Australian Government
Australian Transport Safety Bureau

# Lessons from a helicopter winching accident: linking research with industry

**Presented by**
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AVIATION | MARINE | RAIL

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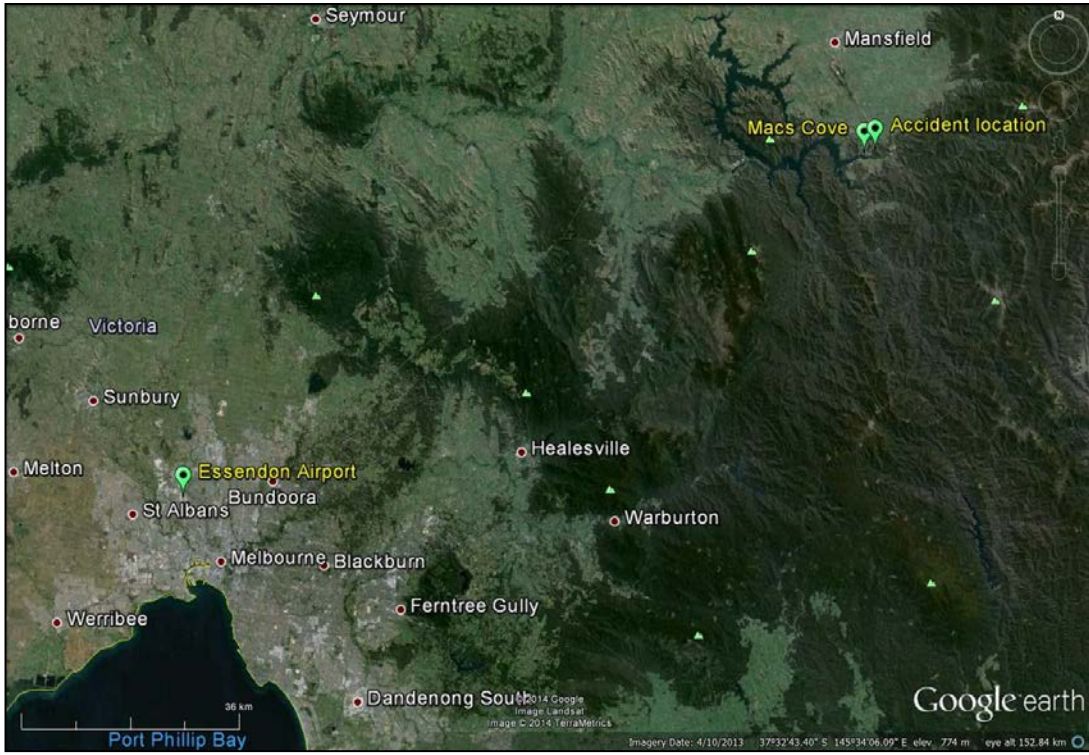
# Topics

- Overview of the winching accident
- Research and testing
- Findings
- Missing link

