Let‘s talk gear & consequences

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ICAR SÜDTIROL ITALY 2023

Let‘s talk gear & consequences

Content

Sharp edges

Braking forces

Conclusions for us climbers and rescuers

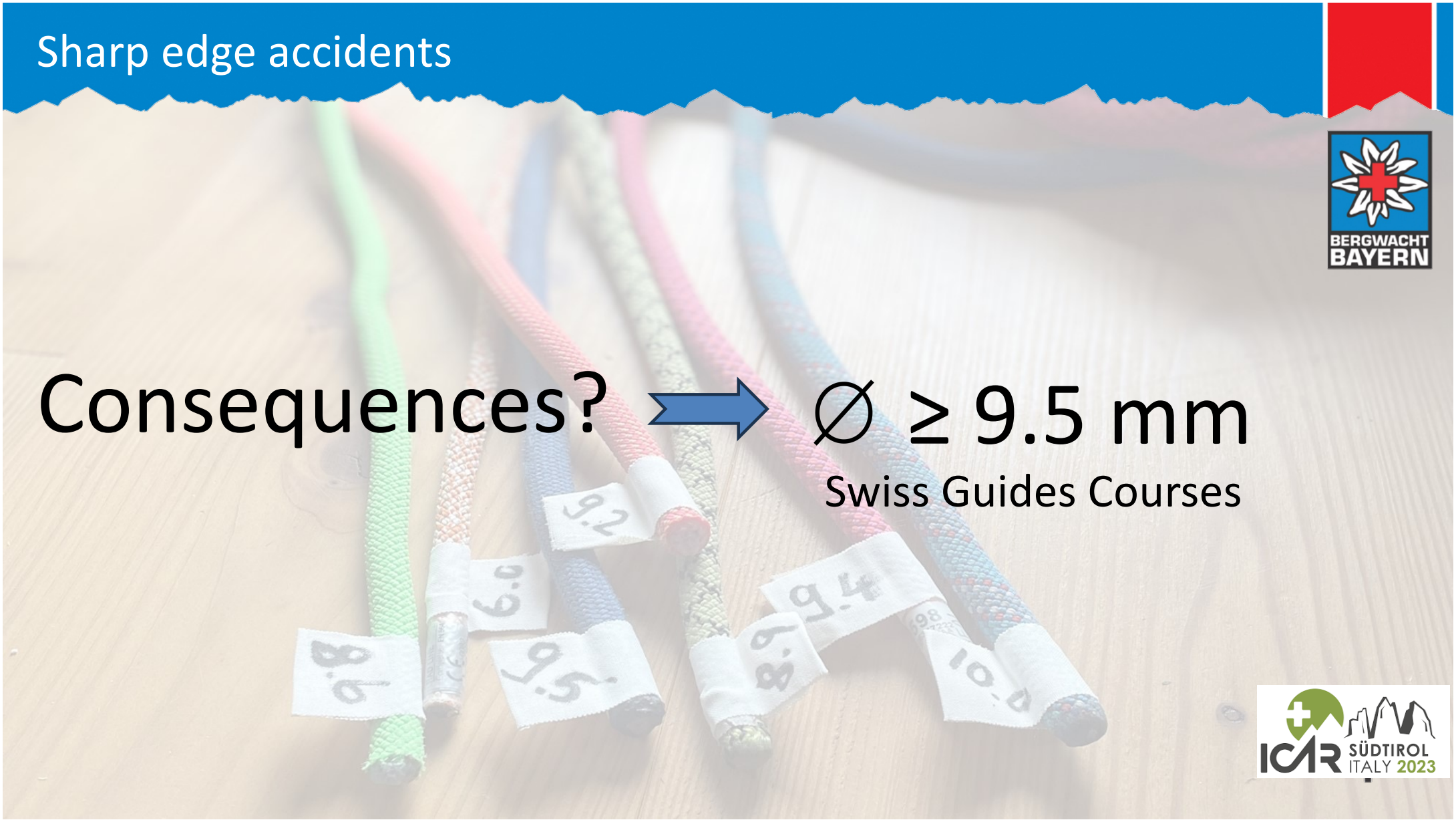
Sharp edge accidents

Two interesting accidents

- Gran Paradiso/ Italy – DAV German Alpine Club
- Nesthorn/ Switzerland – Swiss Guides Course

