

IMPERIAL COLLEGE RARU VALLEY 2011: MOUNTAINEERING EXPEDITION REPORT

Raru Valley, Ladakh, Indian Himalaya 23rd August 2011 - 26th
September 2011



Authored by:

Jonathan Moodie, Robin Jones, Kunal Masania, Joe Prinold, Virgil Scott, Dominic Southgate, Jonathan Bull

Contact: Jonathan Moodie, Fourstones, Curbar Lane, Calver, Hope Valley, S32 3YF jonathan.moodie@imperial.ac.uk

Published January 2012

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1. ABSTRACT

In August 2011 seven climbers from Imperial College London travelled to the Raru Valley in the Ladakh region of the Indian Himalayas. They accessed a subsidiary valley to the Raru Valley known locally as the Tetleh Valley. There they established basecamp and found the Tetleh valley to possess a large number of technical unclimbed peaks around 6,000m, with excellent quality granite. Over the course of three weeks, the team climbed seven new routes, reaching four summits. The highest of which was Lama Jimsa Kangri at 6,276m tall.

2. INTRODUCTION

The expedition team members belonged to either the Imperial College Mountaineering Club (ICMC) or the Imperial College Outdoor Club (ICO). In September 2010 the team members held a meeting to decide what interest there was in organising an expedition for 2011. As everybody in the meeting had similar intentions we decided that we should join into one large team rather than have two separate expeditions than compete for the same grants and increasing carbon footprint. The rock climbing orientated ICMC preferred technical alpine rock routes, whereas the members from ICO preferred high altitude first ascents. This placed a tough requirement on the destination to provide both types of mountaineering. After much research the team settled on the Tetleh valley, which is part of Raru valley. Prior to departure the team had been unable to access any photos or accounts of expeditions to the valley, and therefore, it was a gamble as to which of the two climbing groups would be satisfied with the objective.

The Raru Valley (also spelt Reru) is located in Northern India, in the Ladakh region of the state of Jammu and Kashmir. The mountains bordering the Raru valley range from 5,700-6,300m. The valley starts near Raru village at $76^{\circ}57'48$, $33^{\circ}19'36$ (Figure 2.1 and Figure 2.2).

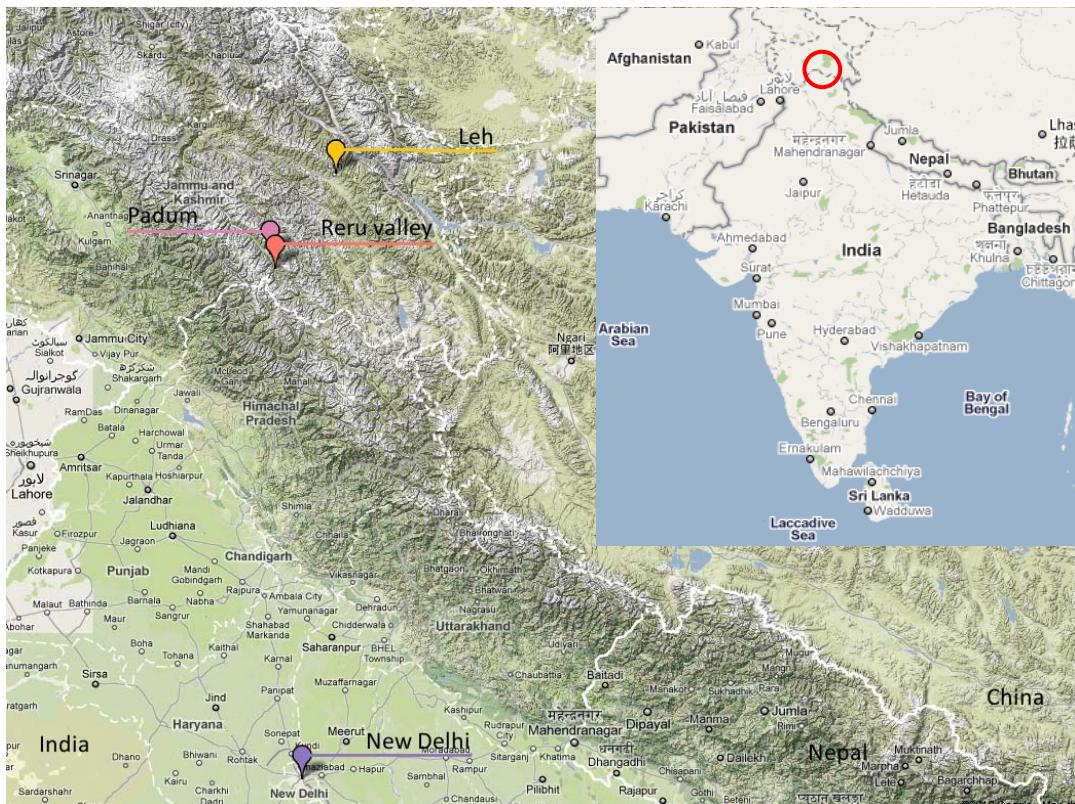


Figure 2.1: Raru location, Delhi, Leh, Padum and Raru valley are labelled.

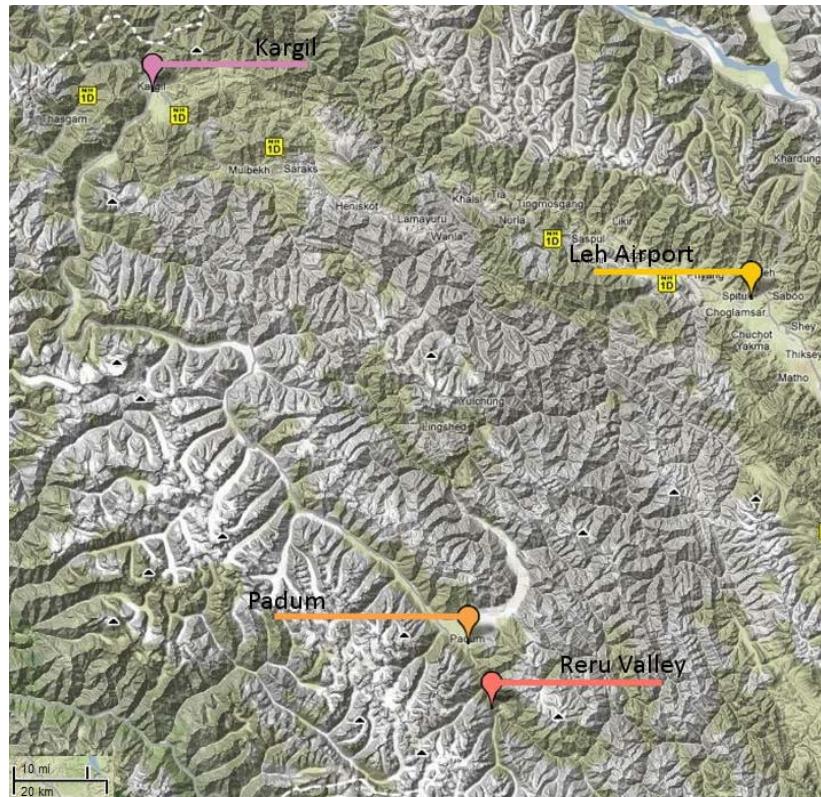


Figure 2.2: Reru valley and surrounding area.

