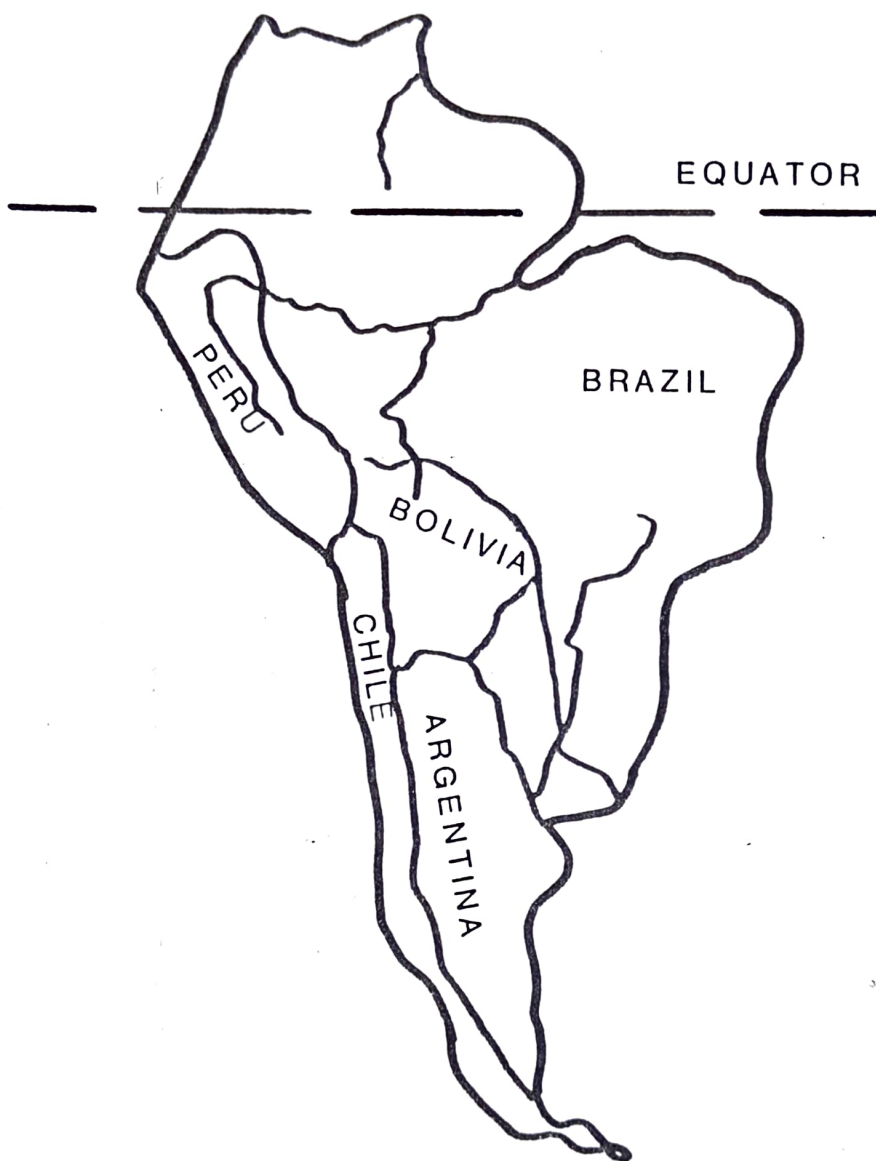


PATRON: Admiral Sir Brian BROWN, KCB,CBE, Second Sea Lord  
& Chief of Naval Personnel

89/30

REPORT OF THE  
JOINT SERVICES EXPEDITION TO  
CORDILLERA REAL (BOLIVIA) 1989



Expedition Leader:

Lieutenant S K JACKSON, FRGS, RN

522 Royal Navy & Royal Marines Mountaineering Club

COMMENT

This report has taken an inordinate length of time to put together and I apologise to those who have been inconvenienced or irritated by my apparently dilatory efforts to produce it. I hope that it will be of use to future expeditions to the Cordillera Real which, judging by the number of enquiries I have received since returning, is becoming a very popular destination for British Mountaineers.

For some months after our return I tackled the problem of raising sufficient funds to repatriate the equipment we were forced to leave behind in La Paz by circumstances beyond our control. I am most grateful for the assistance of Alan SHAVE of the British Embassy, Sr Cesar MORALES ARNAO of Orion Ltda, La Paz and Atlas Air of Feltham, who between them ensured that our equipment eventually arrived safely in UK.

Shortly after our return to the UK one of the team, Lieutenant Christian CROWTHER, was killed in a mountaineering associated accident which deeply saddened all of us. Our deepest sympathy goes to his widow Sharon.



Steve JACKSON

RNH Gibraltar  
1991

Abstract

1. Twenty two personnel comprising eighteen members of the Royal Navy and Royal Marines Mountaineering Club, two members of the RAF Mountaineering Association and two Civilians from the Northwick Park Clinical Research Centre took part in this major expedition to the Cordillera Real in North West Bolivia, during June and July 1989.
2. The expedition was sponsored by the Joint Services Expedition Trust, approved by the Royal Geographical Society and the Mount Everest Foundation. The party carried out an extensive programme of research during the first part of the expedition designed to further scientific understanding of Acute Mountain Sickness (AMS). All members of the team acted as both subject and researcher, the latter after suitable training at the Institute of Naval Medicine and the Royal Naval Hospital Haslar during the week prior to departure.
3. On completion of the research phase 14 members of the team carried out a comprehensive assault on the mountains in the Northern part of the Cordillera Real, completing 114 individual ascents of almost 30 peaks up to 6400 metres in height. Twelve members of the expedition reached the summit of Ancohumá (6427m) the highest mountain in the area and a further two were driven off the mountain by bad weather only 200m from the summit.
4. Eight members of the expedition undertook an arduous trek of over one hundred miles along the Inca gold trail alongside the Rio Tipuani into some of the most remote country in Bolivia.
5. The expedition was captured on video.

Sumario

1. 22 personas tomaron parte en la expedición a la Cordillera Real en el Nor-Oeste de Bolivia durante los meses de Junio y Julio del 1989. 18 de la Royal Navy y Royal Marines Mountaineering Club, dos miembros de la RAF Mountaineering Association y dos civiles.
2. La expedición fue patrocinada por Joint Services Expedition Trust y aprobada por la Royal Geographical Society y Mount Everest Foundation. El equipo llevo a cabo un programa extensivo de investigación durante la primera parte de la expedición con el fin de ampliar el conocimiento científico del Mal de Montaña Agudo (Acute Mountain Sickness - AMS). La semana previa a la partida los miembros del equipo actuaron como topico y investigador, después de estudios en el Institute of Naval Medicine y Royal Naval Hospital Haslar.
3. Al final de la investigación 14 miembros del equipo llevaron a cabo un asalto en las montañas de la Cordillera Real Norte, completando 114 ascensos de casi 30 picos, 6400 metros de altura. Doce miembros de la expedición llegaron a la cima de Ancohumá (6427m) la montaña mas alta en esa región, el mal tiempo impidió que dos miembros terminaran de escalar la montaña a solo 200m de la cima.
4. Ocho miembros de la expedición caminaron mas de cien millas a lo largo del sendero del oro de los Incas al lado del Rio Tipuani hacia lugares remotos de Bolivia.

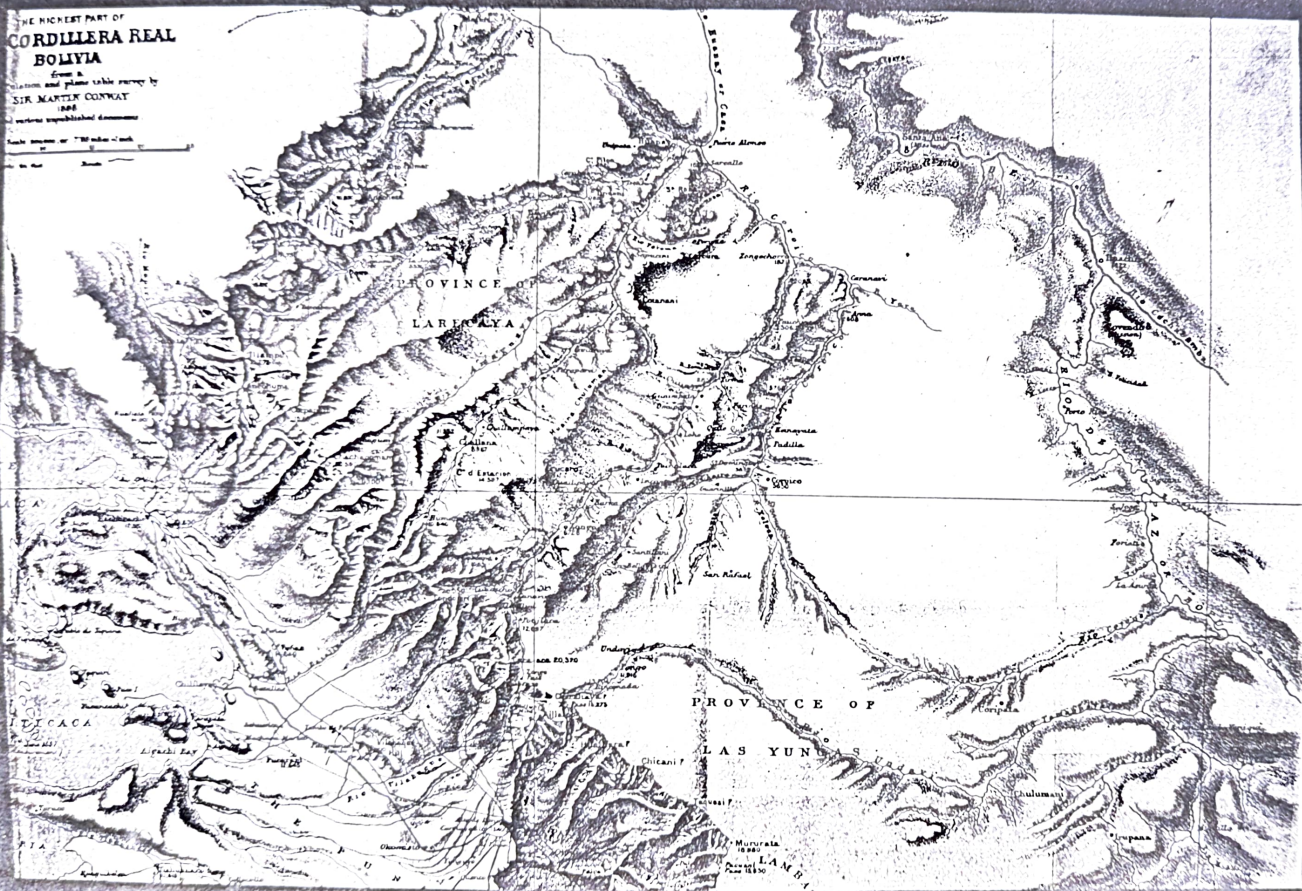


SKETCH MAP SHOWING THE EXPEDITION AREA

THE RICHEST PART OF  
**CORDILLERA REAL**  
**BOLIVIA**

From a  
traverse and plane table survey by  
**SIR MARTIN CONWAY**  
1868  
and various unpublished documents

Scale 1:100,000  
1 inch = 10 miles



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THE ROYAL NAVY AND ROYAL MARINES MOUNTAINEERING CLUB EXPEDITION  
TO THE CORDILLERA REAL (BOLIVIA)  
8 JUNE TO 3 AUGUST 1989

Expedition Patron: Admiral Sir Brian BROWN, KCB, CBE  
 Chief of Naval Personnel & Second Sea Lord

EXPEDITION MEMBERS

Lieutenant	S K JACKSON, FRGS, RN	Leader
Chief Petty Officer (PT1)	P JOHNSON	Deputy Leader
Lieutenant	D J ROBINSON, RN	Equipment Officer
Lieutenant	R TOUGH, RN	Catering Officer
Second Officer	J M GRIMLEY, WRNS	Photographer
Surgeon Lieutenant Commander	J BROOME, RN	Medical Officer
Captain	M PRICE, RM	
Lieutenant	C CROWTHER, RN	
Lieutenant	R STOKES, RN	
Sergeant	R LAKE-BULLEN, RM	
Sergeant	D BURKE, RAF	
LMEM(L)	S IRVINE	
LMA	A DAVIES	
Junior Technician	P JIGGINS, RAF	
AB(MW)	J LEONARD	
PTO	M DAVIES	
FILM CREW		
Commander	P GREGORY, RN	Camera
Lieutenant	J McINNES, RN	Sound
MEDICAL RESEARCH TEAM		
Surgeon Captain	J M BEELEY, FRCP, RN	Joint Leader
Doctor	J S MILLEDGE, MD, FRCP	Joint Leader
Chief Medical Technician	W F SAMPSON, BEM, M Phil	
Mr	N LUFF, HNC, BSc, MIBiol, CBiol	
EXPEDITION GUIDES		
Señor	C AGUILAR	Club Andino Boliviano
Señor	P ARAMAYA	Club Andino Boliviano

LIEUTENANT S K JACKSON, FRGS, ROYAL NAVY  
EXPEDITION LEADER

Born in 1953 and educated at the Brunts Grammar School, Mansfield and the Gosport County Grammar School, Stevan JACKSON entered the Royal Navy as a Medical Assistant in 1973 after three years as a Coal Miner. By 1982 he had been promoted to Chief Petty Officer and was selected for Officer training graduating from the Britannia Naval College, Dartmouth as a Sub-Lieutenant in 1983.

His background includes service in HMS ARK ROYAL, the Institute of Naval Medicine and the Royal Naval Hospitals in Gosport, Plymouth and Gibraltar. During 1983/84 he served with the Royal Marines including an appointment to the elite Mountain and Arctic Warfare Cadre during their annual deployment to the Alps.

Steve JACKSON has been an active mountaineer for almost 20 years and has climbed extensively throughout the UK, the Alps, Norway, East Africa and South America. He has also been involved in the preparations for three Antarctic Expeditions, preparing an ornithological study of the penguins of South Georgia for one.

He joined the Royal Navy and Royal Marines Mountaineering Club in 1975 and was elected onto the Club Committee the following year. In 1978 he took part in the Club Expedition to Northern Norway and the Lofoten Islands and that same year was elected a Fellow of The Royal Geographical Society.

From 1984 to 1988 he was Secretary of the RN&RMMC and in 1985 was responsible for producing the Club's Climbing Guide to Lundy Island.

He planned and led the 1987 Joint Services East Africa Expedition, to Mounts Kenya and Kilimanjaro, and led the RN&RMMC contingent during the 1988 Joint Services Alpine Meet. He will lead the JSAM in 1990 which will be based in the Dauphine Alps, when it is the turn of the RN&RMMC to provide the Meet Leader.

He is currently serving as the Support Manager and Secretary to the Medical Officer-in-Charge of the Royal Naval Hospital Gibraltar, where he lives with his wife Paula, a nurse, and their two young children.



SURGEON CAPTAIN JM BEELEY, FRCP, ROYAL NAVY  
RESEARCH TEAM JOINT-LEADER

Born in 1933 Surgeon Captain Mike Beeley was educated at St Edward's School, Oxford and at Sheffield University where he was a member of the University Mountaineering Club.

He entered the Royal Navy in 1959 and his background includes service in Antarctica in HMS PROTECTOR, Commando Training followed by active service with Commando Units in Aden and Tanzania and the Hospital Ship SS UGANDA during the 1982 Falklands War. He is currently the Staff Medical Officer to the Major General Royal Marines Commando Forces.

As a Consultant Physician he has held appointments as both Professor and Director of Naval Medicine, for a short period was the Acting Dean of Naval Medicine and has had many scientific papers published. In 1980 he was seconded by the Royal Navy as a Visiting Scientist to the Clinical Research Centre in Harrow. His research work led to the introduction of new and successful methods of treatment for casualties suffering from lung injury due to fire-smoke inhalation during the Falklands conflict.

His interests in mountains and associated physiology have been pursued in North and South America, the Alps and Arctic Norway. He was the Research Team Leader on the 1987 Joint Services Expedition to East Africa when low levels of a hormone produced by heart muscle were first shown to correlate with susceptibility to altitude-induced illness.

He and his wife Jane live in Uxbridge with their daughter and two sons.

DOCTOR J S MILLEDGE, MD, FRCP  
RESEARCH TEAM JOINT-LEADER

Born in 1930 Dr Milledge is a Consultant Physician at the Clinical Research Centre, Northwick Park Hospital, Harrow and a scientific member of the Medical Research Council.

He was educated at the Rydal School, Colwyn Bay and the University of Birmingham Medical School.

He moved to India in 1962 where he worked for ten years as a respiratory physician in the Ellore Hospital, Madras.

He has published numerous scientific papers and is co-author of the textbook 'High Altitude Medicine & Physiology', the standard work on this subject.

His high altitude experience is considerable; he was a member of the 1960/61 Himalayan Scientific & Mountaineering Expedition led by Sir Edmund Hillary during which he spent nine months, including the winter, at 6300m.

Subsequently he was a member of the 1964 and 1970 Scientific/Climbing Expeditions to Solu Khumbu; the 1981 American Medical Research Expedition to Everest and Chris Bonnington's successful 1981 British Expedition to Mount Kongur (7700m) in China. He is a member of the Climbers Club and the Alpine Club.

Most recently he was a member of the 1987 RN & RMMC East Africa Expedition which had as one of its primary aims an extensive programme of physiological research designed by Dr Milledge and Surgeon Captain Michael Beeley.

He lives in Rickmansworth with his wife Betty, a daughter who is a nurse specialising in the care of the mentally handicapped and one son who is a medical student.

ADMINISTRATIVE & LOGISTICAL REPORT  
LIEUTENANT S K JACKSON, FRGS, ROYAL NAVY

INTRODUCTION

1. This expedition was conceived during the long drive back to Nairobi from Namanga in Tanzania following the successful ascent of Mount Kilimanjaro by various routes at the culmination of the Joint Services Expedition to East Africa in 1987. Eleven members of that team formed the core of the team in Bolivia.
2. Our original destination was to have been the Cordillera Huayhuash in North Central Peru. Over twelve months of planning including a recce of that area had been undertaken before the decision was made in 1988 as a result of the activities of the Sendero Luminosa (shinning path) terrorists, to switch our location to Bolivia.

The Area

Bolivia straddles the Andes which are at their widest, some 650km, at this point. Along with Paraguay it is one of two land locked countries in South America. It shares borders with Chile and Peru to the West, Brazil to North and East, and Argentine and Paraguay to the South. It is twice the size of Spain with whom it shares a common language.

