1000 m longline body recovery in the Troll Wall, Norway

Odd Staurset,
Norwegian Alpine Rescue Groups
Troll Wall facts

- Highest vertical rock face in Europe
  - Total height from valley floor 1700 m
  - Vertical face 1000 m
- Restricted area:
  - BASE jumping is illegal
  - Climbing is legal at own risk
  - No-fly zone near the wall
- Reason for restrictions:
  - Reduce the risk to rescuers
Main hazard of the Troll Wall:
Troll Wall climbing

- First climbed in 1965
  - Norwegian team
    - the Norwegian route
  - British team
    - the Rimmon route one day later
- First winter ascent 1974
- No legal restrictions on climbing
- 10 previous climbing fatalities on nearby climbing routes
- The wall is now rarely climbed due to increased risk of rockfall
- July 2019: The first climbing fatalities in the actual Troll Wall
Troll Wall BASE-jumping

- First BASE jump in 1980
  - 11 BASE-rescues from 1984-1986 with 4 fatalities
  - BASE-jumping banned by law in 1986
    - still illegal but a quite common activity due to lack of active law-enforcement
  - 9 BASE-fatalities to date in the Troll Wall area
Troll Wall skiing

- First ski descent of the nearby Fiva-route in 2018 by Killian Jornet
Noteworthy Troll Wall rescues/recoveries

- First rescue in 1967
  - German climber with broken ankle on Rimmon-route
- July 1981
  - Two German BASE-jumpers rescued with severe injuries on the Intro-slabs.
- March 1989 – The Thornhill rescue
  - 3-day winter rescue operation high on Rimmon after breaking his thigh on a three-week winter climb
    - Prompted the revitalization of NARG
- September 1989 – missing BASE-jumper
  - Australian found 45 days after accident. 5 fellow jumpers never reported him missing for fear of financial sanctions.
- July 2006 – presumed dead but alive
  - Sea King rescued British climber found unconscious and presumed dead on the intro-slabs below Rimmon
    - Major rock fall immediately afterwards prompted the introduction of a no-fly zone in 2007
- August 2019 – 1000 meter longline
  - Two Czech climbers killed in a fall from Rimmon. Recovered below the Intro-wall using longline.
The situation July 29 2019

- Two Czech climbers presumably starts climbing Rimmon-route July 25
- They are experienced and have been in the Troll Wall before
- Expected to summit July 27 at latest
- Reported missing by family on Monday July 29
- Their car is quickly located where expected
- NARG-personnel soon locate a possible finding through binoculars.
July 29: The casualty site

- Helicopter search confirm location of two bodies under the Intro wall on July 29, 80 m below the start of the Rimmon route
- Position is consistent with falling off close to the Great wall near the Nick-ledges, from approx 200-300 m height
- They are still tied in with several pieces of protection between them
- Based on aerial inspection and circumstances they are presumed dead

- Later analysis: Severe damage to equipment suggests forces caused by rockfall, likely from within the belay chain, ripping out all pieces including an equalized belay station
Hazards and restrictions

- The Intro slabs and area below are prone to extreme rockfall danger
- The position is far inside the no-fly zone
- Manual evacuation is very dangerous and time consuming
- The wall above is 1000 meters
Available methods

• Super-longline with Sea King with hoist
  (as demonstrated in Soldeu)

+ Advantages:
  • The casualties can be hauled into the helicopter without landing
  • Well tested and practiced method in our procedures with a known partner

– Disadvantages:
  • Very large helicopter
  • Time-consuming for the only available rescue helicopter on duty in its area (body recovery is not a primary task)
  • Parts of the procedures will have to be deviated
  • Close to load limit of hoist (2 bodies + 1000 m rope + wind)
Available methods

• Longline with a helicopter without hoist
  (initially not an option)

+ Advantages:
  • Small and maneuverable aircraft
  • Specialist on industrial longline operations
  • Higher load limit with quick release

– Disadvantages:
  • Casualties must be landed 1000 meters below helicopter
  • Not an available procedure for NLA’s ambulance helicopters in Norway
  • Longline procedures with other private helicopter companies has not been practiced by NARG in 20 years
The challenge

- The rope needs to extend well out of the no-fly zone, either/or:
  a) Up to the summit 1000 meters above in a vertical and loose wall (Preferred method by NARG)
  b) Down 900 meters through talus and bushes (Preferred method by helicopter = chosen method)

- Rope and equipment has to be delivered as close as possible to the casualties

- Helicopter cannot hover above while rescuers are exposed to rockfall (due to noise). Hence no one can be on site during the operation
## Risk assessment analysis

### SJA - Sikker jobb-analyse

**Prosjekt:** (nr. og navn)

**Kort beskrivelse av aktiviteten:**

- Utbygging av forudy klart personell Trollvæggen
- Utbygging med Airbus H 125 hekter

