
to the memory of Erica Beuzenberg

Moving on a rope

- Physics
- Techniques
- Applications
- Limitations
- Minimising the risks

"Only one man was moving at a time; when he was firmly planted the next man advanced.

...Michael Croz stood below Hadow, placing the young climber's feet into the toeholds afforded by the sheer rock wall. Then, Hadow slipped and fell against Croz, knocking him off the cliff.

In another moment Hudson was dragged from his steps, and Lord F. Douglas immediately after him. All this was the work of a moment....

Account of the 1st ascent of the Matterhorn, 1865.

Scrambles Among the Alps. Edward Whymper. 1871.

"...Man fand beide tot, an einem Felskopf hängend, das Seil für das 'Gehen am kurzen Seil' vorschriftsmäßig aufgenommen....Einer muß den anderen.... mitgerissen haben.....Watzmann-Ostwand....knapp 300-mal durchstiegen.....als sehr umsichtiger Bergführer bekannt.. Wenn einer die Führungstechnik, auch die am kurzen Seil, beherrschte ...")

"...Both climbers were found dead, hanging on a rock outcrop, the rope correctly tied for "short-roping"...One climber must have pulled the other one off...Watzmann East Face...had climbed it almost 300 times...was well known as a very careful guide...If anyone was familiar with guiding techiques, including short-roping, then it was... Franz Rasp, the president of the IFMGA"

January 1988

Where do parties use a rope while moving together?

What different forms of roped travel are there?

Glacier travel


Short roping

How many people on a rope?

On easy terrain why use a rope at all?


How effective is “short roping” ?

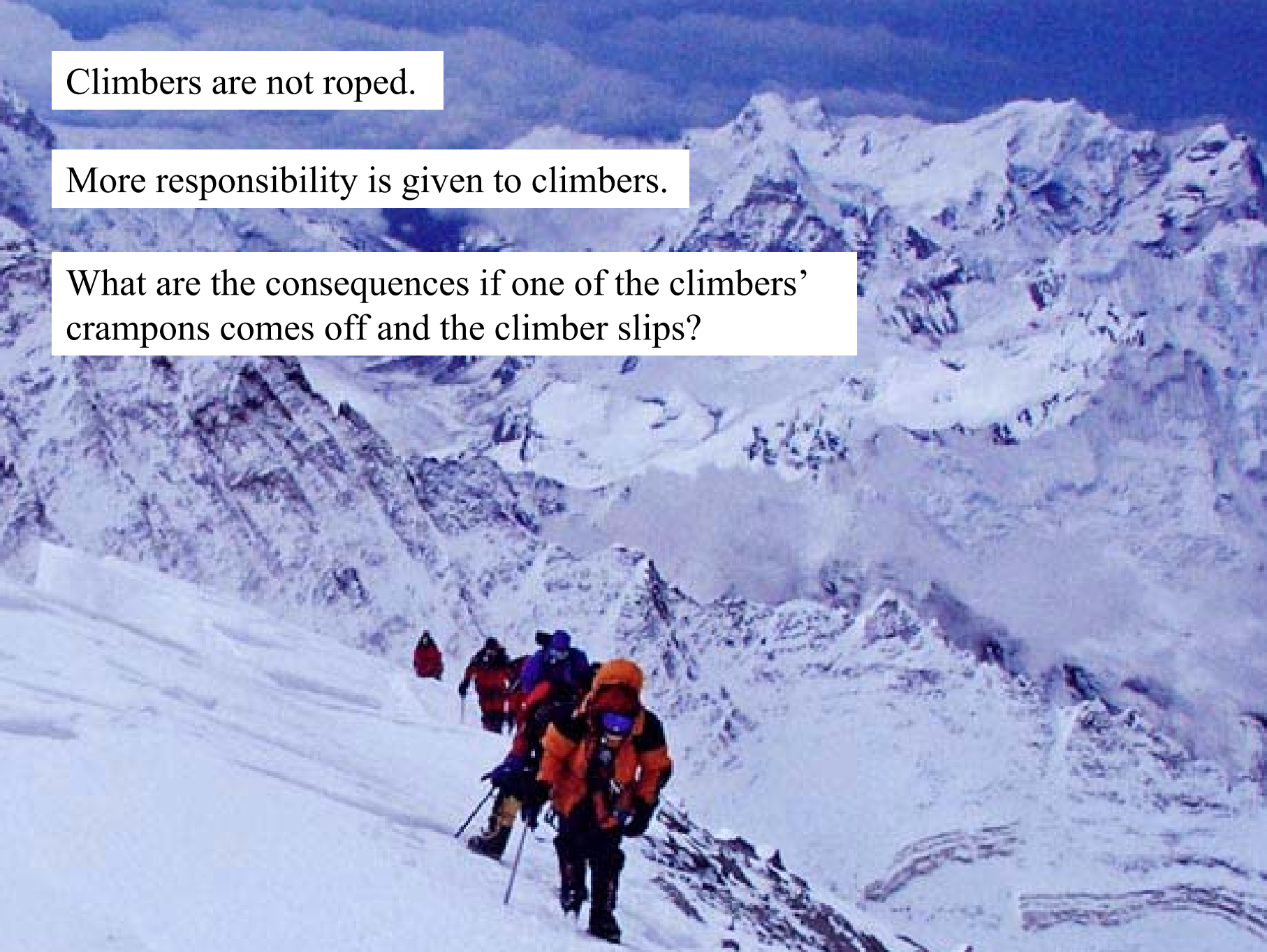
Can the guide hold a fall?

What are the limitations of “short roping” ?


Roped travel with toboggan


What are the consequences if one of the climbers' crampons comes off and the climber slips?


Hard ice with powder coating
25^0 slope with a 1000m drop below
What happens if the top person falls?


Climbers are not roped.
More responsibility is given to climbers.
What are the consequences if one of the climbers' crampons comes off and the climber slips?

What is accepted practice?

Definition:

Short-roping is when a "guide" (the more confident person) and a "client" (the less confident person - either through inexperience, injury, exhaustion, or a variety of other reasons) move together over terrain that is subjectively or objectively hazardous, joined by a rope for the protection or comfort of the client, but without recourse to placing conventional protection. It is sometimes called "confidence roping" but should never be undertaken lightly.

Gareth Hattingh, "The Climber's Handbook"

Accidents of guided parties in recent years during roped travel

New Zealand: - Elie de Beaumont, UIAGM guide, serious injury

- De la Beche, UIAGM guide, serious injury
- Mt Cooper, UIAGM guide, no injuries
- Linda Glacier, UIAGM guide, serious injury
- Linda Glacier, UIAGM guide, critical injury
- Ball Pass, NZMGA guide, three dead

Many overseas accidents

Matterhorn: 1 - 2 accidents every year, requiring evacuation

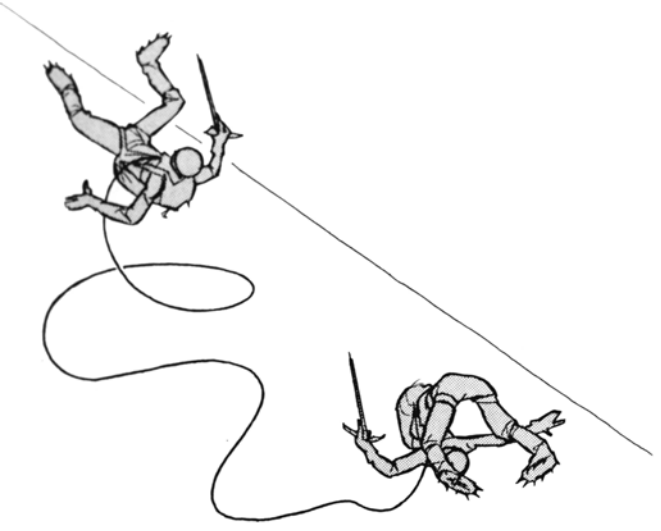
Accidents of parties climbing simultaneously are very frequent. They are one of the most common causes of accidents involving entire parties.

Examples are

- Mount Aspiring (Ramp)
- Mount McKinley (Denali Pass)
- Mount Hood (Oregon)
- Mt Rainier (Washington)
- Pisang Peak (Nepal)

Statistics of known accidents in the European Alps, involving simultaneous movement on a rope, including short-roping, 1977-82

75 accidents with 235 persons involved
97 dead
91 serious injuries



Accidents happened

59% during descent

23% during ascent

18% direction not known

72% of accidents, where direction is known, occurred during the descent.

More than 3 persons per accident in average.

Why not use fixed belay anchors?

To pitch the Matterhorn would take two to three days.

More complex climbs would take a week.

Rock fall through use of a long rope, time being exposed under ice cliffs (e.g. Linda Glacier), fatigue, bivouacs, heavier packs would all pose considerable risks that far outweigh the risks of short-roping.

In most cases there is no alternative to short-roping.

Short-roping is an essential part of mountain guiding.

What is being done to reduce the number of short-roping accidents?

In summer 2002 the Zermatt Mountain Guides Association decided to make a training climb mandatory for clients without mountaineering experience before climbing the Matterhorn.

So far the results have been positive.

After mountaineering accidents the press often comments

"They were not roped up".

Implying that the accident was a result of not being on a rope.

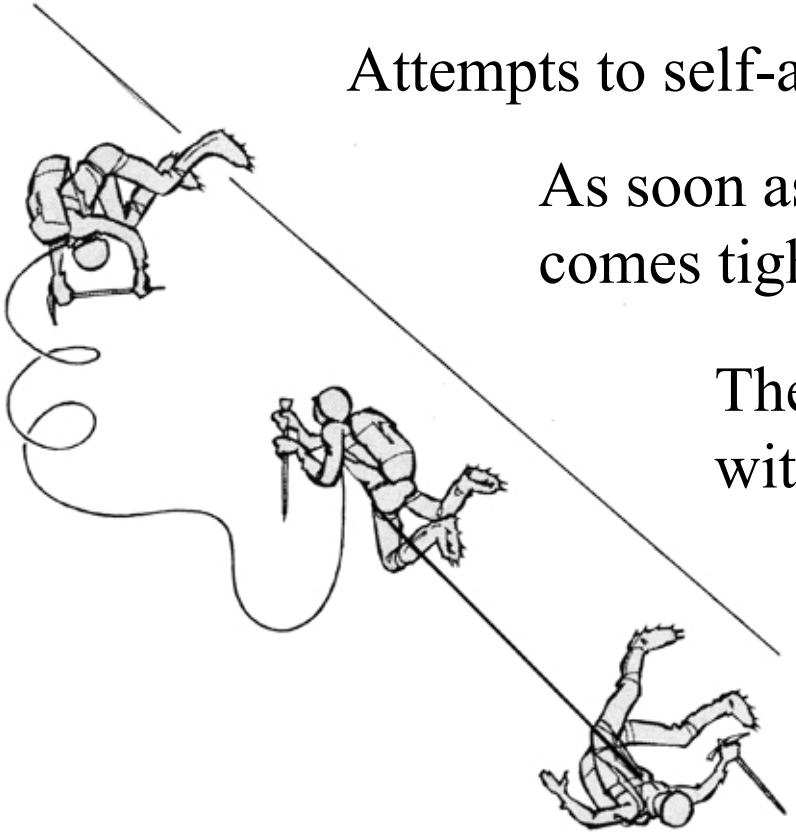
Seldom one hears the comment

"The accident happened because the party was roped up".

Common perception: rope = safety.

A rope can only do one thing:

transfer a force from one end to the other.



Attempts to self-arrest generally fail.

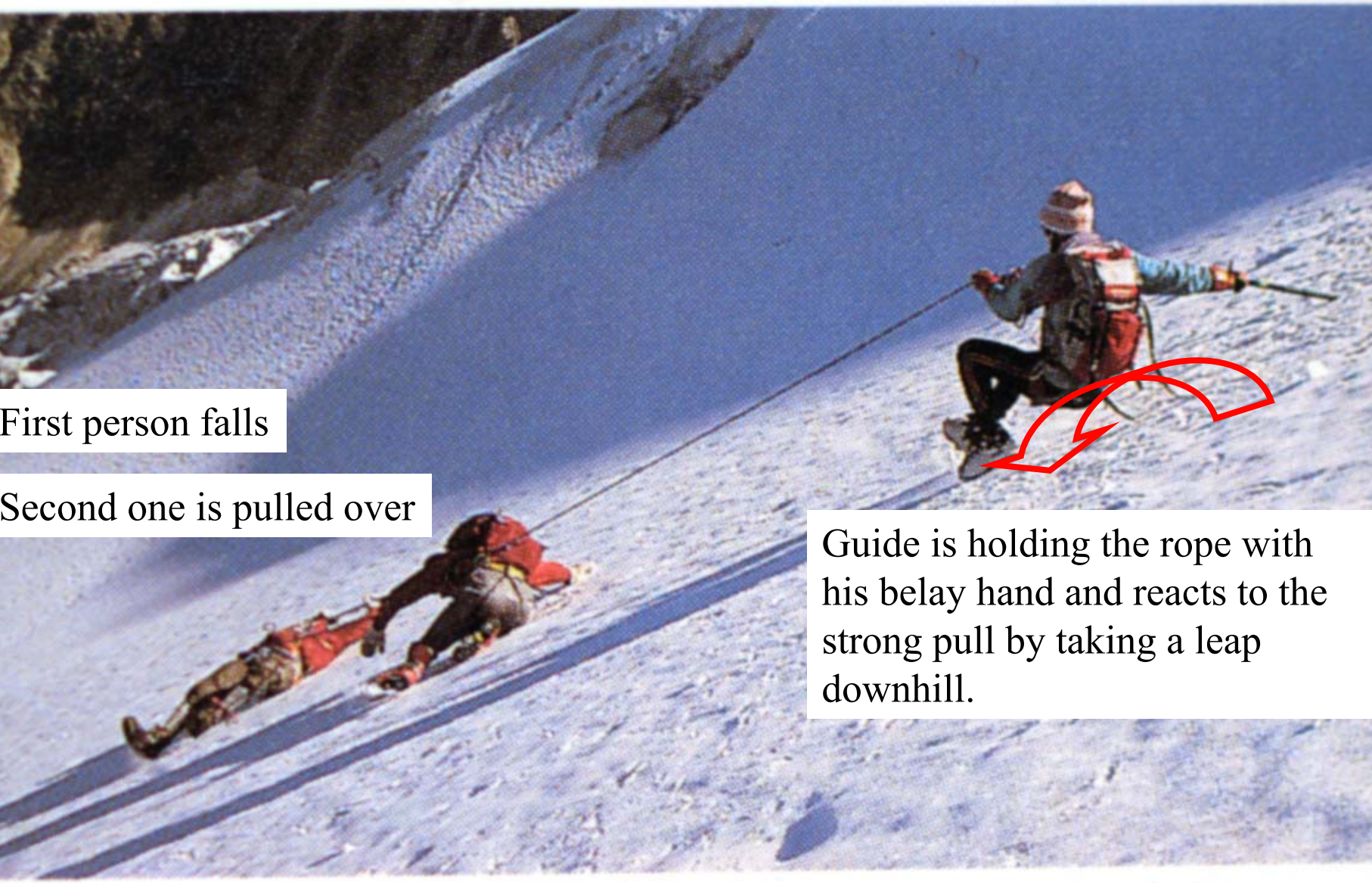
As soon as one person self-arrests, the rope comes tight and that person is pulled off again.

The party would be better off climbing without a rope.

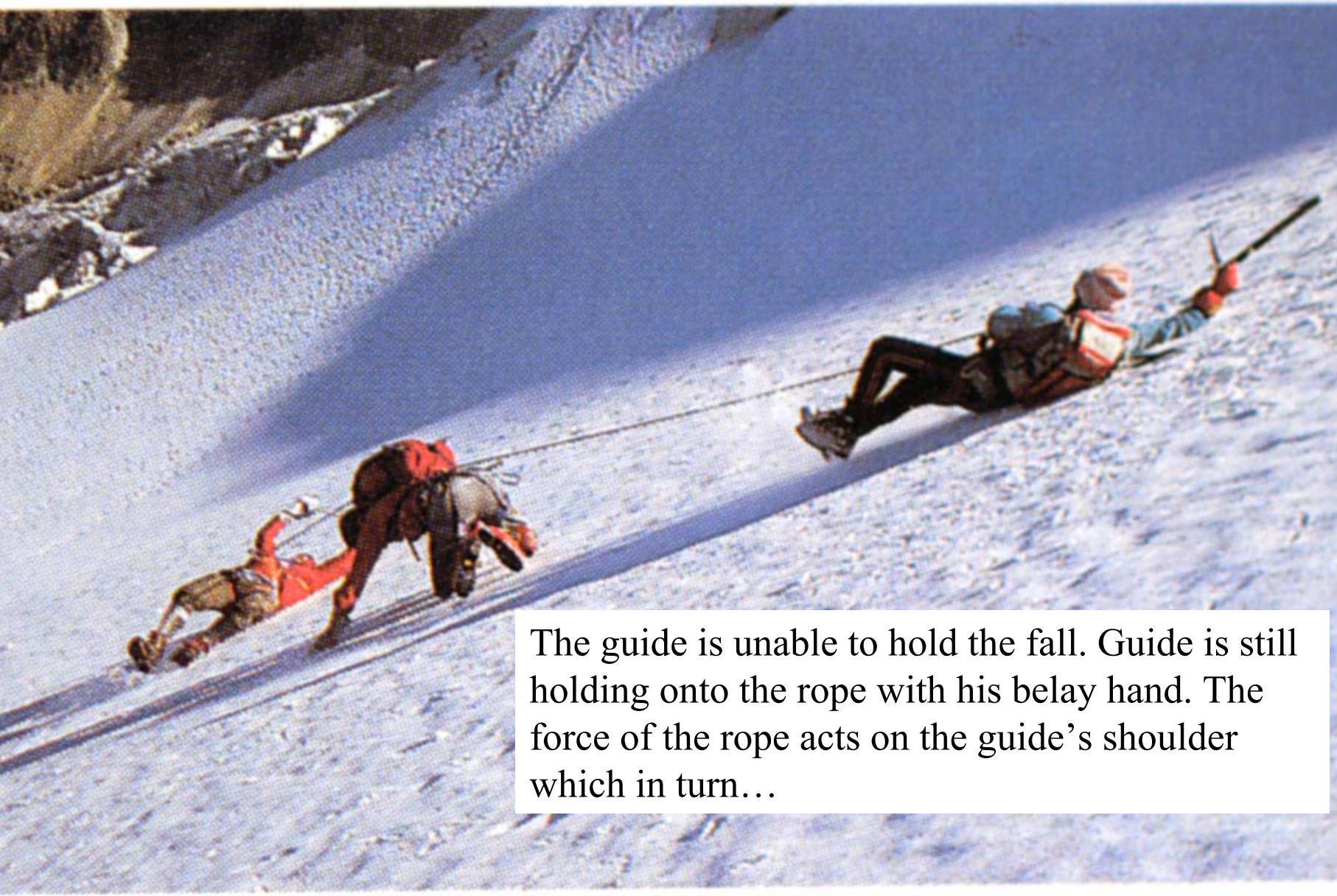
Guides usually do not have this option.

In most cases they choose to short-rope.

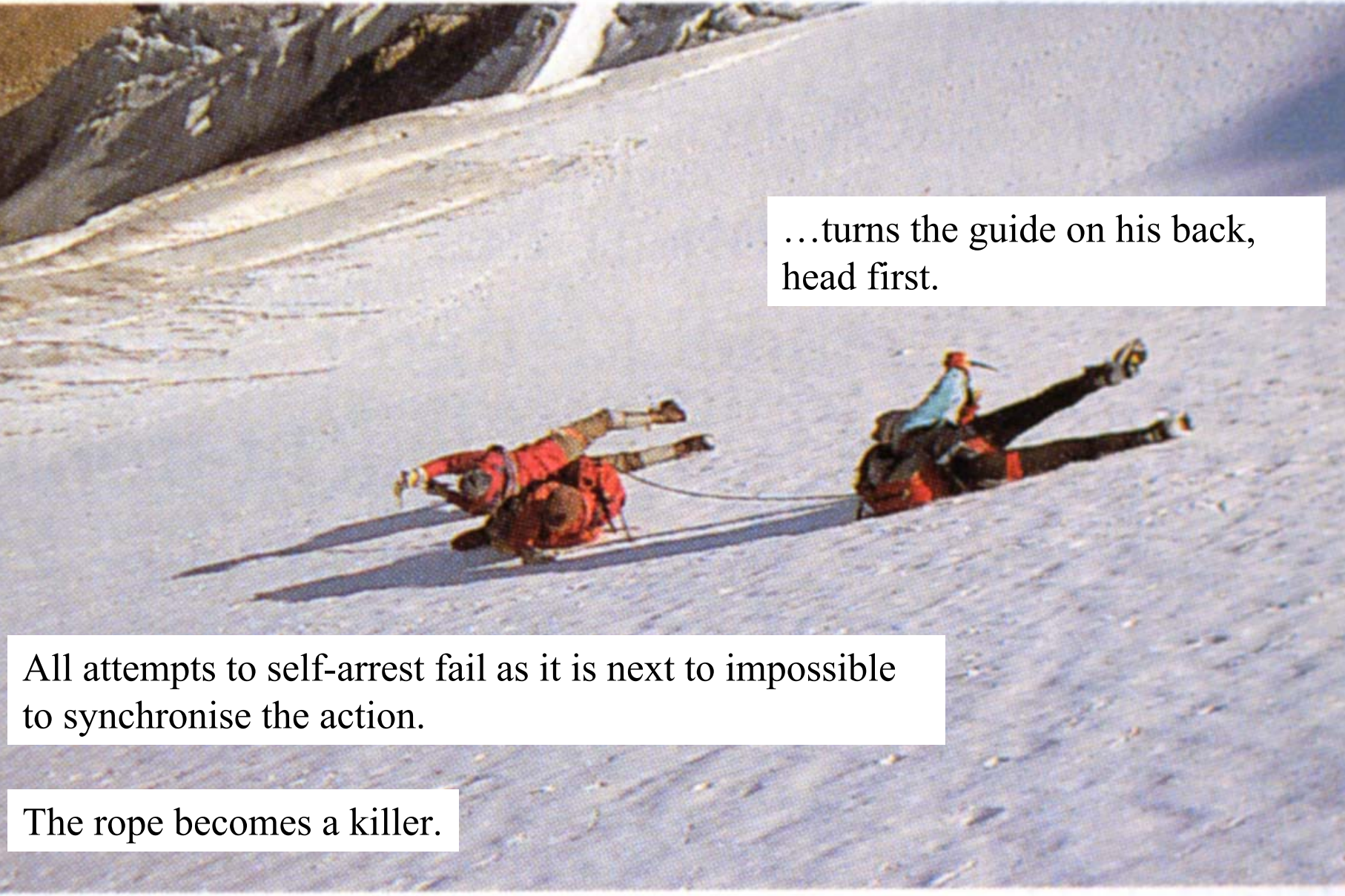
Short roping a party on a 26^0 slope, hard frozen snow



Pit Schubert photos, 1982 test series, DAV Sicherheitskreis. Bottom person was instructed to let himself fa



The guide is unable to hold the fall. Guide is still holding onto the rope with his belay hand. The force of the rope acts on the guide's shoulder which in turn…



…turns the guide on his back, head first.