4. Situated in North West Bolivia the Cordillera Real is part of the Andes of South America which make up the longest mountain system in the world, approximately 9000km long, running from the Caribbean to the Antarctic Ocean.
5. The Cordillera Real is almost 160km in length and has one principal crest running NW to SE. It has four peaks above 6000m and is delimited to the North and South respectively by the peaks of Illampu (6362m) and Illimani (6402m). Access to the range is good and climbing is predominantly on snow, the snowline being at around 4650m.
5. It was the Spaniards who in 1582 made the first recorded ascent of an Andean peak. Andean mountaineering began in earnest in the 19th Century and in 1880 Edward Whymper, fresh from the first ascent of the Matterhorn, first climbed Chimborazo and a series of other Ecuadorian peaks. Climbing in the Andes, which are second only to the Himalayan ranges in altitude thus long antedates Himalayan Mountaineering and is attracting an increasing number of climbers keen to exploit the freedom from bureaucratic control and commercialism of the Himalayas.

AIMS OF THE EXPEDITION

7. (a) To carry out a scientific programme of medical research into the physiological responses during the exertion of ascending to altitude on mountains.
- (b) To undertake a number of ascents including some first British, of peaks in the Cordillera Real, including the highest Ancohuma (6427m) and Illampu (6362m).
- (c) To produce a film of the expedition.

8. Previous research carried out during the 1987 RN&RMMC East Africa Expedition made significant progress towards understanding the mechanisms resulting in Acute Mountain Sickness (AMS). In particular levels of the hormone Atrial Natriuretic Peptide, which is produced in the heart, were measured for the first time in human subjects on ascent to altitude and produced evidence that it may play an important role in protection against adverse changes in fluid balance. The research programme of that expedition led to other important scientific papers which it is hoped will continue once the results of this research are analysed.

#### Scientific Programme

9. (AMS) affects a significant percentage of all expeditions taking climbers to the altitudes encountered in the Himalayas, Andes and other high mountain ranges of the world.
10. (AMS) is associated with well recorded disturbances of fluid balance and with excessive retention of fluid. Subjects so affected are especially predisposed to potentially fatal Pulmonary Oedema ('waterlogged lung') which claims the lives of many mountaineers. Pulmonary Oedema is also an important cause of death in other clinical situations associated with disturbance of fluid balance, particularly amongst subjects under treatment after wounding in battle, in fire victims and in patients on Intensive Care Units. Collection of data on subjects ascending to altitude therefore increases understanding of fluid balance disturbances which predispose to development of Pulmonary Oedema in various clinical situations.
11. The results of the 1987 East Africa Expedition research into altitude illness were presented to the Royal Society of Medicine by Surgeon Captain J M BEELEY RN, Surgeon Commander A R O MILLER RN and Lieutenant S K JACKSON RN on 13 October 1988.

#### Patronage

12. The expedition was honoured by the patronage of Admiral Sir Brian BROWN, KCB, CBE, Chief of Naval Personnel and Second Sea Lord.

#### The Joint Services Expedition Trust

13. The expedition was sponsored by the Joint Services Expedition Trust.

#### The Royal Geographical Society

14. The expedition was approved by the Royal Geographical Society.

#### The Mount Everest Foundation

15. The expedition was approved by the Mount Everest Foundation.

#### Personnel

16. The team comprised:

RN Officers	9
RM Officer	1
WRNS Officer	1
RN Senior Ratings	2
RM Senior Rank	1
RN Junior Ratings	3
RAF Senior	1
MOD Civilians	1
Civilians	<u>2</u>
<u>TOTAL</u>	<u>22</u>

## EXPEDITION PLANNING COMMITTEE

17. On the previous Joint Services Expedition to East Africa in 1987 I made the mistake of not delegating any tasks at all, which in hindsight was not wise. As a result of that experience the following planning committee was set up, chaired by the Leader who retained overall responsibility for all aspects of the Expedition:

Lieutenant	S K JACKSON RN	Chairman/Leader
Surgeon Captain	J M BEELEY RN	Research Team Leader
CPOPT	P JOHNSON	Deputy Leader
Surg Lt Cdr	J R BROOME RN	Expedition Doctor
Lieutenant	D J ROBINSON RN	Equipment Officer
Lieutenant	R TOUGH RN	Catering Officer & i/c Advance Party
Lieutenant	P H REED RN	Expedition PR Officer
Second Officer	J M GRIMLEY WRNS	Expedition Photographer
Able Seaman (MW)	J LEONARD	Advance Party

18. The initial committee meeting was held in the Royal Geographical Society. Successive meetings subsequently took place at frequent intervals and various locations. Proper minutes of each meeting were recorded, actions were placed on each individual and followed up accordingly. The Leader was kept informed of developments and any problems as they arose.

## Training Programme

19. The Expedition Training Programme undertaken is outlined below:

<u>DATE</u>	<u>EVENT</u>	<u>LOCATION</u>
06-08 Oct 1987	Initial Team Meeting	N Wales
13-24 Feb 1988	Winter Climbing	Scotland
01-20 Jun 1988	Huayhuash Expedition	Peru
16-30 Jul 1988	Alpine Climbing	Switzerland
07-09 Oct 1988	Training Period	N Wales
17-24 Feb 1989	Winter Climbing	Scotland
21-24 Apr 1989	Final Team Meeting	Derbyshire

## Finance and Fund Raising

20. A statement of Income and Expenditure is at Section 9.

## Personnel, Travel, Transport and Freighting Arrangements

21. On the outward journey from UK to Bolivia the team flew with British Airways from Heathrow to Sao Paulo and with Varig from Sao Paulo to La Paz.
22. For the return journey we flew from La Paz to Rio where we had a five day stopover before flying on to Heathrow.
23. BA offered considerable discount on the fare which was negotiated via their Group Travel Executive.
24. In addition BA negotiated an advantageous rate with Varig for the flights between Brazil and Bolivia.

## Equipment

25. The bulk of the team equipment which weighed in excess of two tons, was flown out to La Paz independently of the personnel but scheduled to arrive shortly after we did.

26. This was handled very efficiently by Atlasair, Atlas House, Central Quay, Feltham, Middlesex, TW14 0UU (01 890 3644).
27. All 53 kit bags containing our equipment arrived on time but were subsequently lost by the Customs which I suspect is not unusual. It is a requirement in Bolivia that you employ an Agencia Despachadora de Aduana to deal with the importation of anything into the country.
28. The British Embassy put us in touch with Orion Ltda, Casilla 3309, La Paz Tel: 323448 or Fax: 369588. They have the advantage that one of their employees Raoul Gonzales is related to the Head of Airport Customs.
29. Our equipment arrived in La Paz on Friday 16 June and was released to us the following Tuesday which appears to be something of a record. There have been accounts of expeditions taking up to six weeks to get kit through customs.

#### Transportation within Bolivia

30. The team travelled to Sorata from the airport using two derelict buses which were obtained for us by the Club Andino Boliviano. These vehicles took almost five hours to cover the 100 kilometres to Sorata, about half of which is off road. There was however no real alternative.
31. The road from El Alto Airport to Sorata runs NW across the Altiplano, a cold, barren, windswept plateau much of which is over 4,000m above sea level. There are a number of checkpoints along the journey, the main one being at Achacachi where passports are checked and logged by the military who keep a close eye on all visitors.
32. From Sorata we travelled the 52 kilometres to the village of Cocoyo, via Ancoma, using three Four Wheel Drive Toyota Land Cruisers for the team and a small lorry for the equipment. These were hired in Sorata. The lorry could only go as far as Mina Candelaria which overlooks Cocoyo as the road is too narrow and tortuous from thereon.
33. At Mina Candelaria the equipment in the lorry was transferred to the Toyotas and the team mostly walked down the steep, winding path to the village where we camped.
34. To transport our equipment from Cocoyo to the Expedition Base Camp, alongside Laguna Negra, 132 llamas and a total of 50 Arrieros and Porters were used. Llamas can carry only 14kg loads so we left some non-essential items in the village to save money. Llamas are readily available but it took a couple of days to assemble the number that we required.
35. We experienced a great deal of difficulty with transport principally because we were such a large outfit and everyone wanted to take advantage of us and make a killing. A common trick is to stop in the middle of nowhere and demand extra payment, this happened to one expedition who had been in the area just before us but fortunately not to us.
36. Future expeditions would be wise to draw up a written contract, in Spanish, to be signed by all parties concerned.

#### Fuel

37. Petrol for vehicles and stoves is available at Achacachi and at Sorata, immediately in front of the Hotel Prefectural. Calor Gas is also available in Sorata.

## Guides

38. The services of one guide, Carlos Aguilar were arranged through the Club Andino Boliviano. In the event he brought a friend along with him, Pedro Aramaya who acted as interpreter as Carlos could not speak English and none of the team spoke good Spanish.
39. The guides arranged transport and accommodation, bought food and fuel, hired llamas etc., under the guidance of the expedition leader. In La Paz at the end of the expedition they organised a trip to a folk show (penas) as well as day trips to Lake Titicaca and Chacaltaya Ski Club.

## Club Andino Boliviano

40. The CAB are the main point of contact for all expeditions to Bolivia. Any approach to the Bolivian Consul in London from prospective expeditions will be steered towards the Club Andino, though they are not a government organisation.
41. They are a small organisation with only 30 or so members of whom Carlos and Pedro are probably the best to hire as guides. The principal activity of the Club is Ski-ing and they own the ski run on Chaclataya, an hours drive North from La Paz with spectacular views of Huayna Potosi.
42. The CAB have set up an agreement with the Hotel Copacabana in Sorata, which is run by a bizarre German called Eduardo Kramer, and a transport outfit to provide a complete package for expeditions to that area of Bolivia.

## Guide Books & Maps

43. There is no complete Guidebook to the Cordillera Real. There is the Allain Mesilli Guidebook 'Cordillera Real de Los Andes' which covers some of the major peaks but is not very comprehensive. A guidebook is currently being written by the leader of this expedition.
44. A good 1:50 000 map of the Cordillera Real Nord was produced by the Club Alpino Aleman in 1987 and may be available through West Col Productions, Goring, Reading, RG8 OAP. It is rumoured that a map of the Cordillera Real Sud will soon be issued.

## Diplomatic Clearance

45. Diplomatic Clearance was applied for and granted through normal service channels.
46. On arrival in La Paz the Expedition Leader, along with Surgeon Captain Mike BEELEY and Lieutenant Dick TOUGH called on Her Majesty's Ambassador at the British Embassy.

## Customs & Immigration Procedures

47. British Passport holders do not require a visa to enter Bolivia. On entry at El Alto airport a 30 day visa will automatically be given but if you ask politely that will almost certainly be extended to 90 days on the spot.
48. Our advance party obtained 90 day visas in this manner however the main body didn't. Dick TOUGH obtained 90 day visas for all when he returned to La Paz midway through the expedition.

## Currency

49. The currency in Bolivia is the Boliviano with an exchange rate of approximately 6 to the £.

50. The Boliviano is one of the strongest currencies in South America at the moment as a result of the excellent progress made by the current government to reduce the previously horrendous level of inflation. At present inflation is running at about 25%.
51. Changing money in La Paz is as simple an affair as in any other capital city. There is an administration charge, sometimes as much as 2% for changing travellers cheques in any of the cambios. Most hotels prefer to be paid in cash either in \$US or Bolivianos.
52. Suprisingly we were able to pay for the hire of llamas and vehicles with \$US travellers cheques.

#### Medical Arrangements

53. The Expedition Medical Officer's Report is at Section 5.

#### Rescue Facilities

54. There are none in the Northern Cordillera Real. Any serious casualty would have to be evacuated using the resources within the party. There is however a hospital at Sorata with reasonable facilities including a fully manned Operating Theatre and X-Ray Department.
55. As a result of the lack of rescue facilities the expedition purchased a Gamow Bag, a portable decompression chamber, which when inflated to 2 psi using the footpump reduces the relative altitude of the occupant by about 6000ft. It has been credited with saving the lives of four climbers who were suffering from Acute Mountain Sickness on Everest in 1988.

#### Equipment

56. The Expedition Equipment Officers report is at Section 6.

#### Victualling

57. The Expedition Catering Officers report is at Section 7.



MOUNTAINEERING REPORTBYLieutenant S K JACKSON, FRGS, Royal NavyExpedition LeaderMountaineering Aims

1. The mountaineering aims of the expedition can be summarised as:
  - a. To introduce a large number of club members to High Altitude Mountaineering in the Andes.
  - b. To climb rock, snow and ice and mixed routes of varying technical difficulty.
  - c. To get as many members as possible to the summits of Ancohuma and Illampu.
  - d. To increase the number of club members with expedition experience who will be available for selection for future expeditions.

Summary of Achievements

2. The expedition was successful in achieving all of these aims with one major exception. Only one attempt to reach the summit of Illampu was possible which proved unsuccessful.
3. 12 members of the expedition reached the summit of Ancohuma (6427m). A further two members got within two hundred metres of the summit before being driven off by bad weather.
4. 25 separate peaks over 5000m high and a slightly lower number of peaks over 4600m were climbed, giving a total of 40 individual ascents by the various climbing teams.

Weather and conditions

5. During June and July Bolivia is in its dry season and we expected to encounter hot, clear days and cold, clear nights. Less than 1mm of precipitation per month is normally experienced in La Paz at this time of the year.
6. We actually experienced a considerable amount of unseasonal weather with a pattern which established itself as three days of poor weather followed by about ten days of good weather. The snow and ice conditions were mostly good though there were some areas of deep snow, principally on the South faces of some mountains.
7. The overnight temperature at Base Camp was consistently around  $-8^{\circ}\text{C}$ . Higher up at some of the advanced base camps and bivouac sites the temperature dropped to  $-24^{\circ}\text{C}$ .

Base Camp

8. Base camp was established on an ideal site alongside Laguna Negra (Grid Reference 555/52), the obvious, and for an expedition of our size the only one large enough to accommodate us.
9. The campsite was on an area of flat ground immediately adjacent to the West shore of the Lake. It is approximately 20m long and 6cm wide, with a river emptying out of Laguna Leche forming the opposite border of the site.

### Advance Base Camps

10. Three permanent ABC's were established:
  - Alpha: For attempts on Pico Del Norte, Esperanza and peaks at the Northern end of the range.
  - Bravo: Immediately below Yapuchanani.
  - Charlie: At the bottom of the glacier leading to Ancohuma for attempts on that mountain, Buena Vista, the Hankopiti's etc.
11. Two or three other temporary camps or bivouac sites were used, particularly for summit bids on Ancohuma.

### Climbing Teams

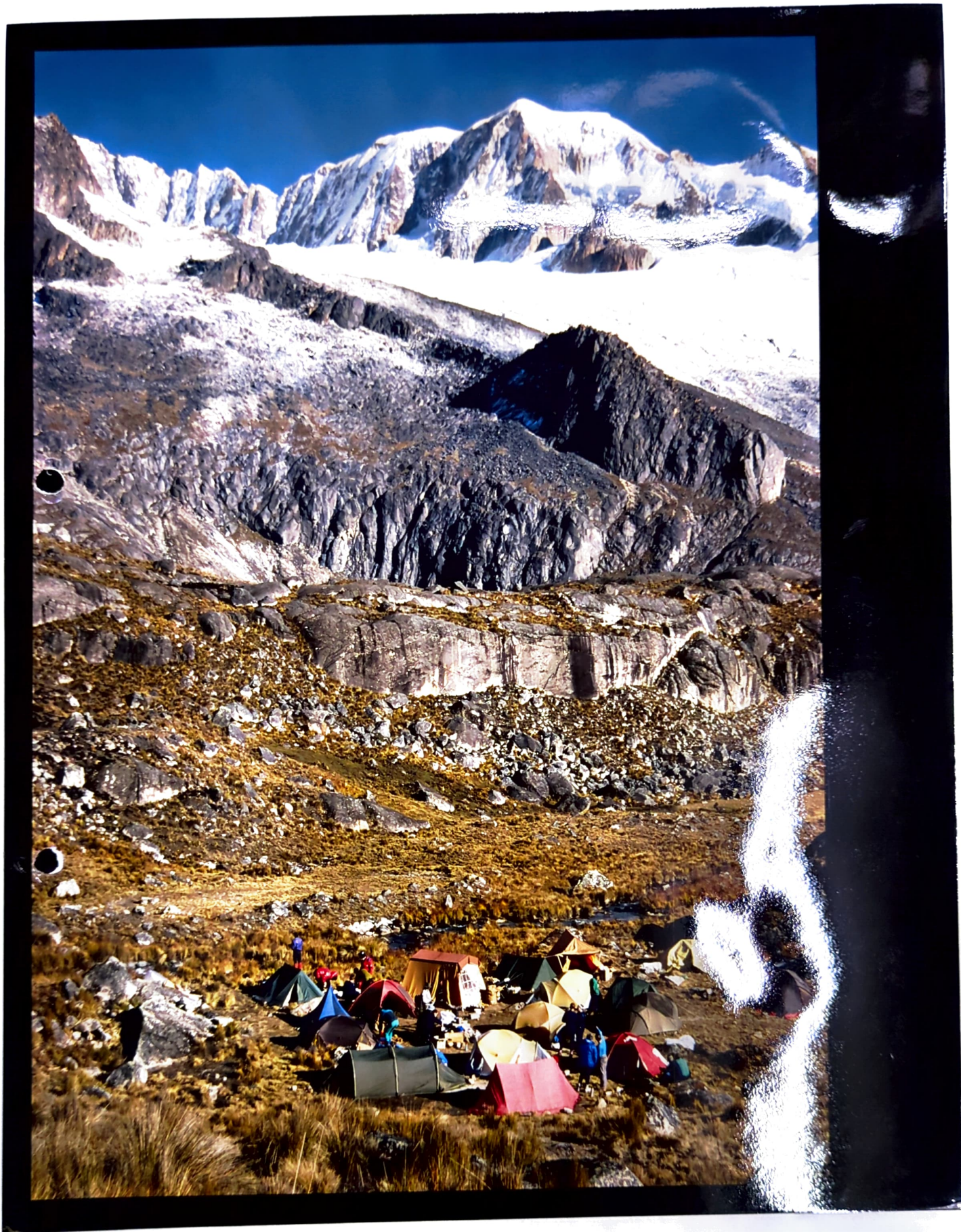
12. The climbers were paired off early in the expedition, most already knew or climbed regularly with their partner so this presented no difficulties.
13. The pairs were then formed into groups of four for reasons of safety although inevitably there were occasions when this was not possible.
14. Teams were free to choose their own mountaineering objectives and entered their plans in the Expedition Climbing Log (the same one as used in East Africa, so useful reading on days of bad weather!) at least 24 hours prior to departure. As a great deal of discussion ensued before decisions were made and each team was very well balanced it was never necessary to veto any proposal.

