in grunt. The 5Ah is still a great compromise between size, weight and bulk and performance, you can see the difference in size in the image opposite. For the recip saw, we're more concerned with the duration offered by the 12Ah but it really does add to the operational weight and bulk at over twice the weight of the 5Ah battery. The sheer grunt of a 12Ah on the recip is not something we use quite so much because we mostly don't want to force the cut







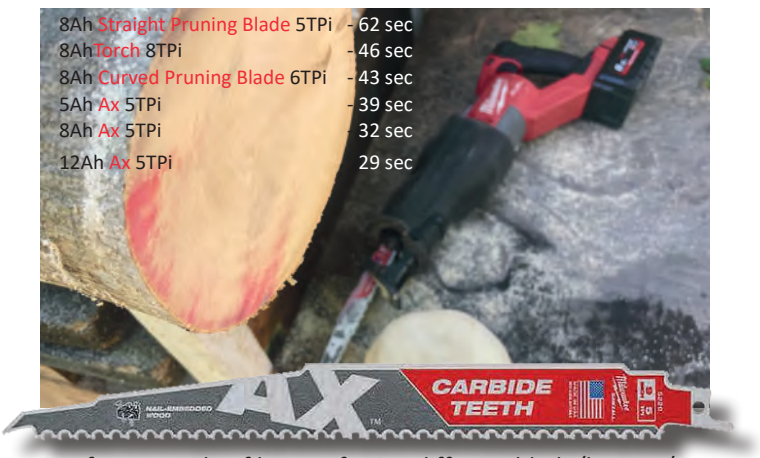
as we might do with a rotational cut with a chainsaw but the 12Ah can handle far greater force than the 5Ah. The dedicated wood blades on a recip saw are a narrower slicing blade than the wide chipping blade of a chainsaw and it doesn't appreciate trying to rotate the cut too quickly; it will bind up faster and become less efficient as the cut progresses. Vibration is a '*Goldilocks*' thing - you need to apply enough pressure at the saw's pivoting shoe to keep the blade fully engaged but not force the cut and cause the reciprocation speed to slow and possibly stall particulalry as the battery power goes down. This slowing is what causes increased movement of the target material and increased vibration is quite substantial at the best of times (hence not using for impales), it will also accelerate overheating of the motor and draining of the battery.

Talking of impales, let's get back to blades and there's no doubt that if you were to choose just one blade to do most jobs it would be the longer *Ax* 5TPi blade (or equivalent) in either standard or the wider HD version or possibly the more metal-oriented *Torch* 6TPi because it is even more robust. The 'multi-role' versions of the *Ax*, also called 'Demolition' blades can cut wood, metal, plastics, brick and breeze block. The question is, are they jacks of all trades, master of none? Our extrication man Nick Appleton will discuss carbide metal blades in detail shortly for extrication but the 'demolition' versions are super-tough, multi-role blades that are necessarily quite coarse so, for more focused work requiring less vibration and cleaner cuts in metal, the finer toothed but durable, dedicated metal cutting blades (for vehicle A/B/C/D posts, hinges and sheet material) are still hard to beat - but of course - that's if you've got a selection to choose from in which case you might also go for much sharper, pruning style blades for wood of which the Ax does have its own version. This would be for for clean sawn timber, shores, posts etc. (with no nails/screws/metal furniture embedded) rather than live wood but recip saws can be co-opted into use for storm work if the chainsaws are already deployed. Indeed, if a vehicle even carries a chainsaw, it will usually be just one so a wood-cutting-equipped recip-saw has often been a useful addition for clearing peripheral branches from downed trees blocking road and railways or in an emergency with person's trapped. It was realised early on that impales involving wood are better dealt with using a small chainsaw or even a hand pruning saw than with a reciprocating saw because of the excessive vibration and movement that can crop up especially if being used by an inexperienced operator, but dedicated, extremely sharp pruning blades certainly improved this for a while (as we'll explore shortly). Metal-cutting blades, using finer teeth could be used on wood with care but it's *Hobson*'s choice as to whether the finer teeth TPI of ≥24 blade gets through with less vibration before the teeth bind up (keep switching out blades?). In all cases, where a casualty's injury can be exacerbated by uncontrolled movement of the impaled material, whether wood or metal, it needs to be held as firmly as possible, as close to the blade as possible either mechanically using clamps or manually. It's much easier to control movement close to the blade than distal to it with an exaggerated amplitude. No matter which type of blade you



choose, make sure that they are hardened/heat-treated - the majority are and certainly for the named brands but as with everything these days- there are plenty of unknown brands. Some not bad, like the EZARC we're showing for wood cutting below, and some very average.

In more recent times we have seen the introduction of curved pruning blades akin to arborists' Japanese handsaws. These are much better at encircling and 'hugging' branches during the cut, pulling the material towards the blade rather than pushing it backwards and forwards in that low-frequency vibration we most want to avoid. Milwaukee themselves don't yet produce a curved blade pruning blade so we had to go to the dark side to test these against the straight blade and to keep things fair - we used straight blades from the same company rather than *Milwaukee*'s own 6TPi blade. We are using green wood to compare performance then we'll discuss the techniques and best practice using a recip saw with carbide tip-metal and multi-use blades, most of which also applies to wood and softer material cutting like brick and breeze block - we've never had much success with cutting heavily aggregated concrete with recips despite some laudable specialist blades using diamond and carbide grit blades - this would either have to be very small sections of concrete with clear areas of concrete between the aggregate and/or an absolute last resort because you can't get the hydraulics or disc-cutters into play. Nevertheless, once again - even for concrete, you at least have some chance with a recip saw making it the most versatile of all rescue tools.



So after a couple of hours of using different blade/battery/material combinations we first used new 8Ah batteries on the curved and straight blade pruning blades followed by the latest version of the 9"/23cm 5TPi *Ax* and 8TPi *Torch*. We then used three new batteries in 5, 8 and 12 Ah with the same *Ax* blade, starting with the 5Ah. The wood was a uniform length of Acer/ornamental maple 6"/15cm in diameter - a tougher proposition than our normal 4x4 posts. What did we learn? Those *Axe* (and even the *Torch*) blades are very hard to beat. Even the specialised wood pruning blades didn't touch them and in fact, being shorter and thicker there was no deviation on a forced *Ax* or *Torch* cut. Our money remains very much with the *Ax* family but more spcifically the 5TPi demolition if we had to choose *just one* but we're not so quick to grab the specialist pruning blades for wood any more!

PROS AND CONS OF RECIPROCATING SAWS WITH CARBIDE BLADES IN EXTRICATION

PROS (+)

- **Less traumatic forces** passed through to the vehicle and casualty than the shearing forces applied when using hydraulic cutters
- **Compact profile** fits into tight spaces, footwells, and hard-to-reach internal structures.
- **More forgiving of hard metal cutting.** Hydraulic cutter blades can catastrophically shatter when cutting hinges if used incorrectly. Reciprocating saws mitigates the risk to rescuers and having to replace damaged expensive hydraulic cutter blades.

CONS (-)

- **Noise levels** can be excessive when cutting impairing essential communication between rescuers
- **Slower cutting speed** than hydraulic cutters on hinges and structural steel pillars.
- **Consumes battery power rapidly** when slicing through hardened materials

TACTICAL USE OF RECIPROCATING SAW WITH CARBIDE BLADE

Manage the Kickback Zone and Maintain Shoe Pressure

•**Mechanical Leverage**: Reciprocating saws rely on the operator to supply the normal force (pushing force). Insufficient pressure causes the teeth to skate across the hardened steel work-hardened surface, dulling them instantly.

•**Firm Anchor**: Press the adjustable metal guide shoe completely flat and firm against the vehicle frame or pillar before pulling the trigger.

•**Eliminate Leverage**: Never allow space between the tool body shoe and the target object. Gap spacing causes violent bouncing, blade breakage, and hand-arm vibration syndrome HAVS

•**Tip Clearance**: Ensure the tip of the blade does not bottom out or strike internal objects (like seat belt pretensioners or hidden reinforcement structures) behind the pillar wall.

CLEAR TRIM AND INSPECT BLIND ZONES

•**Strip Interior Trim**: Use a pry tool to peel back plastic interior coverings before cutting to expose structural reinforcements, side-curtain airbag gas inflators, and wiring harnesses.