All attempts to self-arrest fail as it is next to impossible to synchronise the action.

The rope becomes a killer.

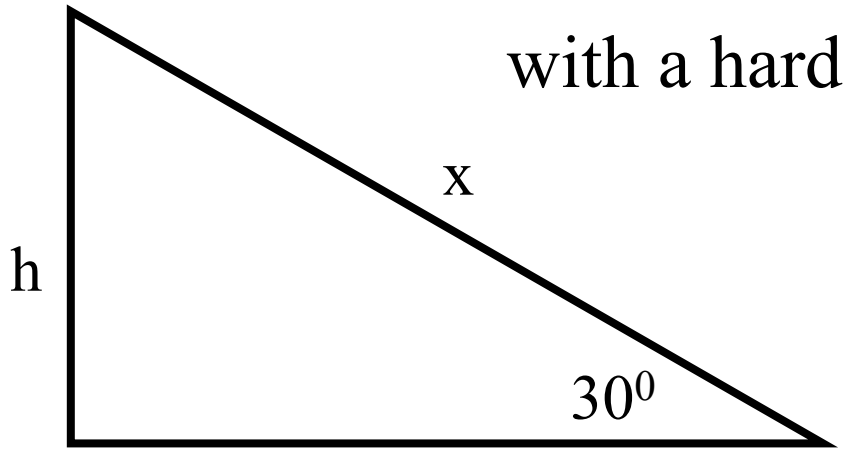
Variety of methods guides around the world recommend for short roping:

At least 3 m between guide and client.
As short a rope as possible to the client, not more than 1 m.
Only one coil in the belay hand, remainder in uphill hand.
Up to 7 m of coils in the belay hand.
Rope is locked off at the belay hand.
Rope is not locked off at the belay hand.
Allow for controlled slippage of rope in the belay hand.
Have a hand loop tied into the rope to prevent slippage.
Hold belay hand up right next to your chest, in order for give.
Hold belay hand down, in order to have client really tight.
Two clients maximum.
Up to six clients.
Rope from harness to belay hand as short as the angled arm.
Rope from harness to belay hand as long as the outstretched arm.

There is a bewildering variety of methods, mostly based on empirical knowledge and personal experience, seldom tested!

Let us look at some of the physics

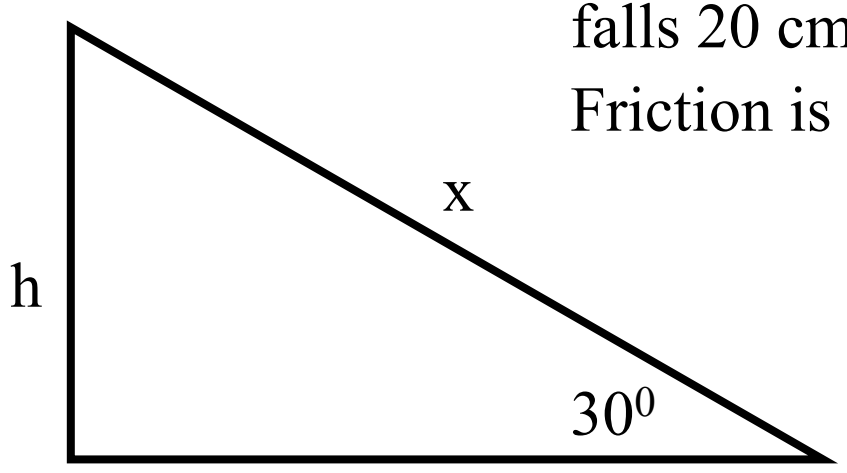
Let us look at a 30^0 snow slope with a hard frozen surface



The friction on the surface can be regarded as negligible regardless of clothing.

During field trials (DAV Sicherheitskreis, 1982) the speeds v(x) of a falling body at the bottom of a 42^0 slope were measured against that of a free fall of same height. Calculated speeds are:

angle of slope	20^0	30^0	40^0	50^0	60^0	70^0	80^0	90^0
v(x) relative to free fall	95%	97%	98%	98%	99%	99%	99%	100%



Let us look at a body of mass M that falls 20 cm down a 30^0 slope. Friction is negligible.

$h = x \sin(30^0)$

for $x = 20$ cm

$h = 10$ cm

The kinetic energy at the bottom of the slope, $E_{kin}(x)$ equals the kinetic energy after a free fall of height h, $E_{kin}(h)$

$E_{kin}(h) = E_{kin}(x)$

$Mgh = 0.5\ Mv^2(x)$

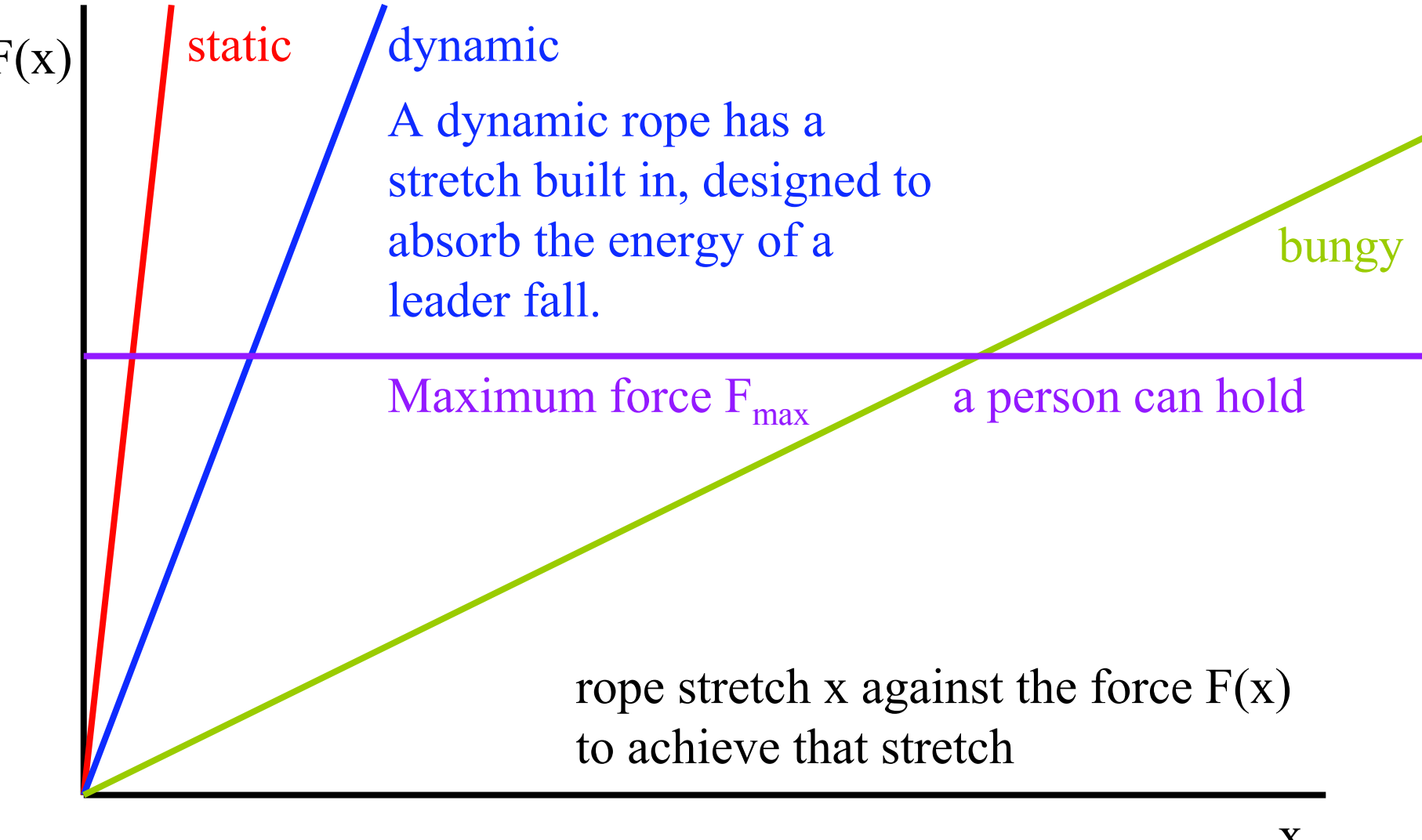
$g = 9.81\ ms^{-2}$

$v(x) = v(h)$

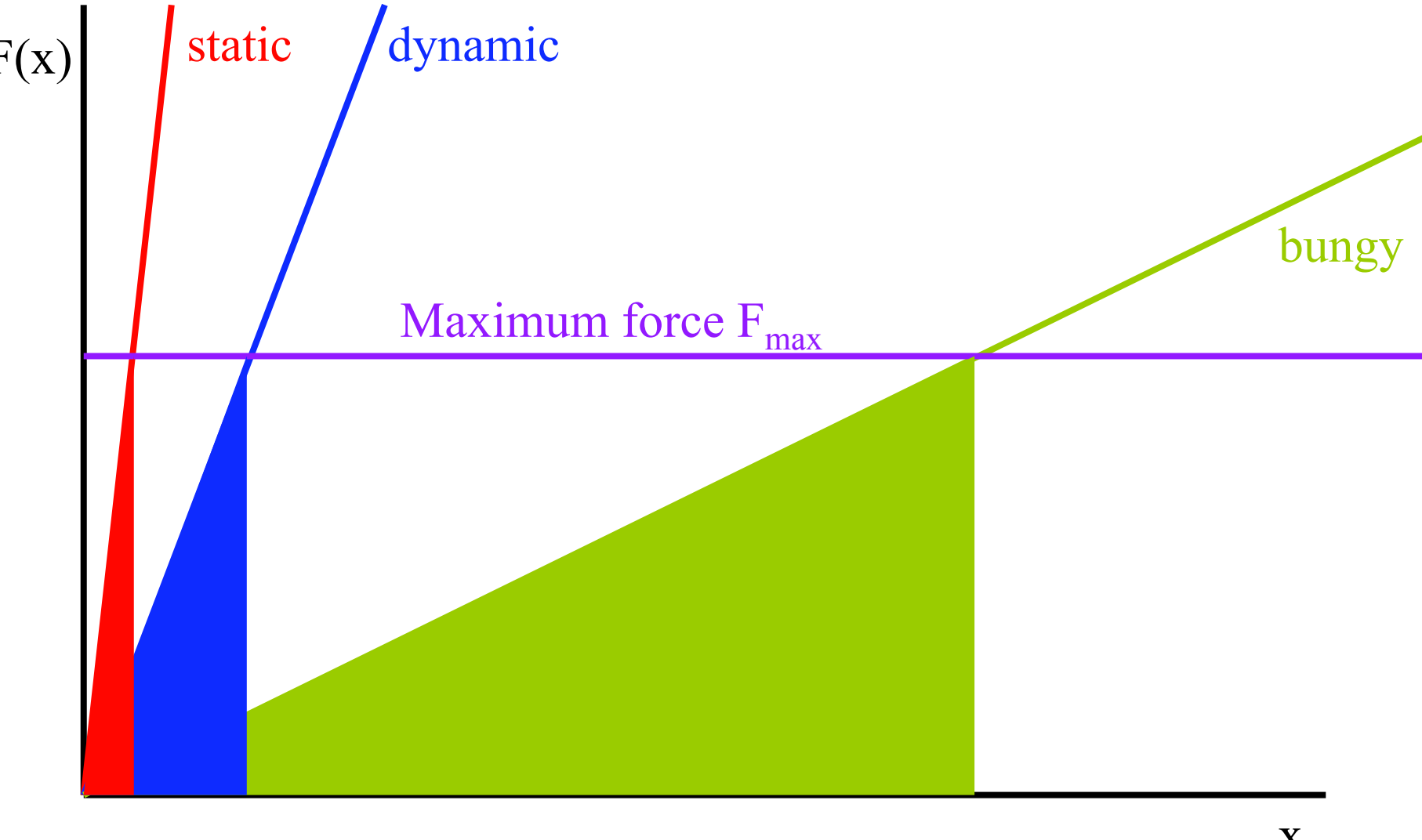
$= 1.4\ ms^{-1}$

A body accelerating down a 30^0 slope for 20 cm reaches a speed of $1.4\ ms^{-1}$

What difference is there between a static rope and a dynamic one for short roping?



The area under the graph corresponds to the energy absorbed due to rope stretch.

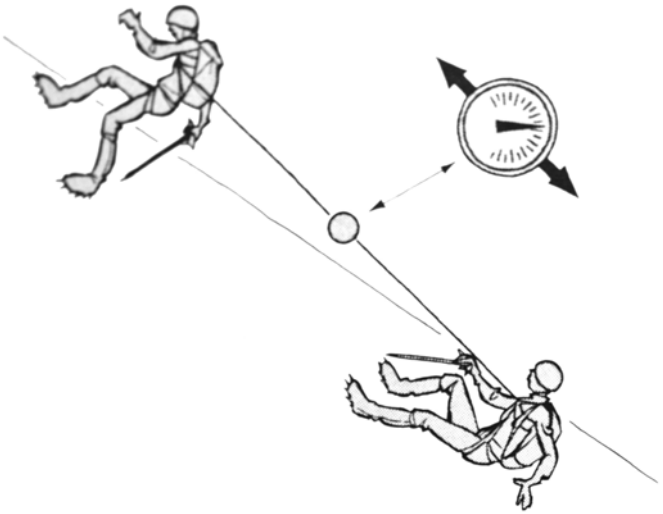


What forces are experienced in a short roping situation?

What force F_{max} do you think you can hold while short-roping?

Forces measured during field trials (DAV Sicherheitskreis, 1982)

Climbers (80 kg) were placed on slopes of 30^0 - 40^0. Other climbers (80 kg) were instructed to fall. Various positions were tested. The force was coming onto the the harness. The forces necessary to dislodge the climbers were measured.

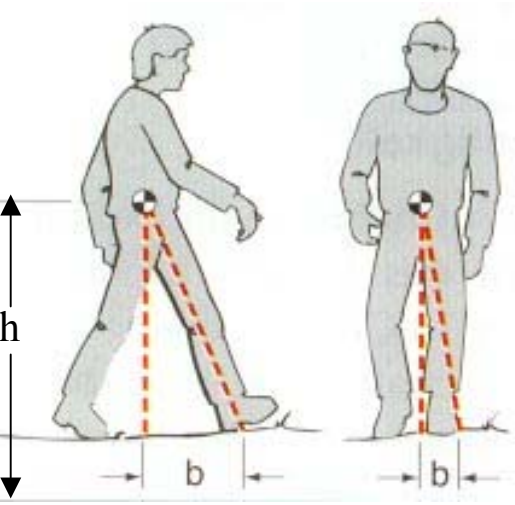


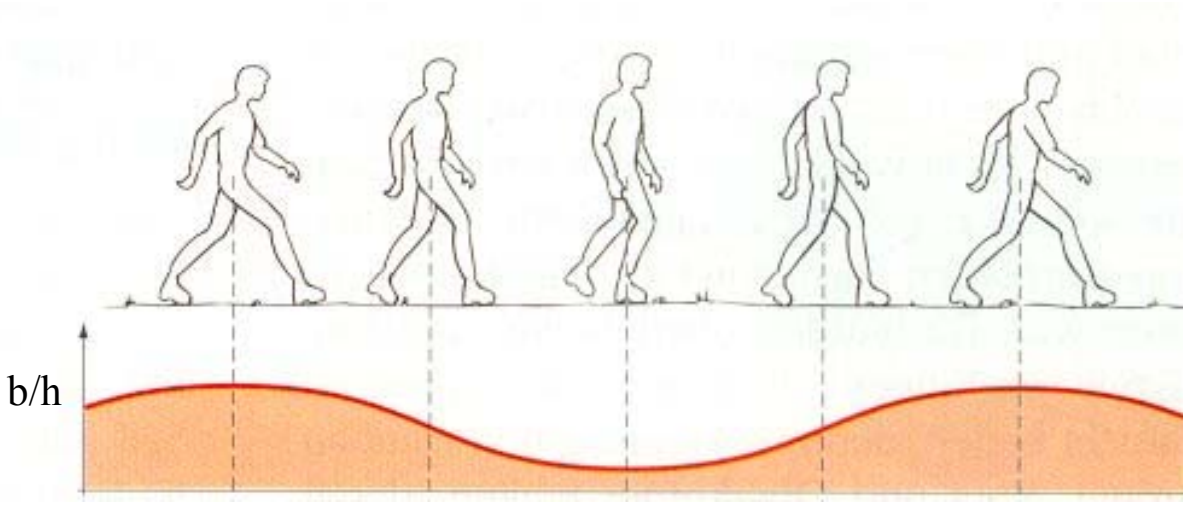
Forces measured were in the following range:

Standing, sideways force:	0.3 kN
Standing, frontal force:	0.4 kN
Moving, sideways force:	0.05 - 0.2 kN
Moving, frontal force:	0.05 - 0.2 kN

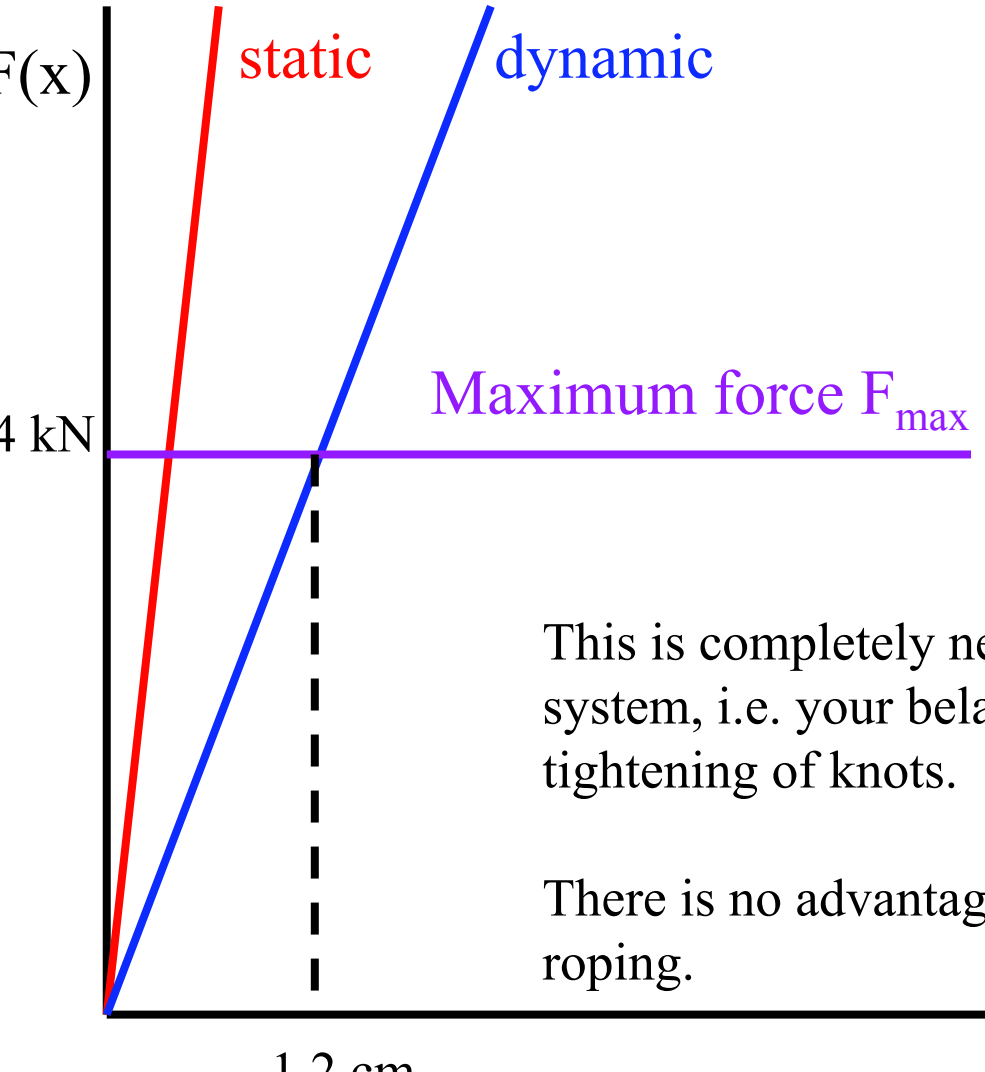
Stability b/h depends on the phase of the stride, or on the position of legs when standing.

When one foot is up stability is close to zero.





What difference is there between a static rope and a dynamic one for short roping?