Sharp edge accidents

Sharp edge accidents



Consequences? ⟹ ∅ ≥ 9.5 mm

Swiss Guides Courses

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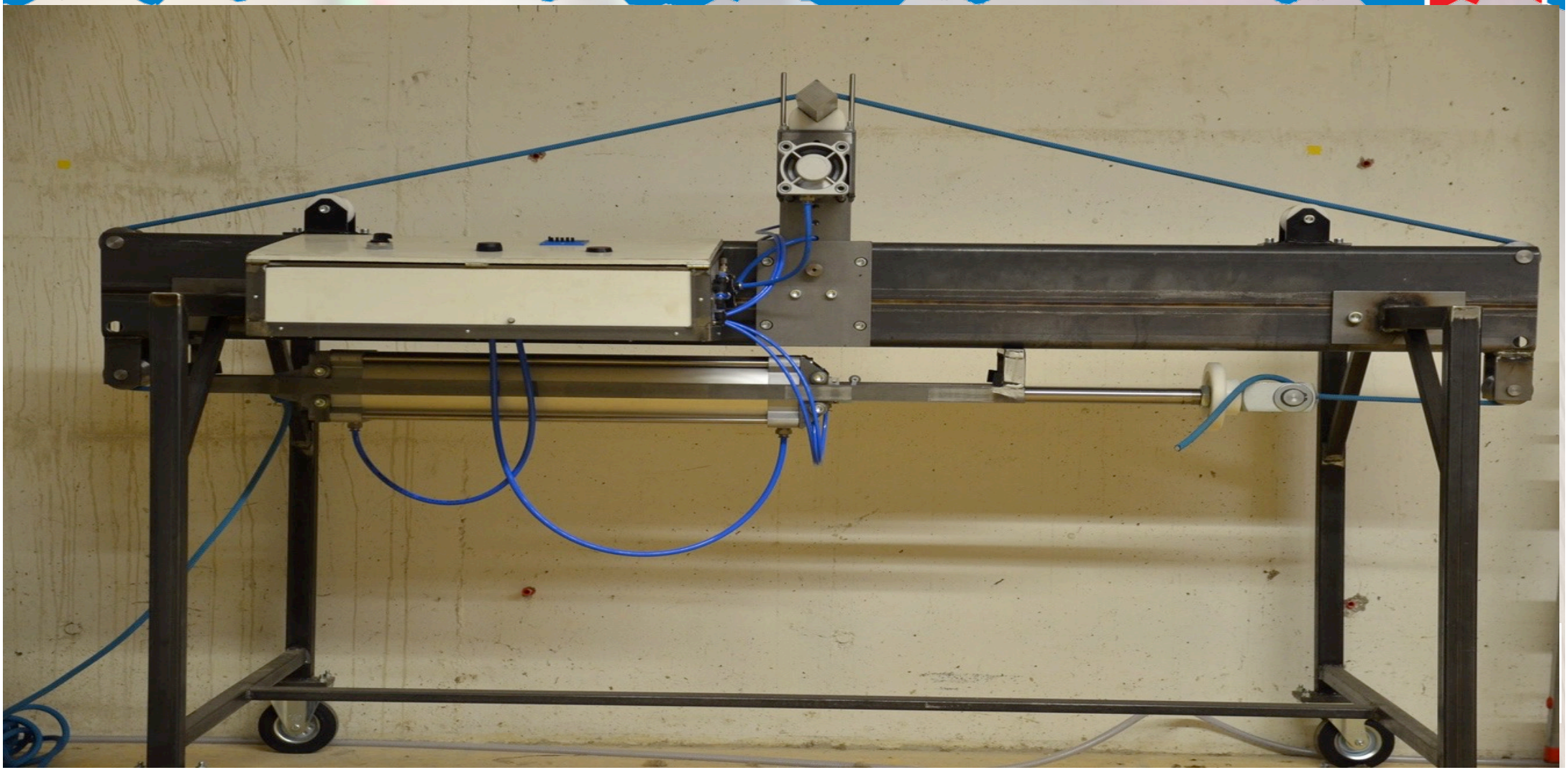