# Occurrence details

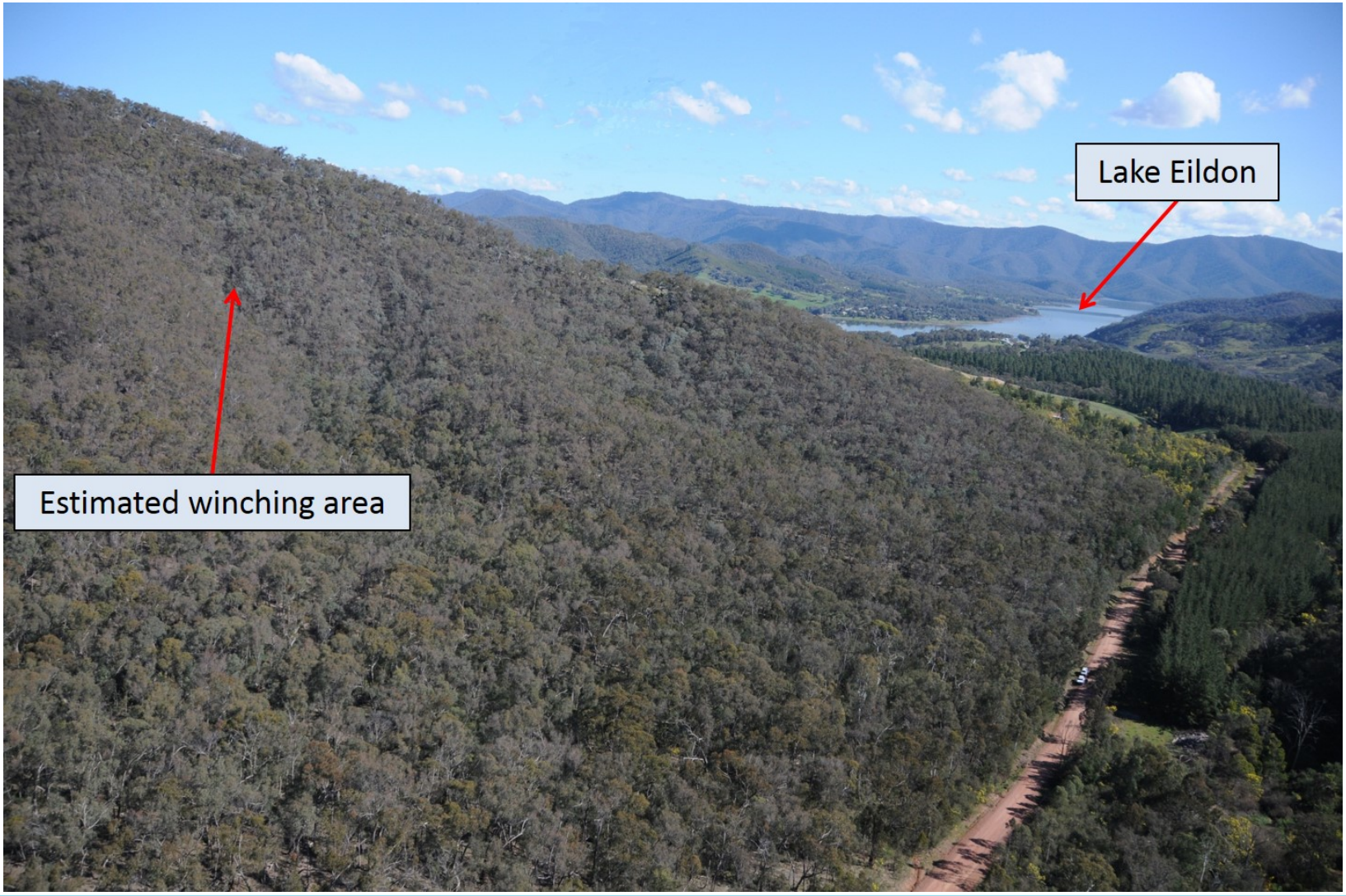
- AO-2013-136
- near Mansfield, Vic
- 31 August 2013
- VH-VAS
- Bell 412EP
- 3 crew, 1 patient
- VMC




