IRATA SAFETY BULLETIN SB21.2

Discussion on rescue training incidents

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2. Selection of back-up devices used for two-person use

2.1 The function of a back-up device is to prevent a fall or injury in the unlikely event of any kind of problem with the working line system. [i.e. not just main line failure].

2.1.2 IRATA ICOP section 2.7.1 and 2.7.7 says before each job users should select the most appropriate equipment, assess likelihood of foreseeable misuse and put in suitable control measures. This applies particularly if equipment is to be used differently from its intended purpose, or from the tests included within the standard to which it has been tested. Common sense suggests the overriding factor is that equipment should be fit for purpose.

2.1.3 Devices used as back-ups may conform to different 'industrial' standards. For example;

- EN 353-2 [fall arrest standard] e.g. ISC Rocker, Petzl ASAP, Komet Stick & Run
- EN12841 type A [Rope access systems - rope adjustment devices

2.1.4 ICOP 2.7.7.2 says: "When back-up devices are dynamically tested in accordance with standards, the tests represent a (vertical) free-fall. In certain circumstances, an uncontrolled descent may not be a free fall and the back-up device may not activate…..back-up devices should be selected which are known to perform in such a way that an uncontrolled descent at all angles likely to be encountered during use would be prevented or minimized".

2.1.5 ICOP 2.7.1.3.4 also says: "just because a piece of equipment does not claim conformity to a particular standard, it does not necessarily mean that it is unfit for use".

2.2 Petzl Shunt [EN 567 Rope clamps – 'mountaineering' standard for recreational use]

2.2.1 Normally reference should be made to the manufacturer's website and equipment user information. However, the information provided with a Shunt does not reflect use as a back-up device in rope access.

2.2.2 The IRATA website www.irata.org contains Shunt Guidance (January 2008 and August 2009) from IRATA in 'Safety Notices' section and a specialist statement Petzl statement on use of the Shunt in 'Technical Information' section.
http://www.irata.org/irata_technicians.htm

2.2.3 Tests at an assessor workshop showed that in extreme conditions, in this case a 200 kg steel mass dropped onto a 1 m device lanyard (cow's tail) attached to a Shunt placed immediately below the anchor knot [fall factor one], the shunt slipped 5 m to the ground without slowing. When repeated with a mid-rope knot, the Shunt detached from the rope. A static load of 200 kg is near the limit of the Shunt's resistance to slipping. The Shunt will usually slip at slightly higher values with larger diameter rope.

2.2.4 Subsequent less severe tests with dummies [more comparable to a body and less severe than a steel mass] of lower mass, e.g. 150 kg with a lower fall factor have shown that a Shunt can hold after variable slippage. [See http://www.youtube.com/watch?v=Jv-YCRb6xbI] However the amount of slippage will vary depending on the actual mass and

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height fallen for any particular incident. An uncertain outcome with a dynamic two-person load poses questions about the suitability of the Shunt as suitable back-up device for rescue loads.

2.2.5 In May 2009, Petzl issued a specialist statement on "*continued use of the shunt in professional rope access*" stating that this (back-up for rope access) use falls outside the general instructions issued. [25.05.09 http://www.irata.org/irata_technicians.htm]. Petzl say: "use of a Shunt as a back-up device for more than one person requires careful consideration" and "Responsibility for use remains with the user and employer". "We remind you that in this application the Shunt is not covered by EN 353-2 and EN 12841 standards"

2.2.6 IRATA Shunt guidance 2008 [http://www.irata.org/safety_notices.htm] says: "WARNING: If there were working line failure during a two-person rescue, a shunt is likely to slip many metres if used in a regular way [i.e. slack back-up lanyard [cow's tail] /approx fall factor 1]".

"It is good practice at all times to minimise slack in the back-up lanyard, but especially during a two-person rescue". Keep the potential fall distance to an absolute minimum by having minimal slack in the back-up lanyard".

2.2.7 IRATA Safety Bulletin 17 says: - All users of Shunts should be made aware during training of methods of use and possible misuse, including:

a) diameter and configuration of Shunt cord e.g. length, with / without knots in the end;

b) length/type of device lanyard (cow's tail) and attachment to harness;

c) chosen method of operation and use with / without gloves.

NOTE The chosen method of operation should not impede the functioning of the back-up device in case of any working line problem.

2.2.8 Failure to let go of the Shunt cord when necessary is foreseeable misuse, Ref ICOP 2.7.7.5 and is a separate issue from use of the Shunt for rescue loads. This potential problem applies to both single person use and two person use in rescue.

2.2.9 Tests on single person descents at an IRATA meeting at Petzl HQ to simulate working line failure, incorporating an additional dynamic safety line managed by a third party, were done with very experienced volunteers to see if the Shunt cord would be released. In 25% of cases, the fall was held by the safety line, as the Shunt had not been released, even though the fall was expected. It was suggested that diameter and configuration of Shunt cord, use of gloves and how the cord was held with particular descenders may have influenced the result. To be effective in an incident, [if the Shunt cord is held when the handle on the descender is being operated] the method of holding the cord must be so light that release will be an involuntary action.

2.3 Other back-up devices

2.3.1 Devices such as the Petzl ASAP which conform to an industrial standard such as EN 12841 Type A are widely used in many European countries as required by their legislation. Use of the ASAP for two-person rescue falls outside EN 12841, but Petzl approve two-person rescue use providing it is used with an Absorbica energy absorbing lanyard http://www.petzl.com/en/node/10072).

2.3.2 Detractors of the ASAP point to a variety of factors such as the complex mechanism suggesting it will be prone to problems with work such as spray painting or blasting, difficulty of working with the very short attachment lanyard. However, European operator members claim to have few problems with these back-up devices in such use.

