

# KNOW THE ROPES

## RAPPELLING

2012



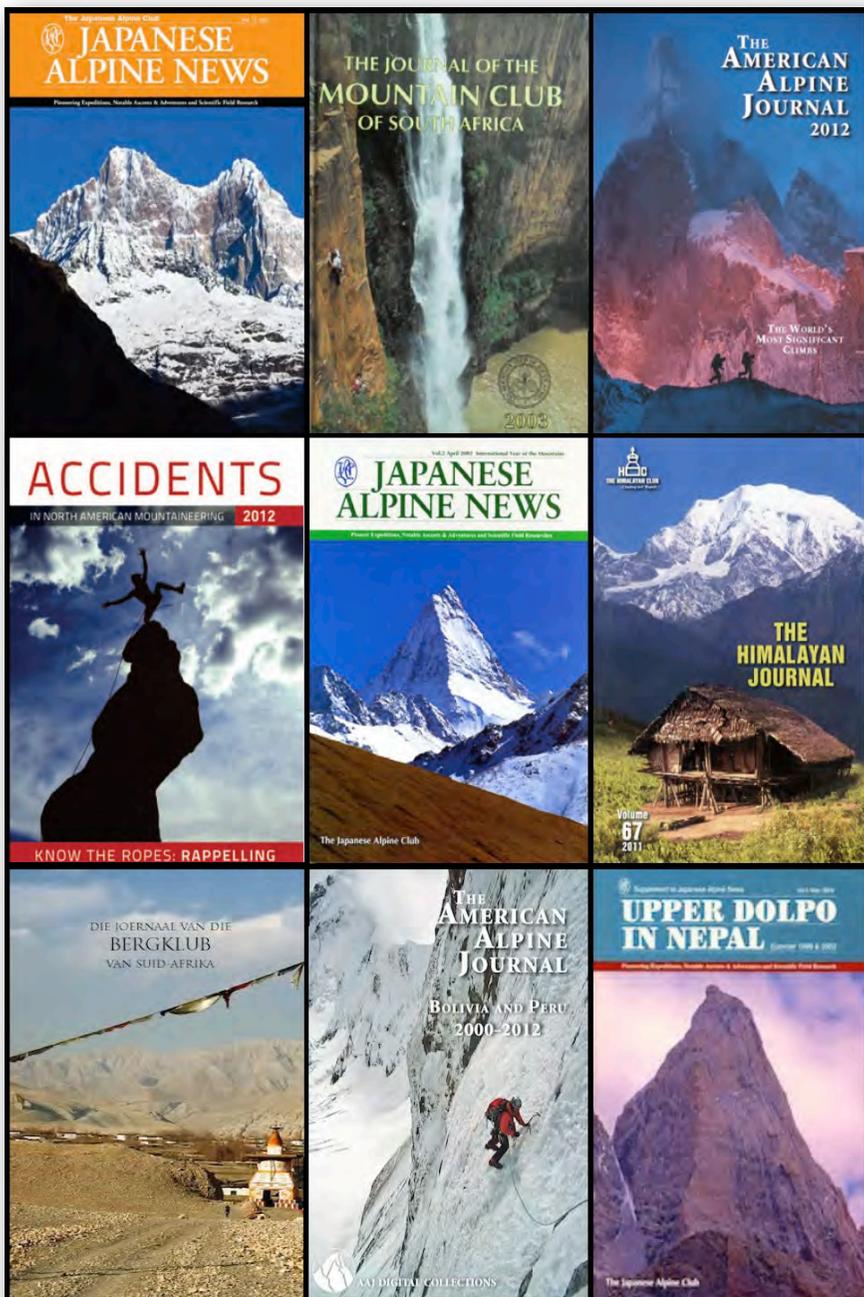


THE MOUNTAINS WE LOVE CAN BE UNFORGIVING AT TIMES. AFTER OVER ONE HUNDRED RAPPELLING-RELATED ACCIDENTS IN THE LAST DECADE ALONE, WE HAVE CREATED A HOW-TO GUIDE ON BEST RAPPELLING PRACTICES.

*Know the Ropes* is published as part of *Accidents in North American Mountaineering*. In each edition of *Know the Ropes*, you will find valuable information to help you prepare and safeguard against climbing-related accidents.

