

WILDERNESS SAR

PARKRANGERS, MOUNTAIN&CAVE RESCUE, WATER&HELL-OPS



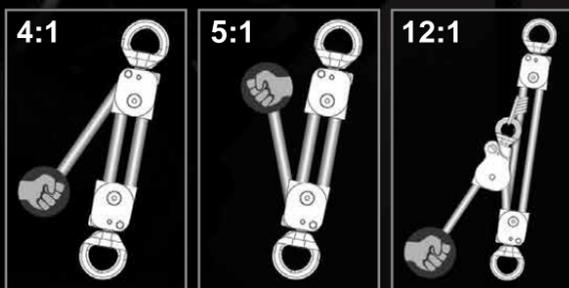
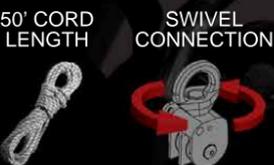
ISSUE

7



AZTEK SYSTEM

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



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

MIN LENGTH
9" (22.8cm)

< WIDE RANGE OF OPERATION >

MAX LENGTH
13' (4m)



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

WILDERNESS SAR

ON THE COVER



Two bites of the cherry on this cover. Our rescuer is sporting a Princeton Tec EOS II headlamp and this issue is the final part of our GUIDE to Headlamps with the lowest lumen output models of less than 100 lumen - unlike this EOS II which just misses out at 130 lumen. Then there's those Magna-Pulleys again that we mentioned in the last issue. From Tim Anderson of ARS these are another, 'why didn't I think of that' product. Probably because most of your pulleys are alloy so magnetism didn't seem obvious. The double pulley at the top can be pulled apart into two single pulleys ala the double becket, single rope model at the bottom. See page 2 for more.

EDITOR: Ade Scott
ade@trmedialtd.com

CONTRIBUTING EDITORS:
Australia: Roland Curll
NSWRBDU
South Africa: Rob Thomas
MCSASART
USA: Reed Thorne
RTR-Arizona
UK: Richard Hackwell
MCA Coast Rescue

PHOTOGRAPHY:
Tim Anderson
Darryl Ashford-Smith • Lexi Baines
Roland Curll • Charles Farabee
Joe Klementovich • Brian Tecyk

REPRO:
Jo Evernden

ADVERTISING:
Kelly Matthews
admin@rescuemagazines.com

ADVISORS:
Shawn Alladio (K38)
Chris Walker (RNLI/DLSAR)
Paul Whittington (COMRU)
Darryl Ashford-Smith (SMRA)

CONTRIBUTORS THIS ISSUE:
Roland Curll
Andrea DeVries
Kyle Gautreau
Sam Morton
Greg Thoman
Josh Wood
NB: Articles NOT shown as authored are by WSAR, TRM and ACM staff and written/edited by Ade Scott

SUBSCRIPTIONS (all prices US\$)
4 PRINT issues including postage
UK/USA/Canada \$20
Worldwide \$20 + \$5 p&p
8 PRINT issues including postage
UK/USA/Canada \$35
Worldwide \$35 + \$10 p&p
4 DIGITAL issues worldwide \$8
8 DIGITAL issues worldwide \$15

BULK SUBSCRIPTIONS
to one address - worldwide
10x 4 PRINT issues= \$150 inc P&P
25x 4 PRINT issues= \$275 inc P&P
50x 4 PRINT issues= \$500 inc P&P

EMAIL: admin@rescuemagazines.com
rescuemagazine@aol.com

www.rescuemagazines.com

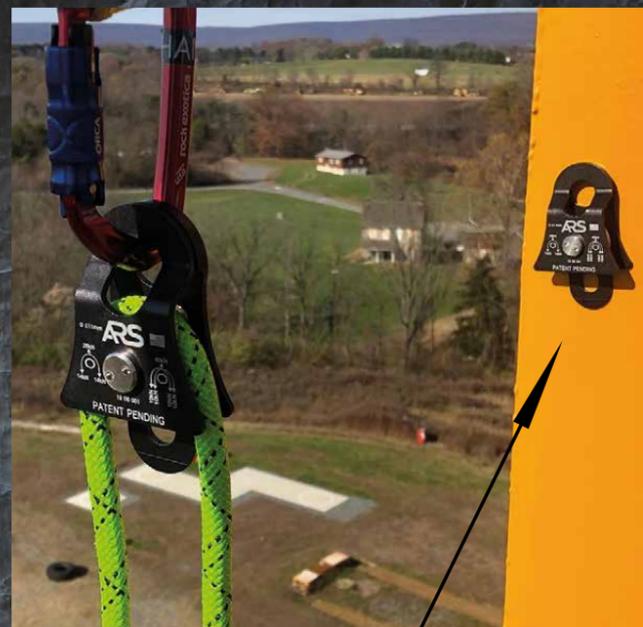
CONTENTS 7

- 2 **PRODUCT NEWS:** Rope & Dog stuff, PPE & Water Stuff
- 10 **WOMEN in RESCUE:** Women's Rescue Gear
by Andrea DeVries
- 20 **GUIDE to Headlamps pt3 <100 Lumen**
by Ade Scott
- 34 **TESTING - AZTEK Heavy Duty Rope Testing**
by Kyle Gautreau, Sam Morton & Josh Wood
- 44 **SAR SAFETY: Pt1 Prerequisites and Protective Clothing**
by Greg Toman
- 56 **GUIDE to Lightweight Descenders/Belay Devices**
by Ade Scott
- 64 **GEAR: Silva Explorer: Using a Map & Compass Still Matters**
by Roland Curll



pic by Joe Klementovich

MagnaPULLEYS



CAN YOURS DO THIS?

Magnetized pulleys that come as a con-joined pair but can be separated with a hefty pull. In use, all of the heavy loading is via the eyes/becket and adjoining carabiner so these babies aren't coming apart any time soon. They clean up your pulley systems immeasurably and give you options. And, as the image above testifies, if you have any steel or magnetized rock on your patch you have another make-shift storage option. Price for 2020 is \$139 US, and that is for a "set" aka double pulley configuration with a double becket option. We spoke to



inventor Tim Anderson and there's been strong sales to the arb industry and great interest from the special forces community for some small ninja rope kits built around the flexibility the Magna-Pulleys provide, particularly since two sets enable you to build virtually every MA imaginable. A 1/2" rope capacity version is in the works for later in 2020. www.andersonrescue.com



ED: A metal that wouldn't be much use in MagnaPulleys is Titanium which is a shame because it is immensely strong and relatively light, not least because it requires far less metal to achieve the same objectives. It is, however, a bit more expensive since this one swivel costs about the same as the set of Magna-Pulleys shown opposite. Conterra in Washington State USA, are well known for their Scarab beetle-looking descenders but have now added this weeny swivel to their product range, something that will greatly interest kit-weight fetishists.



TiRadius Swivel

Weighing in at only 83 grams, it's no wonder we made a swivel out of titanium. It's tougher, lighter and stronger. NFPA (G) certified to a MBS of 38kN! TiRadius is the lightest G rated rescue swivel we know of, and it still accepts 2 carabiners in each end. Working load: 5kN Dimensions: 3" x 1.25" x 1" Cost: \$136.45



www.conterra.com

XCMC CLUTCH™

by **HARKEN** INDUSTRIAL™



MORE IS POSSIBLE

cmcpro.com

TRACKING THE SEARCH DOGS

[NB: The ARTEMOS 100, called the ALPHA 100 in the USA are the touchscreen version while the slightly cheaper A50 is push button. K5 collars are called TT15 & TT15 mini in the US. Some specifications may vary]

ADVANCED GARMIN DOG TRACKING

Garmin Ateomos 100 (Atlas 100 in the USA) dog tracking handheld is an invaluable tool that helps you achieve optimum performance from your dogs. This easy-to-use integrated handheld system allows you to track your dogs in the field, delivering their exact position as often as every 5 seconds. With Ateomos/Atlas 100, you can now track your fellow dog handlers¹.

- Tracks up to 20 dogs or dog handlers up to 10 km away
- Better control using geofences, radius warning, broadcast tone and vibration signals to the dog through K 5 (TT15 in the USA) dog collar
- 5 second update rate provides fast location tracking when dogs are on the run
- Enhanced security — remotely activate the LED on the K 5 dog collar or call other users via the emergency alarm on Ateomos 100 handheld
- Intuitive, glove-friendly and with bright 3-inch (7.6 cm) colour touchscreen
- Preinstalled 100K European or US maps and 1 year free subscription to BirdsEye Satellite Imagery

TRACKING OF A NEW CLASS

Monitor each dog's speed, distance and their direction of travel. Plus, receive notifications on the actual status of the dog, such as if they are "On Point". A single Ateomos 100 can track up to 20 dogs or fellow handlers from a distance of up to 10 km by receiving signals from additional Ateomos 100 handhelds or K 5 dog devices (sold separately)¹. With update rates of up to five seconds, the Ateomos 100 allows you to keep close track of your dogs. On the K 5, the top-mounted GPS/GLONASS antenna provides fast and reliable satellite positioning and high tracking accuracy, even in demanding environments.

FOLLOW YOUR DOG'S EVERY MOVE

Because the A100 comes preloaded with the 100K maps, you'll always know your surroundings, and for more details the free one year subscription to BirdsEye Satellite Imagery allows you to have a realistic view of terrain, including roads, water, woods and more.



BETTER CONTROL

You can stay in control with Ateomos 100 even if you don't follow every step that your dog takes. With the help of geofences and radius alerts, you can check the dog's movements and get notified when a dog leaves or enters a specified area. By using Ateomos, you can even "talk" to your dog through vibration and acoustic signals on the K 5 dog device. This way, you can remotely guide well-trained dogs.

For best use of the battery life of the K 5, you can change the update frequency of the dog device from your Ateomos handset and make quick adjustments to changing conditions. Using the Ateomos in Base Station mode together with BaseCamp, Garmin's free planning software, you can conveniently control the location of dogs and fellow handlers from the larger screen of your laptop. An additional feature is that you can start and stop a VIRB action camera mounted on the dog with your Ateomos handset through the K 5 dog device.

IMPROVED SAFETY

Configuring geofences when preparing for your next outing helps you ensure that dogs do not go close to dangerous areas such as roads or steep cliffs unnoticed. With geofences, you can create restricted areas and set up alerts that beep when the dog approaches near. If your dog is near a road, you can remotely activate the bright LEDs on the K 5 dog device unit to improve visibility. K 5 can also be set to rescue mode so that the radio automatically switches to a lower refresh rate once the battery drops below 25% — this way you can get an additional 12 hours of search time to find a lost dog. In case of danger, you can send an emergency alert to all connected Ateomos devices indicating your precise location, allowing others to immediately plot a route to this location.

SHARE WIRELESSLY

With an expanded ecosystem of wireless connectivity options, A 100 is well connected with other Garmin devices. For example, the outdoor Garmin DriveTrack™ 70 LM GPS can receive and display dog positions on its moving map — with TOPO or satellite image views — and show navigation cues to your dog's current location. Likewise, fēnix® 3 and fēnix® 5 GPS watches can receive dog status updates and alerts for viewing at a glance on your wrist while you're in the field.

ROBUST AND DURABLE

Garmin devices are known for their truly rugged designs optimised for outdoor use, and Ateomos 100 is an excellent example of this quality. Ateomos 100 has a glove-friendly brilliant 3 inch (7.6 cm) touchscreen with excellent readability in all lighting conditions, and its rugged housing is IPX7 waterproof. The K 5 dog device is even more durable and its design has been adapted to the strict requirements for dog collars used in the harshest conditions. The dog device is waterproof to 1 ATM (10 m)² and equipped with an extremely durable braided steel VHF antenna for reliable operation even in dense tree cover. Cost = £850/\$800 for 1 receiver and one collar £339/\$299 for one collar

¹The K 5 is only compatible with the Ateomos 100 and Ateomos 50.

²Can withstand pressure corresponding to a depth of 10 meters.

SPECIFICATIONS

Physical dimensions	6.4 x 16.5 x 3.8 cm
Touchscreen	YES
Display size	3.8cm/1.53" width 6.3cm/2.55" high 7.6cm/3" diagonal
Display resolution	240 x 400 pixels
Display type	Transflective, 65-K color TFT touchscreen
Weight	250g/8.8oz with std antenna and battery
Battery	Rechargeable lithium-ion (included)
Battery life	Up to 20 hours
Water rating	IPX7
High-Sensitivity Receiver	YES
Memory/history	4.0 GB
Interface	USB
Preloaded maps	YES (RecMap Europe or USA)
Ability to add maps	YES
Basemap	YES
Storage and power capacity	microSD™ card (not included)
Waypoints/favs/locations	4000
Routes	200
Track log	10,000 points, 200 saved tracks
Barometric altimeter	YES
Compass	YES (tilt-compensated 3-axis)
Sun&Moon Information	YES
Area calculation	YES
Auto routing (turn by turn)	YES (optional mapping for detailed roads)
Custom maps compatible	Garmin Connect™ compatible (online community shared data)
Website:	www.garmin.com

DS

NOW STOCKING 5.11 TACTICAL PRODUCTS

MEDICAL

ALWAYS BE READY.

RESCUE | MEDICAL | MOULAGE

5.11

T: 01329 311451

E: info@dsmedical.co.uk

www.dsmedical.co.uk

ESSENTIAL KIT BAGS

BY NAME AND BY NATURE



Lyon Equipment in the UK have added even more bags to their burgeoning professional range with redesigned rope/Kit bags in three sizes.

30: A medium size bag (pic below left) that can contain personal kit and hardware, or, up to 100m of 11mm rope, the 30 ltr capacity makes this bag suitable for a range of tasks on the worksite. The bag follows the same design and has all the same features as the larger ESSENTIALS 40 ltr version whilst being compact in stature. £42.



40: A large profile bag that can hold a person's rope access kit, including helmet and harness, or up to 150m of 11mm rope. The 40 ltr capacity makes it an all-round bag, able to carry a variety of items whilst still being manageable when carried on the back. The bag is fitted with two shoulder straps and a large handle. £48.

60: The largest in the ESSENTIALS range (pics top right), this 60L bag can accommodate 200m of 11mm rope. Able to stand open unsupported, it has a wide top entry

making packing straightforward. In addition to the shoulder straps the bag has two large side-handles. This bag is ideal for the transportation and storage of ropes and gear. £72.



- Durable 620g/m waterproof fabric, meeting EN ISO 2286-2 standard
- Cordura reinforced base offering additional protection against wear
- Fold over lid closure to protect the contents
- Stainless steel hook buckle for lid closure
- Double shoulder straps and large grab handles
- Hook buckle loop and daisy chain loops can be locked together with a zip tie or security tag after packing
- Clear PVC tamper proof ID pocket with internal entry
- Stands open for packing
- Flat base for stability
- Webbing loop on inside of the bag for attachment

The ESSENTIALS bag range are available in 30, 40 & 60 ltr versions as well as being available in either Blue or Black.

www.lyonequipment.com

CLIMBING TECHNOLOGY NEW ARIES HELMETS

Ventilated helmet range compliant with the EN 12492 standard, developed for mountaineering, tree climbing and mountain rescue services. Aries Tree & Aries Air

- ergonomic design for great comfort
- designed to guarantee an excellent line of sight in any direction
- ABS shell with high impact absorbing capacity, provided with several vent holes assuring excellent internal ventilation (Aries DiElectric/Site helmet – no vents)
- accurate head strap adjustment turn-knob, adjustable by the use of one hand
- the height of the headband can be adjusted into two different positions
- interior parts in breathable Cordura
- comfortable, washable and replaceable interior padding, chinstrap & head strap
- robust chinstrap, designed to limit the risk of losing the helmet in case of a fall (strength greater than 50 daN)
- provided with head lamp clips and earmuffs quick attachment (e.g. 3M-Peltor, Sperian)
- compatible with VISOR A and VISOR A-F, polycarbonate eye shields featuring scratch-resistant and anti-fog coating, easily fitted thanks to a practical clip fastening system
- compatible with dedicated reflective stickers
- Available in orange, red, black, white and yellow



www.climbingtechnology.com

WILDERNESSAR Issue 7

Always between you and the ground



**Maker of the first
kernmantle SRT Ropes
in the USA**

www.bluewaterropes.com

NEW PETZL SWIFT

MULTI-FUNCTION HEADLAMP



[ED: A brand new design from Petzl and we don't see too many of those at the moment. Probably because they have most things sewn up and are still ahead of the curve with most of their models. This one has a nice battery level indicator which is one of the best we've seen and will probably feature in later models and revamps. Cost is around €/\$/£100, Colours: Black, White & Orange. The SWIFT RL PRO rechargeable headlamp offers 900-lumen brightness. With REACTIVE LIGHTING® technology, a sensor analyzes the ambient light and automatically adjusts headlamp brightness to user requirements. It also has red lighting to ensure stealth. SWIFT RL PRO is intuitive, with a single button for easy control over all lamp functions. The five-level gauge allows precise monitoring of the battery charge level. The lamp is compatible with Petzl helmets, and mounting accessories allow it to be attached to any kind of helmet.

FEATURES

- Light output: 900 lumens (ANSI-FL1 STANDARD)
- Weight: 123g
- Technology: REACTIVE LIGHTING® or STANDARD LIGHTING
- Beam pattern: mixed or focused
- Energy: 2350 mAh Lithium-Ion rechargeable battery (included)
- Recharge time: 6h
- Certification(s): CE
- Watertightness: IPX4 (weather-resistant)
- Headlamp comes with a plate for mounting on Petzl VERTEX and STRATO helmets.



www.petzl.com

Lighting performance

Lighting performance as defined by the ANSI/PLATO FL 1 protocol						
Lighting technology	Lighting color	Lighting levels	Brightness	Distance	Burn time	Reserve
REACTIVE LIGHTING®	white	close-range work	100 lm	35 m	10 to 50 h	10 lm for 2 h
		proximity	300 lm	55 m	5 to 40 h	15 lm for 2 h
		movement	900 lm	150 m	2 to 30 h	
		distance vision	550 lm		4 to 50 h	
STANDARD LIGHTING	white	close-range work	10 lm	12 m	100 h	10 lm for 2 h
		proximity	200 lm	55 m	5 h	15 lm for 2 h
		movement	550 lm	110 m	2 h	
		distance vision	250 lm	95 m	4 h	
	red	-		visible at 700 m for 30 h		-

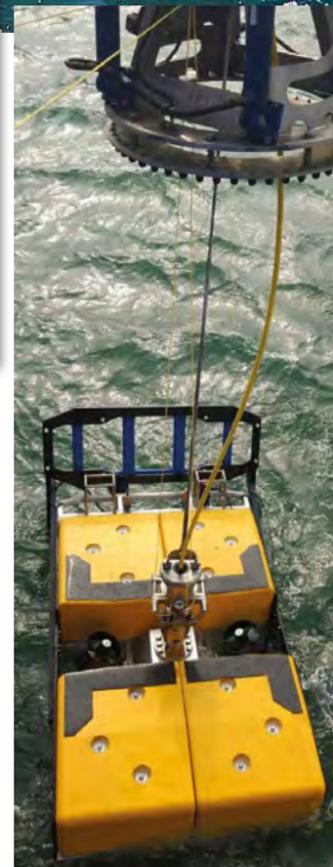
The Ultimate Wilderness Tool

Deep Ocean engineering is a California-based manufacturer of powerful, expandable, rugged underwater and surface drone vehicles with over 600 ROV systems sold to over thirty countries. We have now added a new type of Remotely Operated Vehicle (ROV) to their already diverse and impressive product line, the Phantom® X8. This electric, light work-class, vehicle is the largest and most heavy-duty ROV manufactured by DOE and packs a robust design for deep sea maneuverability and power. Configured with six vectored horizontal and two vertical 2.2 kW Tecnydyne brushless thrusters, the Phantom® X8 has complete control and authority in any given direction, even in the toughest currents. For clarity underwater, the Phantom® X8 boasts high definition (1080p) front (+/-90°) (pan optional) and rear (low light) cameras with 3 LED lights emitting 30,000 total Lumens and adjustable brightness controlled by the pilot control box or GUI. Auto functions for heading, altitude, depth, and positioning guide and control the ROV



Pic above: The X8 has significant control and can maneuver with propulsive force in all directions

for diligent underwater tasks and inspections. The Phantom® X8 is hand-built on a rugged, resilient, non-corroding polypropylene chassis that accommodates heavier payloads and allows the integration of a wide variety of sensors and upgrades. Deep Ocean Engineering designed the Phantom® X8 with deep sea exploration and light intervention in mind. Its performance at depths up to 1,000 meters is adaptable for various underwater tasks in any condition. Applications for the X8 include pipeline inspection/routing, offshore wind farm maintenance, infrastructure repair, survey research and many more. www.deeopocean.com



A Vehicle Used to Search all Environments...

safe and quickly with a JW Fishers commercial grade ROV



- Highly Portable
- Commercial grade
- High power LED lighting
- 1,000' depth capability
- (4) high output motors
- Pan & tilt front AND rear cameras come standard
- Starting at \$20,995



JW Fishers Mfg., Inc.
 (800)822-4744
 (508)822-7330
 Email: info@jwfishers.com
www.jwfishers.com



Progress (at last) in Woman's Rescue Gear

By **Andrea DeVries**
Raven Rescue -Canada
ravenrescue.com



WOMEN in RESCUE

[ED: we mentioned in our other publication, ARBCLIMBER, how ridiculous it seemed that we would even have a separate article on women performing the kinds of tasks they've been doing for several decades, in fact, Grace Darling would argue, centuries. But here we are in 2020 and still there is a huge disparity in the ratio of sexes in rescue and therefore in equipment manufactured specifically to suit the female rescuer. As highlighted in other work sectors, the vast majority of the world continues to treat and pay women differently to their male counterparts. In the voluntary rescue sector this is obviously not an issue although one wonders how many teams around the world would continue with disparity if everyone was paid. By 'differently' what we really mean is 'worse' and in this day and age it's frankly embarrassing. An alien life-form examining our progress from afar might have thought in the 50s and 60s that we were heading in the right direction with all manner of discriminations being legislated out of existence. How disappointed they would be to take a look 60 or 70 years later and find that not only has nothing much changed apart from reliance on technology but in some aspects of life we've been treading water for most of this century if not actually going backwards! Rescue and the outdoor recreation trade has seen better progress than most industries, as Andrea's article highlights, but it seems mighty slow which forces us to have articles highlighting the continuing disparities. Raven Rescue is a training and supply company in Canada and we don't often have overtly commercial contributors but the brands and models highlighted (which we can thoroughly recommend as well) are being stocked by Raven specifically because they have made the effort to better suit/fit women so we're happy to make an exception here. There are, of course, many other companies producing female-oriented equipment but it needs to be a little more than simply the same kit in pink; the UK's RNLI uses Helly Hanson suits that are a specific female cut (see RNLI pic on page 17) and trousers with a female 'comfort' zip so these are meaningful design considerations. Female-specific helmets have been produced by, for instance, Petzl and Black Diamond for many years, we just need to extend this specialisation to ALL other relevant items and that doesn't just mean smaller sizing; not all females are petite and many need equipment to fit a figure with curves that are the opposite to a middle-aged man's waistline expansion! Taking a lead from the outdoor clothing and footwear companies which have ALWAYS produced gender-specific products, there are now an exponentially increasing number of rescue companies bridging this weird gap in the market so hopefully, this article will soon be out of date!]