SUMMARY OF MOUNTAINEERING ACHIEVEMENTS

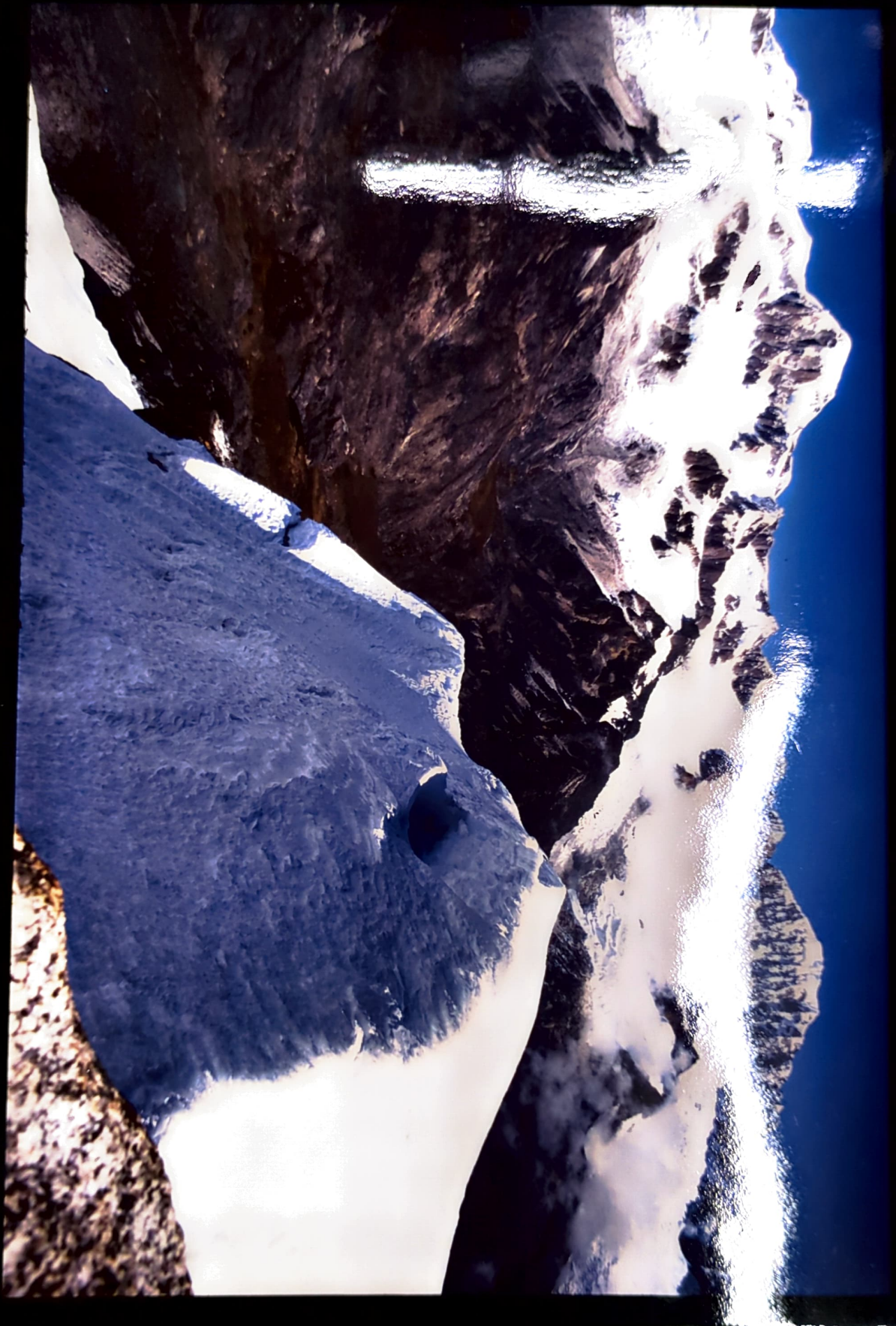
<u>PEAK</u>	<u>HEIGHT</u>	<u>PARTY</u>	<u>DATE</u>
Unknown	5363m	JIGGINS & IRVINE	27 June
Viluyos II	5545m	A DAVIES & MILLEDGE	28 June
Viluyos III	5352m	PRICE & CROWTHER	28 June
Viluyos II	5345m	PRICE & CROWTHER	28 June
Viluyos I	5645m	PRICE & CROWTHER	28 June
Nameless Peak (S)	5580m	PRICE & CROWTHER	28 June
Yapuchanani	5526m	PRICE & CROWTHER	28 June
Unknown	5213m	BURKE/LUFF/SAMSON/BEELEY/ BROOME/ GREGORY	29 June
Unknown	5387m	"	29 June
Yapuchanani	5526m	JOHNSON/ROBINSON/LAKE-BULLEN	29 June
Nameless Peak (S)	5580m	"	29 June
Viluyos I	5645m	"	29 June
Makatanya	5607m	JOHNSON/ROBINSON/LAKE-BULLEN	30 June
Taparacu	5725m	"	30 June
Gorre de Heilo	c5600m	JIGGINS/IRVINE/M DAVIES	01 July
Pico Del Norte (N)	6060m	"	01 July
Pico Del Norte (S)	6070m	"	01 July
Hankopiti I	5875m	TOUGH/GRIMLEY/STOKE	01 July
Unknown	5524m	PRICE & CROWTHER	02 July
Monte Triangulo	5660m	PRICE & CROWTHER	03 July
Mesacatanta	5616m	PRICE & CROWTHER	03 July
Taparacu	5725m	PRICE & CROWTHER	03 July
Haltatawa	5620m	PRICE & CROWTHER	03 July
Buena Vista	5400m	JOHNSON/JACKSON/BURKE/LAKE-BULLEN/ ROBINSON/LUFF	05 July
Viluyos III	5352m	LEONARD/BROOME/BEELEY/SAMSON	06 July
Ancohuma	6427m	JOHNSON/LAKE-BULLEN/ROBINSON/ BURKE/LUFF	07 July
Hankopiti I	5875m	JOHNSON/LAKE-BULLEN/ROBINSON/ BURKE/LUFF	08 July
Ancohuma	6427m	PRICE & CROWTHER	08 July
Ancohuma	6427m	A DAVIES & MILLEDGE	08 July
Buena Vista	5400m	JIGGINS/IRVINE/M DAVIES	08 July
Hankopiti I	5875m	LEONARD/BROOME/BEELEY/SAMSON	08 July
Yapuchanani	5526m	JACKSON/BROOME/GRIMLEY/STOKES/ Mc INNES	09 July
Hankopiti	5875m	PRICE & CROWTHER	09 July
Ancohuma	6427m	JIGGINS/IRVINE/M DAVIES	09 July

Ancohumá	6427m	TOUGH/STOKES/GRIMLEY (forced to retreat in snow and electric storm at 6200m)	11-14 July
Unknown	5563m	MILLEDGE	12 July
Gorro de Heilo	c5600m	MILLEDGE/A DAVIES	13 July
*Pico Esperanza	5760m	MILLEDGE/A DAVIES	15 July
*Yoko De Ancohumá	6044m	LAKE-BULLEN/ROBINSON	15 July
Kimsakoloyo	5895m	"	15 July
Viluyos IV	5458m	ROBINSON/MILLEDGE	19 July
Viluyos III	5332m	"	19 July
Viluyos II	5545m	"	19 July

Notes: \*Possible first ascent.



Base Camp - looking towards  
Pico Del Norte (the highest point visible)



Ancohuma on the left - Illampu on the right

ROCK CLIMBING IN LA PAZ  
BY  
Junior Technician P JIGGINS RAF

9. In the depths of down-town La Paz, Pedro Aramaya introduced us to Amor de Dios, a small conglomerate crag with about 6 routes put up already. The hardest being 'Acupuncture' (VIII) 40' which takes a steep wall using finger pockets which are generally good although the climbing is very reachy.
10. About ten feet to the right of Acupuncture the crag faces a small concrete football pitch. This face has a gentle overhang at about 70' running its length. The routes here tend to demand much more powerful climbing on large (sometimes) holds although there are some reasonable opportunities to rest they generally require a lot of stamina.
11. Just to the right of the arete on the left of the crag a route (about Grade VI) follows a series of blue arrows which indicate the line.
12. Six feet right of this direct line is taken by another hard route (about VIII) via an old tree root. This involves powerful initial moves with the crux high up. This was completed by Steve IRVINE after a few attempts and was then climbed by Chris CROWTHER with no falls.
13. Right of this is a Grade VI leads up the wall and finishes up a steep layback crack.
14. One new route was put up:

JIGGINS IN THE RIGGIN (Grade 8.5)

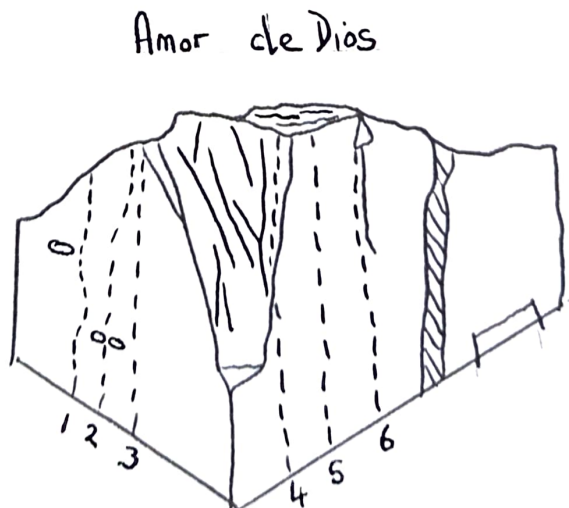
On the wall to the right of Acupuncture via some two finger pockets, poor holds.

Finish direct.

FA Paul JIGGINS Jul 89.

Comparative Gradings

BOLIVIA	UK
6.0	5b
7.0	
8.0	5c
8.5	6a
	6b



- Routes
1. Acupuncture
  2. Jiggins in the Riggim
  3. 7.0
  4. 6.0
  5. 8.0
  6. 6.0

ROCK CLIMBING IN RIO  
BY  
Lieutenant C CROWTHER Royal Navy

1. "Mans first contact with Sugar Loaf dates back to 1817 when Henrietta Carstairs, a British nanny, became the first person to successfully scale the summit. It was however only in 1972 that four Australians finally conquered the North Wall; the last unclimbed route".  
(an extract from a tourist guide to Rio).

Date: 29 July 1989

Route: Sugar Loaf Direct

Teams: Christian Crowther)  
Martin Price ) Italian Route  
Malcolm Davies )  
  
Paul Jiggins ) Crazy Horse  
Steve Irvine )

2. "Only the best route in the world"; this must have been what we came on this exped for! Five days in Rio and nothing else to do but... piss up, see the shows, eat, sunbathe on Copacabana and last and least .... climb! ! ! ..... well we did and even to our surprise it was simply superb.
3. This is how to do it. Take a taxi to 'Sugar Loaf', the locals call it PAO DE ACUCAR but everyone knows where it is because it stands in the middle of Rio as prominent as Nelson's willy! - From the bottom; (you will be dropped off at the Cable Car) - just do what all the rest of the tourists do-get the cable car!, costs about £1.50 and it will take you up speedily, James Bond style to the half-way station. From here follow signs to Belvedere Garden (a garden walk) and follow your nose for approximately 10-20 minutes (depending how fat you are) along a winding jungle path avoiding the prickly trees and bamboo shoots in the eyes, until you reach the highest point on Sugar Loaf Mountain. From here climb straight up until you reach the top! Well it goes more or less like that except don't start right at the bottom where the bolts look obvious and there is loads of graffiti because Paul Jiggins tried that and couldn't do it (he climbs 6c!). Instead start left 20' climb a VS crack and traverse right on some bolts to reach the main arete (where the rock changes colour on the postcard from tan-coloured on the left to stripy on the right.....straight up the middle!). Follow this line of bolts (about 10 to 20' apart) for 3 superb pitches of 5b with loads of 5c moves and what views!! - very fingery and an edging boot would help a lot. From here the angle eases from the vertical (well at least 80°) to a more acceptable slab type climbing of 70°. After a long run to a lonely peg the route seems to disappear probably because it follows the "wire", a handrail which the locals climb hand over hand up vertical rock and without any protection. Follow the route of the wire; just using it for protection until you see some bolts out to the right. Traverse across to these and continue for two pitches to the top. Now the climbing gets interesting, especially if it's getting dark; it's taken six and a half hours to reach this point, it's cold and the spotlights are on! The best way to tackle the final pitch (which is a cinch at 6a with a 25' run out!) is....let your oppo lead it!!! he will enjoy it for sure - even more so if he gets to the top! After the standing ovation by the tourists and signing autographs treat yourself to a few beers and a hamburger before taking the cable car down.



4. After all not every mountain can offer E25c climbing with an E36a finish  
topping out with R&R at the restaurant with the best view in Rio.....DO IT!



Sugar Loaf Mountain

ASCENT OF YAPUCHANANI (5526m)  
SATURDAY 8 TO SUNDAY 9 JULY 1989

BY  
Second Officer M J L GRIMLEY Womens Royal Naval Service

Leader: Steve JACKSON

The Team: Richard STOKES, John BROOME, James Mc INNES, Jane GRIMLEY.

Saturday

We left Base Camp at 0800, and headed down the valley past Leche Khota whilst the edge was still frozen and bog-hopped and boulder hopped into the next valley by Viluyo Jankhouma on one side and boulder moraine on the other. We reached ABC just after 1000, and having dumped our bivvi gear in the tent and had a brew, we started up the snow slope towards Yapuchanani. We roped up and donned crampons from the start. James who had never experienced either before set off like an old-timer.

Our leader was strangely silent apart from a few wheezes to begin with, but managed to point out a fox running across the snow (without crampons). Having reached the top of the snow slope we followed our leader on a mixed route of mainly rock, as he explained the benefits of crampons on granite. Continuing up another steep snow slope we all had to stop at the crucial moment to allow pictures of our leader leading, breathing in to give a more streamlined image and topped by the Lake District hat (bought in 1962 for 3/6d). We then found a spot to sit down, break out the Rolos and admire the views. Continuing for a short way on snow-covered scree, we reached a large snow bridge, with a glacier 'cliff' on either side, long icicles hanging from the tops guarding a 'good' bivvi cave below. Our leader doubted the safety of the snow bridge, and attempted to give us a demonstration of front pointing an El in grivels. Richard watched in amazement, and suggested leading the rest of us up the snow, whereupon our leader took charge again, slid down the rock and stomped up the ice at great speed. James mentioned that he felt sick but nobody heard.

Snow flurries began to fall at 1430, as we dumped rucksacks at the base of snow covered scree and headed off up the gully towards the summit slopes. James said he felt sick again.

Twenty minutes later we all made the top of the gully-more rock than ice and our leader led us the last 30 metres to the summit. James was sick, twice, in 30 metres. We took it in turns to pose at the summit of Yapuchanani 5526m, and look at the peaks stretching the length of the Cordillera Real. We also checked the altitude on our leader's Altimeter, and recorded the moment for posterity.

We made a rapid descent from the summit as snow continued to flurry, and James continued to be sick. Our leader leaped down the slope like a mountain goat, all former headaches and bronchitis forgotten. He went A over T on the final slope, but was saved by the expedition doctor. We arrived back at the tent for 1600 intending to return to Base Camp, but James' gut was worse so we decided to stay put for the evening.

A glut of rations meant that 4 of us shared one packet of Rolos and two oxtail soups. James went without. By 1700, all that was left to do was to pile 5 of us into a 3&1/2 man tent. Cosy. It was going to be a long night, so we started playing Fizz Buzz but stalled at number 8. Our leader suggested playing "Just a minute", but knowing his dits last at least an hour, nobody else was too keen. We had just dozed off at 2100ish, when John BROOME decided to remove his contact lenses; having found a torch so he could see his eyes, he knelt on Steve to open the tent and extract a plastic bag from underneath 5 rucksacks, and then breathed heavily on the frozen water bottle to thaw the contents and pour them into the bag with the lenses. James said he still felt sick so we zipped his sleeping bag up round the top of his head.

### Sunday

Dawned bright and clear. After sharing one brew of chocolate and 8 Rolos we dismantled the tent and headed back to Base Camp behind our leader arriving at 1130.

ASCENT OF PICO DEL NORTE (6050m)  
BY  
Leading Marine Engineering Mechanic (Electrical)  
S IRVINE

30 June

1000 Malcolm DAVIES, Steve IRVINE and Paul JIGGINS set off up to ABC below Pico del Norte, at 5400m. Walk went better only taking 3&1/2 hours by the new route (drop down from Base Camp to dry laguna then up via the obvious righthand walk).

01 July

0200 - woke for breakfast early, and set out at 0330 across the glacier which suprisingly gave no real problems, other than Steve I's crampons falling to bits for the first of many times. By 0830 we stood on the summit of Gorro de Hielo having climbed it via the pronounced ridge seen from Base Camp. A steep descent of the Face took us swiftly to the col and basin separating us from Pico del Norte. Here it seemed sensible to leave our sacs. The basin was fairly straightforward although care has to be taken to avoid some hidden crevasas. Paul knows 'cos he fell in one!

0930 - started our ascent of Pico del Norte by its NE ridge which proved a couple of exciting little pitches and a great deal of front-pointing; even a bit of rock if you're that way inclined. We were a tired team when we arrived at the North summit but even more tired at 1330 after plodding through calf deep snow we stood on the South Summit at 6060m.

Our descent route followed the ascent route, except on Gorro de Hielo where we came down the large steep couloir between both mountains. Seeing the crevasas in daylight showed just how lucky we had been to cross the glacier so quickly in the morning. We arrived back at ABC at 1730 - time taken 14 hours.

