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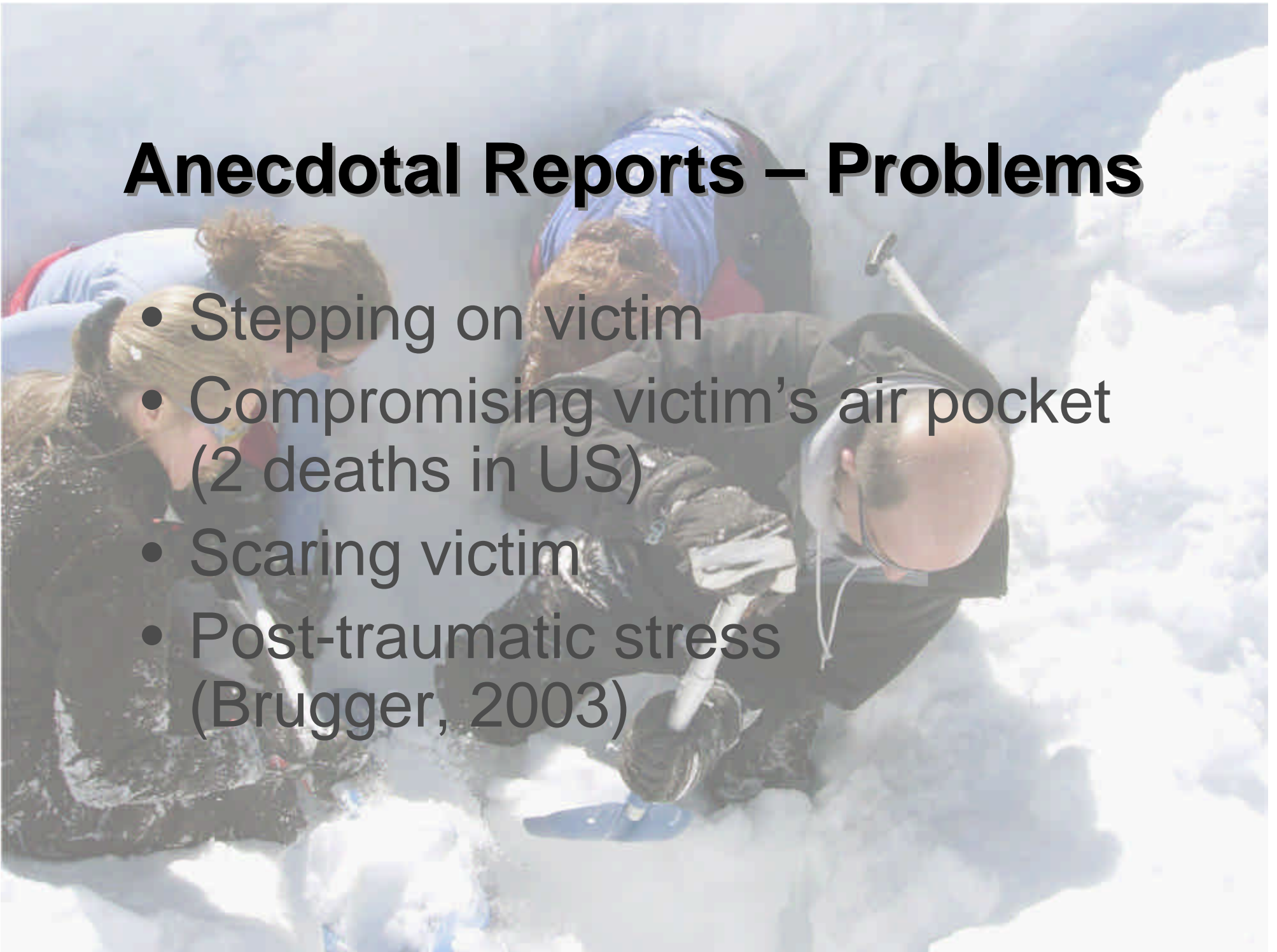
# **Strategic Shoveling: The Next Frontier in Companion Rescue**

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# Anecdotal Reports – Problems

- Stepping on victim
- Compromising victim's air pocket (2 deaths in US)
- Scaring victim
- Post-traumatic stress (Brugger, 2003)