Five years ago, in the Raven Rescue (Canada) Women in Rescue newsletter, we featured an article about Rescue Gear For Women. From staying dehydrated in order to avoid a PPE doffing restroom break, to chest-crushing PFDs, the landscape has remained much the same since 2014. However, there are some brand-name manufacturers making waves with their commitment to high-quality rescue gear for women. With each piece of equipment they design, the message to the rescue industry gets stronger – professional female rescuers shouldn't have to choose between women's-specific and rescue-specific gear.



STORIES OF COMMITMENT

As a rescue equipment distributor for first responders across Canada, we've come face-to-face with a handful of tenacious manufacturers that are dedicated to equipping female rescuers with top-quality gear. While each organization has its own reasons for equipping female customers, they're united by the common value of keeping rescuers safe.

The origin story of Georgia-based manufacturer, Pigeon Mountain Industries, compels them to maintain their commitment to high quality rescue equipment that fits all individuals:

PMI is a company founded and run by men and women who love ropes and rigging and who come from a field perspective. Many of our employees (men and women) are rescuers, rope access technicians, cavers and climbers who are passionate about work and play in the vertical realm.

Loui McCurley, present CEO of PMI, has been a member of Alpine Rescue Team in Colorado since 1985, and has also served as a firefighter and a rope access technician. In the early days especially, finding equipment to fit women was challenging at best for a slender woman. She recalls that most of the equipment she used back then was ill-fitting small menswear, equipment designed for children, and/or equipment designed for other purposes. As a result of this experience, Loui was motivated to find new and better rescue equipment solutions for herself and other women. Meanwhile, the late, great, PMI founder and avid caver/rescuer Steve Hudson, at 6'4" and not a slight build, experienced similar issues at the opposite end of the spectrum. Together they formed an agreement that any future PMI harness, helmet, or glove would be bounded by their respective size extremes. PMI is also sensitive to hand size when selecting hardware suppliers with whom to partner for

carabiners, descenders, and other equipment. Loui still serves as a Technical Specialist with Alpine Rescue Team, and is also a certified Rope Access Technician. She remains highly sensitive to the specialized needs of women who work at height and makes special effort to collaborate with and listen to the needs of women in the industry.

Across the country in California, Kokatat Director of Sales, Jeff Turner, says that their long-standing commitment to keeping female rescuers well equipped is a company-wide tradition. *"This goes back a long time for us. Our former design manager had worked for Kokatat for many years, and she was in a position to influence the design and development of all our gear. It was important to her to develop products that are designed to fit women."*

And head over the pond to the Czech Republic, home of harness manufacturer Singing Rock, and you'll find out why they produce a rescue harness with the smallest waist on the market: *"The main reasons for including small size were basically two – women, and smaller-sized people in Asian and South American markets,"* reports Sales Manager Jindrich Truhlár. *"We receive various positive comments on small harnesses, mainly from female rescuers."*

Even more 'niche' is UK manufacturer Arbortec catering primarily to arborists and forestry but with obvious crossovers into SAR. They produce and actively market an entire range of chainsaw protective trousers and jackets which you would think would be very much a male dominated market in 2020 though the ratio gap will continue to close. This is perhaps the best indicator of change, when we see specialist equipment made for the few rather than the many.

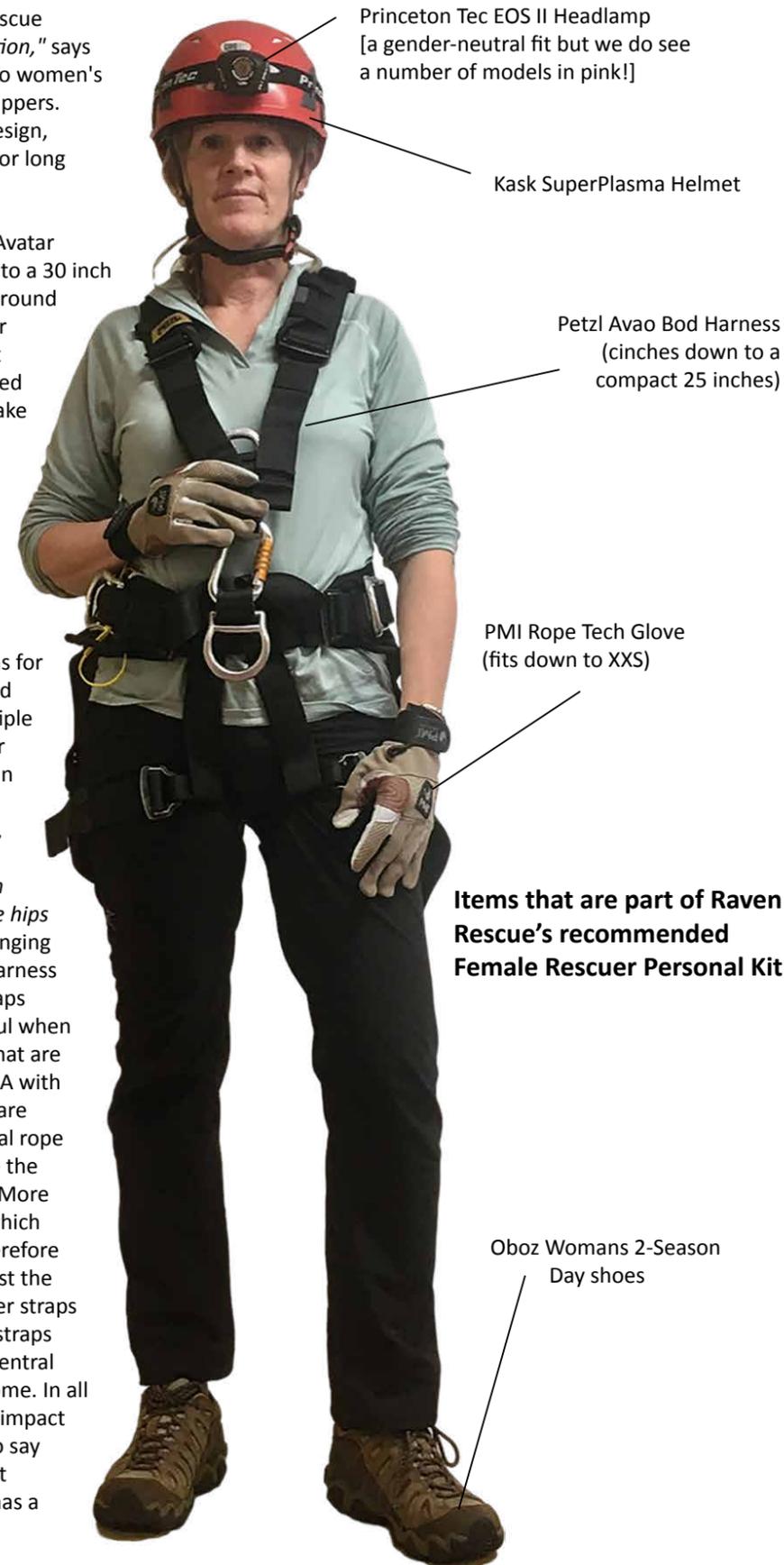
WHAT CAN MAKE THE GEAR BETTER?

Female rescuers face equipment issues across all rescue disciplines. *"It basically comes down to fit and function,"* says Jeff Turner. In the world of drysuits, this translates to women's specific patterning, drop seats, and lowered relief zippers. Kokatat knows that these elements are critical to design, particularly for the rescue professional who works for long stretches in their garments.

As for harnesses, adjustability is critical. Take PMI's Avatar harnesses, for example. The PMI Avatar goes down to a 30 inch waist, has the ability to adjust the rear risers to fit around a curvier body shape, and offers the choice of either a V-type or H-type chest harness. The Avatar wasn't specifically designed FOR women, but it was designed BY women, so it includes some features that will make it adjustable to a range of body sizes. And if a small waist is the most important item on your harness tick list, keep in mind that the Singing Rock Expert III cinches down to a compact 22 inches.



..... but small doesn't necessarily mean great. Shauneen Nichols (left) has been involved in her local Search and Rescue teams for over a decade, and has served as a search manager on multiple occasions. We spoke with her five years ago in our women in rescue feature, and when we touched base this time around, she pointed out that "most full body rope rescue harnesses, even in the smaller sizes, still tend to dig into the hips no matter how much you adjust them." This year, Singing Rock introduced the padded waist of the new 3D Harness in a size small, which goes down to 25 inches. Perhaps some women will find the additional padding helpful when they have to spend hours in their harness. Others that are helping to bridge the gender divide include DBI-SALA with the Nex harnesses and Tractel with Ladytrac which are admittedly not new and are aimed more at industrial rope access but they are light, start from XSmall and, like the Singing Rock 3D have enhanced, strategic padding. More familiar to rescuers might be the Petzl AVAO BOD which is again more of a work positioning harness and therefore generally too large for mountain rescuers but at least the thinking is going the right way, their leg and shoulder straps distribute weight evenly across the body while the straps in front gather together and are connected with a central carabiner which may provide greater comfort for some. In all cases, what is needed is strapping that reduces the impact force on the breasts in the event of a fall. It's safe to say that while the rock climbing and industrial fall arrest ranges offer specific harnesses for women, rescue has a way yet to go.



Princeton Tec EOS II Headlamp [a gender-neutral fit but we do see a number of models in pink!]

Kask SuperPlasma Helmet

Petzl Avao Bod Harness (cinches down to a compact 25 inches)

PMI Rope Tech Glove (fits down to XXS)

Items that are part of Raven Rescue's recommended Female Rescuer Personal Kit

Oboz Womens 2-Season Day shoes



Pic by Brian Teyck for The Responder

When it comes to PFDs, Shauneen says that some of the women she knows opt for Astral PFDs, because "the way they're cut gives our bust a bit more room. Once you get any full-bodied PFD tightened down adequately, it just crushes your chest and you can't breathe properly. Unfortunately, making room for our chests takes away some of the buoyancy of the PFD, which is crucial to keeping larger males up out of the water during a rescue." It is this kind of feedback on fit that prompted Raven Rescue to add the Type-V NRS Zen Rescue PFD to its Standard Swiftwater PPE Kit for Women.

Creating gear that fits professional female rescuers also means considering their perception in the workplace. "Our female customers have made it clear to us that they do not particularly want to be singled out with pink helmets or fru fru [ED: had to Google that one! it means 'very decorated or girly in nature'] features in gear," McCurley comments. Women in rescue want to perform their jobs with excellence, alongside their male counterparts. PMI doesn't necessarily label gear as a product designed just for women, but the smaller size range and unique designs mean that the equipment is safe and comfortable for women (and petite men) to use.

WOMEN'S GEAR AND THE BOTTOM LINE
 "Although in the past years, it has been something of a challenge to sell enough of these specially sized items to justify the inventory, sometimes you just have to 'do the right thing' even when the economics don't quite jive," says PMI CEO, Loui McCurley. "Equipment that fits well and performs well provides a greater level of safety, and better supports an inclusive environment and the advent of more women in rescue and in other forms of work at height. For this reason alone we believe that the investment is worthwhile."
 "This is a long tradition for us, and frankly, it just makes sense," explains Jeff Turner at Kokatat. "Women, or men, we want all of our customers to be happy, comfortable and safe." But challenges remain, particularly in swiftwater equipment. While there are a number of recreational PFDs and drysuits that work well for women, they don't include the robust features that you can find in rescue-specific products like the Mustang Sentinel Series Drysuit, or the Mustang MRV150 Swiftwater Rescue Vest. Mustang's rescue products lead the industry year after year, so naturally we were curious why they haven't invested in optimizing their PFDs and drysuits for a women's fit. "This is due to the business case that must be considered when

CREW KIT
THE NEXT GENERATION

Comfortable with greater freedom of movement
 Lighter, yet reinforced for all weathers



Technical layering keeps crew warm and dry
 Tailored fit for male and female crew
 Waterproof and breathable Helly Tech® fabric



ABOVE: The UK's RNLI ran billboard-style promotions in 2019 to promote the service and included an equal number of active woman crew-members. So it's just as well that they also adopted female-specific drysuits from Helly Hansen. The Gecko helmet isn't a female-specific shell but it has a self-air-blown customisable interior to fit any shape or sized head.

developing PFDs, and the regulatory costs involved," says Mustang Representative, Tony McCormick. "The potential volume of business is a key issue, and costs to design, produce and get through the regulatory hurdles dictates the viability of the products."
 This financial pinch point has frustrating implications for professional female rescuers looking for off-the-shelf options. While the Kokatat Odyssey Drysuit does feature women's specific patterning and many robust features (including suspenders, reflective accents, and Gore-Tex reinforcement), it remains a different suit than the Mustang Sentinel Series, which provides for professional rescuers with foam padding, reinforced nylon seat, reinforced wrists and reinforced zippered ankle overcuffs. Professional female rescuers will find more rescue-specific options in the Type V Kokatat Guide PFD, which has equipped females for over twenty years with a quick release belt, reflective tape, pockets, and female-friendly sizing, and Mantis green colouring (available in 2020). With options like the Kokatat Guide PFD on the shelf, the grip held by Mustang's MRV150 is beginning to loosen. But comparing rescue-specific gear to women's-specific gear remains a challenging undertaking – many of the products available are still as different as apples and oranges. The reality that Mustang identified faces every gear manufacturer: female recreationalists far exceed the

Oceanid™
 WATER RESCUE CRAFT

RDC@Oceanid.com
 (208) 322-3600

number of female rescuers in the rope and swiftwater industries. Off-the-shelf equipment options reflect this reality. Take the world of swiftwater, for example. The recreational market is packed with excellent options for female paddlers. NRS' Pivot and Crux drysuits are great examples, along with Kokatat's Front Entry and Odyssey suit. And when it comes to PFDs, NRS has a collection designed specifically for recreational paddlers, which are well-worth considering along with Kokatat's Guide PFD, and their soon-to-be-released 2020 Hustler (which features an expanded size range to fit a variety of body shapes). And let's be clear – these drysuits and PFDs are excellent, and they can certainly be worn by female professional rescuers on the job. In fact, male rescuers opt to wear recreational suits and PFDs all the time... there's no requirement that rescuers have to wear rescue-specific gear! But the fact remains that female rescuers don't have the choice that male rescuers do. Female professional rescuers have to choose between a recreational item designed for the female body type, or a rescue item designed for men.



Buddy check..... photo courtesy of PMI

**WOMEN-SPECIFIC... OR RESCUE SPECIFIC?
A FUTURE WHERE WE WON'T HAVE TO
CHOOSE ONE OR THE OTHER**

The time is right for rescue gear designed for women to become a staple in the industry: safety standards continue to motivate employers to equip first responders to the best of their abilities; more women are taking on rescue roles around the globe; and manufacturers with a strong commitment to equipping female professionals are well-positioned to meet an increased demand. Organizations like PMI, Kokatat, Arbortec, NRS, Petzl and Singing Rock have already made their dedication clear. Professional female rescuers can motivate future developments at these forward-thinking companies by providing regular feedback about their needs. Kokatat's custom-suit builder program is a prime example – it enables professional female rescuers to order a suit with women's specific patterning, along with almost all the bells and whistles of the most robust rescue suit. Kokatat's customization options already allow the best of both worlds, and who knows... the more orders that are placed, the greater the chance that female rescuers may one day see off-the-shelf availability.

Here at Raven RSM and in the pages of WILDERNESS SAR, TECHNICAL RESCUE and ARBCLIMBER, we will continue to promote manufacturers that are dedicated to equipping rescuers of all shapes and sizes. We exist to support and educate First Responders, whether they are professionals and volunteers, or occasional workplace rescuers. Getting rescuers into the right tools for their rescue jobs is part of our task and we're starting by offering Women's-specific Swiftwater and Rope PPE Kits alongside our original line of PPE Kits. The items we've selected for our kits weren't necessarily designed specifically for women – like the Aqualung Evo 4 Boot, for example – but they're available in smaller sizes than other options on the market. We will continue to upgrade these kits with different products introduced to the market, as the days of having to choose between women's-specific or rescue-specific come to an end... and women's rescue gear becomes a standard we can all expect.

"Zipline/highline spanning water

Photo courtesy of PMI



STERLING

PRODUCT TESTING IS IN OUR BLOOD.

It's why Sterling products consistently exceed certification standards and are trusted in harsh, real-world rescue situations.

Working with expert field testers, including independent tester Mike Forbes of RopeCraft.org, who designs torture tests for life-safety gear, provides us with unbiased feedback and objective results. This allows us to improve our processes, develop new products like the SafeGuard™ Rope Protector, and redesign existing favorites like the SuperStatic2 Series.

Visit SterlingRope.com for more details on our testing procedures, certifications and product lines.



SafeGuard™ Rope Protector

Length: 18"

The SafeGuard is designed to protect ropes on sharp, jagged edges or over especially rough surfaces. It allows ropes to move freely while avoiding abrasion or cutting damage and has been thoroughly tested in industrial and outdoor rescue setups.



Green



Red



White



Blue



Black

11 mm (7/16") WorkPro™

Our low-elongation, dual-certified, static rope is light, easy to work with, and significantly stronger than other similarly constructed ropes. With a pre-steamed nylon core and 32-carrier polyester sheath, the WorkPro gets its strength from the balanced core and sheath that share loads evenly.

EN 1891: Type A & NFPA 1983: Technical

MBS: 8,092 lb



Orange



Red



White



Blue



Black



Yellow

11 mm (7/16") SuperStatic2™

Our do-it-all static rope is 100% nylon, with a core specifically engineered for more flexibility and better handling. The SuperStatic2 is compatible with a broad range of gear and hardware, making it the ideal rope for all types of high-angle rescue scenarios.

NFPA 1983: Technical

MBS: 6,519 lb

HEADLAMPS

<100 lumen

part 3

That means less than 100 so there are no 100 lumen models here, 99 is the upper limit. This is the third and final part of our GUIDE to headlamps and is the smallest selection of professional grade models. If we included all the Christmas cracker and unbranded models there would be hundreds but we're only interested in proven models although many still cost mere pennies in comparison to some of the high-powered, highfalutin models in the 100-200 lumen and especially the 300+ lumen models. We'll be adding an 'UPDATE & ADDITIONAL MODELS' in the next issue, which, I know we said that last time but we not only ran out of space again but the new models were all at the higher end of lumen output so they might as well all go in together under the 300+ Update banner. In this <100lumen category we again see some names more familiar as rope and rescue equipment manufacturers but we haven't really seen any expansion of their ranges for this year so maybe they peaked with their initial splurge into the market. We've again used part of the he intro from the previous two parts because you may either be reading this for the first time or have forgotten what we said last time.

As always we've limited our GUIDE to the best brands for professional use. That doesn't mean that there aren't one or two random, unbranded models that aren't any good or some rebadged models like Milwaukee, Coleman or DeWalt that aren't also noteworthy BUT, they're provenance isn't always with more extreme conditions in mind. You already know the brands we've used for decades and consider to be top of the tree from specialist manufactures like Petzl, Pelican, Princeton Tec, Streamlight, Koehler, LedLendser, Unilite, Underwater Kinetics and Koehler. These are hard to beat but some others with a broader product range like Black Diamond and the very impressive Silva are also worth consideration though the latter has none in this <100lumen category. We're

not sure what happened to the German brand Lucido that Mammut bought a few years back, you can still buy the TX1 but it doesn't appear on any Mammut website so perhaps that didn't work out. We mentioned last time that manufacturers categorise their own products as either Sport or Industrial, sometimes separating out Emergency Services but they can virtually all cross-over into each other's fields. The exception might be 'Intrinsically safe' lighting meeting ATEX or r US HAZLOC which might be an extravagance for anyone not working in industry or mine-rescue but if you're not paying a premium for the extra certification, the light itself will be just as good as most, if not more robust than many. Similarly cave rescuers may not want the brightest spot beam on the market because it would be permanently bouncing back off close surfaces, a flood option would be essential. But otherwise, sport models just tend to be smaller and lighter which would suit many a Mountain Rescue, cave rescue or wilderness SAR team. We haven't made the distinction between sport or industry or tactical or rescue – if it has the features you want at a price you can afford, that's all that counts.

KIDS MODELS

There was a time this category would have contained the majority of world headlamps but as technology of battery and bulb/LEDs has improved so has lumen output. Some key manufacturers listed in our previous Guides don't have even a headlamp model below 100 lumen – companies like Fenix, Koehler, Nitecore, Silva and Unilite. Unusually, we have included at least 3 models here that are intended for kids but the manufacturers did such a good job that if you avoid the vibrant pink models with fluffy animals or scratch the rocket off the blue ones, they're very useful for adults too. The Petzl Tikkid for instance has a headband that releases under tension, it turns off after an hour's continuous use to preserve power and it has a luminous



Climbing Technology's headlamp being put to use in close-quarter work on Mt Blanc. Pic - Klaus von Orto

MARKET GUIDE

reflector so it can be found in the dark – why haven't all headlamps got that?

ANSI/PLATO FL1 PROTOCOL

The American National Standards Institute stole a march on the EU by coming up with an acceptable criterion for cross-comparison of lighting and the PLATO FL1 protocol is being widely adopted. It creates a more level playing field and enables everyone to compare like for like without the inflated and misleading figures presented by many. So look out for **FL1** in the IP Rating column. Just to give you an idea of how this testing protocol is shaking this up, the Petzl E-Lite was originally quoted as 50 lumen out to 30m for 7hours but under the standardized PLATO FL1 testing it is now 30 lumen out to only 7metres for 3hours on the maximum setting. If a company as capable and up-front as Petzl is having to modify its output figures just imagine what a difference it would make to less scrupulous manufacturers' figures. It's highly likely that any peripheral brands will be making things up to look more impressive than they really are, like thousands of lumen output that actually only last for a few seconds or a beam range that is calculated on just being able to see the beam rather than what you can see with that beam! It's always worth checking on the true test parameters for the specification being presented to you but few are quite as forthcoming about this as the market leaders like the 3 P's, Petzl, Peli and Princeton Tec. We show **FL1** in the IP column and here is Petzl's useful info on the FL1 test protocol:

BRIGHTNESS (lumens)

This measurement is taken between 30 and 120 seconds after the headlamp is turned on. It indicates the maximum light output, when the lamp is first turned on, using new batteries.

LIGHTING DISTANCE

This is the maximum distance between the lamp and the location where only 0.25 lux of illumination remains. The measurement is taken when the lamp is turned on, using new batteries. Lighting distance depends directly on brightness, but mainly on the shape of the beam. [ED: note that we are quoting the MAXIMUM beam range possible at the highest setting]

BURN TIME (hours)

This corresponds to the length of time for which lighting remains optimal, from when the lamp is turned on, until 10% of maximum light output is reached. Then it switches to reserve lighting.

RESERVE LIGHTING

Reserve lighting ensures a minimum light level for walking. However, the light may not be sufficient for fast paced activities (such as running, mountain biking, skiing...).

ANSI IP RATING

In addition the IP rating for water-resistance or waterproof this uses X4 for water resistant (splash-proof), X7 for water proof when immersed momentarily and X8 for submersible do a limit stated by the manufacture, usually something like 1m for 5minutes etc.

CHINESE MANUFACTURE

We usually add a sub-flag to indicate the actual country of



scuemagazines.com

manufacturer as distinct from the main origin flag which is the home country of the company.