02 July

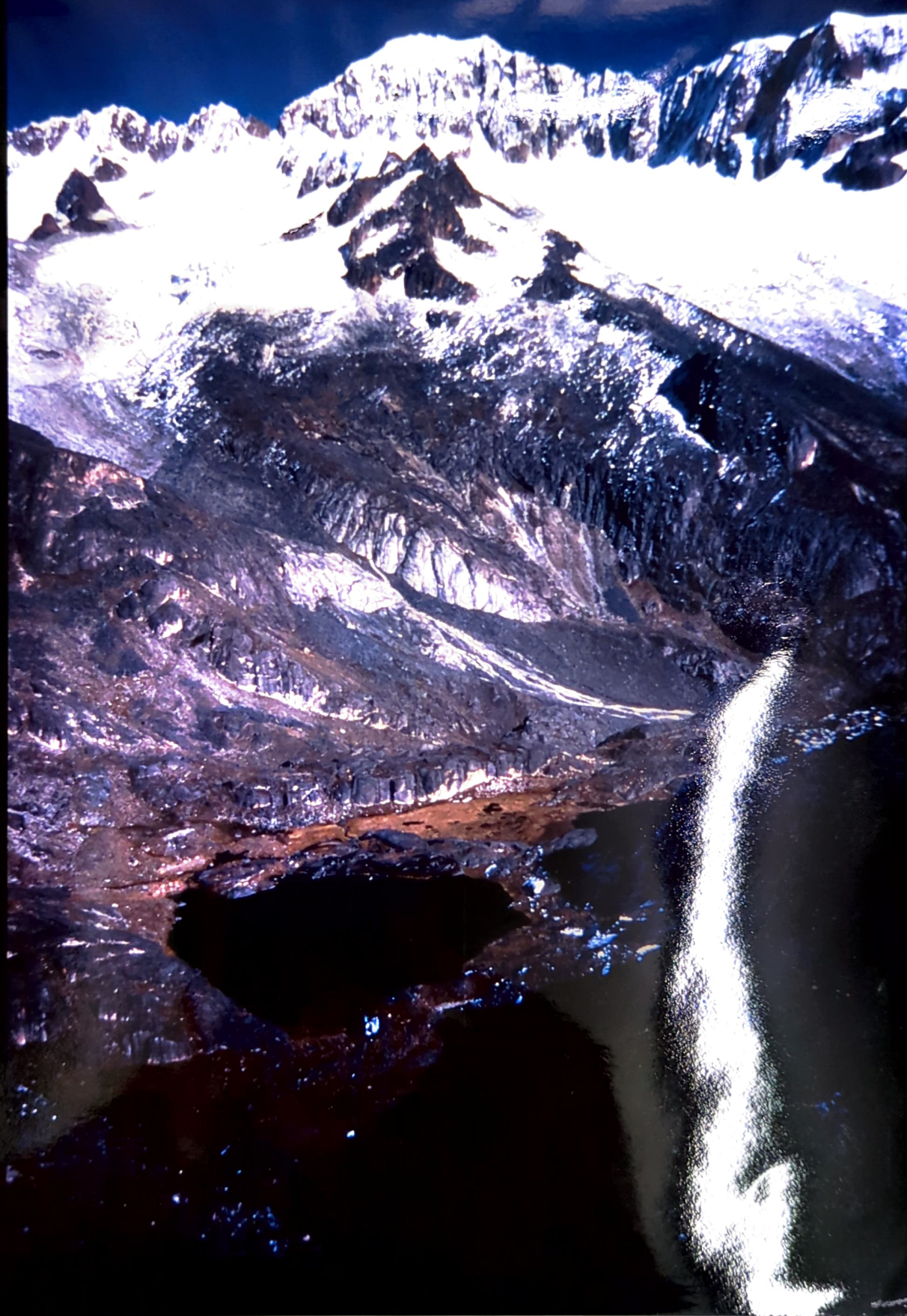
Heavy snow overnight and all day kept us trapped in the tent, playing cards and gambling for Rolos. Malcolm was kept busy tidying up on behalf of the "Green Party". Morale high!!

03 July

Even more heavy snow kept us in yet again. Paul had to cut his book in half to give Steve something to read. Endless card games prevented morale from slipping.

04 July

A night of very high winds and driving snow kept us awake most of the night but a fine, if windy, morning allowed us time to pack up, tidy up and return to base taking around 2 hours. Shame about the weather better luck next time!!



Illampu seen from the Viluyos Range. Base Camp  
is visible alongside the Laguna Negra.

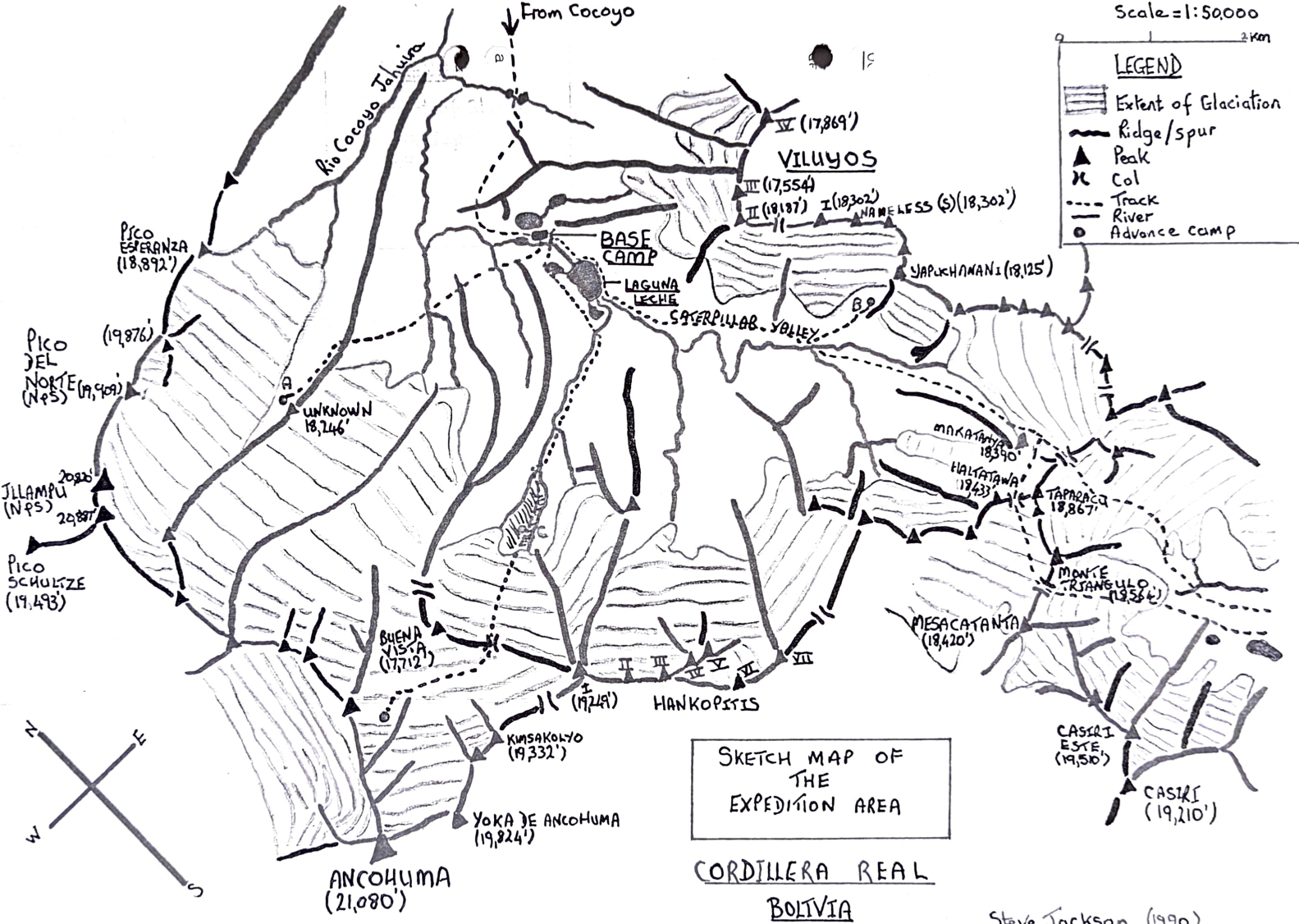


The Viluyos Range from the glacier leading to Ancolhuma



The Cordillera Real from Lake Titicaca

LEGEND	
	Extent of Glaciation
	Ridge/spur
	Peak
	Col
	Track
	River
	Advance camp



SKETCH MAP OF THE EXPEDITION AREA

CORDILLERA REAL  
BOLIVIA

Steve Jackson (1990)



ANNEX 2E

ASCENT OF ANCOHUMA (6427m) - 05 TO 08 JULY 1989  
BY  
Chief Petty Officer (Physical Training Instructor)  
P JOHNSON

05 July

Pete JOHNSON, Steve JACKSON, Richard LAKE-BULLEN (LB), Robbie ROBINSON, Nigel LUFF and Dave BURKE set off from Base Camp to establish ABC below Hankopiti I glacier. Took about 2&1/2 hours. Tents were pitched and it was decided to climb to the glacier col and try Buena Vista I. All were successful the route finishing with a lovely little ridge (18,300ft). Descent and food and drink.

06 July

The following morning we set off minus Steve J who was being sick and decided to descend. Back up our previous route to the col then a descent into a huge snow basin which had to be traversed towards Ancohuma. Laborious trail breaking by all team members saw us gain the col to the south of peak 5970m. Another 1km saw us select a bivvi site at around the 6000m mark. Stoves refusing to work efficiently and intense cold drove us into our bivvi bags for a very long uncomfortable night.

07 July

Friday morning the sun starting to hit us, we were away by 0940 across the bottom of the route, a ridge gained by a steepish face of 300ft. The ridge was knife edged and had excellent exposure on both sides. This was followed to a levelling of the angle where sacs were dropped and a plod of 30-40 mins saw us on the summit of Ancohuma (21,209ft). All that remained was a descent of the same ridge, completed safely, pick up bivvi gear and try to make ABC.

On the way back Martin and Chris were met and they surpassed themselves by providing a well needed hot drink for all, Cheers Boys!!

Camp was eventually reached at 1930ish and everything in sight was cooked and eaten.

Jim and Alan had arrived at advance camp so we crammed into Nigel's tent - a surprisingly comfortable night.

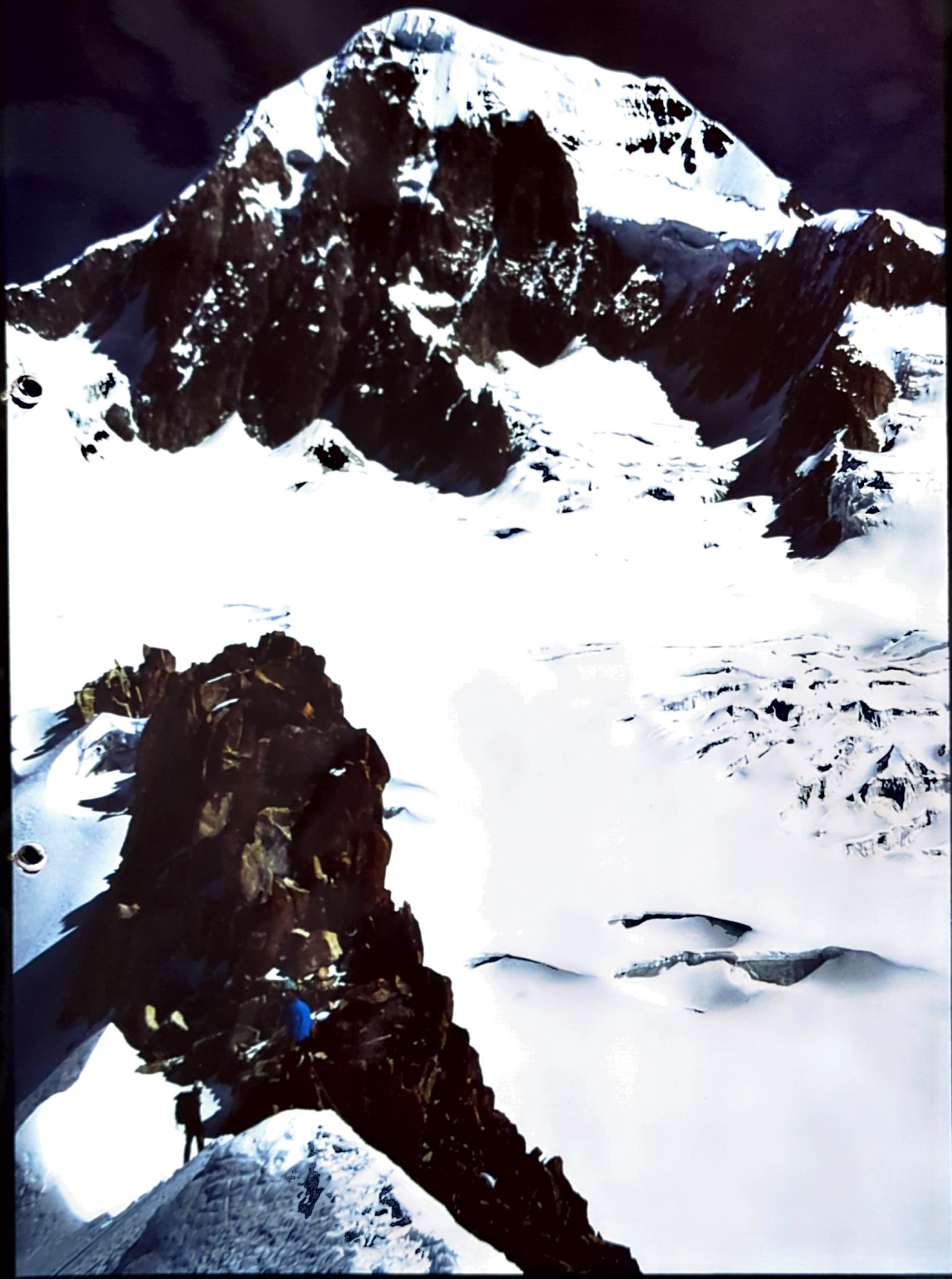
08 July

We decided to go for Hankopiti I, back up the dreaded glacier and then a casual ascent of the mountain with views of Martin and Chris, and Jim and Alan on our previous days route.

Descended to ABC pack up and down to Base, Bread Rolls, Cheese, Beer, Heaven.



Bivouac on Ancohuama at 6000m



Ancohuma from Buena Vista

ASCENT OF PICO ESPERANZA (5760m)-11 to 16 JULYBYLeading Medical Assistant A DAVIES RN&RMMC11 July

Jim Milledge and Alan Davies left B/C after lunch, for Illampu ABC arriving 4 hours later.

12 July

Left the tent at 1000 for recce of snow conditions. I had diarrhoea and felt very weak so returned to the tent. Jim ascended spot height 5563m from where he could view the glacier and find a route through to Gorro de Hielo. During the afternoon Martin and Chris arrived making it a very tight squeeze in the tent.

13 July Ascent of Gorro de Hielo

Awoke at 0615 and away shortly after 0700. Finding a much shorter way across the glacier than previous parties. The surface was fairly firm with some much softer patches.

Approach to the ridge of Gorro de Hielo was by a snow bridge which is more direct than shown in the Mesili Guide. The ridge was reached at 0900. Moving together we started up the normal route through some rocks and onto the snow ridge to its right. The snow was soft and insubstantial but slightly firmer going was found in the tracks of previous parties.

We found a place to take a breather on the crest of the ridge about half way up. From there we decided to move in pitches. I led the first pitch on a good ice screw belay and Jim led through for a further 30ft to a big rock spike. Taking up the lead again some mixed climbing led to the summit ridge and the summit at 1400. Descent was made via the West Flank to the col with Pico del Norte, arriving back at the tent at 1630.

14 July

Rest day.

15 July-South Face Pico Esperanza

Awoke at 0530 and very efficiently away by 0610. Moving up to the col of Pico del Norte via a variation on the right above an ice cave and through some seracs. The sunrise had been spectacular, which was just as well as it was the last we saw of the sun all day. Menacing clouds gathered even at that time of the morning. We retraced our descent route from Gorro de Hielo moving left onto the ridge between Gorro and Pico Esperanza. At the lowest point on the ridge we descended into the snow basin. The snow was very, very insubstantial as we "avalanched" down.

Contouring round to the left, to beneath the intended point of ascent, we were in thigh deep snow. The major problem of the route was crossing the bergschrund which was completely hidden and possibly double. The first, almost successful, crossing was at a point where some hard ice showed through. A double axe pull up enabled me to get my front points in but two moves later both axes dislodged and I fell unceremoniously back into the soft snow below the bergschrund.

The second, almost successful, crossing ended in my almost total disappearance into the bergschrund. The actual crossing took place where the slope was uniform and possibly the site of a snow bridge. The snow, however, was only just satisfactory and we moved together up to the first patch of rocks. We then climbed in pitches through some mixed ground to the upper snow field. The snow deteriorated again to the consistency of wet sugar and made progress difficult.

We reached rocks again and a good belay. Further progress on snow was pointless so rock climbing over large flakes led to the summit at 1400.

The weather was closing in and visibility dropping. We thought a descent of the snow slopes north of the west ridge was probably best so we abseiled down to the snow on that side. Visibility was so poor we could not see the route, so we elected to re-ascend to the summit and descend via the east ridge to the col with Pico del Norte.

This proved to be highly problematical with large rock towers to bypass. Using three very difficult abseils we pendulumed around these obstacles. I was sure we would have difficulty recovering the rope, but each time it was retrieved successfully.

Some further down-climbing and a long traverse of the west flank of the ridge led us to the col. It had been snowing for the entirety and to reach this point from the summit took 4 hours.

Making very rapid tracks to reach the tent before dark we only just failed, having to cross the scree by headtorch, reaching the tent at 1900.

6 July

Returned to Base Camp.

ATTEMPTED ASCENT OF ILLAMPU AND ASCENT OF YOKO DE ANCOHUMA (5895)  
AND KIMSAKOLYO (6044) 12-16 JULY

by

Lieutenant D J ROBINSON, FRGS, Royal Navy

Myself, Steve Jackson, Pete Johnson and Richard Lake-Bullen (L-B), set off between 1000 and 1400 on Wed 12 July on the standard plod to Advance Base Camp Charlie in good weather. We were camped and fed by 1700 and spent a cosy night sharing a VE25.

Thurs 13 JULY

Decamped at 0850 and on glacier by 0930. Arrived at top of col, closely followed by L-B, Steve and Pete arrived 45 mins later. Steve was still suffering from Bronchitis and decided to return. We went on past the US camp, meeting Jane Grimley at 1300 at her camp, after her descent from Ancohuma. By 1345 we were well up the high

col and looking forward to seeing over to Illampu. Unfortunately, the weather closed in very rapidly and in whiteout conditions and blowing snow we decided it would be unwise to camp over the high col with the possibility of being snowed in and the concomitant dangerous return journey!

Returned to "Jane's Camp" and put up our tent. Dick Tough and Richard Stokes descended through the storm, which turned out to be short lived, to their tent. Dined and followed very slow progress of US group returning from Ancohuma, eventually by torchlight. Spent a very cold night on the glacier, displeased with lack of progress.

Fri 14 July

A bright morning found us slowly decamping. I borrowed Dick's sleeping bag as his group were returning to Base and I did not want two more nights frozen! L-B and I set off up for the high col again, fully loaded for another go at the Illampu recce. Weather bright and clear, but a very cold wind. Left col at 1010 and on col by 1150. Traversed North, staying high on ridge of ice, bergshrunds and some rotten rock, the views over the ridge were spectacular. Traversed until the ridge started to drop and sat and ate lunch.

It was obvious that the planned route would not go; the "pass" and "ridge" of the map were actually bergschrunded faces and overhanging seracs and glaciers!

Despite my keenness to move further along and try one of the steep little peaks on the ridge, L-B reckoned it was too dangerous and the peaks not worthwhile and so we returned to the High Col. Feeling somewhat despondent we descended from the col but during the descent the peaks of Kimsakolyo and Yoko de Ancohuma caught our eyes.

We immediately changed our plans and decided to ascend the centre (safest line) of the glacier and camp in the corrie, a safe distance from the rock faces of both mountains. By 1615 we had established our camp and had also picked out a couple of possible gully and face lines.

