

100kg Abseil Position Drop Test

Venue: Gridins Training Centre, Lithuania

Dates: 21st & 22nd May 2012

Testers: C Parkin - Auditor/Assessor, Arturas Vengalis - L3 Training Manager Gridins) V Tomas Daugintis – L3 (Gridins), Robertas Daugintis - L3 (Gridins), Arunas Saulinskas - L1 (Gridins), Adriano Peixoto - L3 Assessor (Alpitec/S.Tec), Rogerio Matos- L3 Assessor (Alpitec).

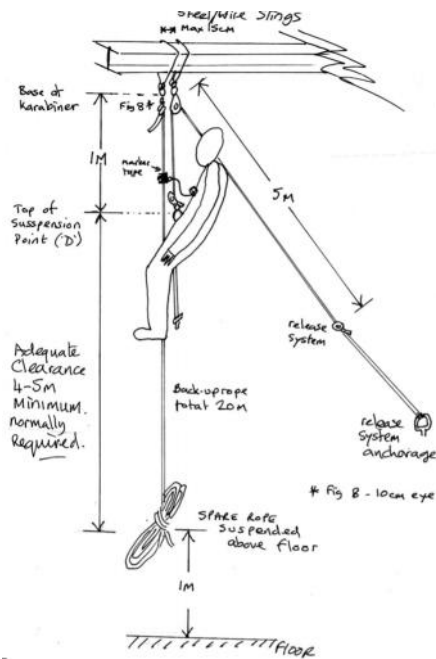
The test was designed to investigate the effectiveness of devices when positioned in the extreme lowest acceptable position whilst descending or at the work-site. Live tests would be required to investigate the issues relating to operator handling of the devices.

All test completed on new sections of 11mm Marlow LSK Low-stretch Rope (EN 1891A).

100kg was used as the test load (2 x 50kg weight bags) that was suspended 1m below the anchor point using a Test Plate with facilities to simulate both Waist (ventral) and Chest (sternal) attachment of cows-tails or supplied lanyards.

The 100kg tests primarily showed the device and cows-tail/lanyard performance as there was only 1m of rope above the load point.

This simulates a serious scenario at the top of an anchored rope where there is very little rope stretch to absorb load. The stretch and the knot tightening was measured and recorded. (Found to be around 10% - 9cm -16cm in the 1m of rope and knot).



Pictures showing the test plate with both waist and chest attachment points.

Weight Bags 50Kg each.

Left: Set-up for chest attachment.



Right: Set-up for waist attachment

The tests involved the following devices, three are know to members and three others are newly developed and in final production stages of development. Some field investigations have been under taken by UK North Sea Operator members, the ISC RED, DMM Catch and S.Tec Duck are scheduled for field trials July & August 2012.



ISC **RED** -EN tests scheduled at SATRA - June 2012

A simple to use swing plate device with a large karabiner connection eye and a short tug cord (not fitted on pic.) for manual positioning on the Back-up Rope. The RED can be positioned by the user and will stay in that position. For use with up to 80cm Dynamic Rope Cows-tail (Inc. Karabiners) Waist or Chest Attachment. (Shorter Cows-tail required when used on chest point).

Tested with: 80cm cows-tails with Fig 8 knots



S.Tec **Duck R** – EN12841A Tests Completed by SGS - 17.05.12

Fitted with 4cm tug cord for manual positioning on the Back-up Rope. The Duck R can be positioned by the user and will stay in that position. Can be used with either the S.Tec 45cm Webbing Lanyard (chest) or Dynamic Rope Cows-tail - 80cm max (waist).

Waist or Chest Attachment options.

Tested with both 45cm Lanyard and 80cm cows-tails with Fig 8 knots

DMM **Catch** - EN12841A Tests Completed by SGS - 17.05.12



A sprung version of the DMM Buddy, allowing it to be positioned high on the back-up rope and stay in the optimum position. Fitted with a handle and panic button. Can be used with either DMM Two Point Cows-tail or Dynamic Rope Cows-tail - 80cm max.

Waist or Chest Attachment.

Tested with the DMM Two Point Cows-tail (long x 2 short x 1).



SAR **Rocker** – EN 12841A

A well-established EN353, EN 358 and EN 12841A for use as a rope access Back-up.

Supplied with 10. 20 & 30cm SAR Twin-eye lanyards.