# Anecdotal Reports – Problems

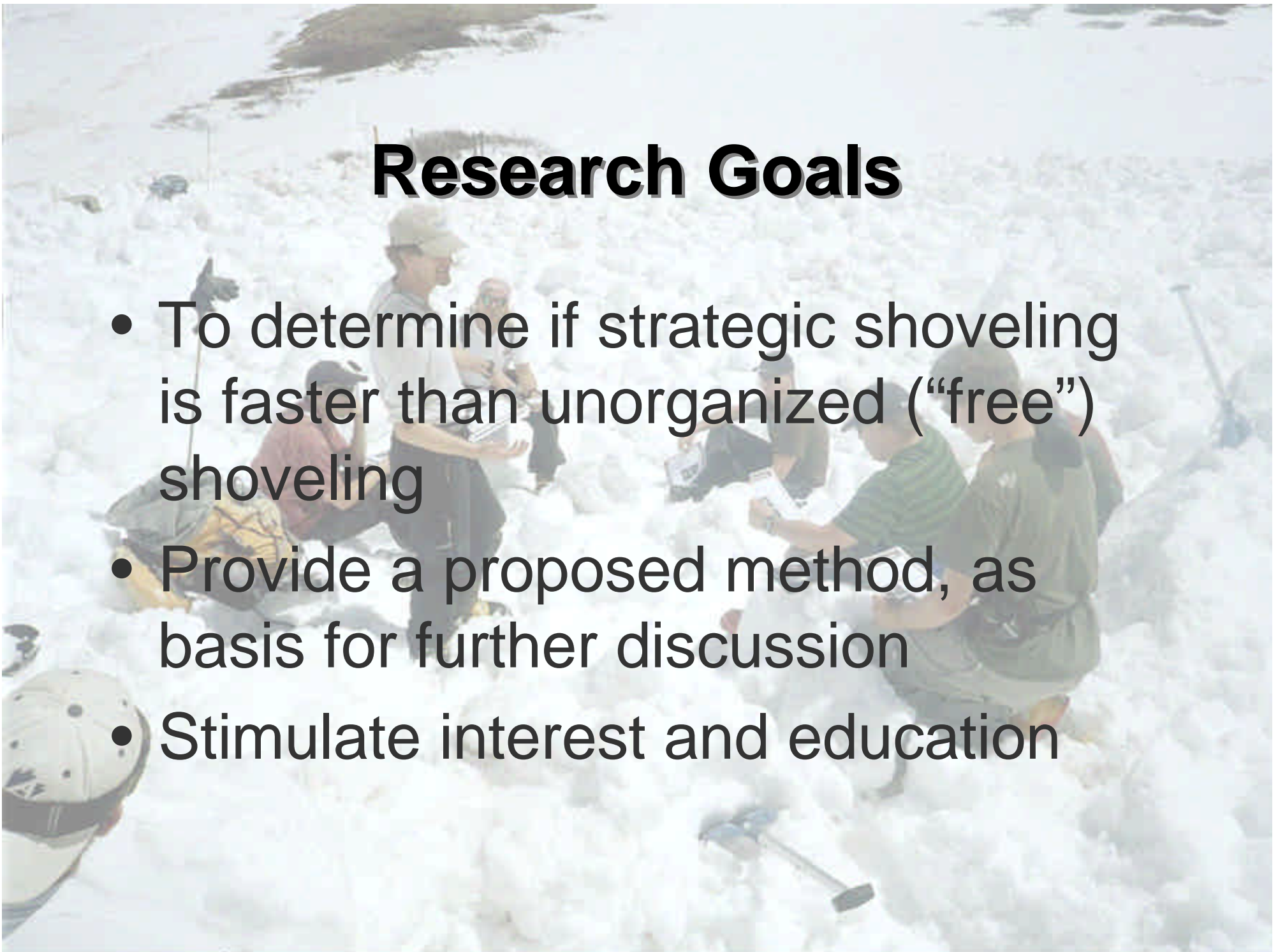
- “Free” digging at probe.
- Cone-shaped hole.
- Difficult to clear snow.
- Snow falling back on top of victim.
- Nearly impossible to treat or roll victim.





# Research Goals

- To determine if strategic shoveling is faster than unorganized (“free”) shoveling
- Provide a proposed method, as basis for further discussion
- Stimulate interest and education



# Previous Efforts



## *Literature:*

- Freudig & Martin (1995)  
“...dig downward along the probe. The hole must be particularly spacious...”

# Previous Efforts



## *Literature:*

- Tremper (2001)  
“...the size of a large jacuzzi that can hold 30 people.”

# Previous Efforts



- German Alpine Club (Semmel, et al., 2005)

Form a line or triangle downhill of the probe to remove snow.

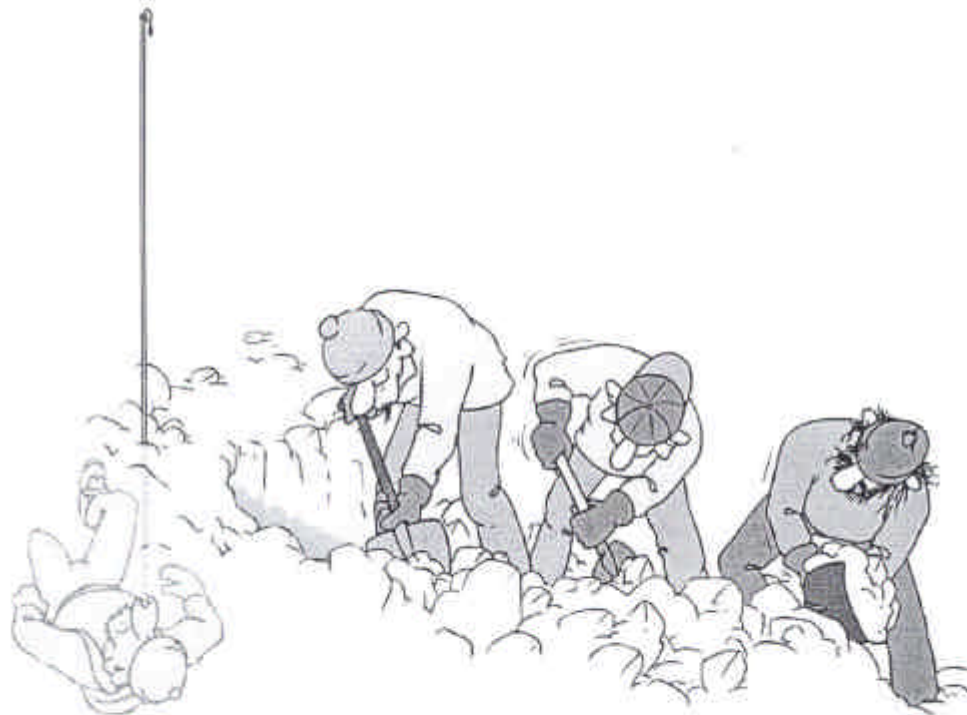


Bild 22: Am idealsten wird in einer Dreiergruppe gegraben. Die Retter organisieren sich und graben in einer Reihe. (Auskubung westenmarkieren)

Trampling  
victim's  
air space:

Strictly  
***Verboten!***





# Previous Efforts



## *Literature:*

- Canadian Methods – various publications

Downhill start

Chopping blocks in hard snow;  
avoid prying

# Previous Efforts



## *Literature:*

- Willy Pfisterer (Parks Canada, Ret.)  
Terraces downhill of probe.  
("Oral history")

# Previous Efforts



## *Literature:*

- Colin Zacharias, ACMG  
Terraces around probe.