Decided over dinner to try the gully line running from a snow ramp directly to the summit of Yoko de Ancohuma. (This line is obvious when approaching up the corrie, but is less clear from close up, until actually ascending the snow ramp. It also appeared to be about Grade 1 or 2 but once on the ramp it is steeper and turned out to be Grade 3.)

Sat 15 July

Up and away by 0850, roped for the slight descent from the camp through the crevasses and bergschrunds to the foot of the snow ramp. Expressing mild alarm at the Peugeot 205 GTi sized boulders and smaller bits of granite scattered around the foot of the route. We moved to the right of the ramp trying, helmetless, to avoid looking at the tottering pillars of rotten granite looming above, resembling collapsing library shelves!

We reached the foot of the gully by 0950, having climbed fair thaw/freeze surface of ramp (Grade 1 to 2) and crossing a narrow though deep bergschrund. The start of the gully proper was guarded by a rock band (10 feet) covered with a boss of hard water ice. This and the realisation that the route was a good Grade 2 to 3 made us unship hammers to join our ice axes!

The water ice was quickly climbed and took picks and front points cleanly without shattering. Elated at the sight of the gully soaring above we ignored objective dangers and commenced piolet canne, to move together on upwards. Two thirds of the way up the gully gradually steepened and continued at Grade 3 (perfect nevé all the way) to below small seracs/ice cornices, which had a convenient exit between them.

Now, front pointing, we moved up to the exit, L-B leading. The snow suddenly changed to deep, sugary junk, under a windcrust. This choss started to fall on me so I moved right under a sun rotted serac. L-B swam over the exit, deciding to top the route round the cornice as the steep slope to his left was deep and slidy. I heard the clang of steel as he was belaying and shortly afterwards I joined him under the blue ice of another serac/ice cornice, our only warthog firmly embedded. I sank my boots into the sugar snow below the ice and belayed L-B as he turned the ice cornice and disappeared again. With 3m of rope left (9mm doubled) he shouted that he needed more rope. I rearranged the belay and he was soon ready to bring me up. I swiftly nipped round the corner, chilled by the cloud now swirling around us.

With a thin perforated cornice to my left, I swam up deep sugar using buried axes as levers, then climbed through a gap in the cornice, following the rope, to join L-B on the steeply sloping summit bank at 1200. Both of us grinned widely and photographed each other, then moved down to more level snow and sat down for lunch, admiring the views through breaks in the cloud.

Descended calf deep snow to the broad ridge, heading for our days bonus, Kimsakolyo, which presented a sharp pyramidal top to us.

We passed the dome of Espalda at 1325 with the snow now thigh deep so I took the lead. L-B's extra weight still caused him to sink behind me. We gingerly crossed a snowbridge over an enormous and beautifully iced bergschrund and onto firm nevé, passing between other huge crevasses and onto the face of Kimsakolyo at 1335.

Climbing close to the edge we reached the pointed top by 1415, again elated by the quality of the ascent and the fantastic views over the crevasses to the West and over to Ancohuma. Usual photocall, then rapid descent and over Espalda and an ice scramble down the W side (Grade 1-2) directly approaching our camp. We gingerly crossed the snow depression below the ridge and walked to camp, arriving at 1530.

L-B, hating long evenings at camp, suggested that we move the tent to "Jane's Camp", thus saving time in the morning. As we moved off (1600) the weather, which had been lowering from the South, broke and it started to snow heavily. By "Jane's Camp" we decided to continue down, reaching the US Camp by 1638 and chatting to the Brit climbers camped there; they had been weathered off Ancohuma.



Richard LAKE-BULLEN on summit of  
Yoko de Ancoltumet



Tired and hungry we slogged up to the col and struggled to find our way down the glacier in white out conditions, often having to quarter back and forth to recognise crevasses and seracs lining the route; good job we were familiar with it!!

Eventually, we were relieved to scramble down the snout, which looked very different to when we first took steps on it, arriving at ABC Charlie at 1815. It was still snowing. We chatted to two climbers who had also set up camp there and ate ourselves silly.

Sun 16 July

Clear, sunny start, slow decamp. Cleared camp site of gash etc., leaving just VE25 tent for Dick Tough's party who were due to return for a final attempt at Ancohuma. Took a slow walk to Base Camp (1020 to 1115) arriving in cloudy, dank weather for a rest.



Martin PRICE on Mesacatlanta



Christian CROWTHER on Mesacatlanta



The Viluyos Peaks from ABC Charlie

MEDICAL RESEARCH

BY

Surgeon Captain JM BEELEY, FRCP, Royal Navy  
Research Team Joint-Leader

PROJECT TITLE: Physiological responses and problems during the exertion of ascending to altitude on mountains.

Research Protocols-Bolivia 1989

1. All expedition members agreed to co-operate during the first part of the expedition with research designed to further scientific understanding of Acute Mountain Sickness. The following projects were undertaken:

- (1) Hypoxic ventilatory response (HVR) and AMS There are conflicting reports on the association of a blunted HVR and AMS. Twenty two personnel will have their HVR measured at the Clinical Research Centre, Northwick Park Hospital, Harrow before going to Bolivia and the results compared with AMS scores during the first few days at altitude. This differs from our previous study in that HVR will be measured at both a fixed blood level of carbon dioxide and also when allowing the level to fall as it normally does when exposed to altitude.
- (2) Physical fitness and AMS It is said that fitness is not protective against AMS, but there are suggestions that fitter subjects put themselves at special risk by making more rapid and vigorous ascents than their less fit counterparts. On the Bolivian Expedition fitness will be assessed before departure at the Olympic Medical Centre in Harrow and at the Institute of Naval Medicine by measuring maximum oxygen uptake (VO<sub>2</sub> Max). A simpler test (the "shuttle Test"), from which VO<sub>2</sub> Max can be derived, will be carried out before departure and repeated during acclimatisation; results will be compared with scores for severity of AMS and with changes in the levels of hormones which control fluid balance. This will determine, for the first time, whether severity of AMS relates to "start line" or increasing fitness.
- (3) Rate of respiratory acclimatisation and AMS A number of studies suggest that a failure to quickly increase respiration and thus lower blood carbon dioxide levels on arrival at altitude is associated with AMS and, perhaps, the development of pulmonary oedema ("waterlogged lung") but numbers of subjects previously studied have been too small to prove this theory. The rate of respiratory acclimatisation will be followed by serial measurements of alveolar gases at intervals before and after arrival at altitude to see if this response can account for individual variation in susceptibility. Sleeping levels of blood oxygen (SaO<sub>2</sub>) will be measured in a sub-group of subjects using a pulse oximeter because nocturnal breathing patterns may determine the development of AMS.
- (4) AMS and water/sodium balance Our earlier studies showed that disturbance of salt and water balance may be a factor in the genesis of AMS. Measurements will be made of 24 hour urine volumes and sodium concentration, the plasma hormones (atrial natriuretic peptide and aldosterone), body weight changes and lower leg volume (as an index of fluid retention). Results will be compared and correlated with severity of symptoms of AMS.
- (5) Signs of pulmonary oedema During the first three days at Base Camp at altitude clinical examination of all subjects will be made for lung abnormalities; lung function tests, which measure lung volume and efficiency, will be undertaken repeatedly. Results will be compared and correlated with severity of symptoms of AMS.

(6) Treatment of Acute Mountain Sickness Anecdotal evidence suggests that one type of drug (non-steroidal anti-inflammatory drugs) relieve symptoms of AMS more effectively than simple pain relieving drugs (e.g. "panadol"). If this is true, evidence about the mechanism of high altitude headache will emerge. We shall compare, scientifically, the effects of such drugs with a placebo (i.e. nil treatment).

## REPORTS FROM PREVIOUS EXPEDITIONS/RESEARCH

2. Relevant reports and papers from previous expeditions or research are listed below:

(1) Jackson S K, Beeley J M, Broome J R et al (1987)

Report to RGS of Joint Services East Africa Expedition  
RGS Archives

(2) Withey W R, Milledge J S, Beeley J M et al (1983)

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J Appl Physiol; 55(2) 409-412

(3) Beeley J M & Clark R J (1988)

Inhalation Injury  
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(4) Milledge J S, Beeley J M et al (1988)

Atrial natriuretic peptide, altitude and acute mountain sickness  
Submitted to Clin Science

(5) Milledge J S, Broome J R & Beeley J M (1988)

Microvascular fragility & acute mountain sickness  
Brit Med J 196 : 610

(6) Milledge J S, Beeley J M et al (1988)

Hypoxic ventilatory responses and acute mountain sickness  
Europ J Respirat : in press

(7) Schoene R B, Lahiri S, Hackett P H, Peters R M, Milledge J S, Pizzo C J, Sarnquist F H, Boyer S J, Grabet D J, Maret K H & West J B (1984)

Relationship of hypoxic ventilatory response to exercise performance on Mount Everest  
J Appl Physiol : Respirat Environ, Exercise Physiol 56 : 1478-1483

(8) Beeley J M & Golden St F (1983)

Fluid balance during exercise in cold conditions  
Casualty Care Workshop No 3, Medical Operational Problems in a Cold Environment  
Institute of Naval Medicine, Alverstoke 114-140

(9) Milledge J S, Catley D M, Ward M P, Williams E S & Clarke C R A (1983)

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3. Publications and material read are listed below:

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- (2) Singh I et al (1969)  
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- (3) Simmons R I et al (1969)  
Acute pulmonary oedema in battle casualties  
J Trauma 9 : 760-775
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Amer Rev Respirat Dis 135 : 924-929
- (5) Paliczka V J et al (1987)  
A multi-stage shuttle run as predictor of running performance and maximal oxygen uptake  
BRIT J Sports Med 21 : 163-165
- (6) Weil J V, Byrne-Quinn E, Sodal I E, Filley G F & Grover R F (1971)  
Acquired attenuation of chemoreceptor function in chronically hypoxic man at high altitude  
J Clin Invest 50: 186-195
- (7) Rebuck A S and Campbell E J M (1974)  
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Amer, Rev, Respirat, Dis 109 : 345-350
- (8) Read D J C (1967)  
A clinical method for assessing the ventilatory response to CO<sub>2</sub>  
Aust, Ann, Med, 16 : 20-32
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The clinical assessment of acute mountain sickness  
Quart, J Med, 54 : 91-100
- (10) Hunter D J, Smart J R and Whitton I (1986)  
Increased capillary fragility at high altitude  
Brit, Med, J, 292,88
- (11) Harrison M H (1985)  
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- (12) Hackett P H, Rennie D, Hofmeister S E, Grover R F, Grover E B and Reeves J T (1982)  
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PRELIMINARY SCIENTIFIC REPORT  
IN MEDICAL RESEARCH

Medical Research Team

Surgeon Captain J M BEELEY Royal Navy and Dr J MILLEDGE  
Surgeon Lieutenant Commander J R BROOME Royal Navy and CMT W SAMPSON  
Mr N LUFF and LMA A DAVIES

1. As indicated the scientific programme was built around a series of projects concerned with Acute Mountain Sickness (AMS). Since AMS is only a problem during the first few days at altitude, the programme was conducted during a three day period at the Institute of Naval Medicine before departure (base line studies) and concentrated mainly in the first four days at base camp in the Cordillera Real.
2. The form of the expedition favoured a study of AMS in that there were quite a large number of subjects (22). They were available for base line measurements before the expedition. The planned ascent to base camp (4,500m) was sufficiently fast and high to anticipate at least some AMS in most of the subjects. The fact that the base camp was only a days march from the road-head was also an advantage.
3. In the event the loss of our accompanying baggage resulted in a delay of 7 days at Sorata (2,500m) so that by the time the expedition reached base camp, 9 days after arrival in Bolivia, a considerable degree of acclimatisation had taken place. Thus we only experienced mild AMS in a few individuals. Nevertheless the scientific programme was completed as planned and preliminary results do show some positive results.

AMS SCORING

4. AMS symptoms were scored for each subject on each day after arrival at base camp using a proforma. The following symptoms were scored:-

Headache  
Lassitude  
Insomnia  
Anorexia/Nausea/Vomiting

5. Points were scored for each symptom; 1,2,3, for mild, moderate or severe. In the case of the last symptom, for anorexia 1, nausea 2 and vomiting 3 points. Since it was felt that insomnia could well be due to causes other than AMS the score for the symptom was halved (although this made very little difference to the ranking of AMS). Points were totaled (and doubled to eliminate half points) for the three days after arrival at base camp. By day 4 no subjects had any AMS symptoms.
6. AMS scores ranged from 0 to 33 out of a possible maximum of 61. A subject with mild but definite AMS might have a score of 10. On this assumption 12 out of our total 22 members or 11 out of our 17 primary subjects had at least this degree of AMS.

MAXIMUM OXYGEN INTAKE AND AMS

Are subjects who are physically fit less prone to AMS than unfit subjects?

7. For the purpose of this study we have taken maximum oxygen intake (VO<sub>2</sub>max) as a measure of fitness. We realise that this may not be appropriate but it is probably the best measure available.

8.  $\text{VO}_2\text{max}$  was measured before the expedition by two methods. First by use of a treadmill with collection of expired gas during a progressive exercise test. This is the standard method used in exercise laboratories. The other is an indirect method known as the "shuttle run" in which the subject runs between two marks 20m apart keeping time with beeps and messages on an audio tape. The subject has to run even faster until he is unable to keep up. This point is noted and the  $\text{VO}_2\text{max}$  read off from a calibration chart.

**Results:**  $\text{VO}_2\text{max}$  measured by the traditional treadmill method ranged from 35 to 76 ml/Kg/min. and by the shuttle run from 43 to 61 ml/Kg/min. The correlation coefficient  $r$  was 0.47 which for  $n=17$  is only just significant at the 5% level.

Neither of these measures of  $\text{VO}_2\text{max}$  (fitness) showed any significant correlation with AMS scores.

### AMS AND HVR

9. There is some evidence that subjects who later develop AMS hypoventilate on arrival at altitude compared with subjects who are more resistant. We planned to obtain more evidence on this point on this expedition (see below). If this observation is true the next question is do susceptible subjects have an inherently lower ventilatory response to  $\text{CO}_2$  or Hypoxia (HVR) as measured in a brief test in the laboratory. The evidence on this in the literature is conflicting. Some workers claim to have shown that subjects prone to AMS have a low HVR but in a previous study we found no correlation between HVR (or  $\text{CO}_2$  response) measured before the expedition and subsequent AMS score. We planned to repeat this study using a variation of the HVR test. In the previous study we measured HVR at a fixed  $\text{PCO}_2$  of 49mmHg (the fixed venous  $\text{PCO}_2$ ). On this occasion we made two measurements, one at a fixed  $\text{PCO}_2$  of 40mmHg (the alveolar  $\text{PCO}_2$ ) and one in which the  $\text{PCO}_2$  was allowed to fall as Hypoxia was imposed as it does on ascent to altitude.
10. Twenty one subjects attended the laboratory at Northwick Park Hospital during the three months before the expedition. HVR was measured using two forms of a rebreathing progressive hypoxia test. In one form the  $\text{PCO}_2$  was kept constant in the other it was allowed to fall. The two types of tests were alternated and three of each were carried out. The ventilation (l/min) and the oxygen saturation ( $\text{SaO}_2$ ) were recorded on an X-Y plotter so that the response line was inscribed in real time. The slope of this line represents the HVR.

**Results:** The mean HVR (fixed  $\text{PCO}_2$ ) was 1.65 (range 0.51 to 4.11) l/min/% $\text{SaO}_2$ . Mean HVR (reducing  $\text{PCO}_2$ ) was 0.66 (range 0.08 to 2.22) l/min/% $\text{SaO}_2$ . There was a strong correlation between the two ways of measuring HVR ( $p = 0.001$  on paired  $t$  test). There was no significant correlation between AMS scores at altitude and either measure of HVR or any measure of the difference between the two HVR measurements.

We conclude that susceptibility to AMS cannot be predicted from measurements of HVR in the laboratory and that the level of ventilation in the hours after arrival at altitude is not determined by the acute ventilatory response to hypoxia.

### AMS AND FLUID AND ELECTROLYTE BALANCE

11. It is widely thought that some derangement of fluid balance is involved in the genesis of AMS, either retention of fluid or redistribution from the intra- to extra-cellular volumes. Fluid balance is intimately related to sodium (Na) balance and this in turn to kidney function and the level of the hormones aldosterone and atrial natriuretic peptide (ANP).

12. We made 24 hour urine collections during the control period on two days and for the first three days after arrival at base camp. Aliquots were taken after the volume had been measured and brought back for analysis for Na and potassium (k). From these results 24 hour Na and K excretion could be calculated. Body weight was recorded on the same days and blood taken for measurement of haematocrit as an indication of changes in plasma volume and for aldosterone and ANP. These hormones are important in the control of sodium in the body. Aldosterone causes sodium retention and ANP promotes sodium excretion.

**Results:** 24 hour urine volume showed a decrease on arrival at base camp. The base line mean was 2589ml. On day one at base camp it was 702ml on days 2,3 and 4 it was 1696, 1472 and 1289ml. There was no correlation between AMS scores and 24 hour urine volumes on any of the 4 days after arrival at base camp.

24 hour Na showed a marked reduction on arrival at base camp. Mean base line Na excretion was 182 mmols (at Sorata 269 mmols) and for the first three days at base camp 73, 111 and 127 mmols. For K excretion there was no significant change. There was a significant correlation between AMS scores and the 24 hour Na excretion on the day of arrival at base camp ( $p=0.026$  Kendal's rank test).

Aldosterone; there was a rise of plasma aldosterone concentration on arrival at base camp (presumably due to the exercise taken on getting there). The mean base line value was 274 pmol/l and on the morning after arrival at base camp it was 445 pmol/l falling to 313 and 289 pmol/l on the next two mornings. There was a trend for higher values to be associated with more AMS but the correlation was not statistically significant.

Atrial Natriuretic Peptide; results of the analysis are still awaited.

Haematocrit showed the expected small rise on arrival at altitude (presumably due to an initial fall in plasma volume). The mean base line haematocrit was 42.4 and on the morning after arrival at base camp it was 45.7. It was 45 and 44.7 on the next two days. There was no correlation between changes in haematocrit and AMS scores.

Body weight; all subjects showed a reduction on arrival at base camp with a mean loss of 3.73Kg compared with base line weights in the UK. There was no correlation of weight loss with AMS scores.