A dynamic rope stretches 10% at a force of 10 kN

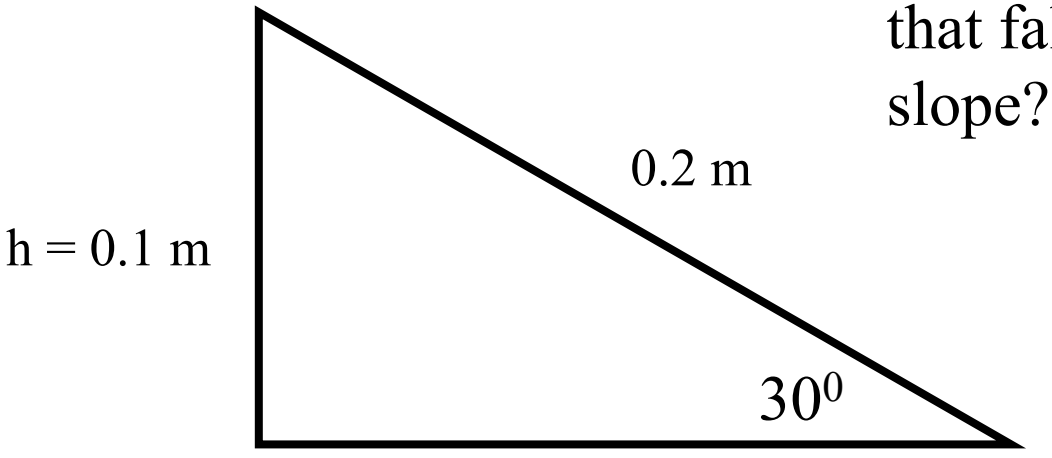
For a 3 m long short-rope this is 30 cm at 10 kN

At the maximum force F_{max}, i.e. 0.4 kN, the dynamic rope stretches 1.2 cm

This is completely negligible compared to the give in the system, i.e. your belay hand, the client's waist and the tightening of knots.

There is no advantage using a dynamic rope for short roping.

Can we hold a body of 80 kg that falls 20 cm down a 30^0 slope?



$Mgh = 80\ kg \times 9.81\ ms^{-2} \times 0.1\ m$

$= 78\ Nm$ Energy that needs to be absorbed

In the best case scenario we can hold approximately $0.4\ kN = F_{max}$

Let us assume our belay arm is angled at the beginning of the pull, and acts like a spring (bungy), and is straight at the end of the pull of F_{max}

Let us assume the give of our arm is 0.3 m

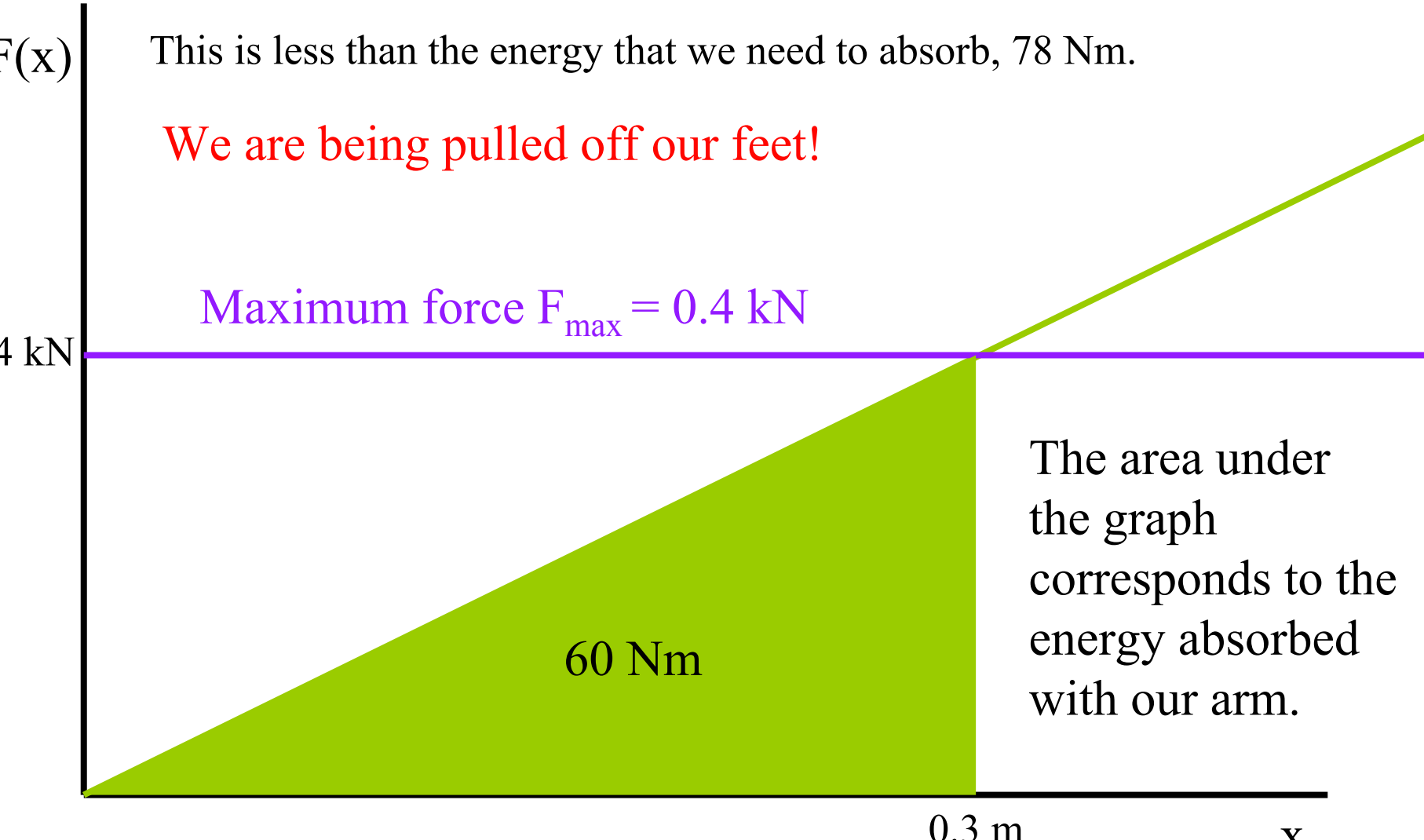
The energy we can absorb with our arm is

$0.5 \times F_{max} \times 0.3\ m = 0.5 \times 0.4\ kN \times 0.3\ m$

$= 60\ Nm$

This is less than the energy that we need to absorb, 78 Nm.

We are being pulled off our feet!

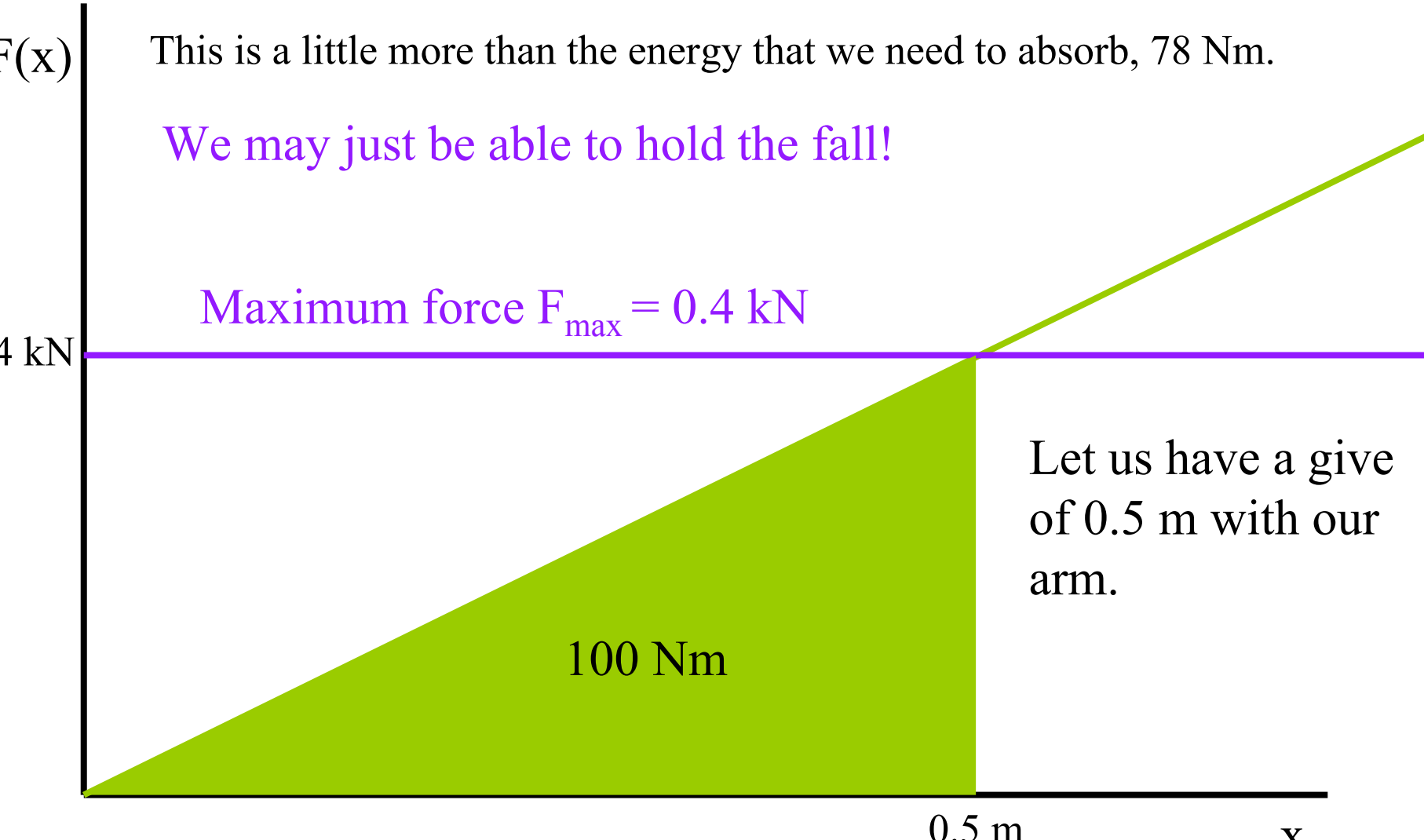


The energy we can absorb with our arm is

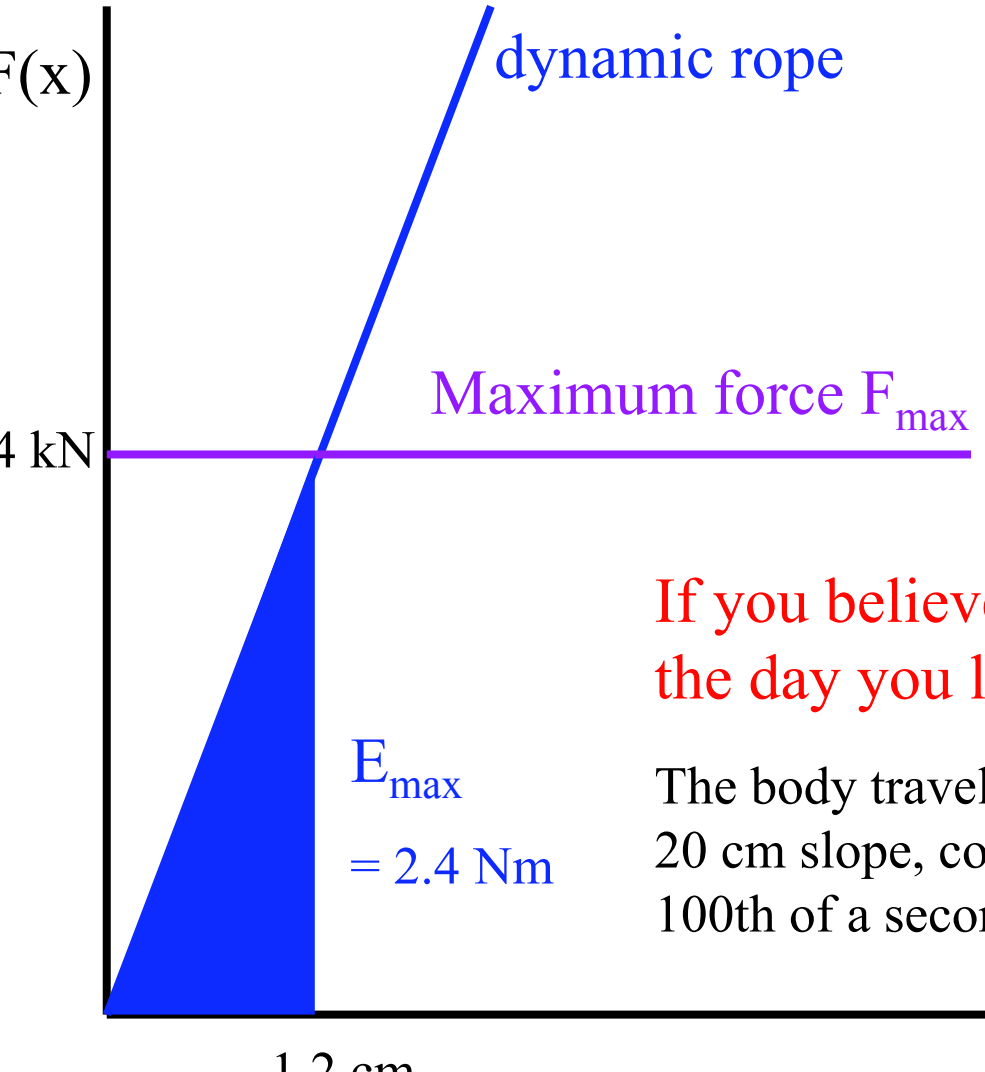
$0.5 \times F_{max} \times 0.5\ m = 0.5 \times 0.4\ kN \times 0.5\ m$

$= 100\ Nm$

This is a little more than the energy that we need to absorb, 78 Nm.



Your arm is straight and there is only the dynamic property of the climbing rope to absorb the maximum energy E_{max} before being pulled off by the maximum force $F_{max.}$



The rope stretch is 1.2 cm at most

E_{max} = 0.5 x 400 N x 0.012 m

= 2.4 Nm Energy absorbed

E = 78 Nm need to be absorbed

E > 30 x E_{max}

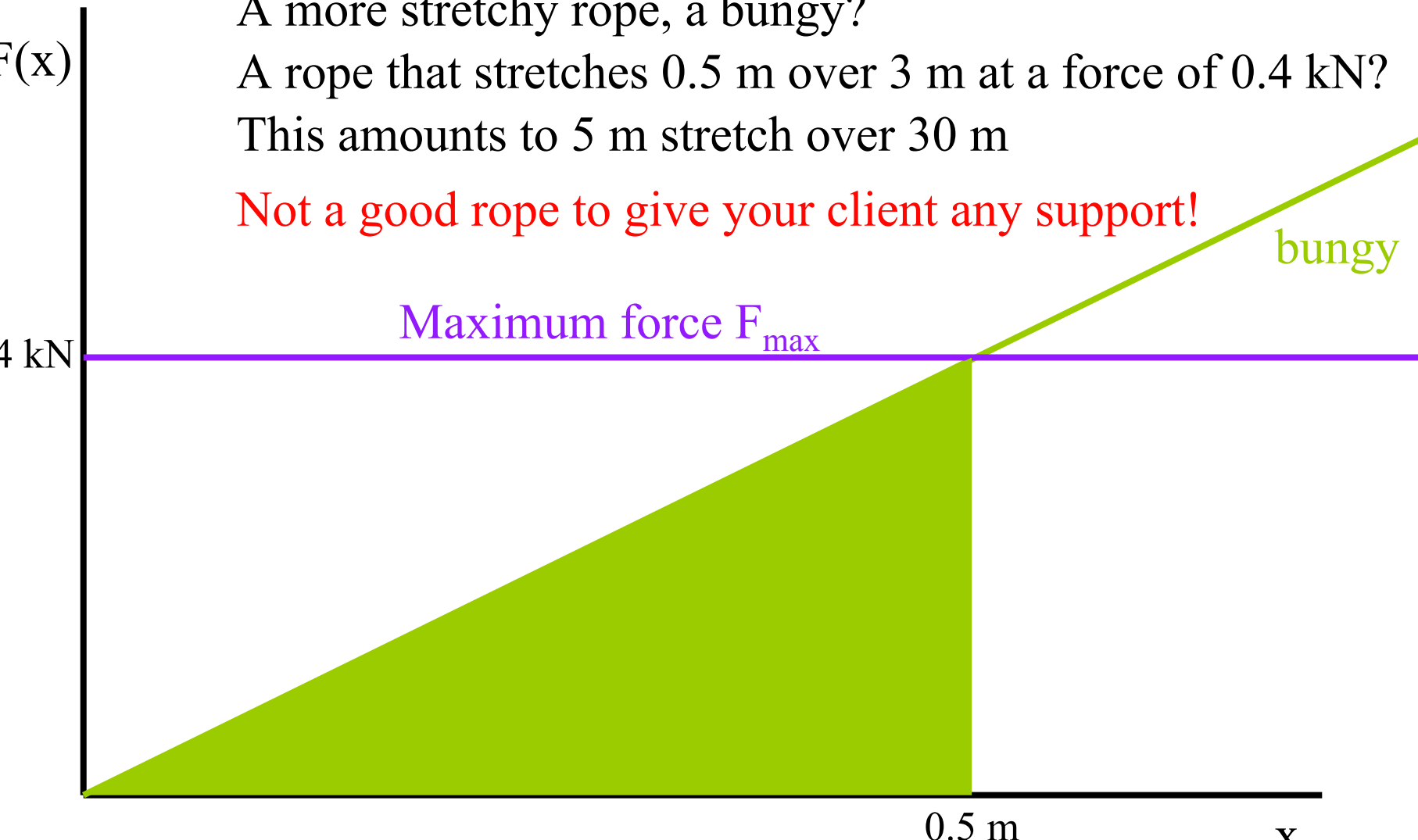
If you believe that your dynamic rope saves the day you live in a dreamworld!

The body travelling at 1.4 ms^{-1} at the bottom of the 20 cm slope, covers the 1.2 cm distance in less than 100th of a second. No time to react either!

Would a more dynamic rope save the day?

A rope designed to absorb more energy at smaller forces?
A more stretchy rope, a bungy?
A rope that stretches 0.5 m over 3 m at a force of 0.4 kN?
This amounts to 5 m stretch over 30 m

Not a good rope to give your client any support!

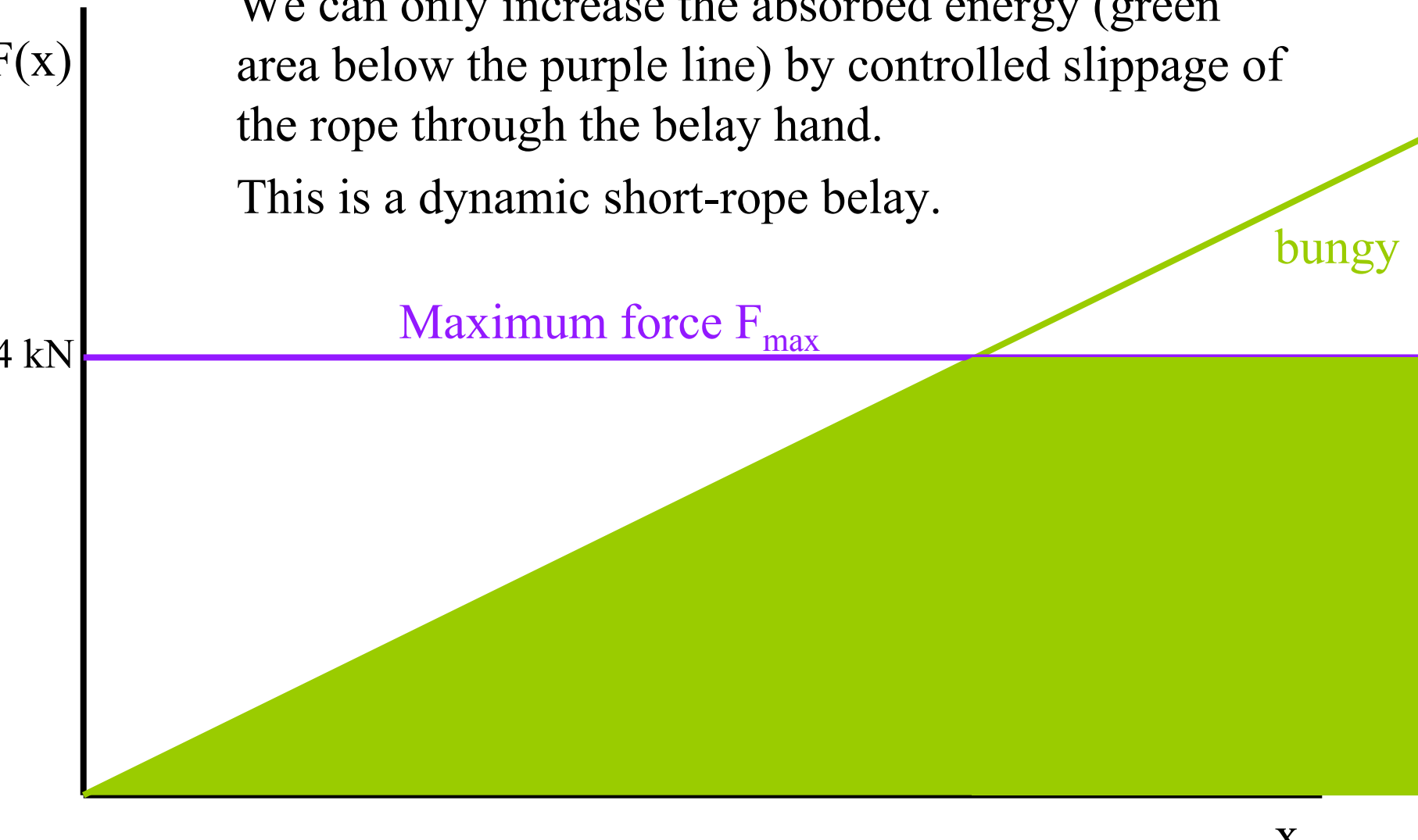


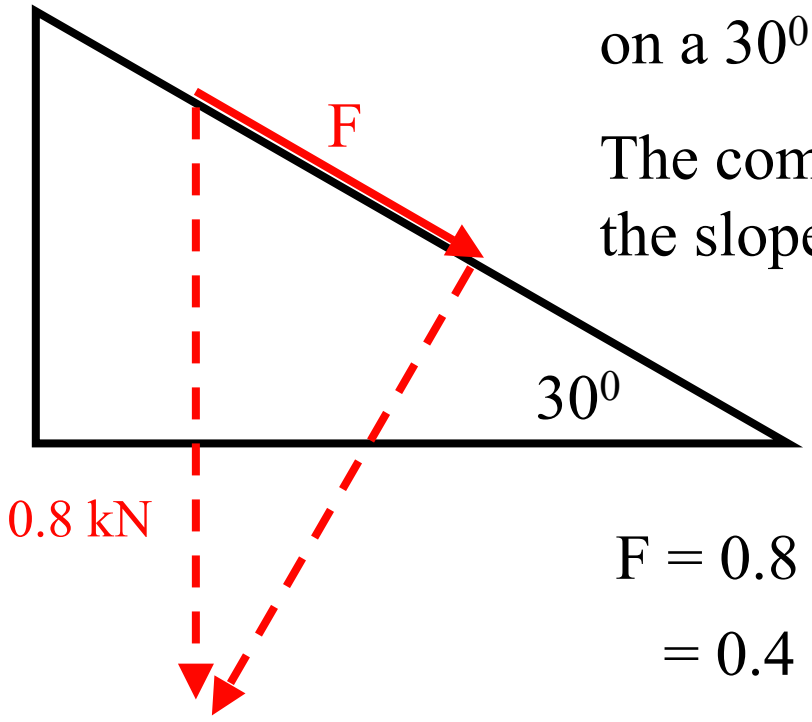
How can we increase the absorbed energy?