•**Avoid SRS airbag inflators**: Never cut directly into a live, un-deployed SRS airbag inflator canister; this will cause a catastrophic explosive rupture.

CONTROL CUTTING DYNAMICS

The cutting dynamics of a reciprocating saw during vehicle extrication are controlled by a complex interaction of mechanical force, material kinematics, thermal friction, and blade geometry. Managing these physical factors determines whether a blade cleanly severs ultra-high-strength steel (UHSS) or quickly destroys its cutting teeth.

1.SPEED CONTROL.....

.....High-strength steels like boron steel require **low speed and high pressure**. Running the saw at maximum speed destroys the blade's carbide tips through friction-induced thermal failure before they can mechanically chip the steel.
Why Low-to-Medium Speed is Required
.....**Prevents Thermal Failure**: Running a saw at maximum speed (typically 2,800 to 3,000+ SPM) generates extreme frictional heat. This heat destroys the brazing holding the tungsten carbide teeth to the steel backing, causing the teeth to immediately shear or melt off.
.....**Overcomes Ultra-High-Strength Steel (UHSS)**: Modern vehicle pillars contain hidden layers of boron steel and UHSS. Hard alloys must be mechanically chipped away rather than ground down. Lower speeds give the carbide teeth time to bite, fracture, and plough through the hardened material.
.....**Eliminates Work Hardening**: If you run the blade too fast, it will slip and "skate" across the material. This creates immense friction that instantly work-hardens the vehicle steel, making it harder than it was originally and creating an impenetrable barrier.
.....**Reduces Brittle Carbide Chattering**: Tungsten carbide is incredibly hard but highly brittle. High speeds increase violent vibrations and sheet-metal harmonics, causing the carbide teeth to micro-fracture and chip when they impact multiple nested steel layers inside a pillar.

2. VARIABLE TRIGGER MODULATION: Rescuers should modulate the saw to mid-to-low strokes-per-minute (SPM) ranges (typically 1,000 to 1,500 SPM) to maintain a stable cutting temperature. On most professional rescue saws, this means pulling the variable speed trigger to about one-half to two-thirds of its maximum capacity.

3. VIBRATION AND HARMONICS

•**Resonance Destruction**: Thin vehicle body panels flex violently under reciprocating action. This high-frequency deflection causes micro-chattering, which chips brittle tungsten carbide teeth.
•**Blade Thickness**: Heavy-duty rescue blades feature a thicker profile (typically 0.050 to 0.062 inches) to resist bending and absorb structural harmonics during severe multi-layer cuts.

4. THERMAL AND FRICTION DYNAMICS

•**Work Hardening**: UHSS alloys harden further under extreme heat. If the cut zone gets too hot, the vehicle steel becomes harder than it was originally, creating a physical barrier to the blade.
•**Heat Dissipation**: Specialized rescue blades use advanced titanium-based coatings or aggressive gullet geometries to eject red-hot metal chips rapidly, pulling thermal energy away from the cutting edge.

5. BLADE GEOMETRY AND TOOTH ENGAGEMENT

•**Teeth Per Inch (TPI)**: A lower TPI (e.g., 6 to 8 TPI) features larger gullets that clear thick metal debris efficiently, preventing the blade from binding in multi-layered pillars.
•**Tip Alignment**: Individual carbide teeth are welded onto a spring-steel backing. If fewer than three teeth span the thickness of the metal layer simultaneously, individual teeth can catch, snap off, or jam.
•**Access and Clearance**: Short blades (e.g., 6-inch/150mm) often fail to clear the total thickness and geometry from all sides of a thick B-pillar, requiring a 9-inch/225mm or longer heavy-gauge carbide blade.

SUMMARY OF BEST PRACTICE OPERATION

To optimize the use of a reciprocating saw with a carbide blade during a rescue, firmly press the saw shoe against the material to be cut, engage the trigger to roughly 50% speed, and apply relatively heavy, continuous forward pressure. Let the weight and mechanical leverage of the tool do the work - if you see sparks flying excessively, you are running too fast.

BATTERY CONSIDERATIONS

We invested early in Milwaukee batteries and went for the 12Ah as our 'high power' and 5Ah as our 'volume' battery as there is a considerable difference in cost over the now more common 8Ah Choosing between a 5 Ah and a 12 Ah Lithium-ion battery for vehicle extrication comes down to balancing weight and handling against sustained power delivery and runtime under extreme load.

5 Amp Hour Battery

•Weight & Mobility: Weighs roughly 0.6–0.7 kg less than a 12 Ah pack, making the saw significantly more agile, easier to manoeuvre inside tight passenger compartments, and less fatiguing for overhead or awkward horizontal cuts.
•Power Output: Delivers standard high-drain current, but smaller cell counts can experience minor voltage sag under heavy, continuous binds.

12 Amp Hour Battery

•Power Delivery: Utilizes a larger array of high-capacity cells to reduce internal resistance, enabling the saw's brushless motor to maintain peak strokes-per-minute (SPM) and maximum torque when fighting high-strength boron automotive steels with a carbide blade.
•Thermal Management: Runs significantly cooler under heavy loads, heavily reducing the chance of the battery management system triggering a thermal shutdown mid-incident.
•Weight Penalty: Adds noticeable bulk and weight (typically 1.5+ kg total battery weight), which compromises fine tool control during delicate patient-proximity cuts.

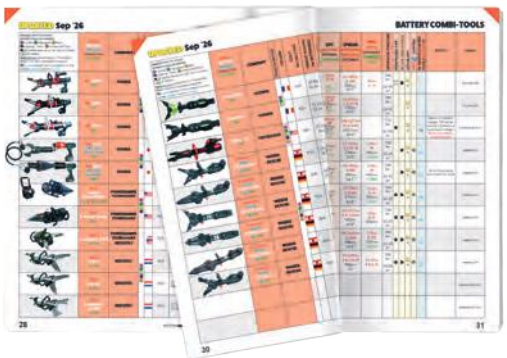
OPERATIONAL TRADE-OFFS		
	5 Amp Hour	**12 Amp Hour**
ERGONOMICS & HANDLING	High agility, Low arm fatigue	High bulk Heavy pivot weight
CARBIDE BLADE EFFICCIENCY	Good initial speed. Prone to sag during prolonged bind	Uncompromised power under heavy b-pillar/hinge cuts
THERMAL RISK	Moderate-high risk on extended multi-cut ops	Low risk; superior heat dissipation

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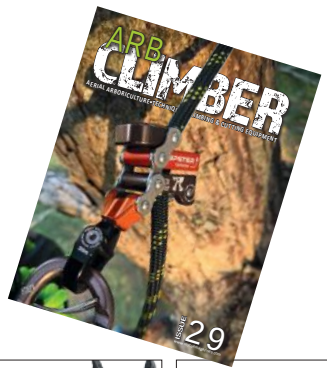


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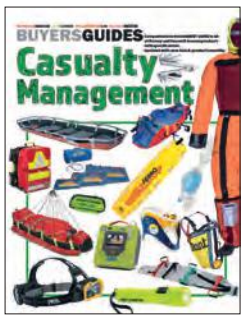