# Companion vs. Organized Rescue



## Companion

- limited resources
- limited manpower



## Organized

- greater resources
- greater manpower



# Situation – Companion Rescue

- Transceiver rescues are getting faster.
- In practiced hands transceiver search is shortest time phase of rescue.
- Excavation requires most time.



# Situation

- Transceiver rescues are getting faster.

Recreationists:

*years*

1977–2000 (n=35)

2000–2006 (n=41)

( $P_{t\text{-test}} = 0.030$ )

*time (mean)*

29 min.

18 min.

Data: CAIC

# Situation

Mean Burial Depth  
Recreationists:  
1.16 m

n = 592

Data: CAIC



# Situation

- How Much Snow To Remove

1 m burial

~ 3 m<sup>3</sup>

(900+ kg or  
1–1.5 tons)



Equivalent of a 30 m sidewalk covered by  
30 cm of new snow.

# Situation

- Body Position

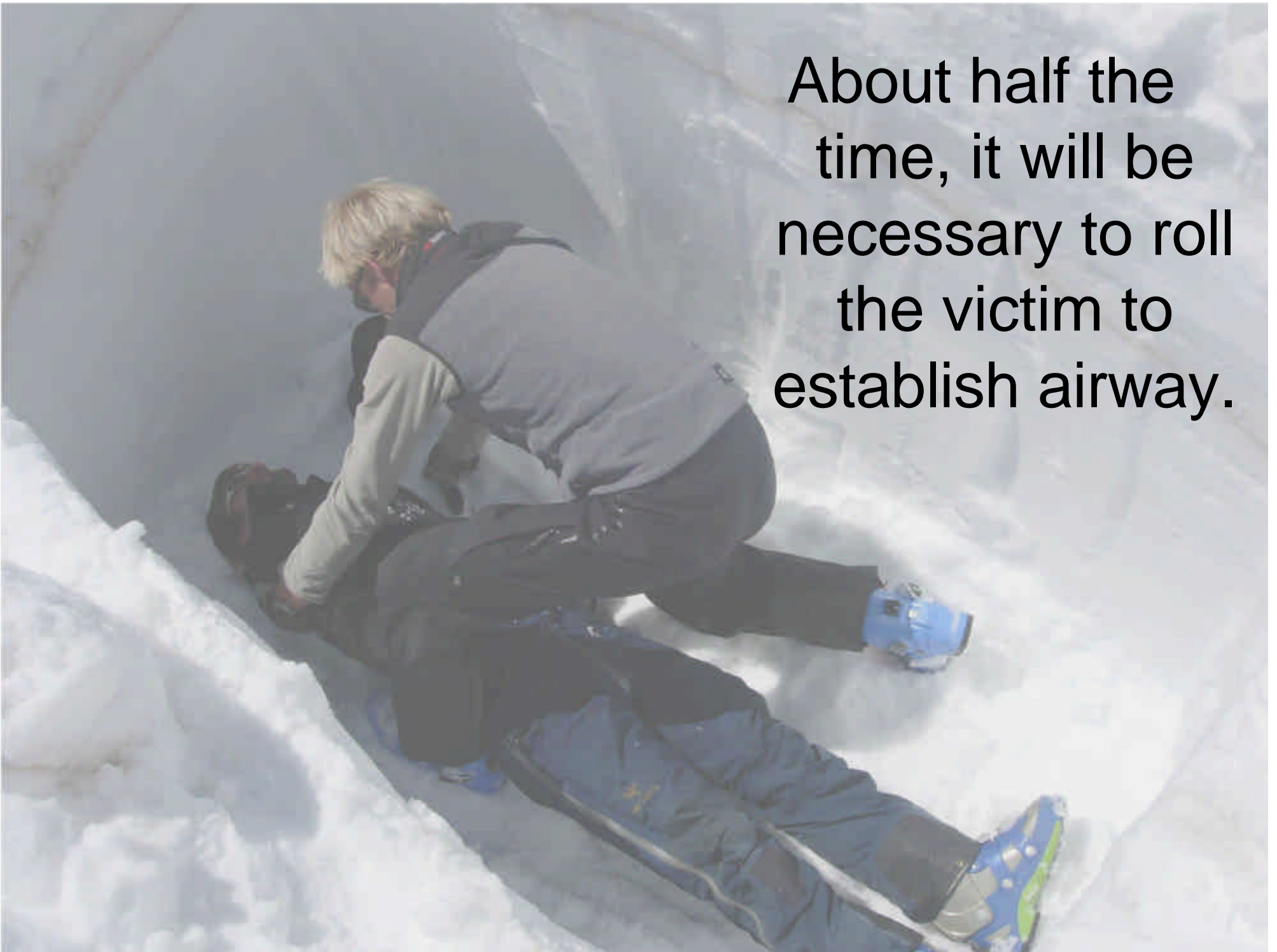
Prone (face down)	45%
Supine (face up)	26%
Vertical (sitting/standing)	16%
Side	13%

