

TECHNICAL RESCUE

EMS, EXTRICATION, SAR, ROPE & WATER RESCUE, TACTICAL & USAR



ISSUE
83



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PETZL RESCUE SOLUTIONS

Every second counts in high-stakes situations — that's why technical rescue operations require skilled rescuers and the best equipment. It's also why rescuers train continually, as they're doing here on a via ferrata in Switzerland. They know that they can count on Petzl to provide high-performance tools.

A technical rescue solution including a STRATO VENT HI-VIZ helmet, DUO RL headlamp, FALCON MOUNTAIN harness, MINI TRAXION progress-capture pulley, SPIN L1 pulley, and ROLLER COASTER rope protector. www.petzl.com



Access the inaccessible®

CONTENTS

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Drone's eye view of the 2023 Turkish Earthquake demonstrating either how random building collapse can be in an earthquake or the importance of building to correct standards. pic courtesy of london Fire Brigade

CONTENTS

- 2 ON-THE-COVER**
Leader Group Search Eqpt
- 4 PRODUCTS**
USAR • Rope Rescue
Water Rescue • Trauma • Tactical
- 18 DRONES**
Drones in Urban Search & Rescue
By Darryl Ashford-Smith & Lee Newman
- 24 EXTRICATION**
Self Extrication
by Rich Denham & Nick Appleton
- 28 MARKET GUIDE**
Battery Spreaders
- 44 WATER RESCUE**
Drones for Rope Delivery
by Dr Michael Croslin, Mitch Sasser & Idan Peretz
- 52 ROPE RESCUE**
A Pirate's Guide to Anchor
Systems pt1
by Reed Thorne
- 62 MARKET GUIDE**
Inflatable & Solid 'Short' Boards



Above: It's been a bad year for earthquake fatalities largely due to the Turkish 'quake killing almost 60,000 but Afghanistan and Morocco also saw almost 3,000 deaths each. This picture shows Leader Group's acoustic listening system deployed in Turkey p2-4 and we discuss drone use on p18



Above: Drones have been used to good effect in water rescue delivery systems for some time especially by beach lifeguards but not so much in inland swiftwater ops. Our regular SWr team are joined by drone specialist Idan Peretz to explore their capabilities p44

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FRONT COVER

French USAR
specialist Leader
Group's search
camera system in use
with the European
rescue contingent in
Turkey in Feb2023.
See p2 to 4 for details
on what types,
and how, to deploy
specialist equipment
in USAR



ON THE COVER- LEADER GROUP

HOW SEARCH AND RESCUE TEAMS FIND SURVIVORS AFTER EARTHQUAKES



Following a disaster, such as the earthquake in Turkey and Syria in February '23 and Morocco and Afghanistan in September and October '23, every second counts! Urban Search And Rescue (USAR) teams must act quickly and efficiently within the first few hours / first few days following the disaster to save entombed victims as quickly as possible.

RAPID SEARCH AND RESCUE

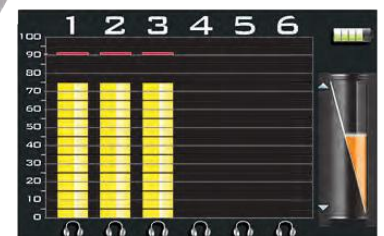
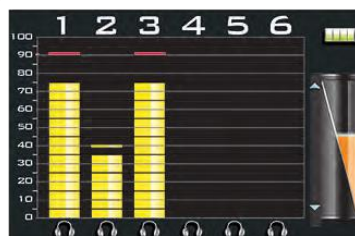
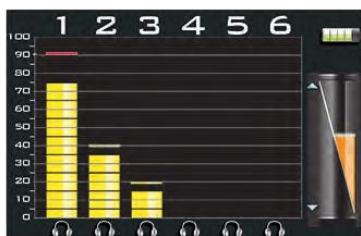
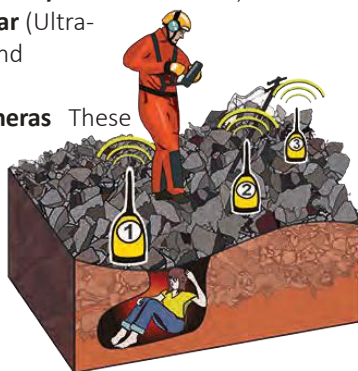
In the early hours after a major disaster, when many areas need checking, emergency teams conduct **rapid searches to maximize the opportunities for saving lives**. Rescuers are usually finish searching at a site within a few hours, then move to the next area. They can use this stage to identify zones where a deeper search would be worthwhile. Specially trained search and rescue dogs (K9 teams) are employed to move quickly in the rubble in order to sniff out signs of life. Indeed, these trained dogs detect live human scent, even when a victim is buried deep in rubble.

FULL SEARCH AND RESCUE

This phase of operations, also called "technical search" **locates, and rescues deeply trapped survivors**. The search and rescue of entombed victims requires the involvement of search and rescue specialists with **very specific USAR equipment to detect and locate victims, communicate with them** and then extract and rescue them. USAR teams often use victim location dogs, but they also use **electronic victim search equipment**:

- With **seismic sensors/acoustic sensors**,
- **UWB rescue radar** (Ultra-Wide Band – Ground penetrating radar)
- **USAR search cameras**

These 3 technologies complement each other and allow rescue teams to go faster.



Drawings showing how to use LEADER seismic sensors to find a victim under rubble.

LIFE DETECTORS WITH SEISMIC SENSORS (SEISMIC /ACOUSTIC LISTENING TECHNOLOGY) - SEARCH

Seismic detectors (also called listening device) are designed to **detect and locate the position of conscious buried survivors** under the rubble following a collapse.

Ultra-sensitive, seismic sensors use seismic technology to detect the smallest sounds/vibrations caused by survivors buried under rubble (scratching, hitting, shouting, etc.) **and help pinpoint their location**.



What is seismic technology?

Seismic detectors, like a wave receiver, sense **vibrations which resonate and circulate in the different materials of the collapsed building and amplify them via a control box**. The technical search specialist can **"listen" via audio headsets** and **"view" the audio signal** via a bar graph on the control box for vibrations made by victims under the rubble.

How to use seismic sensors?

1. First of all, placed on the same line, the team LEADER **deploy the seismic sensors by placing them on the surface of the rubble**.
2. Then, a long whistle sounds to demand **total silence**. One of the rescuers **hits the ground with a heavy metal bar** and an interpreter asks out loud **"Is anyone there? We're the rescue team."**
3. They listen in silence and **wait for the victim's "response"** (scratching, hitting, shouting, etc.) to help locate them.

3.1. **If no response and no vibrations detected: rescuers continue through the zone to be covered, repeating the same method.** The objective is to map the zone by identifying the location of buried victims.

3.2. **If the sensors receive a signal** (represented by sounds in the audio headset and via an active bar graph on the control box): The intensity of the signals received by each sensors is compared. **It is then necessary to focus on the sensor which receives the strongest signal** and gradually bring the two others closer in a triangle, until they all display the same intensity. **The position of the victim is identified when all sensors have a signal at the same intensity.**

LIFE DETECTORS WITH UWB RADAR (UWB TECHNOLOGY) - SCAN

One of the **latest innovations in terms of victim location** equipment is the **UWB (Ultra-Wide Band) radar detector** (also called **GPR - Ground Penetrating Radar**). This radar detector is designed to **detect and locate the position of entombed victims** following a collapse. It uses the **Ultra-Wide Band technology** (highly sensitive stabilized band) to detect the movements of a buried victim. **It can detect the smallest movements - even the breathing of an unconscious person!**



What is UWB technology?

UWB is a radio modulation technique based on the transmission of very short impulses. The UWB sensor is a transmitting/receiving device with an ultra-sensitive

UWB sensor producing electromagnetic waves that can pass through construction materials.

It can scan/probe through 50 cm of dense concrete or any other construction material such as bricks, asphalt,

sand, wood, tiles, plastic, plaster and glass. (Note that electromagnetic waves cannot pass through metal surfaces, damp surfaces (clay), or water).... and can detect the movement of buried victims.

How to use the UWB rescue radar?

- The UWB sensor must be placed in contact with the rubble by a rescuer and **should be regularly moved according to a virtual search grid** so that the radar can survey below the surface. The objective is to map the zone by identifying the location of buried victims.
- During this time, a second search and rescue specialist **monitors progress on the remote wireless control box** in real time.
- The UWB detector **scans the ground by sending waves that pass-through building materials.** If these waves return with

a gap in length, this indicates that there is movement and it may be a buried victim. **When the UWB radar sensor detects a movement under the rubble, the screen displays an icon indicating the depth at which the movement is found**, as well as the **frequency of the movements** (strong/weak) to determine whether it is a human or not. This means survivors can be detected very quickly in real time. Its high sensitivity and the stability of its signal allow detection with precision down to 1 meter:

- **strong and irregular movements** such as the movement of a conscious victim's arm up to 30 meters in free field conditions.
- Or **regular weak movements**, such as the chest movements/breathing of a victim, even if unconscious, up to 10 meters in free field conditions

SEARCH CAMERAS - CAM / TIC / RD90

Once the survivor is detected and located, a second step involves **visually verifying that it is a human** with search camera. Equipped with a microphone/speaker module, it can also be used to **communicate with the person** to determine their assistance needs.



Search cameras allow inspection of confined spaces....

What is a search camera?

A victim search camera is a **miniature camera** (47 mm in diameter for LEADER models) **designed to slide into very narrow spaces** such as cracks, gaps and standard 51 mm holes drilled by USAR teams to inspect behind a wall or inside a confined space. The USAR search camera is **connected to a control box with an extra-large color screen** to inspect the area/confined space and identify potential survivors.

How to use a search camera

The search and rescue camera is designed to be used "anywhere you cannot see". For this purpose, it can be fastened to two mounts:

- **EXTENDIBLE TELESCOPIC POLE VERSION:**

Search camera are most often used with a telescopic pole (which can be extended to 3 or 4 meters in length) allowing to inspect:

- **Confined spaces** by simply inserting the camera through a gap/hole.
- **Inaccessible areas at height** by inserting a camera through a window or gap in the wall,
- **Behind walls.** The



...behind walls....



...inaccessible areas at height....

ON THE COVER

camera (47 mm in diameter) is inserted into a hole (with a standard diameter of 51mm) which has been previously drilled by USAR teams (using a corer or drill) to view the cavity where the survivor is located.



...and very deep areas.....

• CABLE REEL VERSION:

Reel-mounted cable versions are also available. **Equipped with several tens of meters of cable** the search camera is used to **inspect very deep areas such as cavities, crevasses, pipes, very deep wells in very damp or underwater environments.**

In addition, there are several types of search cameras to cover different situations:

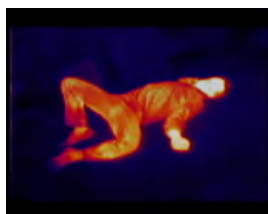
COLOUR SEARCH CAMERA OR VISUAL SEARCH AND COMMUNICATION

WITH THE VICTIM - CAM

The color search camera (left) provides the ability to **visually inspect inaccessible/confined, difficult-to-access spaces.** Once the victim is located, it is then possible to communicate with them thanks to the microphone and speaker built into the camera head.

THERMAL IMAGING SEARCH CAMERA TO LOCATE VICTIMS BY DETECTING HOTSPOTS AND COMMUNICATE - TIC

The USAR thermal imaging camera (right) provides the ability to locate survivors by **detecting hotspots** (the heat of a victim's body). The Thermal Imaging Camera (TIC) **supplements and accelerates searches to focus on hotspots and contrasts in temperature to find survivors or their heat signature in dark, confined spaces, dusty environments, smoky areas,** etc. Fitted with a microphone and speaker, the camera head can be used to communicate with the victim.



WATERPROOF SEARCH CAMERA FOR VISUAL SEARCHES IN EXTREME SITUATIONS - RD90

The waterproof search camera provides the ability to inspect inaccessible/difficult-to-access confined spaces such as crevasses, cavities, wells, etc. and allows searches in very damp or underwater environments to several tens of meters deep.



THE LEADER MULTISEARCH: 5 IN 1 MULTIFUNCTIONAL USAR SYSTEM

The life detector LEADER MULTISEARCH is the only USAR system to combine up to 5 peripherals on the same control box:

• VICTIM LOCATION / DETECTION:

- o **Peripheral SEARCH:** seismic sensors to listen sounds/vibrations of entombed victims,
- o **Peripheral SCAN:** UWB rescue radar to detect the movements of buried victims, whether conscious or unconscious.

• VISUAL LOCATION + COMMUNICATION:

- o **Peripheral CAM:** USAR color search camera to locate victims and communicate with them,
- o **Peripheral TIC:** USAR thermal imaging search camera to locate victims through a visual search for hotspots in rubble in very dark, dusty, smoky environments, etc.
- o **Peripheral RD90:** USAR waterproof search camera to locate victims in very damp environments or underwater to a depth of 90 meters or 180 meters

The MULTI-APP box is the heart of the LEADER MULTISEARCH (or MS) system. **Depending on operational needs in the field,** it is used to **connect up to 5 interchangeable peripherals in turn** (CAM, TIC, RD90, SEARCH, SCAN) in order to allow rescuers to be ever more efficient and to go ever faster in the search for buried victims!

Thousands of LEADER devices are used by an extensive number of Search and Rescue (SAR) teams worldwide (INSARAG, SUSAR, etc.). These robust and effective devices are **tried-and-tested around the world** and have continued to prove themselves recently during the earthquakes in Turkey and Syria and Morocco.

More info:
www.leader-group.company

RAPTOR® RESCUE

Developed with the input of special operations medics, EMTs and fire professionals familiar with standard shears, the Raptor shears were crafted with just the right balance of multipurpose features for emergency response without an overkill of tools to complicate sometimes life-threatening situations. Holster included.



Available online from: www.whitbyandco.co.uk

LEADER® MultiSearch

5 IN 1 MULTIFUNCTIONAL USAR SYSTEM

A SINGLE TOOL FOR ALL YOUR SEARCH AND RESCUE OPERATIONS!

- **Versatile:** Connect up to 5 interchangeable peripherals on a single control box!
- **Configurable:** Compose your kit according to your needs!
- **Scalable:** Complete your kit at any time by adding new peripherals!



SCAN ME



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The most comprehensive
GUIDE to **USAR & Extrication**
Equipment ever produced
Available from Summer 2024
Individual guides to:

- Hand Hydraulic Rescue Tools
- Electric/Hydraulic CombiTools
- Electric/Hydraulic Cutters
- Electric/Hydraulic Spreaders
- Electric/Hydraulic Rams
- Special & Entry Tools
- Battery Reciprocating Saws
- High Pressure Airbags
- Low Pressure Airbags
- Stabilisation Struts
- Shoring Struts
- Tripods & Frames
- UAVs/aerial Drones

- USAR/Search Robots
- Search Cameras
- Acoustic Systems
- Powered Winches/Ascenders
- Mini Hauling Systems
- USAR Helmets
- Multi-Gas Monitors
- Protective (Hard) Cases
- Extrication/USAR Gloves
- Area Lighting
- Extrication Knives/Multitools
- Bariatric Training Manikins

LATER SUPPLEMENT:

- SCBA & EDBA
- Pop-up & Inflatable Shelters
- Rebar Cutters
- Circular Saws

After decades of producing Market Guide articles that detail all of the key models available in any particular range of equipment we have now introduced a set of continually updating (page-tuning pdf) **BUYERSGUIDES** that incorporate all of the Market Guides we have had and will have - updated with new text, new models, prices and specification changes. Readers can check back whenever you like on the same link to see the latest updated version. Alternatiely you can get the link from our website and some others. You can download a pdf version using the cloud icon in the flip-page version or even print a copy if you have enough paper and ink - good luck though because these are all around 500 pages in length.

Currently compiling but this will be the link: <https://accessandrescue.hflip.co/GuidetoUSARextrication>

FIRSTLOOK

FL360

360° SEARCH AND RESCUE CAMERA

WHEN EVERY SECOND MATTERS

www.firstlook.net

RESCUE GUARDIAN

Motion/Movement sensor for rescuers



The Paratech Rescue Guardian is the most advanced monitoring and alarm system for technical rescue available, monitoring load changes, seismic activity and incline via contact using suction cups, clamps and direct attachments to struts etc. to increase the safety of rescue personnel and on-scene victims. Pair RESCUE GUARDIAN with Paratech's *Remote Monitoring Application* (Android & iOS) and monitor multiple Rescue Guardians from a single smart device. (It can be used as a Stand-alone system without the app)

- As a vibration, incline, and load monitor
- As a visual / auditory alarm
- Attached to walls, floors, beams, any Paratech equipment
- Resting on any surface
- Monitors: Load, Vibration, Incline Wirelessly
- Transmits: Load change, Vibration, Incline data
- Warning System: 6 high-powered red LEDs High decibel auditory alarm notifications via Bluetooth

Applications:
Structural Collapse (Raker Shoring, Vertical Shoring), Vehicle Stabilization, Trench Rescue, Stand-alone monitoring

1 week Battery Life: under continuous usage in low-power monitoring mode. Includes a low battery warning. Easily replaceable and available lithium-ion batteries.

Approximate costs are just under US\$8,000 for one unit. The 2xUnit case with accessories shown above left is around US\$17,000.

www.paratech.com

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PRODUCTS- ROPE STUFF

www.rescuemagazines.com

...a carabiner, a swivel and a pulley walk into a bar...

Rock Exotica and CMC have taken the next logical step in hardware evolution by combining the Omni-Swivel with their SwivaBiner to produce what CMC describe as a 'single compact device' - genius though it is, and we want one, we're not so sure about it being 'compact', at least not in terms of length because you could simply use a stubbier connector on a swivel pulley but there's no doubting the speed and convenience of a regular carabiner over a maillon or allen-key link. Sold in the US by CMC who have this to say...

It has a double-detent sideplate that opens while the pulley is still attached to the anchor. Teaming up with Rock Exotica, CMC offers a single and double sheave SwivaBiner each certified to NFPA standards. They are an excellent option for mechanical advantage systems for hauling and ascending, and they work well in combination with high anchors, tripods, and redirects. The SwivaBiner is patented, time-tested, made in the USA, and brought to you by two companies committed to quality and service. For more swivel pulley options, check out our full ProSwivel Pulley line.

Features:

- Combined swivel, single or double pulley, & carabiner reduces system length, allowing more travel
- 1.1" sheave is compact and lightweight, efficient for a variety of applications
- Pivoting sideplate allows rope loading without



- Disconnecting from anchor
- Double-action detent button prevents accidental opening of the sideplate
- Sheave is mounted on sealed ball bearings for maximum efficiency
- Rotating swivel aligns rope with the direction of pull
- Ergonomic design for anchoring and loading with one hand
- CNC machined for optimal strength & weight
- Prusik minding faceplate prevents entanglement
- Double sheave pulleys equipped with integrated becket
 - Compatible with rope up to 13 mm (1/2 in)
 - Ideal for rescue, work at height, and tree care
- Classified to NFPA Technical Use Patented, USA Made, time-tested, and proven

1.1" PMP Single SwivaBiner Pulley
 Wt: 200g (7.0 oz)
 Dims: 168 x 51 x 30mm / 6.6 x 2 x 1.2"
 MBS: 22 KN (4,946 Lbf)
 MSRP: \$125

1.1" PMP Double SwivaBiner Pulley
 Wt: 298 g (11 oz)
 Dims: 195 x 51 x 53mm / 7.7 x 2 x 2"
 MBS: 22 KN (4,946 LBF)
 MSRP: \$155

www.cmcpro.com

HELI-WINCH HARNESS

The KONG TARGET PRO AERO KIT has been conceived and designed to safely suspend and secure helicopter rescuers during helicopter rescue operations, both inside the aircraft and during winch phases. The kit consists of a harness combined with a life jacket ensuring buoyancy in case of emergency. The life jacket uses a CO2 cylinder for auto or semi-auto inflation.

JACKET AERO

The *Jacket Aero* is made of NOMEX® fabric with NOMEX® breathable mesh. The orange borders are made of PU-coated nylon. A variety of pockets necessary for storing survival and/or operational material can be attached to the Jacket. It is equipped with a pair of removable slings for attaching the Jacket



to the harness. Weight approximately 1.3 kg, buoyancy 200N (20 liters)

TARGET PRO AERO

Rescue and helirescue harness, conceived for those situations where light weight and freedom of movement are essential. Equipped with automatic buckles on the chest and leg loops for ultra-fast dressing. All buckles are made of stainless steel AISI 316 to ensure maximum resistance in corrosive and marine environments. The wide padding on the leg loops guarantees greater comfort during suspension. The kit is available in 4 sizes: S, M/L, XL, XXL.



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Swinging sideplate allows for midline rope attachment

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Symmetrical body streamlines rigging with prusiks

The Apex Swivel Pulley combines 54 years of design and manufacturing knowledge with an uncompromising program of innovation, prototyping and user feedback.

The result is unmatched security and deceptively simple operation. This robust, American-made pulley will give you the confidence to complete your operation, no matter how complex the challenge.

Visit our website to check out our entire line of Apex Pulleys.



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SPECIFICATIONS

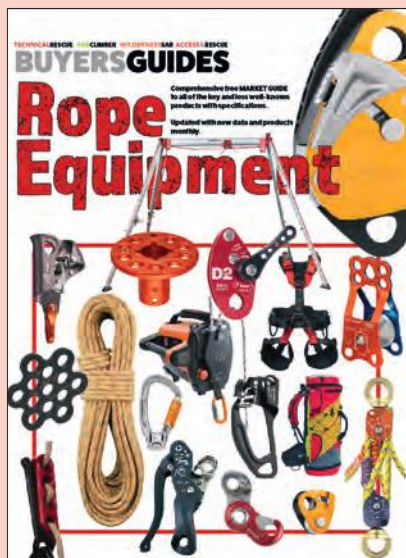
APEX 1.5 Single Swivel Pulley

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

*NFPA-G Certified

PRODUCTS-ROPE-RELATED BUYERS GUIDES

www.rescuemagazines.com



Complete/updating on this link:

<https://accessandrescue.hflip.co/GuidetoArboristEquipment>

See page 6,12&14 for introduction to our 6 new **BUYERSGUIDES**.
Currently compiling on this link:
<https://accessandrescue.hflip.co/GuidetoRopeEquipment>

Pt1 CLIMBING/RIGGING
 Harness Tool Carriers
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 Swivel Pulleys
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 Arborist Helmet
 Sit Harnesses
 Climbing Spikes
 Organsier Bags
 Throwline Bags
 Throwline Weights
 Throwline cord
coming soon

Harness Tool Carriers
 Rigging Plates
 Pulleys & Tandem Pulleys
 Swivel Pulleys
 Trolleys/Carriages
 Progress Capture Pulleys
 Carabiner Pulleys
 Carabiners

Descenders/Bail-outs
 Rope/Lanyard Adjusters
 Handled Ascenders
 Hand & Chest Ascenders
 Foot Ascenders
 Powered Ascenders
 Mini Hauling Systems
 Low Stretch Rope

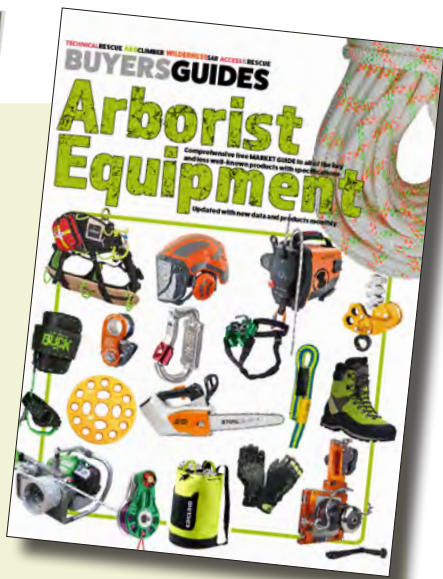
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 Rope/Tackle Bags
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 Dog Harnesses
 Tripods & Frames
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STC
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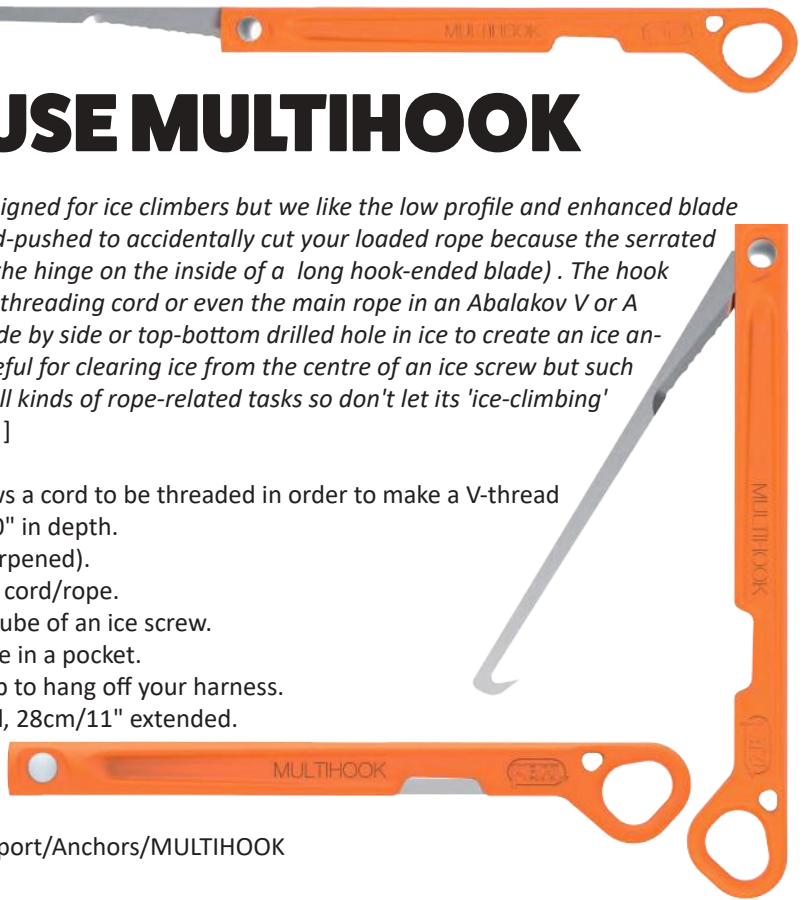


- Pt2 CHAINSAW/ SAFETY Summer 2024
- Chainsaw Trousers/Gloves
- Tree Climbing Boots
- Chainsaw Boots
- Chainsaw Trousers
- First Aid/Trauma kits
- Top-Handle Chainsaws
- Rear-Handle Chainsaws
- Hand Saws
- Chainsaw Lanyards

MULTI-USE MULTIHOOK

[ED: Technically this is designed for ice climbers but we like the low profile and enhanced blade safety . You would be hard-pushed to accidentally cut your loaded rope because the serrated cutting edge is closest to the hinge on the inside of a long hook-ended blade). The hook is intended to be used for threading cord or even the main rope in an Abalakov V or A thread configuration (a side by side or top-bottom drilled hole in ice to create an ice anchor). The hook is also useful for clearing ice from the centre of an ice screw but such a hook can be useful for all kinds of rope-related tasks so don't let its 'ice-climbing' specialisation put you off.]