However, we had to take them off because virtually every manufacturers' lights were made in China and the tables looked ridiculously cluttered. It's easier to tell you that Princeton Tec, Lupine, Streamlight and Pelican DON'T manufacture in China/Vietnam/Taiwan! Even Petzl use a Malaysian manufacturer. China and Taiwan obviously manufacture to a high standard and have a virtual monopoly on LEDs so Chinese manufacture is no indication of diminished quality. However, there are hundreds of unbranded Chinese models that we don't know the efficacy of in terms of testing and some claims for output that look dubious. Stick to brands you know from the rescue industry and particularly with good warranties and you should be good. The stigma of Chinese manufacture is being eroded but some are still proud to say that they make their own products in-country or with some help from neighbouring countries.

ELECTRONIC WIZARDRY

The future continues to point towards electronic sophistication although there is a lot to be said for the simplicity of an on-off switch giving you the choice of light or darkness. Petzl have been pioneering masters of technical electronics with their *Constant* lighting metering, *Reactive* lighting and programmable options. This is exemplified by the *Nao* from the last issue but shown in our headband section, although it's quite odd that Petzl's most professionally capable model isn't listed under their 'Professional' range, only 'Sport'. Don't let that put you off unless you need intrinsic safety because many of these low-lumen models are aimed at sport but that nicely encompasses many wilderness rescue activities.

REGULATED OUTPUT: Petzl call it *Constant* lighting but it's the 'regulated' mode that many other brands now use and means that you get a regular light intensity for the full duration of the charge rather than a rapid or gradual drop-off of beam intensity once the batteries are low. This kind of electronic control circuitry also keeps an eye on temperature and should cells start to overheat it will regulate the light output to stop permanent damage. Boost or Turbo modes are limited by temp control. There are only handful of regulated models in this selection and the lower prices reflect this.

REACTIVE LIGHTING is completely absent from this selection and is the opposite of 'Constant'. It is of two types – Petzl's 'Reactive', not to be confused with 'reactive' as a verb, uses a sensor to figure out the amount of reflected light and therefore the proximity of whatever you're looking at – if it's a map it turns down the lighting, if it's a way off in the distance it increases the power. The second Petzl innovation is a 'Face-to-Face' function which is much simpler than their 'Reactive' but is still reactive in the sense that it recognises proximity of other headlamps and reacts by dimming your headlight accordingly – that will please your colleagues but is only any use to you if their headlamps are similarly equipped otherwise, prepare to be blinded if you're in a consultation huddle.

9490 AREA LIGHT



Silent lighting on-demand



- ▶ Rugged, Rechargeable and Portable
- ▶ Easy and quick to set up
- ▶ Mast extends above 1.8 metres
- ▶ Battery can be swapped to extend light duration
- ▶ Intelligent control to programme light up to 24 hours
- ▶ Self-contained system

RELIABILITY DOESN'T COST...IT PAYS.

2780 LED HEADLIGHT

- ▶ Red rear light (constant or flashing)
- ▶ Pivoting head for directional beam
- ▶ Downcast LED technology
- ▶ Battery status indication
- ▶ Waterproof to 1 metre



RELY ON PELI



MATERIALS.....

The vast majority of these headlamps are made of some form of toughened plastic, not the thin brittle stuff that your kids' toy's battery enclosures are made of but tough enough to withstand a drop onto concrete from a metre/3ft up. That particular test is what sets the professional grade models in this guide apart from the cheaper camping lights. Machined and die-cast alloys are also evident in some brands like LEDLENSER and NITECORE. This always gives a reassuring feeling of being robust even if some of the carbon-plastics are just a s tough but they don't feature in many ATEX/intrinsic safety models! Talking of which, we've included mention of ATEX (or Intrinsic Safety in old money) in the NOTES column but a hazardous atmosphere is not normally a risk that needs to be catered for in wilderness search and rescue. Nevertheless, many teams have responsibility for road accidents and remote industrial sites so intrinsic safety could be a useful feature. It tends to be on the lower power lights in part 1 of this guide because of close-quarter and confined space working which doesn't require a 1000 lumen spot light blinding everyone and everything in a 10 foot radius.

HEAD BANDS.....

We didn't have room to include a column for the type of headbands available. We barely had room for all the data as it is. However, headbands are a consideration when it comes to comfort and fit. There are five types for the smaller lights but the bands we show for the Nao with its odd cats-cradle and the Zipka with its retractable headband, don't feature in this Guide pt3:

1) FULL strap with a lateral and dorsal strap, usually in a soft facing elasticated fabric. This retains the front light-housing and rear battery mount (if separate) well, especially on a helmet which can be slippery and require additional clips.

2) HEADBAND-ONLY which is the vast majority of the <100 lumen models and will be in either a sweat-wicking elasticated band or it may be a much heavier duty solid black rubber for industry and helmet adhesion.

3) INTERMEDIATE headband as exemplified by Fenix which has an occipital band coming off the lateral headband that helps keep the headlamp centred. There's also the Petzl Nao, minimalist elastic cord version which is about as light as a headband can be and again hugs the occiput (rear brain-case). The 'oddities' from Petzl are the Zipka 4) with a RETRACTABLE cord strap and the Elite 5) with a single 'bootlace' tightened through a simple toggle.



IN THE FOLLOWING TABLES.....

COSTS Are rounded up. no £19.99 here!

MAX LUMEN as quoted by the manufacturers has become the industry standard measurement for light output in preference to Lux etc. so is the easiest way to compare like-for-like. Note that for some models, the quoted max lumen is for very short bursts only because the overheat protection would otherwise kick in. Unlike the high-power models, these <100 lumen models don't have a higher-power 'burst' so the Lumen figure quoted is pretty much the lumen you get, at least for the early part of battery life. Some models have lumen-output adjustment listed in the MODES column as 'DIMMABLE' but not to be confused with 'FINITE BEAM' which refers to beam width adjustment. Power adjustment may be found on the rear battery housing as a dial or lever as with the LEDLENSER H6 pictured opposite next to the H5 which is a lighter, less costly variant that doesn't have that feature. In both cases, beam width adjustment is via a sliding lever below the bezel.

MIN RUN TIME is given for the main White light only and at its most powerful constant output setting (if this is variable). There are some models that offer red, green and/or blue LEDs which will extend these times as will the emergency flashing modes but that is never at the max lumen and NOT included in our quoted figures.

MAX RUN TIME is at the minimum constant power output but might not be using the main beam at all even if it's got variable output because many have additional, smaller 5mm LEDs. Some have a high power LED, a low power LED or LED(s) and a coloured LED(s). In the case of one tactical helmet mounted light, the white LED is quoted at 48 hours on low while the blue LED will give 120 hours – we have quoted the lowest power white LED on constant beam even though flashing (strobe) beams will also extend run time, considerably in most cases. There is a technical difference between what most users think is run time ie. from switching it on to the beam dying completely – it's a little better than that as Koehler nicely explain: "Run Time is defined as the duration of time from the initial light output value – defined as 30 seconds after the point the device is first turned on – using fresh batteries, until the light output reaches 10% of the initial value."

FRONT LEDS.....

Indicates front beam colour options and a rough guide to LED size. This is obviously dictated by the colour of the LED but it can simply be a coloured lens over a white LED. Most LEDs are white with a clear lens and many have an additional, often smaller white or coloured LED to offer less dazzle and/or longer duration than the main beam alone. Some have a Red, green or blue LED to preserve night vision, some have all three colours. Pelican has a model with 'colour-correction' output which casts a 'real' white light that doesn't artificially alter the colour of things like



blood or change blues to green etc. Each separate LED gets its own square indicating colour of the front LED and relative size. Interchangeable lens colour options would normally be listed in the NOTES but there are none in this selection.

SPOT to FLOOD.....

refers to the width and/or strength of beam. This used to be altered with a twist of the bezel and in many cases still is but more often than not, variable or mixed beam output (shown as ■) is provided by the push of a button or might be automatic. Most will adjust between a tight spot giving intense light across a narrow beam to a more diffuse flood across a wide area and some combine the two types to create a mixed or vari-beam but this is rare in this class of light, much more common in higher lumen output models. At least one model here, the CT Lumex uses a swing-down diffuser to change from spot to flood while the LedLenser H5 has bezel adjustment to change from spot to flood.

BEAM MODES.....

Are unfortunately called by a wide variety of company-specific terms as they seek to stamp their own mark on industry



nomenclature. So we've pretty much listed the modes as they do even though you'll spot many of the same modes under different names. The examples above are from Nightstick (Bayco) and seem pretty straightforward where two LEDs are used either separately or at the same time. Modes are changed by a range of mysterious push-button combinations, similar to a Freemason's handshake – nobody really knows what the sequences are, they just pretend that the ultimate beam mode is what they meant to do. A notable exception is the Petzl E-Lite (pic right) which has the unfortunately rare feature of icons on a rotating switch to show exactly what mode is where. I wish all headlamps did this. The E-Lite is a tiny, emergency-only headlamp that comes in a little storage case and has been around for a few years but still not enough (if any!) companies have followed their lead and simplified the switching modes. For all lights other than the E-Lite, read instructions carefully and practice before you get into the field. If there is a rotating

bezel around the bulb/LED this will generally adjust the beam width so have an infinite number of 'MODES' listed as 'FINITE brightness adjustment' in part 1, 'Finite Beam' in part 2 and not required in this issue! With some intelligent systems the beam will automatically adjust for distance-from-object so that map reading uses a dimmer light than distance searching and this will be further indicated in the 'REGULATED' column. Some lights have flashing or strobe modes that may be SOS signalling, rapid, epilepsy-inducing flashing or slow flashing. Emergency service vehicles discovered long ago that the most conspicuous lighting is a flashing white light so these will not only be more likely to attract attention it generally uses less energy as well. A number of the modes are designed to extend battery life by using a lower lumen output than the maximum and indeed some models only achieve the maximum quoted lumen output by pressing a 'boost' button for a few seconds at a time. The beam modes listed are for FRONT-White LEDs only.

REAR LIGHT....

Some models have a rear red or white LED – very useful for knowing the proximity of your colleague in the dark – that's if the enormous front-facing white light hadn't already given the game away. In actual fact, the rear light can be seen from over a kilometre away so there is method in the madness and these can be flashing or constant, flashing giving the longest battery life and shown □ for white flashing or □ for red flashing. An understandably popular feature for tactical users who are using a low visibility red or coloured beam and don't want to be shot in the back by colleagues.

BEAM THROW/DISTANCE....

is measured from the light to the point at which the lux reading is 0.25 which is roughly the same as a full moon on a clear night. CANDELA in burnt orange (which should really be Candelas with an 's' but we couldn't fit it in!) is the figure for beam intensity, generally at the centre of the beam and is the term that replaced 'candlepower' in the lighting industry.



MARKET GUIDE



www.rescuemagazines.com

ADJ HEAD ANGLE....

refers to the angle that the front headlamp can be manually adjusted to. Some will rotate 90 degrees to point directly at your feet while your face is still pointing forwards. This is generally achieved with an incremental 'ratchet' to keep the head firmly located in each of the desired angles. Some do not quote an angle so there may just be a black square in this column, you can safely say that these will adjust from/to at least 60° and probably closer to 90° in most cases.

BATTERIES included....

A description in orange indicates the cells supplied with the light. Where a choice exists, the output data is based on the first battery type listed. Unless otherwise stated AA and AAA refer to disposable batteries. But rechargeable or high-power lithium and/or Nickel Metal Hydride cells are often an option. There is also a **BATTERY/RECHARGEABLE** column indicating whether the supplied cells are disposable ■ or rechargeable batteries ■ and if the headlamp can use other types of cell shown as □ for rechargeable option and □ for disposable cell options. Check out the 'USB' column for models easily charged via laptops, phones, vehicles etc. the oval USB-C will likely become standard but most still use the flat-bottomed mini USB.

BELT MOUNT.... This refers to the ability to move the battery pack to your belt or to keep them warm inside clothing while still in use. This feature is common in high output models needing larger batteries but rare for the lower lumen output ranges from 0-299lm. There are again none in this GUIDE with a dedicated belt mounted battery pack and the vast majority have batteries within the headpiece rather than in a separate battery compartment on the head band. For the few with separate battery cases, you may be able to partially dismount these in order to stow on a belt or in a pocket and these are indicated by □. This option also takes weight off the head. Not all are easily moved from their headband but in an emergency, ie. where power is low and the outside temperature is sucking the life out, you could resort to a multitool, cut it away from the headband and stow in under a warm armpit. Nice.

POWER STATUS....

Not to be confused with 'Charge-Status' which is how long your depleted cells are taking to charge up. Power Status is how much usable power you have left and is given as ■ = for constant power status always on view- usually indicated by a series of small LEDs. □ = power status shows temporarily whenever the light is switched on. ■ = indicates that an incremental power status is shown on request (by pressing a button) and an outline square □ = indicates that intermittent flashing, or a solid red LED or an audible beep tells the user that the battery is getting low – some have LEDs and an audible reminder.



WATER RESISTANCE is shown with a black square and is listed under the **IP RATING** where the last number ranges from 1 to 8 with X7 and X8 being submersible. The X in these examples refers to dust ingress and is a number from 1 to 6 but not often given for headlamps.

WARRANTY....

Unlimited Lifetime warranty is shown as ■ Limited lifetime as □ but these may only be valid in the country of purchase. A Square AND a number = a limited time warranty in years OUTSIDE the country of origin, none in this list though. A plus symbol + after a number means the warranty may extend further but will generally exclude the cost of parts.

COB or Chip-On-Board (pic right)

Are becoming the norm and have been around in area lighting for many years. Not so many of these smaller lights have them but as singles or arrays you will see them more and more. They are distinctive as what looks like a flat strip of plastic sometimes with more distinct flat circles or squares sat at the back of the reflector. Even less to break with no glass optics.



HAZARDOUS ATMOSPHERES

These do crop up in low power headlamps because confined-spaces for instance don't require or want lights that are too powerful and therefore blinding in a small space. This feature is highlighted in the NOTES section. In Europe we cover this with the acronym ATEX and zones 0 for the longest exposure to a hazardous atmosphere to zone 2 for the shortest exposure and in the US as HAZLOC (for Hazardous Location) but the two standards are not mutually exclusive in pure standards terms even though performance might be. In the US The National Electric Code (NEC) further defines hazardous locations by "class" and "division."

There are three classes of hazardous locations:

Class 1 locations are made hazardous by the presence of flammable gases, liquids or vapors.

Class 2 locations are described as hazardous because of the presence of combustible dusts.

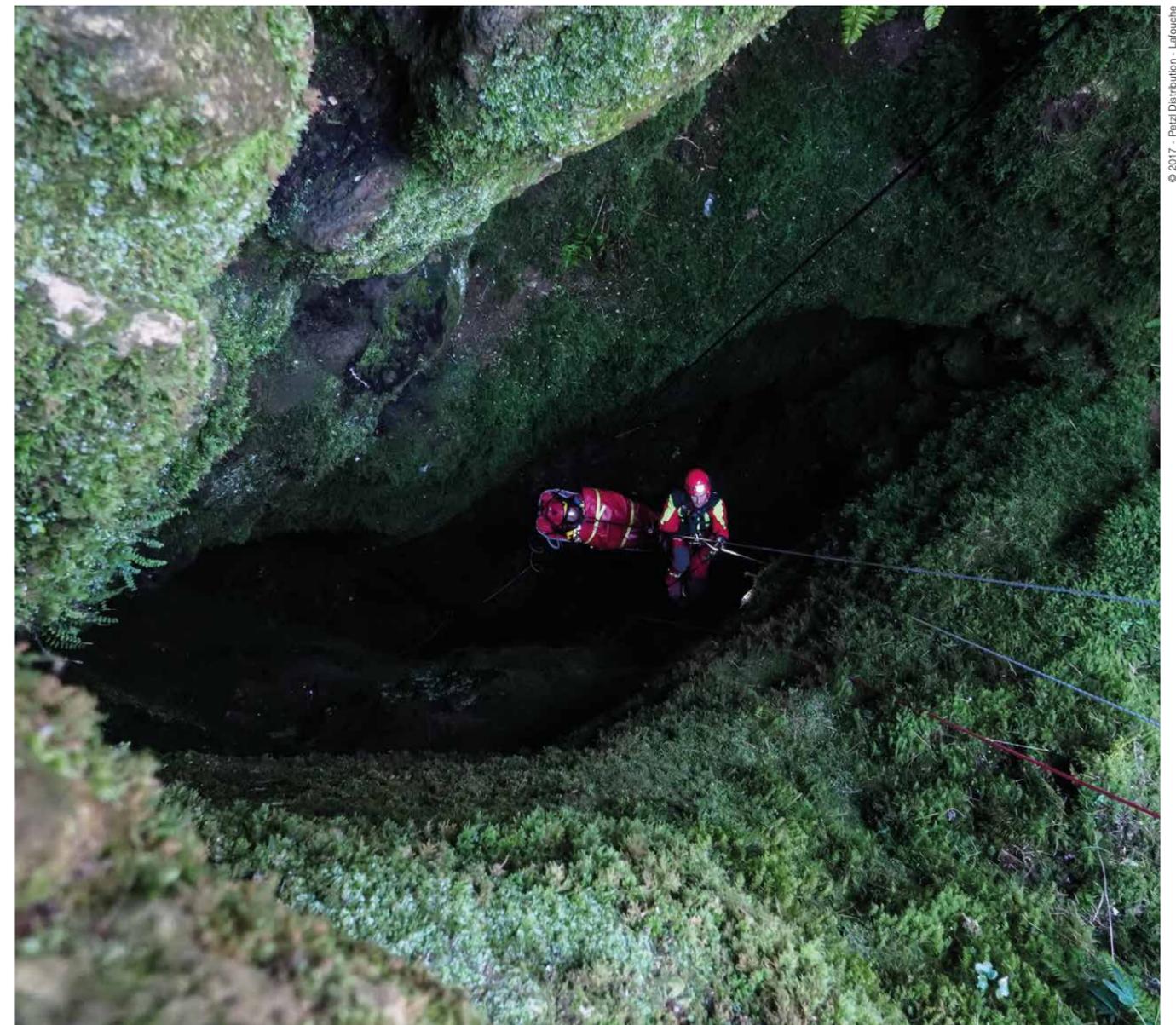
Class 3 locations contain easily ignitable fibers or flyings [ED: not to be confused in the UK with 'filings' as in... iron-filings].

"Division" refers to the likelihood that ignitable concentrations of flammable materials are present.

Division 1 designates an environment where ignitable concentrations of flammable gases, liquids, vapors or dusts can exist some of the time or all of the time under normal operating conditions or where easily ignitable fibers and flyings are manufactured, handled or used.

Division 2 locations are areas where ignitable concentrations are not likely to exist under normal operating conditions or where Class 3 materials are stored or handled.

As with parts 1 and 2, there will be many brands you might know that are not featured in this Guide. We have stuck with brands and lights that are either at the top of the professional tree or are reliable enough to be used by professionals even though many will be from the sport sector. 'Sport' can be just as professional as 'Industrial' or 'Rescue'!



© 2017 - Petzl Distribution - Lafouche

PETZL EXPERTISE

TRUSTED BY PROFESSIONALS

Whether day or night, on a rock face, or at the bottom of a cave, rescuers don't stop. When facing these critical situations, GRIMP rescue workers know that powerful and robust lighting is an absolute necessity.



DUO S

Ultra-powerful, waterproof and rechargeable headlamp, featuring Petzl's FACE2FACE anti-glare function. 1100 lumens. www.petzl.com



Access
the
inaccessible®

IMAGES NOT TO SCALE	MODEL	COMPANY	ORIGIN	COST	WEIGHT inc. batteries	MAX LUMEN	MIN RUN TIME @max power	MAX RUN TIME @min power	FRONT LEDS	SPOT/FLOOD/VARI	FRONT MODES	REAR LIGHT FLASHING	MAX BEAM DISTANCE CANDELA	ADJ HEAD ANGLE	BATTERIES included	CHARGE TIME	POWER STATUS	USB CHARGER to MINI USB	STD BATTERIES RECHARGEABLE	BATTERY to BELT	REGULATED AUTO LIGHT DIM	SWITCH LOCK	IP RATING FL1	COLOURS	WARRANTY LIFETIME	NOTES	WWW.
	Gizmo	BLACK DIAMOND EQUIPMENT		£20 \$20 €22	84g 2.9oz	90	30h	75h	1	1	Dimmable Spot Strobe	-	30m 98ft	■	3x AAA	-	-	■	-	-	-	-	X4	■ ■ ■	3	discontinued	blackdiamond equipment.com
	Stride	BLACK DIAMOND EQUIPMENT		£30 \$30 €30	35g 1.2oz	25	1.5h	1.5h	1	1	White Flood Red Flood Red Strobe White Strobe	-	8m 26ft	-	Li-ion	-	□	■	-	-	-	-	X4	■	1	Intended as a strobe or rear light adjunct to more powerful headlamps	blackdiamond equipment.com
	Wiz	BLACK DIAMOND EQUIPMENT		£25 \$20 €20	67g 2.4oz	30	5h	60h	1	1	Full Dimmed Strobe Red	-	8m 26ft	■ +/- 30°	2x AAA	-	-	■	-	-	-	-	X4	■ ■ ■	1	Equally great for adults! Auto shut-off after 2hrs. Head tilts both ways, multi-coloured LED	blackdiamond equipment.com
	Lumex (HD972)	CLIMBING TECHNOLOGY		£25 \$36 €33	59g 2oz	85	2h	2h	1	1	Spot Flood Red Red Flashing	-	? ?	■ 90°	1x AA	-	-	■	□	-	■	-	X4	■ ■	2		climbingtechnology.com
	Pentalite	EDELRID		£14 €15	90g 3.2oz	33	25h	30h	1	1	High Medium Strobe	-	25m 82ft	■ 60°	3x AAA	-	□	-	-	-	-	-	X1	■	-	Magnet on head for separate attachment to metal surfaces	edelrid.de
	HL10	FENIX LIGHTING		£28 \$35 €25	57g 2oz	70	0.5h	30h	1	1	Low Medium High	-	15m 50ft 55	■ 100°	1x AAA NiMH	-	-	■	-	■	-	-	X8	■ ■	5	head detaches as a stand-alone light	fenixlighting.com
	Command Lo-Pro (410-L06)	FOXFURY		\$70	272g 9.6oz	65	7h	26h	1	1	Low Medium High	□	28m 92ft	-	4x AA	-	-	■	□	-	-	-	X7	■ □	1	Alloy head	foxfury.com
	Command Tilt (410-T09)	FOXFURY		\$75	272g 9.6oz	65	7h	26h	1	1	Low Medium High	□	28m 92ft	■ 38°	4x AA	-	-	■	□	-	-	-	X7	■ □	1	Alloy head	foxfury.com
	Klik Micro	KONG		£20 \$23 €18	30g 1oz	25	40h	77h	1	1	High Low Red Red-flashing	-	25m 82ft	■ 90°	2x CR2032	-	-	■	-	-	-	-	X6	■ ■	2		kong.it
	H5	LEDLENSER		£33 \$35 €35	120g 4.2oz	25	20h	20h	1	1	High	■	70m 230ft	■ 90°	3xAAA NiMH	-	-	■	□	-	-	-	X4 FL1	■ ■	5-7	Alloy casing	ledlenser.com
	NEO	LEDLENSER		\$25 €25	88g 3.1oz	90	10h	40h	1	1	High High/red blink Low/red blink both Blink	■	10m 33ft	■ 90°	3xAAA NiMH	-	-	■	□	-	-	-	X4 FL1	■ ■ ■ ■	5-7	Alloy casing	ledlenser.com
	Pulse Micro (PS318)	LUXPRO		\$7	68g 2.4oz	30	6h	10h	1	1	High Low Strobe	-	25m 82ft	■ 90°	2x CR2032	-	-	■	-	-	-	-	-	■ ■	-	comes with hat clip	luxproflashlights.com
	NSP-4602B	NIGHTSTICK		\$30	101g 3.5oz	35	12h	36.5h	1	1	Spot High Flood High DualBeam	-	19m 62ft 92	■ 45°	3x AAA	-	-	■	-	-	-	-	X7 FL1	■	1	Inc. elastic and rubber head bands	nightstick.com