3. Control measures in rescue training [in no particular order].

3.1 Height of rescue

3.1.1 Very low height [less than 1.5 m for descender] – Use for initial training to get correct sequence, even though back-up is likely to be ineffective at this height. For example, it could be from standing height to laying the casualty on the ground.

3.1.2 Low height [around 2 m for descender] A benefit is that it is easy to observe. When operating close to the ground or other structure, users need to be aware of the 'clearance'

required (refer to manufacturer's information) and to minimize any potential impact by the variety of ways which maintain any back-up device in a high position.

3.1.3 Intermediate height [over 4.5 m] Not as easy to observe without a suitable platform, but if casualty transfer is done here [with pre-descent checks] there is adequate 'clearance distance' and greater distance for devices or operator to stop the descent. There is a chance of more serious injury as height increases, but could still be a problem if a problem occurs later at a low height. There is the option to stop the exercise at 2 m and separate the rescuer and the casualty.

3.1.4 Calculation for rescue clearance with ASAP and Absorbica, i.e. full deployment of energy absorber (1.4 m), clearance from sternal attachment to their feet (1.5 m), clearance below their feet to avoid hitting obstruction (1 m). 1.4 m + 1.5 m + 1 m = 3.9 m minimum clearance required for one person. During a rescue, the 'casualty' normally will hang below the rescuer, so an extra 0.7 m allowed for failure of short connecting anchor lanyard (cow's tail), giving a total of 4.6 m.

3.2 Trainer /assessor supervision

3.2.1 Techniques demonstrated need to be explicit and early intervention made if trainees do not follow procedure. Assessment is more difficult, as the assessor does not want to intervene too early.

3.2.2 Suitable management of sequence of training exercises / appropriate trainer to trainee ratio to be able to observe and intervene.

3.2.3 Trainer and other trainees buddy check and function check, particularly before descent, also throughout the rescue by 'casualty'. Also, possible 'bottom belaying' in each rescue.

3.2.4 Trainer checking to ensure device lanyard (cow's tail) to Shunt [if Shunt used] is within rescuer's reach to avoid accidental locking onto safety line.

3.2.5 Trainer checking to ensure minimal slack in device lanyard (cow's tail) if Shunt used.

3.2.6 'Bottom belaying' as an additional control to prevent uncontrolled descents, and avoid confusion between ropes, though less useful when working line goes through a braking karabiner and is held high.

3.2.7 The casualty's backup device left on and managed by the casualty throughout the exercise.

3.2.8 A blocking knot at 2 m on working line may be effective, but is questionable because of rope stretch and potentially high impact forces and needs 'bottom belaying' to release.

3.3 Alternative techniques

3.3.1 Alternate operation of the descender and Shunt in a rescue exercise is an option and is widely used during single person descent training. Without good working line control, descent may not be smooth and will result in a higher fall factor for the back-up device each time it is lowered.

3.3.2 Rescue using two descenders with various options:

- both descenders attached to the 'casualty';
- both descenders attached to the 'rescuer';
- one descender / back-up on each person and operated alternately 300/400 mm increments – suited for short descents and avoids two-person loading of equipment. During the above option to use a back-up on a third rope, back-up device/s left above one or both descenders.

3.4 Additional fall protection systems

3.4.1 Additional safety line controlled by third party. Ideally, 'top rope', but less satisfactory if extra safety line goes over a pulley, because of rope stretch with two-person load at low height.

3.4.2 Consider use of controlled rate descender [centrifugal brake type] rated for two-person loads.

3.4.3 Additional fall arrest systems may be inappropriate, unless they are approved by the manufacturer with a two-person load and limited clearance height.

3.5 Other options

3.5.1 Impact absorbing flooring /mattresses to minimise injury if all else has failed.

3.5.2 Use of different coloured working and safety lines to help avoid confusion between ropes.

3.5.3 Greater use of a dummy/ manikin will minimise number of people at risk, but inconvenient to position initially.

3.5.4 Use of support seat is recommended for 'casualty', though care is necessary to ensure correct loading when transferring load to rescuer and loading of stitching on central loop of sit harness.

3.5.5 Where possible, avoid two-person loading of equipment, e.g. by lifting or lowering the casualty.

4. Summary of standard operational checks before descent

NOTE *Where practicable, the operational checks before descent should be part of a buddy / supervisor check. Although specific to this incident, the following controls apply to the majority of rope access systems.*

4.1 Carry out a 'pre-use check' of equipment: visual/ tactile/ functional (see manufacturer's instructions).

4.2 For the initial descent, where possible attach an anchor lanyard (cow's tail) to an anchor during a 'function test'/'mini-abseil' see (4.5) below.

4.3 Attach the back-up device to the safety line and maintain it in a high 'hands off' position until all the checks described below have been completed.

a) check the back-up device attachment karabiner is correctly closed;

b) check for correct attachment and orientation of the back-up device on the safety line by pulling down on the device lanyard.

4.4 Attach the descender to the working line. Check that:

a) the descender karabiner is correctly closed, with the opening towards the user and pointing downwards;

b) the working line is threaded into the descender as illustrated on the descender and/ or as the information supplied by manufacturer;

c) the catch on descender side plate is fully closed, if one is present. Otherwise, check the instructions for the correct installation of the device to the harness or anchor.

4.5 Carry out a function test /descent test /mini-abseil as follows:

a) with either the back-up device in a high 'hands off' position or an anchor lanyard (cow's tail) attached, unlock the descender with a secure grip on the control rope and do a 150-200 mm descent, until the descender is functioning correctly and a controlled descent can be made. If an anchor lanyard (cow's tail) is used for protection, it should then be removed;

b) at any time before recommencing a descent, particularly if the descender may have been unweighted at a worksite, carry out the 'function test /mini abseil' (i.e. do a 150-200 mm descent with the back-up device in a high position).