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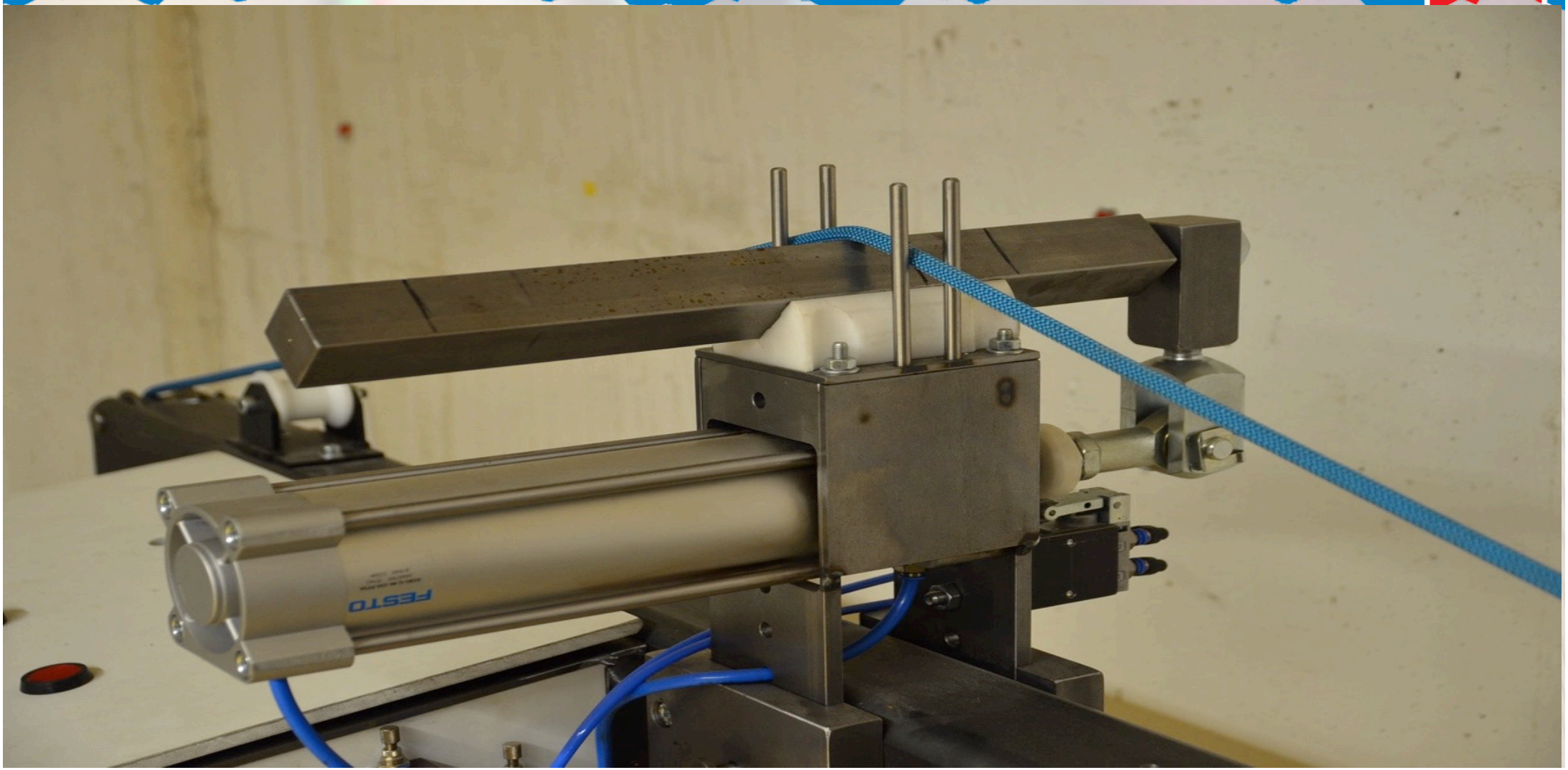