n = 235

Data: CAIC



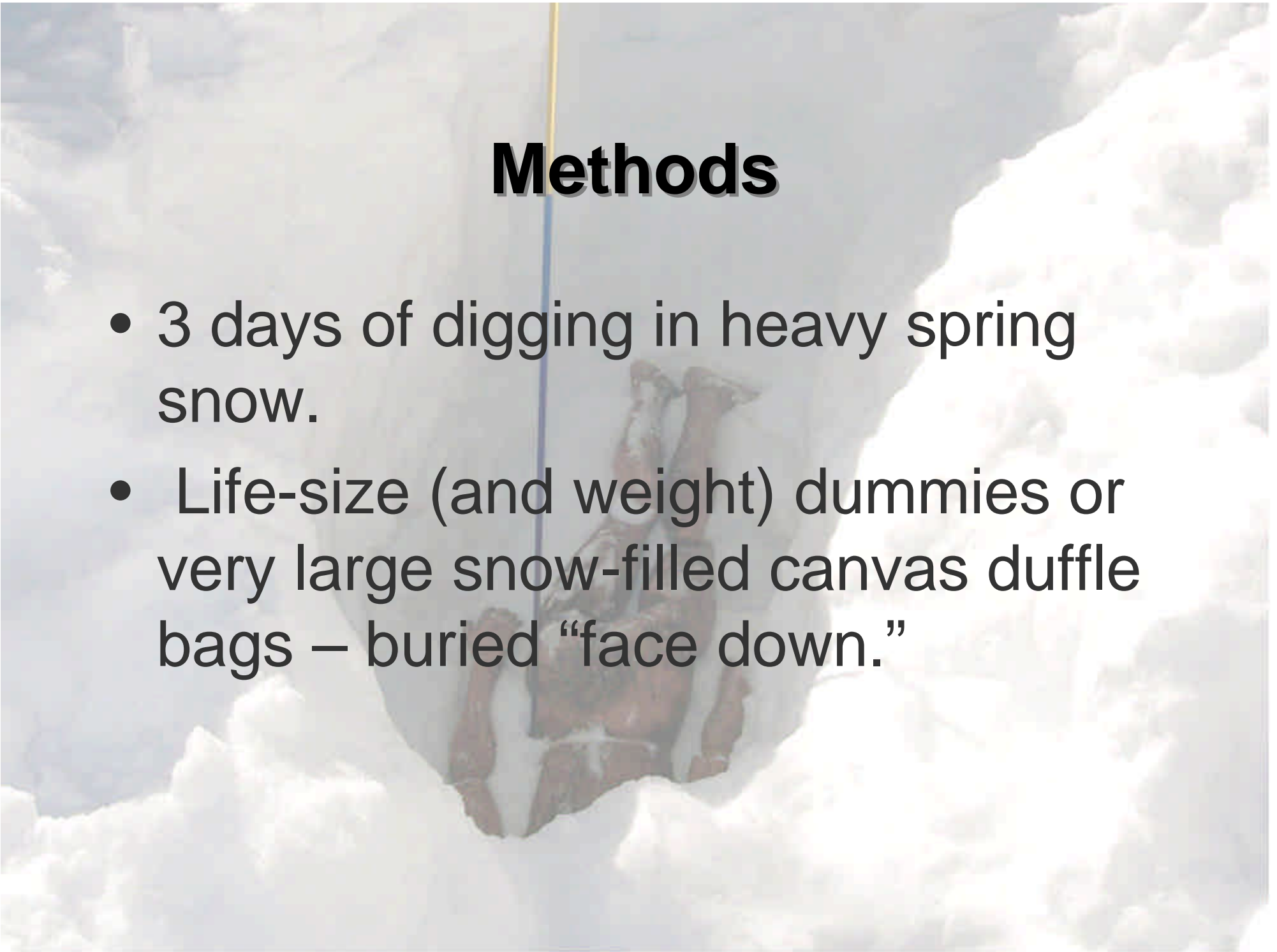
About half the  
time, it will be  
necessary to roll  
the victim to  
establish airway.