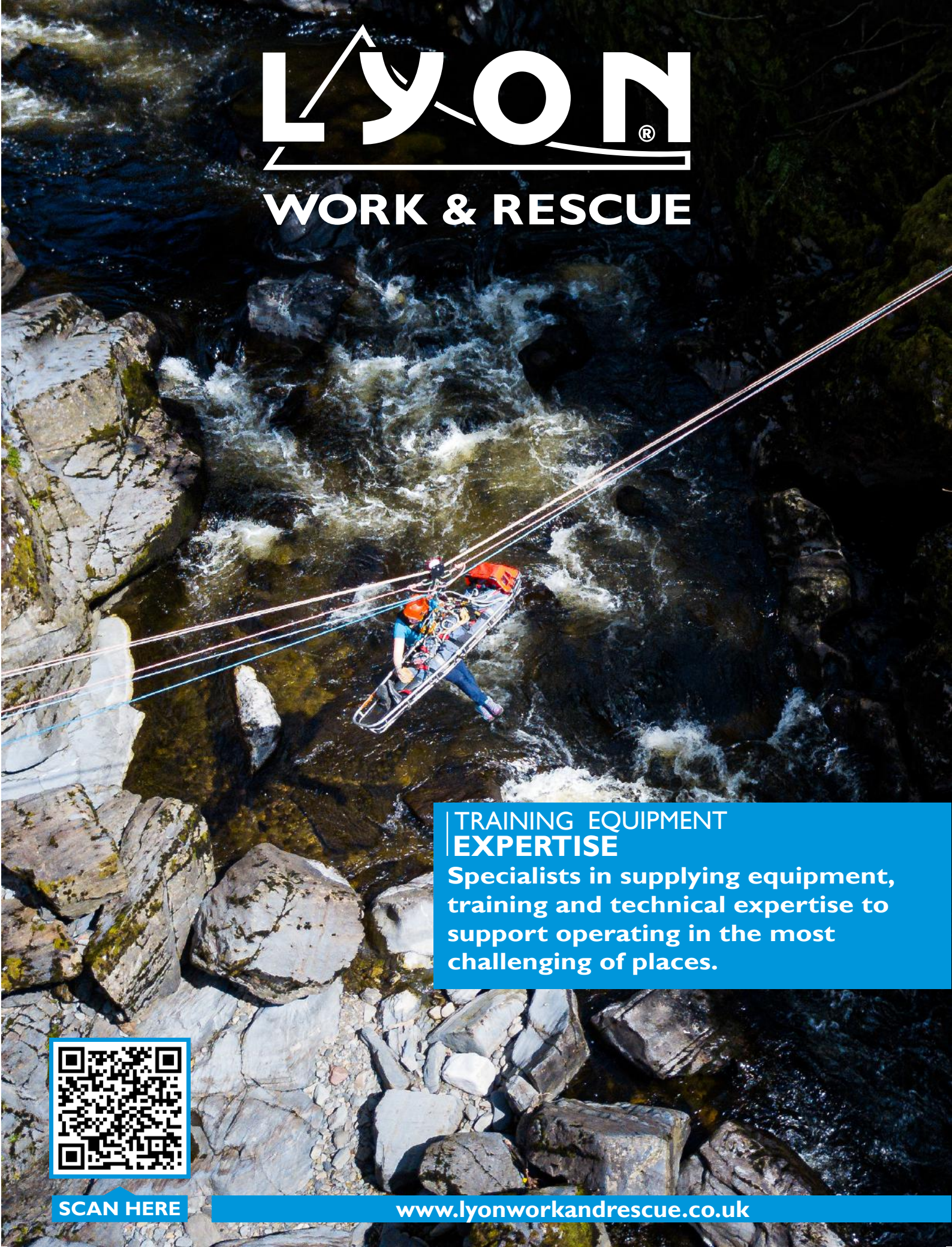











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WATER RESCUE

Are we focusing on the right problems?



by **Dr. Steve Glassey PhD**

Dr Steve Glassey has been teaching swiftwater rescue for almost 25 years and is a registered assessor for the International Public Safety Qualifications Authority (IPSQA) for swiftwater rescue. Steve is a Higgins & Langley recipient, a PADI Public Safety Diver™ and specialist advisor (expert witness) to the New Zealand Coroners Court.

Fire and rescue services pour money and hours into flood and swiftwater rescue capability —yet too much of that investment is shaped by tradition, by whatever kit is in the appliance bay, and by the seductive assumption that danger scales up with the sheer volume of moving water. It does not. Drawing on 3,281 verified incidents worldwide, the newly launched *Global Flood Rescue Events Database* (*GFRED*) lets training officers set anecdote aside and ask a harder, more disciplined question: where, specifically, does water rescue kill — and are our training hours aligned with that risk? In most services, they are not.

THE PROBLEM OF MISDIRECTED EFFORT

The central finding of GFRED is uncomfortable but useful: fatalities do not cluster around "big water" in the abstract. They cluster around a handful of hydraulic features that look survivable and are therefore under-respected. A modest reallocation of finite training time towards these high-lethality hazards would deliver a disproportionate cut in preventable deaths — among the public and among responders. An evidence-based programme concentrates on those features, teaches crews to recognise and refuse them, and treats rescuer survival as a measured outcome rather than an assumed one.

FREQUENCY IS NOT LETHALITY

The three most frequently recorded environments in GFRED are.....

Title Photo by: Damir Senčar

- **strainer or sieve entrapments** (431 incidents),
- **capsize and swim events** (428)
- **large-scale flood evacuations** (338).

Judged on volume alone, they look like the natural priorities — but frequency is a poor proxy for danger. Re-rank the data by fatality-to-incident ratio and a darker picture emerges. **Low-head dams and weirs** sit at the top: of 250 recorded incidents, 244 involved a fatality — a lethality approaching 98 per cent. Often only a metre or two high and not marked on any hazards map, these structures generate a uniform recirculating hydraulic that holds victim and rescuer alike. Their reputation as "drowning machines" is not rhetorical excess; it is what the data records. **Hydraulic (recirculation) entrapments** add a further 232 incidents to this lethal category.

This is not an argument that fitness and swimming ability do not matter — they plainly do, and a confident baseline of in-water competence is a prerequisite for anyone committing to moving water. The point is one of emphasis. A crew that can swim strongly but cannot read a hydraulic, judge a stopper wave, or recognise the smooth horizon line of a submerged weir is equipped for the wrong problem.

THE ENTRAPMENT PROBLEM

Paddling-related environments hammer the point home. Strainers, hydraulic entrapments, foot and body entrapments, and boat pins together account for more than 900 GFRED incidents. Taken as a group, **entrapment against or beneath an obstacle** — not open-water swimming distance — is the dominant killing mechanism in moving water. (The dataset is skewed towards paddling, as the bulk of records were drawn from the *American Whitewater accident database*.) The operational implication is balance, not substitution. A curriculum that stops at river swimming while treating entrapment escape and strainer drills as a brief demonstration has inverted the risk. The greater share of contact hours belongs with river-reading and avoidance, defensive and aggressive swimming applied in current, and rapid extrication from strainers and foot entrapments. Swimming is the platform; entrapment escape and hazard avoidance are what turn that platform into survival.

AVOIDING RESCUER SOUP

Two further findings should shape every programme, and the first is about the rescuers themselves. GFRED records 91 rescuer fatalities and 66 rescuer injuries, most occurring during flood and swiftwater operations where responders entered moving water. This is not a footnote — it is evidence that the profession, with regrettable regularity, converts a single-casualty incident into a multiple-casualty one.

It validates the discipline of the reach–throw–row–go–helo hierarchy, and it demands that "no-go" be taught as a defensible, documented decision rather than a failure of nerve. This magazine's co-founding father of swiftwater **rescue,** Dr Michael Croslin, has been preaching this for decades. A



service that cannot articulate the conditions under which it will decline to enter the water has not yet built a mature swiftwater capability. Embedding dynamic risk-assessment tools such as the ECHO swiftwater multi-hazard tool into operating procedures lets agencies set explicit risk-tolerance thresholds to keep crews alive.



Checking vehicles following flash-flooding in Ayutthaya Thailand in 2011. pic: Manit Larpluechai

THAT SINKING FEELING

The second finding concerns flotation. Among fatal incidents where the detail was recorded, 507 victims were explicitly documented as not wearing a personal flotation device (PFD), against only 194 who were. The signal is unambiguous. Flotation and hazard recognition are the factors that most consistently separate survivors from fatalities — a strong swimmer without a PFD in a hydraulic is still in grave danger. For public prevention this argues for relentless PFD promotion; for crews, it makes PFDs non-negotiable PPE on every water task, including, and perhaps most importantly, those that begin as "routine" bank-side jobs.

WHAT THE INCIDENTS TEACH

The aggregate numbers acquire their teaching force in individual events. Each of the following is drawn from GFRED.

The low-head dam — Henry's Fork, Idaho, USA (2 July 2023). Six adults ran a raft over a diversion dam; the hydraulic trapped craft and occupants, three drowned, three self-rescued. The archetypal responder-killer. Any downstream attempt must begin from the assumption that the hydraulic will hold both victim and rescuer — shore-based reaching and throwing, not entry, is the default. Treat local low-head dams as named, mapped hazards with pre-planned, entry-averse procedures.