- The Petzl Multihook Allows a cord to be threaded in order to make a V-thread ice anchor, up to 25cm/10" in depth.
- Optimal hook (can be sharpened).
- Serrated blade easily cuts cord/rope.
- Can be used to clear the tube of an ice screw.
- Can be folded, for stowage in a pocket.
- Can be clipped with a krab to hang off your harness.
- Length: **16cm/6.3" folded**, 28cm/11" extended.
- Weight: 40g/1.4oz
- Cost £30/\$36/€35



www.petzl.com/INT/en/Sport/Anchors/MULTIHOOK



4D POLE

NFC READY



www.kong.it



After 30 years of producing Market guide articles we decided to compile 6 entire **BUYERSGUIDES** for each of our market sectors. The **BUYERSGUIDES** are free-to-all as hyperlinked, digital, page-turning publications that are continually updated on the same link so that readers can get the latest version whenever they want to take a look for something. New products will be incorporated into the tables and intros as they are released. Prices will be continually monitored and updated, discontinued models will have a note to that effect before being removed altogether, Safety Recalls can also be noted and removed when they have been dealt with. Our researchers check, collect and collate data for these **BUYERSGUIDES** and the introductions are tweaked to keep them current.

- Water Rescue Helmets
- Water & Ice Rescue Drysuits
- Rescue PFDS
- Dog PFDs
- Water Rescue Drones & ROVs
- Water-Capable Aerial Drones
- Inflatable Platforms/Paths
- Inflatable Rescue Boats
- Inflatable Sleds
- Inflatable Rafts
- Inflatable & Solid Boards
- Inflatable & Solid Stretchers/Collars
- Lightweight PM Pulleys & Tandem Pulleys
- Mini Hauling Systems
- Water Rescue Rope
- Throwlines & Throwbags
- Water Rescue Knives
- Submersible lighting
- Water Rescue Manikins



Later Supplement:
Rigid Inflatable Rescue Boats
Hovercraft
Airboats



Currently being compiled but this will be the link:

<https://accessandrescue.hflip.co/GuidetoWaterRescueEquipment>

[ED: Suckers that we are for shiny stuff and things that make life easier we were naturally drawn to this even though, at the time of writing, it was not yet available, keep your eyes peeled]. ...

A state-of-the-art wearable system offering rescue personnel the advantage of battery powered underwater propulsion to enhance performance and reduce fatigue during underwater operations. Developed and manufactured in the U.K. by Northern Diver, our Side Mounted Dive Thrusters are at the forefront of innovation. They offer hands free propulsion, via the latest technology, unrivalled construction and expert engineering, effectively enhancing performance and reducing fatigue during search & rescue operations.

After learning about the difficulties and kit restrictions that the technical fire brigade water rescue TEAMS WERE EXPERIENCING, WE REdesigned the layout of our original DT4 Dive Thrusters to solve the problem. Our personal propulsion thrusters are now available to any rescue team in a side mounted model and have been designed specifically for rescue applications.



SYSTEM FEATURES

- Run time: 25 minutes
- Max operating distance: 1.2 miles
- Max operating speed: 2.7mph
- Overall size: 380*85*220mm (per unit)
- Nominal battery bolts: 25.4VDC
- Battery capacity: 20Ah
- Typical charge time: 2.5 hours
- Battery: lithium ion (with gas vent)
- Individual thruster weight: 5.5kg
- System weight with belt: 12.2kg

PERFORMANCE

Maximised efficiency and power of the Thrusters to reach their full potential. Constantly working to ensure the best streamlined profile underwater, to reduce drag and increase the speed.



NIMROD - REMOTE CONTROL

In addition to the manual control provided, the Side Mounted Thrusters have the capability to be remotely operated with Northern Diver's NIMROD underwater navigation system. This enables the user to alter their speed without removing hands from the navigation equipment giving complete control, whilst maintaining a smooth underwater profile.

To infinity.... & beyond..



Thruster Harness System

Refined for seamless integration with the user's standard kit. Improves comfort, practicality, and usability. Available in one adjustable size to cater to a wide range of body types.

Thruster Batteries

Side mounted design designed specifically to work with a divers other kit. Battery pack uses high capacity Lithium-Ion cells and an advanced battery management system with built in protection.

Thruster Units

Through the application of hydrodynamics and intensive university research, Northern Diver have maximised the efficiency and power of the Thrusters to reach their full potential.

The state-of-the-art motors and drive components produce impressive thrust. The propellers are driven by an innovative magnetic coupling.

SYSTEM MAINTENANCE & SPARES

To ensure the long life of your dive thrusters we offer cleaning kits, maintenance kits and the option to purchase spare parts.

The maintenance kit - features the basic items required to maintain the operation of your DT4 dive thrusters and includes a small waterproof hard case for easy transportation. Each maintenance kit includes: allen keys, spanner, propellers, silicone grease and storage case.

The cleaning kit - protects, lubricates, and maintains the best signal quality of the thruster connector cable pins. Consistent maintenance of the cable pins helps reduce intermittent connections, arcing, RFI, wear and abrasion and provides long-lasting protection from oxidation on the plated surface. Each cleaning kit includes: micro- cleaning cloth, swap pack, cleaning solution and storage case.

All components that make up the Northern Diver Dive Thruster System can be bought as a separate part if required. Each component is easy to order through your Northern Diver sales representative and available for quick delivery in most cases.

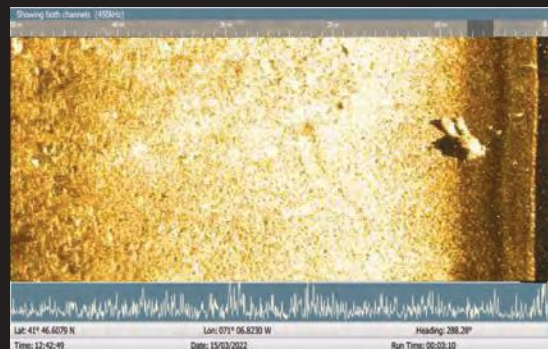
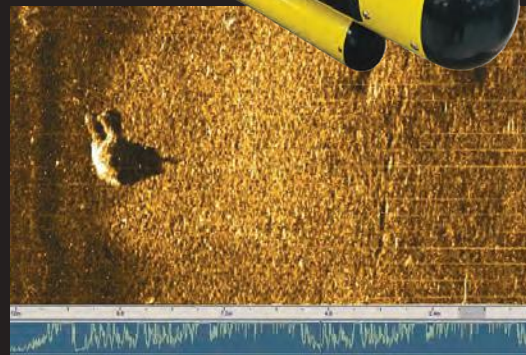
www.ndiver-rescue.com/side-mounted-dt4

Side Scan Sonar

The ideal tool to locate drowning victims and missing evidence



JW Fishers Mfg., Inc.
(800)822-4744
info@jwfishers.com
jwfishers.com





This one is mostly casualty packaging like stretchers, splints and collars plus medical/trauma packs together with personal protective equipment like helmets, gloves and boots. We also have important ancillaries like lighting/head torches, multitools/knives and training manikins. This is the last of the 6 to be produced and is expected in late 2024 and will be on this link:

<https://accessandrescue.hflip.co/GuidetoPPEcasevac>

- Rescue (Climbing) Helmets
- Ski-Mountaineering Helmets
- Water Rescue Helmets
- USAR/Fire-Rescue Helmets
- Evacuation Triangles/Harnesses
- Rescue Stretchers/Litters
- Helicopter Stretchers/Litters
- Sled Stretchers (snow)
- Stretcher Bridles
- Spine Boards
- Cervical Collars
- Fracture Management
- Medical/Trauma Packs
- HeadLamps
- Hand torches/flashlights
- Area Lighting
- Training Manikins
- Helicopter Harnesses
- Gloves
- Service Footwear
- Paramedic Shears/scissors
- Multitools

Lightweight O₂ Rebreather for rescuers & combat-medics

'FIDO': is a closed-circuit oxygen rebreathing device for acute, in-field oxygen treatment that was created to replace old, cumbersome free-flowing oxygen systems with large cylinders. Certified by the EU in 2020 the Swedish designed and manufactured FIDO is also registered with NATO and is invaluable to rescuers in all sectors operating away from road ambulance access- USAR & disaster response, caves & mines rescue, dive and water rescue, wilderness and tactical situations. As you know oxygen is the most used drug in emergency medicine. For a long time, the medical oxygen market has needed an oxygen delivery device that is smaller, dramatically more efficient, and more easily deployed in the field in emergencies. Due to its design as a closed-circuit re-breathing device, FIDO uses O₂ very efficiently, employing a significantly smaller oxygen bottle without compromising quality or output. FIDO is four times smaller and 90% lighter than existing systems

on the global market, with double the run time. As a comparison; with a 5-liter gas cylinder and 200 bar, FIDO can provide continuous 12-hour treatment.

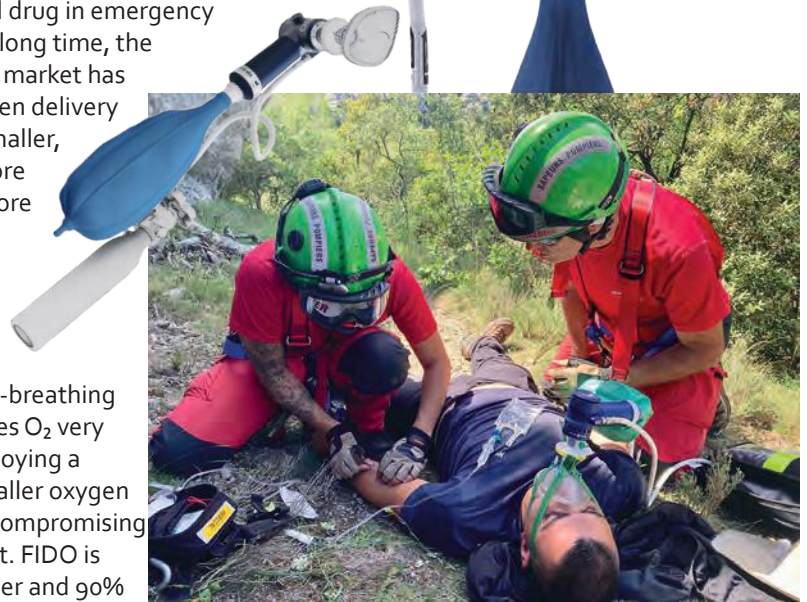
- Weight only 1.5 kg/3.3lb
- Provides 60 minutes of oxygen treatment with only a 40 centilitres oxygen bottle
- Delivers between 52% and 89% of O₂ (adjustable)
- Generates warm return air to the patient, about 33°C and humid air <95%
- The input pressure level of FIDO is 4.5 bar and 200 bar in the cylinder
- 100% mechanical, no need for electricity or battery to us it
- Medically certified (CE IIa), we operate according to ISO standard 13485
- Approved for national and international air transport according to IATA-DGR
- Developed to be rugged and withstand all conditions

Some Key features for Military and Emergency & Rescue:

- Due to lightweight packaging, it is easy to keep mobile.
- FIDO can be deployed in less than 30 seconds.
- The efficient use of O₂ in the rebreathing process means that the FIDO system only requires a small O₂ bottle.
- Special Forces use the FIDO in field-hospitals, on aircraft, in battlefield medic kits, and on naval ships and battlefield vehicles.
- FIDO has a long action-time in relation to the amount of O₂ consumed: 0.4 litres of pressurized O₂ (200 bar) delivers approx. one hour of treatment.
- Built-in on-demand function (Flush button) should higher oxygen concentration levels be necessary for medical reasons.

email: christophe.galan@mirola.se

Web: www.mirola.se





FOR THOSE WHO EXPECT THE BEST,

EQUIPMENT THAT EXCEEDS

YOUR EXPECTATION.

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

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

844.414.RESCUE
CASCADE-RESCUE.COM

'GHOST' CARABINER

Built by DMM and designed from the ground up as a carabiner for tactical and law enforcement end users, particularly in urban environments. Certified to EN12275:2013 (Mountain Equipment - Connectors) and EN362:2004 (PPE against falls from height). The brief of the Ghost carabiner project was to significantly **reduce the sound signature** of the gate mechanism and all other contact surfaces whilst maintaining the size, gate opening and strength characteristics of a standard screwgate carabiner. [Helic quote a comparison of 78.2 decibels compared to 105.5 decibels for a regular DMM Ultra D carabiner. By creating a bespoke carabiner back we have been able to

injection mould a noise reducing coating over all of the main surfaces whilst leaving an exposed aluminium rope basket to maintain good wear characteristics. The unique screwgate configuration contains proprietary dampers to manage the distinctive 'click' of the gate mechanism being opened or snapped closed, a feature which is especially important in covert urban climbing operations.

Another benefit to the over moulded screwgate barrel is that it creates an anti vibrate function once fully closed adding another level of safety.

At 72grams and measuring 62 x 109mm the Ghost carabiner is an excellent size for general purpose use.

Weight 72g - MBS Main Axis 22kN- Minor Axis & Gate Open 7kN
Gate Opening 16mm www.helixoperations.com



Forced Entry Equipment
Access Ladders/Hooks/Extension Poles
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Powered Ascenders
Mini Hauling Systems

Low Stretch Rope
Tactical/Bail-out/Escape Cord/Rope
Rope/Tackle Bags
Anchor Slings & Lanyards
Helmets
Dog Harnesses

Currently compiling on this link:
<https://accessandrescue.hflip.co/GuidetoBlackEquipment>



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NEPTUNE^{POLE} & SIERRA^{HOOK}

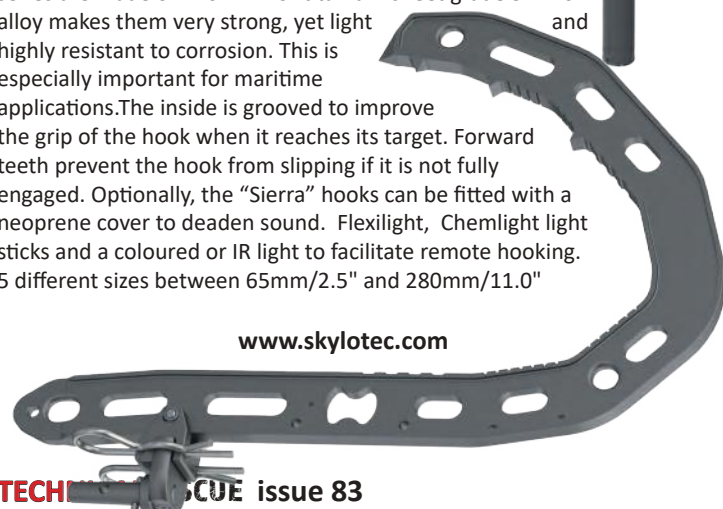
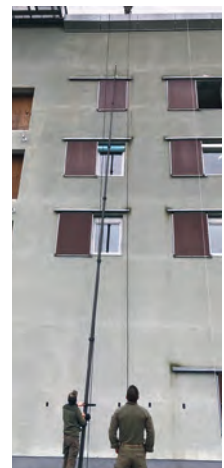
SKYLOTEC has launched a new solution gaining access to structures/ships for Police, military and coastguard. : the electric telescopic pole "Neptune". combined with the This provides a quick way to get a hook and ladder into position to establish access in complex situations such as boarding a ship while underway or a building

in an urban area. The system is equipped with an electric motor that provides users with instant speed while maintaining maximum control when extending the mast; extending to a height of 20 m / 65.6 ft is possible within 8.5 seconds. Powered by a standard 18V lithium-ion battery available worldwide, the motor unit is intuitive to operate and features a simple one-handed Patent pending manual override system. This means that it can be used even if there is a fault with the motor or battery. The motor housing is IP68 waterproof for four hours at a depth of 15 metres and is made of impact-resistant polymer. This reduces the weight to a minimum, as do the mast

components made of high-strength carbon fibre, which are also corrosion-resistant. This is an advantage especially in the maritime environment and increases the longevity of the material. A folding stabiliser handle also facilitates transport and storage of the electric telescopic pole. If necessary, the handle can be folded down immediately for use. Lengths= 12m/39.4ft, 16m/52.5ft and 20m/65.6ft; a set with two batteries and a charger is also supplied in a protective case. The electric telescopic pole "Neptune" is compatible with all titanium hooks and ladder systems from SKYLOTEC.

The titanium *Sierra* hook is reinforced to withstand high point & arch loads. This has the advantage that several users can climb at the same time. The hooks of the "Sierra" series are made of Ti-6Al-4V or titanium sheet grade 5. This alloy makes them very strong, yet light and highly resistant to corrosion. This is especially important for maritime applications. The inside is grooved to improve the grip of the hook when it reaches its target. Forward teeth prevent the hook from slipping if it is not fully engaged. Optionally, the "Sierra" hooks can be fitted with a neoprene cover to deaden sound. Flexilight, Chemlight light sticks and a coloured or IR light to facilitate remote hooking. 5 different sizes between 65mm/2.5" and 280mm/11.0"

www.skylotec.com



Even more flexibility due to modular design

VECTOR X & Y

Experience your vertical freedom with the great VECTOR harness system, our fall arrest and positioning harness for free-hanging work in rope access as well as tree care: Lightweight, comfortable, and universally applicable.

The VECTOR harness is available as a set with a traditional chest belt in Y-shape or for maximum freedom of movement in X-shape.

www.edelrid.com

EDELRID 

Wide area drone shot of the Turkish earthquake showing how efficient such systems are for initial hasty searches - here the room partitions are clear and as the drone descends, victims might be immediately apparent to the drone operator when a ground search could take hours and be risky for rescuers.

DRONES for USAR

part1

By Darryl Ashford Smith



& Lee Newman



Darryl, a veteran of USAR/ISAR in the London Fire Brigade is now a officer in the Search & Rescue Aerial Association-Scotland, Scottish Rescue Training Support Officer, Scottish Cave Rescue Organisation officer and delivers technical rescue and disaster training worldwide for Technical Rescue International.

training Mountain Training

Lee is currently the RPAS Manager in the London Fire Brigade and ISAR Responder. He became project manager for the LFB's drone project after seeing drone technology being used at the Grenfell fire. He has used drones on 100's of occasions to survey fire incidents alongside showcasing the technology and its advantages to fire and rescue services.

The use of Uncrewed Aerial Systems (UAS) by fire and search and rescue organisations at Urban Search & Rescue (USAR) incidents is increasing rapidly. Although technology can only be relied upon so much before a physical search and rescue will have to be carried out, the use of UAS's can dramatically improve situational awareness, lead to better decision making and enable a more efficient and safer operation. This two-part article leads the reader through External assessment and search including rubble pile search (part 1) and internal search (part 2) including flying inside structures and voids.

INTRODUCTION

Uses of UA specific to USAR operations include:

- Wide area assessment (as defined by the INSARAG Guidelines)
- Worksite triage assessment (as defined by the INSARAG Guidelines)
- Structural assessment & monitoring
- Detection and monitoring of hazardous materials or environments
- Search
- Situational awareness and 2D/3D mapping.

ADVANTAGES:

- Can search areas that are unsafe or inaccessible to responders
- Can search large open areas quickly
- Can zoom into specific areas/targets from a distance and observe through thermal imagery
- Minimise risk, reduce effort and speed up operations
- Can increase the efficiency of the overall assessment/search by negating specific areas
- Can increase situational awareness for incident managers

The UA may be free flying or tethered (tethered UA uses a permanent physical link, in the form of a flexible wire or cable, to provide power and communications).

DISADVANTAGES:

- Smaller less capable UA may not fly in inclement weather (depending on severity of weather and capability of UA)
- Limited flight time/quantity of batteries
- Flight time may be reduced in cold conditions and if using ancillaries such as spotlights or speakers.

Although a search may yield negative results with regards to finding a casualty, it must be remembered that clearing an area/compartment/void to exclude it from the search is important to

ensuring the whole search effort is efficient.

Awareness training must be given to all those that manage incidents or those that manage searches as although it is the pilot that will have the experience to fly and utilise the UA in the best possible way at any given incident, those that manage incidents must recognise when and where they may be best deployed and most importantly, how they can be used to reduce the risk.

The image below shows an example of a structural collapse involving significant damage to the upper floors. This incident is a prime example of where a UA can be utilised to significantly reduce the risk to Responders. The UA can be deployed to assess the scene as a whole and of the structure, identify casualty locations, identify suitable access and emergency egress routes and to monitor the operations and the structure itself negating at least in the initial stages, the committing of personnel which will subject them to increased risk.



As can be seen, there are many opportunities for a UA to be used externally and even internally. To physically carry out the areas of work the UA could be utilised for would be extremely difficult and hazardous to responders. Perhaps alternatives such as aerial appliances could be used however, there may not be the space and there may be the risk of further collapse considering debris can be seen on the street and hanging off the structure.

The following hazards may be present at a USAR incident regarding UA use:

- Members of public
- Overhead telecommunication wires
- Overhead railway/tram wires
- Trees
- Street furniture
- Structures
- Vehicles/roads
- Responders
- Air assets such as other drone teams/helicopters
- The use of UA's by the press or members of public
- Aerial appliances
- Weather conditions and urban features affecting wind
- Other hazards according to incident type

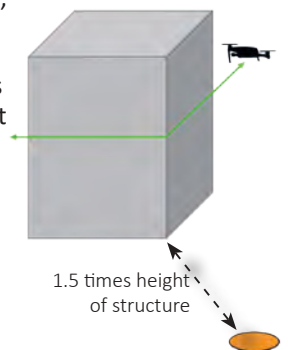
Where possible, the Pilots position should be in a location

where the team can use the UA for the task in clear sky. The UA is flown within line of sight with the Pilot, with clear sky behind. By operating in this way, the Pilot will know that the UA will not impact anything as otherwise, it is very difficult to judge how close a UA is to structures or any other obstructions. Of course in an urban environment this may not be possible on every occasion.



To aid in making the UA visible, a fluorescent skin can be applied and a strobe light fitted which further increases visibility and has the advantage of not using in-board power.