**SJA-gjennomføres fordøi:**

- Arbeidet medførter avvik fra beskrivelser i prosedyrer og planer
- Aktiviteten er ny og ukjent
- Folk som ikke kjenner hverandre skal jobbe sammen

**SJA-ansvarlig:** (navn, sign.

**Dato:** 31/4 - 1908

**Ansvarlig for aktiviteten:** (firma)

**Romdal felles rederingsgruppe**

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<thead>
<tr>
<th>Hvilke oppgaver er vi bekymret for?</th>
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<th>Har vi kontroll på farerne? (sett kryss)</th>
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**Læringsområde:** (Pylles ut av SJA-ansvarlig etter at jobbes er gjort: Hva kan gjøres annerledes/bedre neste gang? Hvilke positive erfaringer er viktig å ta med seg?)

- Skade på personell: Steinsprang
- Snøskred
- Fall
- Kommunikasjon

**Mulige farer**

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<tbody>
<tr>
<td>Sammenstøt/påhjærsel</td>
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<td>Brann, eksplosjon</td>
<td>Bevegelige gjestander/klemfare</td>
<td>Skarp gjeestand (kutt, stikk)</td>
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<td>Fallende gjeestand</td>
<td>Støy, vibrasjon</td>
<td>Tunge, tunge materialer</td>
<td>Overflater med høy/lav temperatur</td>
<td>Fare for elektriske støt</td>
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<td>Høyt rykk, sprutfare</td>
<td>Støy, vibrasjon</td>
<td>Stråling</td>
<td>Støy, olje, gasser, giftige stoffer</td>
<td>Mangfold. blysning</td>
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<td>Værforhold (vind, kulde, tåke)</td>
<td>Naturhendelser (trom, ras)</td>
<td>Arbeid i tankere/olje-oversett</td>
<td>Drukningsfare</td>
<td>Annet, spesielt</td>
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July 30: First attempt

- Superlongline with 330 Squadron Westland SH-3 Sea King
- 1) Ascend 1000 m with rope
- 2) Deliver rope and attached equipment near casualties
- 3) Lay out rope down the talus from casualties
- 4) Rescuers scrambled to site and packed and placed bodies behind large ice block connected to longline
July 30: First attempt

- 5) Sea King picked up 900 m rope in safe zone connected to hoist wire. Expected load 560 lbs. + wind (hoist limit 600 lbs)
- 6) Ascend to free rope from ground
- 7) Increasing winds caused rope to countinously catch trees, bushes and rocks.
  - Took 2 hours to almost free the rope. Rescuers exposed to (and experienced) rockfall over extended period trying to release rope snags.
- 8) Attempt aborted due to deteriorating weather, time and fuel capacity.
Aug. 2: Second attempt

- Longline with Nord Helikopter
  Airbus AS350/ H125

- 1) Simulated test-flying
- 2) Deliver people at summit + spotter at opposed summit
- 3) Deliver equipment at summit
- 4) Deliver large rope-bag in safe area
- 5) 1000 m ascent with rope from safe area using wall as reference
- 6) Deliver weighted rope close to casualties
Aug. 2: Second attempt

7) Deliver rope at summit

8) Attach casualties to rope
   - Decided not to use previous rope due to risk of snag
Aug. 2: Second attempt

- 9) Tighten rope at summit with Power ascender
Aug. 2: Second attempt

- 10) Pick up rope at summit
- 11) Fly rope clear of wall
- 12) Lift casualties
- 13) Land casualties at safe area
Aug. 2: Second attempt

- 14) Release 1000 metres of rope
- 15) Perform an ordinary 40 m longline and deliver the package in valley

- Total time from start of flying:
  - 6 hours
- Time from rope pickup at summit until package landed in talus:
  - 15 min.
Teamwork issues

- Distribution of risk must be fair between partners in order to minimize total risk
  - If one partner insists on no risk, other partners must accept higher risk and thereby total risk might increase
- Written risk assessment helps risk awareness
  - Important for the police if something occurs during the operation
  - Required when standard procedures are deviated
- Need alternative partners with different tools for different tasks
  - Training is essential to perform safe rescues
- Where is the limit of no rescue?
  - Private teams will attempt rescues instead
- Is elegance worth extra risk?
  - It’s a highly visible operation at a tourist attraction
    - Pull them out/down in harnesses instead of spending time packing?
    - Cut ropes instead of lowering if in a wall?
Conclusions

• First attempt should have been aborted earlier when risks increased due to continuous rope snags
  – It is a typical rescue problem that the situation escalates and risks accumulate. When do we say stop?

• Evacuation beneath the wall is relatively simple compared to evacuation in the wall itself.
  – There is no guarantee that rescues can be performed in the Troll Wall!

• Access to smaller helicopters must be included in the portfolio of NARG-partners.
  – This is not deliverable by existing partners.
  – Requires training (=funding) and procedures for cooperation

• The operation was not beyond the limit of acceptable risk.