The family in the current — Mississippi River, Lock; Dam No. 7, USA (12 May 2007). A family of four was drawn into the hydraulic below a navigation dam; all four drowned. Low-head and navigation dams are lethal to the public as well as to paddlers, and their danger is invisible from upstream — a powerful case for pairing operational readiness with sustained public education and, where authority allows, engineering advocacy for signage and barriers.

Vehicle in floodwater — Osong underpass, South Korea (15 July 2023). An embankment failed and floodwater filled a road underpass within minutes, trapping vehicles; fourteen died and some 400 responders were involved in the aftermath.

Vehicle-in-floodwater accounts for 173 GFRED incidents and 137 deaths. The lesson is twofold: crews need rapid, standardised in-water vehicle extrication drills, and communities need effective public education about entering flooded crossings. A caution, though — messaging must be evaluated, not assumed. Examining vehicle flood mortality in Texas across the life of the ubiquitous "turn around, don't drown" slogan, Bryant (2021) found no convincing evidence it had reduced deaths. The implication is not to abandon messaging, but to design it around behaviour-change evidence and audit it against outcomes. Underpasses and low crossings should be treated as predictable death traps in flash flooding and pre-identified for closure — engineering and enforcement that do not depend on the public having absorbed a slogan.

The rescuer who did not come home — Coolana, Queensland, Australia (25 February 2022). An experienced State Emergency Service volunteer, aged 62, was swept away and drowned during the 2022 floods; the responsible agency was later charged over workplace-safety breaches. This sits at the intersection of the responder-toll finding and the new reality of executive accountability. It is no longer sufficient to mourn rescuer deaths as tragic inevitabilities. Where a service commits people to moving water without adequate assessment, training or command discipline, legal consequence may follow. For executives, investment in swiftwater competence and "no-go" authority is now a governance obligation, not an operational nicety.

Expertise is not immunity — South Fork Payette, Idaho, USA (13 May 1978). Dr Walt Blackadar, among the finest whitewater paddlers of his generation, died pinned in a strainer. A permanent caution: strainers do not discriminate by ability. Spend the time on strainer recognition, avoidance lines and rapid release — not on the false confidence that fitness or experience confers safety.

WHERE TRAINING SHOULD BE FOCUSED

Read together, the aggregate data and the individual cases point to four priorities any evidence-led programme should elevate above general swiftwater competence:

1. **Hydraulic-hazard recognition**. Dedicated low-head dam and recirculation training. Crews must identify the smooth horizon line, understand why the recirculation holds, and default to entry-averse, shore-based technique.
2. **Strainer avoidance and defensive swimming**. Built on a baseline of swimming competence but prioritising river-reading, avoidance lines, aggressive swimming to safety and rapid intervention to entrapment.
3. **Rescuer self-protection**. Mandatory PFDs, disciplined risk assessment, and a documented "no-go" framework to cut responder deaths and injuries.
4. **Vehicle-in-floodwater response**. Standardised extrication drills combined with proactive closure of low crossings and evidence-based public education, supported by engineering and enforcement. Training curricula must evolve to mandate realistic, in-water rescue of persons from vehicles, ensuring the risk is properly addressed rather than avoided due to the cost

or inconvenience of suitable training locations. Vehicle rescues are a routine part of flood response, not a specialist extra. One study found around half of flood fatalities are vehicle-related, so every swiftwater and flood rescue technician should be trained and assessed to rescue occupants from vehicles in water. Not including this capability is like certifying a paramedic who cannot use a defibrillator because the equipment is expensive or difficult to access. Training standards need to reflect the incidents rescuers actually face, and vehicle rescue and related complications are on the rise.

A CALL TO ACTION

None of this requires exotic equipment or a wholesale programme redesign. It requires the courage to reallocate hours towards the environments the evidence shows are killing people —and away from those that are merely common. The GFRED record is unusually well suited to guiding that reallocation, and it should be revisited as the dataset grows. The measure of a swiftwater rescue programme is not the confidence of its crews in fair conditions, but the survival of victims and responders in the worst of them. Focusing finite training on high-lethality hydraulic hazards, on entrapment, on rescuer protection and on the floodwater vehicle offers the single greatest return on that investment. The data has told us where the water kills. The remaining task is to train as if we believe it. GFRED is freely available to public community at *www.gfred.org.*

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Karijini National Park WA

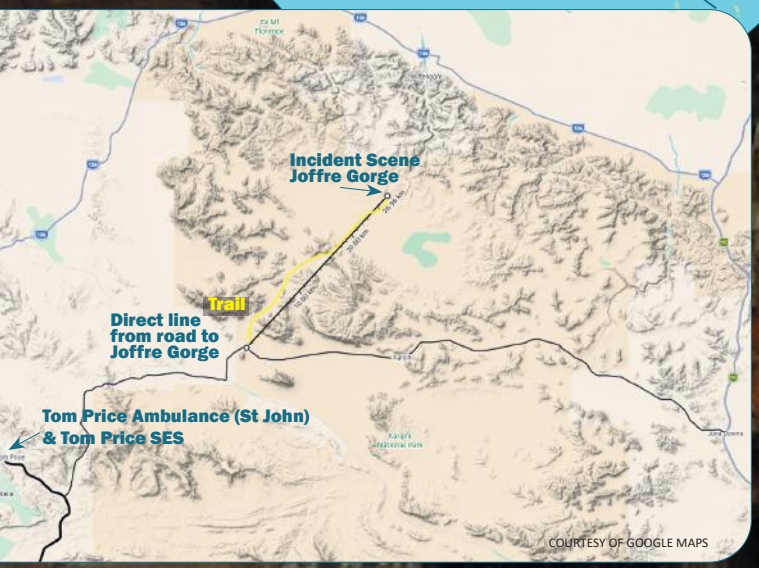


inter-agency Rescue

of US Police Officer July 2025

www.rescuemagazines.com





870 miles (1400km) north of Perth in Western Australia is Karinji National Park, a whopping 2,422 sq miles (6,274 sqkm) and it's only the second largest in the state let alone Australia as a whole. The park is largely undeveloped with a parks access road (Karijini Drive) through the centre and surrounded by one interstate a regional road and a railway but these are several hours of hiking away from the main natural attractions. The park is serviced by Rangers from the Parks and Wildlife Service plus St John Ambulance and the ubiquitous State Emergency Service (SES) from the town of Tom Price on the western end of Karijini Drive. Scenic hotspots, lookouts and tracks are remote, arid, dangerously hot at over 40° C outside of limited 'cooler' periods and dangerously prone to flash floods anytime from November to April and since the various gorges and waterways and pools represent the majority of attractions these are the danger points and many have very limited access and egress.

This particular incident in Joffre Gorge in the north of the park had no flash flood concerns but at the wrong time of year this location would have been a significant risk with a vastly different outcome.

OFFICIAL OVERVIEW

The Western Australia Government has a regional management office that covers the National Parks, state/local parks and all tourist hotspots outside of private ownership - the *Department of Biodiversity, Conservation and Attractions* and they released the following press release about the incident. This is for general public consumption so is quite generic but sets the scene before we look in more detail at what happened:

The dramatic rescue of an American tourist from a gorge in Karijini National Park has highlighted the best of inter-agency cooperation during visitor season. Parks and Wildlife Service Rangers, St John WA paramedics and SES volunteers worked together for five hours to rescue the tourist from Joffre Gorge.

US Police Officer Antonio Fanning was hiking through the gorge last July (2025) when he fell around 8 metres (26ft) and landed in the rocky pool below, suffering a fractured vertebra. Fortunately, four fellow hikers were nearby and provided first aid while raising the alarm.

The first on the scene were Parks and Wildlife Service Rangers, who were joined by St John WA and SES volunteers in what became a logistically challenging rescue.

After being placed carefully on a stretcher and winched up 60 metres to the top of the gorge, Officer Fanning was taken to hospital for treatment.