AMBULANCE
VH-VAS
AMBULANCE

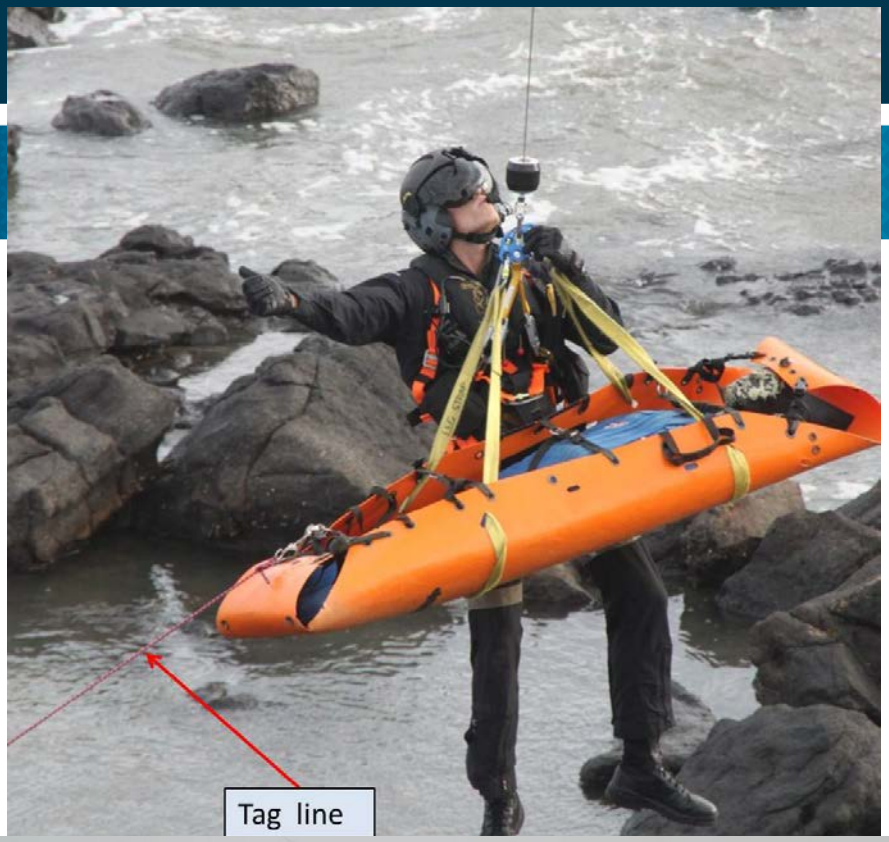
# Basic facts

- Experienced pilot, winch operator, and paramedic
- Tasked to retrieve patient, suspected broken ankle
- Ground party tasked prior to helicopter departure, Victoria Police, State Emergency Service, Country Fire Authority, 2x Ambulance Victoria Paramedics and a student Paramedic
- Paramedics provided clinical care to patient, including pain relief for their ankle injury (morphine)


Lake Eildon
Estimated winching area

# Winching preparation

- Winch area heavily wooded, about 1 – 1.5km from road
- Crew noted trees about 18m high with dead branches
- Discussed patient winching options
- Paramedic winched in and would organise a suitable winch area to be cleared
- Comms issues, so standard hand signals to be used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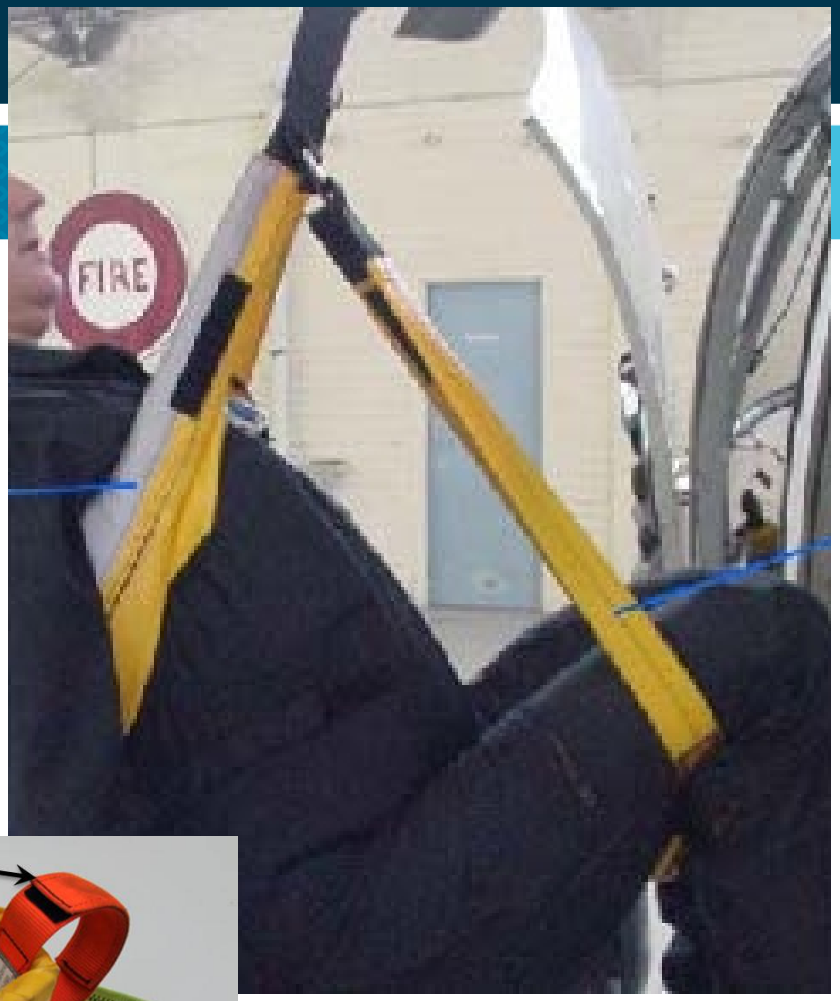
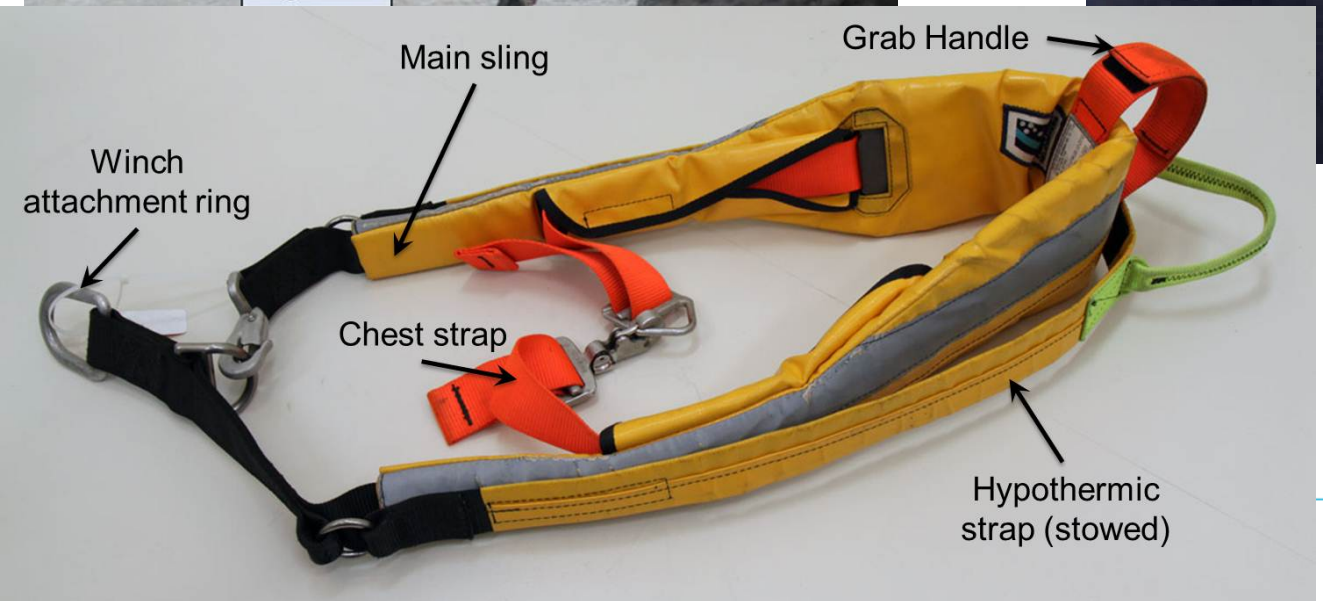