3. RESEARCH

There were no existing accounts available belonging to an expedition having visited the Tetleh valley, suggesting the valley was yet to be visited by an expedition (this was later confirmed by discussions with residents of Raru village). During planning, the primary source of information was from two previous expeditions to the Raru valley, both took place in 2009. Trip reports were published in the American Alpine Journal and on UKClimbing.com. In addition to the trip reports, an Olizane editions map and Google Earth were also used.

2009 KYOTO ZANSKAR EXPEDITION

In August 2009 Kimikazu Sakamoto and three additional senior Japanese mountaineers led an exploratory expedition to the Raru valley with the objective of identifying virgin peaks. Their decision to travel to Raru was inspired by renowned Indian mountaineering authorities Safyabrata Dam and Harish Kapadia who at that point believed no climbing had taken place in the Raru Valley. The team identified and named peaks numerically, R1-R36 and photographed 21 peaks that they believed to be virgin summits, within this report we refer to some mountains using these names, corresponding to a sketch map produced by the Kyoto Zanskar Expedition (Figure 3.1). The Kyoto Zanskar expedition was purely for reconnaissance and they did not make any ascents of the peaks, however, they did write an account for the American Alpine Journal 2010.

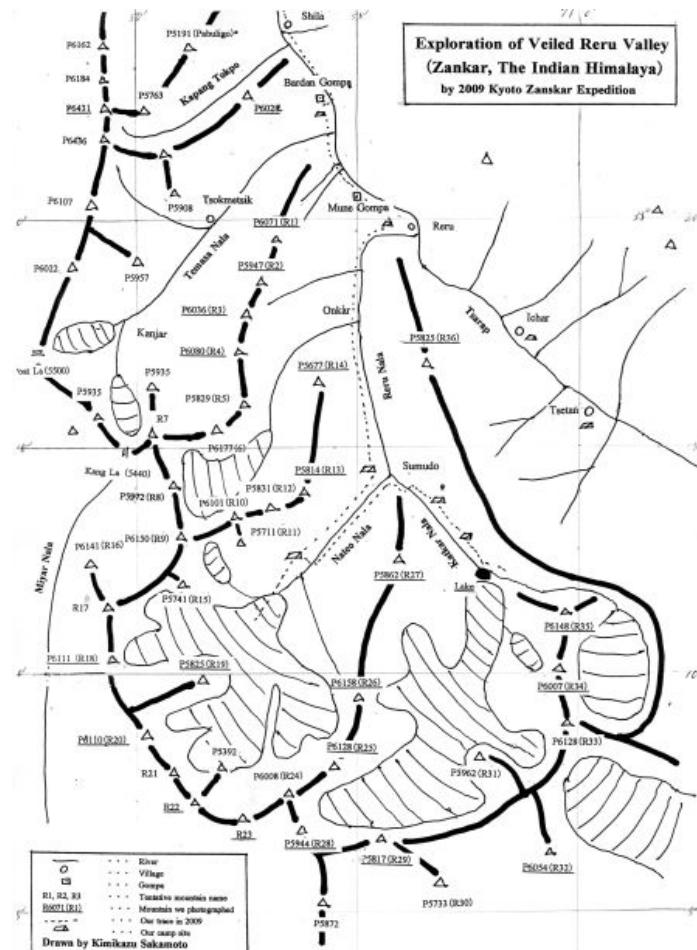


Figure 3.1: Sketch map of the summits of Raru valley, including the Tetleh valley (R1-14).

2009 PEAK ASPECT EXPEDITION

In September 2009, Peak Aspect (a UK-based climbing instructing partnership led by Jason Bailey) travelled to the Raru valley with the main objective of attempting an unclimbed peak. They achieved this by climbing Skilma Kangri 5977m and a trekking peak which they named Mt. Jules 5800m. They also wrote an account of their expedition for the American Alpine Journal 2010 and commented that they believed no climbing party had visited the area prior to 2009.

4. TEAM MEMBERS

			
Jonathan Moodie	Kunal Masania	Dominic Southgate	Jonathan Bull
Expedition Leader	Team Hindi Speaker	Alpine Mixed Team Leader and Medical Officer	Equipment Manager

			
Virgil Scott	Robin Jones	Joe Prinold	Anupam Murkerjee
Technical Rock Team Leader	Logistics	Treasurer	IMF Liaison Officer

TEAM BIOGRAPHIES

JONATHAN MOODIE

27 years old, Expedition Leader, British, PhD student

Seven years trad climbing experience, Scottish winter (IV), alpine climbing French Alps (TD), sport climbing throughout Europe, aid climbing, SPA training, ski touring and extensive hiking experience. Aspirant Member of the Alpine Club.

KUNAL MASANIA

27 Years old, Hindi Speaker, British, Post Doctorate

Member of Expedition to India: completed three first ascents. Member of big wall expedition to Morocco: completed one first ascent, six years trad climbing experience, Scottish winter (VI), Alpine Climbing French Alps (TD+), sport climbing throughout Europe, long distance hiking, ice climbing in Norway (WI5+), trekked Kilimanjaro, competitive rower. Aspirant Member of the Alpine Club and member of the BMC technical committee.

DOMINIC SOUTHGATE

28 Years old, Alpine Mixed Team Leader, British, Post Doctorate

Led expedition to Greenland: completed three first ascents. Expedition to Pakistan: new route on 6001m peak. Eight years trad climbing experience, Scottish winter (IV), alpine climbing in French and Swiss Alps (AD+), sport climbing throughout Europe, qualified mountain leader, long distance hiking, SPA training, ski touring and wilderness first aid training. Aspirant Member of the Alpine Club.

JONATHAN BULL

25 Years old, Equipment Manager, British, EngD Student

Guided expedition to the Peruvian Andes climbing six peaks over 5,000m. Seven years trad climbing experience, Scottish winter (V), alpine climbing French Alps (AD+), Sport Climbing throughout Europe. Aspirant Member of the Alpine Club.

VIRGIL SCOTT

25 Years old, Technical Rock Leader, British, Patent Examiner

Member of expedition to Bolivian Andes; completed many first ascents up to 5000m. Member of expedition to Atlas Mountains; completed new big wall route. Climbed in French Alps every year since 2006; completed many classic routes up to TD+. Winter climbing experience up to V, 5. Wilderness medical training completed. Member of the BMC technical committee.

ROBIN JONES

25 Years old, Logistics, British, EngD student

Seven years trad climbing experience (E3), Scottish winter (V), ice climbing in Norway (WI4), alpine climbing French Alps (TD), sport climbing throughout Europe. Aspirant Member of the Alpine Club.

JOE PRINOLD

25 Years old, Treasurer, British, PhD student

Seven years trad climbing experience (E3), Scottish Winter (IV), alpine climbing French Alps (TD+), Multi-pitch Sport Climbing throughout Europe. Aspirant Member of the Alpine Club.