#### AMS, SPIROMETRY, ALVEOLAR GASES AND SaO<sub>2</sub>

13. There have been reports that subjects who later develop AMS tend to have lower alveolar CO<sub>2</sub> pressure (PACO<sub>2</sub>) and arterial oxygen saturation (SaO<sub>2</sub>) on arrival at altitude. They also are reported to have greater changes in vital capacity (FVC) and peak expiratory flow (PEF). We therefore carried out spirometry (FVC, FEV<sub>1</sub>, PEF) and measurements of SaO<sub>2</sub> (using a pulseoxymeter) and collected end-tidal gas samples for measurements of PACO<sub>2</sub> and PAO<sub>2</sub>. These studies were done at RN Hospital Haslar, at Sorata and on arrival at base camp for the first three days. Spirometry was also carried out after exercise both at sea level and at altitude.

**Results:** Spirometry. FVC was reduced at base camp by a mean of 270ml on days 1 and 2. This reduction was significant ( $p=0.005$  on paired t test). There was no significant change in FEV<sub>1</sub> or PEF. Reduction in FVC was greatest in those who developed most AMS. The correlation in FVC with AMS scores was significant for change in FVC on the second day at base camp. After exercise values for all measurements tended to be less. This reached significance for FVC at sea level ( $p=0.025$ ), for FEV<sub>1</sub> and PEF at both Sorata and base camp ( $p=0.05$ ).

Arterial saturation (SaO<sub>2</sub>): SaO<sub>2</sub> was of course reduced at base camp where the mean value for resting awake subjects was 77.8 and 79.2% on days 1 and 2. At Sorata it was 93.6% (sea level values are between 96 and 98%). Subjects with AMS tended to have lower SaO<sub>2</sub> and the correlation was significant for values on the second day at base camp ( $p=0.014$  on Kendal's rank test).

An attempt was made to record sleeping SaO<sub>2</sub> during the second night at base camp on the 5 most and 5 least affected subjects with AMS. Unfortunately since AMS developed more on the following day it turned out that we had not chosen the best five for each group. Also there was some equipment failure due to the effect of the cold on the battery operated oxymeters. In the event we recorded usable traces in 4 subjects in the AMS group (mean AMS score 19) and 3 in the non-AMS group (mean score 7). There was no significant difference in the SaO<sub>2</sub> mean, maximum or minimum values between the two groups.

### LACTIC ACID EXERCISE

14. It has been known since 1935 that serum lactic acid levels after maximum exercise are lower at altitude in acclimatised subjects than at sea level. This seems paradoxical since with the shortage of oxygen at altitude one might have expected the body to use the anaerobic pathway for energy production even more than at sea level and so produce higher lactate levels. In acute hypoxia, such as breathing a low oxygen mixture in the laboratory, this reduction in post exercise lactic acid concentration is not seen. There is no really satisfactory explanation for this paradox. We planned to make a contribution to this problem by at least following the time course of the development of this phenomenon. Following the shuttle runs blood was collected three minutes after stopping maximal exercise and stored for lactate measurement back in the UK.

Results: The mean lactate at sea level was 13.5 mmol/l; at Sorata 10.02 and at base camp on days 2, 10 and 15 was 7.4, 7.3 and 7.7 mmol/l respectively. The changes from sea level to Sorata and from Sorata to base camp were significant ( $p=0.001$  and  $0.003$  on unpaired t test). It is interesting to note that the reduction in levels was complete by the first run at base camp ie within 24 hours of arrival. Thereafter there was no further decrease over two weeks of acclimatisation.

### ALTITUDE, AMS AND TNF

15. Tumour necrosing factor (TNF) is a substance produced in the body by, amongst other tissues, malignant tumours. It is thought possibly to be the cause of anorexia and vomiting associated with widespread malignancies. We therefore accepted the offer of Dr J W LARICK to assay plasma samples for this substance and to see if there was any correlation with symptoms of AMS especially with those of anorexia, nausea and vomiting.

We await the results of this analysis.

PROGRAMME FOR CONTROL STUDIES  
RN Hospital Haslar and Institute of Naval Medicine 10-14 June 1989

<u>Date</u>	<u>Day</u>	<u>Time</u>	<u>Activity</u>
10	Sat	1800	Briefing on science programme.
11	Sun	0700	Blood sampling then rise; empty bladder, discard urine, start 24 hour urine collection. Body weight. Breakfast.
		during day	End-tidal gas sampling. Spirometry, peak flows. Fat fold measurements.
			No hard exercise.
		1600-1800	Lower leg volume.
		Night time	SaO <sub>2</sub> (pulse oxymeter) sleeping measurements.
12	Mon	0700	Blood sampling. Rise; Empty bladder, end 1st Collection, Start 2nd Collection. Bodyweight. Breakfast.
		during day	V <sub>O</sub> <sub>2</sub> max measurement, 9 subjects. Shuttle run, 10 subjects.
		1600-1800	Lower leg measurement.
13	Tue	0700	End 2nd urine collection. Body weight.
		during day	V <sub>O</sub> <sub>2</sub> max, 10 subjects. Shuttle run, 9 subjects.
14		am	Conclude any tests not completed.
		Mid-day	Dep for London.

EXPEDITION MEDICAL OFFICER'S REPORT

BY

Surgeon Lieutenant Commander J R BROOME, MRCP, Royal NavyMedical Equipment

1. A comprehensive medical outfit was carried in two white RN Medical Officers' Emergency Chests. In addition we took an RN resuscitation case and spare size C oxygen cylinder. First Aid kits packed into small plastic boxes were packed up for use by each of the climbing groups.
2. The only novel piece of emergency equipment was the "Gamow Bag" - a portable inflatable compression chamber proven on Everest to be a life saver for cases of high altitude pulmonary and cerebral oedema. After the experience of expedition members on Mt Kenya in 1987 and in the Alps in 1988 the very remoteness of the Bolivian Andes was of concern and the "Gamow Bag" did much to provide reassurance.

Prevention

3. All expedition members were fully immunised against Yellow Fever; Typhoid; Cholera; Polio; Tetanus and Hepatitis A.
4. Anti malarial prophylaxis with weekly Maloprim and Chloroquine was commenced before departure.

Proceedings

5. Thankfully, as is so often the case, little of the medical equipment was used. One member of the expedition suffered a bronchitic illness following arrival at base camp which proved resistant to treatment with antibiotics and only fully resolved on return to lower altitude.
6. Mild gastrointestinal upset was experienced by most expedition members at some stage. This responded to simple anti diarrhoeal medication and rarely persisted beyond 48 hours.
7. No significant musculoskeletal or traumatic injuries occurred.
8. Other than headache and transient nausea in a minority of expedition members, no more serious symptoms of acute mountain sickness required treatment.
9. We were able to help the local community in Cocoyo in a small way by treating the small son of Pedro, our trek guide, who developed a large abscess in the right cheek following a fall. This rapidly responded to paediatric doses of magnapen.
10. On our return to Sorata during our journey back to La Paz, the bulk of our non-accountable medicines and equipment was donated to the tiny clinic that served the area. For this the staff were incredibly grateful, receiving each item like a christmas present. To our amazement the most prized items were not the modern antibiotics but the simplest things like sterile sutures and hypodermic needles - a reflection of the disparity between the relative prosperity of La Paz and the rest of the country - and a striking reminder that the standard of medical care and resources we enjoy in Britain are rarely even dreamt of in much of the world.

11. Overall we must be grateful for the lack of illness or injury throughout the expedition with no clinical problems more demanding than the regulation of our leader's bowels!



EXPEDITION EQUIPMENT OFFICERS REPORT  
BY  
Lieutenant D J ROBINSON Royal Navy

1. At 0930 on Friday June 1989 2.14 tonnes of Expedition Equipment departed HMS SULTAN, Gosport in a 4 ton lorry en route to Atlasair, Feltham, near Heathrow airport for onward freighting to Bolivia and the Base Camp in the Cordillera Real. The gear, loaded by four stokers using a forklift truck consisted of 13 packing cases, 17 kitbags of communal gear, 18 kitbags of personal gear, 3 cardboard cases and a mountain stretcher. It had taken seven months to select, acquire and pack the enormous variety of items required for the expedition which along with several cases of dried rations made up the consignment. A good deal of extra medical equipment was also taken to Bolivia but that was someone else's problem!
2. Expedition equipment requirements were divided into two parts, communal team equipment and personal gear.
3. As the team was initially chosen from experienced Club Members personal kit lists were issued early in the organisational phase of expedition planning, a copy of the list is at Annex A. Personnel used this list as a guide and equipped themselves as best suited their own needs and choice of manufacturers, ensuring however that they complied with the safety requirements laid down by the Expedition Leader.
4. Communal equipment was obtained from a variety of sources, the major supplier being naval stores, once DGST(N) Customer Codes and a UIN were obtained. Orders commenced in October 1988 and continued to March 1989, with several last minute purchases necessitated by changes in plans (Bolivia not Peru) and other peoples good ideas occurring a fortnight before despatch date. Communal equipment lists are at Annex B.
5. The bulk of our equipment was flown from UK on 15 June and arrived in La Paz the next day where it remained out of our reach until red tape and bureaucracy were overcome, the latter at a cost of almost \$2000!
6. The equipment arrived in Sorata at 0130 on 20 June where some of it was needed for the medical research programme so a great deal of unpacking and repacking ensued, one of the less attractive features of a large expedition.
7. Because of the extra expenditure incurred as a result of our enforced delay in Sorata and the unforeseen importation costs it was decided to leave some kit behind to save on transportation costs.
8. Luxury items such as large tents, chairs and tables were stowed in the Hotel. A large collapsible water tank was also left behind and it was the only item which proved totally unnecessary as water settling facilities were not needed at Base Camp. We were unable to fill the Camping Gas bottles, which were freighted empty for safety, so a local supply was purchased. Unfortunately the bottles and fittings did not match the stoves so modifications were improvised. Despite being a successful means of communal catering they were not completely safe and the procedure is not recommended. Cookers which do fit the bottles and hoses can be purchased in Sorata but supplies are not guaranteed and the items are all very heavy.
9. All gear was moved from Sorata to Cocoyo along with the team in one lorry and three Toyota pickup trucks.

10. At Cocoyo it was broken down into loads to be carried up to Base Camp by llama. Unfortunately what was an acceptable 14 or 15kg on Friday was not acceptable on Saturday; had to be 12kg and be able to fit snugly over the back of the Llama.
11. Thus when the animals gathered further repacking by the arrieros was necessary and tight control of the gear was lost as loads were broken up and scattered through the Llama herds. However not one item was lost as despite the melee and our suspicious view of the chief arriero the locals were completely trustworthy.
12. Elevated Llama prices forced a further trimming of stocks so some duplicated items and another large tent were left crated at Cocoyo. This reduced tentage to just one unit which proved only just adequate at base camp for the medical test recording and research.
13. On arrival at Base Camp gear was hastily stowed and covered with tarpaulin as our arrival was heralded by a snowstorm. It was then tidied and restowed during the next two days as best suited its requirement for research and team use.
14. The equipment proved effective and requires little description of its usefulness although some items have notes alongside them in the lists at Annex. The following items are worthy of further report;

Tentage Accommodation tentage was efficient and sufficiently roomy although the large family tentage was sorely missed during cold evenings and the unseasonal bad weather periods. The one large tent did provide basic shelter for the researchers and for group gatherings but was very cramped. It did however stay up through two snowstorms, unlike the Royal Marine Arctic prototype which will presumably require a rethink by the MOD! The new Club VE25's were excellent, both at base and high on the mountains. The two emergency exits/windows giving good ventilation and proving ideal for the disposal of night-time pee-bottle contents.

Centrifuges and Generators These two items essential to the success of the medical research were the electric centrifuges and the generators to drive them, two each of which were taken. The centrifuges were obsolescent units obtained from medical stores and the Honda EM650 generators were purchased locally in Portsmouth. These had to be fitted with high altitude carburettor jets purchased through a contact in Zurich who obtained them from Tokyo. Generators and centrifuges ran faultlessly, processing the hundreds of blood samples required by the medical research team. In addition the generators were used to charge the video team's batteries plus those of other expeditions and provided electric lighting via the inspection lamp extension, taken for emergency medical lighting.

MSR XGX Petrol Stoves - Were purchased for both club stocks and team members, as a single fuel source simplified logistics. 90 litres of petrol were purchased in Sorata for use in the mountains and transported in five jerrycans. The economic generators (approx 0.4 litres/hour consumption) and use of communal calor gas cookers at Base Camp left a surplus of 18 litres which was given to other expeditions. The stoves were fairly economical despite the altitude and they proved very efficient once it was realised that they had to be kept scrupulously clean. A combination of 'thin' air and low grade petrol blocked jets and burners and a pre-cook clean was necessary. The stoves produced a pocket-rocket flame which boiled water and heated food very rapidly even at the highest camps.

Radios - Phillips Telecom very kindly loaned the expedition 4 handheld PFX transceivers and the associated battery charging set. Although tested fully during the early ascents they proved of limited value. Two-way reception could not be adequately established and they were used very little despite being carried high on several routes.

15. Some very good equipment offers were made by suppliers and manufacturers and these were made use of by team members to upgrade or supplement their personal gear. Mountain Equipment and Berghaus Ltd offered contract prices on their brands of kit and Touringsport of Gosport gave excellent discounts on the broadest range of gear possible from folding buckets and bootlaces to tents and technical hardware. Mountain Technology gave greatly reduced prices on their range of ice axes and hammers and this was taken up by five of the climbers all of whom were impressed by the quality of manufacture and performance of the tools particularly the "Vertige" modular tools.
16. Personal gear was broken into two loads, the maximum allowed on the aircraft, ie 23Kg, plus a surplus of up to 17Kg which went out with the freight. All the gear which accompanied the team, including the medical research equipment used at RNH Haslar prior to departure, was mislaid at Sao Paulo and was not received until six days after our arrival at Sorata. Dangerous items of cargo such as the Cryostat, CO2 and O2 Gas Cylinders were flown out separately and although also delayed they arrived intact.
17. Personal gear was packed into service kitbags, which although adding to the weight provided a degree of flexibility when packing clothing and climbing sundries. Ease of handling, marking for identification and lack of straps to foul transport and baggage carousels were additional advantages. Many personnel simply stuffed rucksacks into them then added poly bags with boots, hardware, ropes, etc as they desired.
18. As in all ventures some ingenuity helped get the best from both kit and situation, but generally all equipment proved sound and reliable and gave good support to a successful expedition.
19. I just hope we get it all back!

#### Acknowledgements

Touringsport Ltd, Gosport  
 Mountain Equipment  
 Mountain Technology  
 Berghaus Ltd  
 Royal Geographical Society  
 Mr Will TALBOT, Atlasair  
 Mr Peter HARRIS,  
 Auto Marine Sales, Southsea  
 Mr Andy MATTERSON, Zurich  
 Supply Dept, HMS SULTAN  
 Transport Section, HMS DAEDALUS  
 BMC, Manchester

Loan of altimetres  
 Freighting of equipment  
 Loan of Radios  
 Generators  
 High altitude carburettor  
 Stores support and storerooms  
 Lorries and bus to London  
 Equipment Insurance

PERSONAL EQUIPMENT AND CLOTHING

<u>Item</u>	<u>Quantity</u>	<u>Cost (£)</u>
Balaclava	1	6.60
Scarf	1	5.00
Salopettes/Climbing Breeches	1 pr	106.00
Shirt	2	30.00 each
Socks	2 prs	4.00 each
Duvet/Mountain Jacket	1	120.00
Cagoule/Waterproof Jacket	1	82.50
Boots Climbing	1 pr	108.00
Boots Walking	1 pr	80.00
Rock Boots/PA's	1 pr	40.00
Training shoes	1 pr	40.00
Gloves (Inner and Outer)	1 pr	22.00
Sleeping Bag	1	280.00
Bivouac Bag (Goretex)	1	90.00
Glacier Goggles	1 pr	25.00
Rucksack	1	112.00
Compass	1	25.00
Watch	1	25.00
Whistle	1	2.00
Headtorch and spare batteries	1	18.00
Climbing Helmet	1	24.00
Climbing Harness	1	27.35
Ice Axe	2	45.00 each
Ice Hammer	1	45.00
Snow Gaiters	1 pr	40.00
Crampons/Footfangs	1 pr	58.00
KFS	1	1.05
Mug	1	0.61
Mess Tins	1 set	3.75
Swiss Army Knife	1	26.30
Sony Walkman	1 (Optional)	
Dhobie Gear		
Water Bottle	1	5.45
Fuel Bottle	1	5.45
Thermos Flask	1	23.95
Ice Screws/Warthogs/Snargs	2 each	6.81 each
Pitons	4	3.36 each
Deadman/Deadboy/Snow Stake	1	12.25
Runners/Chocks/Friends etc	Full Rack	120.00
Extension Slings	3	1.60 each
Descendeur/Stitch Plate	1	10.95
Karabiners (Screw Gate)	6	4.32 each
Karabiners (Snap Link)	6	3.62 each
Sling '8'	2	4.00 each
Sling '4'	2	3.11 each
Stove MSR XGX (Petrol)	1	64.25
Jumars/Prussiks	1 pr	39.95
Housewife (Sewing Materials)	1	
Moneybelt	1	2.00
	<u>TOTAL</u>	<u>1949.03</u>

EXPEDITION COMMUNAL EQUIPMENT

<u>Item</u>	<u>Amount</u>	<u>Cost (£)</u>	<u>Remarks</u>
Tents (High Mountain)	16 @ £375.00	6,000	
Ropes	20 @ £55.00	1,100	
Rope 150m x 7mm Drum	8 @ £155.00	1,240	Fixed rope
Crusader Berghans	30	Naval Stores Item (NSI)	
Kit Bags & Padlock	40 of each	NSI	Excellent
Packing Cases	13	NSI	
Paracord	100m	NSI	
Mallet	1	NSI	
Molegrips	2	NSI	
Screwdriver Set	2	NSI	
Wire Cutters	2	NSI	
Tent Repair Kit	10	26.50	
PFX Radios	4	Nil	
Batteries CP6 1.5v	40	NSI	
Batteries 4.5v	50	NSI	
Table Folding Wooden	2	£21.36	
WD40	5	NSI	
5 Gall Plastic H2O Cont	6	NSI	Excellent used as seats
5 Gall Fuel Container	6	NSI	
2 Litre Fuel Container	2	NSI	Fuel at High Camps
Masking Tape Yellow	10 Rolls	NSI	Good for marking kit
Toilet Roll (Soft)	50	NSI	Essential
Fuel Filter	2	NSI	
Coleman Petrol Lantern	2	72.20	1 broken
Fluorescent Tape	1	NSI	
Tarpaulin	4	NSI	
Gash Bags Black Plastic	100	NSI	
Candles	30	NSI	
Polythene Bottles Ltre	25	NSI	
Snow Shovels	3	RN&RMMC	
Funnels Various	3	NSI	
Dishcloths	20	NSI	
Paper Towel Rolls	15	NSI	
Scotchbrite	20	NSI	
Detergent	5 Litres	NSI	
Altimeter	3	20.70	Hire from RGS
Disinfectant	5 Litres	NSI	
Ice Screws/Snargs etc	25	RN&RMMC	
Snow Stakes	6	RN&RMMC	
Silk Gloves	24 prs	NSI	
Bostick	2 tubes	NSI	
Araldite Sets	3	NSI	
Hacksaw	2	NSI	
Blade Hacksaw	6	NSI	
Waterproof Matches	5 packs	5.50	
Polythene Tubing	1 roll	NSI	
Cardboard Toilet (Arctic)	10	NSI	Excellent
Water Purifying Tabs	3000	NSI	
Camp Gas Stoves & Bottle	2	65.00	
Folding Buckets	2	5.00	Very useful
	<u>TOTAL</u>	<u>£8556.26</u>	