We cannot increase the maximum force we can hold.

We can only increase the absorbed energy (green area below the purple line) by controlled slippage of the rope through the belay hand.

This is a dynamic short-rope belay.





Can we hold a static load of 80 kg on a 30^0 icy slope?

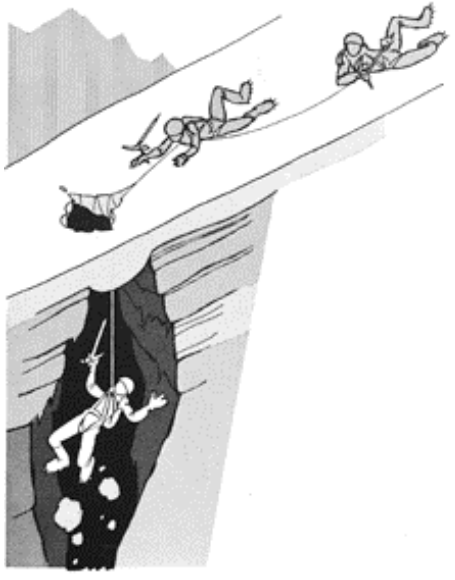
The component perpendicular to the slope is responsible for friction.

$$F = 0.8 \text{ kN} \times \sin(30^0)$$
$$= 0.4 \text{ kN}$$

This is the maximum force we can hold!

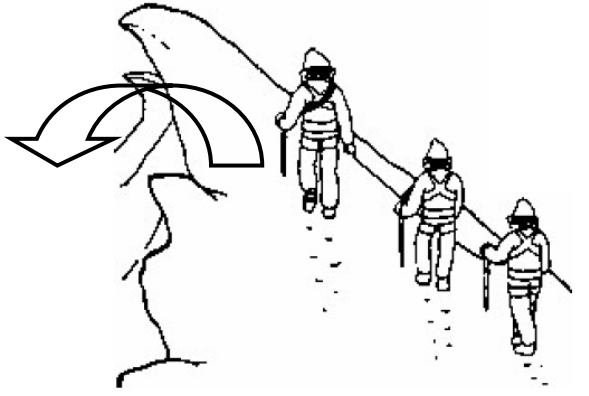
What are your chances of holding a fall once you have let go of the rope, i.e. you can no longer hold the rope with your hand?

- works well if you are wedged behind a boulder etc.



- it is the common glacier travel scenario.

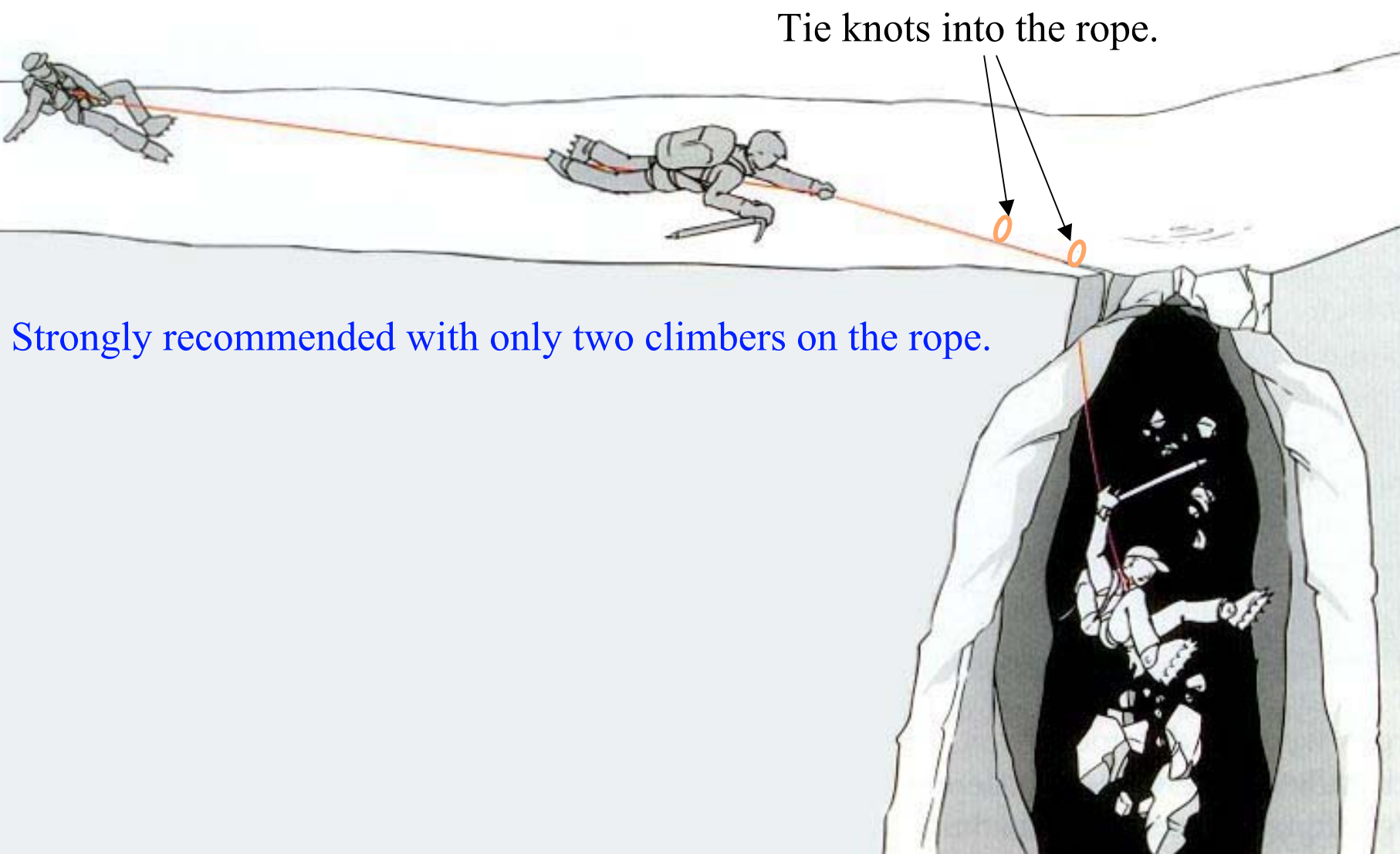
> 20^0 there is a serious risk of being pulled into the crevasse.



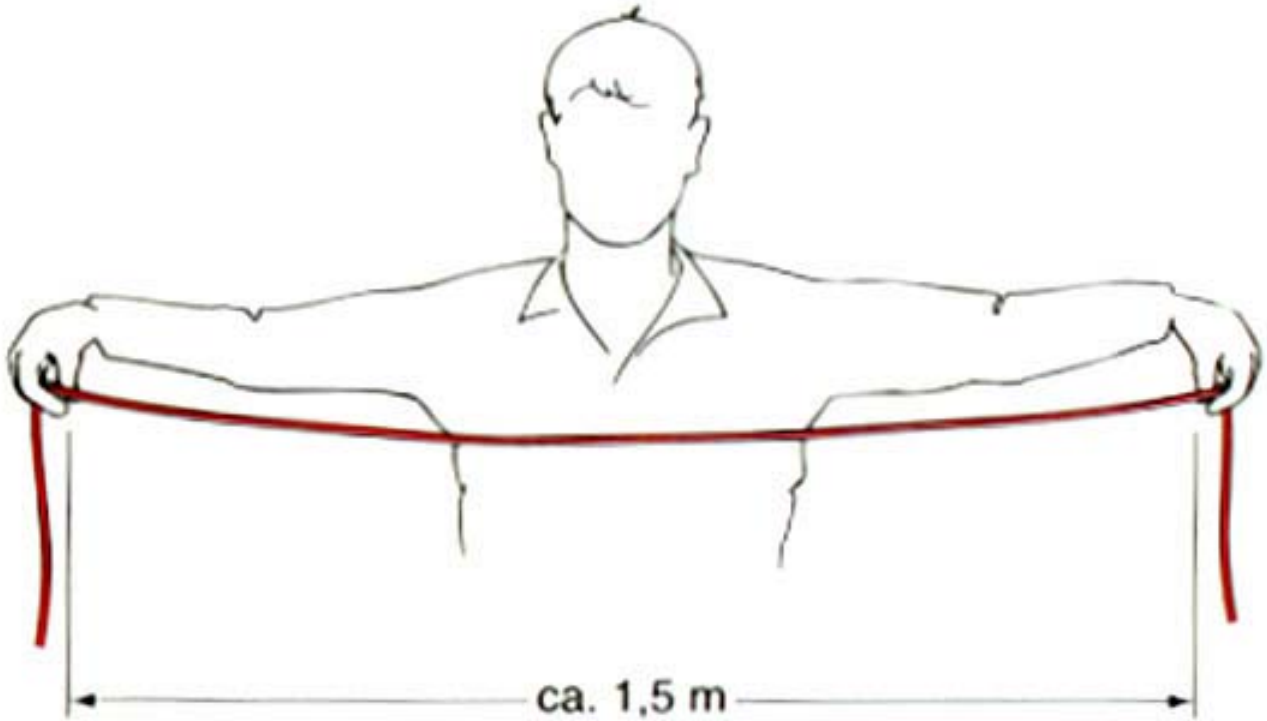
- works on ridge lines if you can jump onto other side of ridge.

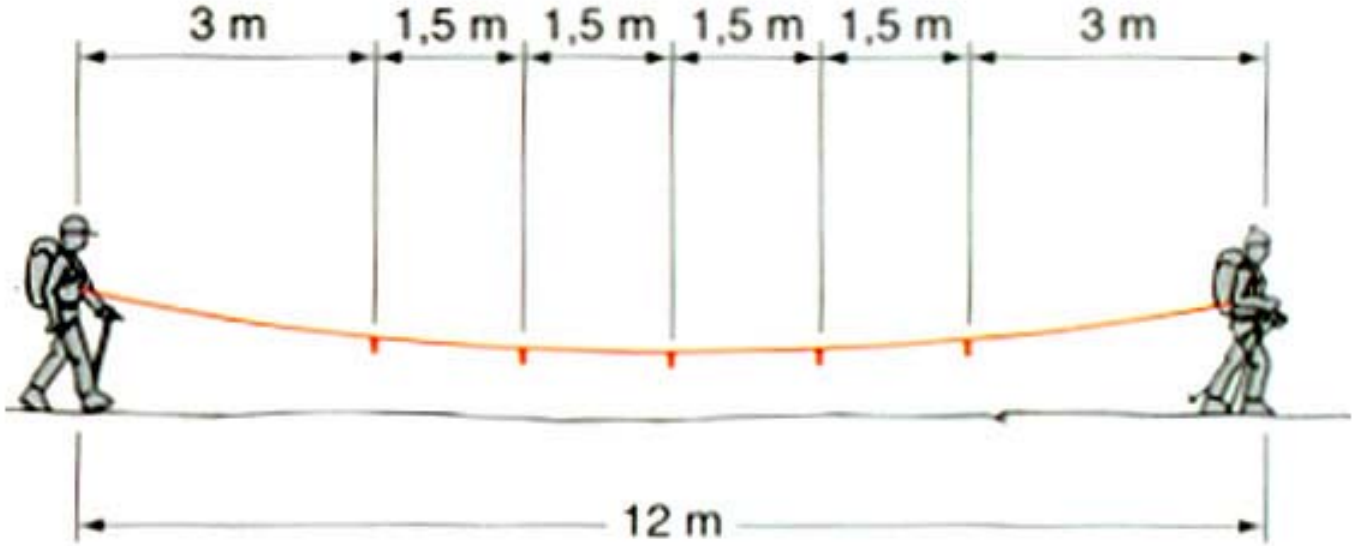
Even on level ground we can get pulled into a crevasse if the first person falls.

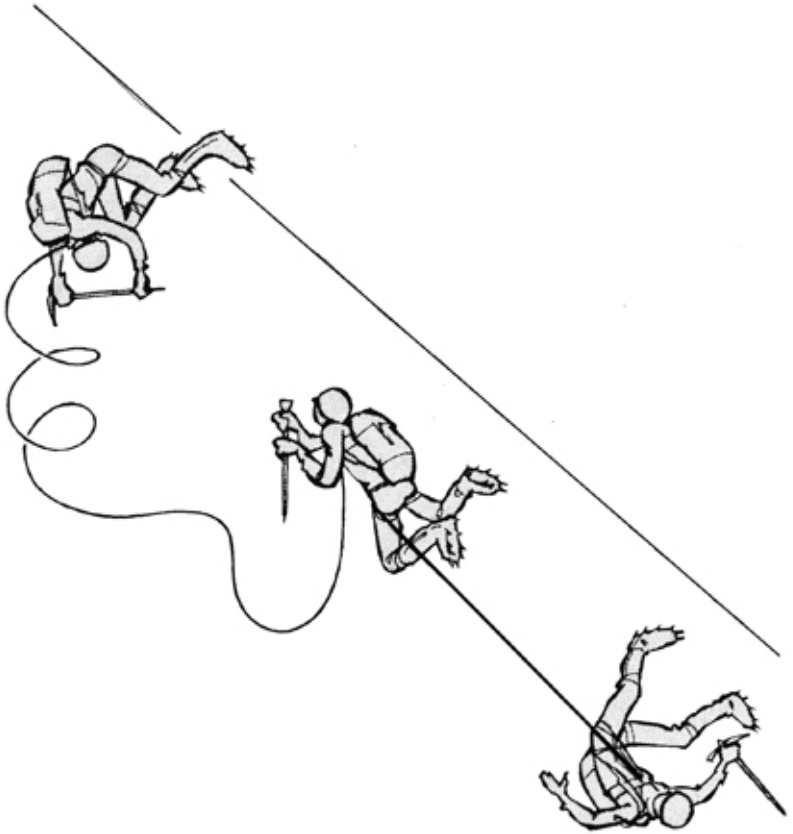
What can we do to increase the friction on the crevasse edge?



Strongly recommended with only two climbers on the rope.


ca. 1,5 m


3 m
1,5 m
1,5 m
1,5 m
1,5 m
3 m
12 m



Not a single case is known of a guide holding a client by self-arresting, once the client has fallen down a hard snow or ice slope, and the guide has lost control of the rope from the belay hand!

What are the advantages of short-roping?

Greatly increases clients' confidence in moderate terrain.

As a result they are more relaxed and concentrate better on secure footing.

Thus there is a greatly reduced probability that they fall.

Time factor.

What are the disadvantages?

In case of failure the entire party may come to grief.

Short-roping is only designed to prevent a slip from turning into a fall.

The guide needs to act immediately.

Short-roping has serious limitations and risks.

You cannot manage the risk!

The laws of physics are independent of your experience and your guiding qualification.

You can only minimise the risk!

Your decision how to minimise risk depends on

- the likelihood of a fall
    - client's competence (crampon and self-arrest skills)
    - availability and condition of equipment
    - fatigue of party
    - environmental conditions
        - gradient of the slope
        - surface conditions
        - weather (wind etc)
- time factor
    - time exposed to ice cliffs, avalanches or rock fall
    - deteriorating environmental conditions with time
- the consequences of a fall
    - is there a safe run out?
- your ability to hold the fall
    - highly subjective, depends on your perception and skill

Guide : Client ratios for short-roping in different terrain

Recommendations VDBS

Where	Guide : Client ratio
Snow and firn slopes depending on conditions critical > 30^0	1:1 preferred 1:2 for easy terrain 1:3 maximum
Ice slopes critical > 25^0	1:1 preferred 1:2 maximum
Ridge lines (firn, ice, rock)	1:1 to 1:3 depending on difficulty
Mixed terrain and terraced rock	1:1 preferred 1:2 maximum

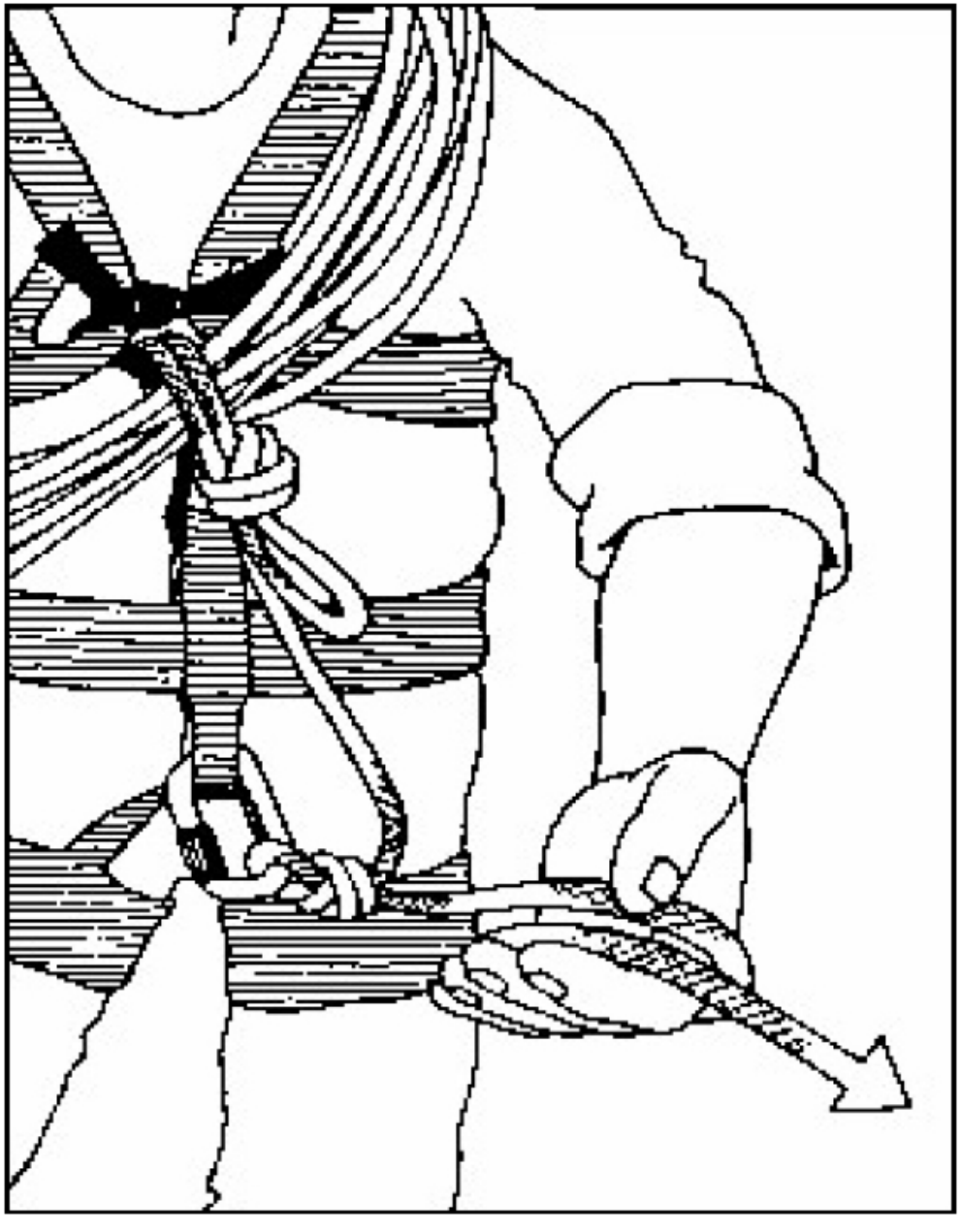
How do we tie in for short-roping?

Are there different methods for different situations?

- glacier travel
- mixed terrain
- ridge lines
- short obstacles and short slopes

How do our overseas colleagues handle short roping?

Let us look at the recommendations of the VDBS:



Spare rope over shoulder, or in pack and tied off.

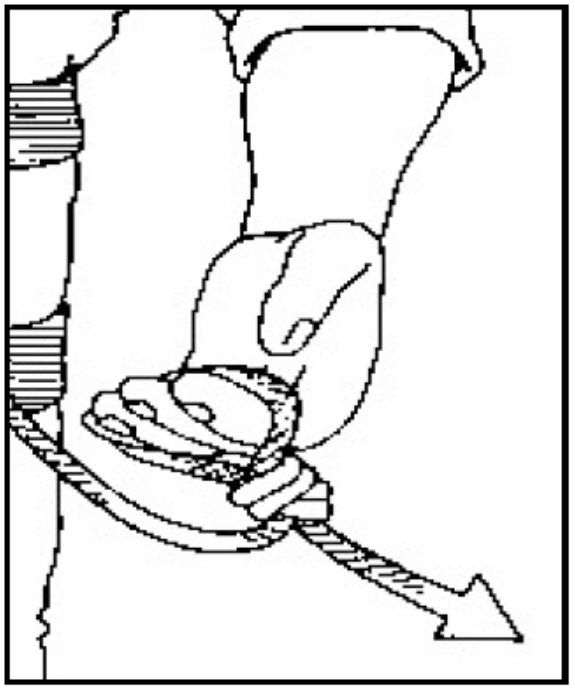
Rope attached to lowest point of harness.

Length of rope to belay hand kept short. No coils.

Rope on belay hand not locked off.