As with normal USAR safety considerations, personnel must keep at least 1.5 times the height away from the structure and preferably along the line of the corner. This ensures that if there is further collapse that personnel are at a safe distance already. By being positioned along the line of the corner, also allows the pilot to maintain visual line of site with the UA whilst using it to observe/search two sides of the structure but remaining in one place instead of doing one side at a time.



WIDE AREA ASSESSMENT (ASR LEVEL 1 AS DEFINED BY THE INSARAG GUIDELINES)

When used for wide area assessment, the UA Team should ensure that information is gathered in an effective way. Considering that the assessment could cover a range of incident types or damage such as structural collapse, fire, heavy transport (road/rail/aircraft), water related, hazmat related, the incident management team will require a range of views to obtain critical information and to gain situational awareness.

Having the scene properly assessed means that the incident management team can be situationally aware. The purposes of the wide area assessment are:

- Determining the scope and magnitude of the incident
- Identifying scope, location and types of damage
- Estimating the urgent resource needs
- Developing a sectorisation plan & establishing priorities
- Identifying general hazards & infrastructure issues
- Identifying potential Base of Operations locations.

A wide area assessment may cover a very large area of which

may have to be sectorised which should be carried out at the earliest opportunity. An assessment using the drone may assist in this sectorisation. It will also assist in the identification of worksites (a site requiring search & rescue operations). A wide area will generally be too large for a UA to cover (unless BVLOS) however, it may cover segments of the wide area.

An overall view will be required of the whole of the incident scene from above and each side along with close up views of specific areas of interest. A consideration may be to establish a methodical approach of positioning of the UA to achieve this method such as:

- Breaking down into sizeable segments (the segments do not have to relate to a sector, this is just a method of making the whole search area manageable specifically for the UA)
- Each segment (denoted in yellow in the image) should overlap any adjacent segments
- Using ground features for the segment boundaries such as roads or rivers will help to make demarcation of the boundaries easily identifiable for the Pilot
- Fly the shape (denoted in white), taking video and photos from each side with the camera at an oblique angle
- It may be a consideration to use mapping software but if this is not available, fly manually taking video/photos ensuring overlap of each photo/video/flightpath (in green)
- Another option is to carry out a point of interest search on any notable areas of interest (shown in red)



MAPPING SOFTWARE

There are many types of automated mapping software which may be used to convert a mass of images into one useable real world view of the whole area photographed. The software takes a number of photos that can then be converted into a 2D or 3D model. The features available with common off-the-shelf systems include;

- Adjustable boundaries or flight path (allows the pilot to set

the boundaries/path using the map on the controller. Any shape of area may be flown by adding waypoints

- Photogrammetry and geotagging (capture of photographs to recreate a survey area. The images are stitched together using software to create a realistic, geo-referenced, measurable 2D or 3D models)
- Adjustable settings allow for speed, height, gimbal control, yaw and actions on completion
- Mission information gives flight length, estimated flight time, quantity of waypoints, photo quantity, lat/long
- Ability to resume the flight from the last waypoint on battery changes.

WORKSITE TRIAGE ASSESSMENT (ASR LEVEL 2 AS DEFINED BY THE INSARAG GUIDELINES)

The main purpose of the worksite triage assessment is to identify specific and viable live rescue sites within the allocated sector to allow assignment prioritisation and to make a plan of action. The specific purposes of the worksite triage assessment are:

- Confirm live, possibly live and deceased victims Location of victims
- Identify opportunities for immediate and easily achieved rescues
- Identify type of structures, construction, construction materials and size
- Identify access/egress points to the site and structures
- Estimation on how long operations will take
- Identify specific hazards
- Establishing priorities within the worksite
- Identify potential key areas (logistics, medical etc.)

The assessment needs to be a fast paced but methodical. A Worksite Triage form (for INSARAG teams) should be used to gather the essential information at this stage to identify worksites with rescue opportunities. The following methods of carrying out the assessment by UA may be utilised (of course, some of the methods may not suit every

structure):

- Circumnavigate with the camera facing into the structure and with the camera angle set to capturing the whole structure itself and the surrounding area. This will give an overall picture of the structure and the area or buildings adjacent to it
- Assess from directly above the structure as a whole and zoom in on any areas of interest

- Position the UA facing each side of the structure, where possible, and assess on all floor levels zooming in on any areas of interest
- Video and photographs to be taken at each stage.

SITUATIONAL AWARENESS & INCIDENT MONITORING

The most common use for a UA is situational awareness which will give the incident management team an overall picture of the incident, the ability to monitor progress of operations and assess or monitor high risk areas or operations. When used for monitoring the progress of operations or for high-risk areas/operations, the UA Pilot must coordinate with on scene key personnel to ensure that the flights are coordinated with periods within operations where the higher risk activities may be taking place. As flight time is limited, to observe a scene with little activity may waste flight time when needed.

When monitoring high risk activities such as a rope rescue, it is preferable for the Sensor Operator to be a team member that has a comprehensive knowledge on the subject so that they can anticipate what should be happening and will be able to highlight problem areas or conditions that may require action.

STRUCTURAL ASSESSMENT & MONITORING

The UA may be used as a 'stand-off' method of either carrying out a structural assessment or for structural monitoring.

STRUCTURAL ASSESSMENT

- If possible, a Dangerous Structures Engineer (DSE) or other suitable qualified and experienced person should be utilised as the sensor operator
- Identify the type of building/structure and method of construction
- Assess the likelihood of collapse
- Consider the structural integrity of the building and the effect of heat and weight from firefighting media
- Look for signs of collapse, which may include:
 - o Cracks in walls
 - o Sagging floors or floors deflecting from wall
 - o Displaced columns
 - o Dropping arches
 - o Bulging walls
 - o Buckling columns or beams.
- Identify suitable locations for use of structural monitoring devices and shoring.

STRUCTURAL MONITORING

The UA may be able to be utilised to either zoom in, or fly close to previously fixed Tell-Tale type structural monitoring devices to ascertain any movement. This negates sending in a person to do this thus reducing the risk. In addition, the UA may be able to identify any further movement on parts of the structure that have been previously marked to ascertain any movement (e.g. as in the below image monitoring shear on a marked location).

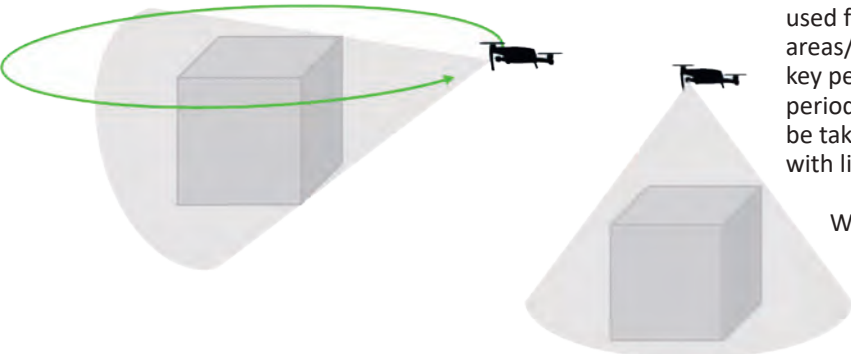
SEARCH

Search with a UA can be difficult, complex and has many variables such as environmental conditions, the weather, the type of structures/ground and the experience of the Pilot. There is no substitute for training and maintaining a standardised, structured approach for each type of flight, search method or search pattern. The following principles are common to all UA search methodologies:

- Large search areas should be broken down into smaller areas taking into account line of sight restrictions, battery duration and weather conditions
- The search should always commence prior to the search start point or should overlap the search limits of a search segment or of the whole search area
- The height, speed and camera angle may differ for each search
- For any search with the UA, or the camera in motion, either should be held static from time to time as any movement from the casualty may be the only thing that gives its position away
- A search, with the camera facing forwards, is likely to have areas obscured from the field of view. A search should be carried out from the opposite/another direction to cover as much ground as possible
- The distance between search sweeps depends on the ground/structure conditions. The spacing may need to be adjusted accordingly depending on the complexity of the collapse and the nature of the debris. The distance between search sweeps may need to be closer over particularly broken or complicated areas or further apart over sparse areas.

The Pilot will have to establish at what height the UA will fly at, at what speed and at what camera angle. This will be determined by:

- Safety
- Type of assessment or search
- What is being searched for and size etc.
- The weather/environment
- The nature of ground/debris/structure.



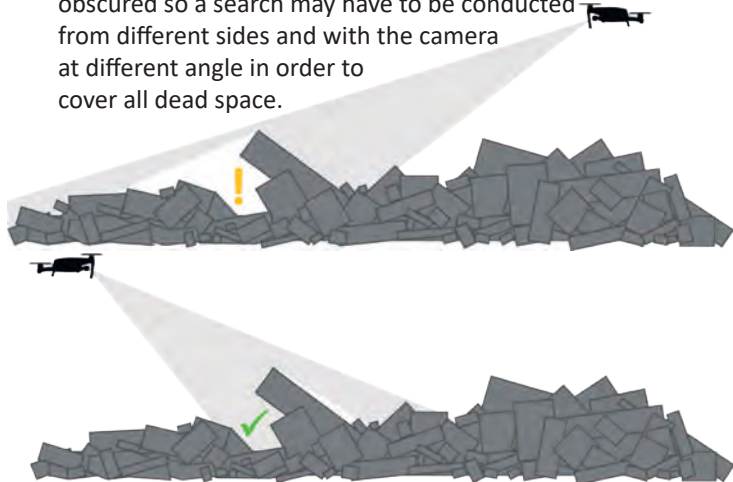
RUBBLE PILE/COLLAPSE SEARCH

The following principles are common to searching a collapse/rubble pile:

When searching a collapsed structure/rubble pile, the outer/lower edge must be searched as part of the search. The UA should be positioned as low as possible with the camera facing forward, as if it is positioned directly above or even at an oblique angle, the casualty or clues can easily be missed.



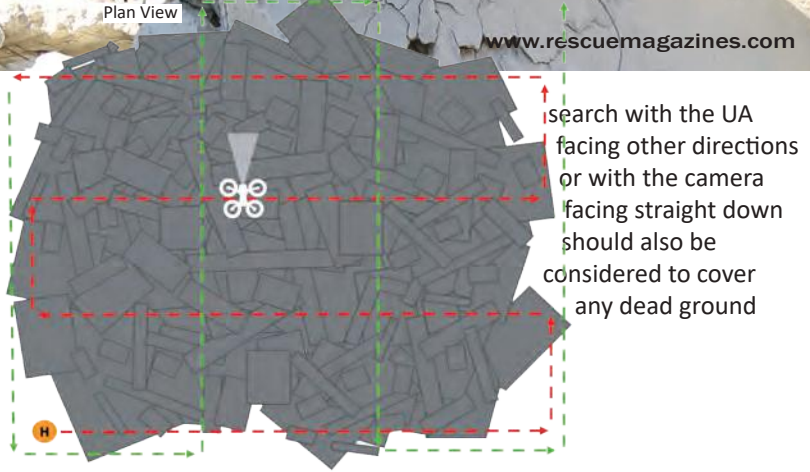
Similar to the previous regarding the angle of the camera and the nature of the debris, areas will frequently be obscured so a search may have to be conducted from different sides and with the camera at different angle in order to cover all dead space.



RAPID GRID SEARCH

If a rapid search of an area (rubble pile) is required, there are various options depending on the type and size of the area requiring search. A principle of a rapid search is that the track flown to search is a grid comprising of a number of squares that makes up the whole search area.

- The search is conducted with the UA always facing forwards
- The search will commence from behind the start point (as previously described) and should overlap the search limits
- From the corner of the search area, the UA is flown sideways until the search limit passed (first direction of search denoted by red line)
- The UA is then moved forward ensuring that an overlap of field of view is made
- The UA is then moved in the opposite direction until the UA reaches the other search limit and so on
- A repeat search should be carried out but with the search pattern at right angles to the previous (green line). A



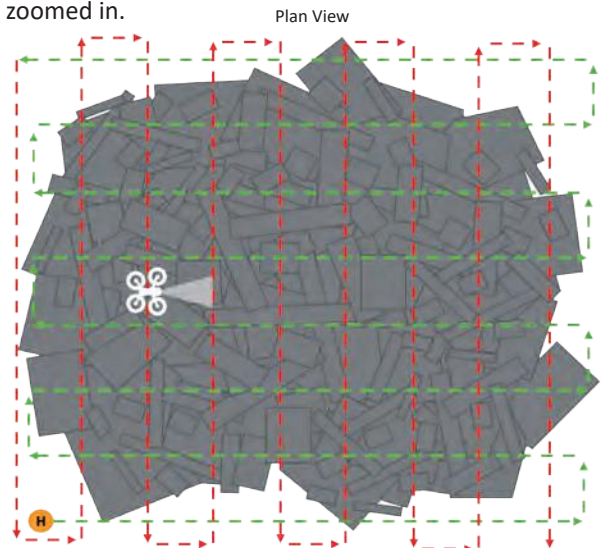
search with the UA facing other directions or with the camera facing straight down should also be considered to cover any dead ground

EFFICIENT GRID SEARCH

Conducted in the same way as the Rapid Grid Search but when searching in much more detail.

- A Rapid Grid Search should be considered in the first instance to quickly check the area for obvious signs of any casualties
- The search is conducted with the UA always facing forwards
- The search will commence from behind the start point and should overlap the search limits
- From the corner of the search area, the UA is flown sideways until the search limit passed (first direction of search denoted by red line)
- The UA is then moved forward ensuring that an overlap of field of view is made
- It is then moved in the opposite direction until it reaches the other search limit and so on
- A repeat search should be carried out but with the search pattern at right angles to the previous (green line). A search with the UA facing other directions or with the camera facing straight down should also be considered to cover any dead ground

Because this search is probably in use because no obvious signs of any casualties were located in the Rapid Grid Search, either the UA will be at a lower height or the camera will be zoomed in.



NEXT TIME: DRONES for USAR part 2: Internal Search

Obelisk

for Technical Rescue teams



Designed and manufactured by Lyon Equipment specifically for emergency service work. Adjustable width cross-head with max height of 2200mm for a large, clear working area below the anchor points.

LYON
WORK & RESCUE



SELF EXTRICATION

RAPID REMOVAL VS SPACE-MAKING

by Rich Denham & Nick Appleton



TRm Extrication Editors:

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

Self-extrication

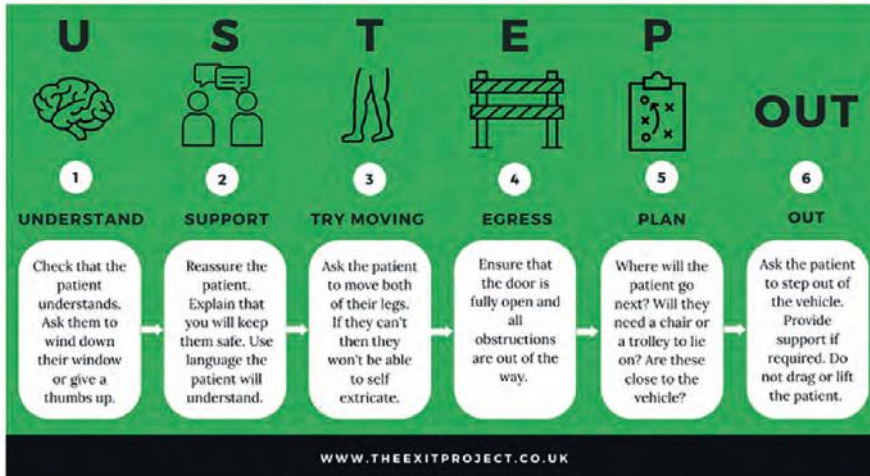
U-STEP OUT. A HOW-TO GUIDE



INTRODUCTION

Resist the urge to deploy those hydraulic tools. This article is all about patient self-extrication following-on from *Evidence Based Extrication* in the last issue (TR82), which reviewed original research recently published by a team led by Dr Tim Nutbeam and Rob Fenwick, under the umbrella of the EXIT (Extrication in Trauma) Project (pic left).

For context, the main conclusion of this research, taken as a whole, is that rescuers should reduce extrication times by recognizing that the absolute (spinal) movement minimization approach, which evolved due to a concern that excess movement may lead to avoidable secondary spinal injury, was never actually justified. Further that this approach should instead be replaced – where it is in accordance with your



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rescue organization’s clinical governance – with:

- an emphasis on rapid self or assisted extrication
- and where this is not initially possible, the timely creation of minimum safe space through which the trapped person can subsequently self-extricate (or be extricated by rescuers focussing on the minimization of time rather than movement)

PROCESS

With regard to rapid self or assisted extrication, the EXIT Project’s highly functional U STEP OUT protocol is detailed opposite , and this is subsequently expanded on with example photos and commentary:



U- UNDERSTAND

While rescuer protection is paramount, if it is safe to do so a rescuer should raise their visor and lower any mask, thus facilitating effective communication with the patient, allowing verification of whether they are fully responsive and that they demonstrably understand their circumstance.



S- SUPPORT

Many patients who are capable of self-extrication will do so immediately after the collision. If they are capable but have chosen not to do this, then they will likely require a rescuer’s reassurance that they will be safe if they do so. The patient should agree to the plan and rescuers must be aware that they may change this preference and if so, be able to manage this.



T- TRYMOVING

Ask the patient to move both their legs, if they cant they wont be able to self extricate



E- EGRESS

The door must be fully opened and also consider the need to force it away from this patient if this will assist safe movement. Both the exit space and the identified egress path must be clear of all trip hazards and obstructions.



P- PLAN

Determine where will the patient go on exit and ensure that a suitable means of support is available and nearby.



OUT

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

SUPPORTING INFORMATION

The historic approach to patients and extrication with a focus on absolute movement minimisation had no evidence base and possibly contributed to patient harm. Instead, a “gentle patient handling” approach should be adopted. This allows patients to move, within their own limits, and where appropriate this movement can be gently facilitated. There is no need to hold or support patient’s head if they are fully conscious. Furthermore a summary of relevant findings from the reports reviewed in TR82, clearly shows that self or minimally assisted extrication:

- is the extrication type which takes the least time by far, typically less than two minutes
- is favoured by patients
- leads to the smallest amount of spinal movement
- consumes the least operational resources
-

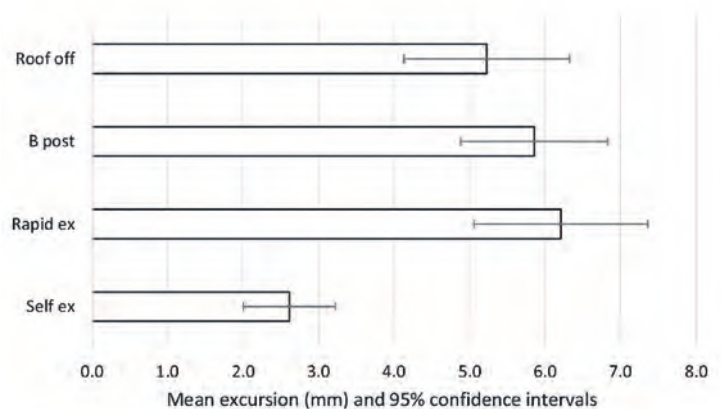
It should therefore be considered as the standard first extrication option for all patients who do not have contraindications, which would include:

- An inability to understand or follow instructions
- Injuries or baseline function issues that prevent standing, including unstable pelvic fracture, impalement and bilateral leg fracture

It is worth noting that the patient movements during various extrications were extensively studied by the EXIT Project, and the three rescuer-delivered extrication options listed in the following graph, all created significantly greater movement than self-extrication.

Note in the following graph:

‘Roof Off’ - A, B and C posts and the roof removed facilitating an upwards inclined and rearwards extrication.



‘B post’ - the B-post, driver’s and driver’s side rear door are removed to facilitate patient access and diagonal horizontal extrication

‘Rapid ex’ - the driver’s door is opened and the casualty is extricated laterally and horizontally.

For clarity, whilst absolute movement minimization is not a requirement, generally reducing patient movement is best practice, and as can be seen above, self-extrication consistently produces the least spinal movement.

As all other extrication techniques share a similar level of movement to each other, then if rescuer extrication is necessary, selection of the most rapid technique - appropriate to the situation - should be made to facilitate timely removal of the patient from the car.

Note that if a patient is physically trapped, removal of the entrapment (e.g. a dash roll to relieve compression of the legs) - followed by assisted self-extrication - may offer a safe, timely and viable option.

Finally it is important that from the outset the rescuer allocated to support the patient explains to them what is going on and their method of extrication, listens to and manages their concerns and then offers verbal guidance and emotional and physical support as they leave the vehicle.

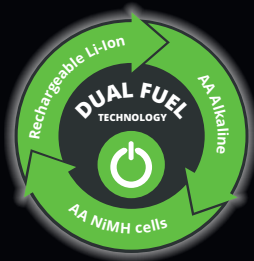
CONCLUSION

The selection of self or minimally assisted extrication will depend on the joint decision of the lead rescuers as to whether this option best suits their patient’s medical circumstances and needs.

The simple **U STEP OUT** protocol can be easily understood and used by all rescuers and where it’s use is appropriate, it will minimize patient entrapment time and consequently help ensure their earliest arrival at definitive medical care.



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

DEDICATED

**'HYDRAULIC'
BATTERY
TOOLS pt3**

SPREADERS

CORRECTION from part 1: *Weber are listed as German, which is correct but the rescue division should more accurately be listed as Austrian. Weber also asked us to point out that their Smart-Force series and the new GENESIS-RESCUE SLI series have underwater capability with the addition of a cover to their Milwaukee batteries, so this would also be relevant to their Smart-Force Combi Tools in part 1 and Cutters in part 2. Our new BUYERS GUIDE to USAR/Extrication Equipment has all of these Market Guides updating continually on the same link - available Free-to-All via our website from Spring 2024*

DEDICATED BATTERY SPREADERS

An image so good, we used it twice - you may remember this *Lukas SP 555 eWXT* spreader from the front cover of issue 76 and this time around it is again highlighting a very key feature of some battery tools - the ability to operate in and even under water. See issues 81 & 82 for detailed discussion of batteries and backpacks. These next two intro paragraphs are mostly straight out of the last issue with the word 'spreader' instead of 'cutter'.

Part one of this series (in issue 81) was on combination tools and those are all spreaders as well as cutters so you should also refer to that selection of battery tools in considering what you need of your spreader and whether the versatility of the combi-tool is more advantageous than the always greater spreading performance of a dedicated tool. If you include the 50 combi-tools in your shopping list of potential spreading tools you have around 98 models to choose from. These are all direct-connect battery systems. Although we have previously mentioned *Libervit's* batteries and underwater prowess, their tools have not been included because they are regular hose-fed hydraulics that operate from a battery driven pump and there are a number of others similar systems. Bear in mind that most hose-fed hydraulic tools can be run from hoses to a battery-powered hydraulic pump but that's a whole different GUIDE!

We included a detailed background to battery tool systems in part one so we won't duplicate too much of that here but we have provided a little more information in some columns so some headers will differ from the first part. We have also altered the layout to vertical (columns) rather than horizontal (rows) because there are far too many force and distance measurements for spreaders that make reading the data even more difficult and cluttered than in this column format. Our **BUYERSGUIDE** to **USAR/EXTRICATION EQUIPMENT** includes completely updated guides on all of these tools and those table too have been re-orientated to this column format.

'JAW' DESIGN

Hurst coined the term '*Jaws-of-Life*' with their original extrication tools and made it into a generic term for all such tools in the US and Canada but most electro-hydraulic rescue tools are manufactured in Europe where the term '*Jaws-of-Life*' is not used. Nevertheless, 'Jaws' is as appropriate a name as any to describe the gaping chasm created by an open set of spreaders. Some of the larger models in this Guide are almost a metre/3+feet wide at full width but the trade-off is that this will be the weakest point at which you could load a spreader either pulling or spreading apart. As with cutters, the strongest a spreader ever gets is with a lift or pull-point closer to the fulcrum or jaws-union pivot pin. In terms of pulling this is rarely possible as most have a dedicated pin hole for attaching pulling chains up near the tip as can be seen in the *Lukas* models on these pages but some, like the *Weber* model on the right, have additional holes that can be press-ganged into use for pulling at the stronger mid-points. However, you will need to check the individual tool's capability because such holes are

One of the three market leaders to fully embrace underwater and smart/diagnostics capabilities is *Holmatro's Pentheon* series



Lukas E3 (EXXT & E3 Connect) tools can operate in and under water even in salt water with their special saltwater battery.