Be sure to check out the complete *Accidents in North American Mountaineering* for even more information on the year's most significant and teachable accidents. For each incident, the American Alpine Club's Safety Advisory Council analyzes what went wrong so you can avoid similar situations in the future. Members of the American Alpine Club receive a free copy of the annual *Accidents in North American Mountaineering*. To join the AAC or buy a non-member copy (print or digital edition), visit [americanalpineclub.org](http://americanalpineclub.org).

[Cover] Kate Rutherford rappelling, Claw Peak, Waddington Range, BC. Photo by Mikey Schaefer. [This page] Jimmie Dunn on an early free ascent of Ancient Art. Photo by Bob Palais.



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# KNOW THE ROPES: RAPPELLING

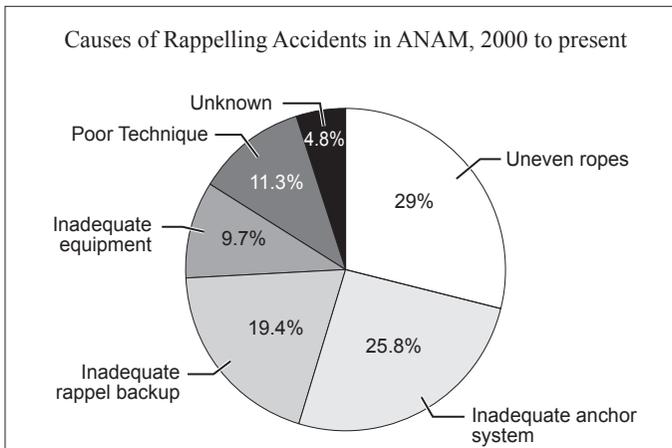
## *FUNDAMENTALS TO SAVE YOUR LIFE*

BY ROB HESS, UIAGM/IFMGA

GRAPHICS BY RICK WEBER

The annual report *Accidents in North America Mountaineering* (ANAM) has been the definitive source of information regarding incidents occurring in the climbing and mountaineering community on a yearly basis since 1950. The careful analysis of such incidents is vital to the identification of common mistakes made by climbers and what might have been done to mitigate them. Very few incidents occur that are what one might call “acts of nature”. Human error is the overwhelming cause of all incidents. Even in cases where these “acts of nature” occurred, one can often trace the chain of events back to some form of error in judgment on the part of individuals involved, ultimately allowing them to be vulnerable to such natural hazards.

For the 2012 edition, *Know the Ropes* focuses on rappelling. We will first look at the common causes for rappelling incidents and then provide best practices for addressing them.



**A review of the primary causes of rappelling incidents from the year 2000 to the present reveals:**

- 1- Inadequate anchor systems, or in other words, anchor failure.
- 2- Inadequate back up for rappels.
- 3- Rappelling off the end of the rope(s)—largely due to uneven ropes.

**Less common causes include:**

- 1- Rappel device issues.
- 2- Stranded due to inadequate rappel rope length.
- 3- Harness/belay loop failure.

**Plan ahead!**

The first step in avoiding any climbing incidents is good prior planning. Get all the information you can from the guidebooks. It is also a good idea to take a copy of a route topo—even if you have done the route before. And consider looking at blogs and talking with friends or acquaintances for information.

Equipment inspection before each season—and before each climb—is always important. Is it time to retire your ropes, slings, or harness? Look closely at all the gear to see if there are any obvious wear and tear issues and consult the manufacturers for recommendations.

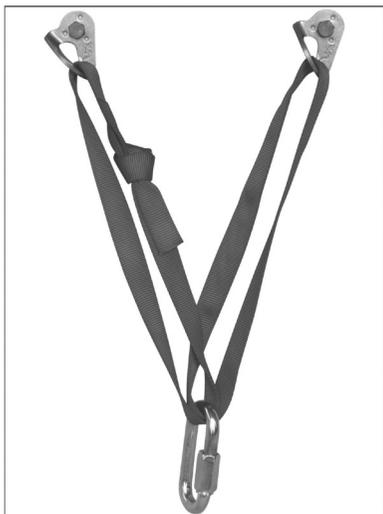
**1. Anchoring Systems**

What about anchor construction and/or inspection for descending? If you climb in popular areas on popular routes, you might expect that descent routes will be well established. But what if you get off route? What if there is severe weather? What if you need to bail? It is not a bad idea to carry a couple of 7mm by 5-meter cords on multi-pitch routes. They function well to tie together multiple points of protection for anchors on the ascent and can be very useful for building or enhancing anchors on descent. Consider a couple of double slings or what might be referred to as four-footers. It is not a bad idea to carry a small safety kit: bail carabiner with a dedicated auto block sling, knife, 5/16" quick link, and even a Tibloc or similar small ascending device.