5. BASECAMP

The basecamp was established at 4,616m ($33^{\circ} 16' 27''\text{N}$, $76^{\circ} 54' 20''\text{E}$) on the 1st of September, eight days after leaving London. Basecamp was situated on a large flat floodplain on the south-east side of the river (Figure 5.1). A small spring was located 500m up stream on the same side of the river at the camp, however, the Rimo team built an aqueduct from rope and tarp to access a more substantial spring 100m from camp but on the other side of the river (Figure 5.2)



Figure 5.1: Basecamp located on the flood plain.



Figure 5.2: Aqueduct and spring.

Raru Village was accessed by minibus from Leh (organised by Rimo Expeditions). Basecamp was approached from Raru village on foot (Figure 5.3). Porters, ponies and yaks were organised by Rimo on arrival at Raru, the day before approach. The approach took two days with stop at Onkar (the confluence of Raru and Tetleh valleys). The final stretch of the approach to the basecamp site was hindered by a scree barrier that prevented access by the animals. The animals were unloaded and the loads were carried along the steep banks beside the river by both ourselves and the Rimo team. The Rimo team cleared and formed a track on the north bank of the river for the return journey, this was utilised when we departed the valley by moving equipment from the flood plains on the south-east side to the north-west bank in the morning when the river was low. The crossing may be problematic for future expeditions arriving in the afternoon.

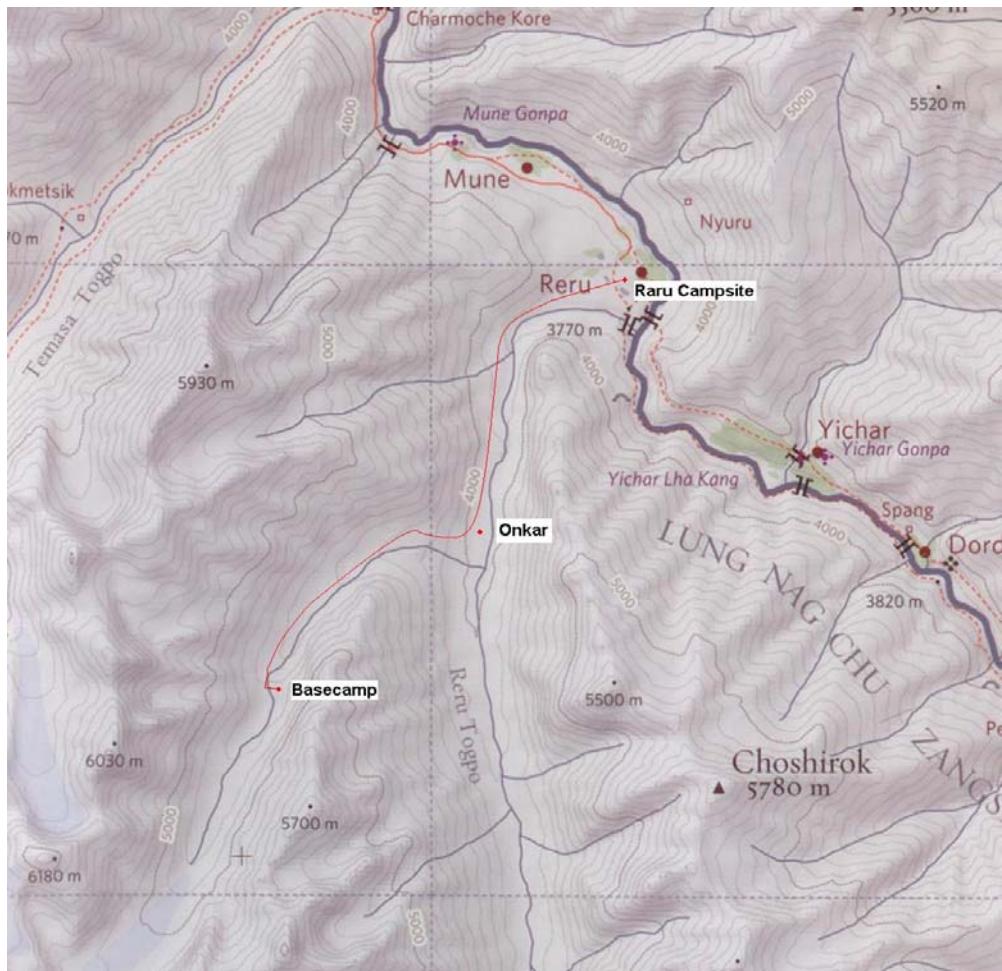


Figure 5.3: Basecamp approach.

6. MOUNTAINEERING OBJECTIVES

On the 2nd of September three team members reccied the large rock face above basecamp whilst the remainder of the team walked up the valley and onto the glacier, to an altitude of 5,200m, with the foot of the glacier at 4,848m (33° 14' 50"N, 76° 53' 22"E). The team took the opportunity to establish a glacier camp at 5,000 m and cache some equipment. The general strategy was to first attempt peak 6,180m (later named Lama Jimsa Kangri); being both our main objective and that of a comparatively less technical difficulty. After returning to basecamp and taking a rest day, the team and liaison officer returned on the 4th of September, with four members (JM, JP, DS, AM) moving the camp from the cache up to 5,100m.

LAMA JIMSA KANGRI 6,276M

The following day the first team continued up the glacier, then up scree slopes to establish a high camp on a plateau at 5,600m South-South-West of the summit of Lama Jimsa Kangri (peak 6177m) with the intention of climbing the South-West face (Figure 6.1).



Figure 6.1: South West face of Lama Jimsa Kangri (6,276m).

The second team (RJ, VS, KM, JB) left the glacier at 5,000m and headed straight on to the scree slopes South-East of the summit of Lama Jimsa Kangri , establishing a camp on the rocky slopes at 5,300m (figure 6.2), with the intention of climbing a gully on the East face (Figures 6.3 and 6.4).



Figure 6.2: Camp at 5,300m on the South-East slopes of Lama Jimsa Kangri.



Figure 6.3: South-East side of Lama Jimsa Kangri (6,276m).

The teams started the summit day at 3am. The team attempting the South-West face encountered a continuous snow slope of 50-60° with good snow conditions which led to a rocky summit ridge, the summit was reached at approximately 10.30am at a height of 6,276m (33° 15' 09"N, 76° 52' 01"E). Descent was by the same route of ascent. Meanwhile, the team on the South face encountered more consistent difficulties of mainly grade II (Scottish winter) for 800m which lead to a rocky summit ridge. The whole route was simul-climbed, with short roping and temporary belays over the more difficult regions (encountering difficulties up to Scottish III). The summit was reached by the East face at noon, descent was also by the South-West face. Both teams reported finding a cairn and weathered tat placed at the summit, which no member of our expedition had placed (Figure 6.5). Despite believing the mountain to have been previously unclimbed, it now seems that it had received a previous unofficial ascent, most likely from the Temasa Valley to the North.



Figure 6.4: VS on snow slopes of Lama Jimsa Kangri.



Figure 6.5: Tat on the summit.

Both teams returned to basecamp on the 7th of September except KM and JB who remained at the cache to attempt another objective.