NOTES: COST: Approx. inc tax and batteries when indicated in orange in BATTERIES column. POWER STATUS: ■=Constantly displayed □=Displays when first switched on ■=Displays on request □=Beep/flash when low BATTERIES: ■=Regular batteries as standard □=Optional Regular batteries ■=Rechargeable as standard □=Rechargeable option

IMAGES NOT TO SCALE	MODEL	COMPANY	ORIGIN	COST	WEIGHT inc. batteries	MAX LUMEN	MIN RUN TIME @max power	MAX RUN TIME @min power	FRONT LEDS	SPOT/FLOOD/VARI	FRONT MODES	REAR LIGHT FLASHING	MAX BEAM DISTANCE CANDELA	ADJ HEAD ANGLE	BATTERIES included	CHARGE TIME	POWER STATUS	USB CHARGER TO MINI USB	STD BATTERIES RECHARGEABLE	BATTERY TO BELT	REGULATED AUTO LIGHT DIM	SWITCH LOCK	IP RATING FL1	COLOURS	WARRANTY LIFETIME	NOTES	WWW.
	XPP-5450G	NIGHTSTICK		\$35	101g 3.5oz	90	13h	22h	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Spot High Spot low	-	80m 263ft 1615	90°	3x AAA	-	-	<input type="checkbox"/>	-	-	-	67 FL1		<input type="checkbox"/>	ATEX/HAZLOC Inc. elastic and rubber head bands	nightstick.com	
	2610 (HeadsUP)	PELICAN		£36 \$37 €72	91g 3.2oz	30	19h	47h	<input type="checkbox"/>	<input checked="" type="checkbox"/>	High Low	-	28m 92ft 194	-	3xAAA	-	-	<input type="checkbox"/>	-	-	*	X4 FL1		<input type="checkbox"/>	ATEX zn 0 Class I, Div1/ IECEx.	pelican.com peliproducts.co.uk	
	2690 (HeadsUPlite)	PELICAN		£41 \$36 €82	116g 4.1oz	74	11h	11h	<input type="checkbox"/>	<input checked="" type="checkbox"/>	High	-	92m 302ft 2124	60°	3xAAA	-	-	<input type="checkbox"/>	-	-	-	X7 FL1		<input type="checkbox"/>	Class I, II & III, Div1/ IECEx. Comes with rubber & elastic headbands. Helmet clip option.	pelican.com peliproducts.co.uk	
	2740	PELICAN		£24 \$24	94g 3.3oz	66	3h	103h	<input type="checkbox"/>	<input type="checkbox"/>	High Low Red	-	22m 72ft 122	45°	3xAAA	-	-	<input type="checkbox"/>	-	-	-	X4 FL1		<input type="checkbox"/>	Translucent blue head casing.	pelican.com peliproducts.co.uk	
	2745	PELICAN		£45 \$29	94g 3.3oz	33	20h	40h	<input type="checkbox"/>	<input checked="" type="checkbox"/>	High Low Flashing	-	35m 115ft 309	45°	3xAAA	-	-	<input type="checkbox"/>	-	-	*	54 FL1		<input type="checkbox"/>	ATEX zn 0 Class I, Div1 / IECEx- *Low-profile switch protected by shroud. Inc helmet clip	pelican.com peliproducts.co.uk	
	2755cc	PELICAN		\$37	96g 3.4oz	72	6.75h	15h	<input type="checkbox"/>	<input checked="" type="checkbox"/>	High Low Flashing	-	50m 164ft 632	45°	3xAAA	-	<input type="checkbox"/>	-	<input type="checkbox"/>	-	*	54 FL1		<input type="checkbox"/>	ATEX zn 0 Class I, Div1 / IECEx- *Low-profile switch protected by shroud. CC= Colour Corrected	pelican.com	
	Pixa1	PETZL		£35 \$48 €34	160g 5.6oz	60	3.5h	16h	<input type="checkbox"/>	<input type="checkbox"/>	High Low Reserve	-	90m 295ft	■	2 xAA or NiMh or Li-ion	-	<input type="checkbox"/>	-	<input type="checkbox"/>	-	-	-	67 FL1		<input type="checkbox"/>	ATEXzn2/HAZLOC, Class 1 Div2 Helmet clip included	petzl.com
	Pixa2	PETZL		£50 \$60 €49	160g 5.6oz	60	3.5h	26h	<input type="checkbox"/>	<input type="checkbox"/>	High Low Reserve	-	55m 180ft	■	2 xAA or NiMh or Li-ion	-	<input type="checkbox"/>	-	<input type="checkbox"/>	-	-	-	67 FL1		<input type="checkbox"/>	ATEXzn2/HAZLOC, Class 1 Div2 Helmet clip included	petzl.com
	Pixa3R	PETZL		£99 \$140 €98	145g 5.1oz	90	3h	11.5h	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Flood Mixed Focus (spot) Reserve	-	90m 295ft	■	930 mAh Li-ion Polymer	3h	<input type="checkbox"/>	-	<input type="checkbox"/>	-	-	-	67 FL1		<input type="checkbox"/>	ATEX zn2/HAZLOC, Class 1 Div2 Helmet clip included	petzl.com
	E+ Lite	PETZL		£24 \$30 €26	26g 0.9oz	30	3h	11.5h	<input type="checkbox"/>	<input type="checkbox"/>	Max Standard Flashing Red Proximity Red Flashing	-	70m 230ft	-	CR2032 Lithium	-	-	-	<input type="checkbox"/>	-	-	-	X7 FL1		<input type="checkbox"/>	Batteries can be stored for 10yrs. Toggle-adjustable headband	petzl.com
	Tikkid	PETZL		£25 \$25 €26	80g 2.8oz	30	2h	120h	<input type="checkbox"/>	<input type="checkbox"/>	Low High Flashing	-	60m 197ft	■	3x AAA or NiMh or Li-ion	-	-	-	<input type="checkbox"/>	-	-	-	X4 FL1		<input type="checkbox"/>	Core Li-ion power pack compatible	petzl.com
	Bot	PRINCETON TEC		£16 \$16	64g 2.25oz	30	3h	58h	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Flood High Flood Low Flood Flashing	-	27m 89ft	■	2x AAA	-	-	<input type="checkbox"/>	-	-	-	-	X4 FL1		<input type="checkbox"/>		princetontec.com
	Eos Tactical	PRINCETON TEC		£60 \$56	103g 3.6oz	60	1h	108h	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Spot High Spot Low	-	48m 158ft	■	3x AAA	-	-	<input type="checkbox"/>	-	-	-	-	X7 FL1		<input type="checkbox"/>	Red, Blue Green filters included. When installed flips up to cover LEDs	princetontec.com

NOTES: COST: Approx. inc tax and batteries when indicated in orange in BATTERIES column. POWER STATUS: ■=Constantly displayed □=Displays when first switched on ▣=Displays on request □=Beep/flash when low BATTERIES: ■=Regular batteries as standard □=Optional Regular batteries ■=Rechargeable as standard □=Rechargeable option

IMAGES NOT TO SCALE	MODEL	COMPANY	ORIGIN	COST	WEIGHT inc. batteries	MAX LUMEN	MIN RUN TIME @max power	MAX RUN TIME @min power	FRONT LEDS	SPOT/FLOOD/VARI	FRONT MODES	REAR LIGHT FLASHING	MAX BEAM DISTANCE CANDELA	ADJ HEAD ANGLE	BATTERIES included	CHARGE TIME	POWER STATUS	USB CHARGER to MINI USB	STD BATTERIES RECHARGEABLE	BATTERY to BELT	REGULATED AUTO LIGHT DIM	SWITCH LOCK	IP RATING	COLOURS	WARRANTY LIFETIME	NOTES	WWW.
	Fred	PRINCETON TEC		£35 \$30	78g 2.8oz	45	74h	120h	1	1	Flood High Flood Low Red High Red Low	-	35m 115ft	■	3x AAA	-	-	■	-	-	-	X4 FL1	■	5		princetontec.com	
	Fuel	PRINCETON TEC		£30 \$30	78g 2.8oz	70	74h	120h	1	1	Flood High Flood Medium Flood Low Flood Flashing	-	44m 144ft	■	3x AAA	-	-	■	-	-	-	X4 FL1	■	5		princetontec.com	
	Quad/ Quad Industrial*	PRINCETON TEC		£45 \$38	96g 3.4oz	78	1h	108h	1	1	Flood High Flood Medium Flood Low Flood Flashing	-	50m 164ft	■	3x AAA Lithium	-	■	-	■	-	-	X7 FL1	■	5	*Industrial version is Class1 Div1 costing £50/\$42	princetontec.com	
	Quad Tactical	PRINCETON TEC		£53 \$43	101g 3.6oz	78	1h	108h	1	1	Flood High Flood Medium Flood Low (RGB Filters)	-	50m 164ft	■	3x AAA Lithium	-	-	■	-	■	-	X7 FL1	■	5	Red, Blue Green filters included. When installed flips up to cover LEDs	princetontec.com	
	Argo Haz-Lo (Haz-Lo ATEX)	STREAMLIGHT		\$57	153g 5.4oz	90	8h	50h	1	1	High Low	-	113m 371ft 3200	■ 90°	3x AAA 3x Lithium	-	-	■	-	-	-	X4 FL1	■	5	ATEX or HAZLOC, Class 1 Div 1. inc. elastic and rubber headbands. HAZLOC= yellow only	streamlight.com	
	Buckmaster Trident	STREAMLIGHT		\$47	156g 5.5oz	80	5h	63h	1	1	High 1x Green 3x Green	-	126m 413ft 5000	■ 90°	3x AAA	-	■	-	-	-	-	X4 FL1	■	5	Flood is green -only	streamlight.com	
	Enduro (2018 model)	STREAMLIGHT		\$20	78.5g 2.75oz	50	5.5h	25h	1	1	High Low	-	66m 100ft 1100	■ 45°	2x AAA	-	-	■	-	■	-	X7 FL1	■	5	integrated helmet/cap clip	streamlight.com	
	Septor Haz-Lo/ Haz-Lo ATEX	STREAMLIGHT		\$57	156g 5.5oz	85	8h	50h	1	1	High Low	-	50m 164ft 620	■ 90°	3x AAA 3x Lithium	-	■	-	-	-	-	X4 FL1	■	5	ATEX or HAZLOC, Class 1 Div 1. inc. elastic and rubber headbands. HAZLOC= yellow only	streamlight.com	
	Sidewinder Compact II	STREAMLIGHT		\$109- \$156	94g* 3.3oz*	55	6h	70h	1	1	High Low Flashing	-	69m 226ft 1175	■ 185°	1xCR123a Li 1x AA 1xAA Li	-	■	-	-	-	-	X7 FL1	■	1	*Weight includes optional headband (Aviation version = Green LED) both versions have Infra Red LED	streamlight.com	
	Trident	STREAMLIGHT		\$42	156g 5.5oz	80	5h	53h	1	1	High Medium Low	-	126m 413ft 4000	■ 90°	3x AAA	-	-	■	-	-	-	X4 FL1	■	5	Class 1 Div 1	streamlight.com	
	Green Trident	STREAMLIGHT		\$42	156g 5.5oz	80	5h	63h	1	1	High Medium Low (green)	-	126m 413ft 4000	■ 90°	3x AAA	-	■	-	-	-	-	X4 FL1	■	5	Class 1, Div1. 10hrs longer on low (green LED) than the Trident (white LED)	streamlight.com	
	Trident Haz-Lo/ Haz-Lo ATEX	STREAMLIGHT		\$58	156g 5.5oz	85	8h	24h	1	1	High Spot Low Spot High Flood Low Flood	-	35m 115ft 2600	■ 90°	3x AAA 3x Lithium	-	-	■	-	-	-	X4 FL1	■	5	ATEX or HAZLOC, Class 1 Div 1. inc. elastic and rubber headbands. HAZLOC= yellow only	streamlight.com	
	Vizion 1	UNDERWATER KINETICS		\$57	110g 3.9oz	65	13h	17h	1	1	Spot Diffuse Diffuse Red	-	60m 197ft	■	3x AAA	-	-	■	-	-	-	X8	■	5	ATEX. Light can be removed to stand as area light.	uwk.com	

NOTES: COST: Approx. inc tax and batteries when indicated in orange in BATTERIES column. POWER STATUS: ■=Constantly displayed □=Displays when first switched on ■=Displays on request □=Beep/flash when low BATTERIES: ■=Regular batteries as standard □=Optional Regular batteries ■=Rechargeable as standard □=Rechargeable option

AZTEK Heavy-Duty Rope Qualification

By **Kyle Gautreau,
Josh Wood &
Sam Morton**

How Sterling tests rope for arduous rescue applications using the AZTEK system, including Rock Exotica AZTEK pulleys.



Right: The AZTEK (Arizona Technicians Edge Kit) has proved itself through the years as an invaluable multi-use rescue tool with over 137 possible ways to be used.

INTRODUCTION

The AZTEK was created by Technical Rescue magazine's venerable Rope Editor, Reed Thorne of Ropes that Rescue with Sterling developing the sewn cord components. The Kit has evolved through the years and in pursuit of constant improvement, we sought to better it. We've received feedback from users that they were looking for increased performance in some specific categories. We set out with these goals for improving the ropes for the AZTEK:

1. *Increased durability and abrasion resistance*
2. *Increased strength*
3. *Increased cut resistance*
4. *Arc Flash resistance*

Using Aramid fibers such as Technora® seemed the obvious choice due to their strength and performance in thermal and abrasive environments. Having both passed the NFPA Elevated Temperature test, SafeTech™ and FireTech2™ were our top candidates for the host rope in the Aramid AZTEK in terms of thermal resistance. These ropes have also proven to be very durable and abrasion resistant in the field. However, aramid fibers are more susceptible to the effects of flex fatigue, requiring the Sterling Engineering Team to do some investigating. To be thorough, we also wanted to quantify abrasion resistance. Thus, our Rube Goldberg-esque cycle tester was devised, which is capable of subjecting rope samples to repeatable and consistent cycling over an object.

Photo by Joe Klementovich

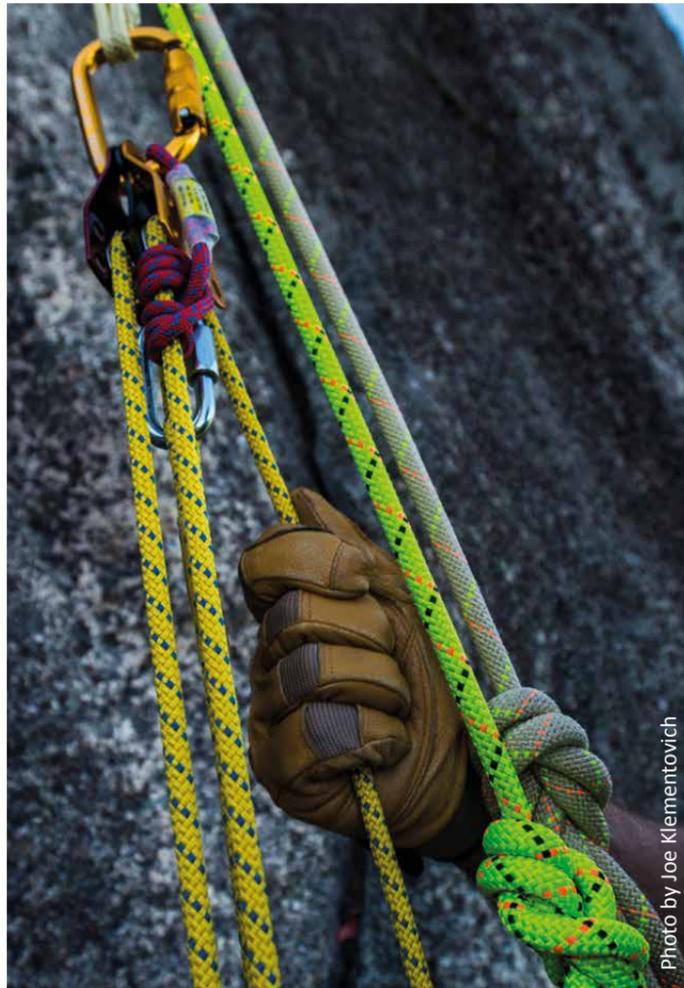
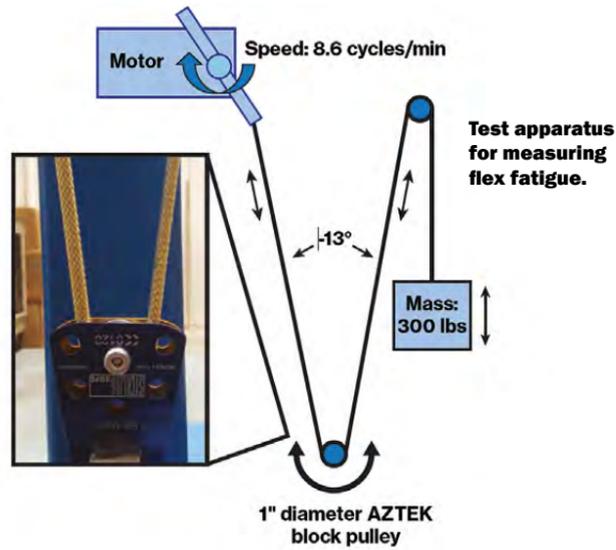


Photo by Joe Klementovich

FLEX FATIGUE

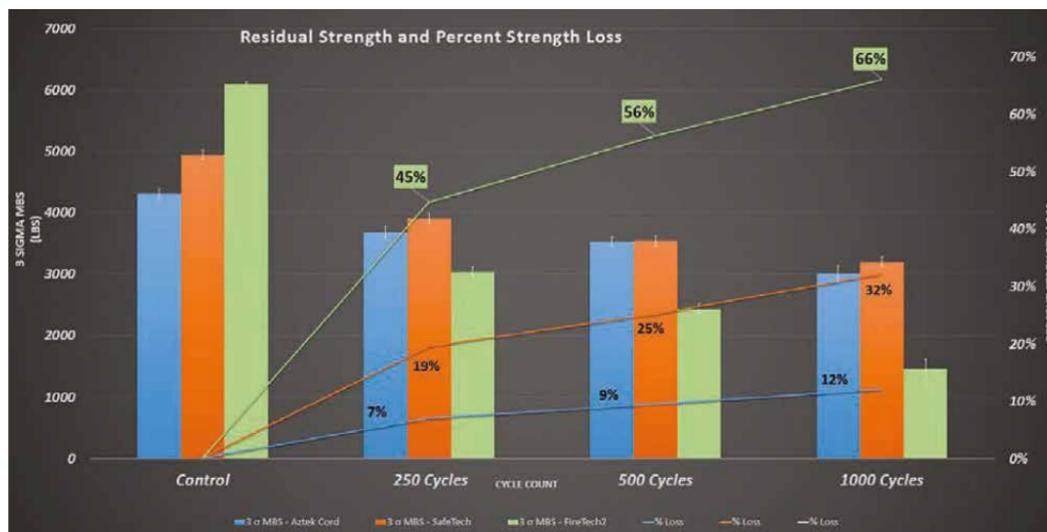
This terminology refers to weakening of fibers that are subjected to repeated bending stress; the bending under load causes internal and external fiber damage. Aramid fibers such as Technora are incredibly strong in tension but are not as strong in bending; the fibers break down at a faster rate than a nylon or polyester. This is also why aramid fiber ropes generally lose a higher percentage of strength in a knot when compared to nylon or polyester.

FLEX FATIGUE TEST SET-UP

The test uses an electric motor to cycle a rope specimen back and forth through a set of pulleys with a free-hanging mass attached to the far end. A sensor counts the cycles and stops the test when the desired count is reached. The residual strength is then found by pulling the sample to failure in our tensile tester using the CI 1800 method over 4" bollards. 5 samples were tested for each cycle count, and a 3 sigma minimum breaking strength was then calculated.

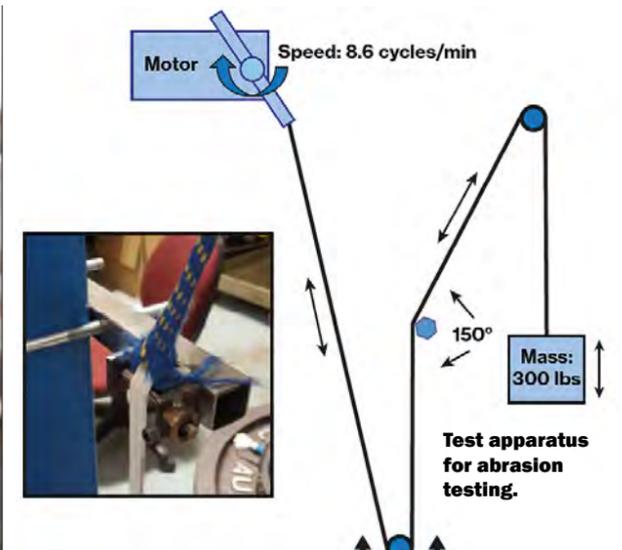
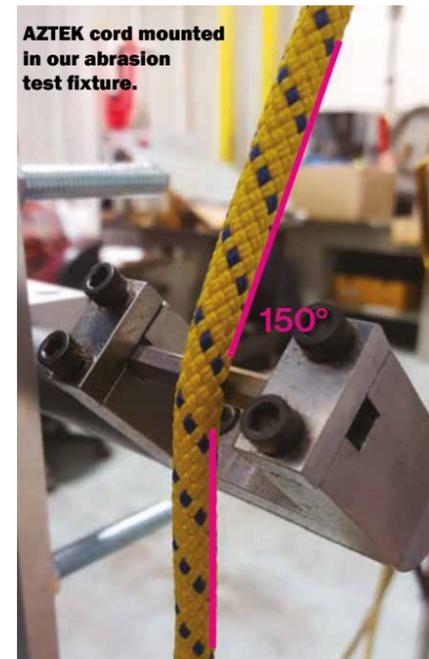
RESULTS

As expected the nylon cord performed the best in this testing; it had the lowest percentage strength loss. The FireTech2 saw a 56% decrease after 500 cycles. The SafeTech lost 25% of the original MBS at 500 cycles but still maintained an MBS over 3000 lbs after 1000.



ABRASION TESTING

Abrasion testing of textile rope is a notorious challenge in the cordage industry. For years, rope manufacturers and backyard rope enthusiasts alike have attempted to crack the code that is a repeatable test method for quantifying the abrasion resistance of rope and cord. Arguments have centered around standardizing certain variables such as abrading edge, line tension, and pass/fail criteria. To add to this, rope constructions can vary significantly and are subjected to different environments. Hence the still non-standardized abrasion test. With the Aramid AZTEK kit in mind, the Sterling Engineering Team gathered knowledge from past and applicable attempts to solve this problem and modified our cycle test stand to accept a new abrasion test method.



this result, though more investigation would be needed to be sure. The SafeTech also had double the amount of cycles compared to the nylon 8 mm so it gave us confidence that it would be significantly more abrasion resistant than the current nylon rope in the kit.