FIRE


Grab Handle
Main sling
Winch attachment ring
Chest strap
Hypothermic strap (stowed)

# Winching task

- Helicopter returned 20 minutes later, winch area cleared
- Double lift with patient in rescue strop
- 80ft hover, about 20ft above tree canopy
- When clear of ground, winch paused for 6 seconds to confirm patient and paramedic were stable
- At about 30-40ft, winch paused for 9 seconds to reposition patient and paramedic, clear of trees

# Winching task cont.

- At 60ft, 15ft below helicopter, patient was wriggling and his arms were coming up
- Winch stopped momentarily approaching the helicopter for a standard control check
- When at the door, the winch operator and paramedic attempted to get the limp patient into the helicopter
- 70 seconds into the winch, despite the crews efforts, the patient slipped from their synthetic jumper and rescue strop, fell to the ground, and was fatally injured.

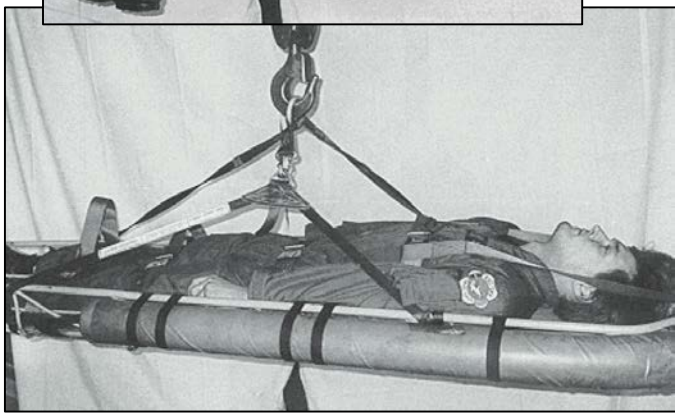
# Research and testing following:

- Norwegian winching incident (Haagensen et al)
  - November 1995, rescue helicopter dispatched to a fishing boat
  - Fisherman experiencing a severe asthma attack
  - Refused to lie down (typical for asthma attack), so rescue strop employed
  - During 20-30 second winch, lost consciousness, retrieved to the helicopter cabin and revived
- Military training exercise (Madsen et al)
  - Soldier left suspended in a rescue strop
  - Unobserved for 6 minutes and subsequently died

# Research and testing

## Haagensen et al and Madsen et al

- Haagensen/Madsen 1998 conclusions:
  - Reduction in ventilatory capacity easily tolerated by healthy individuals
  - Equipment choice for individuals with severe respiratory problems
  - Unconscious person may slip out of rescue strop or rescue strop with hypo strap – use a stretcher
  - Heart rate and blood pressure increases with extended suspension (60 minutes in a rescue strop with hypo strap - Madsen)



# Research and testing

## Murphy et al, 2011

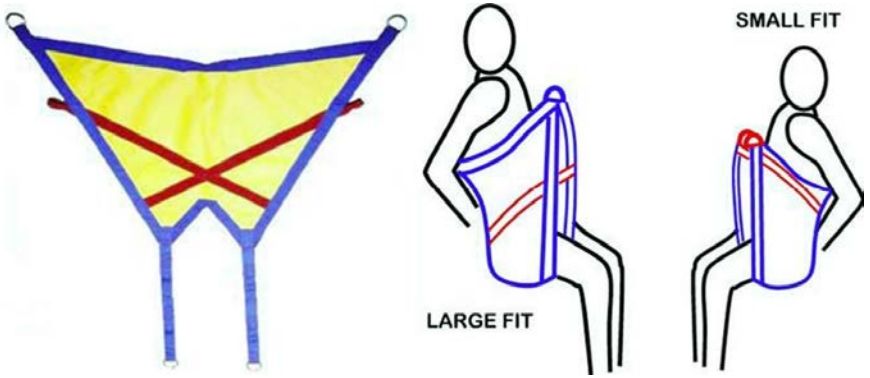
- Expanded testing to include a rescue basket
- Utilised 26 adults, different weights (45-106kg)
- Tested:
  - Forced Expiratory Volume in 1 sec (FEV1), 2 sec (FEV2), 3 sec (FEV3)
  - Forced Vital Capacity (FVC)
  - Inspiratory Capacity (IC)
  - Heart and respiratory rates

# Research and testing

- Murphy conclusions:
  - **Rescue strop**: significant decreases in FEV1, FVC,IC, significant increases in heart and respiratory rates
  - **Rescue strop/hypo and stretcher:** decreases in FEV1 and FVC, no other significant changes
  - **Rescue basket:** no influence on any of the parameters
  - Caution required regarding use of rescue strop
  - Rescue strop with hypo more benign option

# Research and testing

## Kempema (2011)




- Testing utilised a rescue strop, cinch collar (type of rescue strop), and seat-type harness
- 23 healthy participants, suspended for about 4 minutes
- Kempema conclusions:
  - Similar results to previous studies
  - Seat type harness had minimum physiological effects