Weber Smart Force 50 can also operate in and under water with the addition of an IP68 battery cover.





IMAGES NOT TO SCALE

often a weight-saving cut-out rather than an element designed for loading.

The holes engineered into most spreader jaws are for attachment of pulling chains but where the tips are detachable like the *Holmatro Pentheon* above and the *Amkus* below, the pin-attachment point for the tips may also be the chain-set attachment point and this would be preferable because A) the hole is usually a larger (stronger) bore than higher up because it has more material to work with like the *Amkus* below and B) more often than not, it is lower down the jaw and therefore provides greater pulling force.

Whether the tips are detachable or fixed they will first and foremost be adorned with a gripping surface on the inside and the outside so that the jaws can get a solid purchase on the material being spread or squeezed/crushed. There was a time when the only game in town was simple ridges like a set of pliers but this has evolved into more complex forward and rear-facing ridges and 'dog-tooth' grips like the *Holmatro* tip top-right. In engineering terms, having removable tips can create a weak point compared to a single-piece construction but removable tips enable you to replace damaged components and to use either an alternate design or future enhanced designs. Most of the tips in this GUIDE are regular spreading/squeezing tips, albeit in a range of different grip configurations but there are dedicated door-opening tips, bevelled and angled for forced entry into building in our pt5 GUIDE to SPECIAL TOOLS.

ROTATE HEAD and/or HANDLE

There are broadly two types of forward positioning handles on these tools - Fixed or rotating. Fixed handles may provide a full 360° wrap like the *Holmatro* model above or *Lukas* models or it may give about 270° of access (top and sides) like the *TNT Surge2* model above. Rotating handles like *Weber's* decrease the bulk of the tool with a much smaller handle profile but the price you pay is that this needs to be unlocked in order to reposition and use the tool in a



different orientation. As it happens, the vast majority of most spreading actions take place within the top and side orientation (270°). In our tables, we have not differentiated between fixed and rotating handles, only that they allow either 360 or 270° positioning - you only have to look at most images to figure out it is a fixed frame

LED LIGHTS

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

SIZE STILL MATTERS

Unlike dedicated cutters, combi-tools and to some extent rams, spreaders cannot physically get much smaller, at least not in the head/jaws unless they invent some form of telescopic jaw. If you want to spread the maximum distance you will need the longest jaws. Consequently, the largest tools are around a metre/3.28ft long and set to stay that way for a while yet.

NOISE

Covered in the previous parts of this series but worth reiterating that electric tools are silent when not in use so there is no tick-over noise as you get with a petrol engine tool or a generator driven, hose-fed hydraulic system. But there is still noise when the tool is doing its work and this can vary from a hum to a high pitched whirr that gets louder as the tool works harder. So they are not 'silent' but certainly far less noise pollution than a traditional petrol engine/generator-based system.



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WiFi & DIAGNOSTICS

Most modern tool batteries already show charge status - usually with a line of green LEDs but many do much more.

Some like *Holmatro* have a hard-wired diagnostics capability where the tool is linked to a laptop to assess work hours, maintenance and performance. This can be done in the field but is generally a post-incident task undertaken back on-station. Others use a mobile or WiFi app to connect remotely to a 'Smart' phone, device or wrist-monitor. *Weber's* range of *E-Force* models has a *Smart-Force* variant which uses app-management. *Lukas/Hurst E-Connect*

variants have mobile connectivity that allows their tools to be monitored for status, performance and inventory but they have also taken things a step further with an integrated dashboard on the handle to give real time information and the French *Libervit* has a wrist-mounted screen for tool monitoring but isn't included here because they don't use stand-alone batteries.

CHINESE & RUSSIAN TOOLS

As at 2024 Russia has become a North Korea style pariah state so we don't have to consider Russian tools yet even if they were good enough to include. China, however,

continues to vex. They produce quality products for big name companies around the world but there are two problems associated with including their products in our GUIDES. The first is their propensity for copyright infringement via blatant copying of design and imagery, as an example, we have included *Aolai Rescue* because their battery tools are their own



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



BAT
R

Cutting
Replaceable tips for
lifting of load

badged products but they have other rescue products that may be very good but are clearly copied from market leading models, in one case, their Paratech looking



DEDICATED BATTERY SPREADERS

struts even have dark green and yellow livery. If they could only shy away from this continual plagiarism of well known products and concentrate on their own considerable design skills the world would be a fairer and happier place!

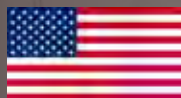
WEBERRESCUE

BATTERY DRIVEN COMBI TOOL FOR RAPID INTERVENTION TEAMS

ing, spreading, pressing and pulling with one device. r breaking doors and windows, cutting round steel and chains, oads, pulling obstacles or opening vehicles (extrication).



Weber Rescue UK
Essex CO9 2EX
rescue@weberuk.com



Genesis RESCUE SYSTEMS
Kettering, OH 45429
https://genesisrescue.com

www.weber-rescue.com



Discover more!

IN THE FOLLOWING TABLES.....

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

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

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

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

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

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

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

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

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

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

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

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

BATTERY DURATION & RECHARGE TIME: Work-time or duration is much trickier as it depends on the resistance of the material being cut/spread/squeezed, the temperature, the age of the battery and even how meticulously you follow the recharge guidelines. Consequently some won't quote a figure at all and others are generous to say the least - consider most to be the absolute maximum with minimal workload. Tools last much longer carrying out hundreds of short duration cuts like the *Genesis* figure of <45mins compared to a few really long and hard cuts like *Holmatro's* minimum 11minute figure in like-for-like cutting/spreading their battery will match the highest time given by others cutting smaller and lighter materials. Recharge time can be more specific though it varies wildly between basic and high speed chargers. The time shown is for the charger supplied or preferred by the manufacturer and may give a time-range if referring to different types of charger.

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

MAX SPREAD FORCE: Is the maximum *theoretical* force possible but only near the fulcrum not the tops at the opposite end. The closer the tips you start the spread/lift the lower the available force. This is not quoted by all because the EN and/or NFPA classifications cover this more accurately. Indeed, one or two manufacturers like *Weber-Rescue* flat-out refuse to quote it because they feel it is a misleading figure which is a fair point. Some of the max figures quoted may therefore be the same as the upper range limit but *in theory only* they could lift/spread a much higher amount. Our figures are in kN (KiloNewtons) and **US (Short) Tons**. There are 1.10 US short tons to a UK/metric ton (or more accurately tonne).

MAX PULL FORCE & DISTANCE: Holes near the ends of the jaws can have a chain fitted - one to an anchor and one to the item to be pulled. As the jaws are closed a pull force is exerted and the object can be moved. This used to be common with a dash-roll or displacement but not so much these days. Due to leverage forces, the longer the jaw the lower the pull force.

SPREAD DISTANCE: The maximum distance the jaws will open but don't forget that the closest to the tips provides the least power.

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

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

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

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

LUKAS




















DISCOVER THE NEXT DIMENSION

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Images Not to Scale						
MODEL	ION iS320	ION iS290	ESP-650	GYKZD-46~97/740	DE625N	
SERIES	Compact		GYKZD-A			
VOLTAGE	54/60v	54/60v	28v	28v	54/60v	
COMPANY	AMKUS	AMKUS	AOLAI RESCUE	AOLAI RESCUE	EDILGRAPPA	
TOOLS IN RANGE						
COST inc tax / VAT	N/A	N/A	\$4500 per 2 tools FOB	N/A	N/A	
WEIGHT IN HAND inc BATTERY(IES) & TIPS	25.8kg 56.9lb	22.5kg 49.6lb	24.5kg 54lb	26kg 57.2lb	22.7kg 50lb	
WEIGHT DEFAULT BATTERY	1.2kg 2.6 lb	1.2kg 2.6 lb	0.9kg 2 lb	0.9kg 2 lb	1.2kg 2.6 lb	
BATTERY Ah OPTIONS	DeWalt FlexVolt 6Ah 9, 12Ah	DeWalt FlexVolt 6Ah 9, 12Ah	5Ah	5Ah	DeWalt FlexVolt 9Ah	
BATTERY DURATION RECHARGE TIME	10-15mins 60mins	10-15mins 60mins	45-60mins 90mins	45-60mins 90mins	10-25mins 85mins	
LENGTH	968mm 38.1"	889mm 35"	905mm 35.6"	1194mm 47"	787mm 30.9"	
WIDTH	282mm 11.1"	246mm 9.7"	350mm 13.77"	320mm 12.6"	282mm 11.1"	
DEPTH	294mm 11.6"	287mm 11.3"	279mm 10.9"	265mm 10.4"	244mm 9.6"	
EN  CLASSIFICATION	-	-			 AS45/625-19	
EN SPREAD FORCE RANGE t=US Ton	-	-	47-124kN 5.7-13.9 Ust	52-562kN 5.8-63 Ust	<131kN 14.7 Ust	
NFPA  FORCE RANGE t=US Ton (at/near tips)	46.9-67.2kN  5.3-7.5 USt	27.5-43.7kN  3-4.6 USt	-	-	32.9-60.6kN  3.6-6.8 USt	
MAX SPREAD FORCE (Theoretical) t=US ton	175.7kN 19.7 Ust	43.7kN 4.4 Ust	-	-	174kN 19.5 Ust	
SPREAD DISTANCE	810mm 31.9"*	940mm 37"*	650mm 25.6"	820mm 32.2"	625mm 24.6"	
PULL FORCE RANGE/MAX (THEORETICAL MAX) t=US ton	33.7-51.1kN 3.8-5.7 Ust	17.9-28.9kN 2-3.2 Ust	(68)kN (7.6) Ust	(73)kN (8.2) Ust	(<46)kN (<5.2) Ust	
MAX PULL DISTANCE	approx 675mm 26.5"	approx 785mm 31"	520mm 20.5"	716mm 28"	482.5mm 19"	
MAX SQUEEZE FORCE t=US ton	N/A	N/A	69kN 7.7 USt	140kN 15.8 USt	69kN 7.7 USt	
WORKING PRESSURE (HYDRAULIC)	700 Bar 10.2K psi	700 Bar 10.2K psi	720 Bar 10.4K psi	720 Bar 10.4K psi	700 Bar 10.2K psi	
REMOVABLE DOOR OPENING TIPS		-	-	-	-	
ROTATE HEAD/HANDLE	- 360°	- 360°	- -	- -	- 270°	
LED LIGHTS	-	-	2	2	-	
WiFi DIAGNOSTICS	-	-	-	-	-	
IN-WATER USE BATTERY/TOOL IP	54 54	54 54	54 54	54 54	54 54	
NOTES	*39.1" with ERT Extended Reach Tips	*37" with ERT Extended Reach Tips. Replaced is281	Cutting tips option and pulling chains	Cutting tips option and pulling chains		
WEBSITE	amkus.com	amkus.com	aolairescue.com	aolairescue.com	edilgrappa.com	

KEY: **COST:** Approx, **INCLUDES** local tax/VAT **OTHER TOOLS IN RANGE:**  = Combi  = Cutter  = Ram  = Special Tools















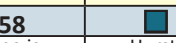
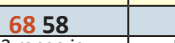
					
S44 SL3 E-Force 28v	S49 SL3 E-Force 28v	S54 SL3 E-Force 28v	S44 SLi E-Force 18v	S49 SLi E-Force 18v	S54 SLi E-Force 18v
GENESIS RESCUE	GENESIS RESCUE	GENESIS RESCUE	GENESIS RESCUE	GENESIS RESCUE	GENESIS RESCUE
					
N/A	N/A	N/A	N/A	N/A	N/A
17.3kg 38lb	20.7kg 45.5lb	20.9kg 45.5lb	18.2kg 40lb	21.6kg 47.5lb	21.8kg 48lb
1.4kg/1kg 3.2lb/2.3lb	1.4kg/1kg 3.2lb/2.3lb	1.4kg/1kg 3.2lb/2.3lb	1.1kg 2.33lb	1.1kg 2.33lb	1.1kg 2.33lb
Genesis/ Milwaukee 5Ah*	Genesis/ Milwaukee 5Ah*	Genesis/ Milwaukee 5Ah*	Milwaukee M18 8Ah/12Ah	Milwaukee M18 8Ah/12Ah	Milwaukee M18 8Ah/12Ah
<45mins 90mins	<45mins 90mins	<45mins 90mins	60/90mins 45-83mins	60/90mins 45-83mins	60/90mins 45-83mins
877mm 34.5"	982mm 38.7"	1015mm 40"	893mm 35.2"	999mm 39.30"	1032mm 40.6"
239mm 9.4"	282mm 11.1"	282mm 11.1"	239mm 9.4"	282mm 11.1"	282mm 11.1"
241mm 9.5"	241mm 9.5"	241mm 9.5"	228mm 9.5"	228mm 9.5"	228mm 9.5"
-	-	-	■ AS44/610-18.2	■ AS55/735-20.7	■ BS50/805-21.8
-	-	-	44-857kN 5-96.3 Ust	50-501kN 5.6-56.3 Ust	50-501kN 5.6-56.3 Ust
41-52kN ■ 4.6-5.8 Ust	51-76kN ■ 5.7-8.5 Ust	46-68kN ■ 5.2-7.6 Ust	-	-	-
-	-	-	-	-	-
610mm 24"	735mm 28.9"	805mm 31.7"	610mm 24"	735mm 28.9"	805mm 31.7"
21-42kN 2.36-4.7 Ust	30-54kN 3.4-6 Ust	26-52kN 2.9-5.8 Ust	68kN 7.6 Ust	70kN 7.9 Ust	67kN 7.5 Ust
388mm 15.3"	558mm 22"	618mm 24.3"	465mm 18.3"	620mm 24.4"	680mm 26.80"
149kN 16.9 Ust	144kN 16.2 Ust	144kN 16.2 Ust	149kN 16.9 Ust	144kN 16.2 Ust	144kN 16.2 Ust
700 Bar 10.2K psi	700 Bar 10.2K psi	700 Bar 10.2K psi	700 Bar 10.2K psi	700 Bar 10.2K psi	700 Bar 10.2K psi
■	■	■	■	■ ■	■ ■
- 360°	- 360°	- 360°	- 360°	- 360°	- 360°
4	4	4	4	4	4
-	-	-	- -	- -	- -
54 54	54 54	54 54	■ 54/68* 68	■ 54/68* 68	■ 54/68* 68
*15Ah powerpack also available	*15Ah powerpack also available	*15Ah powerpack also available	All E-Force tools can convert to hose. * IP68 with waterproof cover	All E-Force tools can convert to hose. * IP68 with waterproof cover	All E-Force tools can convert to hose. * IP68 with waterproof cover
genesisrescue.com	genesisrescue.com	genesisrescue.com	genesisrescue.com	genesisrescue.com	genesisrescue.com

BATTERY
DIMENSIONS
SPREAD
PULL
FEATURES

(T) = Theoretical FEATURES: ● = PARTIAL FEATURE ■ = Option N/A = info Not Available/not given











Images Not to Scale						
MODEL	PSP60	PSP50	PSP40	PSP40CL	SP 333	
SERIES	PENTHEON	PENTHEON	PENTHEON	PENTHEON	E2	
VOLTAGE	28v	28v	28v	28v	25.2v	
COMPANY	HOLMATRO	HOLMATRO	HOLMATRO	HOLMATRO	HURST (IDEX)	
TOOLS IN RANGE						
COST inc tax / VAT	N/A	N/A	N/A	N/A	N/A	
WEIGHT IN HAND inc BATTERY(IES) & TIPS	25kg 55.1lb	21kg 46.3lb	19.4kg 42.8lb	15.2kg 33.5lb	17.3kg 38.1lb	
WEIGHT DEFAULT BATTERY	1.5kg 3.3lb	1.5kg 3.3lb	1.5kg 3.3lb	1.5kg 3.3lb	1kg 2.1lb	
BATTERY Ah OPTIONS	Holmatro PBPA287 7Ah	Holmatro PBPA287 7Ah	Holmatro PBPA287 7Ah	Holmatro PBPA287 7Ah	Hurst 5Ah	
BATTERY DURATION RECHARGE TIME	>11mins 60mins	>11mins 60mins	>11mins 60mins	>11mins 60mins	30-60mins 90mins	
LENGTH	1052mm 41.4"	964mm 38"	956mm 37.6"	811mm 31.9"	905mm 35.6"	
WIDTH	319mm 12.6"	272mm 10.7"	270mm 10.6"	270mm 10.6"	256mm 10.1"	
DEPTH	274mm 10.8"	272mm 10.7"	276mm 10.9"	276mm 10.9"	253mm 9.96"	
EN CLASSIFICATION	■ BS62/820-25	■ AS54/725-21	■ AS43/725-19.4	-	-	
EN SPREAD FORCE RANGE t=US Ton	62-522kN 6.9-58.6 Ust	54-366kN 6.06-41.1 Ust	43-280kN 4.8-31.5 Ust	43-131kN 4.83-14.7 Ust	-	
NFPA FORCE RANGE t=US Ton (at/near tips)	60-112kN ■ 6.7-12.6 Ust	50-93kN ■ 5.6-10.5 Ust	39.1-69.2kN ■ 4.4-7.8 Ust	39-53kN ■ 4.4-6 Ust	39-63kN ■ 4.4-7.1 Ust	
MAX SPREAD FORCE (Theoretical) t=US ton	875kN 98 Ust	875kN 98.3 Ust	875kN 98.4 Ust	875kN 98.32 Ust	836kN 94 Ust	
SPREAD DISTANCE	820mm 32.3"	725mm 28.5"	725mm 28.5"	510mm 20.1"	600mm 23.6"	
PULL FORCE RANGE/MAX (THEORETICAL MAX) t=US ton	79kN 8.8 Ust	67kN 7.53 Ust	51.7kN 5.8 Ust	48kN 5.4 Ust	23-43 (56) 2.6-4.8 (6.3) Ust	
MAX PULL DISTANCE	700mm 27.6"	610mm 24"	613mm 24.1"	393mm 15.5"	440mm 17.3"	
MAX SQUEEZE FORCE t=US ton	127kN 14.2 Ust	135kN 15.17 Ust	59kN 6.6 Ust	47kN 5.28 Ust	144kN 16.2 Ust	
WORKING PRESSURE (HYDRAULIC)	720 Bar 10.4K psi	720 Bar 10.4K psi	720 Bar 10.4K psi	720 Bar 10.4K psi	700 Bar 10.1K psi	
REMOVABLE DOOR OPENING TIPS	■	■	■	■	■	
ROTATE HEAD/HANDLE	- 360°	- 360°	- 360°	- 360°	- 360°	
LED LIGHTS	6	6	6	6	2	
WiFi DIAGNOSTICS	■	■	■	■	-	
IN-WATER USE BATTERY/TOOL IP	■ 67 57	■ 67 57	■ 67 57	■ 67 57	■ 54 54	
NOTES	Extreme grip spreader tips. On-tool charging. Stepless speed maximisation	Extreme grip spreader tips. On-tool charging. Stepless speed maximisation	Extreme grip spreader tips. On-tool charging. Stepless speed maximisation	Extreme grip spreader tips. On-tool charging. Stepless speed maximisation		
WEBSITE	holmatro.com	holmatro.com	holmatro.com	holmatro.com	jawsoflife.com	

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


























					
SP 555 E2	SP 777 E2	SP 333 E3/E3connect	SP 555 E3/E3connect	SP 777 E3/E3connect	M40-Mammoth E3/E3connect
25.2v	25.2v	25.2v	25.2v	25.2v	25.2v
HURST (IDEX)	HURST (IDEX)	HURST (IDEX)	HURST (IDEX)	HURST (IDEX)	HURST (IDEX)
					
N/A	N/A	N/A	N/A	N/A	N/A
20kg 44.1lb	23.6kg 52lb	17.1kg 37.7lb	19.9kg 43.9lb	23.4kg 51.6lb	24.9kg 54.9lb
1kg 2.1lb	1kg 2.1lb	1.4kg/1kg 3.2lb/2.3lb	1.4kg/1kg 3.2lb/2.3lb	1.6kg 3.5lb	1.6kg 3.5lb
Hurst 5Ah	Hurst 5Ah	Lukas 9Ah 5Ah	Lukas 9Ah 5Ah	Lukas 9Ah 5Ah	Lukas 9Ah 5Ah
30-60mins 90mins	30-60mins 90mins	<60mins 150-100mins	<60mins 150-100mins	<60mins 150-100mins	<60mins 150-100mins
1002mm 39.4"	1080mm 42.5"	823mm 32.4"	923mm 36.3"	997mm 39.3"	1106mm 43.6"
265mm 10.4"	309mm 12.2"	256mm 10.1"	265mm 10.4"	309mm 12.2"	309mm 12.1"
280mm 11"	285mm 11.2"	253mm 9.96"	253mm 9.96"	253mm 9.96"	253mm 9.96"
-	-	-	-	-	-
-	-	-	-	-	-
49-72kN ■ 5.5-8 Ust	59-85kN ■ 6.6-9.6 Ust	39-63kN ■ 4.4-7.1 Ust	49-72kN ■ 5.5-8 Ust	59-85kN ■ 6.6-9.6 Ust	45-72kN ■ 5-8.1 Ust
658kN 74 Ust	600kN 67.4 Ust	836kN 94 Ust	658kN 74 Ust	600kN 67.4 Ust	500kN 56.2 Ust
730mm 28.7"	813mm 32"	600mm 23.6"	730mm 28.7"	813mm 32"	1018mm 40.1"
28-46 (58) kN 3.2-5.2 (6.5) Ust	30-49 (60) kN 3.4-5.5 (6.7) Ust	23-43 (56) kN 2.6-4.8 (6.3) Ust	28-46 (58) kN 3.2-5.2 (6.5) Ust	30-49 (60) kN 3.4-5.5 (6.7) Ust	23-42 (50) kN 2.6-4.7 (5.6) Ust
569mm 22.4"	655mm 25.8"	440mm 17.3"	569mm 22.4"	655mm 25.8"	approx 848mm 33"
115kN 12.9 Ust	122kN 13.7 Ust	144kN 16.2 Ust	115kN 12.9 Ust	122kN 13.7 Ust	N/A
700 Bar 10.1K psi	700 Bar 10.1K psi	700 Bar 10.1K psi	700 Bar 10.1K psi	700 Bar 10.1K psi	700 Bar 10.1K psi
■	■	■	■	-	-
- 360°	- 360°	- 360°	- 360°	- 270°	- 360°
2	2	4	4	■	■
-	-	-	-	-	-
54 54	54 54	 68 58	 68 58	 68 58	 68 58
		Hurst E3 range is waterproof & can use EWXT IP68 battery. 5Ah battery reduces length by 20mm. 'Hero' graphics option	Hurst E3 range is waterproof & can use EWXT IP68 battery. 5Ah battery reduces length by 20mm. 'Hero' graphics option	Hurst E3 range is waterproof & can use EWXT IP68 battery. 5Ah battery reduces length by 20mm. 'Hero' graphics option	Hurst E3 range is waterproof & can use EWXT IP68 battery. 5Ah battery reduces length by 20mm. 'Hero' graphics option
jawsoflife.com	jawsoflife.com	jawsoflife.com	jawsoflife.com	jawsoflife.com	jawsoflife.com

BATTERY
DIMENSIONS
SPREAD
PULL
FEATURES

(T) = Theoretical **FEATURES:** ● = PARTIAL FEATURE  = Option N/A = info Not Available/not given