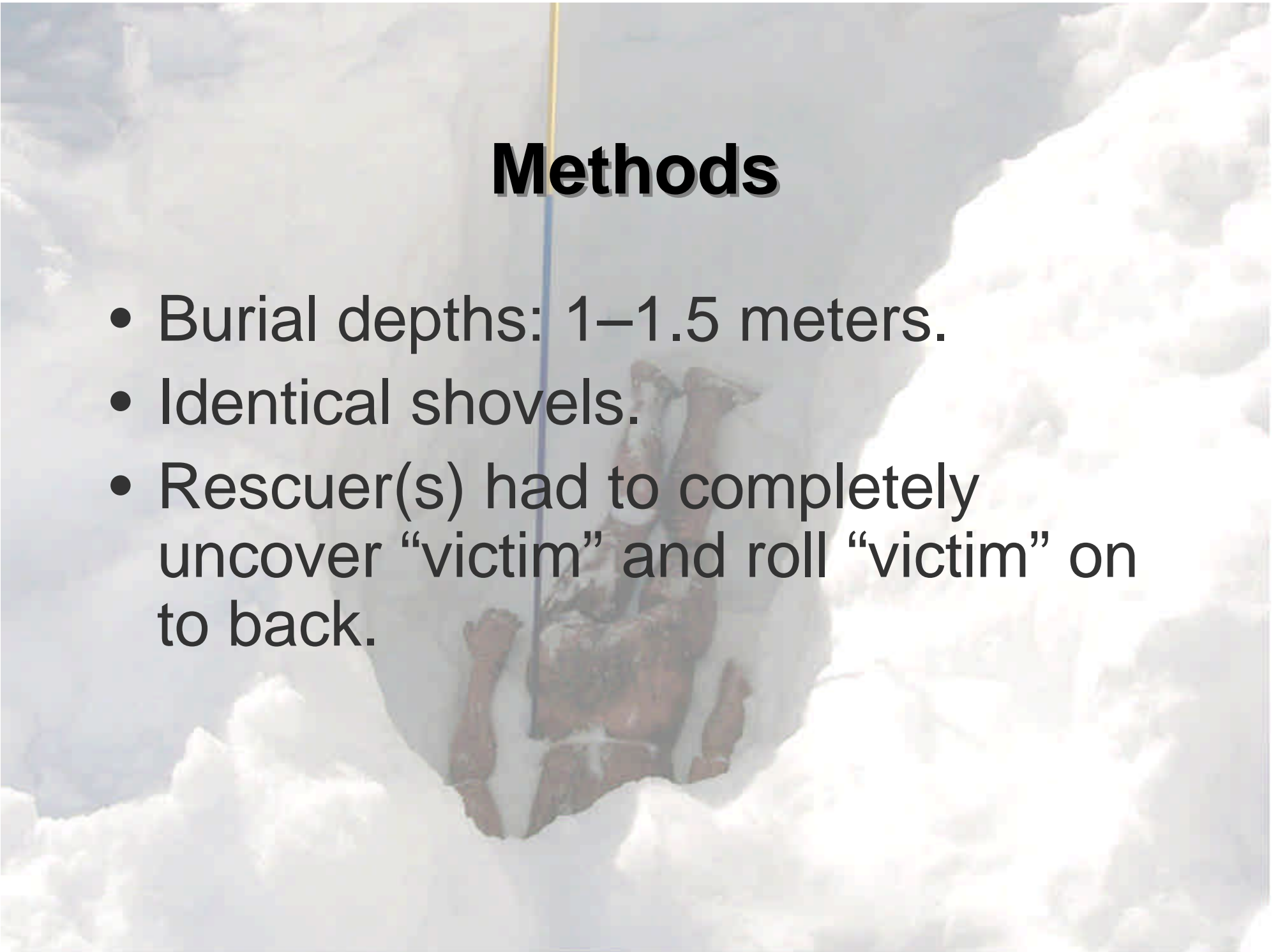
# Methods

- 3 days of digging in heavy spring snow.
- Life-size (and weight) dummies or very large snow-filled canvas duffle bags – buried “face down.”



# Methods

- Burial depths: 1–1.5 meters.
- Identical shovels.
- Rescuer(s) had to completely uncover “victim” and roll “victim” on to back.






















# Methods

- 64 excavations
- Tested:
  - 1 to 4 shovelers
  - unorganized “free” dig
  - Canadian and German methods
  - Strategic method

# Methods Tested

method	shovelers			
	1	2	3	4
Free				
In-line tandem				
German/triangle				
Canadian/terrace				
<b>Strategic</b>				
Deep burial				



# Results – Caution

Too few data samples to make statistical comparisons, but the observations made are quite valuable.

Fitness and motivation can trump technique.