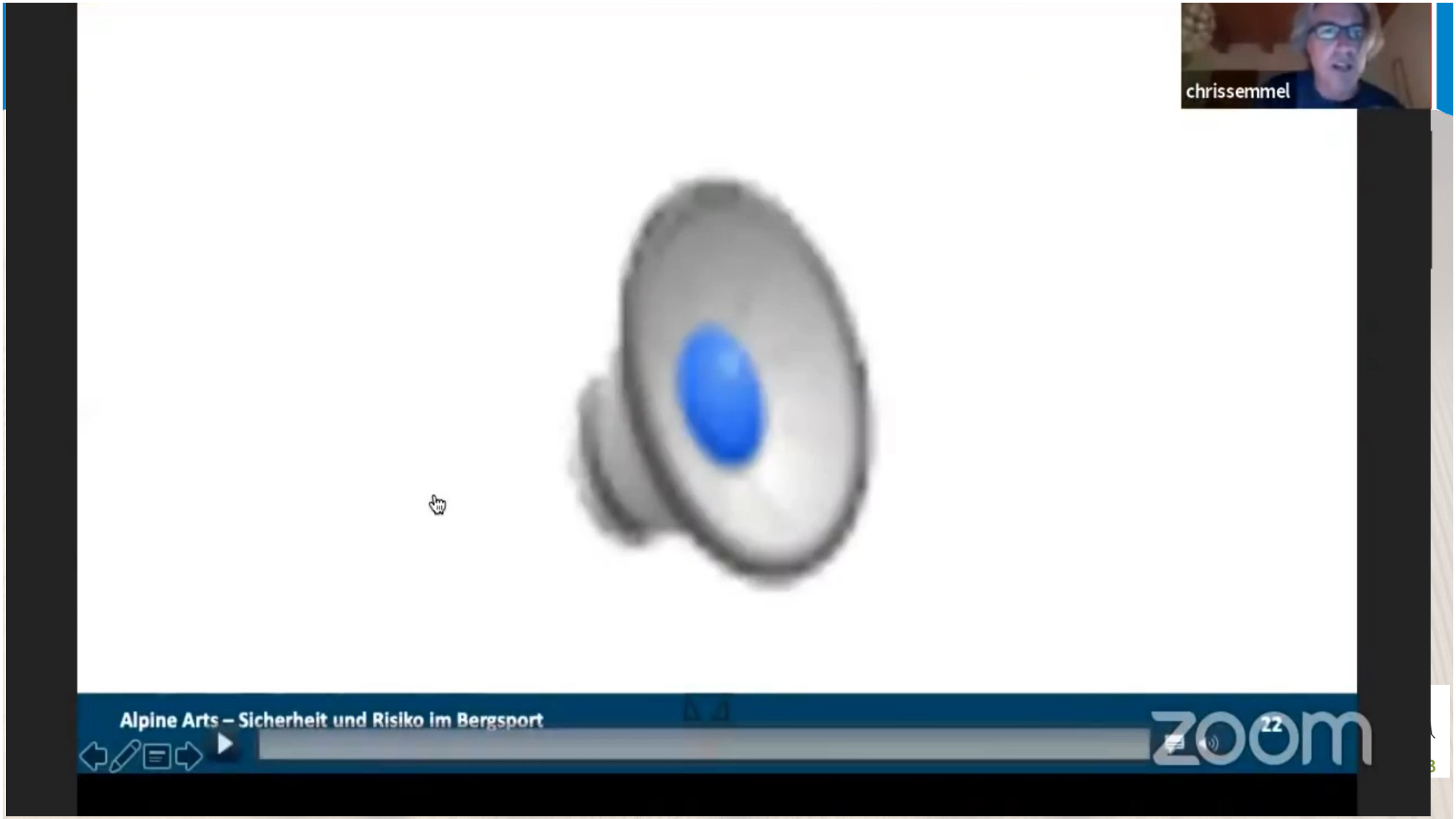
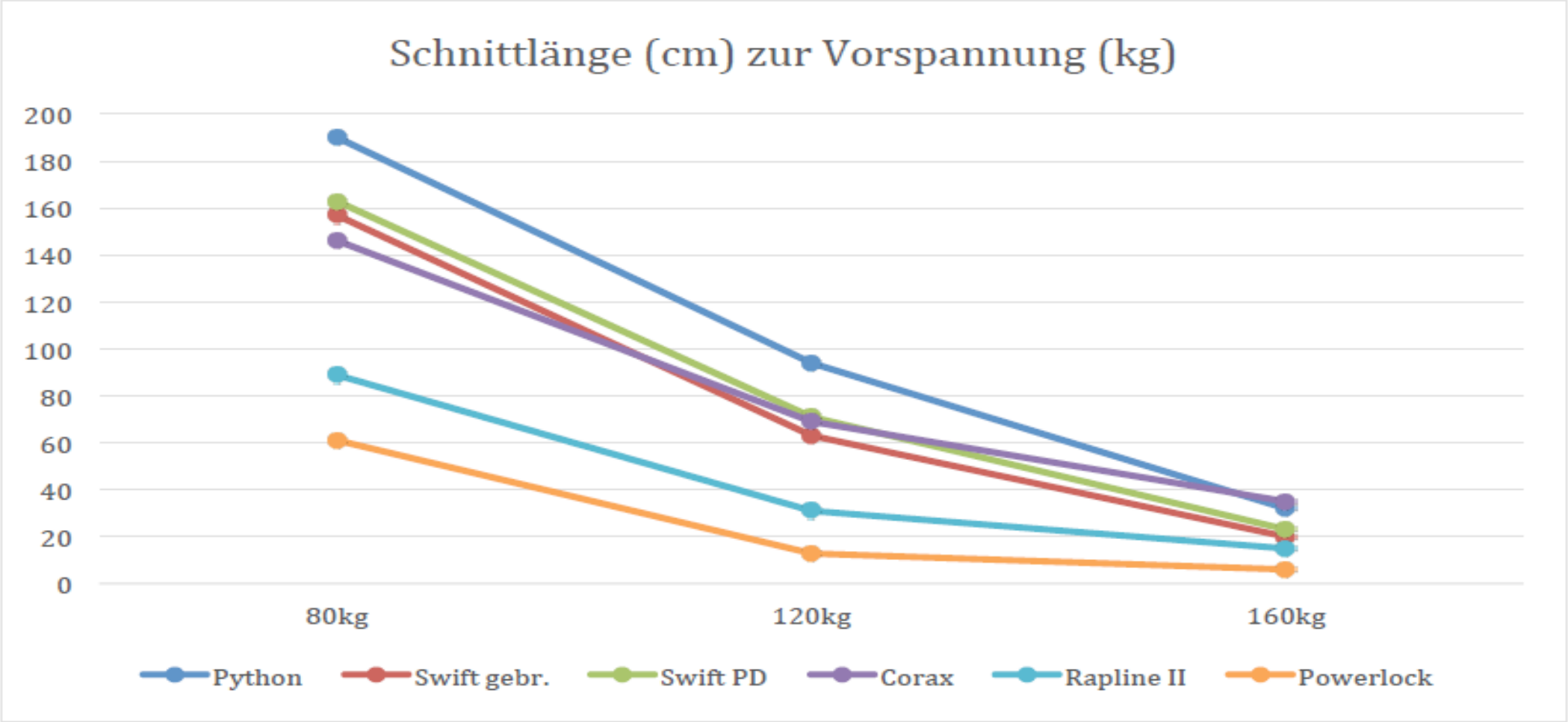