National Park Ranger Michael Bones said: "*The response time from St John Ambulance and from the SES was incredible given where we are.....most of the people involved would be volunteers, people that have all worked a full day… they're coming out here and they're at Joffre Gorge in the middle of Karijini National Park 'til 10 at night helping someone that's got themselves in trouble. It's fantastic work and a real testament to all of the people that have come out and given up their time to help someone else.*"

Mr Fanning is a police officer assigned to a school in his home town of Auburn, Alabama. The community of Auburn raised funds to get Officer Fanning back to the United States on a flight. Officer Fanning, suffered a fractured vertebra, a head injury, a fractured wrist and dislocated finger but has now made a healthy recovery and returned to work. Several months on, he sent a special message to his WA rescuers.....

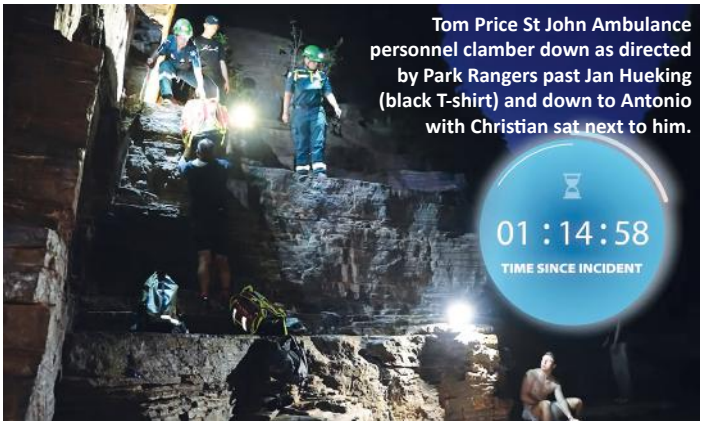
"*I want to thank everybody involved in my rescue," said Officer Fanning..... the Park Rangers, the emergency personnel, the whole volunteer crew that came out and rescued me that night. I appreciate everybody. Thank you Western Australia*."

This incident is another excellent example of inter-agency collaboration to achieve a safe rescue. It was captured on camera by DBCA cameraman Miles Brotherson, who had been in Karijini National Park all day filming a conservation initiative when the emergency call came through just before dusk.

The resulting video will now be used for staff training and safety awareness and can be viewed on the @ParksAndWildlifeWA Youtube channel

INCIDENT NARRATIVE

This the narrative from rescuers, tourists that assisted and the casualty himself with dialogue direct from the afore-mentioned video.....:



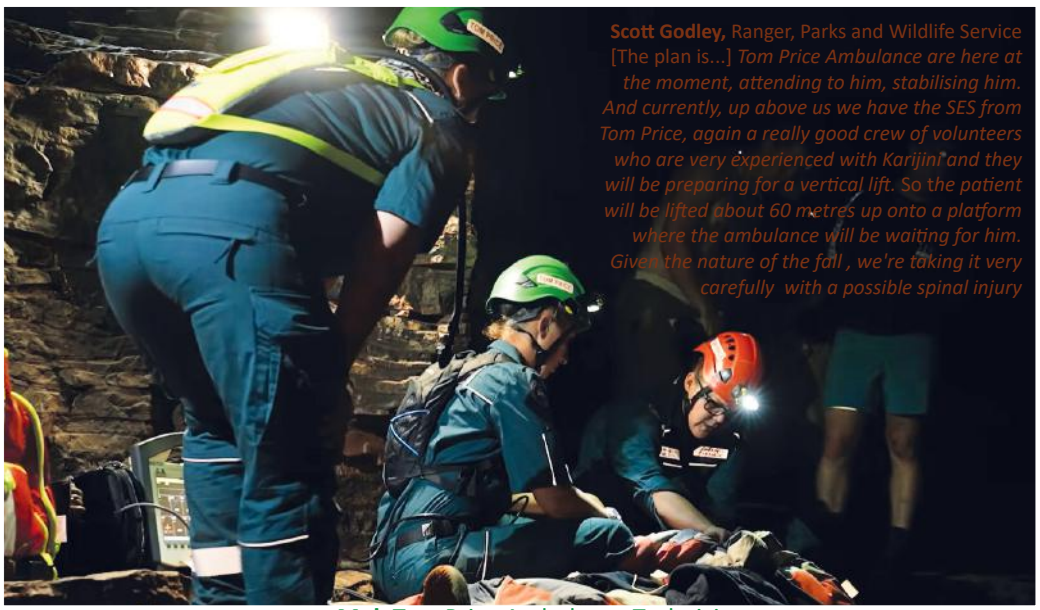
Tom Price St John Ambulance personnel clamber down as directed by Park Rangers past Jan Hueking (black T-shirt) and down to Antonio with Christian sat next to him.

Michael Bones, Ranger, Parks and Wildlife Service:
"So a call's just come in – a gentleman's had a fall down Joffre Gorge. He's fallen approximately 8 metres. There's a Ranger on scene at the moment who's made the assessment that it will require SES and ambulance [from nearby town of Tom Price] ".

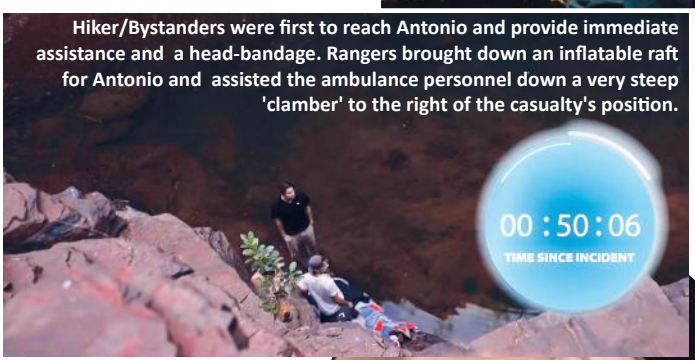
Christian Borg, Australian Hiker/Bystander
"I had just seen Antonio crashing down. He's bounced first, then hit this ledge and landed face down in the water unconscious and we just ran over, pulled him out of the water".

Jan Hueking - German Hiker/Bystander
We thought it would be much worse because it was quite a high fall and he wasn't moving anymore, yeah, I didn't think it would be going [too] well.

Christian Borg, Australian traveller
*Trying to warm him up now. He's [*regained*] consciousness pretty quickly, which is good. [We're] just waiting on the on the medical professionals to come do their bit now.*



Scott Godley, Ranger, Parks and Wildlife Service
[The plan is...] *Tom Price Ambulance are here at the moment, attending to him, stabilising him. And currently, up above us we have the SES from Tom Price, again a really good crew of volunteers who are very experienced with Karijini and they will be preparing for a vertical lift. So the patient will be lifted about 60 metres up onto a platform where the ambulance will be waiting for him. Given the nature of the fall , we're taking it very carefully with a possible spinal injury*