# Role equipment testing-ATSB

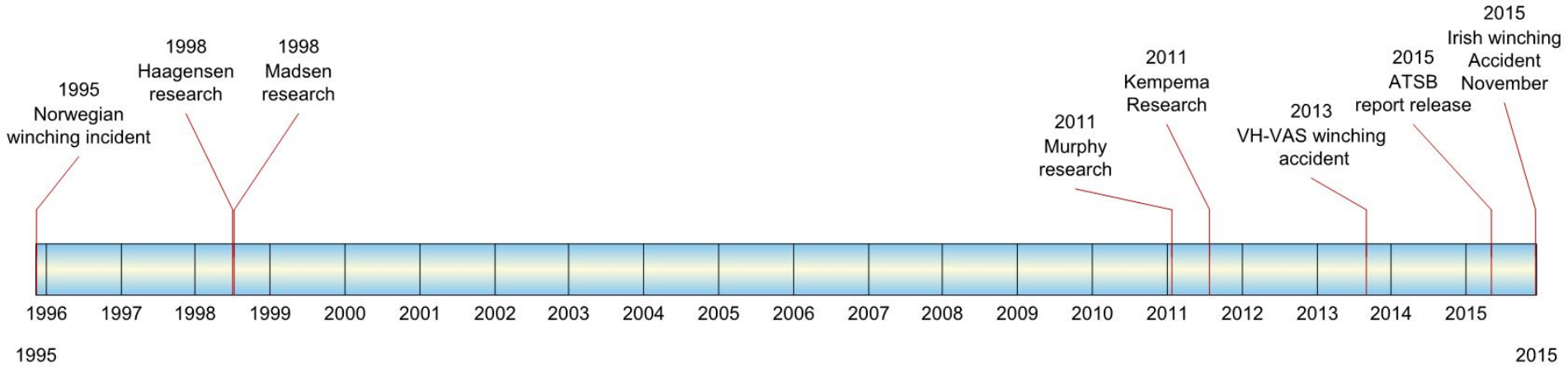
| | 65 kg subject | | 80 kg subject | | 140 kg subject | |
|---|---|---|---|---|---|---|
| | **Strop** | **With hypothermic strap** | **Strop** | **With hypothermic strap** | **Strop** | **With hypothermic strap** |
| **Ability to hold arms down** | Achieved with difficulty. | Easier. | Achieved with difficulty. | Easier. | Struggled to keep arms down. A lot of pressure under the arms and around the chest area. | Started getting 'tingling' in finger tips after 1 minute 30 seconds but able to keep hands clasped. |
| **Breathing** | Breathing was affected making it hard to keep arms down. | Much easier, only a little restricted. | Unrestricted. | Unrestricted. | Breathing was laboured and developed 'shakes'. | Breathing easier but became laboured towards end of trial. |
| **Comfort** | Fingers were 'tingling'. | Significantly reduced pressure under the armpits. | After 90 seconds arms started 'tingling'. | Pressure across back of knees. | Incredibly uncomfortable after 15 seconds, and shoulder cramp after 30 seconds. | Significantly more comfortable, some pressure under the legs and across top of knees. |
| **Time able to be maintained in equipment** | 121 seconds. | No effort required, trial terminated after 110 seconds as the subject reported no effect from securing the strap. | 165 seconds. | No effort required, trial terminated after 150 seconds as the subject reported no effect from securing the strap. | 40 seconds. | Less effort required, trial terminated after 120 seconds. |
| **Security in equipment (wearing shirt)** | Lifted arms, no slippage. Chest strap lost tension as soon as person lifted. | No slippage with and without chest strap secured. Wriggling had no effect. Physically had to bring arms inside rescue strop to promote slippage. | Lifted arms, no slippage. Chest strap lost tension as soon as person lifted. | No slippage with and without chest strap secured. Wriggling had no effect. Physically had to bring arms inside rescue strop to promote slippage. | Lifted arms, slipped out easily. Chest strap lost tension as soon as person lifted. | No slippage with and without chest strap secured. Wriggling had no effect. Had to bring arms inside rescue strop to promote slippage, and then slipped very quickly. |
| **Security in equipment (wearing synthetic jumper)** | Lifted arms, easier to slip out. | Not tested. | Lifted arms, slipped out in less than 7 seconds. | Not tested. | Lifted arms, slipped out very easily. | No slippage with and without chest strap secured. Wriggling had no effect. Had to bring arms inside rescue strop to promote slippage, and then slipped very quickly. |

# Findings

**These findings should not be read as apportioning blame or liability to any particular organisation or individual.**

- ## Contributing factors
  - During the winch retrieval the patient probably lost consciousness due to the compressive nature of the rescue strop around their chest, possibly compounded by the patient's weight and pre-existing medical conditions.
  - The use of a rescue strop, without employing the integral hypothermic strap, was not suitable for the patient's size and medical condition and, following their loss of consciousness, contributed to the patient falling from the strop.
  - **Limited guidance was provided by the operator and Air Ambulance Victoria to crews on the selection of the most appropriate winch rescue equipment given operational and medical considerations. [Safety issue]**
- ## Other findings
  - The rescue equipment used for the winch procedure was serviceable at the time.

# Missing link: Research to operations



# Questions ?