Tested with SAR 30cm and 10cm Twin-eye lanyard



Petzl **ASAP** - EN 12841A
A commonly used device, differs from all others tested, it has teeth that lock it on the rope. It must be used with one of three Petzl lanyards: ASAP'SORBER 20, ASAP'SORBER 40 or ABSORBICA L57.
Chest Point attachment.

Tested with L57 Absorbica



Petzl **Shunt** EN 567

Well Known device. Use as a back-up not supported by the manufacturer, but widely use as such by IRATA members, and the use of the device as a back-up is endorsed by IRATA subject to a risk assessment.

Tested with: 80cm cows-tails with Fig 8 knots – waist attachment.

Steel version of DMM Cows-tail – Nylon version has the same mid-point connection ring.



This test was set up with the back-up device at the abseil descent position with 100kg load suspended on a descent device 1m below the anchor point.

Cows-tailed devices were at the lowest acceptable height – above the descender.

Lanyarded devices were in the 'hang down' free running position.

NB1. During descent the fall distance for all devices would be shorter if the devices were managed in higher positions and/or shorter cows-tails /lanyards.

NB2. At the work site **all** devices can and should be positioned high, the Rocker and ASAP* require locking to maintain this high position. High positioning and minimal slack in cows-tails or lanyards will ensure that device deployment and slippage is minimal and fall distances mainly due to rope stretch.

* Repeated deliberate locking can accelerate wear on the ASAP - <http://www.petzl.com/files/all/product-experience/PRO/B71-PE-ASAP-EN.pdf>

NB3. Many operatives are more than 100kg.

Device	S.Tec <i>Duck R</i>			S.Tec <i>Duck R</i>			ISC <i>RED</i>			Petzl <i>ASAP</i>			SAR <i>Rocker</i>				DMM <i>Buddy Catch</i>			Petzl <i>SHUNT</i>		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	4	1	2	3	1	2	3
Connecting Lanyard	S.Tec, Chest point 65cm, Inc karabiners			Cows-tail - Waist 1m inc. karabiners			Cows-tail - Waist 1m inc. karabiners			L57 - Chest			Drops 1, 2 & 3 used 30 cm SAR Twin-Eye: 50cm inc Karabiners Drop 4 – 10cm SAR twin-eye: 30cm inc Karabiners				DMM Waist: 1m inc.karabiner		DM M Chest 45cm inc. K	Cows-tail - Waist 1m inc. karabiners		
Device movement/slippage.	22 cm	25 cm	25 cm	30 cm	32 cm	34 cm	3 cm	3 cm	5 cm	33 cm	6 cm	-	49 cm	89 cm	65 cm	60 cm	16.5 cm	27 cm	7 cm	23 cm	30 cm	36 cm
Device Stopping distance (slippage + back-up rope stretch)	38c m	37c m	40c m	42c m	43c m	43c m	13c m	14c m	16c m	33c m	24c m	-	75c m	106c m	80 cm	72 cm	28c m	32c m	21c m	34cm	44cm	49cm
Lanyard extension *measured whilst still loaded.	1cm	1cm	1cm	22c m	24c m	21c m	27c m	26c m	29c m	11c m	24c m	-	0	0	0	0	0	0	0	26cm	33cm	34cm
Fall Distance - the most important issue.	0.86 m	0.88 m	0.93 m	1.42 m	1.38 m	1.40 m	1.08 m	1.09 m	1.08 m	1.16 m	1.2 m	-	1.66 m	1.98 m	1.75 m	1.3 m	0.97 m	1.06 m	0.61 m	1.44m	1.49m	1.56m