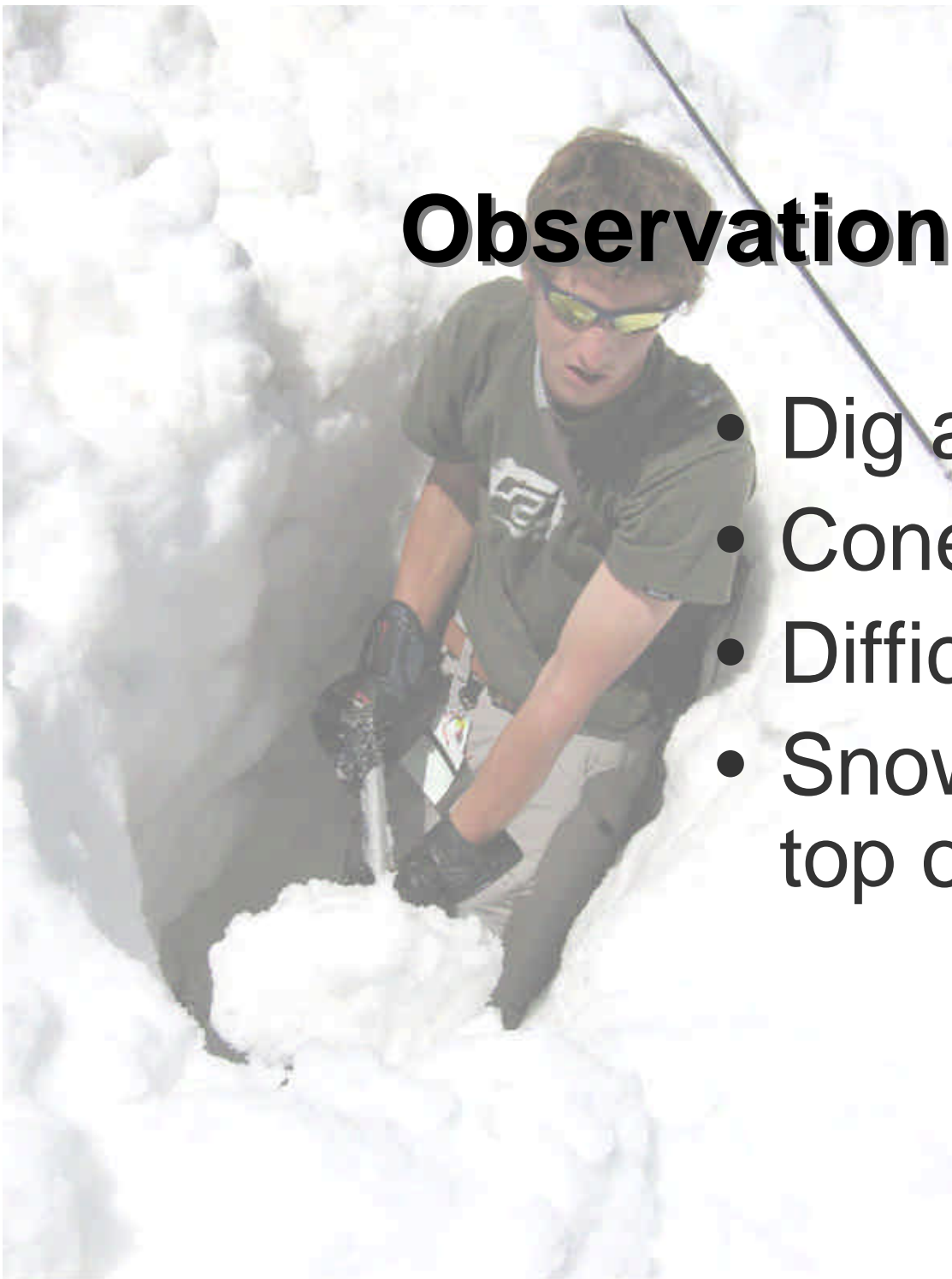
# **Body Posture / Digging Principles**

## Objectives

- back straight
- kneel or sit as close to snow as possible
- keep shovel below waist
- use torso / turn at hips
- move snow only once

# Observations – Free

- Dig along probe
- Cone-shaped hole
- Difficult to clear snow
- Snow falling back on top of victim



# Observations – Free

- Stepping on “victim”
- Trampling victim’s air pocket
- Nearly impossible to treat or roll victim
- **Slower!**



# Observations – Strategic Shoveling

- Combines elements from methods tested
- Space to shovel
- Easier to clear snow
- Space to work on victim
- **Faster!**







# Strategic Shoveling

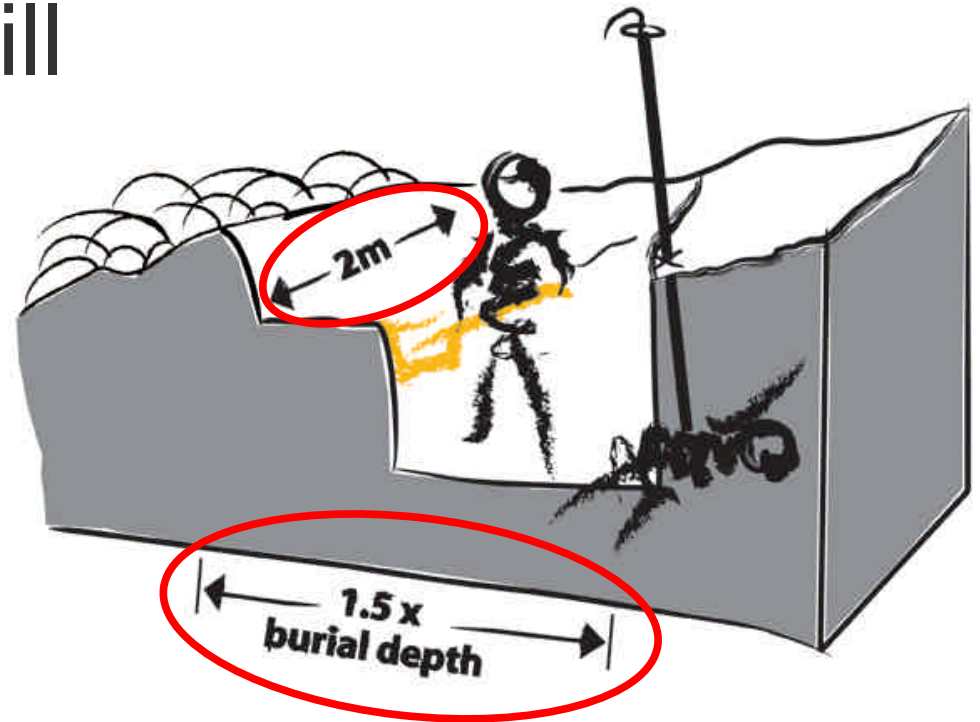
## *All Shovelers*

- Probe remains vertical
- Starter hole – downhill of probe 1.5x burial depth
- Start on knees



