(not current - Current version: WAC Way Z-Pulley)

WAC Way Z-Pulley Setup Steps

This document represents the current WAC Way of setting up the Z-Pulley system for crevasse rescue. The target audience for this document is the instructors and students of the WAC's Basic Climbing Class. Please send comments and feedback to the co-chairs of the Basic Climbing Class of the Washington Alpine Club.

References

- Freedom of the Hills, 8th Edition
    - Video by the Mountaineers based on the FOTH steps
    - Illustrated guide based on the FOTH steps
    - Additional detail on alternative rescue methods by the Mountaineers
- Alpine Climbing: techniques to take you higher. Mark Houston and Kathy Cosley.
- The Illustrated Guide to Glacier Travel and Crevasse Rescue. Andy Tyson and Mike Clelland.

Terminology

Note: In process of changing some of the terms below for easier consumption.

- 'End climber' - The climber in the front of the rope (leading the climb).
- 'Middle Climber' - The climber in the middle on the rope.
- 'Fallen Climber' - The climber at the end of the rope.
- Rope strand between end climber and the middle climber is called the 'end strand'.
- Rope strand between middle climber and the fallen climber is called the 'fallen strand'.

Scenario

Rope team about 50ft (15m) apart between climbers. The last climber on the rope team falls into crevasse.

Big Picture of Rescue

1. Arrest fall and build secure anchor system.
2. Communicate with fallen climber.
3. Devise rescue plan.
    a. Self-rescue: Fallen climber ascends rope with prusik.
    b. Team rescue: Team members use a hauling system (such as Z-pulley) to pull the climber out.
4. Carry out rescue plan.
    a. Self-rescue: Assist fallen climber as needed … i.e. when climbing over lip of crevasse.
    b. Set up hauling system to rescue climber.

Detailed Steps

1. **Fall:** The fallen climber shouts if possible to alarm others on the team of the fall. Everyone that hears the shout repeats it.

2. **Arresting the Fall**
The end and middle climbers arrest immediately. The sooner a fall is arrested the less time there is for it to accelerate and the higher the chances for a successful arrest. While traveling, it's important to keep slack out of the rope between climbers to avoid shocking the system if a climber falls.

3. **Building an Initial Anchor**
Once the fall is arrested, the end and middle climbers establish communication.
They determine whether the middle climber can hold the load of the fallen climber?

a. If No:

i. Middle climber needs to place the anchor as described in b). This is harder as they also have to be in arrest position and does not have a whole lot of freedom of movement. Once the anchor is built and tested, load is transferred to the anchor and climbers can come out of self-arrest and complete the Z-pulley setup as described in b).

b. If Yes:

The end climber is now the lead for building the hauling system and rescuing the fallen climber.
The middle climber double checks the end climber's actions and guards the anchor.
The end climber:
I. Uses personal prusik (self-belay) on rope to approach middle while middle holds the load (usually an easy task because the rope friction across snow does much of the work).
ii. Builds snow anchor as much in line with the loaded fallen strand as possible. The anchor should be placed about 5-10ft down-rope from the middle climber.
iii. Places prusik on fallen strand of rope.
iv. Connects prusik on fallen strand to master point of snow anchor.

- Must be a locking carabiner to master point of snow anchor.

v. Slides the prusik knot down the rope until the sling to the anchor goes tight.
vi. Instructs middle climber to slowly ease the load onto the anchor. However, middle climber must stay ready to self-arrest as a backup in case the friction prusik fails. When easing the load the climbers make sure:

- *That the friction knot holds*.
- *That the anchor is solid*.

vii. As soon as the load has been transferred, end climber ties a figure-eight knot on a bight into the rope between the friction knot and middle and clips it with a locking carabiner to the locking carabiner already attached to the anchor (and holding the prusik). Note carabiner on carabiner here! The knot should be as close to the prusik as possible to minimize shock loads and slip in the event of a prusik failure. Figure-eight carabiner should be close to the spine of the anchor carabiner.
viii. Since the prusik is now backed up, the middle climber can come fully out of self arrest.
ix. Middle can untie and clip into the anchor (if necessary, based on the terrain). At this point, middle climber should continue to monitor the anchor.
x. End climber attaches a pulley with a carabiner to the locking carabiner closest to the anchor (Master point carabiner). Pulley goes between friction knot and figure eight knot. Note carabiner on carabiner here! The carabiner used for attaching the pulley does not have to be a locker.

4. Establishing Communication with the Fallen Climber

a. The end climber approaches the crevasse lip using a self-belay using prusik that is already on fallen strand.

b. Probe with ice axe crevasse lip when approaching in case it is overhung. If the crevasse is overhung carefully try to clean it, but keep in mind that droppings might hurt the fallen climber inside the crevasse or that the overhung lip may also collapse.

c. Try to communicate with the fallen climber. Ask: If additional clothing is needed? Is the climber wedged in? Injured?

d. If fallen climber does not respond, may rappel down to him to check on the situation. See FOTH special rescue considerations.

e. Otherwise, now fallen climber may

i. Prusik out.

ii. Get lowered to a ramp from where he can walk out.

iii. Get raised using a rescue z-pulley system (there are other methods).

5. Minimize Entrenching the Rope

a. Regardless of rescue method, the end climber must prepare and pad the lip to avoid further entrenching of the rope. This might involve freeing up the rope carefully if it is deeply entrenched in the lip already.

6. Completing Rescue with Z-Pulley

a. At the crevasse lip, end climber places a second prusik on the strand between fallen climber and the prusik on the anchor. This second prusik is also known as the 'tractor prusik'.

b. Attach a pulley to this prusik and run the slack hauling strand through this pulley.

C. Push the tractor prusik down toward the fallen climber

i. If self-belaying, make sure your prusik is between the pulley and the anchor (as opposed to you and the pulley). If you have it between you and the pulley, you could fall twice as far when the rope fully extends.

c. Now the system is complete.

7. Operating the Z-Pulley Rescue

a. Remove the figure eight backup knot from the master point.

b. Both climbers pull together to haul the fallen climber.

c. Tend the end climber's personal prusik (which should still be attached between the 2 pulleys) and the prusik on the anchor. Many times, it's more convenient to remove the personal prusik while hauling, then reattach if necessary to reset the system.

d. When the 2 pulleys are about 2 feet away from each other, tie a figure eight backup behind the master point pulley and clip this into the master point.

e. End climber resets the tractor prusik by pushing the prusik toward the fallen climber. Use self-belay to move along the rope.