Images Not to Scale						
MODEL	SP 333	SP 555	SP 777	SP 333	SP 555	
SERIES	E2	E2	E2	E3/EWXT/E3connect	E3/EWXT/E3connect	
VOLTAGE	25.2v	25.2v	25.2v	25.2v	25.2v	
COMPANY	LUKAS (IDEX)	LUKAS (IDEX)	LUKAS (IDEX)	LUKAS (IDEX)	LUKAS (IDEX)	
TOOLS IN RANGE						
COST inc tax / VAT	N/A	N/A	N/A	N/A	N/A	
WEIGHT IN HAND inc BATTERY(IES) & TIPS	17.3kg 38.1lb	20kg 44.1lb	23.6kg 52lb	17.1kg 37.7lb	15.2kg 33.5lb	
WEIGHT DEFAULT BATTERY	1.2kg 2.7lb	1.2kg 2.7lb	1.2kg 2.7lb	1.4kg/1kg 3.2lb/2.3lb	1.6kg 3.5lb	
BATTERY Ah OPTIONS	Lukas 9Ah 5Ah	Lukas 9Ah 5Ah	Lukas 9Ah 5Ah	Lukas 9Ah 5Ah	Lukas 9Ah 5Ah	
BATTERY DURATION RECHARGE TIME	30-60mins 75-150mins	30-60mins 75-150mins	30-60mins 75-150mins	<60mins 150-100mins	<60mins 150-100mins	
DIMENSIONS LENGTH	905mm 35.6"	1002mm 39.4"	1080mm 42.5"	823mm 32.4"	1002mm 39.4"	
WIDTH	256mm 10.1"	265mm 10.4"	309mm 12.2"	256mm 10.1"	265mm 10.4"	
DEPTH	253mm 9.96"	280mm 11"	285mm 11.2"	253mm 9.96"	253mm 9.96"	
EN CLASSIFICATION	AS 42/600-18.3	AS 52/730-20.9	BS 63/813-24.5	AS 42/600-18.3	AC 52/730-21.1	
EN SPREAD FORCE RANGE t=US Ton	42-836kN 4.7-94 Ust	52-658kN 5.8-74 Ust	63-600kN 7.1-67.4 Ust	42-836kN 4.7-94 Ust	52-658kN 5.8-74 Ust	
NFPA FORCE RANGE t=US Ton (at/near tips)	-	-	-	-	-	
MAX SPREAD FORCE (Theoretical) t=US ton	836kN 94 Ust	658kN 74 Ust	600kN 67.4 Ust	836kN 94 Ust	658kN 74 Ust	
SPREAD DISTANCE	600mm 23.6"	730mm 28.7"	813mm 32"	600mm 23.6"	730mm 28.7"	
PULL PULL FORCE RANGE/MAX (THEORETICAL MAX) t=US ton	23-43 (56) kN 0 (0) Ust	28-46 (58) kN 3.2-5.2 (6.5) Ust	30-49 (60) kN 3.4-5.5 (6.7) Ust	23-43 (56) kN 2.6-4.8 (6.3) Ust	28-46 (58) kN 3.2-5.2 (6.5) Ust	
MAX PULL DISTANCE	440mm 17.3"	569mm 22.4"	655mm 25.8"	440mm 17.3"	569mm 22.4"	
MAX SQUEEZE FORCE t=US ton	144kN 5.7 Ust	115kN 12.9 Ust	122kN 13.7 Ust	144kN 16.2 Ust	115kN 12.9 Ust	
WORKING PRESSURE (HYDRAULIC)	700 Bar 10.1K psi	700 Bar 10.1K psi	700 Bar 10.1K psi	700 Bar 10.1K psi	700 Bar 10.1K psi	
FEATURES REMOVABLE DOOR OPENING TIPS	■	■	■	■	■	
ROTATE HEAD/HANDLE	- 360°	- 360°	- 360°	- 360°	- 360°	
LED LIGHTS	6	6	4	2	6	
WiFi DIAGNOSTICS	■	■	-	-	■	
IN-WATER USE BATTERY/TOOL IP	■ 68 58	■ 68 58	■ 54 54	■ 54 54	■ 57 57	
NOTES				All Can use EWXT IP68 battery which is standard on the EWXT range, EWXT does not have on board dashboard	All Can use EWXT IP68 battery which is standard on the EWXT range, EWXT does not have on board dashboard	
WEBSITE	lukas.com	lukas.com	lukas.com	lukas.com	lukas.com	

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






















						
	SP 777	RPS-505	HRS941/HRS-934	HRS931/HRS-934	P16 / S-1601	P-16X / S-1601X
	E3/EWXT/E3connect	E2	SpreaderHead	SpreaderHead	Legacy	X
	25.2v	18v	18v	18v	12v or 16v LIGHT	7.5/12v
	LUKAS (IDEX)	OGURA	OGURA	OGURA	POWERHAWK TECHNOLOGIES	POWERHAWK TECHNOLOGIES
						
						
	N/A	N/A	N/A	N/A	N/A	N/A
	23.4kg 51.5lb	14.2kg 31.3lb	4.2kg +5.4kg 9.3lb +11.9lb	3.9kg +5.4kg 8.6lb +11.9lb	22.3kg 49.3lb	19.5kg 43lb
	1.6kg 3.5lb	1-1.36kg 2.2-3lb	1-1.36kg 2.2-3lb	1-1.36kg 2.2-3lb	*4.5kg / 9.9lb 15.9kg / *35lb	1..36kg 3lb
	Lukas 9Ah 5Ah	Makita 5-6Ah*	Makita 5-6Ah*	Makita 5-6Ah*	Powerhawk 12.4Ah LIGHT 33Ah 12v	Powerhawk 7.5Ah or any 12v source
	<60mins 150-100mins	<12mins 55-120mins	<12mins 55-120mins	<12mins 55-120mins	>30 mins <120mins/<15hr	>30mins <120mins
	997mm 39.3"	600mm 23.6"	328mm +352mm 12.9" +13.9"	303mm +352mm 11.9" +13.9"	635mm 25"	635mm 25"
	309mm 12.2"	206mm 8.1"	111mm +121mm 4.4" +4.8"	111mm +121mm 4.4" +4.8"	254mm 10"	254mm 10"
	253mm 9.96"	101mm 7.1"	272mm +78mm 10.7" +3.1"	272mm +78mm 10.7" +3.1"	305mm 12"	279mm 11"
		-	-	-	-	-
	63-600kN 7.1-67.4 Ust	-	<39.3kN 4.4 Ust	<39.3kN 4.4 Ust	-	-
	-	-	-	-	35.6-48.9kN 4-5.4 Ust	31.6-52.5kN 3.5-5.9 Ust
	600kN 67.4 Ust	745kN 83 Ust	39.3kN 4.4 Ust	39.3kN 4.4 Ust	201.2kN 22.6 Ust	711.7kN 80 Ust
	813mm 32"	505mm 19.9"	158mm 6.2"	158mm 6.2"	356mm 14"	406.4mm 16"
	30-49 (60) kN 3.4-5.5 (6.7) Ust	N/A	-	-	N/A	N/A
	655mm 25.8"	N/A	-	-	approx 270mm 11"	approx 312mm 12.5"
	122kN 13.7 Ust	692.5kN 77.8 Ust	69kN 7.7 Ust	69kN 7.7 Ust	N/A	N/A
	700 Bar 10.1K psi	N/A	N/A	N/A	N/A	N/A
						
	- 360°	360° 360°	360° 270°	360° -	70° 270°	70° 270°
	6	-	-	-	-	-
						
	68 58	54 54	54 54	54 54	54 54	54 54
	All Can use EWXT IP68 battery which is standard on the EWXT range, EWXT does not have on board dashboard	*EU uses 5Ah, US tends to use 6Ah	Heads swap out in seconds. Cutter, Spreader etc. attach via short hose or direct to the powerhead. 941 = US market. All heads interchangeable between power units		Legacy only in support of existing purchases. Accepts all P-16X blades & can be retrofitted to become P-16X*Wt=battery+controller	interchangeable Cutter,spreader &combi heads. Both P16&P16X can use a 12v car battery or any 12v power source
	lukas.com	ogurarescuertools.com	ogurarescuertools.com	ogurarescuertools.com	powerhawk.com	powerhawk.com

BATTERY
DIMENSIONS
SPREAD
PULL
FEATURES

(T) = Theoretical FEATURES: ● = PARTIAL FEATURE ◻ ◻ ◻ = Option N/A = info Not Available/not given

Images Not to Scale						
BATTERY	MODEL	P-4X	X2	Spreader MS	ES100-32	ES100-28
	SERIES	EDD	EDD	GreenSpirit II	Storm Surge	Storm Surge
	VOLTAGE	43.2v	43.2v	18v/28v	18v/20v	18v/20v
	COMPANY	RESQTEC	RESQTEC	SCORPE	TNT RESCUE	TNT RESCUE
	TOOLS IN RANGE					
	COST inc tax / VAT	N/A	N/A	N/A	N/A	N/A
	WEIGHT IN HAND inc BATTERY(IES) & TIPS	20kg 44lb	20.5kg 45.2lb	18.1kg 39.8lb	23.9-23.5kg 51.8-52.6lb	23.31-22.9kg 51.4-50.55lb
	WEIGHT DEFAULT BATTERY	1kg 2.2lb	1kg 2.2lb	1kg 2.2lb	1.1kg / 2.4lb 0.6kg / 1.3lb	1.1kg / 2.4lb 0.6kg / 1.3lb
	BATTERY Ah OPTIONS	Resqtec 2.6Ah	Resqtec 2.6Ah	Milwaukee 8Ah M18 5Ah M28	Milwaukee M18 8/9Ah. Makita6Ah DeWalt FlexVolt20 9Ah	Milwaukee M18 8/9Ah. Makita 6Ah DeWalt FlexVolt20 9Ah
	BATTERY DURATION RECHARGE TIME	<45mins 60mins	<45mins 60mins	60/80mins 45-90mins	10-15mins 87 / 60mins	10-15mins 87 / 60mins
DIMENSIONS	LENGTH	711mm 28"	823mm 32.4"	912mm 36"	944.2mm 37.2"	884mm 34.8"
	WIDTH	271mm 10.7"	273mm 10.7"	250mm 9.8"	283mm 11.15"	283mm 11.15"
	DEPTH	274mm 10.8"	235mm 9.25"	222mm 8.7"	345.4mm 13.6"	345.4mm 13.6"
	EN CLASSIFICATION	-	AS38.4/607-20.5	AS44/610-18.1	-	-
SPREAD	EN SPREAD FORCE RANGE t=US Ton	-	38.4-83.2kN 4.3-9.3 Ust	44-857kN 5-96.3 Ust	-	-
	NFPA FORCE RANGE t=US Ton (at/near tips)	32.8-51kN 3.7-5.7 Ust	34.7-76.7kN 3.9-8.6 Ust	-	225-895kN 25.3-100.56 Ust	249-1014kN 27.98-113.93Ust
	MAX SPREAD FORCE (Theoretical) t=US ton	374kN 42 Ust	342kN 38.4 Ust	171kN 19.2 Ust	895kN 100.56 Ust	1014kN 113.93 Ust
	SPREAD DISTANCE	401mm 15.8"	607mm 23.9"	610mm 24"	700.1mm 27.5"	698.5mm 27.5"
PULL	PULL FORCE RANGE/MAX (THEORETICAL MAX) t=US ton	-	27.4-59.6kN 3.1-6.7 Ust	68kN 7.6 Ust	41.54kN 4.67 Ust	49.7kN 5.58 Ust
	MAX PULL DISTANCE	-	426mm 16.8"	465mm 18.3"	565.2mm 22.25"	463.5mm 18.25"
	MAX SQUEEZE FORCE t=US ton	36.3-57.7kN 4-6.48 Ust	66.3-120.9kN 7.4-13.4 Ust	149kN 16.9 Ust	N/A	N/A
FEATURES	WORKING PRESSURE (HYDRAULIC)	700 Bar 10.2K psi	720 Bar 10.4K psi	700 Bar 10.2K psi	722 Bar 10.5K psi	722 Bar 10.5K psi
	REMOVABLE DOOR OPENING TIPS	■	■	-	■	■
	ROTATE HEAD/HANDLE	61° 270°	- 360°	- 110°	--	--
	LED LIGHTS	□	6	4	4	4
	WiFi DIAGNOSTICS	--	■	--	--	--
	IN-WATER USE BATTERY/TOOL IP	54 54	■ 57 57	■ 54/68* 68	54 54	54 54
	NOTES	3x interchangeable heads/blades. Rear handle option. *Also 28Ah powerpack. Jaw recess (reach)= 118mm	Cutting tips option. Auto high-temp shut-off. Step less speed increase	Converter available for M28 & other batteries. * IP68 with M18 & waterproof cover (not shown)	TNT prices include 2 batteries and Dual Rapid charger. Storm2 series DISCONTINUED Mains adapter=option.	TNT prices include 2 batteries and Dual Rapid charger. Storm2 series DISCONTINUED Mains adapter=option
WEBSITE	rescue.resqtec.com	rescue.resqtec.com	scorpe.net	tntrescue.com	tntrescue.com	

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

						
ES100-24 Storm Surge	SP 44 AS 1093703 E-Force3	SP 54 AS 1091736 E-Force3	SP 50 BS 1091735 E-Force3	SP 44 1101468 Smart Force	SP 54 AS 1101469 Smart Force	SP 50 BS 1101548 Smart Force
18v/20v	28v	28v	28v	18v	18v	18v
NT RESCUE	WEBER RESCUE	WEBER RESCUE	WEBER RESCUE	WEBER RESCUE	WEBER RESCUE	WEBER RESCUE
						
N/A	N/A	N/A	N/A	N/A	N/A	N/A
22.31-22.7kg 49.2-50lb	17.3kg 38lb	20.7kg 45.5lb	20.9kg 46lb	18.2kg 40lb	21.6kg 47.5lb	21.8kg 48lb
1.1kg / 2.4lb 0.6kg / 1.3lb	1kg 2.2lb	1kg 2.2lb	1kg 2.2lb	1.1kg 2.33lb	1.1kg 2.33lb	1.1kg 2.33lb
Milwaukee M18 9Ah, Makita 6Ah Walt FlexVolt20 9Ah	Milwaukee M28 5Ah	Milwaukee M28 5Ah	Milwaukee M28 5Ah	Milwaukee M18 8Ah/12Ah	Milwaukee M18 8Ah/12Ah	Milwaukee M18 8Ah/12Ah
10-15 mins 87 / 60 mins	<45-80mins 60mins	<45-80mins 60mins	<45-80mins 60mins	60/90mins 45-83mins	60/90mins 45-83mins	60/90mins 45-83mins
823.77mm 32.43"	877mm 34.5"	982mm 38.7"	1015mm 40"	893mm 35.2"	999mm 39.30"	1032mm 40.6"
283mm 11.15"	239mm 9.4"	282mm 11.1"	282mm 11.1"	239mm 9.4"	282mm 11.1"	282mm 11.1"
344.9mm 13.58"	241mm 9.5"	241mm 9.5"	241mm 9.5"	228mm 9.5"	228mm 9.5"	228mm 9.5"
-	AS44/610-17.3	AS55/735-20.7	BS50/805-20.9	AS44/610-18.2	AS55/735-20.7	BS50/805-21.8
-	44-857kN 5-96.3 Ust	55-501kN 6.2-56.3 Ust	50-501kN 5.6-56.3 Ust	44-857kN 5-96.3 Ust	50-501kN 5.6-56.3 Ust	50-501kN 5.6-56.3 Ust
286-1078kN 32-121 Ust	-	-	-	-	-	-
-	-	-	-	-	-	-
596.9mm 23.5"	610mm 24"	735mm 28.9"	805mm 31.7"	610mm 24"	735mm 28.9"	805mm 31.7"
63.9kN 7.2 Ust	68kN 7.6 Ust	70kN 7.9 Ust	67kN 7.5 Ust	68kN 7.6 Ust	70kN 7.9 Ust	67kN 7.5 Ust
463.5mm 18.2"	465mm 18.3"	620mm 24.4"	680mm 26.8"	465mm 18.3"	620mm 24.4"	680mm 26.80"
N/A	149kN 16.9 Ust	144kN 16.2 Ust	144kN 16.2 Ust	149kN 16.9 Ust	144kN 16.2 Ust	144kN 16.2 Ust
722 Bar 10.5K psi	700 Bar 10.2K psi	700 Bar 10.2K psi	700 Bar 10.2K psi	700 Bar 10.2K psi	700 Bar 10.2K psi	700 Bar 10.2K psi
						
--	- 360°	- 360°	- 360°	- 360°	- 360°	- 360°
4	4	4	4	4	4	4
--	--	--	--	--	--	--
54 54	54 54	54 54	54 54	54/68* 68	54/68* 68	54/68* 68
NT prices include 2 batteries and Dual Rapid charger. Storm2 series DISCONTINUED chains adapter.option	All E-Force tools can convert to hose	All E-Force tools can convert to hose	All E-Force tools can convert to hose	All E-Force tools can convert to hose. * IP68 with waterproof cover	All E-Force tools can convert to hose. * IP68 with waterproof cover	All E-Force tools can convert to hose. * IP68 with waterproof cover
ntrescue.com	weber.com	weber.com	weber.com	weber.com	weber.com	weber.com

BATTERY
DIMENSIONS
SPREAD
PULL
FEATURES

(T) = Theoretical FEATURES: ● = PARTIAL FEATURE ■ = Option N/A = info Not Available/not given



ROPEWORK

**WATER RESCUE
ROPE DELIVERY
VIA DRONE**

Dr Mike Croslin is co-founder of the world's first swiftwater rescue program, and co-inventor of the very term 'swiftwater rescue' along with fellow water rescue legends Jim Segerstrom, Warren Berg and Barry Edwards. They went on to form Rescue3.

Mitch Sasser is the CEO of training company Tandem Rescate in Chile formed 20 years ago. He was originally trained by Jim Segerstrom, Mike Croslin and Jim Lavalley

Idan Peretz is the co founder and CEO of Highnovate, an Israeli company that develops solutions for safer and easier rope rescue and access. He has more than 30 years of experience in rescue and technical rescue training.

by Dr Mike Croslin

Mitch Sasser

& Idan Peretz





Initial testing of the pulling power of the FPV drone carrying 3/16" water rescue rope rather than carrier line and a REACH device



FPV drone carrying 3/16" water rescue rope attached to a float. The 'box' beneath the drone is the remote release mechanism operated by the drone pilot



ABOVE AND TITLE PIC: FPV drone carrying a 6mm cord rather than the yellow 3/16" Sterling Waterline
INSET: Much lighter carrier lines allow huge distances to be bridged, in this pic a DJI Mavic2 drone is running out a 200m/600ft reel

Last summer our group of Swiftwater and technical rescue educators, equipment developers and drone experts from the US, Chile, and Israel, met in California to develop new approaches to line/rope delivery using drones as the first crossing agent retrofitted with Highnovate VDRC drop system or Convex DropXmini. The group consisted of water rescue expert Mitch Sasser from Tandem Rescate, Chile, drone expert Harley Hiles, Dick and Dane DeBoere - experienced coast guard rescuers and rescue equipment developers, Idan Peretz of Highnovate and Michael Crosslin from Crossline Reach.

The initial idea was to combine the technologies that Idan Peretz's Highnovate developed for remote anchoring by drone-carried systems to the Crossline Reach LCD {line capture device} which reliably and securely clips any rope that it crosses such that the three technologies collaborate together to create remote line delivery and loop anchoring solutions across wide high volume, high-velocity rivers during high water, spring runoff or flooded conditions... After some initial separate trials in Israel and CA, the group got together to combine technology, skills and thoughts.

We started our session on the Stanislaus River at flood stage with a simple Mavic drone retrofitted with the VDRC system. We established a 5/16 Sterling waterline floating rope across a 200ft extremely fast, stout channel in approx 5min using this method). Confirmation of the excellent engineering of the VDRC system with a small standard commercial drone and standard drone operator skill set.

Usually, at spring runoff, establishing cross-river access or mid-channel access requires the deployment of a strong floating water rescue line to belay boats or to establish boat control systems capable of precision placement and holding station of craft to perform a variety of tasks.

As a group, we wanted to explore the possibility of drones pulling a direct, larger-diameter functional floating rescue line directly over a high-velocity channel without needing a messenger line. Directly across, then released to waiting rescuers. Thus compressing the timeline to set up protected hands-on access in cases where there may be limitations of victims remaining in place due to exhaustion, hypothermia, or changing water conditions. We refer to these as Fast Access



You'll have to take our word for it that there is a drone in this picture carrying a carrier line connected to yellow throwline out and around the bridge support

side. By pulling it, we can replace it with a proper line to allow access to the other side. The joint between the carrier line and the main cord is covered by a 'skid' cone (right) to ensure the knot doesn't snag on retrieval.



The system must have a length of line that is a minimum of three times longer than the distance to be crossed. This will allow for bellying and sag of the line there and back.



The second method was to fly the drone with the LCD Reach attached to the *DropX* mini system and connected directly to the rope. The drone flies around a large tree or boulder and crosses its own carry-rope. We then drop the Reach over the rope via the remote 'bomb-release' and once we pull the rope, the *Reach* clips onto itself, and we have an anchor.

Power Pulls, and our drone expert, Harley Hiles, wisely decided to turn to his FPV (first person view) drone experience. Here, he pulled out his own carbon fiber 7-inch rotor quadcopter flying more directly off RC skills. Harley demonstrated the ability to power pull a $\frac{5}{16}$ " (?mm) *Sterling* waterline floating rope over 250ft with a *Reach* attached to a *Convex* drop system, the *DropX mini* shown in the screen-grab on the right, which uses an actuator to pull the pin out and release the carabiner. The rate of ascent and power of the FPV drone allows a very fast gain in elevation before pulling over a fast-moving channel, thus avoiding significant drag on the rope as the drone speeds forward with the load as it loses elevation over the river and then releases the line. We repeated two more direct power pulls on the main Tuolumne at flood stage with the same FPV drone, one pull of 300ft *Sterling* $\frac{5}{16}$ " waterline and a second with a longer 5mm *Pelican* Dyneema braid at 350ft across.



The first system worked well under a bridge by sending the drone around a wide round bridge support flying back to shore. The 1 mm Dyneema rope has very low resistance, and we replaced the rope easily. A $\frac{5}{16}$ " *Sterling* waterline replaced the messenger line.

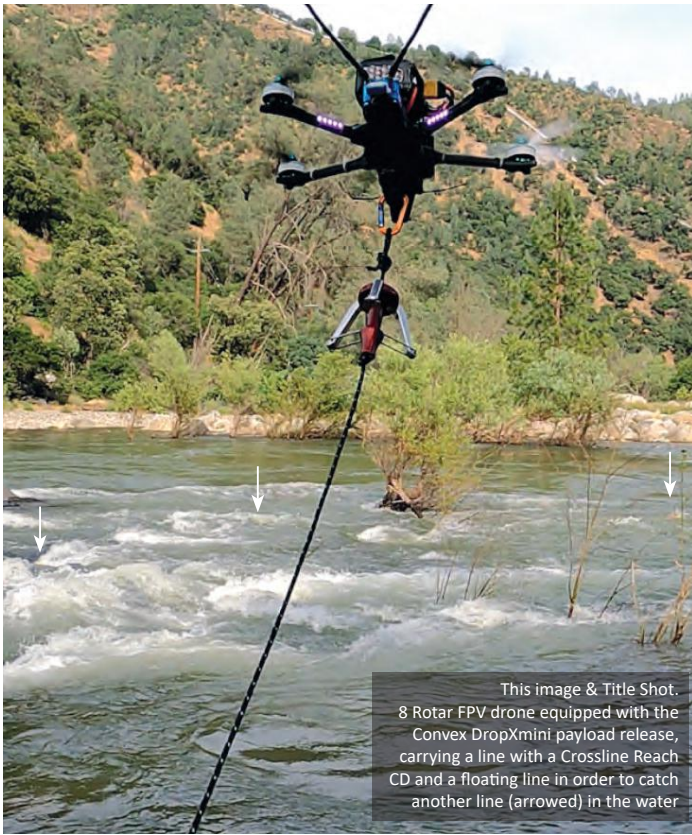
We flew a second flight with a direct power pull with the FPV drone under the bridge and the *DropX mini* using a *Reach* attached to $\frac{5}{16}$ *Sterling* Waterline after flying out 100ft and circumnavigating the round 15ft wide bridge support and

releasing past the extended floating rope then hauling back from shore to clip itself thus creating a looped object anchor. When conditions and circumstance opportunities are present, this is a fast access method in the hands of a smooth drone operator.

Once we were comfortable with the way we could carry a line across the river it was time to try and set an anchor with the drone.

We planned to test two methods - The first one was carrying the spool of 1 mm Dyneema rope on the drone by using the *VDRC* system. The drone flies around a tree or a large object and returns to the same place it took off from. Now we have a thin cord around a tree on the other

The second method worked well in various places, but we discovered that in rough conditions, the result may be good but not what we planned for. When we tried across the Stanislaus river, at high Spring runoff, Harley Hiles piloted his FPV drone and 4mm *Novaline* and *Reach* attached to the mini-drop system skillfully across the river well past the target tree, then looped the tree once and released the rope and it held clipped to a branch before clipping itself. We had a similar result in a practice run around a small conifer, creating a very good anchor but not the one we aimed for. Mitch and Michael



This image & Title Shot. 8 Rotar FPV drone equipped with the Convex DropXmini payload release, carrying a line with a Crossline Reach CD and a floating line in order to catch another line (arrowed) in the water

judged both the dry run looped tree branch anchor and the actual test across the Stanislaus River as adequate for initiating cross river access via a steep angle tension diagonal sending a cataraft across the river as an evacuation platform, letting the current push the craft across, going with the flow. This is a very promising, proper, and relevant method to test further.