SECTION 7

EXPEDITION CATERING AND LIAISON OFFICER'S REPORT

BY

Lieutenant R S TOUGH FRGS Royal Navy

1. Following my selection for the expedition and having accepted the job of Caterer my first action was to write to as many catering firms as possible to elicit sponsorship. In all I wrote approximately 120 letters and the most disappointing aspect was not the number of polite refusals, but the number of firms who totally ignored my letters.
2. Three firms agreed to help us in one form or another and the United Distillers Group came forward with a sponsorship deal involving cash. Since this went outside of my remit the offer was passed to Steve JACKSON. General Foods Limited, through Ian WILSON the Scottish Regional Account Manager and Paul RANDALL the National Account Manager, were very generous in providing Maxwell House Coffee, Ridgeway Tea and Apeel orange and grapefruit powder in sufficient quantity for the entire expedition.
3. Thus one of the main catering problems, 'brews', was overcome, it being extremely important to ensure sufficient liquid intake during exertion at high altitude in order to avoid dehydration. In addition General Foods provided Bird'S Cheesecake Mix, Instant Whip and Dream Topping. All these were used at Base Camp, requiring only water to provide very popular puddings.
4. The other firm to provide some of its products was Beechams who supplied a box of Bovril Drink Sachets, instant Horlicks and individual Marmite Sachets, all of which proved both tasty and popular.
5. Before proceeding further there were several decisions to be made. It was decided that at Base Camp all cooking would be communal, this ensured that although individuals would split down into climbing teams they would all come together at Base Camp, at least at mealtimes.
6. It had already been decided that stoves for use on the hill would be fuelled by petrol. At Base Camp gas would be used as we had information that it would be available in Sorata, at reasonable cost, and was chosen as a quick, clean and efficient fuel to use for cooking for up to twenty two people.
7. We were also aware that lightweight, packaged food suitable for use above Base Camp was not available in Bolivia but that meat, vegetables, pasta, etc were readily available at reasonable cost. Therefore climbing rations were purchased in UK and all other food in Bolivia.
8. The Director of Naval Physical Training and Sport (DNPTS) authorised payment of Cash in Lieu of Rations (CILOR). The rate of CILOR for Bolivia was obtained from the Director General of Supply and Transport (Navy) (DGST(N)), and the money obtained from the Base Supply Officer HMS NEPTUNE. Dehydrated food for use above Base Camp was then purchased from a UK Cash and Carry firm. All food being transported to Bolivia, thereby adding freight charges to the cost of the food, was either unobtainable in Bolivia or provided free by a sponsor.
9. On Thursday 8 June 1989 John LEONARD and I met at Heathrow's Terminal 4 ready to fly to La Paz as the expedition advance party. There were no tickets and British airways first reaction was to phone Steve JACKSON, however they were eventually persuaded that the issue of tickets was their concern and John and I finally joined BA245 to Sao Paulo via Rio.

10. After breakfast on Friday morning the queues for the toilets soon included a large proportion of the passengers and we arrived in Rio feeling very sorry for ourselves. After an hour on the ground we took off for Sao Paulo and on arrival there transferred to the Varig flight to La Paz via Santa Cruz.
11. About one and half hours after taking off from Santa Cruz on the last leg of our journey by air we landed at Santa Cruz again. Apparently the landing gear had failed to retract and after a delay of another two hours we took off again for La Paz and arrived at 1630, some three and a half hours late.
12. We had expected to be met by Carlos AGUILAR our Guide from the Club Andino Boliviano but we saw no-one and the airport was about to close for the day!! We therefore got a taxi to the Hotel Eldorado in the centre of the city, having landed at over 13,000ft we were feeling the effects of the altitude and turned in early.
13. La Paz was closed for the weekend and for the next two days we contented ourselves with short walks to find the whereabouts of the British Embassy, Club Andino and the British Airways Offices. All that walking left us breathless and we rested and kept up our liquid intake in accordance with medical advice.
14. On Monday 12 June we went first to the Embassy where we were given a brief on the local situation by Alan SHAVE, the First Secretary, and advised that if we wished our freight to clear customs inside six weeks we should employ a local Customs Agent. Orion Ltda were the recommended company as one partner, Juna CARLOS CANELAS was also an advisor to the Minister of the Interior.
15. From the Embassy we went to the Club Andino and met Carlos when it transpired that despite assurances to the contrary he did not speak English! However an aspirant Guide Pedro ARAMAYA spoke good English and he was duly recruited as a member of the team.
16. Our next stop was the British Airways Office where we had to confirm the flights for the main party. They confirmed the BA leg as far as Sao Paulo but insisted that we deal direct with Varig for the onward flight. At the Varig office we were informed that they had no knowledge of our group and that they had only eighteen seats left for the flight on Friday. Since all the bookings had been made through BA in London it was back to them to send a telex to London. We finished off the day by returning to the Embassy to send a signal to Steve explaining the flight situation and also to alert him to the fact that on arrival we had been given a visa for 30 days. By application to the Bolivian Embassy in London it would be possible to have this extended but unfortunately Steve never received this signal.
17. On Tuesday we again did the rounds of the Airline Offices but there was no change. We engaged Orion to act for us in obtaining Customs clearance for our equipment, our communication being in French between John LEONARD and the other partner Elvira. Having agreed with Carlos and Pedro that we would undertake a recce out to Sorata and possibly beyond our next task was to hire a vehicle. International Rent-a-Car offered a Toyota Landcruiser at US \$30 per day plus US \$0.35 per kilometre, however they wanted to hold a credit card as security so I duly left them my Gieves and Hawkes Account Card and everyone seemed happy. I assume that if I had not returned the vehicle, the staff would have been the best dressed people in La Paz!
18. On Wednesday we departed at 0500 Bolivian time which meant that we were collected by Carlos at 0530, for Sorata. Here we confirmed our booking at the Hotel Prefectural for 22 on Friday. We continued on to Canton Ancoma via the Chu Chu pass at 4700m. At Ancoma we agreed a price for approximately 100 Llamas for Sunday. We also looked at an alternative route suggested by Carlos for our walk-in to base Camp. As this would have taken us onto the summit ridge of Illampu it was discounted! We made our way back to La Paz arriving at 2130 after a long, tiring but useful day.

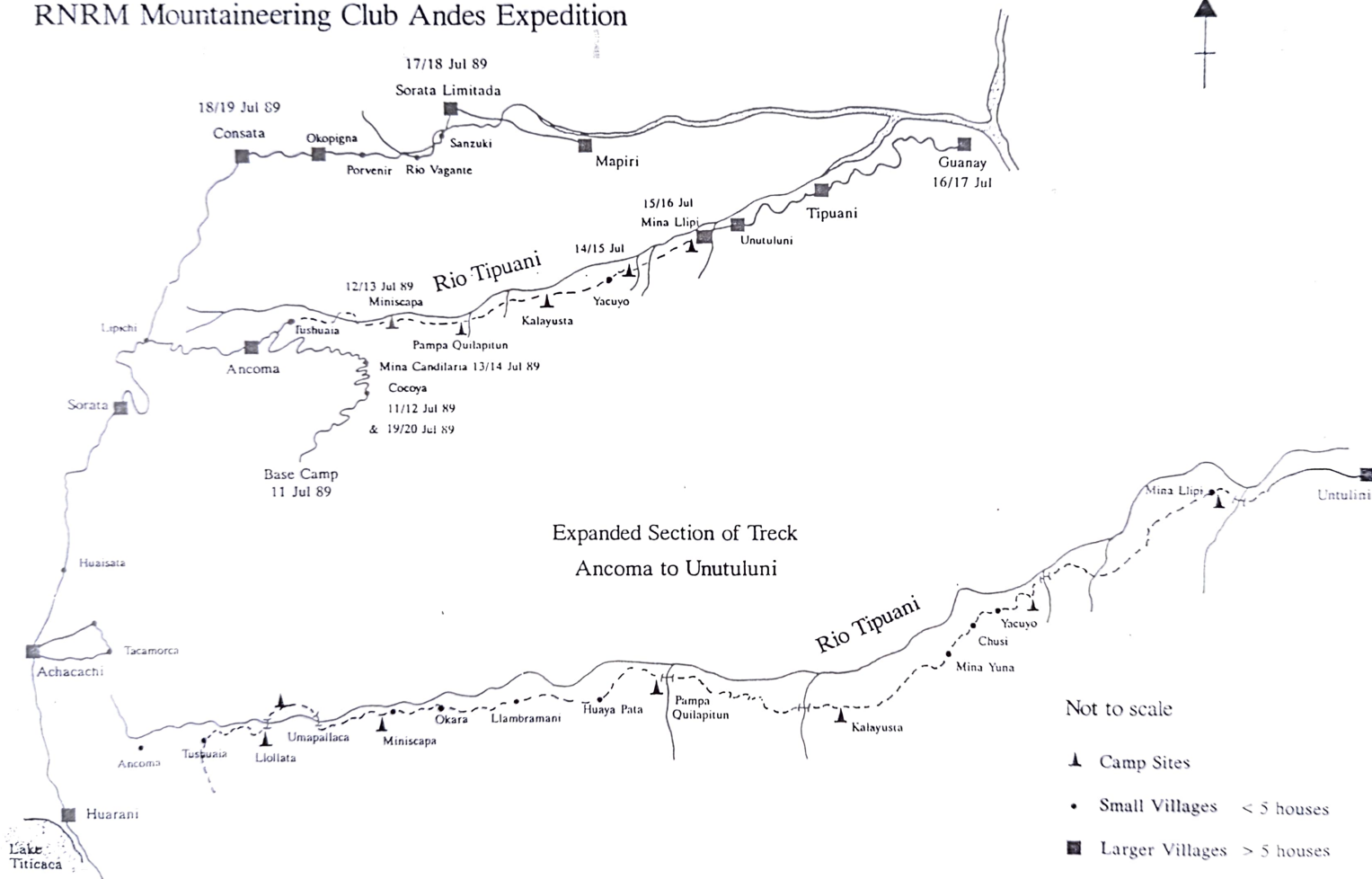
19. On Thursday we at last gained confirmation from Varig that all 20 of our colleagues were booked onto the Friday flight. We went to the immigration office and got our visas extended to 90 days. Afterwards we visited the Indian Market with Carlos and bought utensils, bowls, pots and pans for use in Base Camp and having seen what food was available left Carlos with a shopping list of items to purchase and collect the following day. This only left the confirmation of the road transport, two buses and a lorry which were to meet the team on arrival the next day at 1300 and our job was complete.
20. On Friday John and I checked out of the Hotel and went to the airport to meet the rest of the team. We had arranged to meet Carlos there at 1300. At 1345 Carlos arrived and assured us that transport was available and that all our food was already onboard. The flight arrived two hours late at 1500. We waited in the arrival area and could see the rest of the team in the customs hall, the other passengers passed through customs and still none of our group moved. We could see a lot of discussion taking place and eventually Paul JIGGINS and Steve IRVINE came through to tell us that no baggage had arrived. At 1630 the team came through customs. Steve was welcomed by the President of the Club Andino. It was decided that the bulk of the team would go straight to Sorata and that Pete JOHNSON and Steve IRVINE remained in La Paz with John and I to chase the kit. After emptying my rucksack to lend warm clothing to those without any the two buses departed. The remaining four of us returned to the Hotel.
21. At this stage there were three problems for us to resolve. The hold baggage for the main party was missing, the freight was missing and the Cryostat and other Dangerous Cargo sent separately from Northwick Park was missing. Orion were tasked with finding the Cryostat whilst we went to the airport and contacted Varig. They informed me that the baggage had not been passed to them by British Airways but at my insistence they sent a telex to Rio, Sao Paulo and Santa Cruz requesting the whereabouts of the luggage. On return to La Paz I contacted Orion who informed me that some of the freight and the Cryostat had arrived. I returned to the airport that evening with Raoul GONZALEZ of Orion and found 21 of the 53 items of freight had arrived, however customs had a waybill for 53 items and could not release anything until all 53 items were present though they would release the Cryostat. Sorata being beyond the telephone network I sent a telegraph message to Steve.
22. Sunday was a very frustrating day with everything closed, I made another trip to the airport and again contacted Raoul. On my return Steve had arrived in La Paz.
23. On Monday we were able to speak to the British Airways staff and put down a marker on a claim for loss of the team's baggage. The answer to the telex sent by Varig had arrived, the kit was in the customs shed in Sao Paulo.
24. On going to the airport with Raoul the freight was produced, like a rabbit from a customs shed that I had not previously visited. This was immediately despatched to Sorata by lorry, accompanied by John and Steve IRVINE.
25. On Tuesday the baggage arrived on the daily Varig flight and Steve JACKSON, Pete and I departed for Sorata, with the baggage in a seriously weighed down airport minibus.
26. My liaison duties had not finished, on Sunday 02 July Paul GREGORY and I left Base Camp at 0800 to return to La Paz. It had snowed overnight and what should have been a 3 hour walk to Cocoyo turned into a 8 hour epic. Once in Cocoyo we met Carlos as arranged and departed for La Paz. Heavy snow had made the passes at 4400m and 4700m respectively very difficult to negotiate. What should have been an 8 or 9 hour journey to La Paz took over 27 hours.



27. On Tuesday 04 July we went first to the Embassy to send a sitrep signal to the Expedition Patron and the RN&RMMC and to collect mail. We also arranged to cash a cheque, the team having to stay in hotels in La Paz and Sorata for an extra six days had made a big hole in our finances. After a phone call to the expedition's bank in Kilcreggan the Embassy through the kind offices of Alan SHAVE agreed to cash our cheques.
28. We then called on British Airways to enquire how our claim for compensation was progressing and were told that it had been rejected. When we returned to the Embassy to collect our money we were informed that the Bolivian Navy had shown interest in our expedition.
29. On Wednesday we first took 20 passports to the immigration office in order to extend the visas from 30 to 90 days. Surprisingly this was done with almost no delay. Next we went to call on the Local United Distillers Group representative, part of the sponsorship deal being a Press Conference on completion of the expedition which they were arranging, followed by a Cocktail Party in honour of the Embassy Staff and others who had assisted us in Bolivia.
30. We then presented ourselves at the Navy Offices where we were received by an Aide to Vice Admiral SARENZ KLINSKY, Chief of Naval Staff. We invited a team to the cocktail party being thrown by UDG after the Press Conference and departed on good terms.
31. We were now ready to return however we had been the last vehicle to get along the Cocoyo road which was now impassable. We spent the day shopping in La Paz. In the evening we were assured by Carlos that we could reach Cocoyo on Saturday. Having arranged to be collected at 0700 we were not surprised to be still waiting at 0800. We finally departed at 0900, Carlos and Pedro in a jeep and Paul and I in a Suzuki driven by the President of the Club Andino.
32. Following short stops for lunch and to purchase more provisions we arrived at Cocoyo at 2025 and slept that night in the gold store. On Sunday 09 we arranged for 6 Llamas to carry the additional supplies up to Base Camp and walked up ourselves.
33. To return to Catering, the basis of the diet at Base Camp was made up of pasta and rice with some potatoes and sweet potatoes. Beef was by far the cheapest meat available and proved to be of good quality, this was served up as steak or cut up and flavoured with either curry powder, chilli, garlic and cayenne pepper. Chicken was also available as was tinned fish, mainly tuna and salami which provided a reasonably varied diet.
34. The main meal of the day was eaten at about 1830, just before dark. Breakfast consisted of either bacon and eggs or porridge, lunch was a snack meal of soup, cheese or salami and fresh fruit. Fresh(?) bread rolls were delivered to Base Camp each Monday and these were supplemented by chapatis and bread rolls which we baked ourselves. A kettle was kept boiling most of the time and brews were always available. All fresh fruit and vegetables that were not cooked were soaked in a potassium permanganate solution for 30 minutes prior to eating.
35. Food for use above Base Camp consisted of a breakfast of instant porridge, a main meal of dehydrated meat, dried vegetables and either pre-cooked rice or instant mashed potato or an instant meal from the Batchelors Micro Chef range. A large selection of snack meals and drinks were available for use during the day.

36. Several lessons were learnt, in the list I had handed to Carlos I had asked for dried peas and beans, it seemed perfectly natural to him to purchase chickpeas and kidney beans. The problem that this represented was that water at Base Camp 'boiled' at approximately 65/70°C and the pressure cooker purchased in La Paz was faulty. These vegetables could not be cooked properly and were thrown away. The main vegetables used were onions and carrots although these and all meat had to be fried in oil before being added to a stew or curry I had allowed for peoples appetites to increase markedly once they had started to work hard, in some cases this was true but not for the majority, thus I could have kept to quantities given in catering manuals.
37. Drinking water was taken from a fast running stream adjacent to Base Camp, just to be on the safe side all water was collected in 5 gallon containers and puritabs were added. The water being heavily oxygenated was probably safe to drink untreated but we were not prepared to take that risk. Cooking pots and utensils were rinsed out with potassium permanganate solution after washing and prior to use. The standard of hygiene at Base Camp was good and nobody suffered particularly from an upset stomach at Base Camp or above.

Sketch Map Of Bolivian Trek 11-20 July 1989  
 RNRM Mountaineering Club Andes Expedition



TREKKING REPORT  
BY  
Commander P GREGORY Royal Navy

Introductions

1. Starting on 11 July 1989, eight members of the Joint Services Expedition to the Cordillera Real, Bolivia undertook a trek from the Expedition Base Camp, above the remote village of Cocoyo, across the Andes to Guanay in NE Bolivia. Following the old Inca trail on foot via an Easterly route and using road and river transport wherever possible for the return journey, to finish 19 July 1989.