chrissemmel
Alpine Arts – Sicherheit und Risiko im Bergsport
zoom

Seiltyp	80 kg Schnittl. [cm]	120 kg Schnittl. [cm]	160 kg Schnittl. [cm]	SL/QS [cm/mm²] 80kg	SL/QS [cm/mm²] 120kg	SL/QS [cm/mm²] 160kg
Python 10,0 mm	190	94	32	2,41	1,20	0,41
Swift PD 8,9 mm	163	71	23	2,62	1,15	0,37
Swift PD (gebraucht) 8,9 mm	157	63	20	2,52	1,01	0,32
Corax (Dyneema) 6,7mm	146	69	35	4,13	1,97	0,98
Rapline II (Kevlar) 6 mm	89	31	15	3,14	1,11	0,54
Powerlock (Polyamid) 6 mm	61	13	6	2,16	0,45	0,22

Cutting length to preload



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Facts – single strand:

- Preload from 80 to 160 kg decreases cut resistance by approx. 600 %
- A diameter raise by 1.1 mm from 8.9 to 10 mm increases cut resistance by approx. 20 %
- Dyneema‘s cut resistance is 200 – 300% higher, Kevlar 130 -160 % ⟺ Polyamid
- Cut resistance of a 6 mm dyneema cord = 9 mm single rope

Diameters don‘t matter!