UNNAMED MOUNTAIN C.5,700M

KM and JB set off from Glacier cache camp (5,100m) at, 6am on the 8th of September. The objective was a 5,700m mountain on the South side of the valley. Approach was by a scree slope to gain a col at 5,381m, they cached their axes and crampons at this point. The main ridge at 5,570m was gained via rock. The intention was to continue to the top, some 100-200m higher. Access to the summit required tackling a steep snow slope without axes and crampons (Figure 6.6). Due to difficulties in the climbing and heavy fatigue, the decision was made to descend. Descent was by abseil, crossing back through the col and descent of the scree slope returning to glacier camp at 6pm, then back to basecamp on the 9th of September.



Figure 6.6: Unnamed mountain attempted by KM and JB (c 5,700m).

MOEL KANGRI 5,930M

On the 10th of September JM, RJ and DS departed basecamp to attempt Moel Kangri (peak 5930m) (Figure 6.7). The route took 800 m of ascent over loose rock up a moderate gully, a brief climb out of the gully at 5,600 m was followed by an abseil off the East ridge onto a neighbouring glacier, where camp was established at 5,500 m. The following day the team departed from camp, crossed the glacier to the South ridge of Moel Kangri. The team encountered a boulder field with a modest gradient, this circled the mountain leading to the summit at 5,930 m. Descent to glacier camp was by the same route.



Figure 6.7: Moel Kangri (5930m).

BASECAMP BIG WALL 5,385M

JP and VS attempted the 650m rock wall situated beside basecamp on the south side of the valley (Figure 5.8). They started on the 10th of September at 6am climbing the right hand side of the wall on nicely featured slabs. The first 4 pitches were very high quality, around VS or HVS in difficulty. The rock then became a little less consistent with broken and loose sections, but greater variety – with a nice chimney pitch through a squeeze-hole and a couple of good corner pitches. For the final twelve pitches they traversed out right onto the ridge of the wall and followed almost to the summit. A short walk and then traverse brought a final steep section over

suspect rock to the summit at 5385m. In total around 20 pitches, sumitting at 6pm and then descending down the scree gulley to the left of the wall, and returning to base camp at around 8pm.



Figure 6.8: Basecamp Big wall (route length 650m, ascent in red, descent in blue).

BHAIO AUR BHENO KI KHUSHI 5,985M

KM and JB returned to a higher glacier camp on the 10th of September. The following day they set off from camp at 4am to attempt a rock route on a 5,900m mountain on the south side of the valley. As they approached the base of the route, ominous looking clouds were coming in from the head of the valley. So they changed objective to a route they perceived as more rapid, which took a mixed line to an attractive snowy summit. They avoided a large bergschrund by approaching a buttress from the left of the base of the route at 5,250m, then crossed back right across the buttress and took a line between the snow and rock. A direct line may have been possible, but with no ice screws, they crossed back onto the buttress to gain the upper 80° snow slopes to reach the summit (5,985m) at 3.45pm. The gradient and difficulty was harder than expected,

the route was mixed III/IV and an overall grade of about TD, 700m, they named the mountain Bhaio aur Bheno ki Khushi (Figure 5.9). Decent was via the West facing ridge by abseil. A snow face was traversed left then followed more abseils. Both climbers were back at their tents by midnight, returning to collect ropes stuck on the final abseil the following day.



Figure 6.9: Bhaio aur Bheno ki Khushi (5,985m).

EAST SPUR OF R6 C.6,000M

On the 14th of September JP and VS attempted one of the Eastern spurs of R4 (Figure 6.10). They camped near the base of the spur at around 5000m and started climbing at around 3.30am. After 200m of scrambling they arrived at the main spur just after sunrise and moved together, occasionally belaying short sections. Most of the climbing was around HS-VS, with occasional trickier sections. After about 800m of climbing on absolutely superb rock the spur steepened and they set up a belay. JP set off on a tricky HVS pitch which turned out to be about 75m long due to the difficulty of finding a belay. This brought them to just below 6000m, but still at least 4-5 long pitches from the summit. JP and VS observed poor weather systems moving down the valley and snow began to fall, they decided to descend. After a cold and snowy night on a ledge at around 5750m they continued the descent the following day, returning to the base of the spur in the mid-afternoon.



Figure 6.10: East Spur of R6 (c 6,100m).

On the 14th of September JM, RJ and DS left basecamp to attempt a peak west of peak 6060m, camping first on the glacier at the cache camp, then at the foot of the peak at 5,550m on the 15th. Overnight approximately one foot of snow fell rendering the peak unsafe. This snow forced the return of all parties to basecamp.

KM and JB also abandoned hope of another route and returned to basecamp, when heavy snow covered all the slopes of their potential objectives.

SUMMARY OF OBJECTIVES COMPLETED

By the end of the expedition seven routes had been attempted and four mountains were ascended, these are illustrated on Figure 6.11.