We did not try to fly past smoother tree bases devoid of foliage, such as Palm trees and telephone poles but Idan did have success doing so in Israel. We did not test multi wrap no knots during this session, and these methods should be tested in the future together with direct remote anchor placement via the *DropXmini*.

We decided to test some more advanced techniques passing lines over wide sections or for setting rope systems. The *DropXmini* and the *Reach LCD* have proven useful tools in capable hands. We sent a *Reach* to capture a throwline well beyond the 80ft max distance a rescuer can throw. Successfully removing any reasonable limitation to line capture at distances up to 350 ft (our longest successful line capture on Tuolumne at flood stage).

We also developed a very fast two-step reliable remote anchoring method using two long floating rescue lines. The drone flies past the object to be loop-anchored in a mid channel...tree, rock, small isle, vehicle, anything that will hold a 90-degree change in direction. The drone drops the rope with a float, approx 25-50ft past the anchor object while flying perpendicular to the current vector. The float-equipped floating rope then floats past the anchor and dangles in the current with sufficient rope played out by a competent PPE protected shore



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The REACH LCD is dropped by the drone across the floating rope and is then pulled in until it runs up against the float and the captured rope can then be hauled back to shore.

handler. He/she anchors the $\frac{5}{16}$ Waterline on shore, keeping the floating line up, to keep it from kiting downstream which can unwrap the rope in a stout current sending it in a downstream pendulum back to shore. avoid this by simply keeping the line up...not difficult but important.

Then the drone is re-armed with the *DropXmini* to release a *Reach* device attached to a $\frac{5}{16}$ floating *Waterline* and sent back out to capture the rope and float dangling in the current. This is then hauled to shore, creating a loop anchor that you can choose to tie-off in whichever way you deem the best option. With a skilled pilot and two pre-trained rope handlers, all with adequate experience to read the water and conditions.....this is a leap forward in remote access in high flow states beyond the distance and accuracy limits of trained rescuers. This is a Kiwi method devoid of distance limitations of human throwing. Harley Hiles flew these evolutions mostly with an 7" FPV drone and a world-class expert skillset. He cautions that it takes time and simulation practice to develop his level of expertise, and cloning him into deep learning algorithms is a good idea. His future looks bright indeed. Drones, too if their use moves in this direction as it unquestionably will be already common place in the surf/beach rescue community albeit with simpler rescue scenarios.

The skillsets of the shore handler and drone pilot must work in unison as the flight path is dictated by the current vectors in the river. Be aware that at certain distances the line attached to the drone will touch the water creating unwanted drag. In order to minimize this the handler and drone pilot work together to minimize drag, preferring angles that flow with the current out to the desired location of the drop. The first flight that presents the main line around the obstacle will in most cases have a different take-off location than the second flight that carries the *Reach*(LCD) out to the drop location for the secure clip and continuation of the evolution.



CONCLUSIONS

To conclude our findings from several days of trials -

- Drone-carried systems can simplify rescue, speed it up, and reduce the risk.
- Rescue techniques that can be undertaken with a throwline can be used over wider rivers by using a drone and longer access floating rescue rope.

When using drone-carried systems, you should take into account several factors -

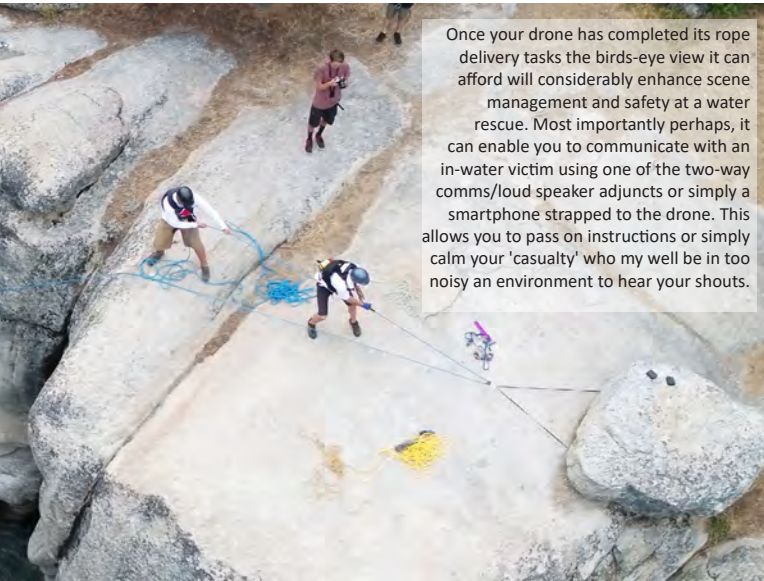
- The width of the river section - the wider it is, it can create more resistance for pulling a rope.
 - The flux of the water in that segment.
 - The rope you use - lighter, small-diameter floating ropes are better for dragging over the water.
 - The type of drone that you are using - its take-off weight limitations, overall strength, and weather limitations.
 - Expertise of the drone operator - especially when flying tethered over water.



FPV Drone with purple REACH

All these should be taken into account, and as always, the more you plan with these systems, the better you understand the potential pitfalls and what to avoid.

When it comes to choosing a drone, different units or agencies have different needs, different budgets and may need it



Once your drone has completed its rope delivery tasks the birds-eye view it can afford will considerably enhance scene management and safety at a water rescue. Most importantly perhaps, it can enable you to communicate with an in-water victim using one of the two-way comms/loud speaker adjuncts or simply a smartphone strapped to the drone. This allows you to pass on instructions or simply calm your 'casualty' who may well be in too noisy an environment to hear your shouts.

to undertake disciplines not related to water rescue like wilderness/USAR search, fire-spotting or Command and Control but do remember that eyes in the sky as a search, personnel safety or command & control function are also valuable to any water rescue teams - take a look at the picture above giving hitherto unprecedented imagery of the rescue area including personnel spread, potential hazards and casualty spotting. For our specific water rescue tasking, Harley, our test pilot decided to use his large FPV drone. He likens the experience to that of a helicopter pilot that can feel more directly the load versus the dampened feel of computerized avionics fighting the load.

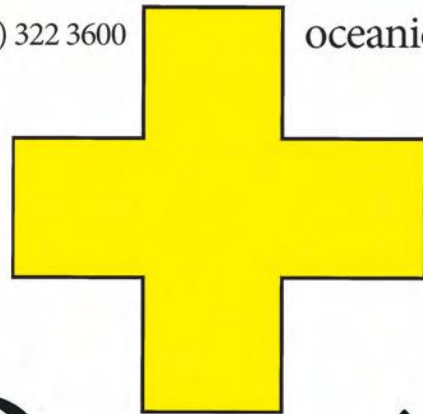
The running costs are around US\$500 and a day taking into account the capital costs, training and consumables etc. There is a need to use simulators to learn this skill set in the beginning. Still, from our collective experience watching the amazing pull power and speed of ascent of a large FPV drone in the hands of an experienced pilot as distinct from a relative newcomer trying to use a lighter, off-the-shelf drone for the same tasks is worlds apart. Swiftwater rescue with the inherent risks of increased drag from current and the number of obstacles is probably the harshest environment that a rescue drone can operate in so if you can't afford the more powerful systems you need to be prepared to lose one or two drones while training. The *Majic3 Pro* for instance is claimed to be able to carry 24kg or resist 24kg of drag, quite a lot more than the more common *Majic 2*.

Maybe in the near future we will see AI operated drones that can replace some of the flying skills and make these systems safer and easier to adapt, but until then it will require good practice of both UAV operators and the rescue team in order to be able to simplify current rescue methods. Our test this summer showed us that in capable hands, a team can upgrade their operational capabilities of rigging and passing line across the stream for safer and faster operations.



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ANCHORS & ANCHOR SYSTEMS.. part 1



by **Reed Thorne**
Ropes that Rescue AZ, USA

Our resident rope genius, Capt'n 'GreyBeard' Thorne starts a new series on anchoring beginning here with definitions and the specifics of 'Point Anchors'. This one's old-school. Coming articles will include

- FOCUSED SUBSTANTIAL ANCHORS
- ANCHOR LOADING
- BOMBPROOF ANCHORS
- FLOATING ANCHORS
- LINEAR ANCHORS
- MULTI-POINT ANCHORS

“Rigging” consists of carefully placed anchors allowing loads to be either held in place and kept from moving, or by where loads are meant to be moved through the use of compression/tension using both controlled friction and mechanical advantage at times it is needed

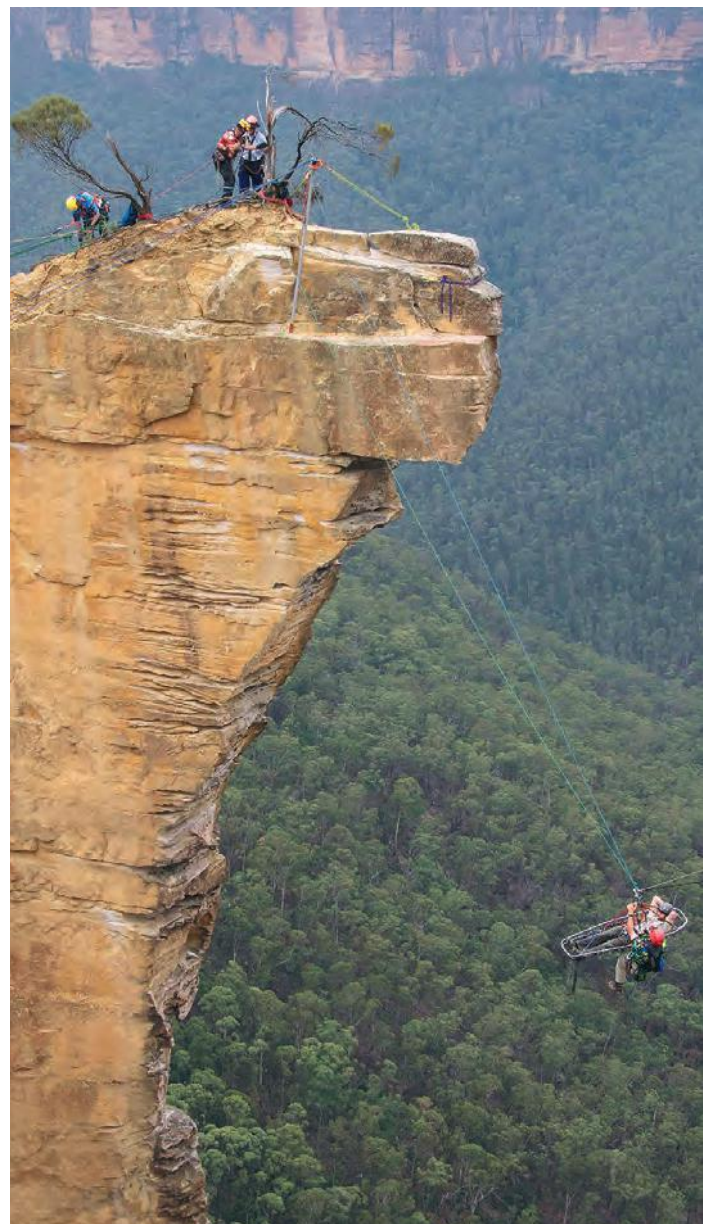
Anchors are the most critical component of any rope system as the entire rescue is in jeopardy if the anchors are not reliable. Anchor systems are made up of two major elements;

1. Choosing the best anchor (i.e. boulders, vehicles, trees, and bolts)
2. Rigging the anchor.

Building an anchor system requires much practice and experience.

When dealing with structures, chose anchor points which are part of the inherent structure of the building. This includes columns, beams, anchors for window cleaning equipment, and elevator housings. Avoid corroded metal, weathered stonework, and deteriorated mortar. Avoid using vents, flashing, gutters, and chimneys. When using a vehicle for an anchor, remove the ignition key, set the brake and chock the wheels. Do not use the bumper. Connect directly to the vehicle frame using such items as the axle, cross member or tow hooks.

Often a desirable anchor is off to the side of a needed direction of pull. Ideally, they should be directly above and close to the fall line. When this is not possible (which seems to be more times than not) advanced anchor rigging skills come into play, namely, focusing the direction of the main anchor to a viable position. Anchor Definition: Used loosely as a general term and referring to any means of attaching a rope, webbing strap, carabiner, or any object to another fixed object for the purpose of anchoring it, and whether for the purpose of securing a load or not.



THE THREE ANCHOR TYPES

1) **POINT ANCHORS:** (or “Anchor Point”)

Refers to those individual anchors, which are specific to one location, as in a crack, on a pole, attached to an object, etc. Point anchors vary from marginal (contributory) up to “bombproof” anchors. also serve as the origin and terminus of linear-type anchors.

2) **MULTI-POINT ANCHORS:** An anchor constructed from two or more independent marginal anchors all contributing to the whole.

There are two types of multi-point anchors:

- **Sliding Anchors:** Those multi-point anchors that are self equalizing or more accurately, load Distributing between the multiple points. Also known as a self equalizing anchor or SEA and Load Distributing Anchor or LDA. One anchors failure may cause significant shock load to the surviving anchors and can result in a domino effect of failures.
- **Fixed System Anchor:** Those multi-point anchors that are manually focused by tying a knot to “fix” and equally share loading between all the anchor points. If one anchor fails, there is minimal shock loading onto the remaining anchors.

Additionally, multiple anchor points within a multipoint anchor which may or may not be sharing force applied equally, and in fact one or more may indeed be only backing up other anchors with the majority of load. One anchors failure may cause some shock load of the surviving anchors however the good part about these anchors is that they are usually rigged to reduce all slack in the system.

3) **LINEAR ANCHORS:** Linear anchors are single or bundled ropes or accessory cord (sometimes webbing) extending between anchor points in a rope system.

Commonly they are either

- **Pretensioned back ties** using mechanical advantage or
- **Opposition front ties** using a single pieces of material. Point Anchors:
 1. Marginal anchors
 2. Substantial anchors



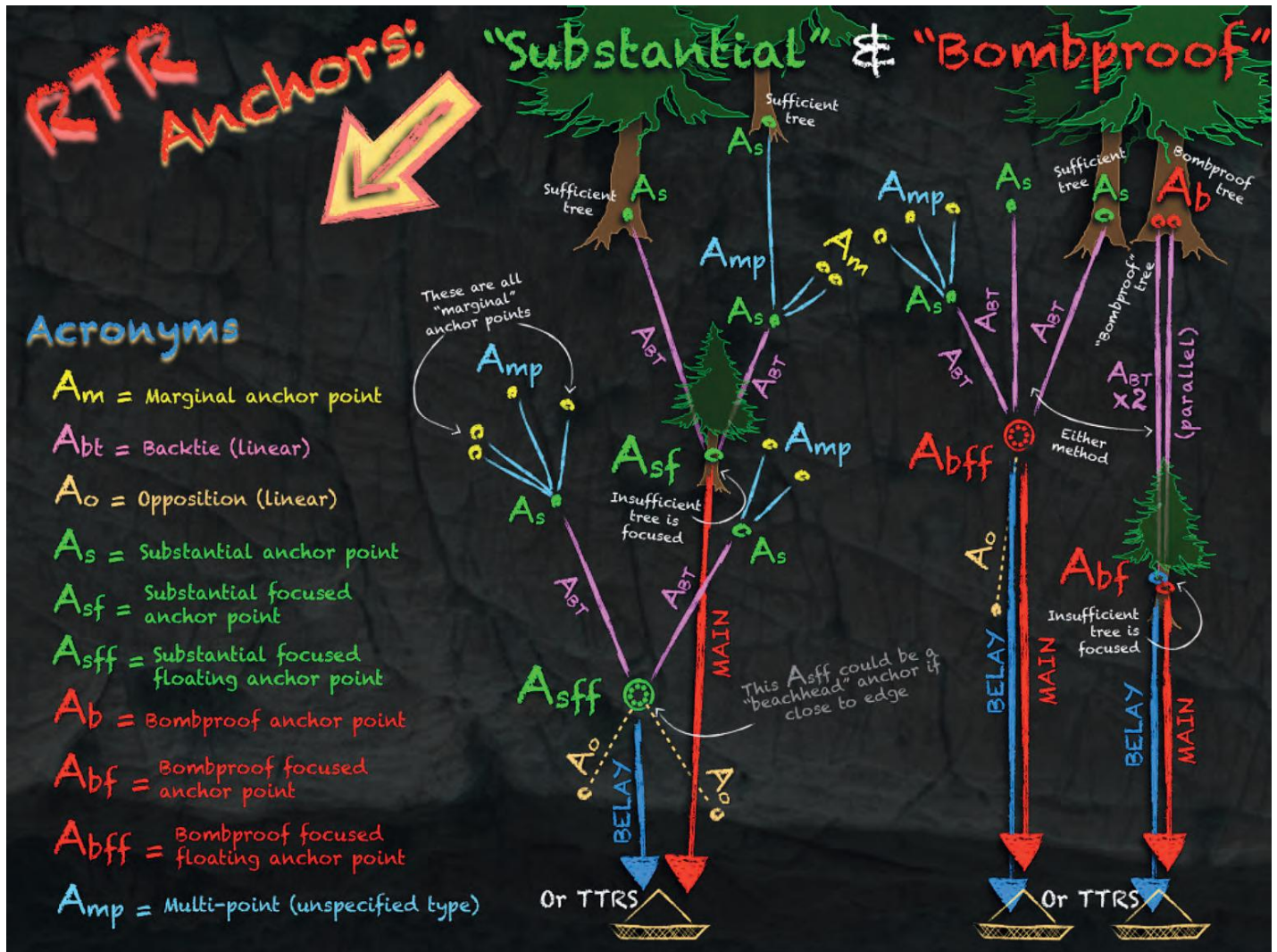
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POINT ANCHORS



POINT ANCHORS:	→	ACRONYM:
1. Marginal anchors		1. Am
2. Substantial anchors		2. As
3. Bombproof anchors		3. Ab
4. Substantial focused anchors		4. Asf
5. Substantial focused floating anchors		5. Asff
6. Bombproof focused anchors		6. Abf
7. Bombproof focused floating anchors		7. Abff

MULTI-POINT ANCHORS:	→	ACRONYM
1. Sliding Anchors		1. Amp or Amps
2. Fixed anchors		2. Amp or AmpFx

LINEAR ANCHORS:	→	ACRONYM
1. Pre-tensioned back-tie		1. Abt
2. Opposition front tie		2. Ao



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POINT ANCHOR STRENGTH

1. Marginal anchors: (Low strength)

DEFINITION:

A “contributory anchor” to the rope system which is subjectively believed not to be able to hold the entire force (plus safety factor) generated during an operation.

Marginal Anchors are smaller “contributory” anchors strengthening the whole anchor system. They are not, on their own, able to make up the entirety of the anchors strength. Several marginal anchors would be needed in the form of a system (hence, “multi-point anchor”) to gain the needed strength.

2. Substantial anchors: (Med. strength)

DEFINITION:

A single anchor or anchor system viewed as substantially capable of supporting half of a two rope system (main & belay or one half of a TTRS)

3. Bombproof anchors: (Highest strength)

DEFINITION:

A single anchor or anchor system viewed as substantially capable of supporting both halves of a two rope system (main & belay or both halves of a TTRS).

So called “bombproof” anchors are large trustworthy anchors capable of holding both the main and belay plus the required safety margin

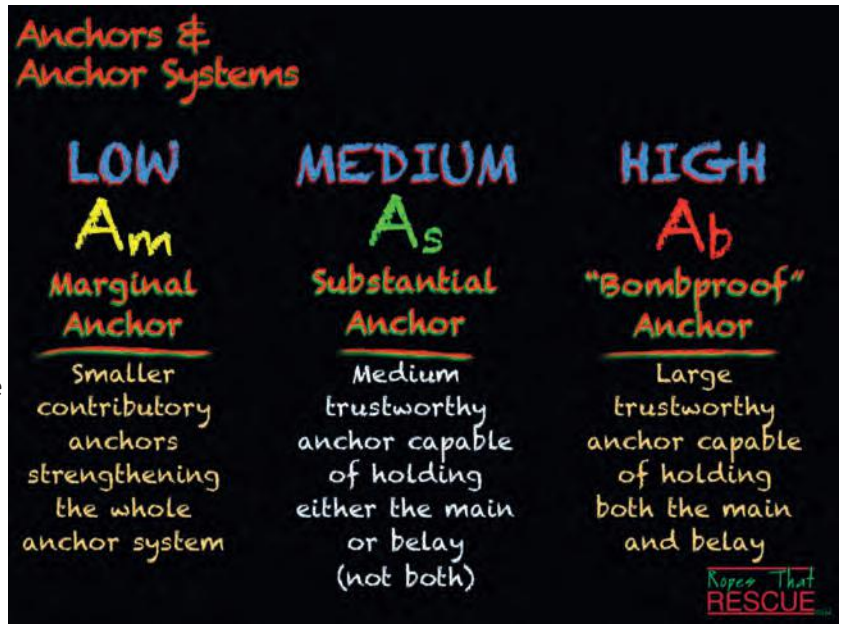
Point Anchors: (or “anchor points”) Refers to those individual anchors, which are specific to one location, as in a crack, on a pole, attached to an object, etc. Examples include---bombproof anchors and marginal anchors (as in the components of an anchor system). (Several point anchors can also be tied on a focused anchor or serve within a system anchor. Focused anchors and system anchors are discussed later). Point anchors also serve as the origin and terminus of linear type anchors. Point anchors are either “artificial” or “natural”.

1) Artificial Point Anchors:

Artificial anchors are those that do not exist when you arrive and need to be placed by the person building the anchor or anchoring system.

2) Natural Point Anchors:

Natural anchors are those that are already in place when you arrive to rig the anchor or anchor system. They include rocks, trees, structural components and are generally believed to be more trustworthy. But any anchor can fail if it is insufficient.



Above: Artificial anchors showing two pieces of rock called “Tricams” both used in an active position.



Top-rightLeft: A wrap 2 pull 2 (W2P2) webbing anchor on a natural rock horn where the end of a linear anchor is tied off.



Middle: A wrap 3 pull 2 (W3P2) on a tree limb. Note the webbing is tied with a water bend and the bend is positioned so that it is on only the constricting band of the anchor.



Right: A wrap 3 pull 2 (W3P2) webbing anchor on a pipe in industry where the end of a linear anchor is tied off.

MARGINAL ANCHORS

Rock Climbing Protection: (or 'pro' slang) Rock climbing protection is segregated into two groupings: "Passive" and "active". Passive refers to a WEDGING action and active refers to a CAMMING action. The difference has little to do with the fact that some have moving parts or not. But not all pro without moving parts are "passive". Tricams are the rare exception in that they can be placed in both a passive AND camming fashion, which is why they are so good for carrying in a rescue pack.

1) PASSIVE: "Wedging" Passive pro included those that WEDGE like a 'chock stone'. Passive pro, or "chocks", as some refer to them, do not have moving parts like the active side does. Most have connecting accessory cord, webbing, or cable stems onto which the anchored rigging attaches with a carabiner. Middle right, the common but dependable stoppers on wire stems showing the wide axis and short axis of each size stopper. This allows for only two size cracks which it can be placed

2) ACTIVE: "Camming" Active pro included those that CAM against the rock surface. They may or may not have moving parts so this is only part of the criteria for an active piece. The Tricam is a very versatile piece of pro which has no moving parts but yet has a camming action. Tricams can also be placed passively. Some active pieces have 3 cams and others have 4. They all rely on a spring to press the lobes (the cam) against the rock face on either side. They are referred to as SLCD's or spring-loaded camming devices. They are placed by retracting the lobes, inserting in the proper size crack, and released to put pressure on the crack sides. Under camming and over camming SLCD's is an issue to be avoided. The mid range is best.

3) COMBO: "Wedging & Camming" Some pro can be placed passively and actively (again, like the tricam) which is a great advantage when trying to find the best piece for a certain rock feature where an anchor is needed.