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Conclusion => single strand

- ✓ No lowering of 2 persons over rock edge
- ✓ Dyneema cords work well for lowering => rescues in free ride terrain
- ✓ **Caution: > 80 – 120 kg (rescuer with gear)**

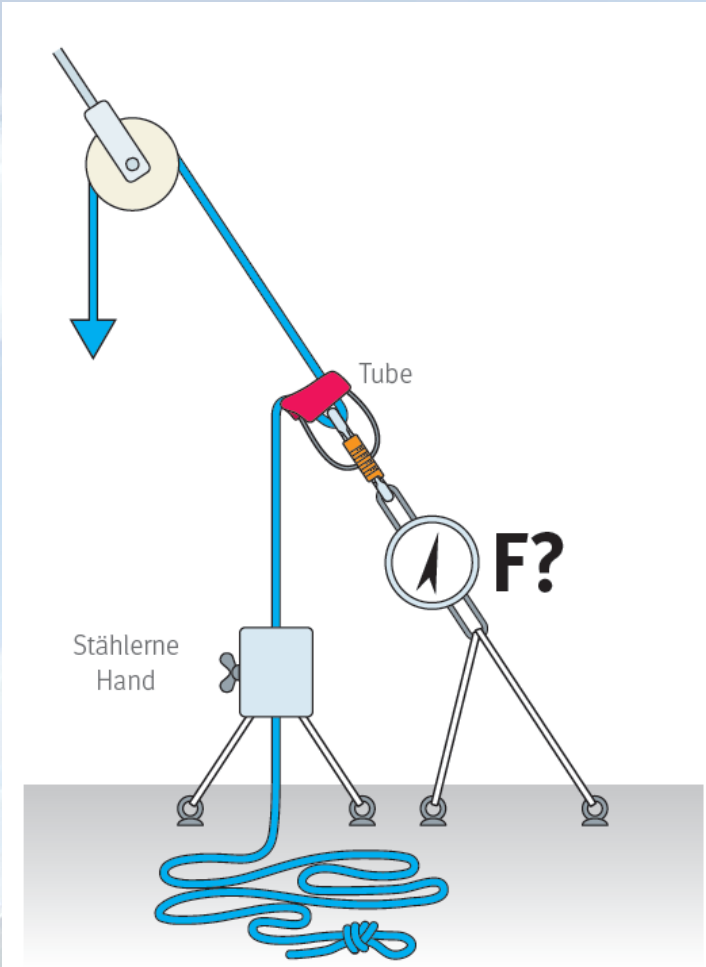
Lowering over rocks