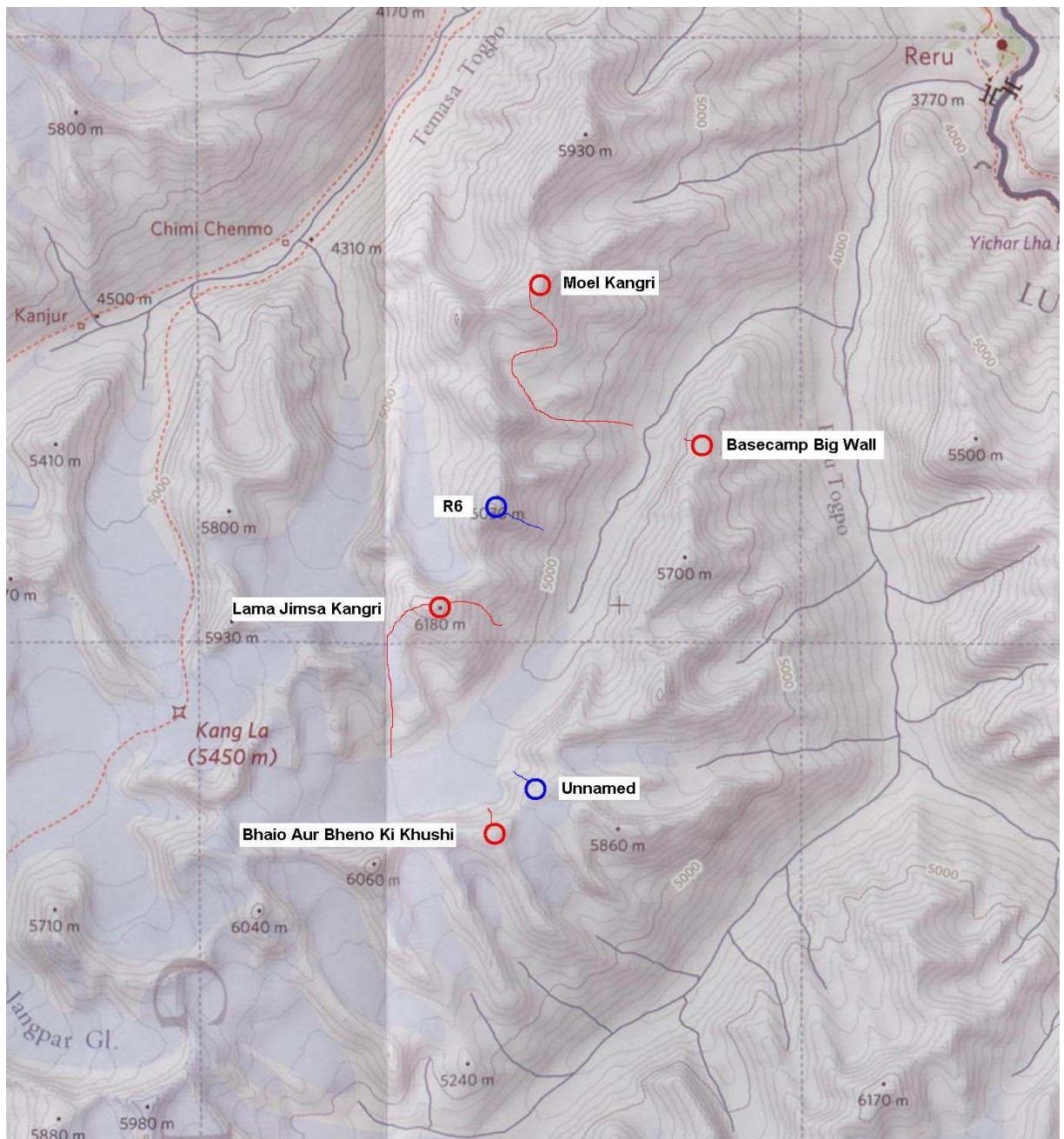


Figure 6.11: Map illustrating the peaks that were summited (red) or attempted (lines). Lines illustrate routes taken.

7. THE TETLEH VALLEY AREA

THE VALLEY

After speaking with the locals, we discovered the name Tetleh Valley (Tetleh Nala) as it was unnamed on the map. The only evidence of humans visiting it were patches of grazed pasture near the confluence with Raru Valley and tales of a hermit, or Lama, that had inhabited a cave in the valley some 100 years ago to meditate until his demise. The current generation of farmers in Raru valley said they never used it as it was difficult to access for grazing, they did say that many generations ago it was also used as a pilgrimage route to a monastery to the south; pilgrims must have been tough to pass over the 5,500m snow-bound col to Miyar

Valley, joining up with the well known trekking rout on the Kang-La pass. The locals said we were the first Westerners to have visited the valley, and we believe the origin of the cord on Lama Jimsa was from ascensionists using easier routes on the neighbouring Temasa valley to the north.

The valley is approximately 10km long with steep rubble-strewn sides, guarded by a steep stony entrance and headed by a gently-inclined glacier up to the back wall of formidable peaks. Compared to the map the glacier had receded some 500m in the last 2 decades. The terrain is mostly rocky with occasional flat gravel beds where the river once ran. Fresh unsilted water is available from several springs. Many alpine flowering plants grow in the nooks of boulders, including the beautiful emblematic Himalayan blue poppy.



Figure 7.1: Flower in the Raru valley at Onkar, en route to Tetleh Valley.

There was evidence of wildlife too: yellow-beaked, high-voiced crows nested precariously on high cliffs, giving us a sense of scale. Marmots sunned themselves on rocks and mice scurried around. Tracks of wild sheep (possibly the bharal, or Himalayan blue sheep) were followed by those of a snow leopard with its cub. Leopard scat was found close to our basecamp and sheep's fleece left drying on rocks next to our tents by the porters was stolen overnight. Later investigation showed that the nearby Hemis National Park is home to some 200 leopards.

On the walk in, our first impressions were of great beauty but rather loose and unimpressive mountain peaks. However, as we walked further in the valley curved around to reveal great granite faces, rocky ridges and inspiring snow-capped peaks all the way to the back wall of the glacier. All were higher than 5,400m, half a dozen over 6000m, rising to Lama Jimsa at 6300m. More importantly there were good lines in abundance at all levels of difficulty, from scree scrambles and snowy ridges up to immaculate 1000m+ granite walls (Figure 7.2) and technical mixed climbs.



Figure 7.2: Unclimbed faces on Tetleh Valley's eastern side and glacier foot.

TETLEH GLACIER

The foot of the glacier was located at $33^{\circ} 14' 50''\text{N}$, $76^{\circ} 53' 22''\text{E}$ at an altitude of 4,848m (Figure 6.2). The glacier was unusually friendly: flat with very few wide crevasses (Figure 6.3). Our load-ferrying trips were consequently done in trainers. It provides easy access to the base of most peaks in the valley, although the scree usually makes the going difficult from there on up.

CLIMBING POTENTIAL

Once based in the valley, it is easy to make a one-day raid on an unclimbed summit. However, some of the best remaining objectives would require a multi-day effort and a fairly high standard of rock climbing ability. Some

outstanding hard lines are crying out for attention: see Figures 6.4 and 6.5. Figure 6.6 illustrates peaks towards the top of the glacier and the col leading to the Miyar valley/ Kang-la pass.



Figure 7.3: Reconnaissance on the glacier. Bhaio aur Bheno ki Khushi (5985m) in the background (centre). Unclimbed peak to the right.



Figure 7.4: Two hard unclimbed 6000m+ summits on the eastern side. There may normally be more snow than this.



Figure 7.5: An ambitious but attractive line in the centre of this unclimbed mountain. Approximately 300m of steep ice, followed by a 300m 70° gully directly to a c. 6,000m summit.



Figure 7.6: The head of the glacier, col into Miyar valley/Kang-la pass centre.

8. LOGISTICS

TRAINING

All team members attended a trip to Scotland in January 2011 to climb in Scottish winter conditions with each other. Four members met for a pre departure climbing weekend multipitching prior to north wales. Team were encouraged to maintain fitness leading up to expedition. Injuries to three team members limited their training prior to departure.

FINANCES

BUDGET

The complete budget of the expedition can be found in Appendix A.

INCOME

A large number of companies and organisations were approached for sponsorship and equipment discounts. Exposure through acknowledgment in post-expedition presentations and reports were suggested as incentives for these groups.