Rock Climbing Protection: Passive (wedging only)
All marginal anchors, whether natural or artificial or passive or active are noted in our nomenclature as:

Anchors & Anchor Systems

MARGINAL ANCHORS
Rock Climbing Protection:

<p>Passive Wedging only</p> <hr/> <p>Stoppers Hexentrics Tricams</p>	<p>Combo Wedging/ Camming</p> <hr/> <p>Hexentrics Tricams (Some dbl. axle SLCD's)</p>	<p>Active Camming only</p> <hr/> <p>SLCD's 3 cam units 4 cam units Tricams</p>
--	---	--

Anchors & Anchor Systems

MARGINAL ANCHORS
Rock Climbing Protection:

Passive
Wedging
only

Stoppers
2 possible
placements

Anchors & Anchor Systems

MARGINAL ANCHORS
Rock Climbing Protection:

Active
Camming
only

SLCD's
3 cam units
4 cam units
Tricams



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Weight: 455 g • 16.05 oz

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Rock Climbing Protection: Passive (wedging only)

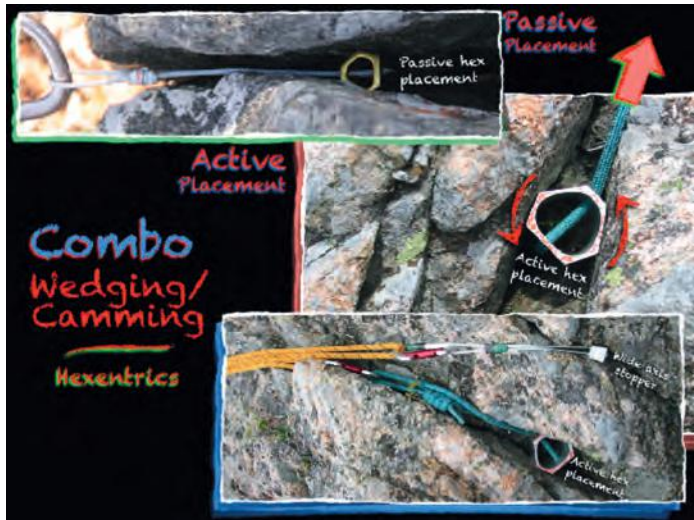
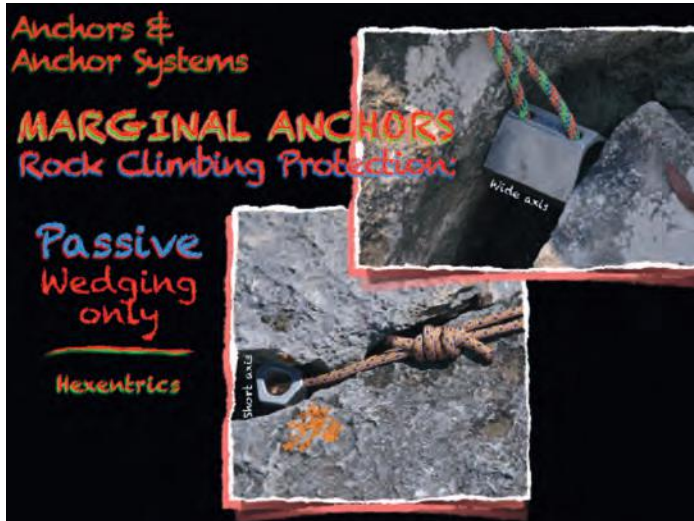
All marginal anchors, whether natural or artificial or passive or active are noted in our nomenclature as:

“A sub m”

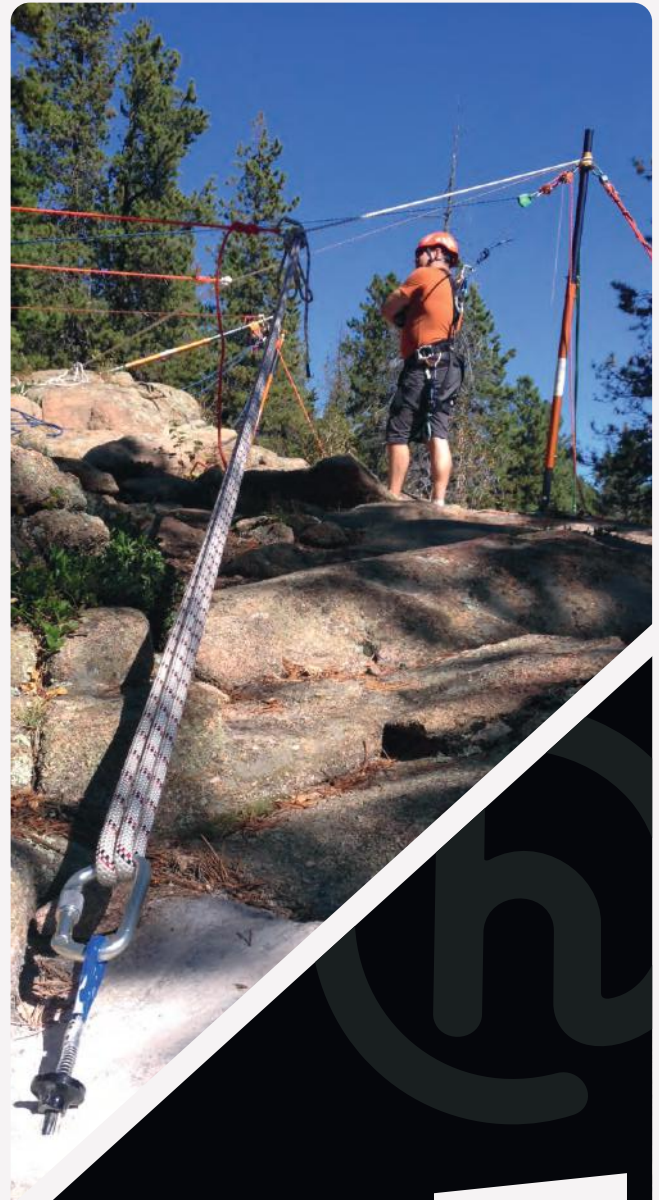
or

“Am”





Left top: Two stoppers nested in a concrete slot with a mixture of long and short axis in each face
 Left bottom: Both stoppers using the wide axis in a good nesting anchor
 Top: Hexentrics used in wide and short axis placements
 Above: Stoppers used in wide and short axis placements
 Below: Camalots used in active position in granite rock
 Left top: Two tricams in active camming position
 Left middle and bottom: Large size tricams nested one on top of the other for a larger crack in the rock, both active camming



ClimbTech

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13mm (1/2") or 19mm (3/4")
 Completely Reusable
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SUBSTANTIAL ANCHORS

Each half of a two-rope system:

Definition:

A single anchor or anchor system viewed as substantially capable of supporting half of a two rope system (main & belay or one half of a TTRS)

There may be anchors that are not marginal nor are they "bombproof". As explained before, they are the middle ground between the two extremes.

A "substantial anchor" is one half of your system, whether belay or main line. A marginal anchor being contributory to the whole system is not strong enough to hold one half of the system on its own. A bombproof anchor is very strong by contrast and can easily handle both the main and belay (or TTRS). So, these terms should not be taken lightly when communicating the quality of anchors.

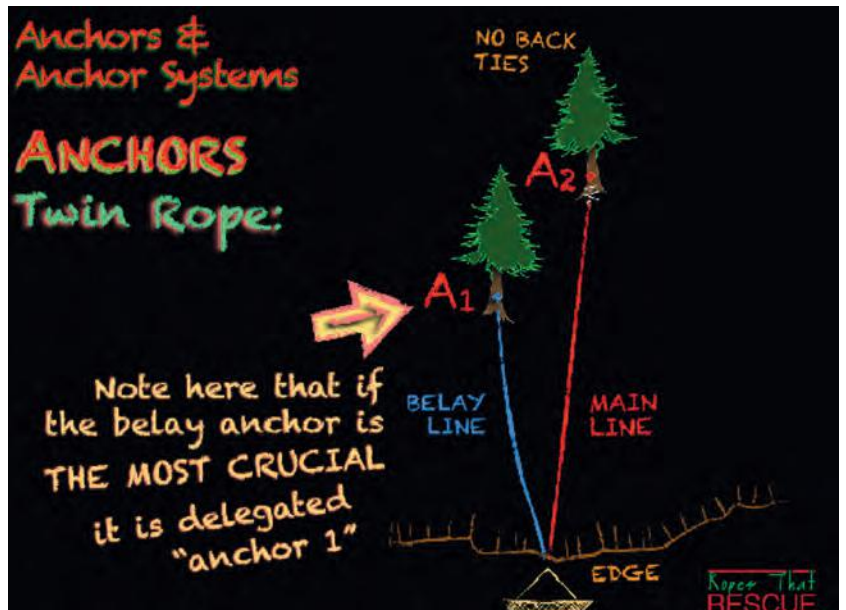
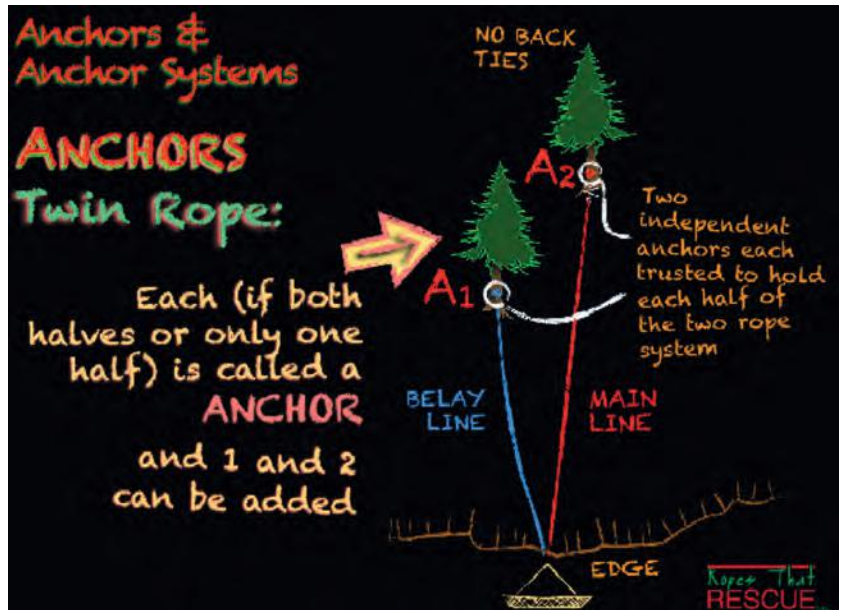
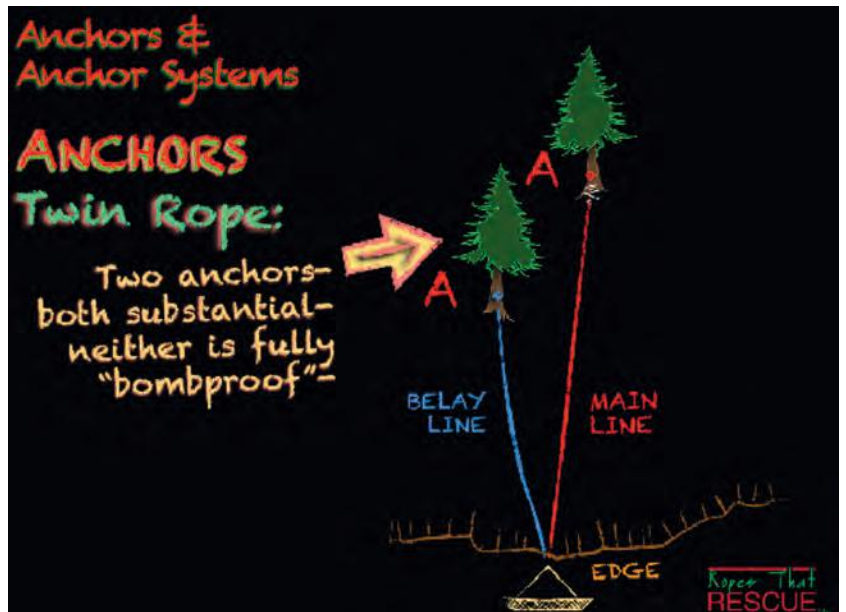
The acronym for the anchor is "A" sub "s" as you can see at right in the top example. The subscript "1" or "2" can be placed after the "As" to denote the position of the belay line anchor (usually number 1) and the main line anchor (usually number 2) as you can see at right middle and bottom.

"A sub s"
or
"As"

Below is a photo of a good solid substantial anchor however, it can only be trusted for one half of the system. A larger, more substantial tree would be needed to be able to put both halves on the same tree.



Next Time we move on to FOCUSED SUBSTANTIAL ANCHORS





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Hot-loading a Lifesled LS2 Board

Inflatable & Solid, 'Short'

RESCUE BOARDS

'Short' as distinct from the numerous long boards and basically modified surf boogie or body boards. These short boards are often called 'sleds' in North America because they are huge compared to a standard sport body board. Most derive from the surf community but in rescue terms it is probably the Carlson Board from the 80's that steered the entire water rescue and swiftwater community towards use of short boards for water entry rescue (as distinct from towing). High-speed towing is now where you see most short boards - on the back of a PWC/RWCs both as a rescue measure in surf, flood and swiftwater and for general transport of a surfer to or from the hairy wave face on a surf beach. Be aware though that just because a board/sled has forward-mounted D-rings, doesn't mean it can be towed by an RWC - these exert a degree of force through acceleration that surfers long ago realised needed to be mitigated by additional elastic connections or strengthened fixings. Of course you could bypass the RWC altogether and power the board itself which is what the ASAP 156 jet-board on the right does. With an average 50minute run-time this is an exciting, if rather more expensive option! The 156 does have a forward towing option but more for recovery than deployment. Swiftwater rescue boards either have no tow eyes because they're intended for swimmers or the eyes are more for control lines and hauling, neither of which involves fast acceleration. True surf-oriented boards are also more able to cope with large waves that can bend or snap boards not designed for that environment. Some, like the Peruvian Suntech boards are reinforced - in their case with a longitudinal aluminium I-beam. Another offshoot has been ice rescue which has spawned a few quite odd designs like the *Angel-Guard* but in principle the main

players like *Ice Rescue Systems RTS* and *MARSARS* sled below, are modified boards, longer than most RWC boards but not quite a lifeguard's long board. They are however, considerably more complex than simply a flotation aid. Both are rectangular with numerous integrated slings and the *MARSARS* sled has a 4:1 hauling mechanism built into the centre of the board that helps haul an in-water victim on board the sled via a set of forearm straps- there are even two rollers in the end to facilitate easier victim movement onto the sled.

We see a definite difference between boards with a US surf background like *Extractor*, *P2P* and *Lifesled* (better known in surf circles as *Wahoo International*) and those from a European water rescue background like *WRSMFC*, *WRS* and *NDiver*. These latter boards and indeed most inflatable short boards are better suited to 'flat' or flood water (and ice or mud) than they are to rough water like surf or swiftwater. They can however be deflated and stored in a considerably smaller space than a solid board although deployment times are also considerably longer. In general, the inflatable boards are the domain of multi-discipline rescue agencies not necessarily using them on every call or with simply no more space on the truck for any more kit. We have dealt with the specifics of inflatable craft in the previous guides to watercraft so no need to discuss that further here - the same rules apply, the materials are the same, the valves are the same only the sheer size and volume and therefore the time to inflate (a couple of minutes even with a hand pump) are different. Beach rescue and standby rescue teams are more likely to go for a solid board and for some boards storage as a flat- one piece can sometimes be easier to fit on or around a rescue vehicle than a plump bag of deflated board.





Something that all 'short' boards have in common is a plethora of handles and all go to great lengths to ensure that they are strongly fixed to the deck. In the case of inflatables it is exactly the same as all inflatable watercraft with glued or preferably welded seams having a considerable track record. Solid boards (which aren't necessarily solid as we'll see shortly) can be a bit trickier because the plastic or foam 'shell' that they have to be fixed into can have inherent localised weakness. So most overcome this by spreading the load either

by broadening the rivet bed as you can see on the *MARSARS* or by running the handles as a continuous length into and out of the body of the board as you see with the *Lifesleds*. *Extractor* mould the threaded receiver into the HDPE shell and claim a 7000lb/3181kg test pull which is quite impressive and likely one of the strongest options. P2P have neoprene covered solid rubber handles while NRS has low-profile flat straps. Some have a 'last-chance' handle right at the back and some even have a last chance sling/cord hanging off the back. Apart from the special purpose boards all of the towable boards have a curved 'stern' both in terms of smoothing off the roughly 4"/100mm side profile and the crescent shape which accommodates the shape of a 'casualty' who is hanging on for grim death more comfortably and safely than a square back edge. In the case of the title picture opposite from *Lifesled* the rescuer is using the board as an in-water access tool and is knelt on it while assisting the casualty that has just been hot-loaded after having his hand grabbed by the RWC driver. He will then be swung back to the waiting rescuer who ensures he has a firm handhold for the journey back to shore.

For inland swiftwater and floods the use of the not-so-short, short board was pioneered for rescue by Robert Carlson after using a regular surf boogie board for sport riverboarding or river sledging as its sometimes called since the early 70s. The *Carlson Board* (pics-top) took the standard boogie design, added a slick, hardened plastic base and deep crescent curve to the rear as well as four handles, none of which had been seen on rescue boards before. These days the board's curved body channel has evolved into two 'limb' channels that retain the forearms better when grasping the handles. The boards still have their original vivid green base as well as a curved profile nose to tail.

The *NRS* board opposite shows a textured, padded surface common to most boards that offers a tactile surface to help grip the body, *ExtractorX Sled* for instance has a 3/8" thick dimpled PVC layer while some like *Extractor* and *Carlson* have scallops in the top surface to better hug the body arms. In fast moving water and particularly on the back of a fast moving RWC any slight turn can make it hard to hang on and virtually impossible on a slick top-surface. This sideways skid at higher speeds is mitigated in some models like *Extracors River X* and *JetRescue's Newk* by use of strakes or channels in the underside

WRS[®]
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High Volume Bow and Rocker - With a raised bow height the X-Sled is able to handle tethers in swift water whilst reducing the risk of the bow diving when loaded. The increased volume maintains stability when occupied by a casualty or rescuer.

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The WRS Rapid D inflatable board

KEY to TABLES.....

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

If it's an **OPTION** it is shown as an **outline square** □□□□□

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

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

COST: a rough guide only - **includes** local taxes/VAT. Varies with exchange rates, extra taxes etc. We usually round up to the nearest Pound£/US Dollar\$/Euro€. We now give a currency conversion figure in orange £\$€ which is simply to give an idea of price, it is not the selling price which will have import duties and bulk shipping etc. to add.

LOAD BUOYANCY VOLUME: These are all linked but all manufacturers show it differently. **LOAD** capacity in terms of the weight of person that the board is designed to carry or more importantly that the connecting D-Rings can cope with. **BUOYANCY** of the board, like a PFD or lifejacket is directly related to the weight it can carry whereas **VOLUME** is more an indication of the sheer size of the board usually correlating with load capacity - - the greater the volume the greater the load capacity. As with inflatable platforms, you can work on roughly 100kg per square metre or 67.2 pounds per square foot.

DIMENSIONS: Length by width by depth/thickness.

MATERIALS: (and type of construction) for the board itself, for

that keep the board in line - much as you see on RIBs. We mentioned earlier that the non-inflatable sleds are not necessarily 'solid', some like the *Extractor* range are expanded foam but have differing densities and are hollow. Some are solid 'polystyrene' but it may surprise some to learn that regular polystyrenes (EPS more-so than EPP) will absorb some water - perhaps up to 7% of total board volume. Talking of volumes, the relative board sizes is not immediately apparent in our tables as the images are NOT to scale but the difference between a river board/body board compared to one intended to be towed by an RWC can be huge. The *Extractor River X Extreme* top-left, is 4'8" long and approximately 130L in volume while the *WRS* in the middle is 6'4" long and around 180L and the *N Diver* on the right is 6'8" long and 280L. Make sure you read the dimensions and volumes to get an accurate idea of size.

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the top surface and for the bottom which is often the same as the entire board if it is rotomoulded or a solid foam. EPS=Expanded Polystyrene. EPP=Expanded Polypropylene

HANDLES TETHER POINTS: Tether points are the attachment D-Rings or in some cases simple thru-board holes that can be used for towing, hauling, securing and directional control but NOT NECESSARILY high speed towing by an RWC - see the next category for clarification.

RWC TOWING: whether or not the board can be towed at high speed by an RWC/PWC or similar high speed watercraft.

NOSEGUARD VALVE PLUG: NOSEGUARD or Bump protection - this can be a separate plastic or rubber nose, sometimes detachable as with the P2P Rescue Sled or it may be protection offered by a continuation up the side of a hull protection as with the WRS board. **VALVE** for inflatable boards - usually a combined inflate/deflate valve, some have an additional PRV or Pressure Release Valve in case of over-inflation. **PLUG** is present on some hollow boards as a drainage measure but can also be used to add ballast or extra floatation (expanded foam) .

SURF/SWIFTFLAT WATERICE: Surf and swiftwater are not necessarily the same as you can get fast moving water with virtually no wave-forms. Here we mean operating in sea waves/surf and fast moving water *with* waves where point loading on the crest or in the dip of a wave can snap or fold if not designed for the purpose. Flat water is flood, lakes and mud where the load is evenly distributed but this can also be 'calmer' swiftwater. **ICE** Any board/sled can be used if you're careful but true ice design requires a longer board, tougher materials (not usually inflatable) and provision for dragging, ice awls, etc.