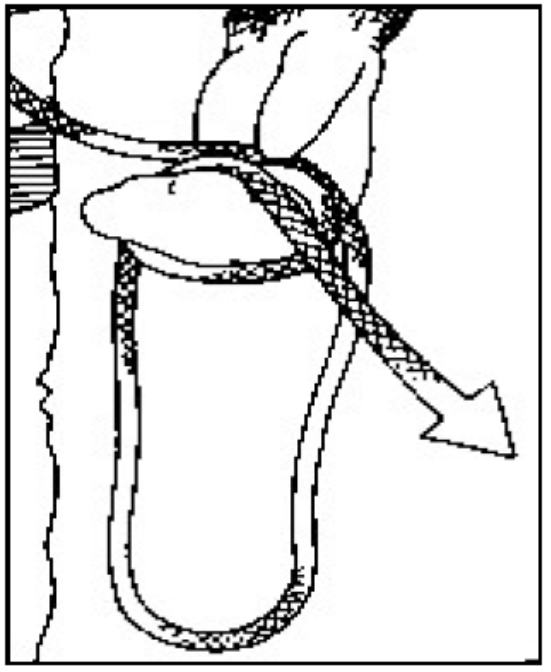
Advantage: Pull comes onto lower point of body, not on the shoulder.

Disadvantage: Very little room to maneuver. Very little scope to react quickly.



Alternatively a hand loop may be used.

Suitable for small diameter ropes.

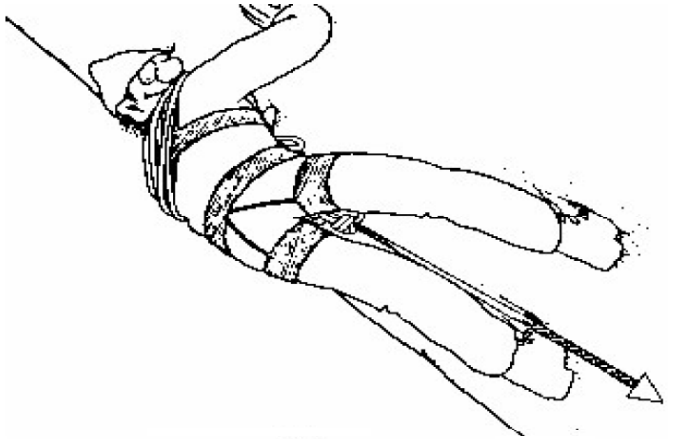


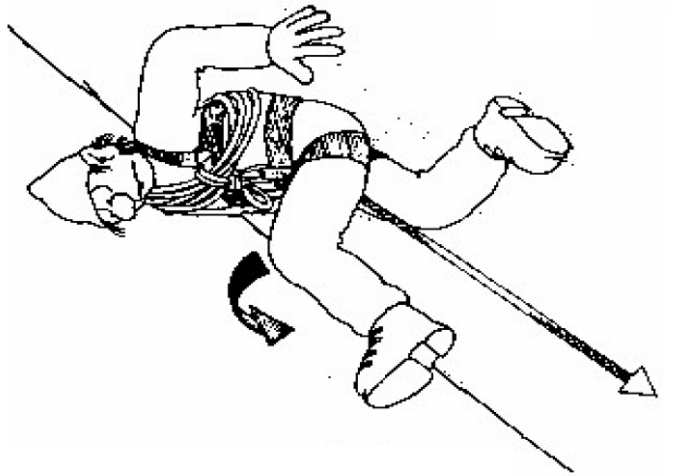
Dynamic hand brake for controlled slippage of rope.

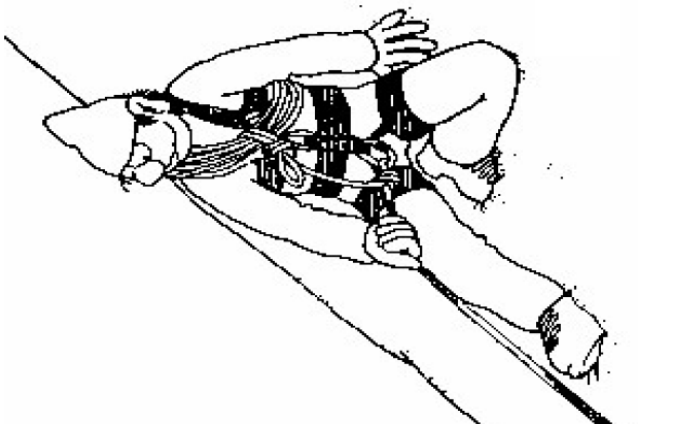
Requires lots of practice.

Only suitable for large diameter ropes.

Depends on type of glove.







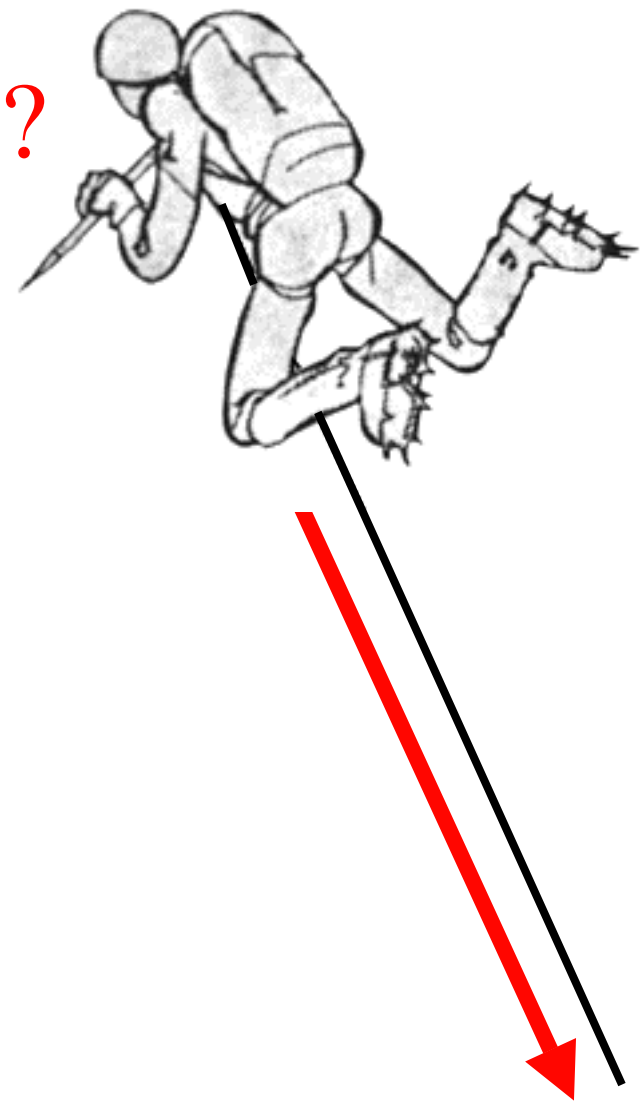
In case of a pull the guide may have to take a quick step downhill.

If client's slip cannot be held guide needs to get into self-arrest position immediately and has to try to hold the fall this way.

May only work on a soft surface where guide can dig in his feet!

In most cases this is wishful thinking !

What about if you need to hold the fall on a hard surface ?



Do you really think you can hold the fall of an entire party with just the pick of your axe?

- That is if you manage to get into your self-arrest position.

- Remember: you were trying to hold the fall with your down-hill hand.

Not a single case is known of a guide holding a client by self-arresting, once the client has fallen down a hard snow or ice slope, and the guide has lost control of the rope from the belay hand!

Other opinions on short-roping:

Gareth Hattingh, "The Climber's Handbook", South Africa

The guide should hold a small amount (2-3m) of slack (excess rope) in the hand away from the client, while his client-side hand controls tension to the client (a thumb-up hold tends to provide greater gripping power).

The slack may either be looped around the hand, or lapped back and forth across (rather than around) the hand.

The "official" advantage of the former is that the rope tightens onto the hand if the client starts to pull the rope through the other hand, adding to safety.

The "official" advantage of lapping is that it is easier and quicker to control the length of the rope. Practically, it comes down to personal preference.

Another opinion on short-roping:

Guide holds the belay hand high against his chest.

Distance to harness tie-off allows for maximum arm movement.

Coils are locked off at belay hand.

This is supposed to allow for maximum give and time to react.

Force to come on arm in the first instance, not on harness.

Tie-off at harness is only considered to be a “back-up”.

Commonly used in New Zealand.

How long a rope for short roping?

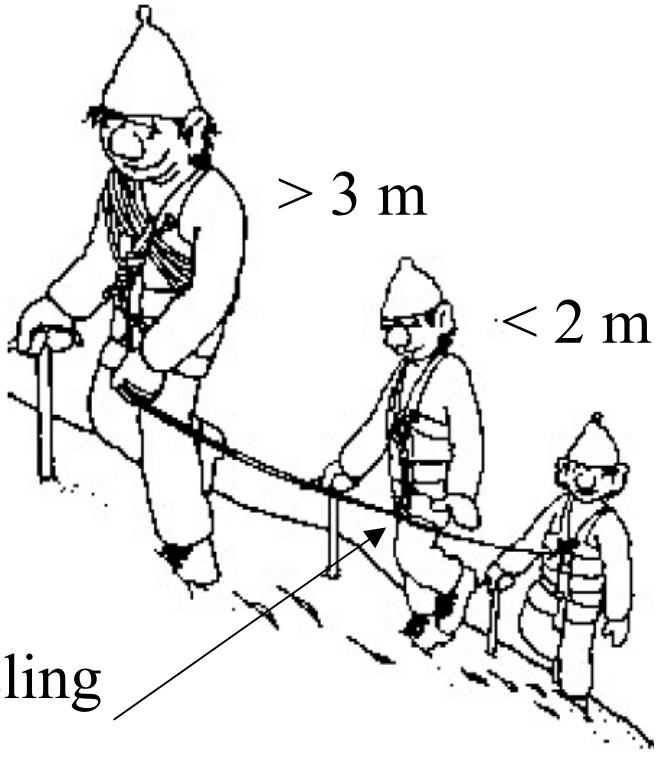
VDBS recommendation

For snow and firn

Maximum of 2 m between clients

Minimum of 3 m from guide to nearest client

Middle client attached with short swivel sling and ascender (“shunt” or “ropeman”).



Petzl “Shunt”

Middle client is tied in with short swivel sling and a “Shunt” or a “Ropeman”.

In case the bottom client slips the rope runs through at the “Shunt” / “Ropeman”.

If clients need to move one at a time the middle client can move up while the lower one waits.

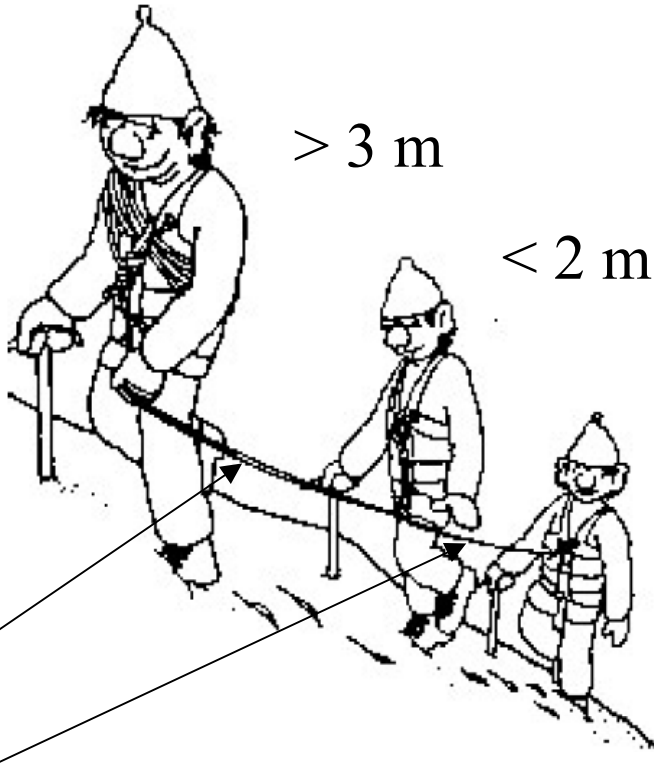
Wild Country “Ropeman”

The lower client can move up while the middle client holds the “Shunt” / “Ropeman” open.

Works the same in reverse on the downhill.

How long a rope for short roping?

VDBS recommendation



Rope always gently tight.

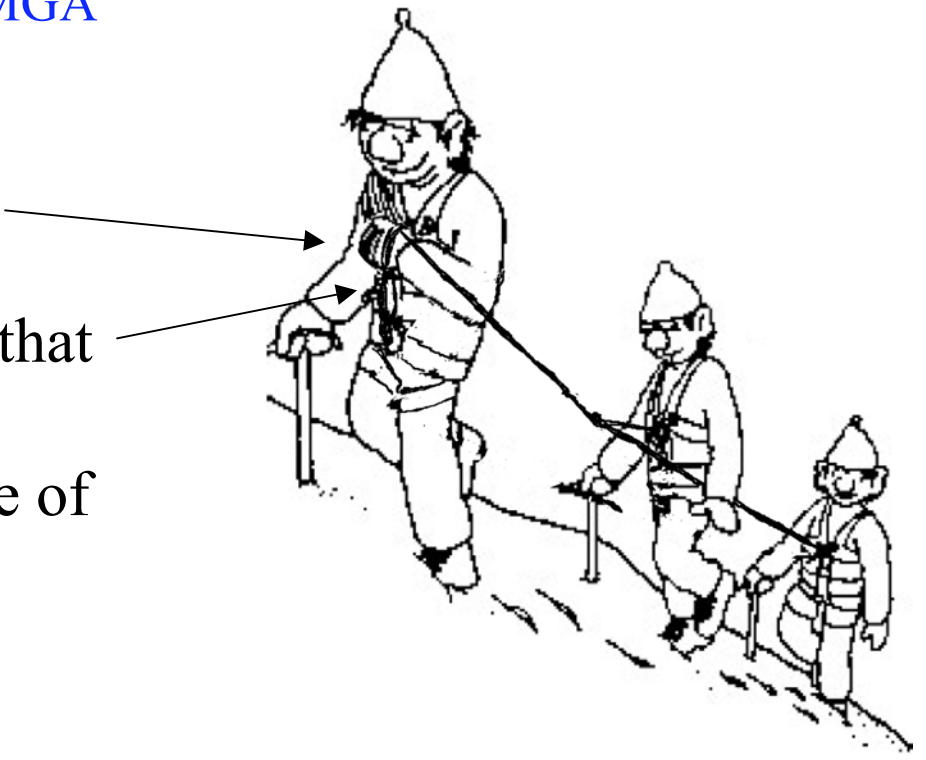
Not too tight as this would unbalance clients.

For traverses the rope is as short as possible.

Preferred Kiwi method, NZMGA

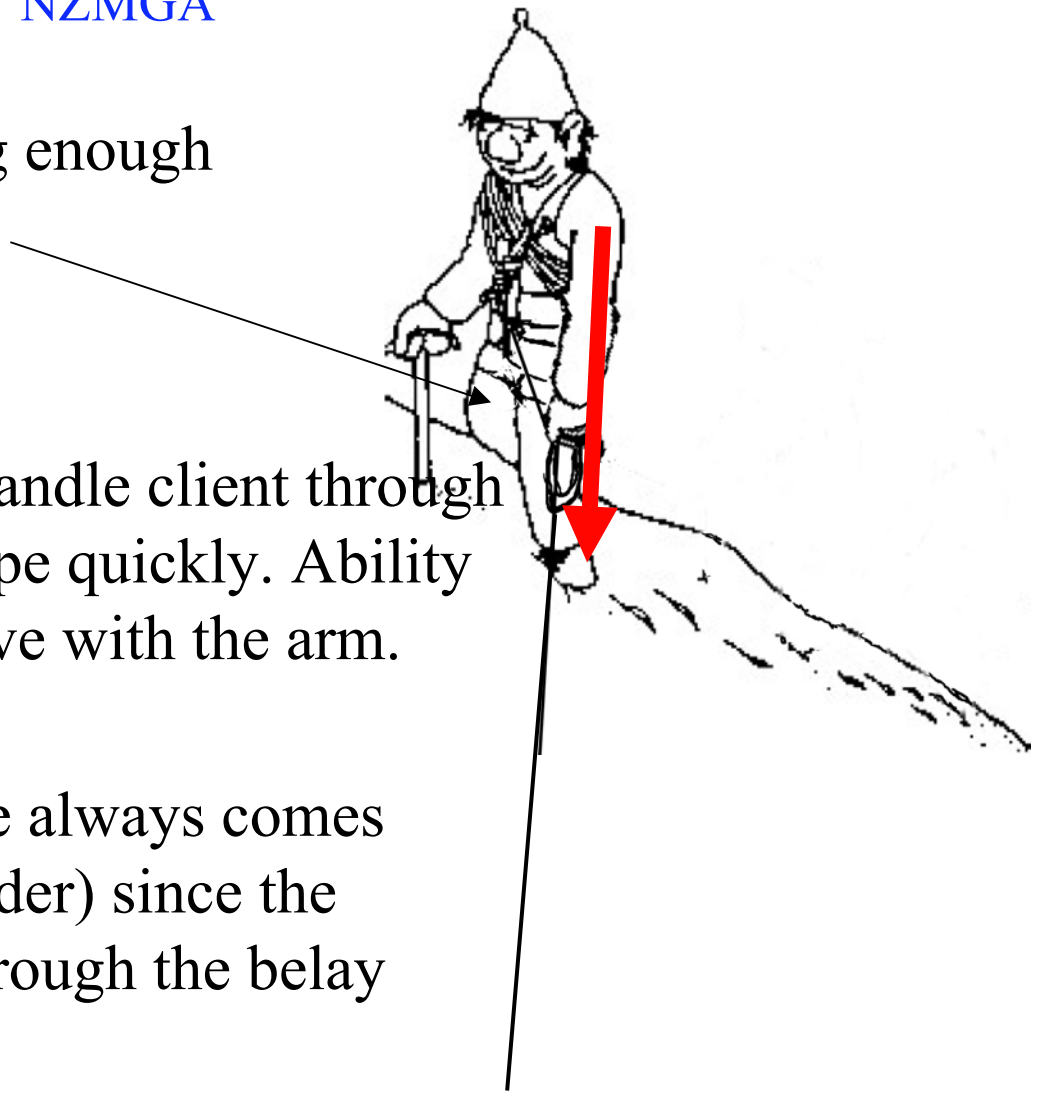
Guide has belay hand close to his chest, to allow give.

Guide carries a number of coils that are locked off at the belay hand, ensuring that there is no slippage of the rope to the client.



Preferred Kiwi method, NZMGA

Rope to harness tie-off long enough to allow outstretched arm.



Advantage: More room to handle client through ability to adjust length of rope quickly. Ability to absorb energy through give with the arm.

Disadvantage: The full force always comes on guide's belay arm (shoulder) since the rope to the harness slides through the belay hand when carrying coils.

Note: While the rope to the client, the "life end of the rope"' is firmly locked off at the belay hand after taking in coils, the "dead end" of the rope to the harness is not locked off.

Recommended method, Swiss mountain guide

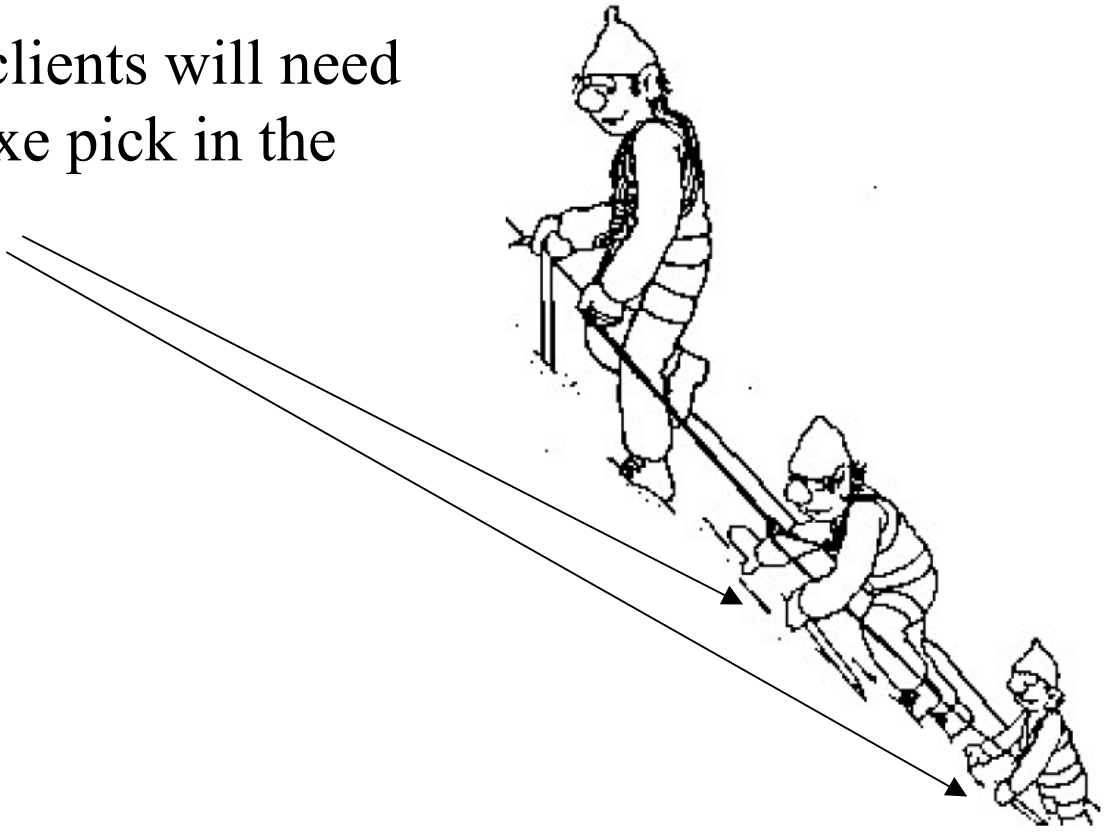
For firn and snow slopes

No. of clients	mainly 2; more depending on gradient
Distance between guide and client	as short as possible, 1 - 2 m
Distance between clients	as short as possible, 1 - 2 m
Middle men	directly tied into rope, often also hand loo
Coils in guide's belay hand	as few as possible, not more than
Coils locked off ?	either locked off, or hand loop, to prevent slippag
Belay hand	down on slightly bent arm

ie Alpen 9/2005

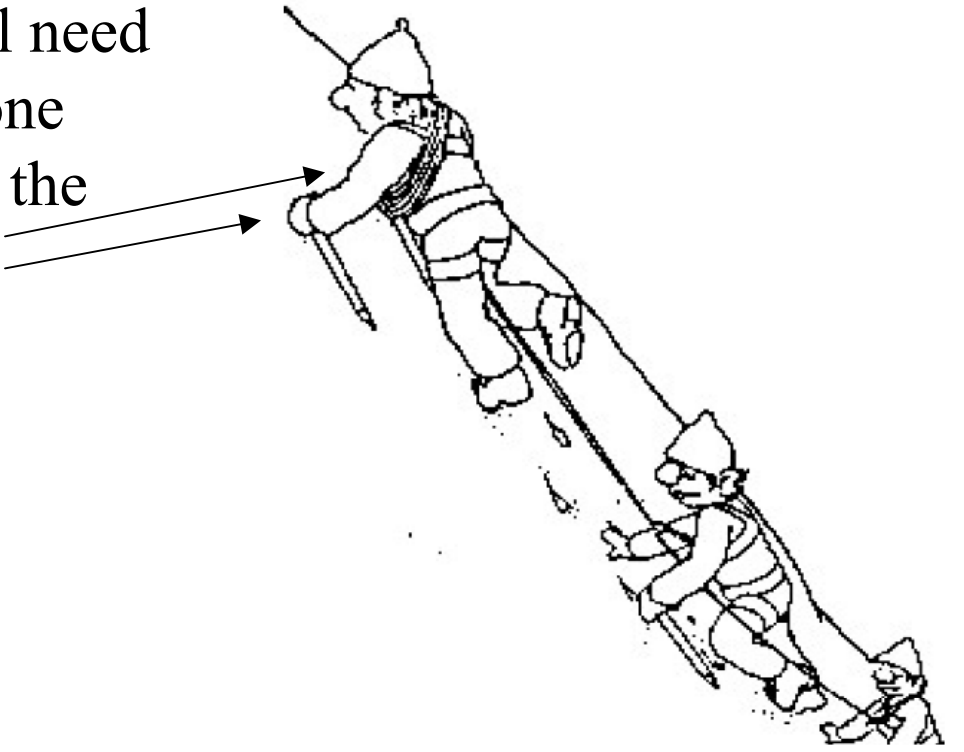
VDBS

On steeper slopes clients will need to travel with ice axe pick in the snow.