All members of the expedition borrowed some equipment from the Imperial College Union's Outdoor and Mountaineering clubs, in particular ice axes and crampons, significantly reducing equipment costs. However, some personal equipment was not suitable to be borrowed from these clubs e.g. ropes, down jackets, down mats and category 4 glacier sunglasses. The expedition therefore applied to a number of suppliers and national distributors to obtain discounted rates for equipment purchase. Grants for equipment were also applied for. The following organisations awarded discounts or equipment grants:

- Lyon Equipment (climbing equipment)
- Montane (clothing)
- Peter Hutchinson Designs (down clothing and equipment)
- Mountain House (freeze dried meals)
- TORQ (energy bars, gels and powder)

A number of other grants were applied for, particularly through the generous opportunities offered within Imperial College. Many of these were successful, with a breakdown of the expedition's income shown:

• Imperial College Exploration Committee grant	£	5,000.00
• Imperial College Trust	£	1,050.00
• Mount Everest Foundation	£	1,800.00
• Welsh Sports Association Ltd.	£	1,200.00
• Old Centralians' Foundation Trust	£	3,000.00
• MCofs	£	400.00
• Personal Contributions	£	6,616.00
• Exploration Board (insurance)	£	2,525.14
• Exploration Board (sat phone - hire only)	£	241.71
• Exploration Board (charger - half of cost)	£	82.80

COSTS

The most significant cost of the expedition was Rimo Expeditions who provided all transfers beyond Leh up to our basecamp as well as food and support at basecamp for the duration of the expedition. The company came highly recommended from previous Imperial College expeditions and lived up to their excellent reputation. Flights were also a significant cost, research was done to find the cheapest flights and these were booked as early as possible to reduce this cost. IMF payments were required to allow climbing in this area, these costs

were fixed. Equipment was also a significant cost and, as discussed, significant sponsorship and grants were successfully obtained to cover these costs. Given the reasonable amount of equipment purchased by expedition members, overall the expedition was financially excellent.

INSURANCE

Travel insurance was provided by BMC expedition insurance and paid for by Imperial College London Exploration board.

TRAVEL, FOOD AND ACCOMMODATION

An itinerary of our travel is contained in appendix B.

All flights were booked several months in advance of the expedition leaving, with the cost of the flights, and baggage allowance (we had approximately 220kg of equipment in total) being the primary factors in choosing which airlines to use. We flew with Jet Airways from Heathrow to Delhi, with a baggage allowance of 2 x 23kg each, and with Air India from Delhi to Leh, with a baggage allowance of 25kg each. Our Rimo agent helped ensure we didn't have to pay for any excess baggage for this internal flight. Airport transfers to and from the hotel were in the form of a minibus large enough for all of us and our luggage and were organised by Rimo. Our hotel in Delhi (Florence Inn) and our guesthouse in Leh (Snowlands) were both booked for us by Rimo, as were our hotels en-route to Raru village. On the outward journey we ate our meals in the hotels in which we were staying to reduce the likely hood of food poisoning. The strategy seemed to have merit, being successful for all but one of the expedition members throughout the expedition.

Our three day drive to get to the Raru valley began by driving from Leh to Kargil where we stayed for the night, with the journey taking under eight hours, including an enforced 40 minute delay at a checkpoint due to one member temporarily losing his passport. On day 2, we drove from Kargil to Padum taking in the Penzila pass at 4,300m. The journey took 13 hours, including a tea-stop at Rangdum. After a night in Padum we transferred into jeep-taxis and completed the 1.5 hour drive to Raru village. The Rimo team had already arrived and set up camp outside the school. A coffee shop was located in Raru, food was available at the bazaar in Padum, however, we chose to purchase supplies from the bazaar in Leh.

Camp in Raru consisted of a cook tent, a mess tent, four tents for the expedition members and a toilet tent. This night was our first night of camping and also our first opportunity to sample the many and varied delights of Rimo expedition food, which was, without fail, tasty and satisfying, if often somewhat eclectic in the combination of dishes, for example a highlight was a dinner of roast mutton and vegetable pizza.

Basecamp was located on a flat flood plain, of which there were several on the ascent towards the glacier, the terrain of which was primarily fist-sized rounded stones and mica dust. Whilst we were away from basecamp climbing our objectives we ate packs of freeze-dried food purchased from Mountain House prior to our departure from the UK. Breakfast meals were shared between two (as the portions were large) and one main meal was consumed per person per evening. To maintain energy levels whilst climbing during the day energy bars and gels, purchased from Torq in the UK, were consumed, in addition to nuts and chocolate purchased in Leh.

COMMUNICATIONS

Satellite phones are not permitted in India, we attempted to obtain a permit as early as six months prior to the expedition, but it became apparent that obtaining a permit whilst outside India was not practical. We know of other groups taking phones, without permits, with cellhire.co.uk offering Inmarsat phones which work in the area, however, a permit is still necessary to bring it in to India

RISKS AND HAZARDS

We performed a risk assessment prior to departure, which was modified after the expedition to reflect our experiences. This is contained in Appendix C for use by future expeditions to the area.

MEDICAL ARRANGEMENTS

All team members took part in a 2-day 'Outdoor Activities First Aid' course in March that covered the basics of lifesaving in a mountain environment. Four members of the team also completed a higher level course in 'Expedition Medicine and First Aid' that covered more complex scenarios, as well as additional equipment and medication for high altitudes. A comprehensive first aid kit was taken that included a main base camp kit and two smaller high altitude climbing packs.

An evacuation plan was drawn up prior to departure in case of a serious injury whilst in the mountains. The journey from basecamp to Raru village could be done in less than a day if necessary and contact could be made with the rest of the world from the village. An emergency doctor in the UK was arranged who could be contacted in the event of needing further expert medical advice whilst in India. Had it been necessary, evacuation would have been co-ordinated with Rimo Expeditions and transport arranged to the clinic in Padum or the hospital in Kargil. Expedition-level insurance covering evacuation was an IMF requirement and was purchased through the British Mountaineering Council.

There were no major injuries or illnesses during the expedition. There were some minor cuts, grazes and blisters but nothing more than regular plasters would cover. The Diamox was used for one member of the team who had difficulty acclimatising but only for a few days as they quickly improved at basecamp. Ciprofloxacin was taken by a number of members of the team who developed traveller's diarrhoea at various times during the trip. A short course was normally sufficient and recovery seen after a few days.

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

It is hoped that by having one 7-man expedition rather than a 3 and a 4 man expedition to different areas, that the overall environmental impact will have been reduced. We made sure that we used a reputable agent in India – Rimo Expeditions – who would ensure good treatment of porters and animal herders. High-mountain food that was flown out from the UK was stripped of most of its packaging not only to save weight but also to reduce waste in India.

As with most expeditions, one of the greatest environmental impacts is likely to have been the carbon footprint of flying to our destination. Unfortunately with already having a 3-day drive in the mountains out to Raru, reaching Leh by overland means was not an attractive option. A single vehicle was used for the first day's

journey from Leh, and could have been used further but the local taxi union regulations prevent large vehicles being taken beyond Kargil.

The team made use of many local facilities on the journey out to the mountains which hopefully put some money into the local economy. The animal herders who tended our yaks and horses were local to Raru and fees were also paid to the village for camping in the valley. Nothing was left on routes or at summits when we were climbing except for a few pieces of tat required for abseiling. Very little vegetation existed in the basecamp area (the ground was mostly sand and fine moraine) and it is unlikely that we had an impact on this. We saw equally little wildlife in the valley, except for birds, and this is unlikely to have been affected as well.

A latrine was dug away from watercourses when we were camped as a group – in Raru, Onkar or at basecamp, and filled in afterwards when we left. Washing was generally done away from the river to ensure that soaps did not pollute the water. All cooking in the mountains was done using gas, whether at basecamp or up high. This ensured no spilt liquid fuel on the ground or any unused fuel being burned at the end of the trip. Canisters were returned to the filling depot in Padum. On leaving basecamp we burned what rubbish we could and carried everything else out to Kargil for disposal.