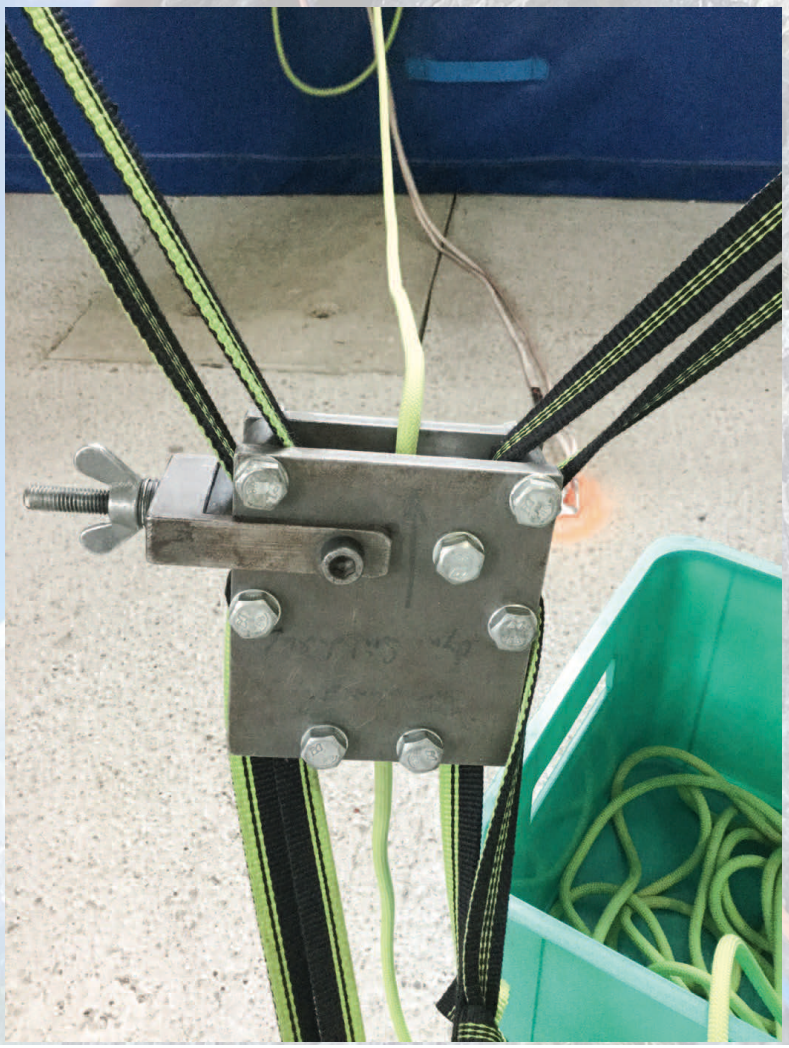
2 people → 2 strands

Rescuer w/gear → 2 strands ?

Incidents – near misses

Test braking forces – simulated hand





220 N

400 N

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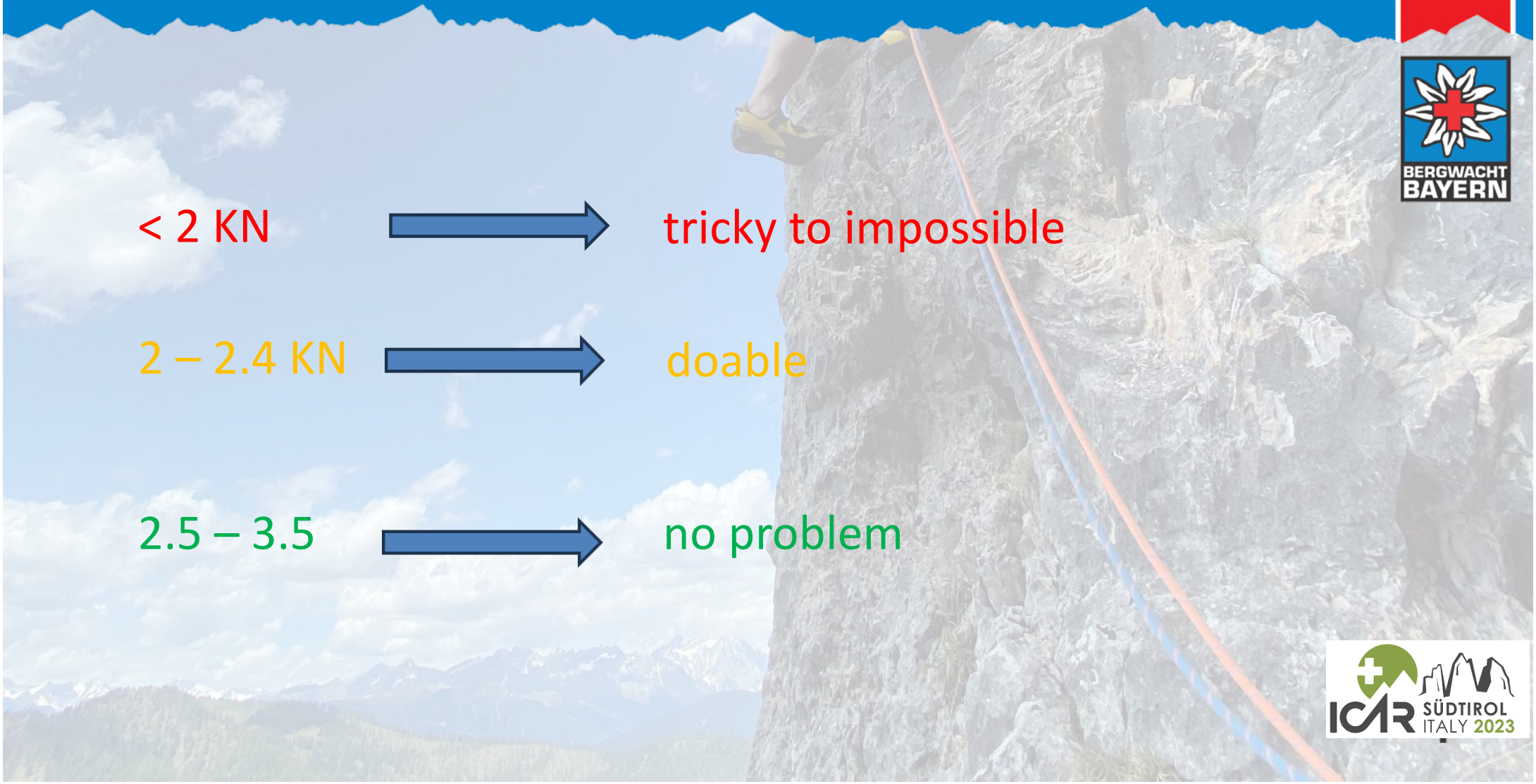
Range of braking forces to hold a fall