VDBS

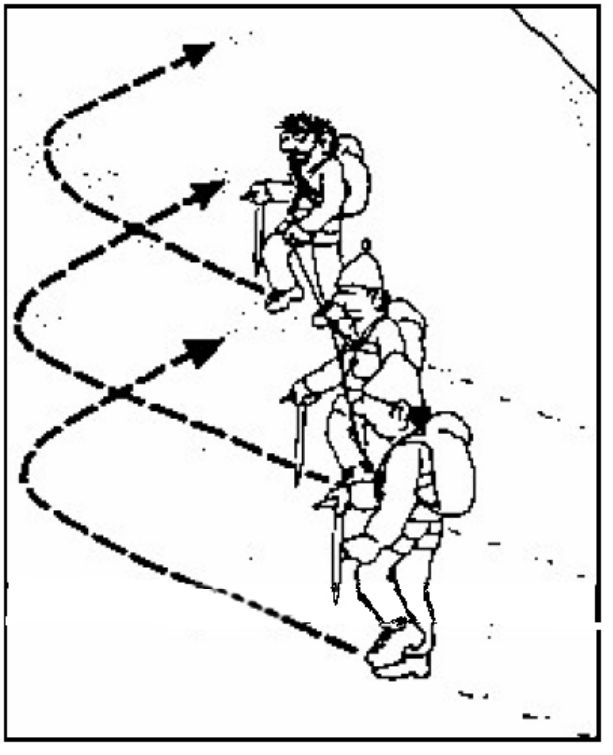
On harder surfaces guide will need to travel with two ice tools, one always applied before taking the next step.



VDBS

Clients are always below the guide.

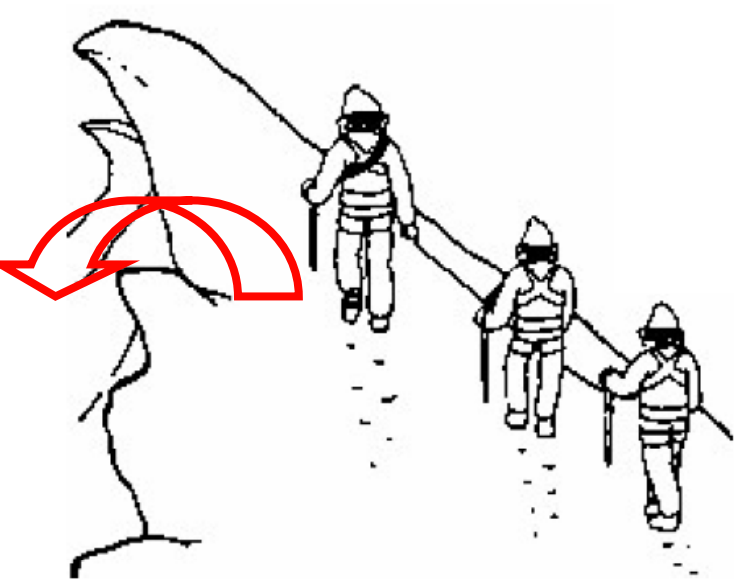
Everybody changes direction at the same time.



Guide travels on other side of the ridge

Disadvantage:
Clients have to make their own steps.

Guide travels on same side of the ridge



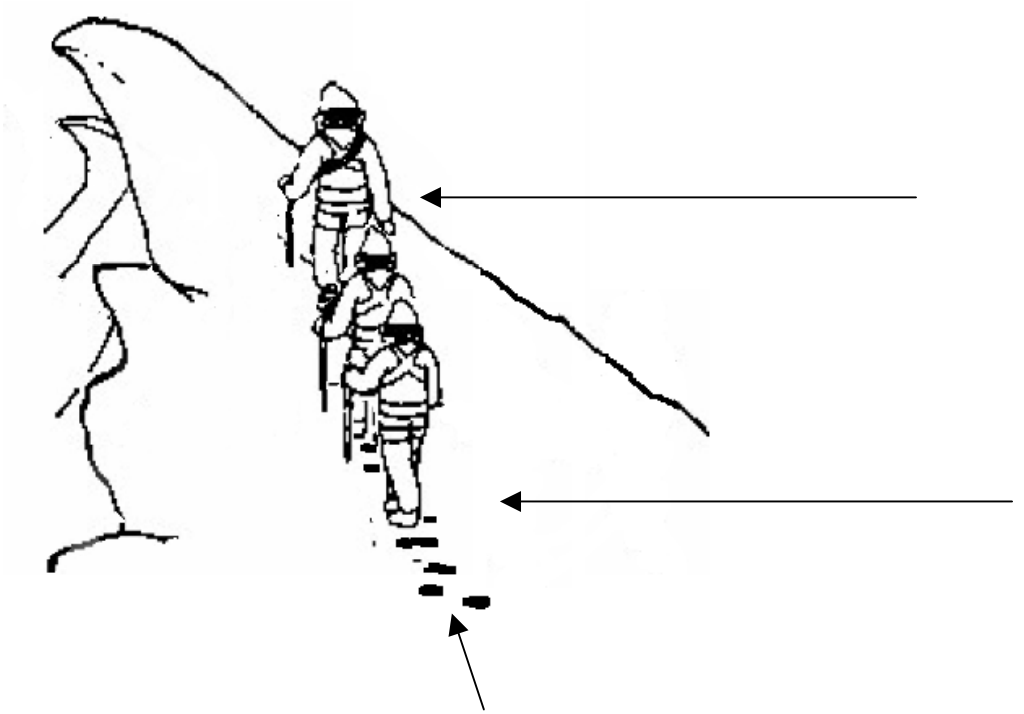
Guide needs to carry enough coils to allow him to jump over to the other side of the ridge.

Guide needs to travel close to the ridge line to achieve that.

In corniced terrain this may just be wishful thinking!

Guide travels on same side of the ridge

NZMGA



Guide often has to pick a fine line between cornice and snow slab.

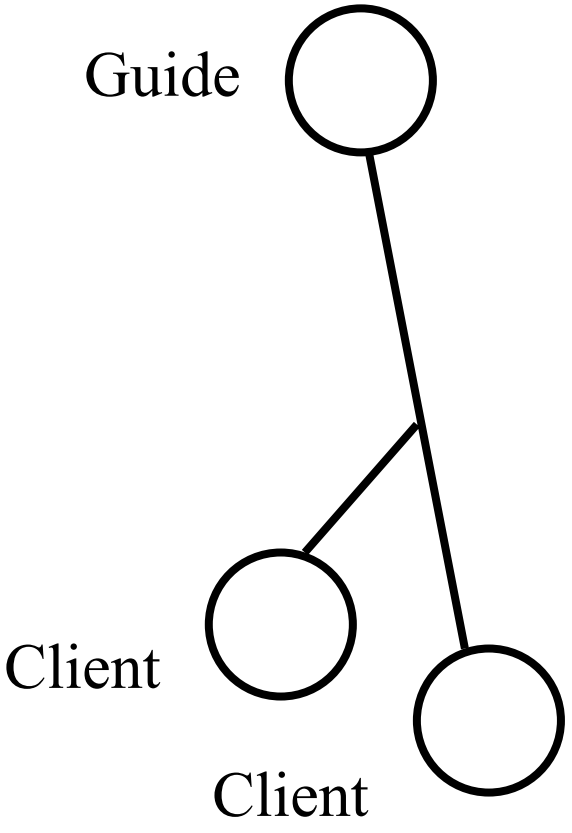
Clients then need to travel in the guide's steps, Not below.

If necessary guide cuts a line of steps on the move.

Short roping in rock climbing situations often requires a longer rope to the client, 3 - 10 m.

Often there are good ways to step behind boulders, rock outcrops etc.

Short-roping two clients without floating attachment



"Inverted Y" method

Guide ties into the end of the rope.

Spare rope either coiled around shoulder or put into pack, ties back at the harness.

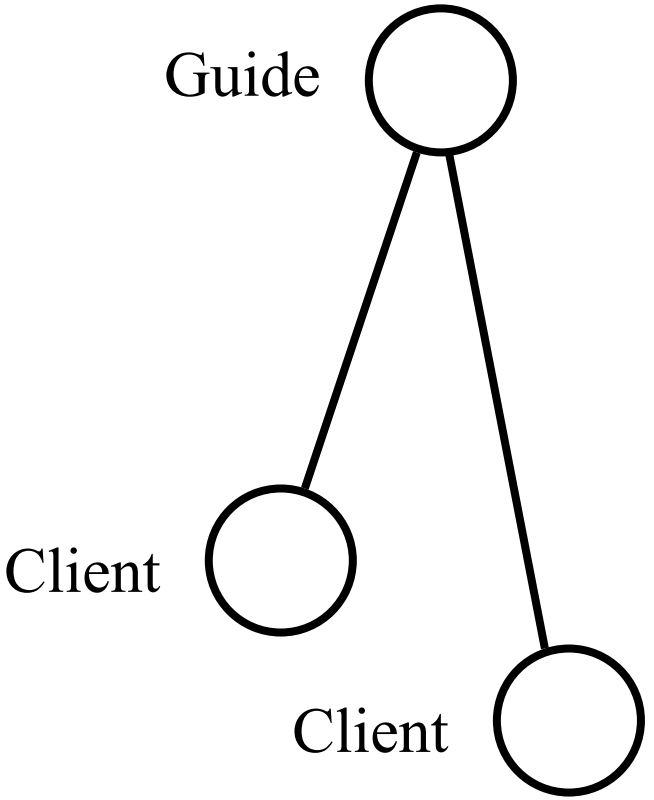
Minimum distance guide-client 3 m.

Guide always in the middle above the clients.

May use hand loop.

Advantage: only one rope to handle.

Short-roping two clients without floating attachment



"Inverted V" method

Guide ties into the middle of the rope, ties back at the harness.

Spare rope either coiled around shoulder or put into pack.

Minimum distance guide-client 3 m.

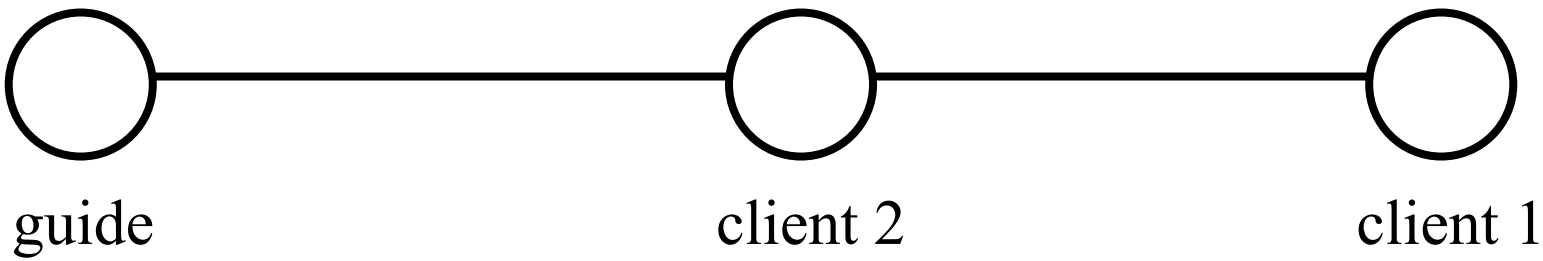
Guide always in the middle above the clients.

May use hand loop for each rope.

Advantage: rope to individual clients.

Quick way to change from glacier travel to short-rope travel

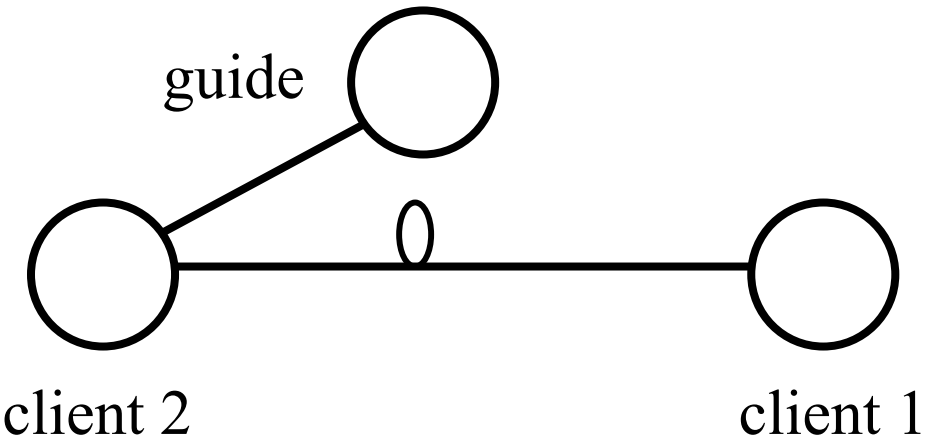
NZMGA winter course 2003



Quick way to change from glacier travel to short-rope travel

NZMGA winter course 2003

Guide steps back and ties hand loop into rope between the two clients.

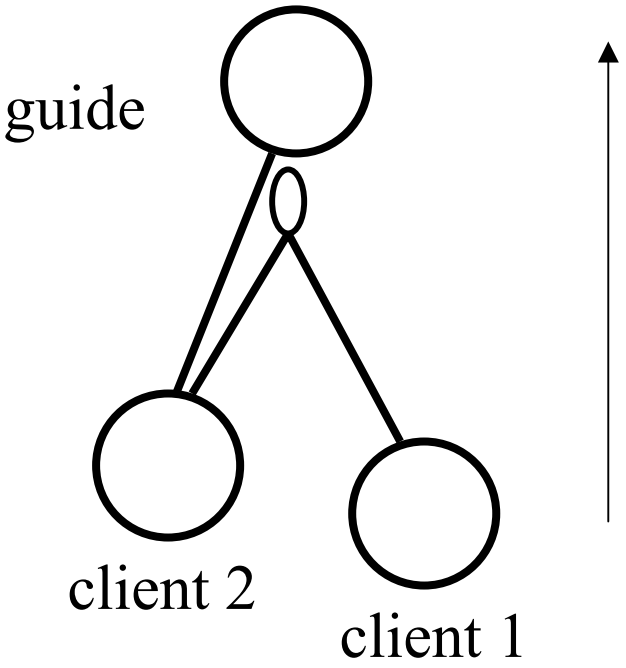


Quick way to change from glacier travel to short-rope travel

NZMGA winter course 2003

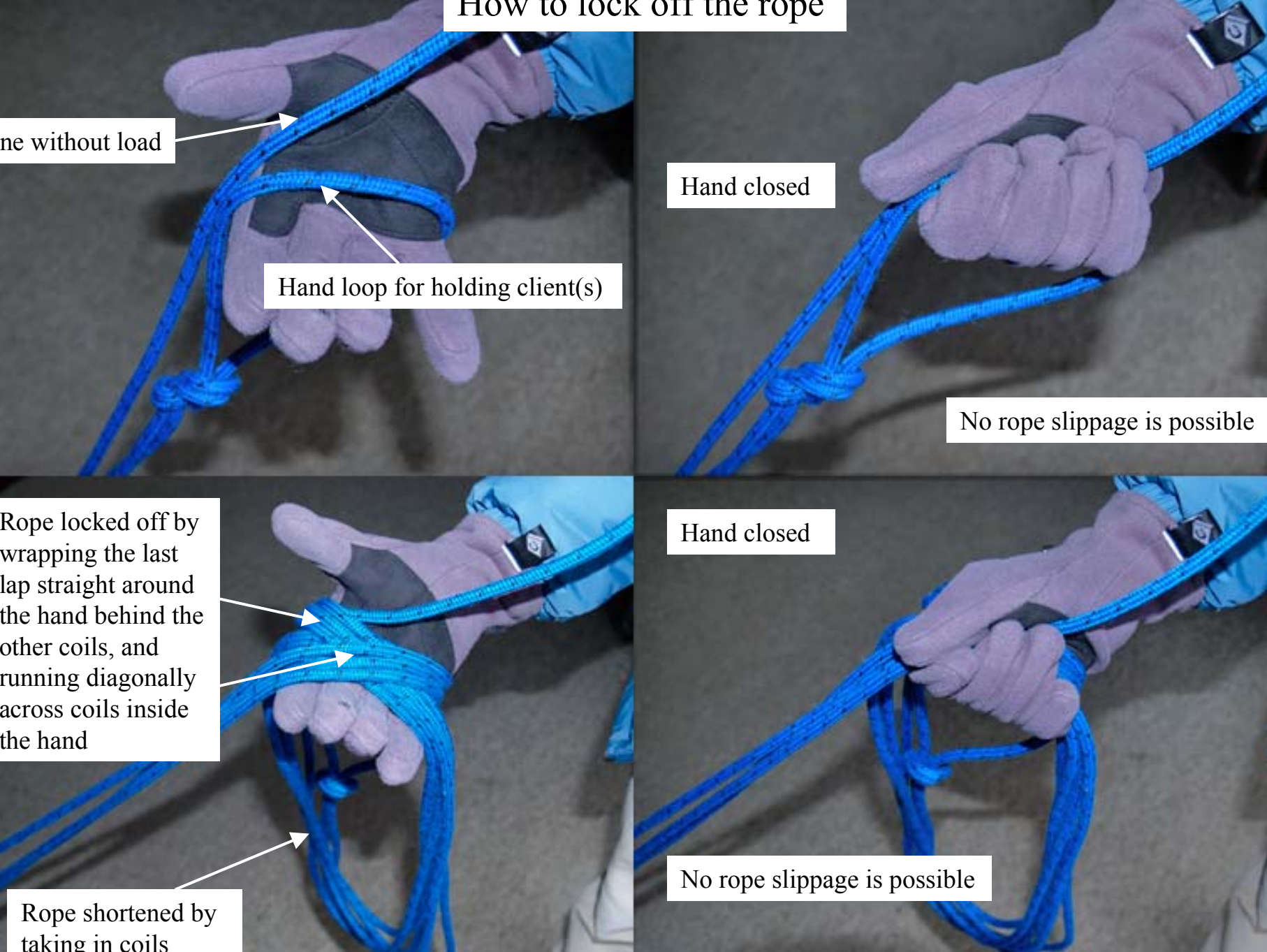
Guide steps back and ties hand loop into rope between the two clients.

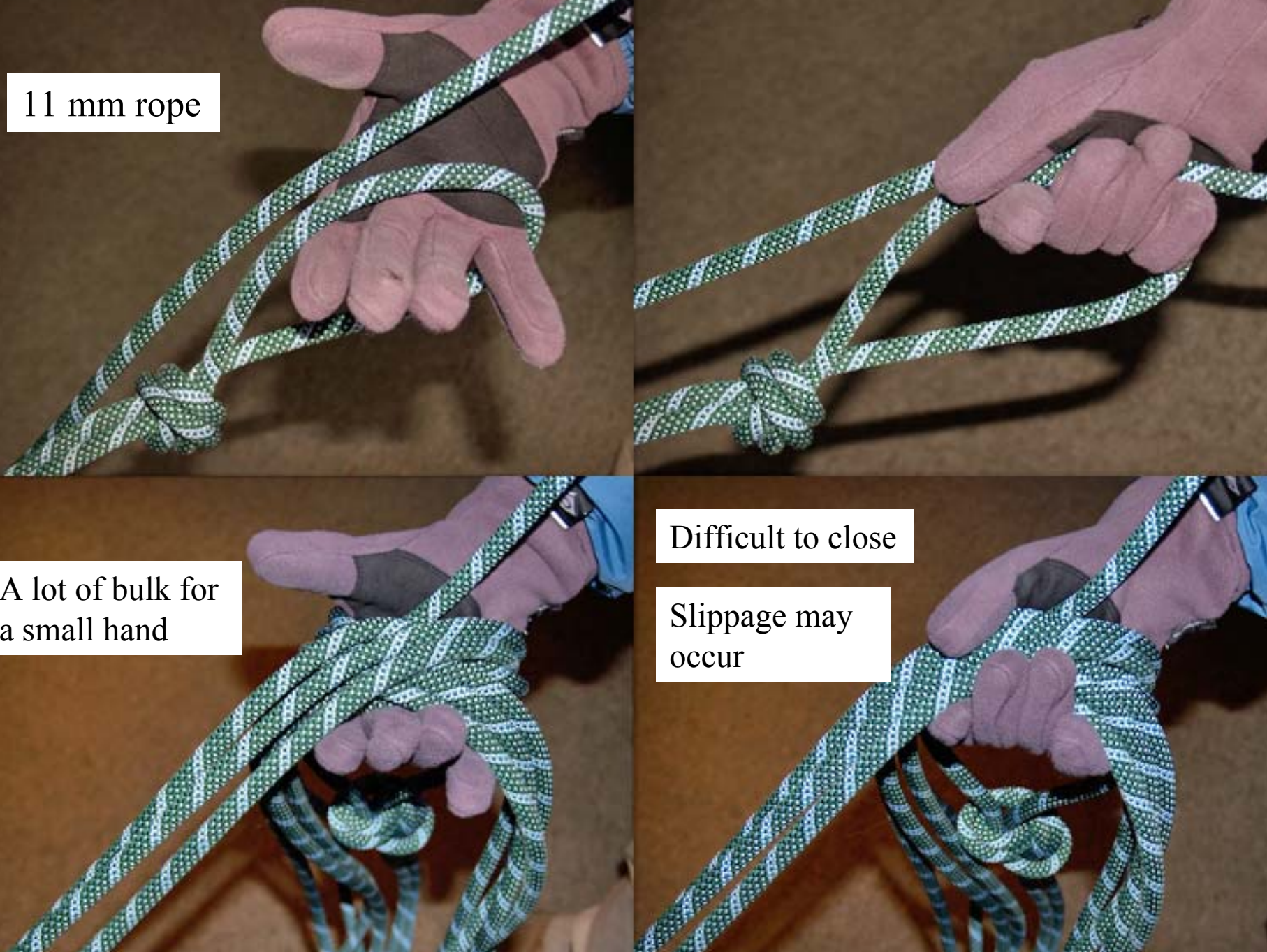
Guide short-ropes with hand loop.