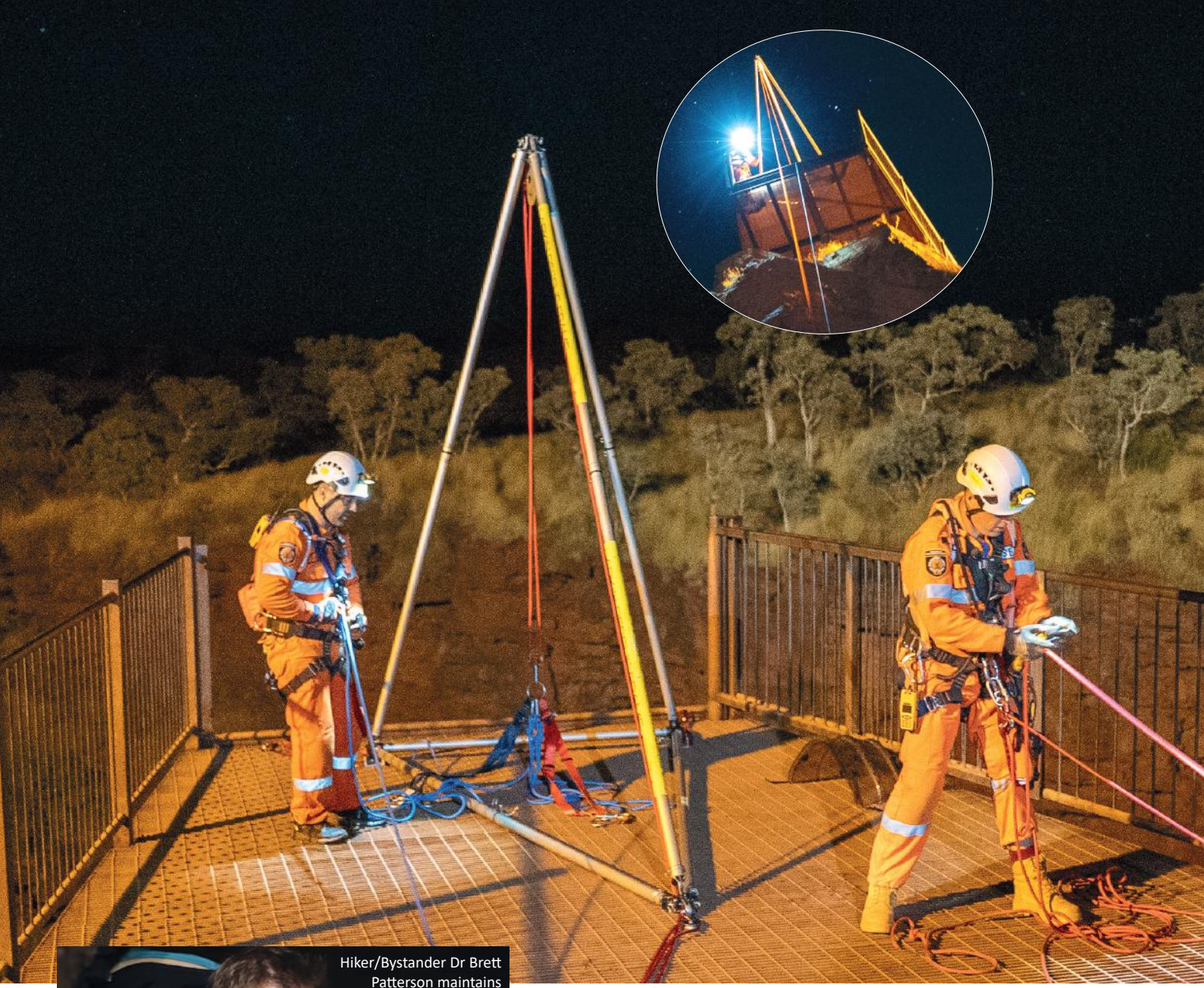


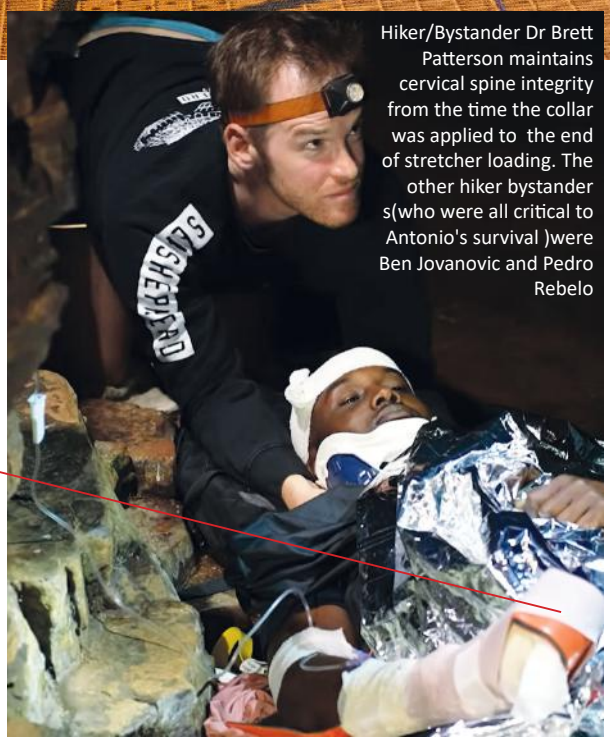
Hiker/Bystanders were first to reach Antonio and provide immediate assistance and a head-bandage. Rangers brought down an inflatable raft for Antonio and assisted the ambulance personnel down a very steep 'clamber' to the right of the casualty's position.



Mel, Tom Price Ambulance Technician
Hello.Hello. What's your name? Who we got here?
Christian Borg, Australian Hiker/Bystander
My name's Christian, this is Antonio - he's fallen about 12metres
Mel, Tom Price Ambulance
Just lay nice and still for us Antonio. I'm Mel. We're going to do a head to toe assessment of you and our SES are forming up, up there at the moment [for roped casualty recovery]
Mel, Tom Price Ambulance Paramedic
[to, Christian] *when he came to, did he cough up any water up? Nup No...., good.*
Mel, Tom Price Ambulance
How long was he out for?
Christian Borg, Australian traveller
No longer than a minute
Mel, Tom Price Ambulance Paramedic [to, Antonio]
Any pain here? Ah, No. You sure? Yep, Mmm, no pain. OK, we're gonna do a blood pressure, Alright.....
I'm going to have to put this neck brace on you, you OK with that? Just to keep your head and neck nice and still.
That's an open fracture....if you could turn your hand around the other way [so that medics can clean and package the hand].







Hiker/Bystander Dr Brett Patterson maintains cervical spine integrity from the time the collar was applied to the end of stretcher loading. The other hiker bystander s(who were all critical to Antonio's survival)were Ben Jovanovic and Pedro Rebelo

ABOVE: While the casualty is accessed and treated below, including for a broken and dislocated finger (left), SES team members rig a *Larkin Frame* High Directional for a 60m/196feet Lower of rescuer with Stokes Litter followed by a raise of the casualty with one stretcher handler. No Rapid Access Technician was sent down initially as Ambulance had 'clamber' access and was also not needed to escort the stretcher alongside the handler due to this very usefully located, projecting, viewing platform negating the risk of rockfall (free-space raise). The *Larkin Frame* is a pyramidal luffing frame allowing the main attachment point to project clear of the edge but then be rotated inboard to land mid-platform. The single platform edge attendant was on twin rope system using Petzl ASAP on safety line and ISC D4 Descender for rope mobility. Rescuers use Skylotec Neon harnesses. For the stretcher, a twin ropes system was used, controlled at the top using *ISC D4* auto-lock descenders on both the main and belay ropes. Hauling by 5 personnel was progressed by a 2:1 on the stretcher bridle and a 3:1 resetting, bolt-on at the top. The haul rope was redirected twice from the platform to the car park 5 metres above due to space constraints