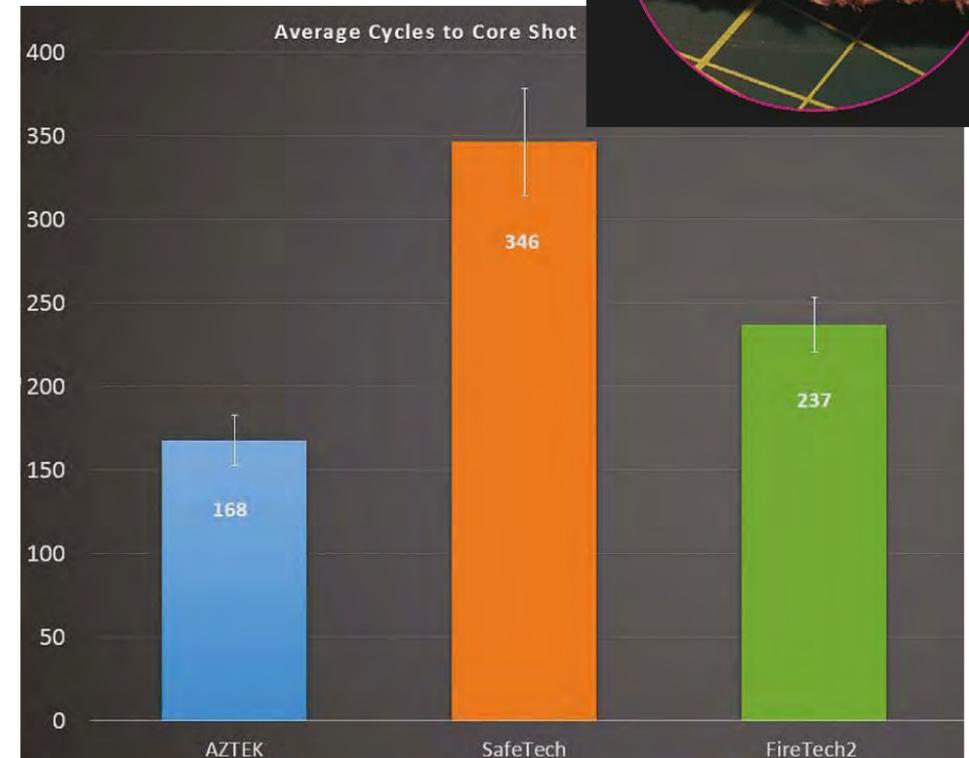


ABRASION TEST SET-UP

ASTM D6770-07 is the abrasion test specification for textile webbing such as seat belts or slings used by rock climbers and rescue personnel. Starting here, we were mainly interested in using the hex bar specified, since we've found that having a consistent and repeatable abrading edge is critical to gathering reliable data. We modified the line path in our apparatus to cycle a tensioned rope over the edge, and halted the test at the first sign of "core shot". We used 300 lbs as the test mass with a 1/4" radius on the hex bar. Five samples were tested for each rope, then results were averaged and plotted in the chart below.

ABRASION RESISTANT SUMMARY

The results of the abrasion testing were consistent and of good quality, showing a significant statistical difference from one another. Given their similar sheath constructions, it came as a surprise to see SafeTech outperform FireTech2. It appears that underlying factors, perhaps core density and elongation contributed to





CUT RESISTANCE

For this purpose we are defining cut resistance as the ropes ability to withstand failure over a sharp edge during a dynamic event. This is different than the measure of abrasion resistance. Determining cut resistance is difficult, there are many factors that could vary the results. There's also not an industry standard or test method for measuring a rope's ability to withstand cutting.

Technora fibers are generally considered more cut resistance; these aramid fibers have more tenacity and are more difficult to cut but we wanted to see if an 8 mm rope made with Technora fibers would provide increased cut resistance that could be correlated to "real world" use.

To test the cut resistance we worked with Mike Forbes from Ropecraft. His test apparatus simulates a loaded rope sliding horizontally across a sharp edge. This would allow us to compare ropes of similar mass with different constructions. We tested 5 ropes; 100% nylon 8 mm, 8 mm CanyonLux™, SafeTech, FireTech2, and 8.5 mm CanyonPrime™.

TEST SET UP:

- 1) 82.5 mm offset (the distance the mass is pulled away from the initial release point. This offset creates the horizontal force sliding the rope sample across the sharp edge).
 - 2) Test Mass = 125 kg
 - 3) The edge utilized is made from M5 steel with a 45 degree chamfer on the cutting surface.
- Cut Resistance Summary:

The Technora sheathed ropes travel farther before failure; we can interpret this as resisting cutting for a longer duration of time. Based on these test results we determined that these ropes have an increase in cut resistance relative to a nylon rope of similar mass. It is important to remember that a rope identified as cut-resistant is not cut proof.

RESULTS

- Nylon PER 62.4 cm
- FireTech2 73.2 cm
- SafeTech 75.3 cm

Photo by Joe Klementovich

TESTING

ARC FLASH TESTING

Why?: There is currently an OSHA mandated requirement for some PPE and equipment to meet Arc Flash compliance. This is mostly applicable to tower workers in the transmission sector. To see if the AZTEK would meet these requirements we had the rope components 3rd party tested to the arc flash criteria of ASTM F887. The components were exposed with incident energy of 40 + 5 cal/cm². There's not a specific standard for a rescue or haul system so we wanted to evaluate the residual strength of the components after the arc flash exposure.

ARC FLASH TESTING SUMMARY

The testing shows significant strength loss due to the arc flash exposure. Though the Technora fiber provides some additional resistance over nylon we don't claim Arc Flash compliance for this kit. There was such a significant loss of strength, and far too many variables and configurations of the kit to know if the residual strength would provide a safe working margin for workers that could be exposed to an arc flash event.

RESULTS

Average residual strength after arc flash exposure
6 mm Travel Restraint: 6.4 kN
8 mm Edge Restraint: 11.3 kN
Full System: 14.7kN

www.rescuemagazines.com

www.rescuemagazines.com

AZTEK ROPE



Damage to AZTEK Kit cause by exposure to arc flash testing.



ADDITIONAL TESTING

To ensure that the ropes and cords perform to a high-level Sterling conducted both in house and field testing.

Because the system relies on the interface of the hitch cords and host rope we tested to confirm compatibility and also to provide data for users on how the system will perform. We tested the Safetech Edge Restraint and the 6 mm TRC cords for the following:

- Load for slippage of ratchets
- Load for slippage of travel restraint
- Break strength of system
- Impact force from free fall drop

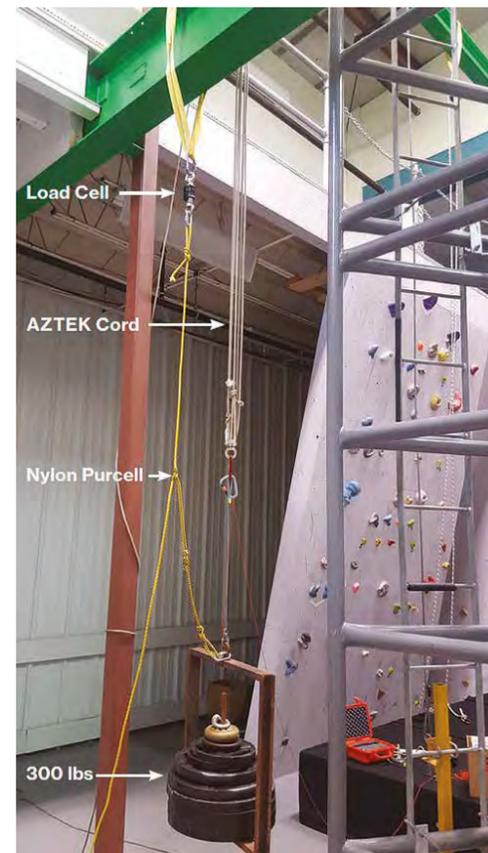
DROP TEST SET UP

Mass: 300 lbs

Hitch: 3 wrap prusik

FF: .3 (1 m of host, .7 m of purcell, .5 m drop)

Mass connected to a 3" loop at purcell



RESULTS

	SafeTech	Nylon
Average Impact Force	3.7 kN	4.65 kN
Average Slip on Host	16 cm	9 cm
Average Slip on Purcell	22 cm	5 cm

Travel Restraint max load 3.5 kN with constant slippage at 2.5 kN on slow pull testing.



Photo by Joe Klementovich

FINAL SUMMARY AND DISCLAIMER

After completion and review of all of the in-house and field testing we finalized the kit by choosing the SafeTech as the Edge Restraint and the 6 mm TRC as the Travel Restraint Purcell and Ratchet. The Technora sheath with nylon core gives the best performance for increased heat, abrasion, and cut resistance while still performing well in the system, and also limiting the strength loss from flex fatigue.

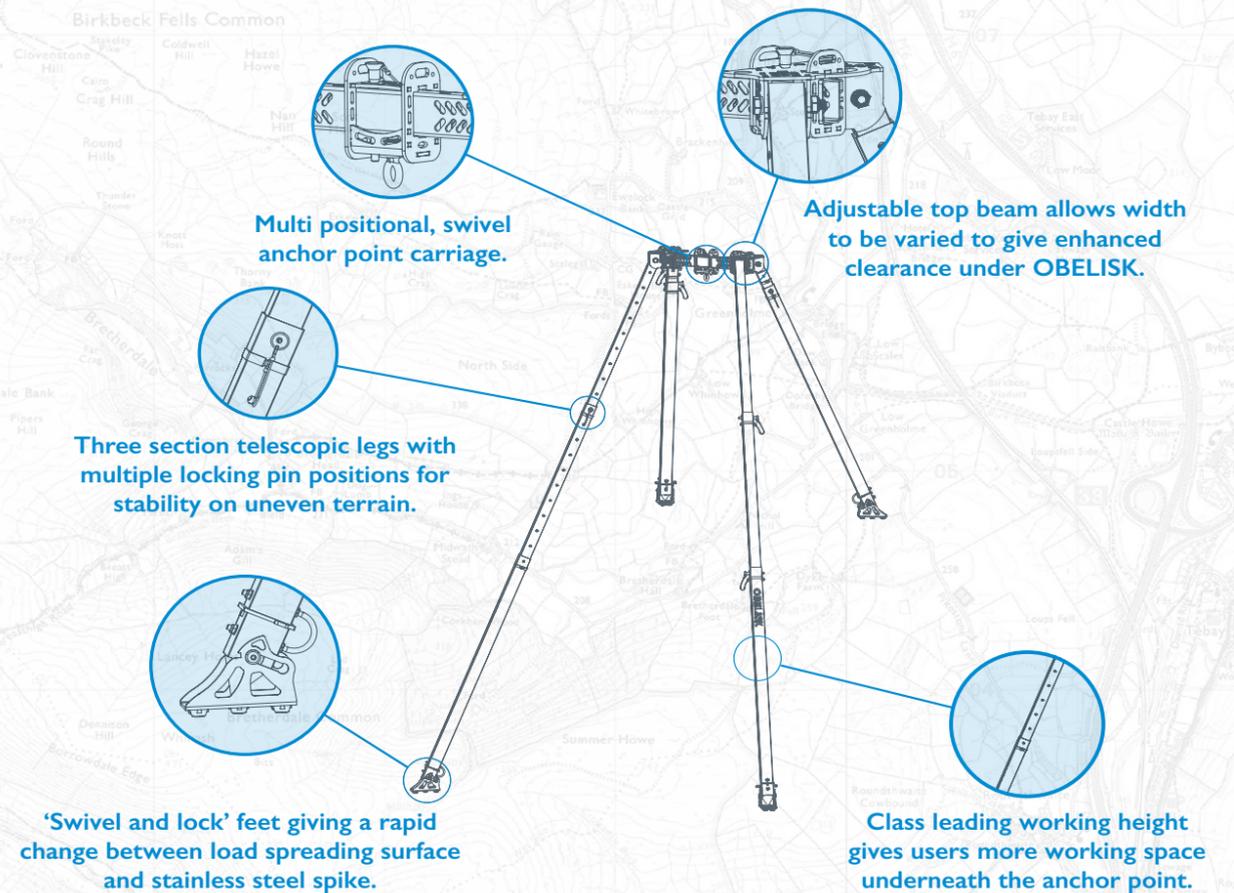
The system is 3rd party certified by UL to NFPA 1983 General Use for a Manufactured System.

The results from these tests cannot be considered definitive, are not exhaustive, and may not be representative of results from actual use in the field. Users need to follow all user instructions provided with this system.

OBELISK ADAPTS SO YOU CAN REACT



OBELISK



Designed and manufactured by Lyon specifically for emergency service work, the OBELISK incorporates a wealth of features that make it ideal for the varied and challenging situations teams have to operate in.

- Stainless steel and anodised aluminium alloy construction combines strength and lightness.
- Telescopic legs can extend to maximum height of 2200mm to allow clear passage of a stretcher.
- 'Push pin' locking on top beam, carriage and legs allow for tool-less adjustment.
- Swivel feet for maximum grip on any surface.
- Adjustable top beam with option for twin anchor point carriages allows for twin rope working without crowding.
- Weight Inc. all accessories: 22Kg.
- Guying points for additional security.
- EN795:2012, PD CEN/TS 16415:2013
- Product Code: LPP0003



For the latest information on the Lyon OBELISK specifications and availability, please contact us at work.rescue@lyon.co.uk or on +44 (0) 1539 624 040



SAR SAFETY



By **Greg Toman**



Greg was awarded a Churchill Fellowship for this research in 2019.

He is currently leading the development of the remote rescue capability for the Queensland Fire & Emergency Service in Australia. Outside of the Fire Service, Greg's background includes a Diploma in Outdoor Education, outdoor pursuits instructor (rock climbing and whitewater kayaking), rafting guide, and instruction in advanced swiftwater rescue and high angle rescue internationally.

photo courtesy of Charles Farabee and YOSAR

Enhancing the overall safety of rescuers and those requiring rescue in mountainous and austere environments

PART 1

PREREQUISITES & PROTECTIVE CLOTHING

The traditional 'point of reference' for rope rescue operations in Australia has been 'Vertical Rescue'. For the majority of Australian rescuers and organisations involved in vertical rescue, the training, rescue systems and equipment used are very much industrial in nature. For many of these rescue organisations, who operate predominantly in an urban environment, 'heavy' equipment is being used such as: full-body harnesses, steel carabiners, steel rigging plates, large multi-sheave pulleys, large diameter rescue ropes, tri-pods and A-frames, steel one-piece stretchers, and a selection of industrial style auto-locking descent control devices. Complying to industrial fall arrest, industrial rope access, life rescue line related Australian and New Zealand Standards has influenced the equipment and systems used for traditional vertical rescue. Accompanying this 'heavy' rescue approach of vertical rescue, is the tendency for organisations to train their personnel 'by the numbers' and limit their ability to deviate from set systems or equipment used.

This mountain rescue research project clearly highlighted that the application of this traditional vertical rescue approach to rescues in austere and mountainous environments was in most cases not suitable, and could create potential risks to rescuers

and those requiring rescue. The rescuer requires in many ways, a complete new set of skills and equipment to undertake these rescues and ensure their safety, compared to traditional vertical rescue. Mountain rescues often involve small teams of rescuers (as few as two) carrying all necessary personal and rescue equipment long distances, over challenging terrain, and in all conditions. They often require rescuers to perform a 'bottom up' approach involving hiking and scrambling, or abseiling and climbing to locate and access a casualty.

Only two organisations involved in this research trained their mountain search and rescue personnel from 'scratch'... the French Fire Service and the Canadian Forces. All other organisations worked on employing or accepting people who possessed an appropriate level of knowledge, skill and ability to operate safely in the mountainous environment for extended periods. This also included an ability to scramble and / or climb terrain rated to a specific level of difficulty. To obtain this level of experience and ability may take many years.

The aim of this research project is to enhance the overall safety of rescuers and those requiring rescue in austere and mountainous environments. This research will identify a number of key areas that can positively affect and enhance the physical and emotional safety of both rescuers and those requiring rescue.

We have divided the full report into four sections over the coming issues with my conclusions at the end of the final section and my acknowledgements and thank yous at the end of this first part.

PREREQUISITES & CLOTHING

- Knowledge, Skill and Ability for Mountain Rescue
- Physical Fitness for Mountain Rescue
- Personal Protective Clothing

EQUIPMENT & SYSTEMS

- Mountain Rescue Equipment
- Mountain Rescue Systems

MOBILITY, HELOS & UAVs

- Rapid Response / Highly Mobile Rescue Capability
- Remote Piloted Aerial Systems

SAR MANAGEMENT & FIRST AID

- Geolocation
- Risk Management
- Preventative Search & Rescue
- First Aid in Austere Environments and Wilderness Areas
- Psychological First Aid and Stress Injuries
- Influence of External Consultants, Mountain Guide & Rescue Associations

KNOWLEDGE, SKILL & ABILITY FOR MOUNTAIN RESCUE

KNOWLEDGE, SKILL & ABILITY FOR MOUNTAIN RESCUE

This research project included six (6) countries and fourteen (14) mountain search and rescue groups, made up of volunteer and paid professional teams. It is not possible, within the scope of this report to outline the required knowledge, skill and ability of each rescue team member specific to each of these rescue groups.

As a generalisation, the process of recruitment for volunteer organisations involved:

1. Referral or endorsement from an existing rescue team member
2. Attendance of an information session outlining prerequisites and overview of SAR
3. Submission of a written application
4. Practical testing of fitness, knowledge, skill and ability to the entry level required for the various outdoor disciplines and / or specific terrain
5. Complete theory and practical training in areas such as: wilderness first aid, rigging, rope rescue systems, patient packaging, incident command, helicopter safety awareness, communication, response vehicle driving and equipment maintenance in order to participate to their level of training in rescue missions
6. Undertake theory and practical assessments for various levels of rescue operations (e.g. helicopter operations, team leader, instructor etc)
7. Attend a minimum number of theory and practical training sessions each year
8. Respond to a minimum number of missions per year



American Mountain Guides Association, URL <https://amga.com/ifmga-mountain-guide/> (2019)

The minimum level of lead climbing ability, where required by volunteer rescue groups, ranged from Grade 10 to Grade 14 under the Australian Ewbank Grading System or French/German 3 to 5, UK HVD/4b to HVS/5b and a US 5.1 to 5.6. With respect to paid rescue professionals, those employed by Parks Canada were required to possess, or be in the process of completing their mountain guiding qualification with the Association of Canadian Mountain Guides (ACMG) or an International Federation of Mountain Guides Association (IFMGA) affiliate Association. Parks Canada Visitor Safety Specialists were also trained in more traditional rope rescue techniques, wilderness medicine and helicopter rescue techniques.

The level of lead climbing ability for Visitor Safety Specialists in Banff National Park was indicated as 5.10 in the Yosemite Decimal System, or Grade 20 under the Australian Ewbank Grading System.

The process of becoming a professional mountain guide is in many ways similar to undergoing a trade apprenticeship in Australia. Candidates are required to attend group and individual training, obtain practical experience under a qualified guide or qualified instructor, pass assessments to move through the various stages of the guide curriculum, and perform a series of tasks (under a range of conditions, over a

* Advance Series Carbon/Ti Litter - 7.7kg
 * Terra Tamer Trail Wheel - 7kg
 * Equalizer Ti Handles - 4.3kg
19kg, all in.

CASCADE RESCUE
 WHEN YOU RISK YOUR LIFE TO SAVE OTHERS
 cascade-rescue.com
 844-414-7377
 International dealer inquiries welcome

period of time) to demonstrate skill, ability and experience. The process in most cases, takes a number of years to complete. Ongoing professional development and demonstration of active involvement in the industry was required to maintain their guiding qualification.

The U.S. Federation Emergency Management Authority (FEMA) provides position qualifications for a range of operations including those pertaining to a mountain search and rescue technician. Mountain search and rescue personnel employed by the U.S. National Park Service operate under the FEMA position qualifications and associated Standards.

The FEMA position qualification for mountain search and rescue technician identifies three levels (or types):

Type 1: Performs search, rescue and recovery in Alpine Environments

Type 2: Performs search, rescue and recovery in Mountain Environments

Type 3: Performs search, rescue and recovery in Low Mountain Environments and can operate within the incident management system.

As this report is focused on non-alpine environments, Type 2 Mountain Search and Rescue Technician operating in mountain environments is of more relevance as a reference.

The following information is summarised from the FEMA, 'Position Qualification for Mass Search and Rescue Operations', Mountain Search and Rescue Technician (Sept 2016)

Mountain environments are defined as:

Tracts of land characterised by steep slopes and great variations in elevation, that require the ability to negotiate routes rated Yosemite Decimal System (YDS) class 2 – 4, and occasionally class 5, and where steep vertical rock, steep forested or bush-covered terrain, talus slopes, boulder fields, and occasional snow and ice obstacles limit travel.

The Yosemite Decimal System (YDS) is used to classify the level of difficulty or exposure for walking, hiking and climbing terrain:

Class 1: Walking with a low chance of injury

Class 2: Simple scrambling, possibility of occasional hand use and little potential danger.

Class 3: Scrambling on an increased angle with increased exposure and necessary handholds.

Falls could easily be fatal.

Class 4: Simple climbing, with exposure and rope use. Falls may well be fatal.

Class 5: Technical rock climbing using a rope, specialised equipment and training to protect against a fall. Unroped falls can result in severe injury or death.

Class 6: Rock / ice so sheer and smooth that it is unclimbable without the use of aid, such as artificial and other devices: bolts, wedges, rope ladders etc

Training requirements outlined include those for Type 3 plus additional Type 2 specific training.