Party Members

2. Paul GREGORY        Team Leader  
 Mike BEELEY  
 John BROOME  
 Willy SAMPSON  
 Dave BURKE  
 Nigel LUFF  
 James Mc INNES  
 John LEONARD

Summary

<u>Date</u>	<u>Event</u>	<u>Time</u>
11 July	Dep Base Camp for Cocoyo, o/n.	4 hrs 15m
12 July	Mina Candelaria, Cachawidi Valley, Tushuaia, Miniscapa, o/n derelict village.	7 hrs 45m
13 July	Okara, Lambramani, Pampa Quilapitan, o/n near bridge.	7 hrs 25m
14 July	Mina Yuna, Chusi, Yacuyo overnight. (Ant problems).	6 hrs 40m
15 July	Puente Nairapi, Mina Llipi overnight.	6 hrs 55m
16 July	Toyota Pick-up to Untulini, Tipuani, Guanay o/n in hotel. (Festival).	40m
17 July	Boat to Mapiri then truck to Sorata Limitada overnight.	
18 July	River crossing to Rio Vagante, Porvenir, Truck to Okopigna, Consata overnight.	4 hrs 45m
19 July	Truck to Florida, Lipichi and Ancoma. Walk to Cocoyo for overnight stay.	3 hrs 55m

<u>Total Time Walking</u>	42 hrs 20m
<u>Total Time in Boat</u>	5 hrs 35m
<u>Total Time in Transport</u>	17 hrs 40m

<u>Estimated Distance Covered:</u>	Walking	170 km
	Boat	33 km
	Truck	354 km
	<u>Total</u>	<u>557 km</u>

## Diary

4. 11 July 1110 - Departed from Base Camp with 21 kg packs following the recognised route used by the locals to Cocoyo, a small farming and mining hamlet. Weather dry and clear, warm sun with slight breeze.

1614 - Arrived at Cocoyo, set up camp beside village football pitch. Dinner - Chicken Supreme and Rice - delicious after some of the food we had sampled at Base Camp. Walked to village to discuss final arrangements with our guide for the trek - Pedro Silva. Sent proposed itinerary by runner back to Base Camp.

2010 - Bed.

12 July 0650 - Awoke, noticeably warmer than 1,100m higher at Base Camp. Porridge for breakfast, packed up and were ready to leave by 0810. Low cloud, little wind.

0830 - Departed Cocoyo, with Pedro, followed roadway to Mina Candelaria before branching off along a narrow track to cross mountains to Rio Tipuani valley. Temperature inversion meant that passage through the clouds was cool but this was countered by some pretty tough walking.

1135 - Arrived at dip in saddle, 4200m, to see both valleys spread out before us. A quick snack in glorious sunshine raised morale before our descent. Impressive views of snow capped mountains surrounded us.

1305 - Arrived Tushuaia, a 3 house settlement whose owners were scratching a living from rather poor soil. Lunch of sardines and cream crackers that had been purchased in Cocoyo.

1325 - The Inca trail started, a well defined cobbled roadway about 3 ft wide along the valley floor. Weather grew misty from low clouds. Stunted trees and vegetation on either side. We met locals at work in the fields and approaching us along the track.

1655 - Arrived Miniscapa, nice campsite with river nearby, well shaded. Local houses, were we had hoped to buy food are shut and locked, they looked as though they not been occupied for several months - result the food our guide assured us that we could purchase on the way was not available. We pooled all our food and managed a scratch meal including Chapatis which went down extremely well.

2150 - Bed, good but tough day overall.

13 July 0725 - Sunny. Nothing to eat for breakfast so after hot drinks decided to press on to Okara in the hope that we could buy something to eat there. Humming birds and lush vegetation surrounded us.

1210 - Arrived at Okara - A shop! Well a mud hut in the middle of a terrace of mud huts. Total stock comprises Sardines and Tuna, pasta, rice and macaroni, 4 small beers and papaya juice. Shop owner persuaded his neighbour to boil up some pasta for us which we duly mixed with tinned tuna - delicious!

1330 - Left Okara and started to climb upwards and ever upwards. The Inca trail was well defined and had obviously taken considerable skill and patience to construct. Sawtoothed our way up and down the trail stopping on the way for Cerveza and grenadines. Children, chickens and pigs seemed to be everywhere when we passed through the odd hamlet.



: BEELEY, SAMPSON, BROOME, PEDRO, LEONARD, GREGORY, LUFF, McINNES, BURKE.

1640 - Passed Huayna, Pedro was loathe to stop as we still had some distance to cover before we reached our next campsite. However at the next farm, populated by a number of 'attractive' girls, it was a different story. We were offered overnight accommodation but declined - bed bugs and dirt - all for \$b2 (50p) per night. Amazingly we were then asked for a toll of \$b2 to use their roadway, a path no different from any other we had previously used, but down rather than up! We paid.

1800 - Arrived at the campsite at last, Nigel whirred into action, preparing dinner, whilst Pedro started a log fire. Dinner of pasta, tuna, onions, tomato puree and real coffee.

2145 - Heads down, tired and happy.

14 July 0714 - Blue sky with light puffy clouds, decided to press on without breakfast before the heat of the sun started to make walking uncomfortable. Why were our campsites always at the bottom of a mountainside? Undaunted we plodded upwards through the dense vegetation to reach a clearing from which we could see a gold mine below, they seemed to spring up in the most unlikely spots.

1130 - Stopped for a break, we seemed to go on and on. The spectacular views were beginning to wear a bit thin by now and we still had another two hours to go before reaching the next village.

1310 - Arrived at Mina Yuna, a gold mining village of about twenty timber and corrugated iron shacks. The villagers owned generators, videos and TV sets which they had secreted about the place. A restaurant! We managed to persuade the ample lady owner to start cooking for us. Unlimited supplies of beer and Egg Banjos at the rather extortionate price of £3.50 per head.

1430 - Replete we headed off for our next destination, Chusi, where we found an upmarket supermarket with shelves bulging, we stocked up with victuals for the evening dinner and carried on.

1740 - Having collected water 20 minutes earlier we arrived at our next campsite, an idyllic spot marred only by the fact that it had no water. Wild pineapples, lemons - that did not taste sour - and bananas that weren't, were everywhere.

2045 - Dinner over and a chat around the campfire we retired to bed, serenaded by the never ending sound of the crickets.

15 July 0706 - Disturbed night for most of us because of the heat which was very oppressive, decided to press on early and stop for breakfast near a fresh water supply. Amazed to find that during the night, Soldier Ants had managed to eat through several peoples rucksack straps and had devoured parts of the tents' mosquito nets.

0900 - Found a nice spot with waterfall for a break, enjoyed a good wash. This and full stomachs made for a happy team. Weather slightly overcast so pleasant for walking, needed because the going was still up and down with monotonous regularity and very tough.

1230 - Lunch as breakfast, the jungle was now more heavily populated with humans. We met local Indians with their Burros, the latter piled high with cases of beer. We all had a swim in bitterly cold water beneath a beautiful waterfall followed by a leisurely lunch.

1400 - Upwards along the track on one of the now familiar Inca staircases.

1520 - Left Inca trail and crossed over into Miners track washed away in several places by heavy rain earlier in the year. Willy took a nasty tumble but recovered well, nothing broken.

1620 - Cerveza at yet another mining settlement, noticeable how the red earth has been dug away by the Bolivians in their search for gold.

1800 - Arrived Mina Llipi the end of the main trek. Dinner - Steak, chips and eggs - twice! TV video featuring would you believe Braddock in English with Spanish sub-titles. Camped on their football pitch overnight and made arrangements for road transport to Guanay for the following day.

2242 - Bed, slightly inebriated, but happy and proud of our achievement.

16 July 0705 - Slightly overcast. Football pitch smelt like an open sewer/farmyard, heaven knows what we had slept on.

0905 - Left village to make our way on foot across high wire bridge to awaiting transport - Toyota.

1015 - Untuluni. Celebrations for the Birthday of La Paz were in full swing. Brilliant sunshine. Traditional pan pipe band with drums all being played by the local children as they marched through the centre of town.

1045 - Off again, very bumpy ride through yet more villages and hamlets all festooned with bunting.

1220 - Tipuani - more celebrations, stopped for lunch.

1520 - Guanay. For a 'large town' this came as a bit of a shock. There were only 3 hotels and they were all pretty grim. Selected the best, dusty, with 5 and 4 bed dormitories, however the showers were hot and we had a chance to wash some clothes.

1800 - Dinner excellent. Even bigger Birthday celebrations (La Paz again) which went on all night. Negotiated for boat to take us all to Mapiri departing the following day.

2200 - Bed. Will they never stop playing that music! It went on all night literally interrupted by locals beating down the Hotel door in search of a bed for the night. Fortunately there was no room at the Inn.

17 July 0630 - Awoke after a very comfortable night.

0717 - Moved out to catch our boat at the 'harbour'. Not our own as promised but the local ferry transport to Mapiri. Approximately 40 locals joined us so it was just as well that we had booked the night before. We sat four abreast athwartships in the wooden vessel some 50 feet long powered by twin 80 HP outboards. Life raft - an inflated lorry inner tube! Discovered that there was no Sunday ferry services, the day before so it was just as well as we arrived when we did.

0741 - Slip and proceed. River water level was low because of the dry season and we went aground on two occasions. Frequently stopped along the way to drop off Gold Miners at their settlements alongside the river bank. They pan for gold at the edge of the river, sleeping under makeshift tents. The boat had to ford rapids in several occasions climbing as much as 5 feet in about a boats' length.





Trekking in the jungle



River transport

1315 - Arrived Mapiri, very sore behinds, very uncomfortable journey. The scenery changed dramatically as we went up river we had left behind the mountain peaks well behind us and replaced them with flat terrain and lush vegetation. Lunch at the local Hotel where yet another celebration was in full swing.

1615 - After a considerable delay Pedro managed to obtain a 'jeep' plus driver to take us to Sorata Limitada. This meant a slight change of plan, we had originally intended to travel by boat but the local boatman was far from keen to risk his vessel at night in the low water level. Long and bumpy journey.

1920 - Sorata Limitada. would you believe another Fiesta! Folk music was being played in the square. Camped on another football pitch - clean this time. Good dinner at local restaurant.

2035 - Bed with music to serenade us.

18 July 0700 - Misty morning, good nights sleep.

0810 - Good breakfast at the same restaurant we had frequented the night before. Pedro had sorted out the transport.

0945 - Depart for Rio Vagante.

1005 - Left transport at foot bridge for downward walk to river bed, forded gentle tributary and followed the main stream. Because the road, washed away at several points, twisted well away from our direct route the locals had advised us to take the most direct route, fording the main river. Undaunted by the strong flow and depth of water our advisers assisted across - quite an experience.

1300 - Lunch and an opportunity to thank our river crossing team with a beer.

1342 - No transport so we followed the road and hitched lifts along the way. Surprisingly easy to be given a lift but they were all for a very short distance.

1645 - Contracted the 'Fat Family' to take us to Consata. Didn't expect Mum, Dad, Son, Dog, Driver plus nine of us to squeeze into the Chevrolet but by now we were used to Bolivian transport. We were entertained by the most terrible of Bolivian music tapes which all sounded the same.

1840 - Consata. Good bunkhouse accommodation, clean with new beds - obviously the owner was gearing herself up for the Gold Rush.

1930 - Dinner. Purchased food for the journey the following morning from the corner store.

2235 - Bed, wind beginning to get up.

19 July 0500 - Awoke early for a prompt start with the Fat Family who we had contracted to take us on to Ancoma.

0600 - Arrived at Chevrolet on time, ready for the off, Fat Family nowhere to be found. Nigel opened the door of chevy only to have Mrs Fat fall out of the car straight into his arms - they were still fast asleep.

0610 - Off at last, after yesterday I insisted that Mr and Mrs Fat and their dog occupied the front seats with their driver, much the best routine.

1240 - Arrived at Lipichi for lunch. There was now a marked change in the terrain as we were well away from the Yungas and back to the mountains region. Another success! The roadside shack where we had planned to eat had run out of food.

1310 - Pressed on Fat Family far from happy. They had not realised how terrible the road was and also the route took them away from their destination, Sorata. Still, having made a bargain we were determined that they should honour their part of it.

1500 - Ancoma. Here we found that some members of the climbing team had returned to La Paz a couple of days early and that those remaining at the Base Camp would be returning a day earlier than planned, the following day, bringing all of our kit with them. We were all secretly quite relieved at not having to climb all the way back to Base Camp just to pack up, turn around and come back down again.

1510 - Started trek to Cocoyo - the last leg. After all those many hours in trucks we found the going tough but it didn't take long to blow away the cobwebs.

1905 - Trek ends - more Cerveza at Pedro's. Temperature rapidly falling as we are now high again.

2010 - Pitch tents, cook dinner.

2245 - Bed, tired, cold but happy.

TREK FINANCIAL STATEMENT

11 Jul	Cocoyo	Food	40
13	Okara	Food/Beer	102
14	Mina Yuna	Food/Beer	188
15	Mina Llipi	Food/Beer	255
		Transport	170
16	Guanay	Hotel	45
		Food/Dinner	111
17	Mapiri	Food	200
		Boat Trip	360
		Transport	100
18	Sorata Limitada	Food/Beer	119
		Transport	40
		Transport	210
19	Consata	Hotel	45
		Food	10
		Transport	280
		Guide	<u>200</u>
		Total	<u>\$b 2475</u>

STATEMENT OF INCOME AND EXPENDITURE

<u>INCOME</u>	<u>£</u>
Personal Contributions	22,000.00
Joint Service Expedition Trust Sponsorship	12,500.00
Joint Service Expedition Trust Endorsement	1,000.00
Cash in Lieu of Rations (CILOR)	5,409.36
Sailors Fund	4,000.00
Director of Naval Physical Training and Sport	2,800.00
RN & RM Mountaineering Club	2,700.00
Fleet Amenities Fund	2,385.00
United Distillers Group	2,000.00
British Airways	1,823.00
Nuffield Trust	990.00
Director of Naval Recruiting	740.00
Northwick Park Research Fund	500.00
Sale of Expedition Jumpers and T-Shirts	365.50
Director of Public Relations (Navy)	250.00
Touring Sport (Gosport) Ltd	200.00
Ferranti	200.00
HMS NEPTUNE Adventurous Training Fund	100.00
FOSNI AT Fund	75.00
Bank Interest	39.05
TOTAL	<u>£60,076.91</u>

**EXPENDITURE****£**

Air Fares UK to La Paz	19,602.00
Equipment	8,556.26
Food	5,551.38
Freight UK to La Paz	4,685.51
Freight La Paz to UK	3,000.00
Gamow Bag (inc customs)	1,437.72
Recce	2,618.02
Customs charges (importation) La Paz	933.00
Customs charges (exportation) La Paz	400.00
Photography	450.00

**ACCOMMODATION**

Hotel Prefectural (Sorata)	16-22 June	1,823.00
Hotel El Dorado (La Paz)	09-21 June	480.00
Hotel Espana (La Paz)	21-26 July	800.00
Hotel Unico (Rio de Janeiro)	27 Jul - 02 Aug	849.00

**TRANSPORT**

La Paz - Sorata	(2 Buses/1 lorry/1 transit)	670.00
Sorata - Cocoyo	(1 Lorry/3 Toyotas)	1,120.00
Cocoyo - La Paz	(3 Toyotas)	700.00
Sorata - La Paz	(Kit)	170.00
La Paz - Airport		83.35

**PORTERAGE**

Cocoyo to Base Camp - Llamas	(x 132)	769.25
- Arrieros	(x 28)	107.70
- Porters	(x 18)	161.55
Base Camp to Cocoyo - Llamas	(x 70)	407.95
- Arrieros	(x 15)	57.70
- Porters	(x 11)	98.00

Training Meets and Committee Meetings	472.80
Expedition Jumpers	406.41
Embroidery	138.12
Expedition T-Shirts	175.00
Expedition Badges	329.05
Bank Charges	50.81
Maps	232.75
Photographs for Report (192 copies)	697.00
Topographical Model (1:50,000) Cordillera Real	1,032.00
Expedition Launch (RGS) Food	371.45
Wine	305.56
Hire	305.00
Miscellaneous	29.57

TOTAL EXPENDITURE

£60,076.91

EXPEDITION DIARY

<u>DATE</u>	<u>EVENT</u>
06 Sept 87	Application for approval submitted.
19 Sept 87	Expedition approved by DNPTS.
11 Apr 88	AMA & RAFMA invited to apply for places.
11 Apr 88	Application for Diplomatic Clearance.
28 Apr 88	CILOR approved.
04 May 88	Second Sea Lord (desig) invited as Patron.
12 May 88	Patronage accepted.
01-20 Jun 88	Recce
08 Jun 89	Advance Party depart UK.
09 Jun 89	Advance Party arrive La Paz.
10 Jun 89	Main Party muster RN Hospital Haslar.
11 Jun 89)	Medical Research RNH Haslar and Institute of Naval
13 Jun 89)	Medicine.
14 Jun 89	Advance Party to Sorata and Ancoma.
14 Jun 89	Expedition Launch RGS.
15 Jun 89	Main Party depart UK.
16 Jun 89	Arrive La Paz then Sorata - Start Research.
20 Jun 89	Expedition Equipment arrive Sorata.
21 Jun 89	Personal Baggage arrives Sorata.
22 Jun 89	Travel to Cocoyo - Suspend Research.
24 Jun 89	Move from Cocoyo to Base Camp.
25 Jun 89	Medical Research Recommenced.
28 Jun 89)	See Summary of Mountaineering
19 Jul 89)	achievements in Section Two.
11 Jul 89)	Trekking Party away - See Section
20 Jul 89)	Seven.
20 Jul 89	Base Camp to Cocoyo.
21 Jul 89	Cocoyo to La Paz.
23 Jul 89	Visit Lake Titicaca.
24 Jul 89	Ski-ing on Chacaltaya (5600m)
25 Jul 89	JACKSON/BROOME/GRIMLEY/GREGORY appear on TV Chat Show and talk about expedition.
26 Jul 89	Post Expedition Press Conference and Cocktail Party La Paz.
27 Jul 89	Depart La Paz for Rio De Janeiro.
27 Jul 89)	Rest and recreation in Rio.
02 Aug 89)	
03 Aug 89	Arrive Heathrow.



ACKNOWLEDGEMENTS

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Admiral Sir Brian BROWN, KCB, CBE - Second Sea Lord  
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 The Mount Everest Foundation  
 Mr Alan SHAVE - 1st Secretary British Embassy La Paz  
 Director of Naval Physical Training and Sport  
 Commander T C BUNN Royal Navy  
 Commander B WESTLAKE Royal Navy  
 Lieutenant Commander Bob DUNKLEY Royal Navy  
 Commander R C PELLY Royal Navy  
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 Mr M TRAVIS - Derbyshire Pennine Club  
 Surgeon Commodore (Naval Medicine and Training)  
 Expedition Advisory Committee (EAC), RGS  
 Senor Sergio CALLUPE  
 Hans CALLUPE  
 Mr David HALL, FCIS - RGS  
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 Nuffield Trust  
 Director of Naval Recruiting  
 Director of Public Relations (Navy)  
 Northwick Park Research Fund  
 Ferranti

HMS NEPTUNE Adventurous Training Fund  
FOSNI AT Fund  
Professor Igor GAMOW



ROYAL NAVY  
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MOUNTAINEERING CLUB  
EXPEDITION TO CORDILLERA REAL  
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