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<p>Images NOT to Scale</p>					
					
<p>MANUFACTURER</p>	<p>ASAP</p>	<p>AQUACENTER</p>	<p>CARLSON</p>	<p>EXTRACTOR SLED</p>	<p>EXTRACTOR SLED</p>
<p>MODEL VARIANT</p>	<p>Rescue 156</p>	<p>Jet Ski Rescue</p>	<p>Carlson River Rescue</p>	<p>Mega</p>	<p>Pro</p>
<p>ORIGIN</p>					
<p>COST</p>	<p>£7421 \$9100 €8600</p>	<p>£565 \$700 €650</p>	<p>£405 \$500 €470</p>	<p>£1940 \$2400 €2250</p>	<p>£1730 \$2100 €1995</p>
<p>WEIGHT</p>	<p>30kg 66lb</p>	<p>13.6kg 30lb</p>	<p>5.7kg 12lb 9oz</p>	<p>31.8kg 70lb</p>	<p>27kg* 55lb*</p>
<p>INFLATABLE SOLID HOLLOW</p>	<p style="text-align: center;">■</p>	<p style="text-align: center;">■</p>	<p style="text-align: center;">■</p>	<p style="text-align: center;">■</p>	<p style="text-align: center;">■</p>
<p>LOAD BUOYANCY VOLUME</p>	<p>60kg 132lb 230L</p>	<p>N/A</p>	<p>75kg 165lb 120L</p>	<p>270kg 600lb 310L</p>	<p>180kg 397lb 160L</p>
<p>DIMENSIONS height x width x Depth</p>	<p>145 x 60 x 28cm 4'9" x 2' x 11"</p>	<p>N/A</p>	<p>142 x 61 x 10cm 4'8" x 2' x 4"</p>	<p>206 x 104 x 14cm 6'9" x 3'6" x 5.5"</p>	<p>160-170 x95x10cm 5'3"-5'7"x3'1.5"x<4"</p>
<p>MATERIALS: CORE EXTERIOR - Top EXTERIOR - Bottom</p>	<p>HD EPP N/A N/A</p>	<p>Drop-Stitch PVC UV-safe Mil-Rubber hard plastic 'sheet'</p>	<p>Closed cell polyethylene foam - hard plastic 'sheet'</p>	<p>HDPE & 10-13mm LDPE inner 3/8" PVC deck pad hard plastic 'sheet'</p>	<p>HDPE & 10-13mm LDPE inner 3/8" PVC deck pad HDPE</p>
<p>HANDLES TETHER POINTS</p>	<p>11+2* 3 (rear)</p>	<p>14 3</p>	<p>4 -</p>	<p>10 3</p>	<p>8or10 3</p>
<p>RWC TOWABLE</p>	<p>NO</p>	<p style="text-align: center;">■</p>	<p>NO</p>	<p style="text-align: center;">■</p>	<p style="text-align: center;">■</p>
<p>NOSE-GUARD VALVES PLUG</p>	<p style="text-align: center;">- - -</p>	<p style="text-align: center;">- 1 -</p>	<p style="text-align: center;">- - -</p>	<p style="text-align: center;">■ - 1</p>	<p style="text-align: center;">□ - 1</p>
<p>SURF/SWIFT FLAT-WATERICE</p>	<p style="text-align: center;">■ ■</p>	<p style="text-align: center;">■ ■</p>	<p style="text-align: center;">■ ■</p>	<p style="text-align: center;">■ ■ ■</p>	<p style="text-align: center;">■ ■ ■</p>
<p>OTHER COLOURS</p>				<p style="text-align: center;">■ ■ ■</p>	<p style="text-align: center;">■ ■ ■ ■ ■</p>
<p>NOTES</p>	<p>A water-Jet-propelled board 16kmh/. Price includes battery charger. *2 'pilot' handles</p>	<p>Includes handpump and repair kit</p>		<p>Range of RWC connection option packages</p>	<p>*Wt includes all optional extras. Tail buoyancy reduced for easier loading and inclined ride when towed. Optional Nose bumper</p>
<p>WEBSITE</p>	<p>asapwatercrafts.com</p>	<p>aquacenter.gr</p>	<p>carlsonriverboard.com</p>	<p>extractorsled.com</p>	<p>extractorsled.com</p>

COSTS: Any £€\$ shown in burnt orange are currency conversions only and will not include shipping, import duty and tax **USES/ FEATURES:** = PARTIAL FEATURE and/or



	EXTRACTOR SLED	EXTRACTOR SLED	EXTRACTOR SLED	HSA	ICE RESCUE SYSTEMS	JETRESCUE
	River X Rescue	RWCiD Pro	RWCiD Mega	Standard/Tow	RTS RaipdTransit-Sled (Ice)	Newks SL5A
	£905 \$1100 €1045	-	-	£1940 \$2400 €2250 \$2600	£2300 \$2800 €2660	£789 \$978 €915
	8.2kg 18lb	11kg 24lb	16kg 35lb	13.6kg 30lb	12.7kg 28lb	12kg 26.4lb
	■	■	■	■	■	■
	54.5kg 120lb 130L	approx 200L	>260L	114kg 250lb 200L 160kg 350lb 300L	310L	approx 120L
	142 x 61 x 15cm 4'8" x 2' x 6"	185 x 107 x 10cm 6'1" x 3'6" x 4"	229 x 109 x 10cm 7'6" x 3'7" x 4"	173x211x96 5'8"6'11"x3'26"x5"	158 x 127 x 15.4cm 5'2" x 4'2" x 6"	150 x 90 x 9cm 4'11" x 3' x 3.5"
	Rotomoulded PE 3/8" Textured PVC PE	Coated Drop-Stitch PVC Chemical welding Grooved PVC pad PE	Coated Drop-Stitch PVC Chemical welding Grooved PVC pad PE	Closed cell polyprop .5mm polyprop/EVA pad .5mm sheet polyprop	HD Polyethylene Foam deck pad HD Polyethylene	Heat Laminated PE Soft Deck Pad Hard skin
	6 7*	8 3	11-12 5	1113 3	6 4	10 3
	NO	■	■	□	NO	■
	□ - 1	■ HalkeyRoberts+PRV -	■ HalkeyRoberts+PRV -	■ --	---	■ --
	■ ■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
				top-skins replaceable		■
	Elbow recesses in deck. Base-Pic shows optional HDPE ice rails	DISCONTINUED inc pump with pressure gauge & bag. Optional Reflective strips	DISCONTINUED There was also a 16ft long 'TEAM' model to carry up to 10 people	PWC Mount kit NOT included. Also a larger 'Fish'-board with 180/400lb buoyancy.	Ice Awl pouches.	
	extractorsled.com	extractorsled.com	extractorsled.com	highsurfrescue.com	icerescuesystems.com	jetrescue.com

OK BUT NOT IDEAL ■ ■ ■ = Option INFLATION TIME: 300L= 1-2mins with manual/electric pump VALVES PRV=Pressure Relief Valve



















MANUFACTURER	LIFESLED		LIFESLED	LIFESLED	MARSARS	MFC INTERNATIONAL
MODEL VARIANT	WAHOO INTERNATIONAL		WAHOO INTERNATIONAL	WAHOO INTERNATIONAL	Ice Rescue Sled	Jet-Ski Board
ORIGIN	LS1	LS2	LS Inflatable		WR0213/001	
COST	£1700 \$2100 €1970	£2100 \$2600 €2440	£805 \$995 €935	N/A N/A	£2100 \$2700 €2500	
WEIGHT	15.5kg 34lb	19kg 42lb	13.6kg 30lb	13.6 30 11.3kg 25lb	9kg 20lb	
INFLATABLE	■	■	■	■	■	■
LOAD BUOYANCY VOLUME	approx 170L	approx 200 L	approx 160 L	10981kg 240180lb 350 L	150kg/330lb 300L	
DIMENSIONS height x width x Depth	160 x 95 x 12cm 5'3" x 3'1" x 4"	188 x 104.1 x 10cm 6'2" x 3'5" x 4"	107 x 96 x 15.25cm 5'6" x 3'2" x 6"	195 x 104.1 x 18cm 6'5" x 6' x 2'3" x 77"	160 x 95 x 12.5cm 5'3" x 3'1" x 5"	
MATERIALS: CORE	Composite	Composite	V-Drop-Stitch	EPS/HD Polyethylene	Glued Hypalon	
EXTERIOR - Top	-	-	UV-safe Mil-Rubber	HD Polyethylene	or Welded TPU	
EXTERIOR - Bottom	-	-	-	HD Polyethylene	-	
HANDLES TETHER POINTS	10 3	12 3	12 3	8 3 (4 2)	10 3	
RWC TOWABLE	■	■	■	NO NO	■	
NOSE-GUARD VALVES PLUG	■ - -	■ - -	■ 1 -	- - -	- 1x Leaffield -	
SURF/SWIFT FLAT-WATER ICE	■ ■	■ ■	- ■	■ ■	■ ■	
OTHER COLOURS			-		■	
NOTES			Includes pump, transport bag & repair kit	integrated 4:1 haul system & rollers within the board to pull victims on-board. Ice Awl pouches.	Inflation Pressure=0.86Bar Includes Repair kit & Carry Bag	
WEBSITE	lifesled.com	lifesled.com	lifesled.com	marsars.com	mfc-international.com	

COSTS: Any £€ shown in burnt orange are currency conversions only and will not include shipping, import duty and tax **USES/ FEATURES:** = PARTIAL FEATURE and/or



	N DIVER	NRS	P2P RESCUE	P2P RESCUE	P2P RESCUE	P2P RESCUE
	Rescue Life Board	Rescue Board	Rescue Sled	Inflatable Sled	Lg Inflatable Sled	Responder
	£627 \$777 €728	£400 \$495 €465	£1780 \$2200 €2065	£767 \$950 €890	£805 \$995 €935	£2660 \$3295 €3090
	14kg 30.9lb	18.2kg 11lb	14.5kg 32lb	9kg 20lb	10.5kg 23lb	18.2kg 40lb
	■	■	■	■	■	■
	200kg 441lb 280L	135L	100L	approx 160L	approx 200L	135L
	185 x 105 x 15cm 6'1" x 3'5" x 5.9"	145x 63.5 x 10cm 4'9" x 2'1" x 4"	167.6 x 91.5 x 10cm 5'6" x 3' x 4"	167.6 x 91.4 x 10cm 5'6" x 3'3" x 4"	182.9 x 106.7 x 10cm 6' x 3'6" x 4"	213.3 x 86.3 x 10cm 7' x 34" x 4"
	PVC Drop Stitch or Hypalon Non-slip EVA PVC/EVA	PVC Drop Stitch - -	EPP High Density Plastic Multi-layer skin	- Neoprene Multi-layer skin	- Neoprene Multi-layer skin	EPS/Fibreglass - -
	12 7	6 2	9 3	12 5	14 3	11 3
	■	■	■	■	■	■
	- 1x Leaffield -	- Leaffield 1xD7 1xPRV -	■ - -	- 1 -	- 1 -	■ - -
	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■ ■
			■	■ ■ □	■ ■	
	Inc Hand-pump, bag & repair kit.	Includes pump and repair kit	Replaceable Nose Cone	Includes pump, transport bag & repair kit	Includes pump, transport bag & repair kit	Plastic protection nose-skid
	ndiver.com	nrs.com	p2prescue.com	p2prescue.com	p2prescue.com	p2prescue.com

OK BUT NOT IDEAL ■ ■ ■ = Option INFLATION TIME: 300L= 1-2mins with manual/electric pump VALVES PRV=Pressure Relief Valve

<p>Images NOT to Scale</p>					
					
<p>MANUFACTURER</p>	<p>PPC FOILING</p>	<p>SUNTECH (LIQUID SHREDDER)</p>	<p>SUNTECH (LIQUID SHREDDER)</p>	<p>SUNTECH (LIQUID SHREDDER)</p>	<p>SUNTECH (LIQUID SHREDDER)</p>
<p>MODEL VARIANT</p>		<p>5859" Rescue Sled</p>	<p>62" Rescue Sled</p>	<p>66" Rescue Sled</p>	<p>71" Rescue Sled</p>
<p>ORIGIN</p>					
<p>COST</p>	<p>£1010 \$1290 €1220</p>	<p>£735 \$909 €853</p>	<p>£760 \$939 €881</p>	<p>£810 \$999 €940</p>	<p>£840 \$1039 €975</p>
<p>WEIGHT</p>	<p>8.2kg 18lb</p>	<p>9kg 20lb</p>	<p>10.8kg 23.8lb</p>	<p>13kg 28.6lb</p>	<p>10.8kg 23.8lb</p>
<p>INFLATABLE ■ SOLID ■ HOLLOW ■</p>	<p>■</p>	<p>■</p>	<p>■</p>	<p>■</p>	<p>■</p>
<p>LOAD BUOYANCY VOLUME</p>	<p>approx 200L</p>	<p>93 124L</p>	<p>131L</p>	<p>139L</p>	<p>162L</p>
<p>DIMENSIONS height x width x Depth</p>	<p>184 x 106 x 11cm 6'1" x 3'3" x 4.4"</p>	<p>148 x 89 x 11cm 4'1011" x 2'11" x 4.4"</p>	<p>158 x 92 x 11cm 5'1" x 3' x 4.4"</p>	<p>168 x 92 x 11cm 5'6" x 3' x 4.4"</p>	<p>181 x 99 x 11cm 6'1" x 3'3" x 4.4"</p>
<p>MATERIALS: CORE EXTERIOR - Top EXTERIOR - Bottom</p>	<p>Moulded Foam EVA traction top triple layer PVC</p>	<p>EPS & Alu stringers non-slip. Anti-Delamination Vinyl 0.6-0.9mm vinyl</p>	<p>EPS & Alu stringers non-slip. Anti-Delamination Vinyl 0.6-0.9mm vinyl</p>	<p>EPS & Alu stringers non-slip. Anti-Delamination Vinyl 0.6-0.9mm vinyl</p>	<p>EPS & Alu stringers non-slip. Anti-Delamination Vinyl 0.6-0.9mm vinyl</p>
<p>HANDLES TETHER POINTS</p>	<p>8 3</p>	<p>14 3</p>	<p>14 3</p>	<p>14 3</p>	<p>14 3</p>
<p>RWC TOWABLE</p>	<p>■</p>	<p>■</p>	<p>■</p>	<p>■</p>	<p>■</p>
<p>NOSE-GUARD VALVES PLUG</p>	<p>■ 1 -</p>	<p>■ - 1</p>	<p>■ - 1</p>	<p>■ - 1</p>	<p>■ - 1</p>
<p>SURF/SWIFT FLAT-WATER ICE</p>	<p>■ ■</p>	<p>■ ■</p>	<p>■ ■</p>	<p>■ ■</p>	<p>■ ■</p>
<p>OTHER COLOURS</p>					
<p>NOTES</p>	<p>Foam core is moulded not CNC cut.</p>	<p>Alu stringer is an H-profile aluminium bar running thru centre line</p>	<p>Alu stringer is an H-profile aluminium bar running thru centre line</p>	<p>Alu stringer is an H-profile aluminium bar running thru centre line</p>	<p>Alu stringer is an H-profile aluminium bar running thru centre line</p>
<p>WEBSITE</p>	<p>ppcfoiling.com</p>	<p>suntechboard.com</p>	<p>suntechboard.com</p>	<p>suntechboard.com</p>	<p>suntechboard.com</p>

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SONAR EMILY
















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

SWIFT WATER RESCUE EMILY

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



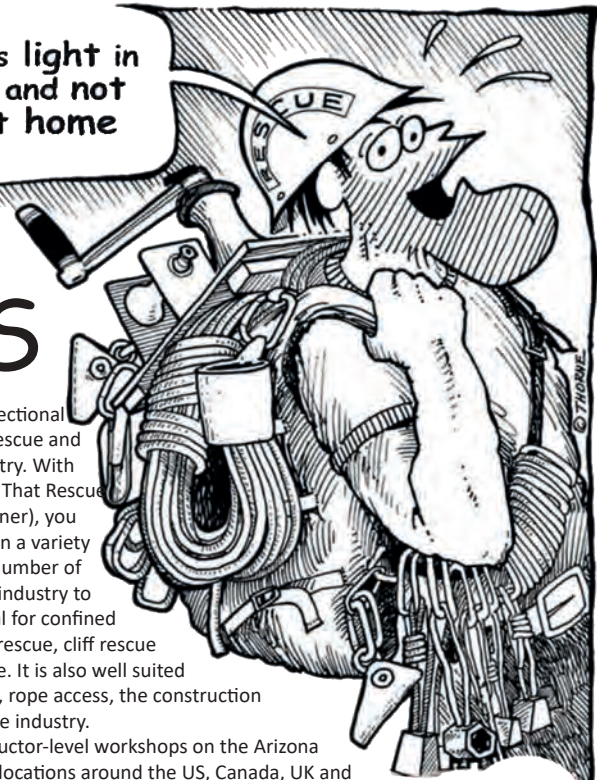
For UK: info@emilyrobotuk.co.uk
For US: info@hydronalix.com

<p>Images NOT to Scale</p>					
					
<p>MANUFACTURER</p>	<p>TIKI FACTORY</p>	<p>TIKI FACTORY</p>	<p>TIKI FACTORY</p>	<p>TIKI FACTORY</p>	<p>WRS</p>
<p>MODEL VARIANT</p>	<p>Rescue Rocket</p>	<p>Rescue Sweamner</p>	<p>Rescue Sled</p>	<p>Rescue Plan 205*</p>	<p>Rapid D</p>
<p>ORIGIN</p>					
<p>COST</p>	<p>£80 \$100 €92</p>	<p>£140 \$171 €160</p>	<p>£560 \$700 €650</p>	<p>£1076 \$1335 €1250</p>	<p>£860 \$1120 €985</p>
<p>WEIGHT</p>	<p>2kg 4.4lb</p>	<p>3kg 6.6lb</p>	<p>8kg 17.6lb</p>	<p>7.5kg 15.5lb</p>	<p>13.5kg 30lb</p>
<p>INFLATABLE SOLID HOLLOW</p>	<p>■</p>	<p>■</p>	<p>■</p>	<p>■</p>	<p>■</p>
<p>LOAD BUOYANCY VOLUME</p>	<p>38 L</p>	<p>70 L</p>	<p>160 L</p>	<p>160 L</p>	<p>180 L</p>
<p>DIMENSIONS height x width x Depth</p>	<p>98 x 43 x 10cm 3'2" x 1'5" x 4"</p>	<p>110 x 70 x 10cm 3'8" x 2'4" x 4"</p>	<p>168 x 99 x 10cm 5'6" x 3'3" x 4"</p>	<p>205 x 70 x 10cm 5'6" x 2'4" x 4"</p>	<p>160 x 95 x 12cm 6.3 x 3.7 x 4.7"</p>
<p>MATERIALS: CORE EXTERIOR - Top EXTERIOR - Bottom</p>	<p>Drop-Stitch PVC Tactile EVA pad PVC</p>	<p>Drop-Stitch PVC Tactile EVA pad PVC</p>	<p>Drop-Stitch PVC Tactile EVA pad Extra PVC half layer</p>	<p>Drop-Stitch PVC Tactile EVA pad Extra PVC half layer</p>	<p>Drop-Stitch PVC Non-Slip EVA pad Polymer clad</p>
<p>HANDLES TETHER POINTS</p>	<p>4 0</p>	<p>2 10</p>	<p>12 3</p>	<p>6 0</p>	<p>10 3</p>
<p>RWC TOWABLE</p>	<p>NO</p>	<p>NO</p>	<p>■</p>	<p>NO</p>	<p>■</p>
<p>NOSE-GUARD VALVES PLUG</p>	<p>- 1 -</p>	<p>- 1 -</p>	<p>- 1 -</p>	<p>- 1 -</p>	<p>■ 2x Leaffield -</p>
<p>SURF/SWIFT FLAT-WATER ICE</p>	<p>■ ■</p>	<p>■ ■</p>	<p>■ ■</p>	<p>■ ■</p>	<p>■</p>
<p>OTHER COLOURS</p>					
<p>NOTES</p>	<p>Alternative to the lifeguard can or torpedo. Inflation in <1min pack size 40x27x10cm</p>	<p>Inflation in 1min Optional, detachable stabilising fins (for hull) pack size 70x15x15cm</p>	<p>Inflation in 3mins or <1min with CO cylinder pack size 70x50x20cm</p>	<p>*also a 215cm version with inflatable side walls see WATER RESCUE BUYERS GUIDE Inflation in 3mins or <30sec with CO cylinder pack size 70x27x18cm</p>	<p>Pack size 100x55x15cm</p>
<p>WEBSITE</p>	<p>rescue.tiki-factory.com</p>	<p>rescue.tiki-factory.com</p>	<p>rescue.tiki-factory.com</p>	<p>rescue.tiki-factory.com</p>	<p>wrsinternational.com</p>

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Ropes That RESCUE[®] Ltd.

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



2023/24 COURSES

ARIZONA VORTEX COURSES

The ARIZONA VORTEX (or AZV) is expressly considered an "artificial high directional" used as a true 1) high frame directional (at the edge or over an opening) or 2) anchor frame. It is so named from it's development in the rugged highlands of northern Arizona's Oak Creek Canyon through the rigging and rescue school, **Ropes That Rescue**. Reed Thorne, the school's owner, developed the AZV with the help of Rock Thompson at Rock Exotica, in Utah. The AZV was created from years of trial and error and of having worked with crude but functional lashed wood frames at RTR. The A.Z.O.R.P. (AZORP = Arizona Omni Rigging Pod) is a valuable accessory to the ARIZONA VORTEX which adds to its ultimate versatility when used in tandem. Anchoring frame back-from-the-edge rigging monopods, bipods and tripods may therefore be constructed using the AZORP + VORTEX adding valuable rigging elements to any rope rescue or rope access operation or job. The ARIZONA VORTEX is manufactured from T-6 aluminum by Thompson Manufacturing Inc. (Rock Exotica) in Clearfield, Utah and is one of the most versatile and state of the

artificial high directional (AHD) available to rescue and rope access in industry. With training from Ropes That Rescue (the "Arizona" designer), you may use this frame in a variety of ways and in any number of environments from industry to wilderness. It is ideal for confined space rescue, mine rescue, cliff rescue and industrial rescue. It is also well suited to bridge inspectors, rope access, the construction trades and the movie industry. We offer many instructor-level workshops on the Arizona VORTEX in differing locations around the US, Canada, UK and Australia (and around the world). See the RTR Open Enrollment Schedule for these offerings under "Artificial High Directional Workshop" or AHDW.

WORKSHOP OR SEMINAR	STATE COUNTRY DATE & FLYER	TYPE	VENUES Classroom-Wilderness or Industrial	Req. Equip You will NEED	Duration Days	Physical exertion Easy 1 Hard 10	Prerequisites (if any), Program Liaison & Special Notes	Location & Sponsor <small>See Website for Flyers</small>	Tuition <small>(Other non-RTR costs may apply)</small>	RTR Lead Instructor(s)
Personal Skills Rescue Workshop	MI Oct 16-22 2023	Solo-Semi Solo Rescue	Classroom Industrial & Wilderness	PSRW Equip List 4/21	Monday/Sunday 7 days	8	No Prerequisite Good physical conditioning strongly recommended. Liaison: Michael DeCraene	Michigan USA Grand Ledge - Auburn Hill See 2021 Program Flyer	\$1,650	Michael DeCraene
Artificial High Directional Workshop	AU October 21-27, 2023	Arizona VORTEX	Classroom Industrial & Wilderness	AHDW Equip List 7/22	Saturday/Friday 7 days	4	No Prerequisite Prior rope rigging experience strongly recommended.	Adelaide SOUTH AUSTRALIA Hosted by Fire & Rescue Australia Training	Contact HOST	Reed Thorne & Keith Thorne
Advanced Skills Rescue Workshop	AU Oct 30-Nov 5, 2023	Advanced Highlines	Classroom & Wilderness	General Equip List 7/22	Monday/Sunday 7 days	8	Prerequisite: Must have completed one program: TSRW, OHRW, IRW, AHDW from RTR (PSRW/STRW do not qualify)	Mt. Arapiles VICTORIA, AUSTRALIA Hosted by Fire & Rescue Australia Training	Register with HOST and NOT with RTR	Reed Thorne & Keith Thorne Len Batley Joel Graham
INTERNATIONAL TECHNICAL RESCUE SYMPOSIUM - Location Pending, November 2 through 5, 2023										
Tree Rescue Workshop-Firefighter	CA Nov 14-20, 2023	Bottom Up Tree Rescue	Classroom & Wilderness ONLY	TRW-F Equip List 7/22	Tuesday/Monday 7 days	10 tree climbing required	Prerequisite: Climbing Trees This program is specifically designed for responding tree emergency personnel in excellent fitness	California USA Nevada City See TRW-F Program Flyer	\$1,650	Keith Thorne & Reed Thorne
Tactical Wilderness Rescue Wkshp	AZ Dec 2-8, 2023	REMS-Rapid Deployment Mnt Rescue	Classroom & Wilderness ONLY	Equip List 7/22	Saturday/Friday 7 days	7 rough terrain inherent	No Prerequisite Concentrates on low and steep angle litter evacuations. Ideal for Rapid Extrication Module Support (REMS) Teams. Guest Instructor: Dale Stewart, AHS Rescue	Arizona USA Town of Jerome See TW/RW Program Flyer	\$1,650	Reed Thorne Guest Inst: Dale Stewart
2024										
Team Skills Rescue Workshop	MD April 21-27	General Team Rescue	Classroom Industrial Wilderness	TSRW Equip List 7/22	Sunday/Saturday 7 days	5	No Prerequisite Prior rope rigging experience strongly recommended.	Maryland USA Chesterfield Fire & EMS Contact Instructor Mike Green See 2021 MD Venue Flyer	\$1,650	Mike Green
Artificial High Directional Workshop	UT May 13-19, 2024	Arizona VORTEX	Classroom Industrial & Wilderness	AHDW Equip List 7/22	Monday/Sunday 7 days	6 some hiking	No Prerequisite Prior rope rigging experience strongly recommended.	Utah USA Rock Exotica & South Dade Metro Fire See Utah Program Flyer	\$1,750	Reed Thorne & Keith Thorne
Team Skills Rescue Workshop	CO Dates TBA May 2023	General Team Rescue	Classroom Industrial and/or Wilderness	TSRW Equip List 7/22	7 days	2	No Prerequisite Denver Fire and local fire agency will take most open spots in this workshop but a certain amount of open enrollment spots may become available as in 2022	Colorado USA Denver Fire Dept. (Taught at COORS FIELD, RED ROCKS and other local Denver venues)	TBA	Reed Thorne & Keith Thorne
Tree Rescue Workshop-Firefighter	CA November 2024	Bottom Up Tree Rescue	Classroom & Wilderness ONLY	TRW-F Equip List 7/22	7 days	10 tree climbing required	Prerequisite: Climbing Trees This program is specifically designed for responding tree emergency personnel in excellent fitness	California USA Nevada City See TRW-F Program Flyer	\$1,750	Keith Thorne & Reed Thorne

www.ropesthathatrescue.com

rock exotica
GEAR FOR THE Z AXIS

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.

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

COLOR CODED



EDGE RESTRAINT



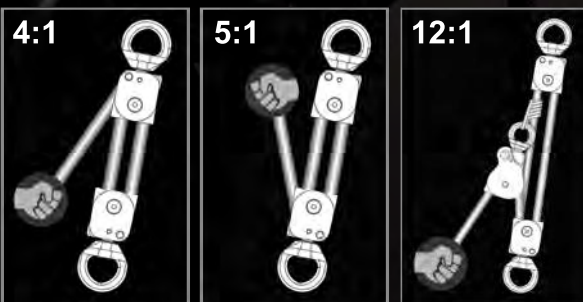
LOW TENSION RELEASE



50' CORD LENGTH



SWIVEL CONNECTION



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

MIN LENGTH
9" (22.8cm)

< WIDE RANGE OF OPERATION >

MAX LENGTH
13' (4m)