**- Assessing Fixed Anchors:**

If using pre-slung objects, be sure to inspect slings thoroughly. Often the slings go behind fixed objects and are not readily visible, so be sure you see that all portions of the slings are in good condition and have not been compromised by little creatures or weathering action. If slung around natural objects such as boulders or trees, be sure to test the objects for security. How big is the tree? Normally it should be at least six inches in diameter and well rooted. How big and secure is the boulder? Get behind it and test it by pushing on it with your legs. Also be sure the anchor sling won't slip off the back.

Are there any metal descending rings or has the rope been running directly on the sling material? If the latter, it could result in damaging the sling upon rope retrieval. If in question, add a sling and add a 5/16" quick link, which has a working load of 1720 lbs. and a breaking strength 5280 lbs.—or bail carabiner wherever possible. The quick links are preferable because they are easily found at hardware stores and inexpensive; and since they have a screw gate, they are easily added to existing anchors.



**Figure 1**

### - Building and Configuring Anchors:

Climbers need to have a working knowledge of bolts (including what modern bolts look like) and to understand what to be suspicious of. In general, bolts are considered to be solid pro. When you know the protection points are good, in this case the bolts, one sling tied in the “magic X” configuration, otherwise known as self-equalizing, is useful in that it uses minimal sling but equalizes the pull on the protection points. The drawback is that it reduces the redundancy of two bolts down to one sling, and should one point pull out, the system will be shock-loaded. In all anchoring cases consider a quick link. (See *Figure 1*.) If

tattered slings are already attached to fixed anchors, consider removing them, which is one reason to carry a pocketknife.

- If building and slinging an anchor for descent, do not skimp on protection. Isn't it better to leave a bit more personal gear rather than face the consequences of the anchor failing? When looking for your anchor point, consider the available protection and also consider the position of the rope and whether it will pull effectively and/or come off cleanly without knocking off rocks. Clearly the protection must be good, for if it is not, nothing else matters. When slinging the protection there are several ways to entrain all points. Regardless of how you construct the anchor, consider equalizing all points such that they share the load equally. Also consider rigging the anchor so that the system is redundant. Then, if a protection point were to fail, the system would not be shock-loaded. (See *Figures 2 & 3*.)

## 2. Rope Rigging and Management on Descents

Proper rigging and rope management is integral to proper risk management on descents. With a bit of pre-planning and preparation, common incidents that occur during descents can be avoided.

### - Rigging Ropes:

Whether using one rope or two for descents, ensuring the ropes are equal in length is important to avoid one of the most common mistakes.

- If using a single rope, is there a middle mark on the rope? If so, and more importantly, is this mark accurate? (E.g. the rope may have been cut.) If working with a rope where the middle mark is not obvious, thread the end of one rope through the rappel anchor and then match both ends. Then while pulling the rope through the anchor, keep both strands together as



Figure 2



Figure 3

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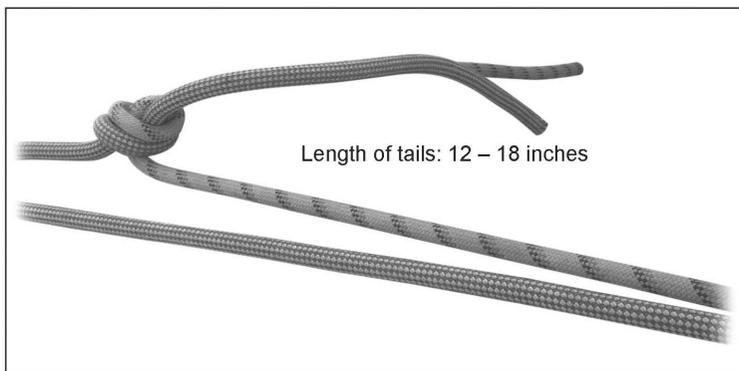
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**Figure 4**

you stack the rope until no rope is left. The bite in the anchor is the middle point. Temporarily tie an overhand knot in the bite—above the anchor—so when the rope is thrown off, the middle is not accidentally lost.