Disadvantage: Guide needs to handle three lines with his belay hand when shortening the rope. He also carries additional coils, being half the rope length from himself to the middle client. The tie back at the guide only serves the purpose for quickly switching back to glacier travel mode.

How to lock off the rope




11 mm rope
A lot of bulk for a small hand
Difficult to close
Slippage may occur

What happens if client 1 slips and the guide loses control of the hand loop?

Client 1 falls 7 m down the slope, and pulls on client 2.

Force comes from client 2 onto guide.

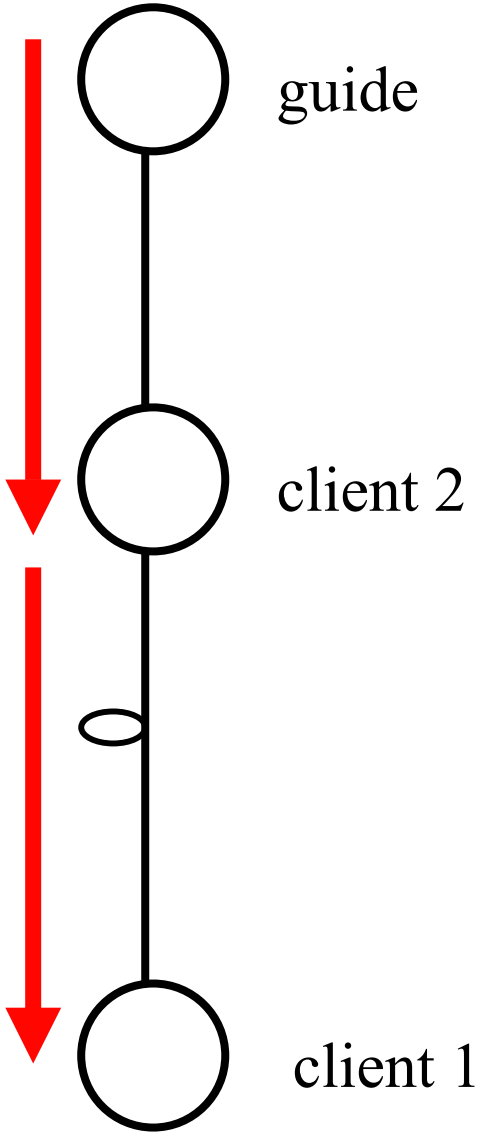
Does the guide have a chance to hold the fall?

For our 30^0 slope and a client of 80 kg the energy of the falling client 1 after his 7 m fall is

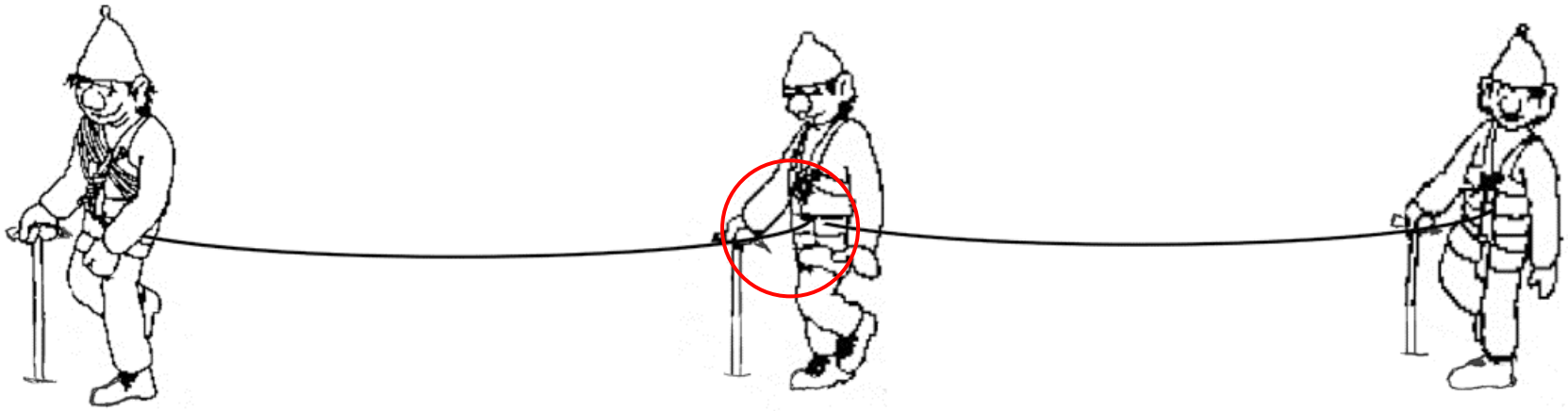
80 kg x 9.81 ms^{-2} x 7 m x $\sin(30^0)$ = 2,747 Nm

Remember? 100 Nm was the maximum energy we could possibly absorb when short roping!

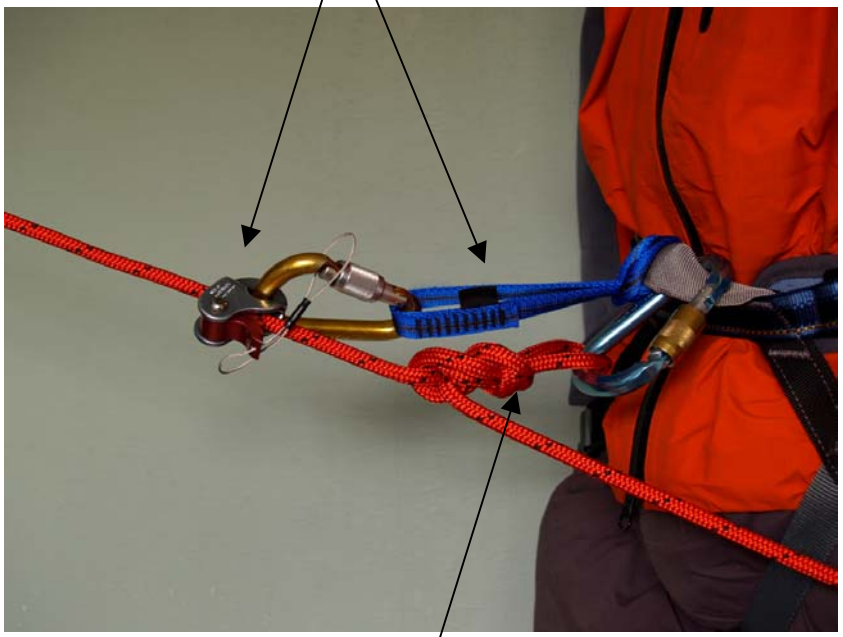
You fly like a rocket!



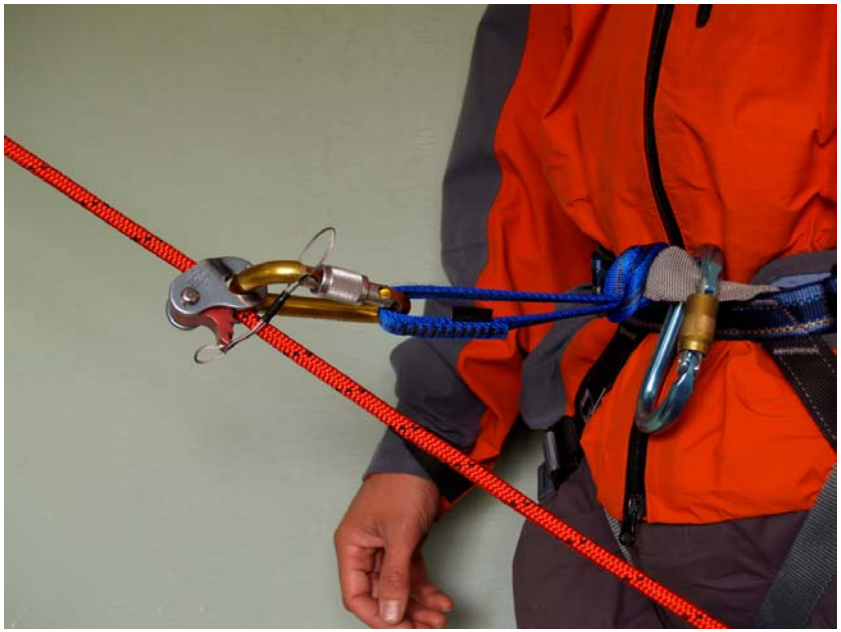
Better method for quick change over from glacier travel to short roping



Tie in with short sling and “Ropeman”



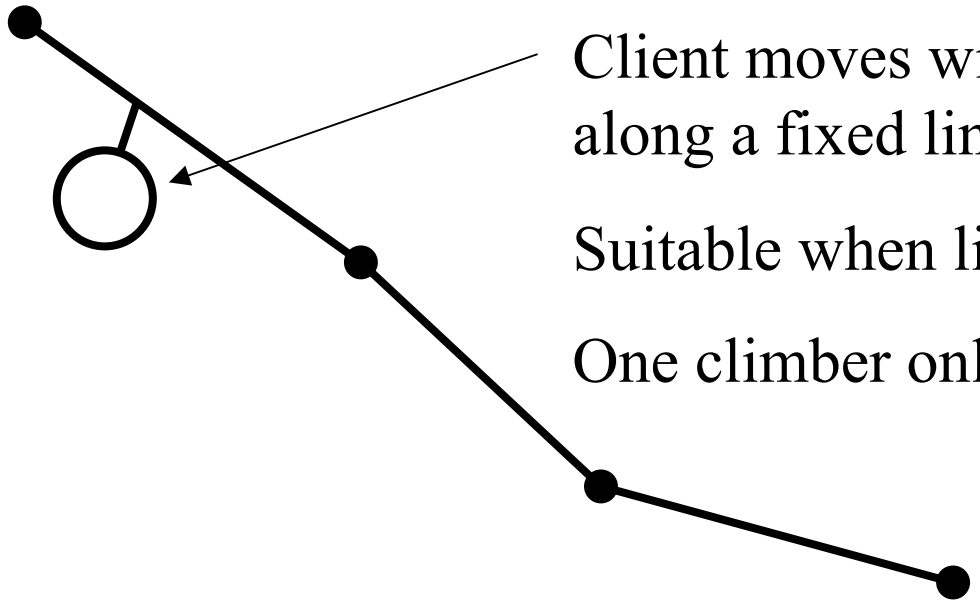
Tie fig 8 back to main tie-in point



For short roping simply untie fig 8

What alternatives are there to short-roping?

- use fixed belays and pitch
- set up a fixed line
- use “teleferique method”
- move together with running belays on fixed anchors
- cut a line of steps (Fox and Franz Josef operations)
- don’t use a rope
- use a combination of above
- abandon the climb



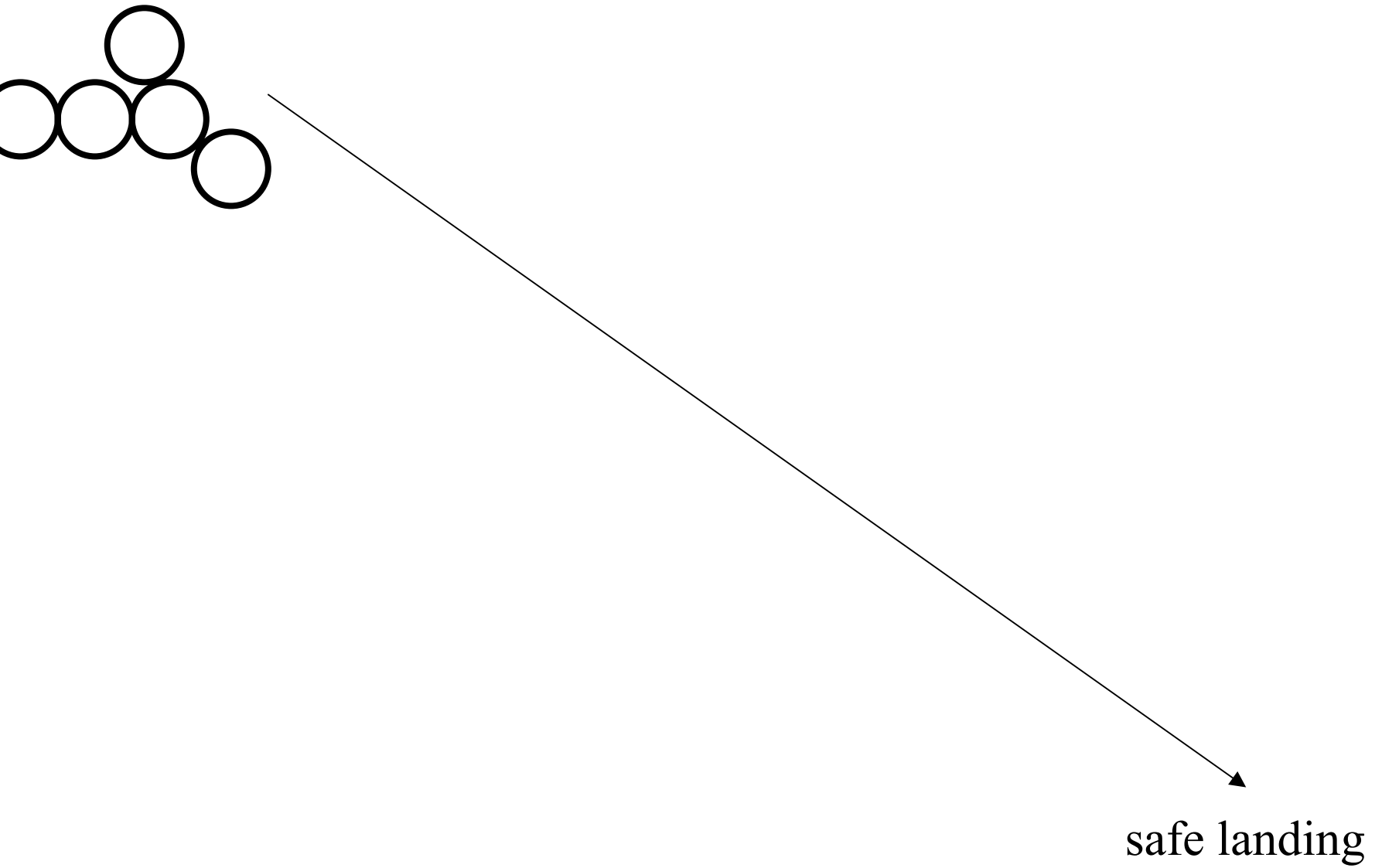
Fixed rope

Client moves with ascenders or prussiks along a fixed line.

Suitable when line is used repeatedly.

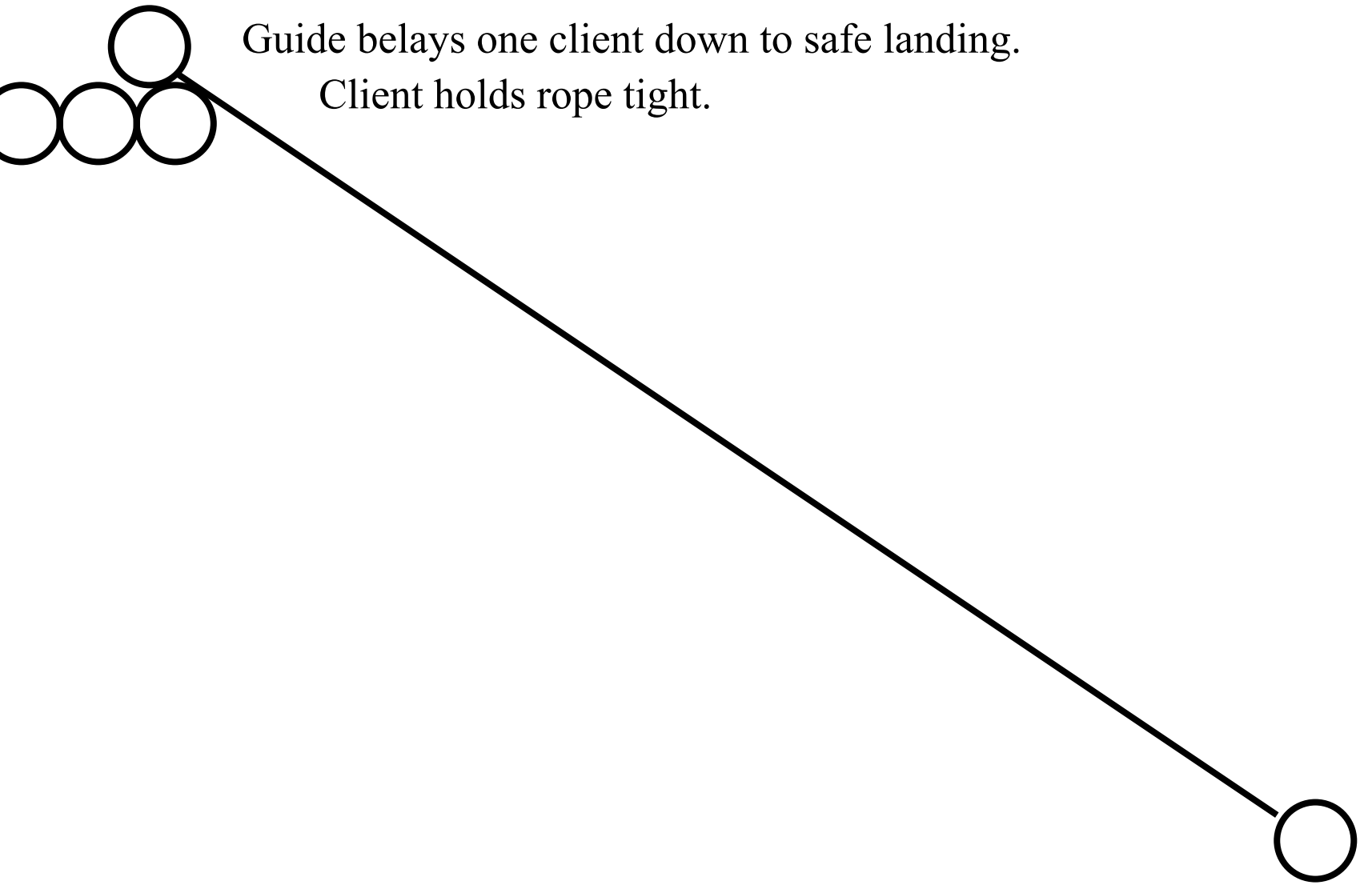
One climber only between two anchors.