# Strategic Shoveling

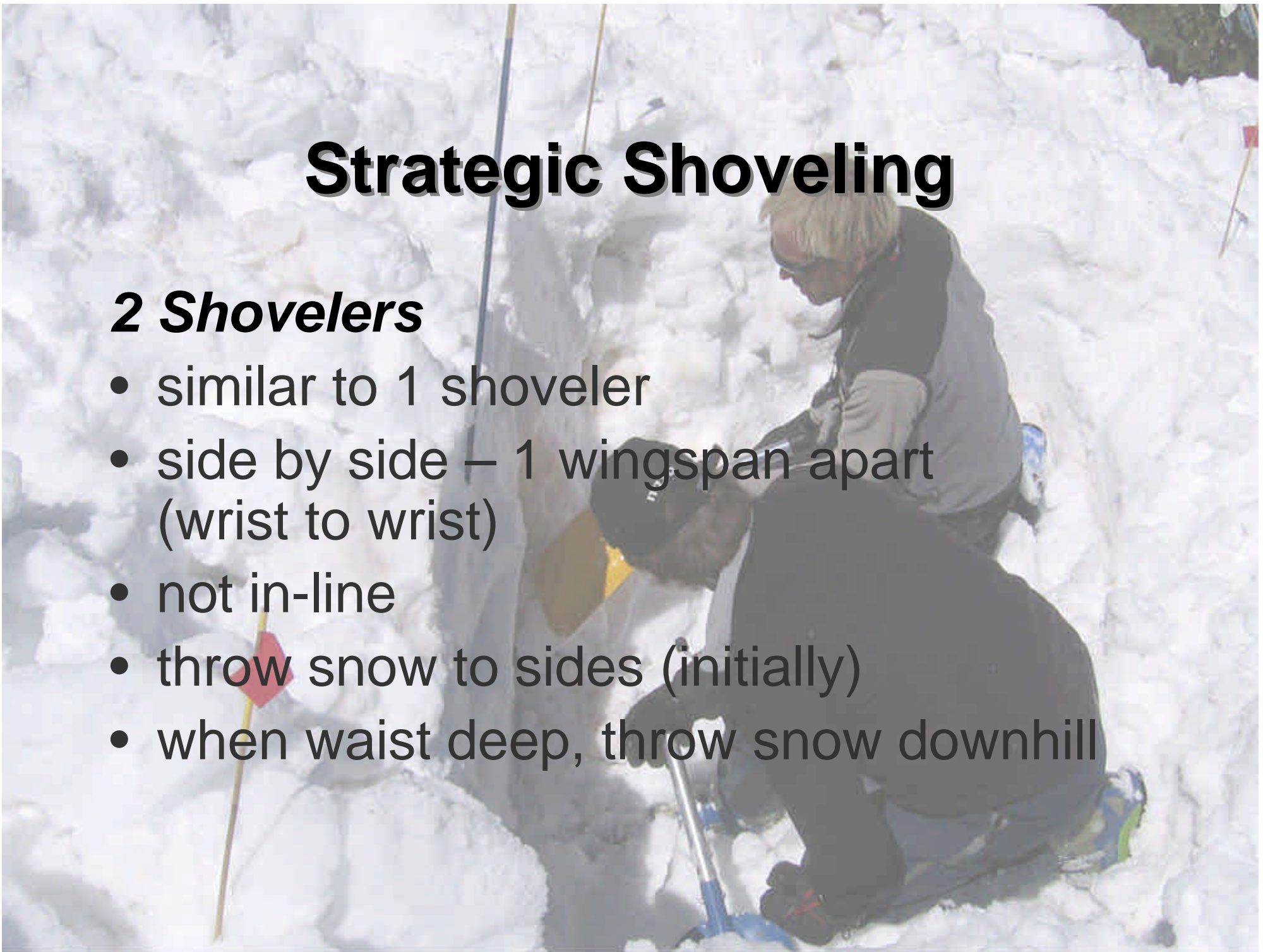
- Starter hole 1.5x burial depth downhill of probe
- 1 wingspan wide
- throw snow to side
- knee to waist deep
- then throw snow downhill



# Strategic Shoveling

## ***2 Shovelers***

- similar to 1 shoveler
- side by side – 1 wingspan apart (wrist to wrist)
- not in-line
- throw snow to sides (initially)
- when waist deep, throw snow downhill



A photograph of three rescue workers in winter gear (helmets, goggles, heavy jackets) shoveling snow on a mountain slope. They are positioned in a line, working together to clear a path. The background shows more snow and some equipment.