- If working with two different ropes, ask yourself if the ropes are equal in length. It is not uncommon to have ropes from different manufacturers that are said to be the same length but turn out to be quite different in length. Measure ropes in relation to each other before getting into a sticky position.

- A good knot to use to tie two ropes together is the flat overhand. This knot has been called a number of things and has at times been unfairly demonized. When used correctly, this knot is superior. Its advantages are that no matter what orientation it starts in, when it comes time to pull the ropes, the knot shifts into an advantageous position that avoids getting caught up or stuck. Simply be sure the knot is well dressed, very snug and has a minimum of 12 inches of tail on both strands. (See *Figure 4*.)

### **- Knotting, Throwing and Descending Ropes:**

Once the ropes are in the anchor, consider temporarily tying the ropes off to the anchor before throwing them so you do not lose where they are positioned. Also, there is no reason to rappel without the ends of the rope secured in some way. A few questions to ask:

- Have you tied knots in the ends of the ropes to ensure you do not rappel off the ends? Consider tying knots in each individual strand as oppose to tying them together, as this lets kinks dissipate. The triple barrel knot is a good choice. (See *Figure 5*.) In some cases, knotting the ends and throwing the ropes might be a recipe for stuck ropes. This is common in windy conditions or on routes known for the features that like to catch ropes! If this is the case, knotting the rope-ends and then clipping them off to your harness thus allowing control of the ends might be a good choice.

- Throwing ropes requires technique and practice. Again, remember to tie off the rope(s) temporarily before you throw them. One good technique is to butterfly coil the first half of one of the rappel strands, then butterfly the second half of the same strand with the end. Throw the first half off, wait a few seconds,

then throw the second half (with the end). Repeat with the other strand.

- Is throwing the ropes the only option? If the weather is windy and/or the trajectory of the ropes is in any way impeded by trees, bushes and other obstacles, you might consider saddle bagging the ropes down the rappel. (See Figure 6.) To do this, separate both strands of rappel ropes so the strands are not crossed. Start with the end of one strand, knot the rope, then butterfly the strand starting with large coils progressing to small coils. This will ensure easy feeding of the rope. Use a single or two-foot sling to cradle the coil and clip off to your gear sling on your harness. Do not girth hitch the coil with the sling. Repeat with the other strand of rappel rope.

- What if my rappel does not reach the anchor and I am stranded? There are some important points for this. First, can you build an anchor with the equipment you have where you are? If you are the first person down a rappel, be sure you have the rack with you. Second, if you are unable to build an anchor, do you have the ability to improvise and ascend the double strand back to the rappel anchor or to a point where an anchor can be built? Having an ability to improvise and ascend ropes with slings and cord is an essential skill to have.

### 3. Rappel Systems and Backups

When ready to rig the rope(s), take a moment to think through the sequence of events to follow. Be sure you have set up different systems for rappels and practice securing yourself to the different anchor systems. Consider taking advantage of a secure location to plan and prepare as much as possible for the descent before getting into an exposed stance. Be sure that you can anchor at the top rappel and all subsequent anchor points. If descending a route with multiple rappels, have an understanding as to how you will protect yourself and other members of your party.

#### -Rappel Backups:

There are several ways to protect oneself when rappelling. As is evident from the “causes” graph, common issues involve rappelling off the end of the rope due to the rope ends being unequal in length, no knots in the ends of the ropes, or ineffective personal friction hitch rappel backups. Adding a friction hitch to the rappel system is one piece of the puzzle that increases security. It is best done



Figure 5



Figure 6

on the brake-hand side of the system, still ensuring a majority of the load in any situation where the backup is employed is on the rappel device. The friction hitch of choice is the auto-block. This hitch has the advantage of being quick to rig, easy to slide down the rope(s) and manage with one hand, and bites well if the hitch is suddenly loaded. The main disadvantage is that unlike other friction hitches, the auto-block can be released or caused to slide under load if it hooks up against or bumps into an object. A common and dangerous example of this is if the auto-block hitch sling is too long and slides up against the rappel device.