Teleferique method

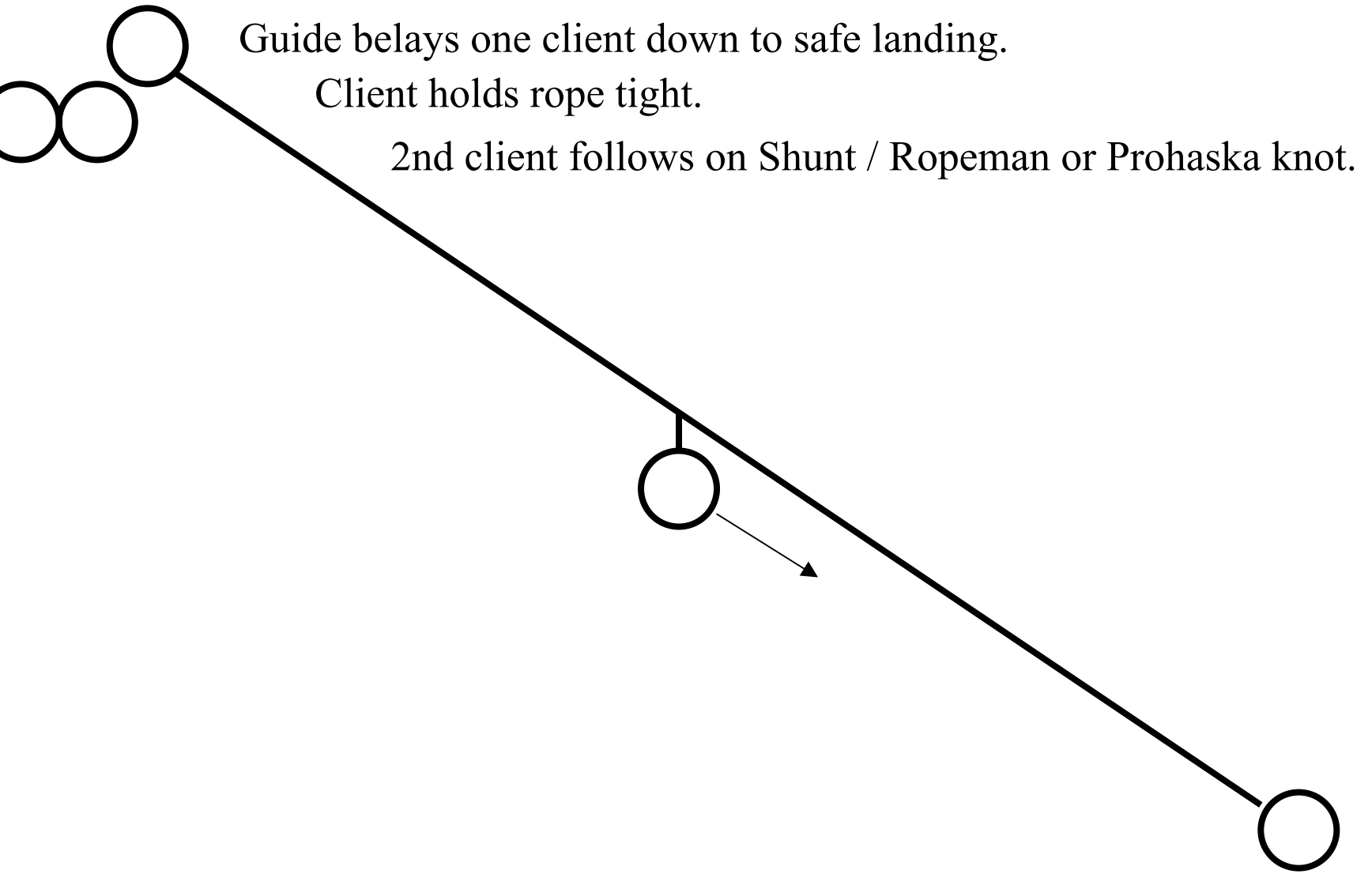


Teleferique method

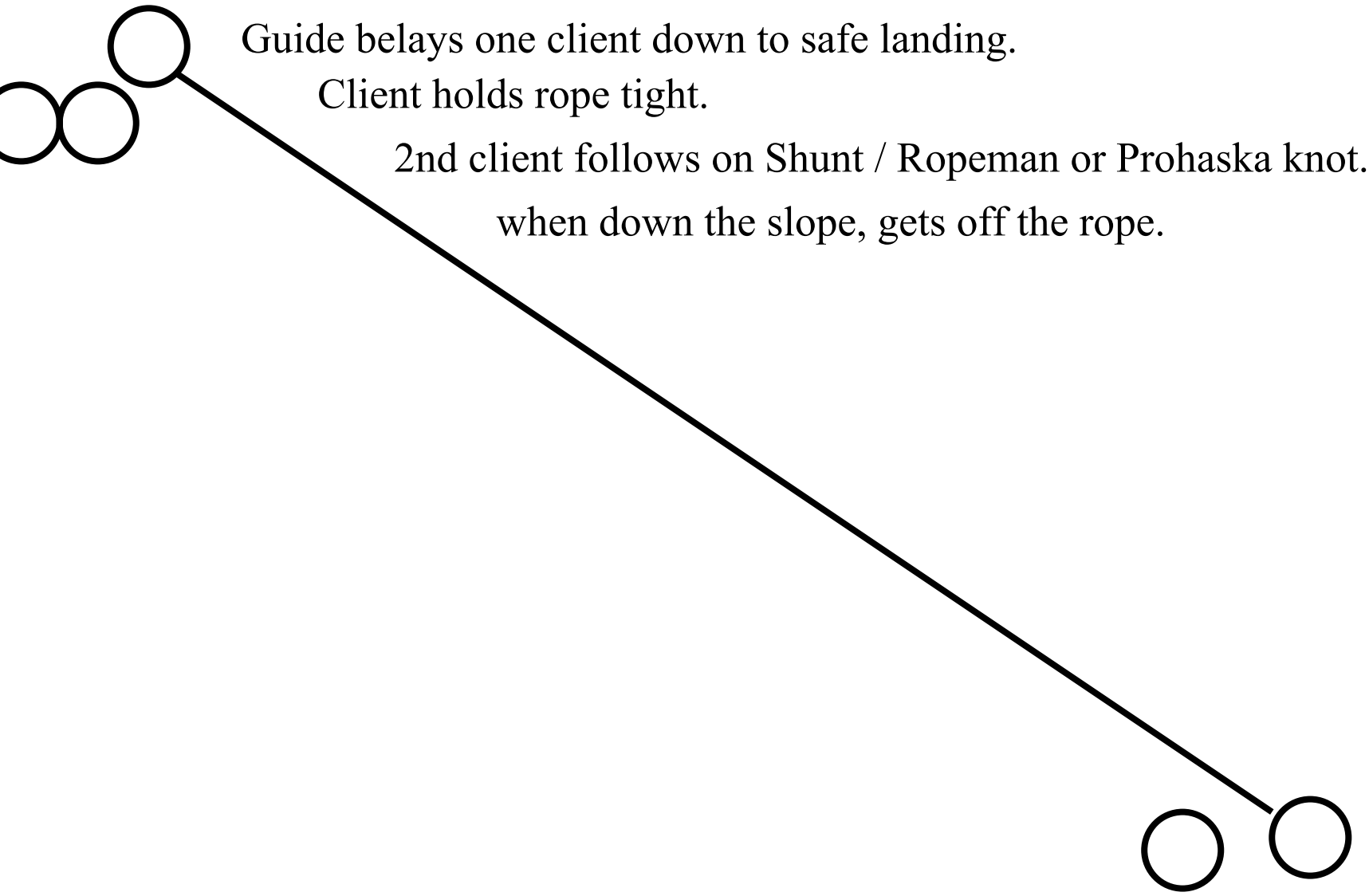
Guide belays one client down to safe landing.
Client holds rope tight.



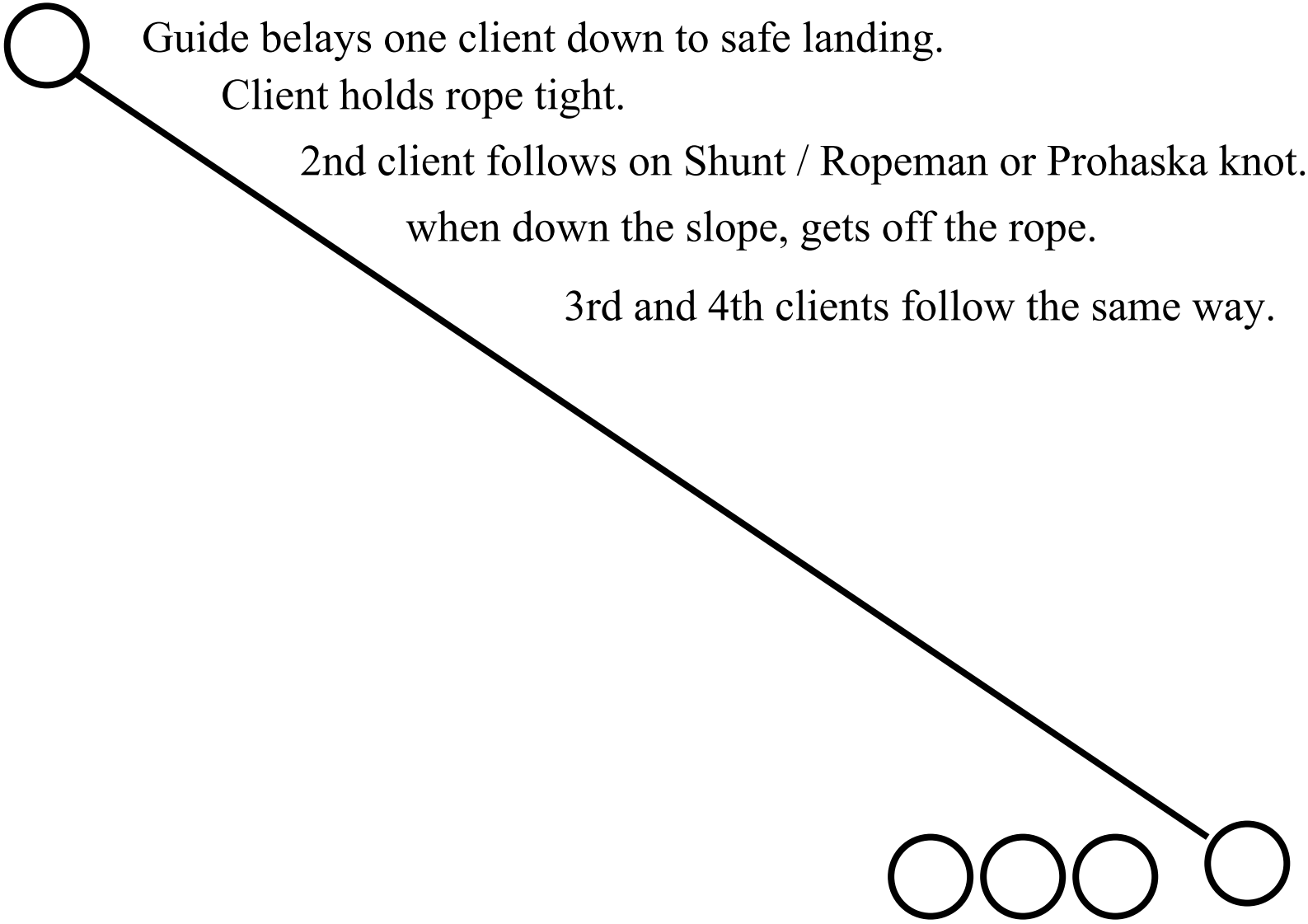
Teleferique method



Teleferique method



Teleferique method



Teleferique method

Guide belays one client down to safe landing.

Client holds rope tight.

2nd client follows on Shunt / Ropeman or Prohaska knot.

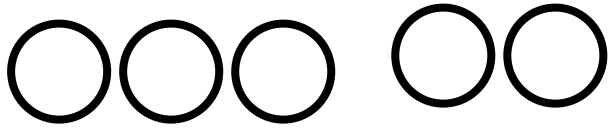
when down the slope, gets off the rope.

3rd and 4th clients follow the same way.

Guide climbs down to his party.

May also be used for climbing uphill.

If 2nd guide is available, he goes down first. Clients can then descend with an Italian hitch or an ATC and 2nd guide controls their descent by checking the tightness of the rope from below.

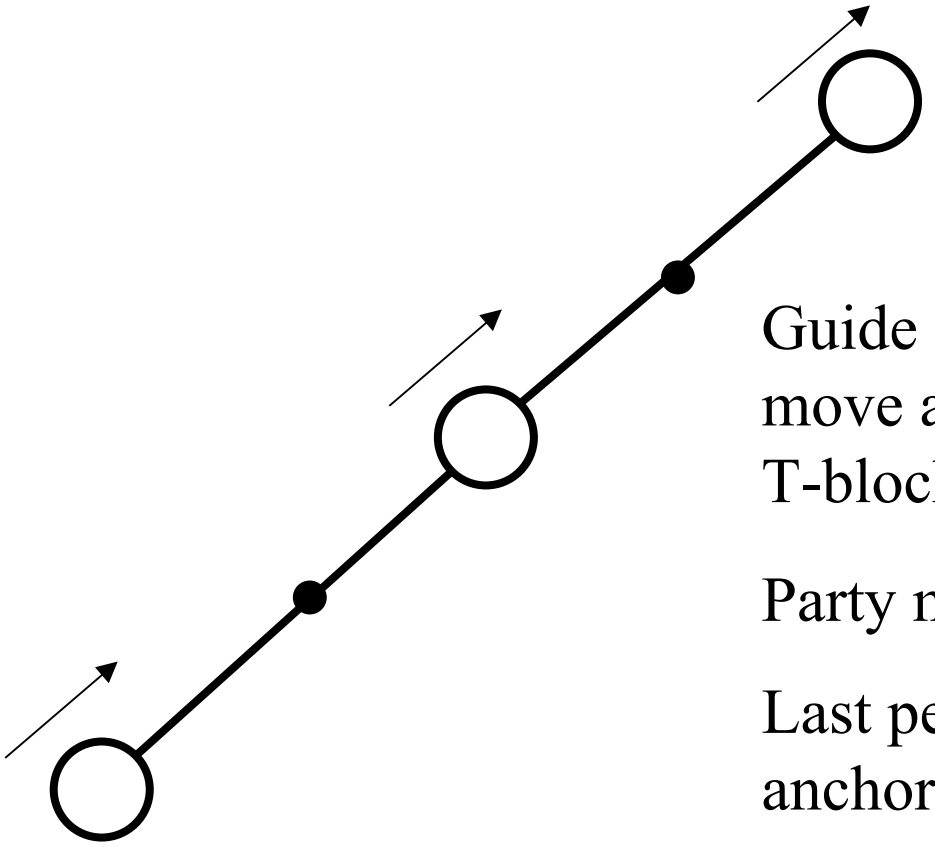


Prohaska Knot

Suitable for all diameter ropes

Even holds on wire cable

Running belays on fixed anchors



Guide sets fixed anchors on the move and adds a rope man, shunt or T-block at each anchor.

Party moves simultaneously.

Last person collects gear or leaves anchors in place for the descent.

Only one person between anchors.

Remember: Short-roping is only there to prevent a slip from turning into a fall.

It is there to give the client(s) support, not to hold a full scale fall.

Can we design a system whereby we can give support to the client(s) but don't end up with disaster for everybody when things get out of control, after the guide has fallen?

O.K. You don't tie into the system.

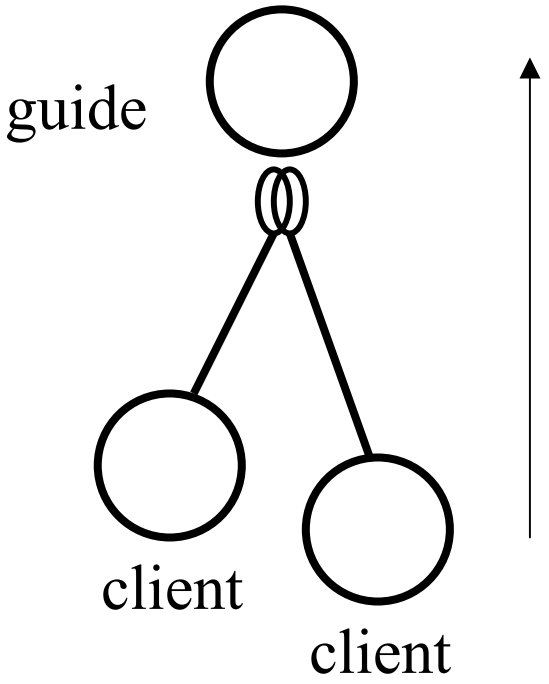
But what do you do with the spare rope?

Stick it into the pack, so that it can pull out easily?

You are still connected!

The friction between pack and rope will drag you down!

The “Dog-leash method” may be the answer



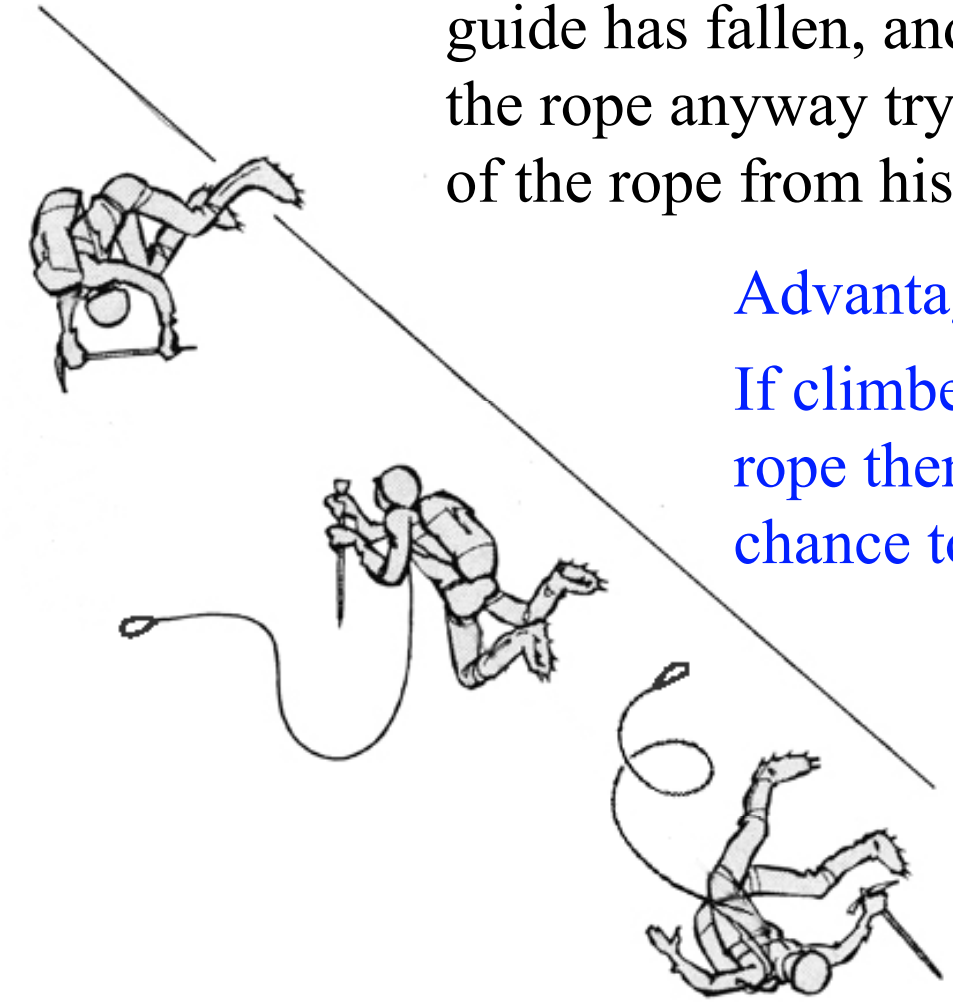
Guide short-ropes with hand loops only.

One or two clients only, individual leashes.

Guide is not tied into the system.

Only suitable for straight snow slopes.

Not for glacier travel, complex terrain, or ridge lines!



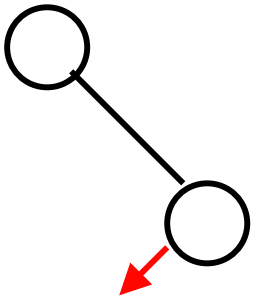
Once things are out of control, i.e. after the guide has fallen, and when he has to let go of the rope anyway trying to self arrest, he lets go of the rope from his belay hand.

Advantage:

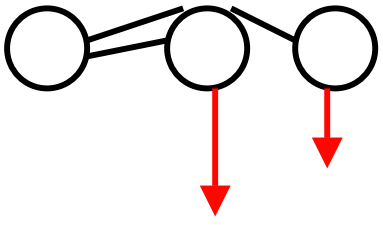
If climbers are not connected by a rope then everybody has a realistic chance to self arrest!

Hidden traps

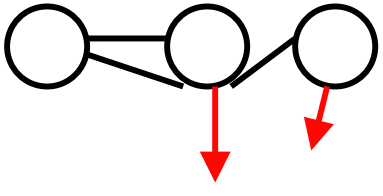
Guide is not straight above client(s).



When traversing, all in a straight line, one client pulls the other one off.



Likewise if rope is on the downhill side.

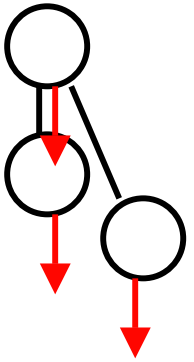


Rope on the downhill side is a slightly better situation than rope on the uphill side when traversing in a straight line. Then the rope needs to be as short as possible.

Hence: rope always on the downhill side.

Not that it makes much of a difference !

More hidden traps



Guide is too close to the clients.

One client slips.

Guide reacts and is pulled against the other client.

Second client is unbalanced and goes for a flight.

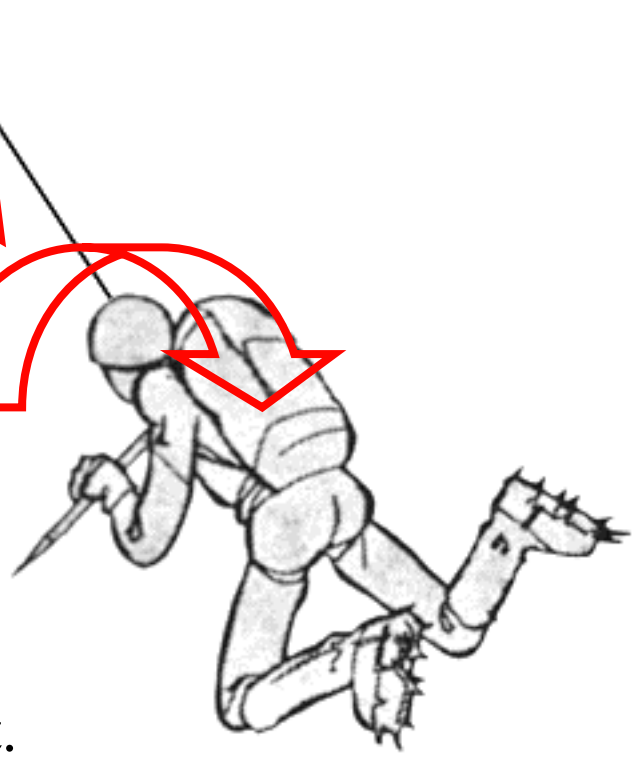
Entire party goes down the hill!

More hidden traps

Your client does exactly what he has learnt.

As soon as he slips he launches down into a self-arrest position.

Feet up and body down, quick and efficient.



This is not the little slip or sit-down that a guide is accustomed to hold when short-roping, it is the the equivalent of a full scale fall!

With your rope tight to the client you jump or go for a flight!

Short-roping remains the Achilles heel of mountain guiding!

Prevention is better than cure.

Reduce the probability of a client fall through:

Secure footing and good route selection

- good crampons and good fit
- no loose clothing and straps to trip over
- plenty of cramponing practice in varied terrain
- adequate pace
- good steps
- choice of most comfortable and safest line

Acknowledgements

Peter Geyer, VDBS, president IFMGA / UIAGM

Pit Schubert, Sicherheit und Risiko in Fels und Eis, 2005

Peter Frick, Swiss Mountain Guides Association

Canadian Mountain Guides Association, guide's manual

Graham Jackson, Gary Kuehn, Phil Penny, Steve Schreiber, Roy Smith, Marty Schmidt, Ewan Paterson

Thank you

I wish you

Enjoyment and fulfillment in your occupation of guiding

and

Safe return from all your travels in the hills

Gottlieb Braun-Elwert