TYPE 3 TRAINING REQUIREMENTS:

- National Incident Management Systems (Command and Control)
- Hazard awareness, survival, navigation, search & rescue, and recovery operations in:
 1. YDS Classes 1 – 5 in low mountain terrain
 2. Rock climbing in low mountain terrain
 3. High angle rope rescue
 4. Low mountain – mountain interface training

TYPE 2 TRAINING REQUIREMENTS:

- Discipline specific training for mountain environments, such as those outlined in the Standard Guide for Training of Personnel Operating in Mountainous Terrain (Mountain Endorsement).
- Hazard awareness, survival, navigation, search & rescue, and recovery operations in:
 1. YDS Class 1- 5 in mountain terrain
 2. Weather conditions including mountain terrain weather and heavy snow
 3. Mountaineering, including avalanche, glacier and crevasse
 4. Rock climbing in mountain terrain
 5. Mountain – alpine interface training

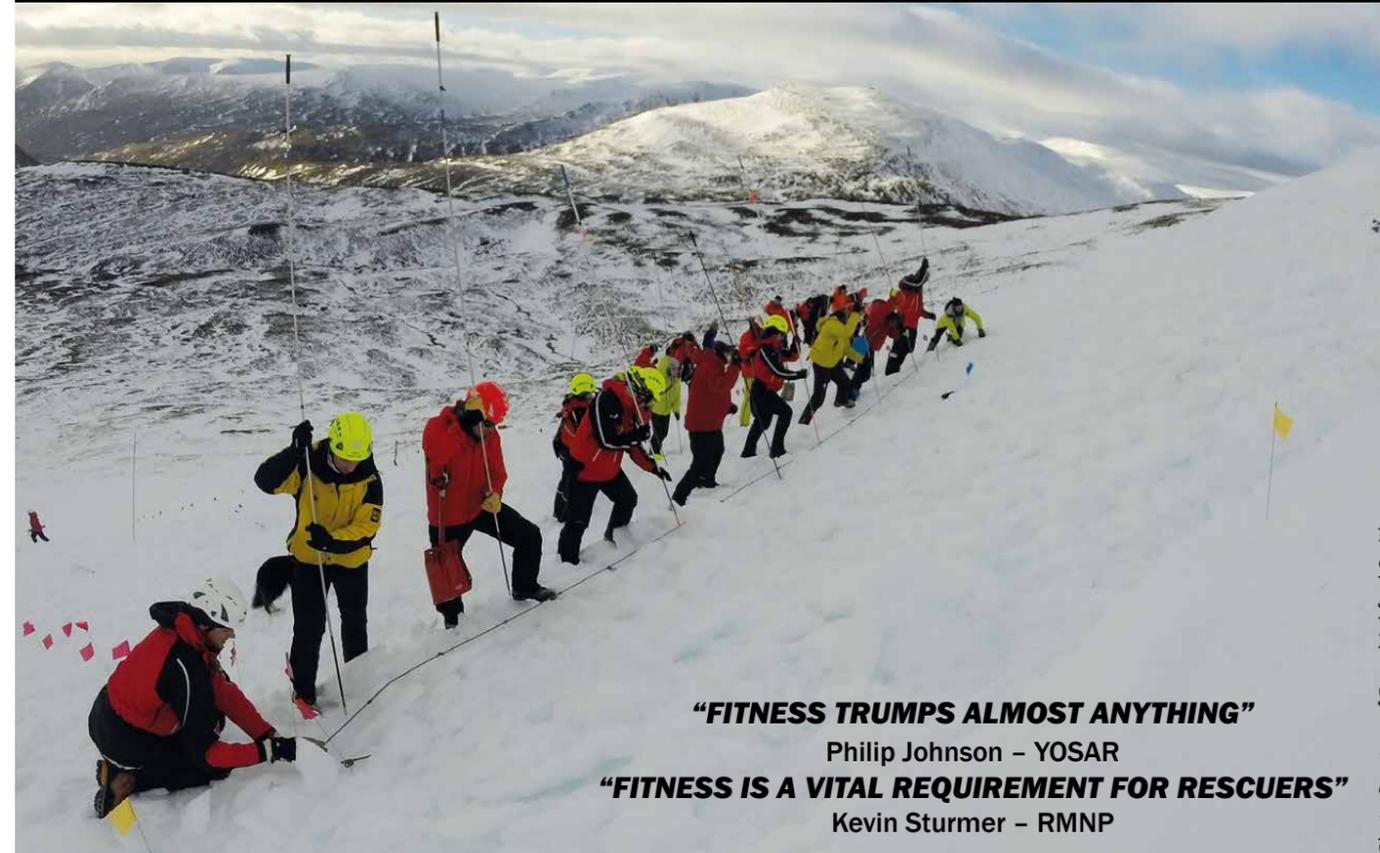
The following is summarised from the ASTM International, 'Standard Guide for Training of Personnel Operating in Mountainous Terrain (Mountain Endorsement)', (2013).

Under the Standard Guide, mountain endorsed individuals are required to have, as a minimum, the knowledge, skills and abilities pertaining to safe movement individually, or as a member of a team, in mountainous terrain in their normal area of operations. In order to verify that they possess both aptitude and attitude for working in mountainous terrain, they must demonstrate the ability to function effectively in highly exposed locations, in the conditions normal to that terrain, and also demonstrate the ability to move safely and effectively anywhere in that terrain.

Rescuers are required to demonstrate knowledge of:

- Human functional and survival needs in cold, windy and wet environments, including:
 1. Clothing suitable for all seasons,
 2. shelter (both emergency and extended stay),
 3. nutrition,
 4. hydration,
 5. hygiene and sanitation.
- Individual and team-specific issues directly related to operations in mountainous terrain
- Medical conditions common to their area of operations
- Hazards and risks specific to mountainous terrain, and methods for avoiding or mitigating them. Hazards and risks may include: personal fall, rock fall, severe and rapidly changing weather, dangerous wildlife.

PHYSICAL FITNESS REQUIREMENTS FOR MOUNTAIN RESCUE



“FITNESS TRUMPS ALMOST ANYTHING”

Philip Johnson – YOSAR

“FITNESS IS A VITAL REQUIREMENT FOR RESCUERS”

Kevin Sturmer – RMNP

Photo Courtesy of Darryl Ashford-Smith

Rescuers are required to possess and carry sufficient Personal Protective Equipment (PPE) and gear to function effectively in mountainous terrain while maintaining personal safety. Individuals are required to demonstrate that they are equipped and have the ability to survive and function effectively as part of a self-sustained team, in mountainous terrain, for a minimum of 48 hours.

Rescuers must also be able to demonstrate:

- An understanding of lightning detection, avoidance and risk reduction techniques
- Basic mountain weather prediction
- Safe travel in mountainous terrain at night
- Safe travel in mountainous terrain during adverse weather conditions
- Self-rescue techniques
- Ability to safely lead an ascent of a YDS Class 4 route
- A practical understanding of mission-specific packing for individual and team operations
- An ability to perform a thorough risk assessment before engaging in SAR activities in mountainous terrain
- An understanding of helicopter operations in mountainous terrain, including:
 1. Safety around helicopters on sloping ground
 2. Hazards resulting from helicopter operations in mountainous terrain
 3. Identifying a safe and functional helicopter landing zone in

mountainous terrain

4. Completion of an Aviation Safety Course
- That they meet the requirements of the Arduous Work Capacity fitness test
- Meet the requirements of an annual medical fitness standard

Specific to performing a rescue in mountainous terrain, an individual is required to demonstrate their ability to:

- Create anchors on steep and vertical terrain, capable of supporting a rescue load, using natural and artificial protection
- Set bolts in rock for anchors
- Safely and effectively move an injured subject in the mountain environment
- Employ small rescue team tactics for operations in mountain terrain

The FEMA Search and Rescue Technician Position Qualification and the Standard Guide for Training of Personnel Operating in Mountainous Terrain (Mountain Endorsement) provides a very good structure for developing a search and rescue response to austere and mountainous environments in Australia.

Undertaking mountain rescues can be extremely strenuous, uncomfortable, painful and long. This is the general consensus among those operating within this field. Mountain rescues

often involve small teams of rescuers (as few as two) carrying all necessary personal and rescue equipment, long distances over challenging terrain, and in all conditions to locate and access a casualty... and this is only half the rescue mission completed.

“Physical fitness and technical ability are foundational elements for a capable mountain rescue technician. They are essential for both a successful response, mitigator for managing dangerous ever changing situations and environments and critical for lessening the potential onset of PTSD and other nefarious disorders from working in situations where there are fatalities and mass casualty events.”

Ben Firth

Visitor Safety Specialist Jasper National Park, Canada

Apart from the technical competence required to operate safely and efficiently in remote / mountain rescue environments... physical fitness, agility and balance are also essential. It is important for a rescue team to be able to move together at a speed appropriate for the terrain, the hazards and the degree of urgency for the rescue. This means that the team can only move as fast as the slowest team member. If a team member is unable to continue due to lack of physical ability or injury,



this may affect the rescue operation in a number of ways:

- For their safety, one or more of the team may have to remain with that team member
- Additional personnel may now be required to take over from that team member
- Their rescue equipment may need to be shared among the remainder of the rescue team adding to each rescuer's overall pack weight, thereby increasing their workload
- The delay may increase team's exposure to the elements or having to operate at night
- Accessing and stabilising the casualty may be delayed

Without exception, both volunteer and professional rescue groups required a high level of physical fitness, along with agility and balance.

Yosemite Search and Rescue (YOSAR) describe the fitness level required by all their personnel involved in search and rescue activities as an 'ability to perform at an arduous fitness level'. This is further detailed in the YOSAR Task Booklet (2019) as:

“Fieldwork requiring physical performance calling for above-average endurance and superior conditioning. These duties may include an occasional demand for extraordinarily strenuous activities in emergencies under adverse environmental conditions and over extended periods of time. Requirements include running, walking, climbing, jumping, twisting, bending and lifting more than 50 pounds; the pace of work typically is set by the emergency situation.”

FEMA outlines that the: “Arduous fitness or work capacity criteria should be consistent with the physical fitness levels outlined in the National Wildfire Coordinating Group (NWCG) Wildland Fire Qualification System Guide Fitness and Work Capacity”

Wildland Arduous Pack Test consists of:

- A 3 mile (4.83km) walk over level ground
- Carrying 45lb (20.4kg) in a backpack or weight vest
- Completing the course in under 45 minutes

For many organisations who are responsible for rescues in a specific area, their physical fitness test involved candidates carrying a backpack containing personal and rescue equipment normally required for a rescue, up to a point on

the mountain, perform designated technical tasks and then return to the starting point.

The Alpine Rescue Team in Colorado introduced a pack test for their members which involved packing and carrying all personal rescue gear, plus personal gear to safely stay in the field up to 48 hours in summer conditions, and one 60m x 11mm rescue rope. They are required to hike 3.2 km out and back (total 6.4km) with a 600m change in elevation, in under 2 hours.

Physical fitness has an influence on one's ability to handle stress and an ability to problem solve while under physical stress.

PERSONAL PROTECTIVE CLOTHING (PPC)

Fundamentally important to the safety and performance of a mountain rescuer and their team is personal protective clothing, including footwear. While the brands and materials used to make them varied between individual rescue teams and between the various countries, the key performance features remain the same.

Appropriate clothing (including footwear) for the activity, terrain, environment, weather and time of day is fundamental to the safety and performance of mountain rescue personnel. This statement was echoed by all organisational representatives throughout the research trip. While not every rescue organisation supplied all layers of clothing free of charge to their rescue personnel, they did have the expectation that all rescuers would possess and carry



Protective/Outer Layers may include insulation like down for cold dry conditions and are used in place of single layer waterproof jackets.

suitable clothing to ensure their personal safety and wellbeing, and enable them to perform any necessary tasks. Professional rescue organisations either supplied all layers of clothing, or provided the outer layers as a highly visible and recognisable rescue uniform. Personnel were then issued an allowance to purchase the other layers of clothing that provided the necessary fit and comfort.

As a minimum, volunteer rescue organisations involved in this research provided a consistent, highly visible outer layer for their members that also identified them as a rescue team member. In some cases, volunteer mountain rescue organisations such as the CNSAS and BRD in the South Tyrol region of Italy, provided all layers as a uniform.



FERNO RESCUE

FERNO RESCUE

Total Rescue Solutions

Ferno Rescue offers total rescue equipment solutions for the professionals who use it and those they serve.

Ferno is the global leader in pre-hospital emergency care solutions, serving emergency services including EMS, fire rescue, mortuary, industrial safety and police.

Ferno exports to over 150 countries and has partnered with safety and regulatory agencies and customers globally to create a new vision for delivery of emergency care. Our dedicated team of customer-focused industry experts are ready to share that vision with you.

For additional information:
Brent Fairweather | Rescue Group Director
b.fairweather@ferno.com

www.ferno.com



Overall, most mountain rescue organisations had close relationships with outdoor clothing and equipment manufacturers. For some outdoor clothing companies, rescue teams provide an ideal testing ground for their products and another avenue to showcase their technical product range in the field. For these reasons, most volunteer rescue teams were able to negotiate 'special pricing' for their members across a range of companies. For example, many mountain rescue teams in the UK have negotiated exclusive deals for their team members with companies such as Mountain Equipment, Arc'teryx, Paramo, Keela, Mammut and Armadillo.

One reason why rescue organisations require prospective members to have existing skills in pursuits such as backcountry hiking, climbing, alpine travel and alpine climbing, is that by doing so they should have first hand experience in maintaining their own personal safety and wellbeing. Selecting, carrying and using a range of clothing and footwear in the backcountry, in a variety of conditions is an important skill in itself, and may directly impact on one's safety.

When talking about layering of clothing, the 3-layer technique of regulation, insulation and protection is often applied to the outdoor environment. This principle is also a common theme in Preventative Search and Rescue (PSAR). The first layer that assists with regulating body temperature may differ depending on the seasons and outdoor conditions. The layering principle is applicable to both the upper and lower section of the body, however the focus is usually on the torso due to its involvement in managing the body's overall temperature.

The **REGULATORY LAYER** is the first layer which is designed to be breathable, moisture wicking, quick-drying and provide

unrestricted range of movement. For many rescue teams this was simply a synthetic short sleeve or long sleeve T-shirt in a colour (e.g. red or yellow) that will stand out in their environment. As an observation, unlike in Australia, protection from UV rays (sunburn) was not a major consideration for many of the teams who used T-shirts as their first layer. For Australia, it would be recommend that the first layer to incorporate long sleeves, a collar and be SPF 50+ rated. Additional features would include pockets and at least one with a zipper closure. This traditional first layer, often referred to as the **BASE LAYER**, maintains a degree of warmth when wet. Garments made from synthetic materials such as polypropylene or natural fibres such as merino wool are often used for base layers.

The first layer can also extend to the neck and head with items like multi-functional headwear (made popular by Buff), protecting the neck from UV exposure and providing a cooling or warming role for the head. These items can be worn under a helmet without affecting the fit.

The **INSULATION LAYER** is essentially a garment that helps to protect the wearer from cold temperatures and is designed to trap body heat inside. The most common material used for the insulation layer is fleece as it is light-weight,

www.rescuemagazines.com



Regulatory/Base Layer



Insulatory/Mid Layer



Protective/Outer Layer

MEET THE BRAND NEW PMI[®] HELMETS



MAXIMUM IMPACT
RESISTANCE
IMPACT



LIGHT AND COMFY

AIR-GO



HIGH VOLTAGE
PROTECTION
E-GO



For all your vertical needs

WWW.PMIROPE.COM

quick-drying, retains warmth even when wet, does not restrict movement, is hard-wearing, relatively inexpensive and can be made to various weight classes or thickness.

Other options used by rescue teams included down and synthetic filled jackets. These options often provided better insulation than fleece, however if the conditions and activity are not matched correctly, these may provide too much insulation. Down filled jackets may also lose their insulation properties when wet. Important features include: ease of putting it on and taking it off while wearing a helmet, ability to easily release excess heat (full length zipper), accessible pockets with zippers, a collar for neck protection, reflective piping / tape, highly visible in colour and compatibility with wearing a rescue harness.

Insulation can also be provided to the head and hands using a beanie or gloves suitable to the conditions. The **PROTECTION LAYER** (pics right) is the outer layer which is exposed to the environment and it should be windproof, waterproof and breathable. There are now numerous fabrics on the market that provide varying degrees of windproof, waterproof and breathability rating. Probably the most commonly known fabric being Gore-Tex. Aside from the performance of the fabric, important features of the outer layer jacket are compatibility with wearing a climbing helmet (hood design) and climbing harness (jacket length), robust and easy to operate zippers, pit-zips to allow excess heat to escape, reinforced sections to prevent wear (elbows and shoulders), accessible pockets while wearing a backpack, reflective piping / tape and highly visible in colour. Bonus features include an internal radio pocket with a tab for the radio handset, small pocket on arm for pen and small note pad (or other items).

With respect to personal protective clothing for the lower section of the body, the regulatory layer is predominantly full-length technical pants that are designed to enhance movement. These pants are generally light-weight, quick-drying, breathable and do not restrict movement when hiking or climbing (even when they are wet). They provide protection from wind, sun and vegetation, and do not create any pressure points when worn under a climbing harness. Other features include:



Photo Courtesy of Darryl Ashford-Smith

www.rescuemagazines.com

www.rescuemagazines.com



"Footwear is the #1 tool that we have"
Ben Firth Visitor Safety Specialist Jasper NP

zippered pockets that can be accessed while wearing a harness. Pants that provide an outer layer should also be light-weight, windproof, waterproof, breathable and reinforced at key wear points (knees and seat). They should be easily put on over other layers of clothing and footwear (side zippers), and be compatible with wearing a climbing harness. Understandably, many rescuers and organisations supported local outdoor gear manufacturers or suppliers by trialling or using their products. The following are a few examples of how various rescue organisations involved in this research managed personal protective clothing: **PARKS CANADA** issue staff with the Arc'teryx Pro Jacket and provide staff with

an allowance for other clothing / footwear. **ROCKY MOUNTAIN NATIONAL PARK** provide staff with Patagonia short sleeve and long sleeve shirts, Arc'teryx Pro Jacket and insulation jackets. **ALPINE RESCUE TEAM** use the Arc'teryx Pro Jacket and members are responsible for the remainder. **ROCKY MOUNTAIN RESCUE GROUP** provide an all-weather jacket made with Gore-Tex in a consistent colour, and have used brands Mont Bell, Black Diamond & Arc'teryx. **CNSAS** and **BRD** provide their members with a complete 'fit for purpose' uniform supplied by Montura (CNSAS) and Salewa (BRD). These are in consistent high visibility colours, branded and with customised features.

MOUNTAIN RESCUE ENGLAND & WALES provide a MREW branded Paramo windproof jacket and for cold weather a MREW branded Mountain Equipment Fitzroy jacket. **AUSTRIAN MOUNTAIN RESCUE SERVICE** provided an AMRS branded, highly visible, all-weather jacket and had just signed a supplier deal with Ortovox.

Hiking, scrambling and climbing in order to perform a rescue are all skills that are dependent on good footwork, and a rescuer's footwork can be heavily reliant on their choice of footwear.

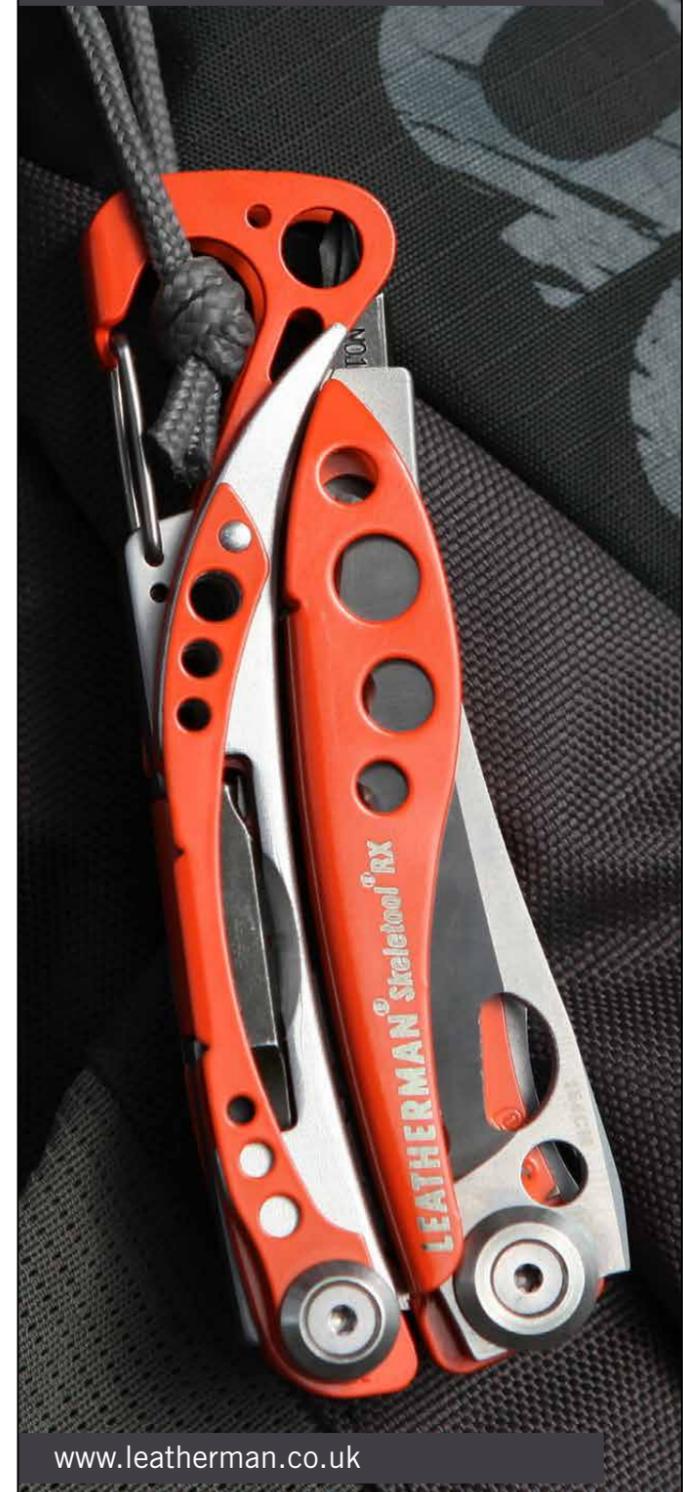
Throughout this research trip, I cannot remember one meeting where the member of the rescue organisation was not wearing a pair of 'approach' shoes. Approach shoes are often described as a hybrid between a climbing shoe and a hiking shoe, and often used by climbers for hiking relatively short distances where scrambling and low grade climbing is required to reach the main rock climb. Reduced cushioning and tread / sole design are key features of the approach shoe. Examples of commonly used approach shoes were: La Sportiva TX4, 5.10 Guide Tennie, Scarpa Gecko, Arc'teryx Acrux SL and Salewa Mountain Trainer.

Rescuers explained that they do have multiple pairs of shoes / boots each suited to a particular terrain, weather condition or technical application. Those people who were supplied personal protective clothing as part of their job as a rescuer, were permitted to select the brand and model of shoes and / or boots that provided best fit, comfort and support.