Rappel backups allow for what is referred to as “hands free” or “locked off” mode. This allows the rappeller to troubleshoot problems such as stuck or tangled ropes, route cleaning, and items stuck in the rappel system. Rappel backups in the form of an auto-block are really only necessary for the first person on a particular rappel. Subsequent rappellers can be protected by a simple “fireman’s belay” from the first person down. In this belay form, the first person down can hold on to the rappel lines and if necessary pull tight on the ropes to arrest any unwanted movement on the part of the rappellers above.

### **-Rappel Extensions:**

When descending, it is necessary to have a rappel device available as well as a sling/tether system to enable clipping in to subsequent rappel anchors.

- The common system of rappelling with the device attached to the belay loop and the back up attached to the leg loop of the harness can be effective, but is hard to adjust so that the auto-block sling does not move up against the belay device, thereby sliding and becoming ineffective. Better ways of rigging rappels so that the auto-block sling does not bump against the rappel device involve rappel device extensions.

- A very important point to note is that all extension systems that attach to the harness via nylon on nylon—such as the four-foot sling or the personal anchoring slings (PAS)—must be girth hitched directly to the tie-in points of the harness. Harness manufacturers specify that slings or personal anchoring slings are not to be girth hitched to the belay loop. When setting up rappel extensions that include tethers for anchoring, some key rigging points are:

- If rigging an extension from a four-foot sling, use nylon slings, not Dyneema. Dyneema has a high strength-to-weight ratio but has very little elasticity, breaking under low loads when shock loaded. (See the study on video by DMM at [dmmclimbing.com/video.asp?id=5](http://dmmclimbing.com/video.asp?id=5)).

- When using a four-foot sling, first girth hitch the sling to the tie-in points, being sure the sewn portion is positioned out near the end of the sling. Next, tie an overhand knot in the sling at a point roughly less than half the distance to the end of the sling. This will allow you to clip the tether back to the belay loop with a locking carabiner when not in use while still attached to the rope with the rappel device clipped to the



Figure 7



Figure 8

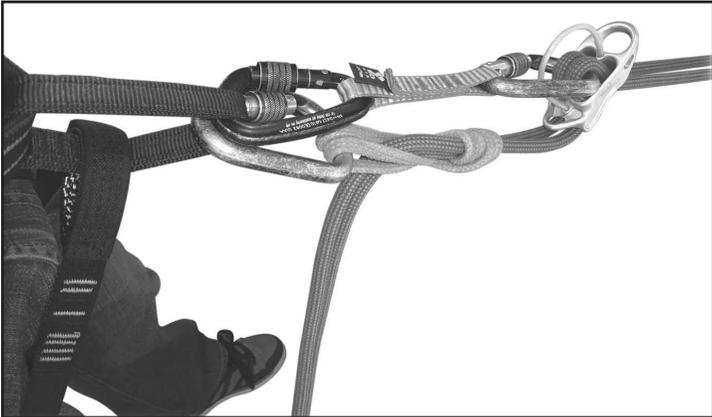


Figure 9

sling on the harness side of the overhand knot. (See *Figure 7*.)

- If using a PAS, first girth hitch the PAS to the tie in points. Next, choose a loop to clip your rappel device to that is less than half the distance to the end loop that acts as the clip-in tether. (See *Figure 8*.) This again will allow clipping the tether back to the belay loop with a locking carabiner as discussed above.

- An additional rappel system that is simple and easy to use but does not incorporate an anchoring tether, utilizes a quick draw with two locking ‘biners. (See *Figure 9*.)

- One common rappel device problem is when clothing or hair get caught in the rappel system. Pocketknives are of course invaluable, but the rappel extension serves to put the rappel device in a position that mitigates the problem by keeping the device further away from hair and clothing.

- Please also note: Daisy chains are for aid climbing and should not to be used as personal anchoring slings.

### **Communication and commitment**

Table II in ANAM shows that about 30 percent of climbing accidents happen on descent. Clearly the ones that end in fatality or serious injury are a result of rappel errors that are for the most part avoidable.

We have covered the set-up systems that will keep you safe. The other human factors are communication and the importance of remembering that you and your partners are a team, so watch out for each other—stay aware! Check each other and double-check all systems. In terms of communications, if you are unsure of what was said, ask again.

This ending leads us to the Know the Ropes topic for next year: lowering errors, both in terms of systems and communications.