9. CONCLUSIONS

A successful expedition headed to the Tetleh valley, where excellent quality objectives were found, the valley supported technical rock routes, mixed climbs and high altitude summits. Over the course of three weeks, the team climbed seven new routes, reaching four summits. The highest of which was Lama Jimsa Kangri at 6,276m tall. There remain a large number of summits around 6,000m in the valley; many of these are on excellent quality granite. The majority of these are technical, and some objectives will be of interest to elite climbers.

10. ACKNOWLEDGEMENTS

The team would like to thank all of the organisations and individuals who assisted this expedition. Especially the Imperial College Exploration Board, the Old Centralians' Trust, Imperial College Trust, the Mount Everest Foundation, the Welsh Sports Association, the Lyon Award and the Mountaineering Council of Scotland. We would also like to acknowledge the contributions from Peter Hutchinson Designs, Montane, Mountain House and TORQ, and the advice, support and information from Lorraine Craig, Chris Green, Bob Schroter, Jonathan Phillips of Imperial College and the Alpine Club members and Library.

11. DISTRIBUTION LIST

This expedition report is to be distributed to the following locations:

The Royal Geographical Society

The Mount Everest Foundation

The Alpine Club

The Indian Mountaineering Federation

Imperial College Exploration Board
 Old Centralians' Trust
 Mountaineering Council of Scotland
 The Imperial College Trust

APPENDIX A: FINANCES

Contributions

Imperial College Exploration Committee grant	£	5,000.00
Imperial College Trust	£	1,050.00
Mount Everest Foundation	£	1,800.00
Welsh Sports Association Ltd.	£	1,200.00
Old Centralians' Foundation Trust	£	3,000.00
MCofS	£	400.00
Personal Contributions	£	6,616.00
Exploration Board (insurance)	£	2,525.14
Exploration Board (sat phone - hire only)	£	241.71
Exploration Board (charger - half of cost)	£	82.80
Total contributions:	£	21,915.12

Payments:

Flights	£	4,429.29
Rimo Expeditions (transfers, food and support)	£	8,011.00
Equipment	£	3,346.41
Sat Phone (including calls and messages)	£	244.59
Visas	£	455.18
IMF costs	£	1,221.37
Leh hotel	£	409.22
Food and Medication	£	967.63
Insurance	£	2,525.14
Miscellaneous (including Rimo tip etc.)	£	305.28
Total payments	£	21,915.12

APPENDIX B: ITINERARY

The expedition took place from end of August to the end of September 2011. Personal communication with the previous expedition teams suggested this was the most suitable time to visit.

The schedule was flexible to allow for any unexpected delays, and the inclusion of contingency days.

27 th Aug	Flights from Heathrow to Delhi Airport.
28 th Aug	Halt day in Delhi – a requirement by the IMF
29 th Aug	Flight transfer to Leh
30 th Aug	Day in Leh to buy food etc.
31 st Aug	Car to Kargil
1 st Sep	Car to Padum
2 nd Sep	Car to Raru
3 rd Sep	Trek 7km into Raru valley, camp at Onkar
4 th Sep	Trek from Onkar to basecamp
5 th -19 th Sep	Attempt mountaineering objectives.
20 nd Sep	Pack equipment. Burn and bag all waste for removal.
20 rd Sep	Trek to Raru village.
21-24 th Sep	Car from Raru to Leh , overnight stops at Rangdum and Lamayaru
25-27 th Sep	Sightseeing and bouldering in Leh
28 th Sep	Return flight from Leh to Delhi.
29 th Sep	Halt day in Delhi – a requirement of the IMF
30 th Sep	Return flight from Delhi to London

APPENDIX C - RISK ASSESSMENT

This risk assessment has been divided into two broad categories that encompass the risk involved with an expedition of this type, namely the risks associated with high altitude and the risks associated with general mountaineering in a glaciated region. The general risks associated with travel to this region have been dealt with in the main proposal and are omitted from this risk assessment. This risk assessment is intended to be dynamic and will be amended as required.

NOTES ON RISK FACTORS

The idea behind using risk factors is provide a combined evaluation of the significance of a risk to expedition members and thus enable them to prioritize preparations and actions when trying to mitigate these. Both 'Likelihood' and 'Seriousness' of the consequences arising from a hazard are expressed on a scale between 0-5; these are then multiplied to give the combined 'Risk Factor', indicating the relative importance of addressing each risk.

HAZARDS ASSOCIATED WITH HIGH ALTITUDE

Hazard	Symptoms	Consequences	Prevention	Response	Likelihood	Seriousness	Risk Factor
Mild Acute Mountain Sickness (AMS)	Headache Dizziness Fatigue Shortness of breath Loss of appetite Nausea Disturbed sleep General feeling of	Mild decrease in levels of concentration and performance	Increase altitude by max. 1000m every 3 days. Allow 1 rest day for every 1000m altitude gain. Acetazolamide may be taken to aid acclimatisation, normally 250mg twice daily.	Rest at current altitude – no further ascent until symptoms resolve Simple analgesia If no improvement, descend If worsens, descend and begin treatment with acetazolamide 250mg twice daily	3	3	9

	malaise.						
Moderate/Severe Acute Mountain Sickness	Mild AMS that is not improved with 24hr rest/analgesia AMS symptoms of increasing severity	As above Normal activity may become more difficult. Member might have to be aided by others.	As above	Descend to altitude below that where symptoms began Begin treatment with acetazolamide 250mg twice daily Consider dexamethasone 4 mg four times daily	2-3	4	8-12
High Altitude Pulmonary Edema (HAPE) Fluid build up in the lungs	Shortness of breath at rest. 'Tightness' in the chest. Marked fatigue. A feeling of impending suffocation at night. Weakness. A persistent cough bringing up white or pink, watery, or frothy fluid. Confusion and irrational behaviour are signs that insufficient oxygen is reaching the brain.	As for Severe AMS plus: Cyanosis Impaired cerebral functions Coma Death	As above	Immediate descent Maintain upright position Dexamethasone 4 mg four times daily Consider nifedipine 20 mg slow release four times daily Evacuation to a medical facility for follow-up treatment.	2	5	10

High Altitude Cerebral Edema (HACE).	Symptoms can include headache, loss of coordination (ataxia), weakness, and decreasing levels of consciousness inc. disorientation, loss of memory, hallucinations, aggressive behaviour, and coma.	As for Severe AMS plus: Impaired Cerebral functions Coma Death	As above	Immediate descent Dexamethasone 4 mg four times daily Consider nifedipine 20 mg slow release four times daily Evacuation to a medical facility for follow-up treatment.	2	5	10
Periodic breathing during sleep	Periodic breathing during sleep, in the absence of cranial trauma, is normal at high altitude				4	1	4

GENERAL MOUNTAINEERING CONSIDERATIONS

These have been subdivided into three sections:

1. Risks of equipment failure
2. General risks associated with the outdoors
3. Risks associated with steep ground
4. General Travel Risks