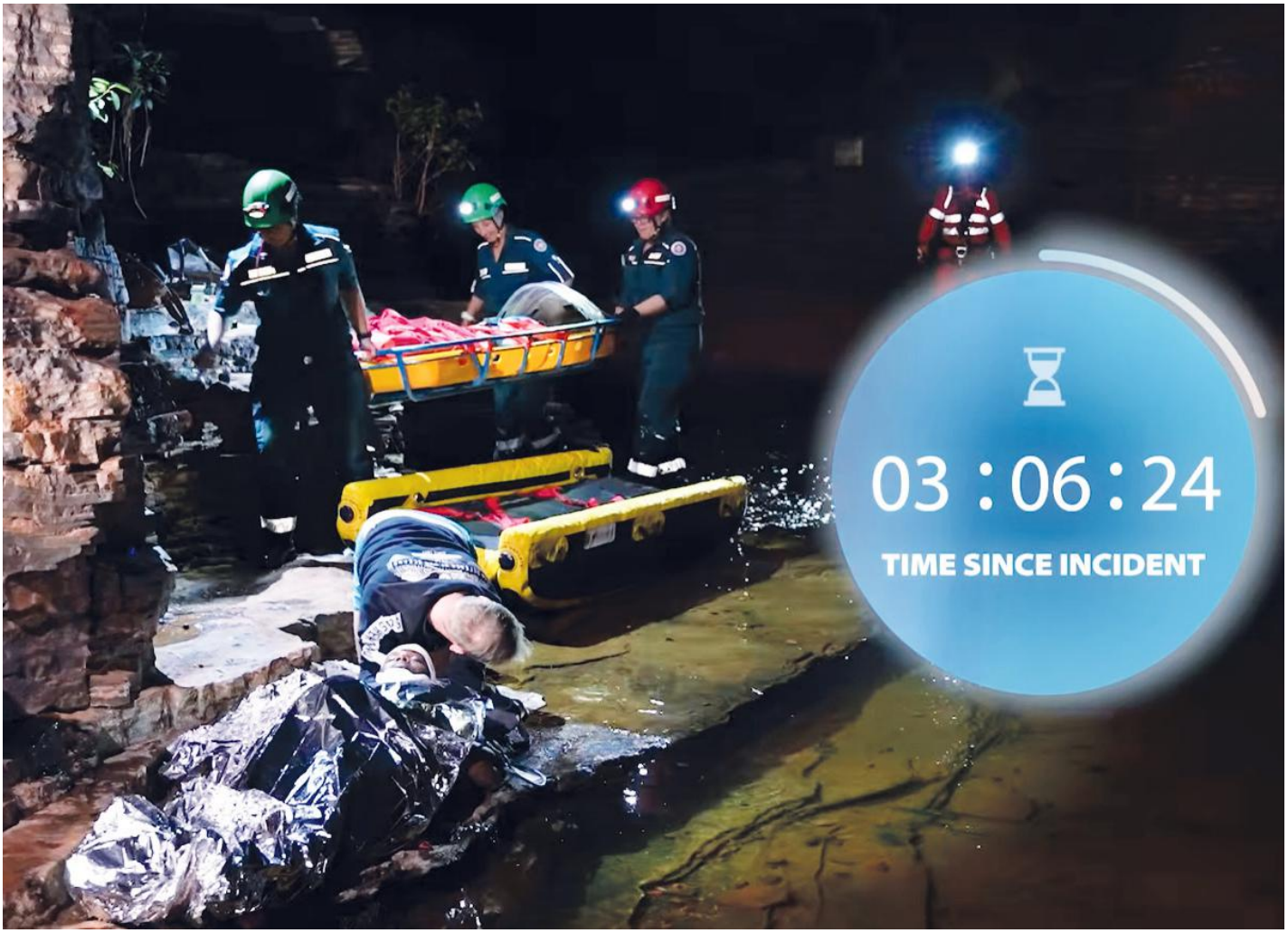
Michael Bones, Ranger, Parks and Wildlife Service:
"It's a particularly difficult gorge to get someone out of. The St Johns officers will walk him across in a stretcher [a Vertical rope rescue stretcher inside a stokes litter mounted on an inflatable (floating) stretcher brought down by the rangers] and because of the risk of rockfall, even with this platform, the patient will be protected in a stretcher [with a see-through head guard/face-shield] and then the lift will begin,so, it is still a risky operation but he's very lucky. He's in good hands and at this stage, in very good condition".



LEFT: At 3hrs into the rescue, an SES technician delivers the *Stokes* litter and *Vertical* (cocoon-style) rope rescue stretcher to the medical team. The *Vertical* is an Australian designed and manufactured stretcher now owned by *Ferno*. The inflatable stretcher has been inflated and positioned in the water near Antonio where hiker, Dr Brett Patterson, maintains cervical spine integrity and continues to do so throughout the transition into the stretchers. Antonio is first lifted into the Vertical stretcher which has it's own harness and load-bearing lift point for both horizontal and vertical alignment of the casualty.

to Antonio: We're going to put a stretcher underneath you, that will hopefully get you a bit warmer and we'll get anything that's wet, away.

The survival blanket and wet clothing are removed then a coordinated lift is performed, first with the *Vertical* slid underneath then into the *Stokes* where blankets are tucked in for a now shivering Antonio.





IN AND

Up, Over, Under, Around, Across, Down, Through...

OUT

Getting in and out—through difficult terrain—can be the defining factor when every second counts. The Cascade Rescue Terra Tamer lets rescue crews traverse difficult terrain and get out faster. And now, its all-terrain wheel has been updated with a new attachment system that accommodates an even wider range of litters. Providing exceptional control and versatility, Terra Tamer easily breaks down for fast transport and setup. Plus, it can be equipped with Equalizer Handles to provide a 24-position system that allows operators to adjust handle positions*. Get in and out—faster, easier.

*Equalizer Handles available in stainless steel or titanium for all Cascade Rescue Professional and Advance Series Litters. Handles can be custom ordered to fit some other litter models.

LEARN MORE ABOUT
THE TERRA TAMER

CASCADE RESCUE BY HARKEN

HARKEN

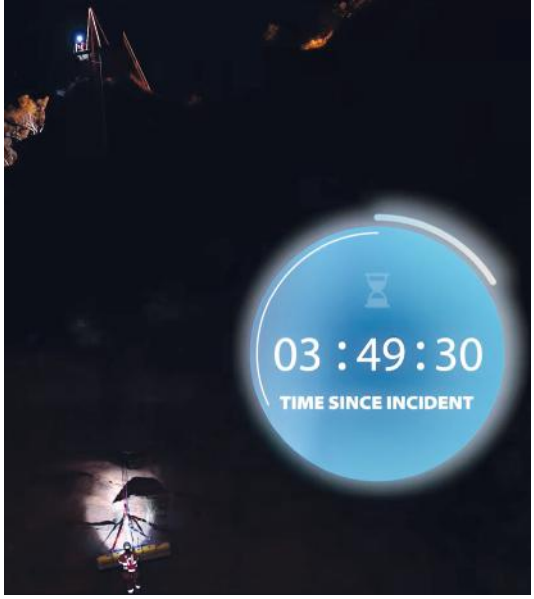




to Antonio: It is going to be bumpy, all right, this is going to get most of the impact [tapping the metal frame of the Stokes] OK? you hear that? Yeah. That's what it's gonna sound like, but you'll be strapped in. We've done this hundreds of times, Alright and this is what we're trained to do. Yeah. I've had my fall for the day. You've had your fall for the day. Now you get the ride for the day. Prepare to lift....and lower.... [onto the inflatable stretcher. The head shield is applied and the straps on the *Stokes* secured. Four *Velcro* retaining straps keep the *Stokes* in close contact with the inflatable which is then walked/floated across the lagoon to the gravel bank beneath the gorge wall. See title picture]