LEATHERMAN

SKELETOOL® RX

An essential tool for EMTs or first responders with a 154CM serrated blade and a carbide glass break bit.



www.leatherman.co.uk

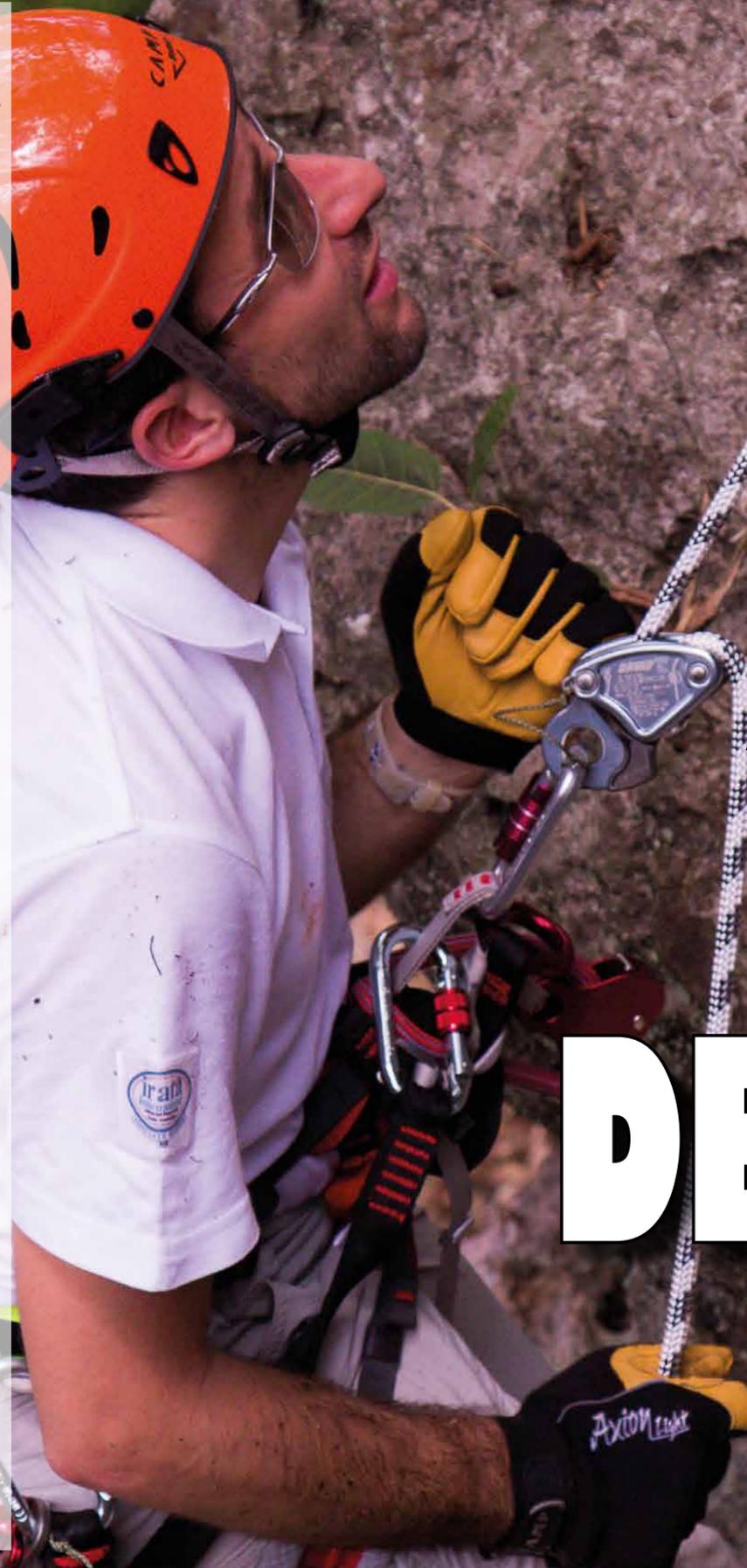
Superlight, autolocking descenders

The purpose of this GUIDE is to identify smaller, lighter devices that are easily carried as 'personal' descenders capable of a two person rescue at a push even if the instructions and standards specifically preclude such an action. We'll probably get grief for saying it, but the fact remains that there are NO descenders/belay devices in this list that are so sketchy on strength or ultimate failure load that they couldn't handle the weight of you *plus* a casualty if you had no other option. Descender cams are not like ascender teeth which can start to tear through rope as the loads increase, unless you're rescuing an elephant, a smooth cam's failure mode will be in the event of a shock loading and that's only where there is a more aggressive 'pinch' between the cam and the casing and where there is relatively short length of rope between you and the anchor or an intermediate edge. The bigger problem may be that you experience considerable difficulty in starting your descent with a heavy load. In a few cases (but not the Camp Druid, Lifeguard and ISC D2 pictured here!) you will need to be careful not to leverage a plastic handle so much that it breaks – then you really are stuck. You will need to take very firm hold of the trail or tail rope while applying a very controlled force as close to the handle's union with the cam as you can and take care that your transition from stopped to moving is smooth and slow and doesn't become a stutter as you lurch from stopped to freefall and back to shuddering stop. Don't forget to gradually release rope through the hand as you depress the handle otherwise you may find you don't go anywhere even after putting the handle into what you think is a freefall position. Indeed, with high loads you may find greater control with the device wide open but controlling on the rope INSTEAD of the handle providing you have sufficient friction. Some larger descenders have ancillary friction posts or hooks for exactly this task but that's rarely the case with these lighter weight models. Handling heavy loads is something you can and should practice in a controlled and safe

environment and get accustomed to exactly what force is required and what handle pulling/pushing technique works best. You may find that in one or two cases, the descender just won't budge under loads over a certain weight. It would be good to know what that ultimate weight is for your chosen descender and then cut down on the pies and doughnuts. The main rule with brake assist descenders is to keep hold of the trail rope at all times except for the very rare occasion when you might need to fend off or hold-on to something or someone with one hand while still descending – this was an easier proposition with old-style manual friction devices like fig-8s but remember that using JUST the handle is a very different feel without that control hand on the tail of the rope and you ARE more likely to accidentally put yourself into locked mode.

A number of escape or bail out devices from the fire-sector are included here if they will operate on regular sized rope because they are, by design, smaller, lighter and tougher than purely sport-oriented devices. We've excluded devices that operate on fire-retardant webbing-only or on rope diameters less than 7mm – there's not a lot of point in everyone on the team carrying a diminutive personal descender that operates on 4.5 or 6mm cord if the team ropes are all larger than 10mm/3/8". However, from a personal perspective you may well want to take a look at an Escape device or kit for personal use because they can be incredibly useful in all manner of access and rescue situations with diminutive sized kits containing, on average, 15m/50ft of rope or webbing that is tough as old boots over unprotected edges because most incorporate high-strength aramid fibres like Technora.

Back to this particular Guide and there is a mix in this list of sport devices (aimed primarily at belaying), tactical, fire descenders and one or two purposely designed small descenders. What they all have in common is auto-locking or assisted braking as it's now become known. If you remove your hand from the device and the trail/tail rope, the device will hold your position and you won't plummet to the ground. There are many fig8 style 'bottle-openers' that are the size of, well... bottle openers, that can function as an emergency descender but these are in the category of 'emergency-self-rescue, much like using your boot laces as prusiks. They



AUTOLOCKING/ASSISTED BRAKING

Lightweight DESCENDERS /belay devices

are not a preplanned in-line device that will auto-lock while you attend to a situation and without twisting the rope into a Shirley Temple (youngsters Google it) but a 'bottle-opener' might just enable you to safely lifeline somebody or, at a push, pick them off of a precarious situation.

BELAY OR DESCENDER?

We've mentioned 'belay devices' as a secondary function of lightweight auto-locking descenders but some of these are belay devices first and foremost and may not even mention descending as a function! However, regardless of whether it is mentioned in the instructions, any device that can lower a climber can function as a descender over short distances. Perhaps the finest and original proponent of brake-assist belaying is the Petzl GriGri now in its fourth and fifth incarnation and as fine a small descender as we've ever used. Remember though that smaller devices have much less metal and surface area with which to dissipate heat so you need to be very aware of heat build-up during descent and either mitigate it during descent, not stop at all or stop before it gets too hot. Any descender can 'belay' in terms of factor-0 lifelining or top-roping where dynamic impact is kept to an absolute minimum but they can't all perform the stiffer task of belaying a lead-climber with the potential for greater than Factor-1 impact. Lead climb belaying mandates use of dynamic rather than static/low-stretch ropes and while dynamic ropes are commonly carried they're not generally as common in rescue as low stretch ropes because climbing up to the casualty/stranded is not as common as top-down rescues. It also requires a more dynamic braking action rather than a sudden arrest which is why some are belay-first like the C.A.M.P. Matik versus the C.A.M.P./ Druid.

DEVICES NOT INCLUDED

Devices larger than around 150mm/6" inc handle and using rope diameters less than 7mm have been excluded although we have included the C-Toms Quickie ostensibly for 6.5mm but you might get away with it on a 'smaller' 7mm. This unfortunately means the very small and light Escapettor using 5mm cord is out. We've excluded heavier devices by using the rather arbitrary figure of 300g/11oz as the upper weight limit for what we consider 'lightweight' for rescue and even then we've had to cheat and make exceptions for the TAZ Lov2 and the ISC/SAR Products RAD. If you're a climber you'll already know that if it weighs more than half an ounce you'll be hiring an extra Sherpa but this is meant to be a multi-use device for rescuers so it needs to do a bit more than adequately belaying your mate while he cleans a new route. That does mean we've excluded a quite prominent model, The Lory by Anthon, also known as the Edelrid Edy or Singing Rock SIR. At 365g this is significantly more than 'lightweight'. We haven't included any devices without a dedicated handle to indicate (or at least imply) that lowering or descending is a proper function of the device rather than an afterthought. All belay devices require you to lower and can therefore function as a descender. All of the Sticht plate/tuber derivatives are manual and

RULE NUMBER 1: Maintain Control of the Trail/Tail/Brake Rope AT ALL TIMES

definitely hands-on while the more complex frame devices like the RAMA, SRC, Smart and Fish which utilise the carabiner as a brake by jamming it against the frame, are neither categorically auto-locking or handsfree. However, the latest term 'brake-assist' probably would apply as it brings in the kind of leeway you need with devices like the Wild Country Revo which may run

briefly before the inertia brake activates. We first used the frame style of belay device in the early eighties with a device from Salewa that hasn't really changed that much in mechanism, just in the space-age looking hot and cold forging and some more complex curves and inlets. We haven't even included the Austiapin Fish even though it has a fold out handle because it's not a separate camming action, just an extension of pushing/pulling down on the end of the body as you do with all others in this genre. The Alpine-Up model from Climbing Technology (pic above) is closest to meeting our multi-functional and autolocking requirements but none of this genre guarantee autolocking (as distinct from a more dynamic brake-assist) in an abseil/rapel so we haven't included them.

Because many of the devices in our Guide to Escape Descenders in TECHNICAL RESCUE #76 are also in this Guide we can steal and modify some of that editorial.....

PANIC GRAB or DOUBLE BRAKE?

We feel this term, often described as 'anti-panic' in descender instructions, to be somewhat insulting to rescuers who are presumably at the top of their game and not prone to panicking. Climbing Technology calls it an 'Extraordinary Braking System' which is perhaps more appropriate to expert users who then don't have to admit to having panicked but instead simply had an 'extraordinary moment'. To keep everyone happy let's think of it as a double or secondary brake to protect against accidental activation that might put you into a free-fall such as pressure from webbing or rigging against the handle. The 'panic' term has come about because a climber's reaction to an unexpected and maybe scary occurrence is to hang on more tightly to whatever you're already holding, in this case the handle of the descender. It was often the case with single action brakes that having grasped the handle and gone into virtual free-fall this further inclined you towards hanging on tighter rather than the unnatural reaction of letting go of everything in order to arrest your fall. So double braking devices arrived and were sold on the ability to mitigate that grab reaction when something goes wrong.

Double or Panic-Brakes come in 3 forms:

- 1) 'Lock' when the handle goes beyond a certain point, they then need to be reset before you continue descent like the ISC D2 and CAMP Druid
- 2) As 1) but instead of having to reset after locking, the handle can continue past the lock and back into descent mode like the newer GriGri +
- 3) if the handle is squeezed too hard, it goes into an 'overpressure' braking action for as long as you

www.rescuemagazines.com



www.rescuemagazines.com

maintain sufficient pressure on the handle or remember to let go altogether. This style of secondary brake is much better suited to tactical and high-speed descents where a sudden arrest could be disastrous whereas a temporary slowing could be easily dealt with. You may never stop completely but you will at least hit the floor at a slower speed. Most Tactical situations prefer no secondary brake at all as with the regular GriGri and Druid Pro.

STANDARDS

The devices in this Guide fall into two distinct standards, one for sport devices and one for escape/rescue devices. EN15151-1 2012 is the cover-all standard for belay devices that can also function as limited speed/distance descenders. The official description is: *'braking devices with manually assisted locking used in mountaineering, climbing and related activities for belaying, with manually assisted locking function, to protect against falls from a height and/or for abseiling with speed regulation. This European Standard applies to braking devices which are loaded with one person and which use mountaineering ropes according to EN 892. In case of abseiling and lowering down, this standard also applies to braking devices, used with low stretch kernmantle ropes according to EN 1891. It does not apply to manual braking devices which are addressed in EN 15151-2:2012, nor to fully automatic fixed installations.* Devices that are specific to Escape, even though they function as conventional descenders may ONLY have a fire-or safety industry related standard rather than the UIAA or EN15151 standards as belay devices. Escape/evacuation devices are NOT intended for mountain rescue and are instead aimed at firefighters and rope access workers but a number of

those shown here may be worth consideration if they meet your team or service protocols. In Europe especially, the wind turbine market is driving a lot of development towards escape and evacuation systems. Many of the larger rescue descenders meet more than one performance standard. For instance, Kong's Indy Evo Plus descender which is too large to be included in this Guide, could be described as a personal evacuation/Escape device as well as a rescue descender and general descender. In contrast NFPA E tends to rule out G and L devices as being too large/heavy and requiring of larger diameter ropes though their specific wording for E versus T hardware is exactly the same. NFPA defines 'Escape' as....

Immediate self-rescue of a single fire or emergency services person from a life-threatening emergency situation, generally above ground, using system components or manufactured systems designed for self-rescue escape.

In Europe, descenders were historically tested to EN 341:1992 Personal fall protection equipment which actually was originally written from the perspective of descenders being used for evacuation purposes in an emergency. The 2011 revision states clearly that it 'does not specify requirements for descender devices that are used for descending in mountaineering, rope access and work positioning systems'. Descenders for these specific tasks are now tested in Europe to EN12841:2006/C. NB: The EN 341 standard includes test procedures that require a series of high-level descent tests to assess the product's ability to perform satisfactorily after repeated use. The standard categorises descenders into two types: 'automatic', which incorporates a braking system that requires no intervention by the user once the descent has



LEATHERMAN

RAPTOR

Developed with the input of special operations medics, EMTs and fire professionals familiar with standard medical shears, the Raptor was crafted with just the right balance of multi-purpose features for medical-specific ops without an overkill of tools to complicate sometimes life-threatening situations.

www.leatherman.co.uk

commenced [so-called 'true-blue' devices], and 'manually-operated' products with a braking system that requires the user to take action. EN 341 refers to these as 'Type 1' and 'Type 2' respectively – ALL of the devices in this article are Type 2 which are manual because you must do something to make the brake operate, even if that is simply letting go of the handle.

DESCENT SPEEDS/DISTANCES

A part of many descender performance standards is a requirement that when descending the device does not get so hot that it can damage the rope it is moving down. This is evaluated by measuring the temperature of the rope contact faces after a decent at a set speed with a set mass over a set distance. This testing is why you see markings such as 150Kg/200m on devices. It does not mean that you can only descend 200m, just that with a mass of 150Kg at a normal, steady descent speed by the time you get 200m in its going to be pretty warm. Travel slower or with a lighter mass and you create less descent energy and therefore potentially less heat from friction.

Some descenders have short handles or release mechanisms that have little mechanical advantage, meaning that the user quickly tires and lets go for a rest. This limits the descent energy very nicely and means that the device does not warm up. Longer handles and more mechanical advantage make it much easier to release the rope, giving finer control but at the risk of allowing a rapid, temperature rising descent. Unlike full-size rescue descenders, lightweight and escape devices don't tend to have larger handles with better mechanical advantage/leverage though this is still a benefit where it can be incorporated to make the initial start smoother and less dramatic and it enables the user to maintain the descent for longer without getting cramps in the hand. In the case of the Core, the handle is longer because it is specifically used as a lever. Devices like the GriGri (right) and Trango have body-hugging folding handles that keep the profile to a minimum.



IN THE FOLLOWING TABLES:.....

ORIGIN: The main flag refers to the manufacturer's home country, but this may not be where the device is made. If we know, we show an inset flag and you will notice a number of 'rebadged' devices like ISC's D2. As we often mention, the figures in this Guide are verified by the manufacturer but you will see different spec on some supplier websites and for some manufacturers that have rebadged a model. No idea why!
COST: Prices are a rough guide only – it can vary due to exchange rates, taxes etc. and we usually round the price up. Russian and Chinese devices may need import duty added.

WEIGHT: for the individual descender

DIMENSIONS: of the device itself. This is mainly given as height or length by width with some quoting the depth (or thickness) of the device. If only one figure is given it will be the longest height or length. This should include the handle in stowed position but some may be quoting length with the handle extended or possibly not including the handle at all.

MATERIALS: **ALLOY** refers to **ALUMINIUM ALLOY** or **ALUMINUM ALLOY** unless otherwise shown. Note that many showing the handle as Alloy (alu) or Steel may also have a comfort cover of rubber or plastic etc. Others like the Core use the entire body of the descender as a lever style handle.

MBL: Minimum Breaking Loads (MBL's) are rarely shown for sport-oriented devices. It's a complex area and it is always best to read the manufacturers product instructions thoroughly to make sure that you really understand what your device is capable of. Generally, the MBL is the minimum figure before failure that will be achieved by the device when used in a specific configuration. In the case of Escape devices which tend to be much tougher than the sport devices, this may even be the MBS of the specific rope it uses rather than the device itself. Some manufacturers bizarrely use the MBL figure that must be met in the relevant standard test – regardless of the fact that their device is capable of much more than that, for instance *many will quote around 12kN because it's the required minimum for some standards while others use the figure at which the device is just about, but not actually going, to fail, making the device appear much 'stronger' than a competitors product.* Rarely, you might see a few MBL's marked on the same product or in the instructions; in these cases, they may relate to each of the configurations described or the separate individual standards tested to. On most products here where a belay function is possible, the MBL may define the maximum load that can be held in a limited dynamic event (top-roping/ FF0.3) where the true applied force is significant.
MRL: Maximum Rated Load can be just as confusing as MBL's. Some performance standards require devices to indicate the maximum rated load that can be applied during that specific application. The trouble is that the MRL may be different for each standard and some manufacturers again do things literally and only test to the minimum figure stated in the standard. This means some devices have differing MRL's marked on them and the MRL marked is actually less than the manufacturer is willing to allow you to apply!

WLL: Working Load Limit (Safe Working Load). Again, rarely used in sports devices. The **MINIMUM** indicates the lowest weight that will be able to descend or that you can lower. This can also be an indication of how easily rope will pull through the device but most will simply quote the standards requirement even if they can handle lower loads.

MAXIMUM figure for the larger rope in the device's range. This figure is not as specific as an MBL and can vary depending on the standard, for instance ropes meeting **EN 341** often have a lower WLL than those meeting ANSI or CSA.

DOUBLE BRAKE/ANTI-PANIC: In addition to braking when you let go of everything this is a secondary brake which engages either fully, shown as ■ or proportional to the handle grip-pressure, shown as ■. A fully engaged brake like the Petzl GriGri means you are safely held until you resume pressure on the handle. A proportional brake may never fully stop you depending on how much grip pressure you apply, often they only slow you but that may be enough to remind you to let go completely in order to fully arrest your descent.

LOAD ROPE WHILE ATTACHED: The carabiner can be clipped in while the rope is loaded into the device. There is therefore no danger of dropping the device during rope installation or

removal. Most belay-specific devices don't have this option.
ROPE DIAMETERS: Descenders that are primarily belay devices will quote a diameter that is based on **dynamic** rather than low stretch rope and these are shown in **green**. Dynamic ropes are always 'softer' and will compress more than stiffer static ropes but the initial diameter that the device will accept is the same for both types of rope, it's the subsequent 'feel' and braking response that will be different. A number of belay devices like the GriGri don't even list low stretch ropes as an option but this is in belay terms where dynamic arrest is required, as a descender, low stretch rope is fine on all belay devices.

EYE DIAMETER: refers to the harness or anchor connection eye as distinct from any secondary eyes intended as becketts for inclusion in a pulley system but this is not the norm for lightweight devices. This is an important figure because some eyes are quite small and would struggle to take some of the larger rescue carabiners and the forged, profiled cross-sections, having been designed originally with round bar section carabiners in mind.

USES:

DESCENDER: ALL of these devices can be used for LOWERING so they will function as a descender which is best achieved on low stretch rather than dynamic rope.

BELAY/ LIFELINING: For this GUIDE we are ONLY considering the devices approved for use with low-stretch/static rope NOT dynamic climbing rope. Lifelining is not necessarily the same thing as a belay where you could end up with the device taking a severe dynamic load. Lifelining may simply mean horizontal

or low angle edge restraint which would impart minimal fall factor to the device in the event of activation. In theory all of these devices could work as a top-belay/lifeline device but in contrast to lowering where the load is constant you must be careful in belaying, not to permit a potential fall factor of more than 0.3 and preferably 0 ! Some do it better than others so marginal devices in this category are shown in a black outline square □ OK but not brilliant.

Some devices will specifically tolerate a rescue belay load of 200kg, fall factor third (0.3) and these are shown as an orange square ■. Virtually all escape devices will lifeline or top-belay but very few, if any, will state that they can arrest a rescue load which is taken to be between 200 & 250kg/441-551 lb.

ASCENDER: Most standard, autolocking descenders (but not the rack style escape devices) can be used as a haul cam or as a second ascender where a more conventional handled ascender provides the top ascender. Two descenders or a descender and a prusik cord/Purcell could also work well enough over short distances. The thing about using a descender instead of an ascender is that, while it imparts more friction during any ascent it does give you the option of an immediate switch to descent rather than trying to downclimb on ascenders or switch systems from ascenders to descender. It's already there.

COLOURS different colour options are separated by a comma. CAPITALS indicate the primary colour or colours if they are half and half. Secondary colour(s) on the same device are in lower case and separated by a forward slash /.



BABY RESCUE BAG

Designed for rescue transportation of the children with a height 40-110 cm, max. weight 25 kg



Size: 80x45x35 cm
Weight: 3300 g

www.singingrock.com



DESCENDERS!