< 2 KN → tricky to impossible

2 – 2.4 KN → doable

2.5 – 3.5 → no problem



Numbers, numbers

Seil		Apus 7,9 mm	Opera 8,5 mm	Canary 8,6 mm	Volta 9,2 mm	Apus 7,9 mm	Opera 8,5 mm	Canary 8,6 mm	Volta 9,2 mm
Handkraft am Seil	Gripping force	Handkraft 220 N				Gripping force	Handkraft 400 N		
ATC Guide	1 Karabiner	1,9 kN	1,4 kN	1,7 kN	1,8 kN	[illegible]	[illegible]	2,4 kN	2,9 kN
	2 Karabiner	2,5 kN	1,8 kN	2,2 kN	[illegible]	2,9 kN	2,5 kN	3,0 kN	3,4 kN
ATC Alpine Guide	1 Karabiner	2,8 kN	1,9 kN	[illegible]	2,6 kN	3,3 kN	2,9 kN	3,4 kN	3,7 kN
	2 Karabiner	[illegible]	[illegible]	3,6 kN	3,8 kN	4,2 kN	3,7 kN	5,1 kN	5,2 kN
Reverso 4	1 Karabiner	[illegible]	1,7 kN	1,9 kN	2,0 kN	2,6 kN	2,4 kN	2,9 kN	3,2 kN
	[illegible]abiner	2,9 kN	2,1 kN	2,7 kN	2,9 kN	3,2 kN	3,1 kN	3,6 kN	4,1 kN
Giga Jul (Tube)	1 Karabiner	1,8 kN	1,5 kN			2,0 kN	2,2 kN		
	2 Karabiner	2,2 kN	1,9 kN			2,6 kN	2,6 kN		
HMS		1,5 kN	1,3 kN	1,6 kN	1,7 kN	2,4 kN	2,2 kN	2,5 kN	2,7 kN

Diameters do matter!

Facts: belay devices – low diameter ropes – gripping forces

- ✓ Tubes are made for single ropes but not for thin ones
- ✓ Alpine tubes are great for thin ropes
- ✓ Soft ropes have higher braking forces
- ✓ Low gripping force + low diameter + Munter hitch = critical combo

Conclusion => single strand w/ tube

- ✓ When gripping force is low – second biner is mandatory
- ✓ Higher diameters result usually in higher braking strength – if rope is not too hard

Future …

Challenges:

- Rope diameter?
- Low or high gripping force?
- Belay device?
- Rope – wet, frozen, hard, soft?
- 1 or 2 biners in tube?
- Munter hitch

Who is able to answer all those questions while on rescue?
Are we? Are our guys we sent off to mission?

Maybe we should just skip low diameters…

Future …

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