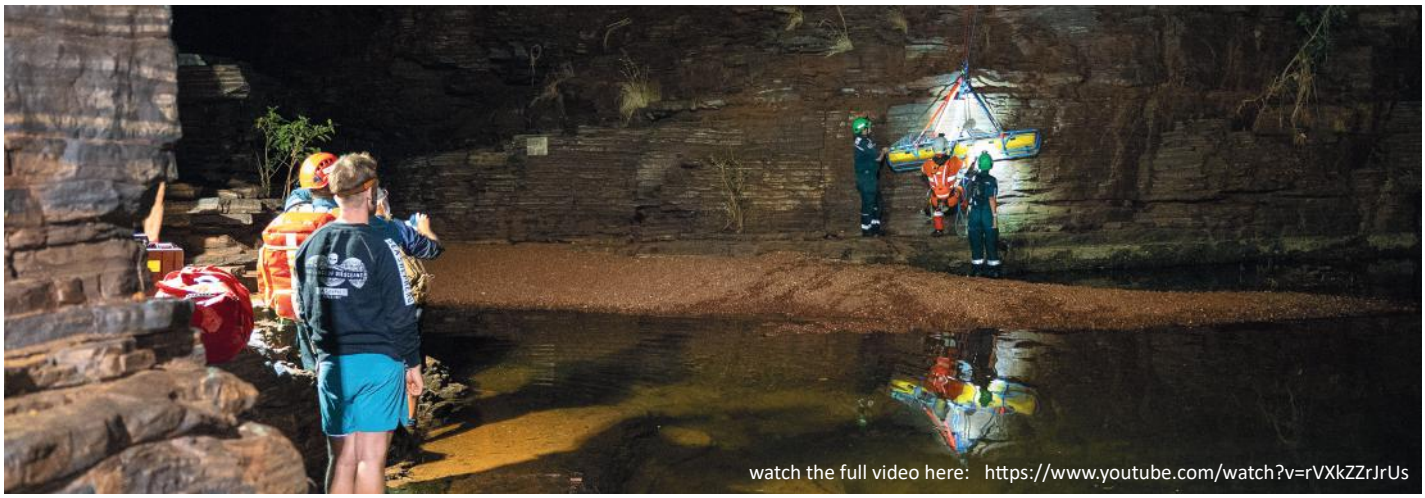


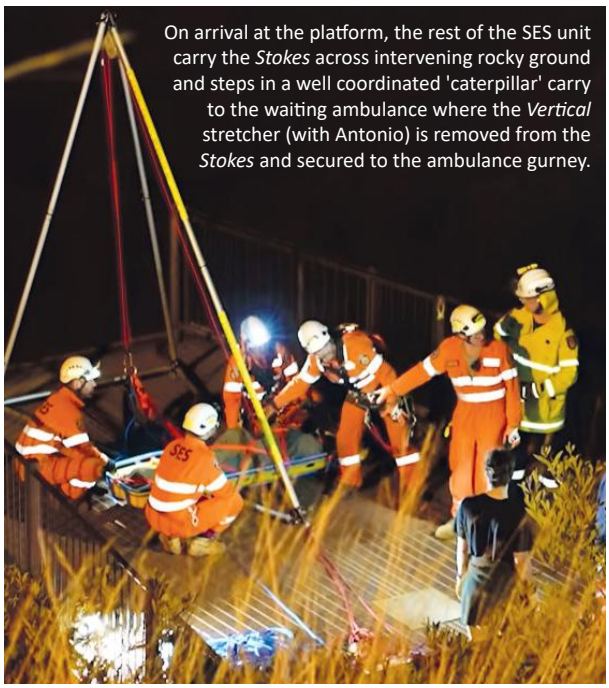
The *Stokes* is clipped on to the pre-rigged stretcher bridle and the SES handler clips back into his main and stretcher attachments points. After final connection and comms checks, the raise begins.]



Antonio: I thought the ledge was going to stop me but kept on going. My momentum kept me going down to the bottom. I don't remember hitting the water . These guys say I landed in the water face down and good thing they were here to get me out. Appreciate you guys.

Michael Bones, Ranger, Parks and Wildlife Service
The response time from St John Ambulance and from the SES was, yeah, incredible given where we are. And most of the people involved tonight would be volunteers, people that have all worked a full day today or even, you know, there's, I know that there's young people that are still part of school. Everyone sort of has their own life. And then, you know, outside of that, they're coming out here and they're at Joffre Gorge in the middle of Karijini National Park 'til 10 at night helping someone that's got themselves in trouble. So yeah, it's fantastic work and a real testament to all of the people that have come out and given up their time to help someone else. I think that Antonio would have felt that he was in good hands. I mean he would also be absolutely terrified, I'm sure. Being pulled up a cliff face, in the middle of the night. Yeah, a 60-metre a cliff face would be daunting for anyone, Especially, when you're out in the middle of nowhere and you don't know who any of these people are. It would be. It would be pretty daunting. But, I hope that he felt that he was in safe hands. And, I mean, the outcome speaks for itself. In a state like that, it would be understandable if you were quite agitated and, very scared. But he did seem to be very composed. And then we found out later down the track that he was a police officer from from the US so I'm sure that probably had something to do with it.


watch the full video here: https://www.youtube.com/watch?v=rVXkZZrJrUs


On arrival at the platform, the rest of the SES unit carry the *Stokes* across intervening rocky ground and steps in a well coordinated 'caterpillar' carry to the waiting ambulance where the *Vertical* stretcher (with Antonio) is removed from the *Stokes* and secured to the ambulance gurney.

9 Months later - Video message from Officer Antonio Fanning, his family and police colleagues:
I want to thank everybody involved in my rescue down in Western Australia. From Christian and his friends that found me, got me out of the water, bandaged me up and stayed with me the whole night until I got put into an ambulance. So I want to thank the Park Rangers, the emergency personnel, the whole volunteer crew that came out and rescued me that night. I appreciate everybody. Thank you.



Thanks to Antonio Fanning,
Miles Brotherson and Alex Gore - DBCA-WA,
WA Park Rangers, Tom Price SES and Tom Price St Johns Ambulance
Photos and stills from video courtesy of DBCA

CMC WICKED PICKET ANCHOR





The Wicked Picket Anchor System is a high-strength, rapidly deployed ground anchor. This comprehensive system includes three hardened steel pickets for strength and durability, a forged Picket Plate with precision formed holes for maximum holding strength, a modular Hitch Point for rigging anchors, an Extraction Prusik for picket removal, and a Carry Bag that rolls open and doubles as edge protection.

TRANSPORT: System components are efficiently organized in the included carry bag. Made from canvas and vinyl coated polyester, the carry bag provides lasting durability both as a bag and as edge protection. Rolling open for easy access, it offers four web loops for tying off at the edge, a clean rope path, and a label / ID holder.

INSTALLATION: Quick and easy to install, the Picket Plate joins all three pickets together, unifying their strength for operations. Pickets are aligned vertically and driven to depth using a sledgehammer or similar tool. This orientation simplifies placement and optimizes pullout capacity.

ANCHORING: Anchoring is streamlined using the included Hitch Point. The Hitch Point can be attached to the front or rear of the plate in a vertical or horizontal configuration, supporting a variety of applications. The Hitch Point is certified to NFPA General Use and also compatible with 2-inch truck hitches. Additional units are available separately if desired.

REMOVAL: Once operations are complete, the pickets are removed with support from the included Extraction Prusik. This cord is looped around the picket head to provide a useful lifting point. The Hitch Point is easily disconnected from the plate using the included 5/8 inch Quick-Release Pin.

FEATURES:

- High-strength, rapidly deployed ground anchor system. Hardened steel pickets = reliable strength and durability.
- Forged Picket Plate simplifies anchor installation and maximizes holding capacity.
- Pickets align vertically for quick placement with sledgehammer.
- Precision-formed holes distribute load to each picket simultaneously.
- Modular Hitch Point attaches to the Picket Plate for easy anchoring. It is compatible with carabiners and textiles including CMC Anchor Straps.
- Hitch Point also connects with 2-inch truck hitches for versatile rigging.
- Extraction Prusik creates a lifting point for efficient picket removal.
- Roll-open Carry Bag simplifies transport and access to components.
- Carry Bag is durable, water resistant, and doubles as edge protection.
- Picket System and Hitch Point are each certified to NFPA General Use.

Wicked Picket Anchor System Kit

DIMENSIONS 114x20x13 cm/45x8x5" WEIGHT 20.4kg/46lb COST $949

Steel Picket	4.4kg/ 9.6 lb	$79
Hitch Point		$87
Picket Plate		$349
Quick Release Pin		$47

Note: NFPA testing performed with Hitch Point and 5/8 inch Quick-Release Pin. Testing was not performed with stakes installed in ground as intended for use. Holding strength of the system is soil and condition dependent. Due to the industrial manufacturing process, the Picket Plate finish may show cosmetic imperfections, and the Pickets may vary in length and finish. These components are built for high strength and durability.

www.cmcpro.com

DMM LAUNCHES A TRAINING ARM

DMM Wales Group has announced the launch of APEX Technical Training, a new specialist rescue and safety training provider serving emergency services, industrial teams, and individuals working in high-risk environments. Many APEX courses are hosted and delivered from the headquarters in Bangor, Gwynedd, giving trainees access to a professional training environment and shared operational resources and expertise. APEX delivers training across five core disciplines:

- **Working at Height** - certified rope access & safety techniques, Steep Ground and Technical Rope Rescue = capability in steep terrain and technical rescue environments
- **Water and Flood Rescue** - safe and effective response in water-based and flood scenarios
- **Emergency Services and Incident Management** - structured response skills for complex, high-pressure incidents
- **Medical and Specialist Response** - critical skills for medical response in remote and challenging environments
- **Personal Protective Equipment** - to support organisations in maintaining compliance and safe systems of work.

Courses are delivered by instructors with genuine operational backgrounds in rescue, safety and emergency response, and combine theory, practical instruction and scenario-based exercises in realistic operational settings. From vertical terrain and rope access environments to steep ground rescue locations and remote, austere conditions. Training is designed for a wide range of professionals, including emergency services personnel, search and rescue teams, rope access professionals, industrial rescue teams, expedition and remote environment practitioners, and organisations responsible for safety and incident response. APEX offers both open courses and bespoke training tailored to organisational requirements, with programmes aligned to recognised industry standards and certification frameworks.

enquiries via email – info@apextechnicaltraining.com

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- Reduce complexity of AHD setups
- Compatible with various Vortex configurations
- Connects to standard 2” receiver
- Available with 90° adapter



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