INDY EVO PLUS



PIRATA

- Two models for different demands
- Light weight and compact size
- Durable stainless steel cams
- Low maintenance and easy inspection
- For use on 10 – 12 mm static kernmantle rope
- Self-braking and auto-locking handle



**HIGH
QUALITY
SAFETY
EQUIPMENT**

distributed in US market by



www.kongusa.com

images NOT to scale	MODEL	COMPANY	ORIGIN	COST	WT	DIMENSIONS of DEVICE	MATERIALS: FRAME CAM HANDLE	DOUBLE BRAKE LOAD ROPE WHILE CONNECTED	MBS/ MBL	MIN MAX WLL	STANDARDS	ROPE RANGE (DYNAMIC)	EYE DIAMETER	USES DESCENDER ASCENDING BELAY/LIFELINING	COLOURS	NOTES	WWW.
	P15	ANPEN		\$135*	245g 8.6oz	140x50mm 5.5x2"	Alloy Alloy Plastic	■	16kN 3597 lbf	250kg 551 lb	GA494-2004	9.5-11mm 3/8-7/16"	17mm 0.7"	■ ■ ■	GREEN	P16 discontinued	anpen.net
	P18	ANPEN		\$150*	223g 7.9oz	96x68mm 3.8x2.7"	Alloy Alloy Alloy		20kN 4496 lbf	250kg 551 lb	GA494-2004	10-13mm 7/16-1/2"	17mm 0.7"	■ ■ ■	BLUE. BLACK		anpen.net
	Birdie	BEAL		£60 \$75 €65	210g 7.4oz	104x50x46mm 4x2x1.8"	Alloy Stainless Steel Alloy		n/a	n/a	EN1551 UIAA	8.5-10.5mm 3/8-7/16"	19mm 0.75"	■ ■ ■	GREY/blue, GREY/green GREY/orange		sport.beal-planet.com
	Druid	C.A.M.P.		£135 \$200 €146	280g 9.9oz	118x76x46mm 4.7x3x1.8"	Alloy Stainless Steel Alloy	■	12kN 2697 lbf	200kg 441 lb	EN 341/2A EN 12841/C EN15151	10-11mm 7/16"	19mm 0.75"	■ ■ ■	RED/black		camp.it
	Druid-Pro	C.A.M.P.		£135 \$220 €132	280g 9.9oz	118x76x46mm 4.7x3x1.8"	Alloy Stainless Steel Alloy		12kN 2697 lbf	200kg 441 lb	EN 341/2A EN 12841/C EN15151	10-11mm 7/16"	19mm 0.75"	■ ■ ■	GREY/ black	Druid Pro is single -lock only with no double brake/anti-panic	camp.it
	Matik	C.A.M.P.		£135 \$200 €146	276g 9.7oz	118x76x46mm 4.7x3x1.8"	Alloy Stainless Steel Alloy	■	12kN 2697 lbf	100kg 220 lb	EN1551 UIAA	8.6-10.2mm 3/8 -"	19mm 0.75"	■ ■ ■	BLUE	Sport model	camp.it
	Quickie Descender (QD)	CTOMS		\$70	95g 3.3oz	60x100x26mm 2.4x4x1"	Alloy Stainless Steel Nylon		*15kN 3372 lbf	n/a	-	6.5mm 1/4-5/16"	19mm 0.75"	■ ■ ■	BLACK, ORANGE	* Designed to slip at around 4kN on new rope	ctoms.ca
	Core	FIRE INNOVATIONS		\$125	193g 6.8oz	152x50x25mm 6 x 2 x 1"	Alloy - Alloy	■	13.5kN 3035lbf	n/a	NFPA-E	7.5mm 5/16"	*	■ □ □	BLACK	*Uses integral tape extension to a carabiner	fireinnovations.com
	QRAB	HIGHNOVATE		n/a	150g 5oz	120x50x40mm 4.7x2 x1.5"	Alloy Stainless Steel Alloy	■	10kN 2248 lbf	160kg 352 lb	NFPAPending EN341pending	7.5-8mm 5/16"	17mm 0.7"	■ ■ ■	BLACK	Red button is a quick release from the rope which does NOT function under load.	highnovate.com
	RAD	ISC		£90 \$120	306g 10oz	112x73x34mm 4.4x2.8x1.4"	Alloy Stainless Steel Alloy		16kN 3957 lbf	200kg 441 lb	EN 12841/C EN15151 EN 358	10.5-12.7mm 9.9-11mm 10.5-12.7mm 7/16-1/2"	15mm 0.6"	■ ■ ■	RED. BLACK	Squeeze-style, with flip down handle extension. Can be converted between fixed and swing-cheek modes.	iscwales.com
	D2	ISC		£157 \$260 €181	290g 10.2oz	143x70x61mm 5.6x2.75x2.4 "	Alloy Stainless Steel Alloy	■	14kN 3147 lbf	140kg 310 lb	EN 12841 NFPA E ANSI Z359.4	8mm 5/16"	20mm 0.8"	■ ■ ■	BLACK. RED	Data for 2018 version (red).2020 version in black with larger handle. * + Custom lengths Also Sold by FERNO & PMI	iscwales.com

NOTES: N/A = info Not Available / not given COST: Approx & include local tax/VAT except* which need import duty and tax added DOUBLE BRAKE: ■=Lock requires reset. □=proportional on squeeze pressure. USES: ■ = OK BUT NOT IDEAL

images NOT to scale	MODEL	COMPANY	ORIGIN	COST	WT	DIMENSIONS of DEVICE	MATERIALS: FRAME CAM HANDLE	DOUBLE BRAKE LOAD ROPE WHILE CONNECTED	MBS/ MBL	MIN MAX WLL	STANDARDS	ROPE RANGE (DYNAMIC)	EYE DIAMETER	USES DESCENDER ASCENDING BELAY/LIFELINING	COLOURS	NOTES	WWW.
	Gnome IR0318	ICE ROCK		€110	275g 9.7oz	107x57x38mm 4.2x2.2x1.5"	Alloy Steel Alloy	■ ■	>12kN 2697 lbf	200kg 441 lb	EN 12841/C	10-11mm 7/16"	15mm 0.6"	■ ■ ■	BLACK. ORANGE/ violet	Device can adapt to better suit specific user weights and rope size	icerockequipment. com
	Fedor Mini 8+*	KROK		\$60* €48*	200g 7oz	110x70x25mm 4.3x2.75x1"	Alloy Alloy Alloy	- ■	>15kN 3372lbf	400kg 882 lb	EN 341	5-9mm 1/4-3/8"	14mm 0.55"	■ ■ ■	SILVER	Carabiner clips through eye in cam, rope can load by opening carabiner gate. NB this seems to have replaced the Fedor Light. *Data unverified	Krok.biz
	Lifeguard	MAD ROCK		£65 \$90 €70	154g 5.4oz	78x48x39mm 3x1.9x1.5"	Alloy Stainless Steel Alloy	- -	n/a	n/a	CE-pending	8.1-11mm 5/16-7/16" 8.9-11mm 3/8-7/16"	14mm 0.55"	■ ■ ■	RED		madrock.com
	Safeguard	MAD ROCK		£65 \$90 €70	154g 5.4oz	78x48x39mm 3x1.9x1.5"	Alloy Stainless Steel Alloy	- -	n/a	n/a	CE-pending	8.1-11mm 5/16-7/16" 8.9-11mm 3/8-7/16"	14mm 0.55"	■ ■ ■	BLACK	Safeguard has no spring and is better suited to escent/rigging than belay- approvals pending	madrock.com
	GRIGRI	PETZL		£65 \$110 €70	175g 6.2oz	115mm 4.5"	Alloy/Steel Stainless Steel Nylon/Alloy	- -	13.5 kN 3034 lbf	140kg 310 lb	EN 15151-1 UIAA	8.5-11mm 5/16-7/16"	15mm 0.6"	■ ■ ■	BLUE, ORANGE, GREY		petzl.com
	GRIGRI +	PETZL		£100 \$160 €95	200g 7oz	115mm 4.5"	Alloy/Steel Stainless Steel Nylon/Alloy	■ -	13.5 kN 3034 lbf	140kg 310 lb	EN 15151-1 UIAA	8.5-11mm 5/16-7/16"	15mm 0.6"	■ ■ ■	VIOLET, ORANGE, GREY	Can be switched or locked between Top-rope and leader belay options	petzl.com
	RAD	SAR PRODUCTS		£90	306g 10oz	112x73x34mm 4.4x2.8x1.4"	Alloy Stainless Steel Alloy	- -	16kN 3957 lbf	200kg 441 lb	EN 12841/C EN15151 EN 358	10.5-12.7mm 9.9-11mm 10.5-12.7mm 7/16-1/2"	15mm 0.6"	■ ■ ■	BLACK	Certified as part of a lanyard system for EN358 with SAR Products rope.	sarproducts.com
	FCX	STERLING ROPE		\$113	221g 7.8oz	140x50x25mm 5.5x2x1"	Alloy - Alloy	■ ■	13kN 3035lbf	-	NFPA-E	7-8mm 5/16"	20mm 0.8"	■ □ ■	GREY/RED		sterlingrope.com
	F4	STERLING ROPE		\$100	170g 6oz	152x50x25mm 6 x 2x1"	Alloy - Alloy	- ■	13.5kN 1376 lbf	-	NFPA-E	7-8mm 5/16"	20mm 0.8"	■ □ □	RED. BLACK		sterlingrope.com
	Lov 2	TAZ		\$275 €200	353g 12.4oz	140x95x50mm 5.5x3.75x2"	Alloy Stainless Steel Nylon	- -	15kN 3372 lbf	200kg 441 lb	EN 358 EN 12841/A-C	10-11mm 7/16"	15mm 0.6"	■ ■ ■	BLACK. RED	also operates on tensioned diagonal ropes	taz3d.fr
	Vergo	TRANGO		£80 \$99 €86	195g 6.9oz	103x58x32mm 4x2.3x1.25"	Alloy Cast Steel Nylon	- -	n/a	n/a	EN15151	8.9-10.7mm 3/8-7/16"	20mm 0.8"	■ ■ ■	PURPLE, BLUE, GOLD	supercedes the Cinch	trango.com

NOTES: N/A = info Not Available/not given COST: Approx & include local tax/VAT except* which need import duty and tax added DOUBLE BRAKE: ■=Lock requires reset. □=proportional on squeeze pressure. USES: □= OK BUT NOT IDEAL

POWER ASCENDERS FOR PROFESSIONALS

ActSafe Power Ascenders are an ingenious combination of a high-capacity rope winch in a compact, lightweight and user-friendly design. They simply redefine the possibilities for working in vertical environments.



The PMX provides the strength and versatility of engine power in a highly-portable design that is built to endure the toughest environments.



The battery-powered ACX with Bluetooth Remote Control makes it the perfect tool for a multitude of lifting operations.



HAND-BUILT
IN SWEDEN

ISO 9001
BUREAU VERITAS
Certification



Get in touch with us today to find your nearest ActSafe distributor

ActSafe Systems AB
Sagbäcksvägen 13
SE-43731 Lindome, Sweden

T: +46 31 65 56 60
E: info@actsafe.se
W: www.actsafe.se



USING A MAP & COMPASS STILL MATTERS

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

Roland is a 19 year veteran of Police Rescue in NSW Australia responsible for rope rescue, extrication, SAR, trauma and swiftwater rescue in the Illawarra region south of Sydney. This huge region incorporates significant coastal cliffs and the Upper Nepean river basin with remote bush, forest, canyons and waterways.

“We don’t need to carry a map and compass anymore because we have GPS”.

Words that are heard all too often these days, but should such a blanket reliance on technology be encouraged when it comes to search and rescue operations. Well, partly.

From a training point of view, GPS and electronic gadgetry is obviously very important and sometimes more complex than simply reading a screen so it needs quality training input and for many it is THE primary means of location because when it works, it works really well. But, just as you should never get in the boat unless you can swim away from it when it sinks so your old-style compass and map-reading skills should be an equal part of training. There are all kinds of failure modes for GPS technology – straight -up losing it, power failure, electronic malfunction, signal loss, satellite loss/failure/military denial and maybe even an EMP. The sun and stars on the other hand are pretty constant and an old style paper map (preferably encapsulated) together with a quality compass completes your belts and braces approach to navigation. Silva are perhaps the leading and

certainly best known compass manufacturer on the planet and not for nothing have they continued to produce a huge range of compasses with great success – people will always need them!

Search and Rescue Teams take responsibility to make sure that they have the right equipment, plus making sure that they are prepared should things not go as planned.

Search and rescue teams are always prepared in the field and know to carry a map and compass as well as a GPS. It is really the general public that is more likely to discard map and compass for electronic exclusivity. Handheld GPS systems are improving all the time, and these devices are usually the only item which is considered for navigation because of their simplicity. Mobile (or cellular) phone reception is improving rapidly and covering more areas than ever before. So the mobile phone combined with a GPS app is a common tool which is now heavily relied upon. and this is because, for the most part it works well.

A search and rescue team can and

frequently does, respond to a call and complete the whole operation using only a GPS as their navigation tool. It is rare for problems to occur with a GPS device, and because it's rare it's probable that map and compass skills are fading even if it is a required part of initial training.

We hope that a rescue operation will always go as planned, but sometimes this is not so. Should you end up with no reception between the satellite and the GPS, a backup plan is essential. Mountainous terrain can cause signal disruption between the satellite and the GPS because, contrary to popular belief, not all satellites are directly overhead at all times. Outside of your vehicle or watercraft, GPS rely on batteries which deplete and even more so in extreme cold – spares and/or ancillary powerpacks and/or solar chargers are a must. And finally, as with any electronic device, it can develop a fault or be dropped and lost. Backup plans are essential, spare batteries, portable chargers PLUS a map and compass.

Technology certainly makes life easier when it works, but common sense should tell you that it doesn't always work. Some military medics do not usually carry medical equipment that runs on batteries when operating in war-zones. They may carry a small pulse oximeter, but devices such as defibrillators, electrocardiogram, or ultrasound are dispensed with, not only because of their bulk, but because of the electronic components that have the capacity to fail in the field and in a war-zone that could include tactical EMP!

A search and rescue team should always have a Navigation Plan before leaving the command post and heading off into the wilderness. When planning for a response to a search and rescue operation, the acronym P.A.C.E can be used:

P rimary **A** lternate **C** ontingency **E** mergency

The P.A.C.E acronym can be applied to communications and to a rescue response in general. In terms of a Navigation Plan: the **Primary** plan will most likely be to use a GPS as the key navigation tool; the **Alternate** plan would be to use a map and compass; the **Contingency** plan which could be to back track, or some other plan which does not require a GPS, a map, or a compass, such as ‘follow the river downstream until you get to the road’, or there is celestial navigation techniques using the stars or the sun, provided you know what you are doing (and you can actually see the stars or the sun); lastly the **Emergency** action could be to activate your Personal Emergency Locator Beacon (PLB) and await help.

Using a map and compass is a fundamental skill that anyone working or venturing into wilderness areas needs to possess, on land and at sea but it needs to be practiced in order to be maintained to a proficient rather than 'dangerous' standard.



Above: smartphone navigation is available to absolutely everyone because many apps like the Terra-Maps above are free. When you see the level of topography and related data that is available it is little wonder that many a weekend-warrior feels invincible in the great outdoors. Right: At the more professional end of the technology market is the Garmin Foretrex 701 which remains immediately to hand (so to speak) with no risk of dropping/losing it.



This is obvious in the sport/contest of ‘Rogaining’. Rogaining is a navigation competition which involves using *only* a map and compass – no GPS allowed. A lot of SAR members participate in these sorts of competitions, which is probably part of the reason they join a Search and Rescue Team to begin with; because they enjoy similar outdoor activities. In Australia there is the annual Emergency Services ‘NavShield’ which is a *Rogain* type competition specifically for SAR teams in the state of New South Wales and visitors from other states. SAR teams are provided a list of coordinates for remote area map locations, then, using their navigation skills, they aim to attend as many listed locations as possible without the use of a GPS. The team with the most points wins. If the participants' map and compass skills are not adequate they will have trouble locating markers and will eventually run out of time, which limits their accumulation of points.

A lot of SAR teams recognise that navigation skills using map and compass as well as GPS are important because both are on their training curriculum. Some teams have a requirement that the member must first learn to navigate and reach a level of competency with *just* the map and compass before they can start training with the handheld GPS devices.

Deigned for use by professionals and experienced outdoor sports persons, Silva's *Expedition* series of compasses are great for Search and Rescue members because they provide a high



level of accuracy and precision. The outer grip of the housing even comes in SAR orange (or is it yellow?). When navigating with a compass, if the bearing is off by just a millimetre this can mean the difference between finding the mark and missing it completely. The further you travel on the wrong bearing, the wider your distance will be from the mark. This is why these skills need to be honed with practice.

The Silva Expedition is a classic baseplate-style compass with Dryflex housing and adjusters that are built in for magnetic declination. This includes permanent adjustment for local magnetic declination. This compass is an upgraded version, which is itself an indicator of the continued use of a compass otherwise there would be no sense in upgrading the model.

The baseplate of this compass has map scales in both millimetres and inches, and has Romers etched on the baseplate for reading grid references at 1:25,000 scale and 1:50,000 scale. Such features assist greatly with the user's navigational accuracy. The Expedition also has silicon rubber feet for better purchase when placed on the map which may be liable to frequent changes of incline especially in high winds. It has luminous markings, which is not unusual in any professional grade compass but not so common is a detachable safety-release lanyard with its own 1:25,000 and 1:50,000 scale printed around its length for more accurate measurements of winding paths/roads/rivers on a map. There is a mirror-sighting version called the Expedition 5 with a 45-degree angle of assistance on the sighting mirror function. A mirror-sighting compass allows the user to read the compass dial whilst at the same time looking at the reference point thus helping to get a more accurate bearing. As with many others, the Silva Expedition has the ability to measure slope angles with the clinometer and the additional slope card. This can be used to

determine how steep the incline is and also for determining avalanche risk, should that be a risk in your area of operations

Training with both a baseplate style compass and a mirror-sighting compass will allow the user to decide on their personal preference. And there are other options like the gimbal-style compass shown above which is designed to be permanently mounted on the deck of a watercraft or suitable vehicle but there are also versions that demount as a hand-held.

The Garmin i66 GPS shown on the title page is fully map-integrated but older or more basic GPS simply give you a direction of travel, albeit an accurate one. But without an accompanying map you won't know whether you're about to encounter a hazard like a cliff or river. Therefore, a map is still part of your Primary plan rather than an Alternate back up to an i66 or similar map-based GPS.

Old school team members and technophobes will tell you that it's quicker to grab a compass and map at the outset of a search than to wait for a GPS to fire up and acquire satellites which may be true but not so much at the first deviation from an original search line or at intervals throughout the search. However, they may still get the upper hand if they have expert local knowledge. Not much trumps local knowledge, not even technology.

The use of a map and compass is not just seen by professionals as a back-up or alternate plan but is also seen as an essential part of their overall search and rescue skills. There is a kudos attained by those who are expert navigators without GPS.

In conclusion, we can agree that the art of using a map and compass is still very much alive and unlikely to ever be entirely replaced even if it is used less and less as a first-choice.

Ropes That RESCUE

Knowledge is light in the rucksack and not easily left at home



2020/21 Seminars & Workshops

WORKSHOPS & SEMINARS	STATE or COUNTRY DATE 2020	TYPE	VENUES	Req. Equip You will NEED	Duration Days	Physical exertion Easy 1 Hard 10	Prerequisite, Liaison & Special Notes	Location & Sponsor Open link for Flyer	Tuition (Other non-RTR costs may apply)	Lead Instructor
Artificial High Directional Workshop	UT April 20-26	Arizona Vortex	Classroom Industrial & Wilderness	AHDW Equip list	Monday/Sunday 7 days	5 - 7 some hiking	No Prerequisite Prior rope rigging experience strongly recommended. Liaison: Ray Daniels	Clearfield, Utah Rock Exotica & South Davis Metro Fire	\$1,475	Read Thorne
Team Skills Rescue Workshop	AZ May 2-8	General Team Rescue	Classroom & Wilderness ONLY	TSRW Equip list	Saturday/Friday 7 days	5 - 7 some hiking	No Prerequisite Prior rope rigging experience strongly recommended.	Historic copper mining town of Jerome, Arizona Jerome Fire Dept	\$1,350	Read Thorne
Team Skills Rescue Workshop	UK May 22-28	General Team Rescue	Classroom Industrial and/or Wilderness	TSRW Equip list	Friday/Thurs 7 days	5	No Prerequisite Prior rope rigging experience strongly recommended. Liaison: Richard Harting	Devon-Somerset UNITED KINGDOM Devon-Somerset Fire Service Exeter	\$1,350 USD via PayPal	Read Thorne
Artificial High Directional Workshop	UK June 1-7	Arizona Vortex	Classroom Industrial & Wilderness	AHDW Equip list	Monday/Sunday 7 days	4	No Prerequisite Prior rope rigging experience strongly recommended. Liaison: Paul O'Sullivan	Wales UNITED KINGDOM R3 Safety and Rescue Ltd.	Contact liaison	Read Thorne
Personal Skills Rescue Workshop	AZ June 24-30	Solo & Semi-Solo Rescue	Classroom Industrial & Wilderness	PSRW Equip list	Monday/Sunday 7 days	9	No Prerequisite Significant car pools to Prescott, AZ. Prior rope rigging experience strongly recommended.	Historic copper mining town of Jerome, Arizona Jerome Fire Dept	\$1,350	Read Thorne
Artificial High Directional Workshop	OH August 15-21	Industrial Rescue	Classroom Industrial & Wilderness	AHDW Equip list	Sat/Friday 7 days	4	No Prerequisite NOTE: Must be US citizen to enter NASA with background screening. Ohio Liaison: Brian Harting	Cleveland, Ohio Multiple venues including NASA Glenn Research Center	\$1,350	Read Thorne
Team Skills Rescue Workshop	MI August 23-29	General Team Rescue	Classroom Industrial & Wilderness	TSRW Equip list	Sunday/Saturday 7 days	4	No Prerequisite Prior rope rigging experience strongly recommended. Liaison: Dave Van Holstyn	Southfield, Michigan REGISTER at www.mtsarf.org Contact liaison Dave Van Holstyn for tuition fee		Read Thorne Dave Van Holstyn
Mountain Rescue Workshop	NY Sept. 13-19	Mountain SAR Rescue	Classroom & Wilderness ONLY	MRW Equip list	Sunday/Saturday 7 days	7 some hiking	No Prerequisite Liaison: Andrew Bajardi Prior rope rigging experience strongly recommended.	New Paltz, New York Mohawk Preserve in the "Gunks" climbing area	\$1,350 (50% off NY Volunteer discounting available)	Read Thorne
Team Skills Rescue Workshop	CAN Sept 28-Oct 4	General Team Rescue	Classroom & Wilderness ONLY	TSRW Equip list	Monday/Sunday 7 days	6	No Prerequisite Prior rope rigging experience strongly recommended. Canada Liaison: Tim Casavant	Nordegg, Alberta CANADA Turn Around Rescue Contact Tim Casavant/ tuition/logistics	\$1,350 USD	Read Thorne
Advanced Skills Rescue Workshop	MD October 11-17	Advanced Highlines	Classroom Industrial Wilderness	General Equip list	Sunday/Saturday 7 days	5	Prerequisite: Must have completed one program: TSRW, OHRW, IRW, AHDW from RTR	Maryland (Montgomery-Frederick Co.) Contact instructor Mike Green for location & logistics	\$1,350	Mike Green
Advanced Skills Rescue Workshop	AU October 16-22	Advanced Highlines	Classroom & Wilderness ONLY	General Equip list	Friday/Thursday 7 days	7	Prerequisite: Must have completed one program: TSRW, OHRW, IRW, AHDW from RTR	Mt. Arapiles, Victoria AUSTRALIA Contact Len Batley for tuition and logistics		Read Thorne Len Batley
JAPAN Technical Rescue Oct 25-Nov 1 Tokyo / Kyoto / Osaka / Saitama - RESCUE JAPAN Contact liaison: Akihiko Uyama										
Advanced Anchoring Analysis & Beyond the Barn Floor	AZ Nov 7-10 & Nov 11-13	Advanced Physics/Rigging & Trigonometry & Physics	Classroom and field testing & Classroom ONLY	See AAA-BTBF flyer	Sat to Tuesday & Wed to Friday	1 Mental 5-8 & 1 Mental 10	Past RTR Alumni Only (or special permission from instructors) You should have a good background in mathematics in order to fully participate in this program	Historic copper mining town of Jerome, Arizona Jerome Fire Dept	\$1,350	Mike Green & Read Thorne
Mountain Rescue Workshop	AZ March 6-12, 2021	Mountain SAR Rescue	Classroom & Wilderness ONLY	MRW Equip list	Saturday/Friday 7 days	7 some hiking	No Prerequisite Prior rope rigging experience and climbing ability are strongly recommended.	Historic copper mining town of Jerome, Arizona Jerome Fire Dept	\$1,250 (50% off AZ Volunteer discounting available)	Read Thorne

www.ropesthathatrescue.com



MAESTRO® S

Descender for technical rescue with built-in progress capture pulley, facilitates manipulation of heavy loads, and may be used as a primary system or as a back-up belay. www.petzl.com

PETZL RESCUE SOLUTIONS

The challenge of the rescue professional is their ability to adapt, facing the unexpected in every situation. In order to always be prepared, the members of the Centre National d'Entraînement à l'Alpinisme et au Ski (CNEAS) train on a daily basis, for example here, on the cliffs above Lake Annecy, France.



Access
the
inaccessible®