1. EQUIPMENT

Risk	Consequences	Preventative Measures	Likelihood	Seriousness	Risk Factor
Stove breakage	Inability to cook and melt water.	Take maintenance and repair kit for stove, including spare parts. Take two identical stoves, so should one fail within the group one operational stove may be constructed. All equipment will be checked to make sure everything is operational and in good working order, prior to expedition.	2	3	6
Fuel loss / leakage	Unable to cook or melt snow. Potential fire or explosion causing serious injury.	Visual and frequent checks of stoves and fuel bottles. Use several fuel containers and fill stove bottles with funnels. Stoves filled with fuel every morning where possible. Only use appropriate fuel containers.	1	3	3
Tent fire	Loss of tent: all persons in one shelter. Potential burns.	Never cook inside tent. Make sure the tents are sufficiently separated and away from source of fire. Refill fuel bottles well away from the tents and cooking area.	1	5	5

Suffocation (from CO or burial)	Death.	<p>Ensure tent is well ventilated. Never do tent zips up fully or cook inside snow holes or other unventilated refuges to prevent carbon monoxide poisoning.</p> <p>Clear heavy snowfalls regularly from tents to prevent the danger of asphyxiation and damage to the tent.</p> <p>Do 'dig-up' snowholes rather than cave-style 'dig-ins' when possible.</p>	1	5	5
Tent loss / breakage	Breakage: Repair. Loss of tent: More persons in each shelter.	All persons will assist with tents in bad weather. In extremely high winds a snow hole or bivouac bags will be used. Appropriate spares and repair kits to be carried. Tents will be checked long before we depart to ensure they are fit for the mountain environment and tents will be secured using snow stakes / ice screws.	1	4	4

2. OUTDOOR RELATED RISKS

Risk	Consequences	Preventative Measures	Likelihood	Seriousness	Risk Factor
Disorientation and loss of Direction on the mountain	Possible exposure.	Frequent reference to compass and GPS units. Ensure navigation is shared amongst group and that those not on the mountains know your route and plans. Navigational skills will be refreshed and improved prior to departure.	2	3	6
Exhaustion, fatigue, dizziness	Lowered core body temperature. Irritable and irrational behaviour. Possible stumbling or falling.	Frequent and adequate rests. Agree flexible climbing schedule. Party moves at the slowest person's pace. Over-compensate on food and fuel supplies. Take lightweight and high energy food products to ensure weight is minimized and calorific value is maximized.	2	3	6
Dehydration	Headaches, dizziness, stumbling.	Regularly and frequently take in liquid. Drink at least 3-4 litres of fluid per day. Ensure group has sufficient fuel to melt snow.	2	3	6

Sun/Snow/wind burn and blindness	Sores, scars, blisters, open wounds, blindness.	Wear sun cream or sun block, lip balm, sunglasses, and sunhat. Team members check each other visually for exhaustion, hypothermia, frostbite and snow burn. Keep limbs covered while on snow/ice, even on cloudy days.	3	2	6
Hypothermia and exposure	Erratic and irrational behaviour, uncontrollable shivering, pale and blue extremities, lowered core body temperature, possible death.	Wear sufficient warm, waterproof and windproof clothing. Always carry spare clothing, and change out of any wet clothing. Do not stay exposed to the wind, and insulate any affected persons. Suitable clothing will be carried to ensure all team members will be sufficiently warm in the harshest of conditions.	2	3	6
Bad Weather	Difficult navigation. The team may become tent-bound.	Refer to compass and GPS units frequently. Share navigation between the group and plan for contingency days, ensuring adequate food / fuel is on the mountain. Take plenty of GPS batteries and carry emergency communication equipment.	3	2	6
Unable to adapt to high altitude physical demands	Impact on climbing schedule.	Undertake physical training to ensure all members are physically capable to endure the expedition [using training schedule developed by the Team]. Preparedness to adjust altitude gain schedule and descend if necessary before going higher. Undertake suitable acclimatization schedule [outlined in 'the Climb section'].	2	4	8
Tripping over guy lines / equipment	Sprained, twisted, fractured or broken ankle or knee. Other injuries.	Never venture out alone. Be observant. Use markers to map designated walking areas around the camps.	3	3	9
Frost bite	Inability to walk or climb effectively. Pale, blue, purple or black and swollen extremities. Potential loss of affected extremity.	Wear sufficient warm and waterproof clothing on extremities. Change out of wet clothes. Get out of wind. Maintain blood supply to extremities.	2	4	8

Small accidents (e.g. cuts, sprains)	Inability to use affected part of body.	Exercise caution at all times, all members will be proficient with the equipment and the techniques used and in first aid techniques.	2	2	4
Larger injuries (e.g. severe bleeding, fractures)	Possibly serious and permanent injury if no medical assistance sought.	Never 'work' alone, exercise caution at all times, all members will be proficient with the equipment and the techniques used and in first aid techniques.	2	4	8
Injury sustained by lifting heavy packs	Strain and or muscular damage. Inability to complete daily tasks and load carrying.	Distribute loads between the group based on abilities of each member. Be prepared to porter equipment. Use of trekking porters while carrying heavy loads when terrain is appropriate.	2	4	8

3. STEEP GROUND

Risk	Consequences	Preventative Measures	Likelihood	Seriousness	Risk Factor
Avalanche / Serac fall See attached Appendix F Avalanche Safety	Destruction of climbing camps. Burial of, or impact with, an expedition member. Possible death.	Awareness of weather conditions and snow stability. Cautious route planning. Avoid crossing and camping under seracs, check camp and tent locations with regards to avalanche risk and seracs fall risk. Be prepared to descend to avoid hazardous snow conditions.	2	5	10
Slipping / falling on ice	Grazes or cuts. Possibility for a sustained fall leading to Larger Injuries (see Outdoor Related Risks)	Always wear gloves on snow/ice. Wear long sleeved tops. Wear sturdy boots. Use crampons and ice axes. Extreme mixed/ice climbing will be avoided whenever possible.	2	5	10
Falling in a crevasse	Becoming cold, hypothermia, going into shock, cuts & grazes, fractures, unconsciousness, death.	Careful route choice across and around crevasse fields and ice falls. Everyone to be competent in crevasse rescue techniques. Rope up where the terrain dictates. Refresher session to be run prior to expedition [see improving skills, advanced rope work].	2	4	8

	Inability to rescue ones self.	expedition [see improving skills, advanced rope work].				
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4. GENERAL TRAVEL RISKS

Risk	Consequences	Preventative Measures	Likelihood	Seriousness	Risk Factor
Car Crash	Serious Injury or death, loss of equipment	Use recommended drivers from Rimo, remain alert during journey	2	5	10
Theft/Mugging	Loss of property, personal injury	Travel in towns according to FCO advice and use common sense. Remain in a group at all times.	1	2	2
Road Crossings in Delhi	Injury or death	Take extra precaution whilst crossing the roads.	1	4	4
Accidents to Porters	Delay or possible termination of expedition.	Adequate equipment and attire for porters. Ensure Rimo arrange insurance for their porters.	2	4	8
Theft from BC	Loss of property	Hide sensitive materials or carry on person during the climbing phases	1	3	3