<p>S.Tec - Duck R</p> <p>Rope: slight bulge and light glazing. S.Tec have confirmed no damage to Device Lanyard has stitching only failure to protective cover only Lanyard OK</p> <p>With Cows-tail: Some variation due to cows-tail tying. Additional fall distance due to cows-tail tightening and more slack to device. S.Tec have confirmed no damage to Device Knot tightening and stretch in cows-tail Predictable performance</p>	<p>ISC – RED</p> <p>Some variation due to cows-tail tying. Testers suggested more movement and noise on tower – higher impact? No apparent damage to Device – inspected on site by ISC Knot tightening and stretch in cows-tail Predictable performance</p>	<p>DMM – Catch</p> <p>DMM have confirmed no damage to the Devices other than some acceptable marking by karabiner. DMM confirmed that this device can be used with a 1m cows-tail (inc. karabiners) Has completed EN 128341A with three lanyards DMM two point Nylon. DMM Two point Steel and Cows-tail. Predictable performance</p>
<p>SAR – Rocker</p> <p>**Drop 4 used 10cm SAR Twin-Eye: 30cm inc Karabiners Wide variation in slippage affected fall distance. The Single drop on the 10cm SAR Twin-Eye shortened the fall considerably. No apparent damage to Device. Slight marking by karabiner Predictable performance but with wide variations on distance</p>	<p>Petzl – ASAP</p> <p>1st Drop resulted in sheath stripping and two inner cores failing, where the ASAP ‘locked on’ the rope was squeezed and damaged by heat (see below for picture). 2nd Drop damage to rope minor but at the same position of where 1st had sheath failure. Testers suggested more movement and noise on tower – higher impact? Deformation to body of both devices. Deployment of L57.</p> <p>Un-predictable effect on rope. Predictable distortion to device and L57 deployment.</p>	<p>Petzl – Shunt</p> <p>Some variation due to cows-tail tying. Wider range in slippage distance. No apparent damage to Device. Knot tightening and stretch in cows-tail. Predictable performance</p>



Damage – 1st ASAP 100kg Drop Test

Considerations for further investigations

The set-up of this test simulates a situation where there is only approx 1m of rope above the device and therefore very little energy absorption in the system.

Discussion regarding other situations/set-up was broadly discussed. Where more rope is above the device it is clear that rope stretch is a major factor in fall distance and often the most contributory factor. But also the elastic nature of the rope may affect the locking on of devices as was seen on later 200kg long rope investigations.

The more serious situation of when the Back-up device just below or just above a knot and its cows-tail/lanyard in a FF1* was seen to require further investigations. This occurs when operatives are required to pass re-belays, knots or when initially getting on ropes anchored just above but they then need to climb over handrails so the cows-tail.

* Where the device is level with its connection to the harness.

Q. Would devices above knots be damaged with no rope to absorb any shock?

Following pages show pictures of damage to rope and ASAP

General Observations:

1. The 1st ASAP result was unexpected, and the Petzl representative C Blakely has taken a sample of the rope for investigations. This device and section of rope are currently held by IRATA.
2. The higher the device and the less slack in the connecting cows-tail or lanyard the shorter the fall.
3. Devices that can be 'parked high' during work periods provide better levels of personal protection.
4. The Devices that slip to help absorb the shock loading were all useable after the drop test and useable as part of an escape evacuation system. The ASAP relies on the absorbing lanyard (shock-pack) to absorb the shock load, thus will have limited use in an eventual escape, as both the device body and the lanyard are damaged.
5. All devices require inspection following drop loading and where this is serious they should be removed from service.

Recommended actions

Procedures, Supervision, Training and Assessment should re-enforce the management of back-up devices and should **not condone** operatives to allow devices to hang low or be left in low position when not moving. It is simple and efficient to handle 'hang-down' devices with its lanyard over the arm during ascent and descent or over the shoulder at work sites.

ASAP – Device and rope following 100kg Drop tests.



2nd 100kg Drop Test. Minor damage to rope caused by teeth. Red mark indicates stopping position of the top edge of the ASAP.



1st 100kg Drop Test

Top end - Sheath failure and two of core strands at the same point on the rope.



1st 100kg Drop Test

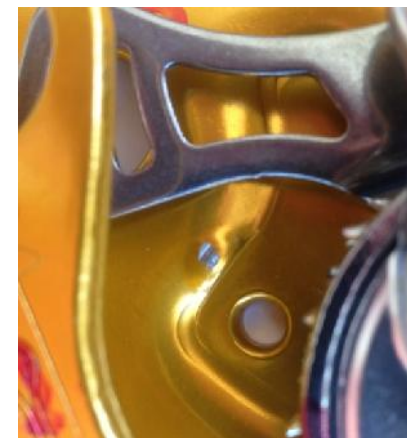
Lower end - of failed sheath showing crushing at the point that the ASAP 'locked on'.



New ASAP – only teeth profile visible



Damage after 100kg Drop test – section of 'wheel' visible



Marking on inner face at the Anti-return stop – the small bump behind the wheel



New – No damage to body at clip point.



Deformation caused by Karabiner during 100gk drop test.



Deformation of device – small hole at top of device exposed.



Left New

Right- Non Return of spring action

More details of inspection - <http://www.petzl.com/EPI/v2/epi-en/Asa/AsaGB.htm>