# Strategic Shoveling

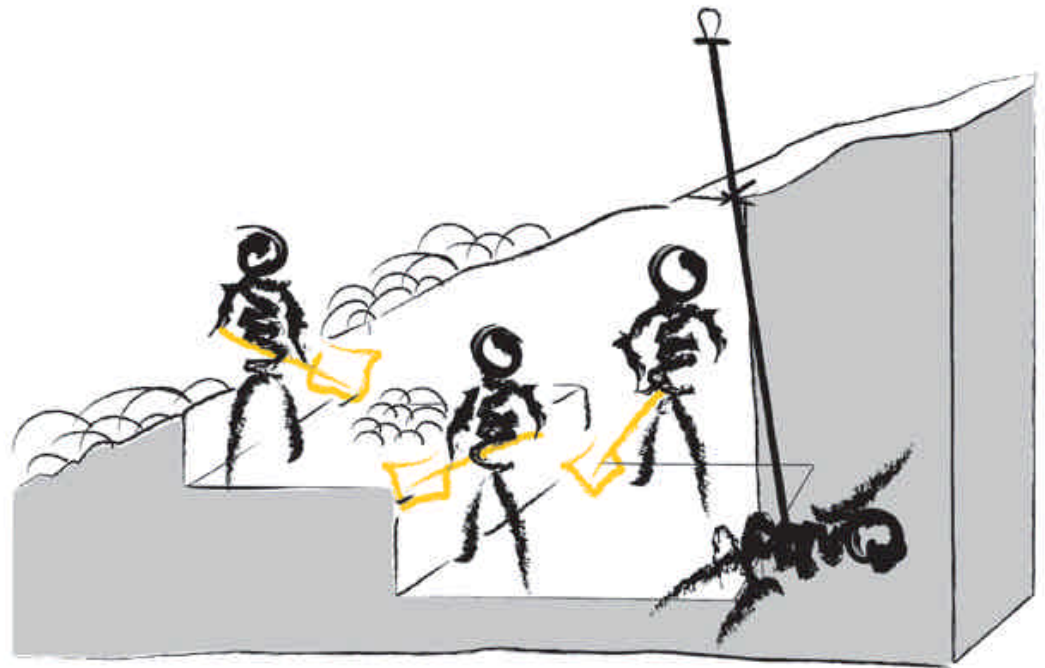
## **3+ Shovelers**

- primary shovelers (2 side by side) at probe
- secondary shovelers at 1.5x burial depth downhill
- once necessary to clear snow downhill, secondary shovelers move out and ready for emergency care

# Deep Burials (>2 m)

Deep burials  
(>2 m)

- use terraces and secondary shovelers to clear snow



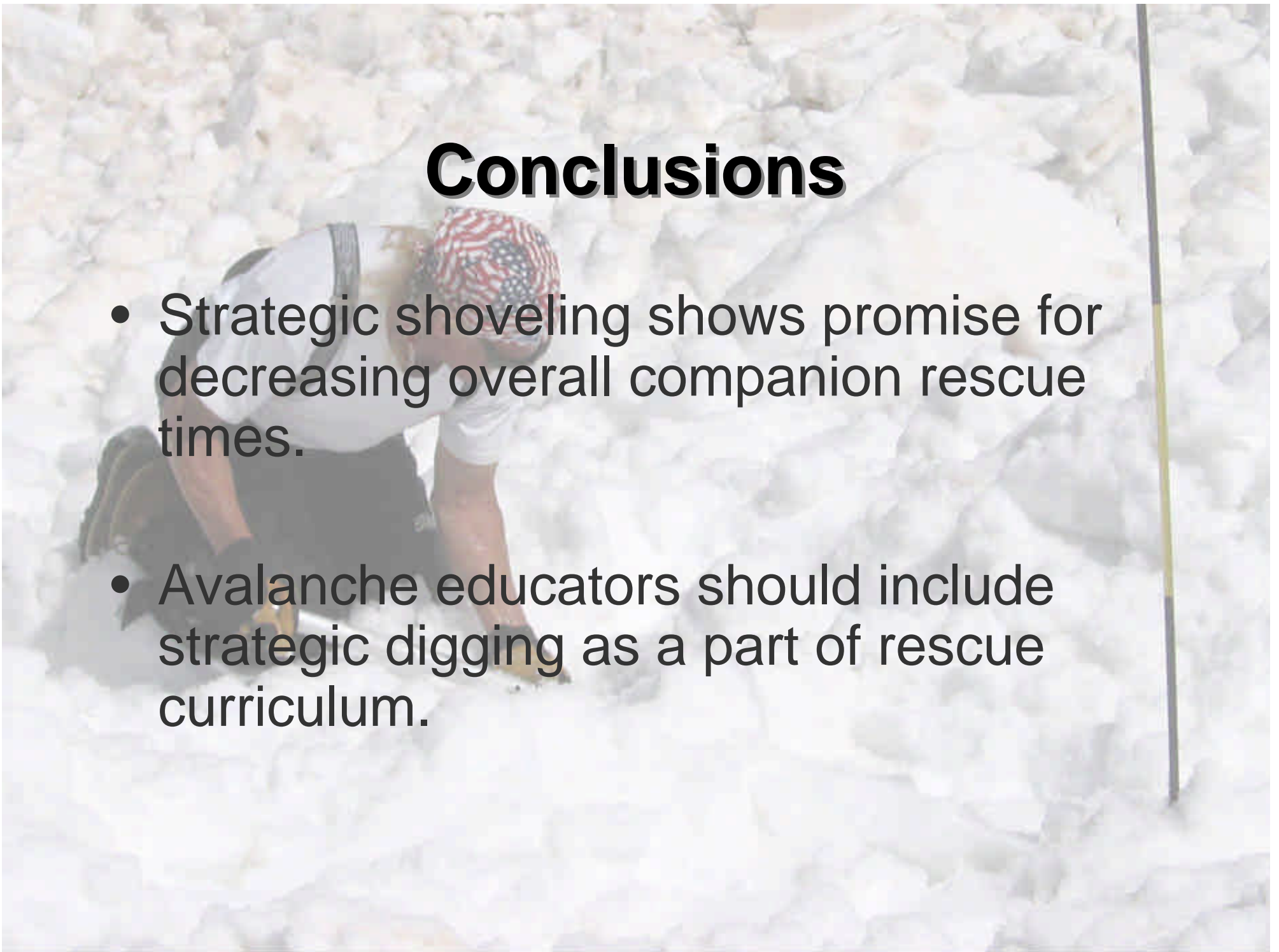


# Conclusions

- Shoveling is time consuming and physically demanding.
- Strategic shoveling saves time, creates a useable workspace, and is easier on the body.

# Conclusions

- Strategic shoveling shows promise for decreasing overall companion rescue times.
- Avalanche educators should include strategic digging as a part of rescue curriculum.







# Acknowledgements

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- Chris Semmel, DAV

# Final Words

1. Strategy
2. Fitness
3. Technique

