APPENDIX 2

Logistics

by Chris Bonington

Logistics and planning may seem the very antithesis of the romantic adventure that mountaineering undoubtedly is. Without careful planning, however, even the smallest two-man trip may fail through lack of food or equipment at the right place at the right time and the romance will quickly turn sour. Personally I have found the planning of an expedition, particularly one as complex as Everest, an intriguing intellectual exercise. These notes are designed to show the course of my thinking in planning our attempt on the South West Face of Everest, but they would be relevant to the planning of any siege-style mountaineering expedition, where a series of camps, linked by fixed rope, are set up.

FIRST STEP

The way I set about it was to start with the summit bid, and then to work back down to determine the number of camps, amount of fixed rope, tentage and other supplies I was going to need. This also indicated the ideal size of team for the climb in hand. At this stage it is also possible to make an initial assessment of the consumption of food and oxygen in the higher camps, but as one gets further down the mountain this becomes too complex and one needs a separate set of calculations.

I have listed in Annexe A the quantities of equipment I assessed we needed from Camp 6 back down to Camp 1. This provided the foundation of my planning for our rate of progress up the mountain and my deployment of the climbers and Sherpas at my disposal. Annexe A also sets out the basic approach to the climb.

DEPLOYMENT ON MOUNTAIN

I had now worked out the weight and quantity of non-consumable supplies (items such as tents, cooking stoves, rope and medical kits, that would stay at each camp or in place on the mountain once they had been carried there). I also calculated the reserves of consumable items such as food/fuel and oxygen to be held at each camp. All this weighed 8,785 lbs (251 35-lb loads) and had to be carried from Base Camp to the appropriate camp on the mountain. The simplest way would have been to shift the lot from one camp to the next using all our carrying power to do it, only moving up as each stage was completed. This course, however, would have been slow and cumbersome, since this would have involved moving all our gear up to our highest point before moving on up to the next camp. This in effect would mean that the speed of our advance would be determined by the build-up of supplies and not by the pace set by our lead climbers.

The solution was to move no more supplies into each camp than was necessary

to sustain the advance; this made it possible to ensure that the lead climbers were never held up for lack of supplies. To achieve this ideal, however, was not easy, for it meant calculating exactly what supplies would be needed at each camp at any time and then ensuring that we had sufficient carrying power, and that it was correctly deployed.

The rate at which we could carry gear up the mountain, assuming a given number of carriers, depended on four factors:

1. The number of rest days required.
2. The effective payload that could be carried by climbers and Sherpas at different heights.
3. An estimate of failures to make carries because of sickness, misunderstandings, etc.
4. The weather—this was something that one couldn't predict. I therefore worked out the best possible rate of progress and ensured we had sufficient reserves at each camp so that we could sit out periods of bad weather.

The estimates I worked out are shown below:

PLANNING FACTORS—Reproduced from the original Planning Document before the Expedition

1 REST RATES

a Sherpas

Base to 3	1 day in 4.
2 to 4	1 day in 2.
4 to 5	Last time we only managed to keep the Sherpas at 4 for two days, during which they made two carries, then returning to 2. To keep 6 Sherpas at 4 this would mean one would need 18 altogether, the other 12 resting or moving. This time, with a better Camp 4, I hope to keep the Sherpas up for 4 days, one of which would be resting. They would then return to 2 and have three days rest before returning. This would mean we should only need 12 Sherpas for the 2 to 4 carry.
5 to 6	Probably not more than 2 carries in succession without a rest—will have to play by ear. They would use oxygen.

b Climbers

Base to 3	Allow every other day.
2 to 4	It is unlikely that the climbers would manage this carry—we might be able to use carries for a 3 to 4 carry once again on an every other day principle.
4 to 5	Every other day. Last time several members of the team made this carry without oxygen—a definite plus.
5 to 6	Same as Sherpas. At this height the climbers probably have the edge on the Sherpas.

2 LOADS

a Sherpas

Base to 3	35 lbs (Camp 2 food boxes 38 lbs, which they should manage)
2 to 4	30 lbs
4 to 5	30 lbs
5 to 6	20 lbs

b Climbers

Base to 3 24 lbs (.66 load)
3 to 4 20 lbs
4 to 5 20 lbs } using oxygen to bring it to 32 lbs
5 to 6 20 lbs }

These weights are based on what happened last time. If climbers can manage more without smashing themselves this will obviously be a good plus. All climbers carry their personal gear from camp to camp which almost certainly will be more than the above.

3 FAILURE TO MAKE CARRIES

This is very difficult to assess, since it can depend on sickness, lack of morale or alternative use of people. In any day's carry I have reckoned on the following percentage of loads not being taken to their destination—

Base to 3 10% 2 to 4 20% 4 to 5 40%

FORMULA FOR MOVEMENT UP MOUNTAIN

Using the above information I now had to work out the most effective way of deploying our carrying power, in the first instance to place in the appropriate camp all the non-consumable items and then to ensure that the expedition's daily consumption was met. There were two major consumable items—food/fuel—which could be considered together, and above Camp 4 oxygen for both climbing and sleeping.

I therefore calculated the weights involved of both durable and consumable items as shown in Annexe B.

Having done this I was ready to calculate our rate of progress and deployment on the climb. In the early stages the vital factor was the problem of clearing firstly Base Camp and then Camp 1 of all the non-consumable items and reserves of food/fuel and oxygen, sufficiently quickly so that I could move the bulk of my thirty-four high-altitude porters up to Camp 2, to start relaying our gear up the Face. With fifty-seven Sherpas and climbers at Camp 2 and above, I had calculated I needed a minimum of twelve carries a day to Camp 2 just to keep them supplied with food/fuel and oxygen (to keep my oxygen reserve at 2 at the desired level as bottles were taken out of it, up the Face). My calculations are shown as follows:

Day 0: At Base—17 climbers, 60 Sherpas, 2 cook staff—independent 12 B.B.C. team 251/351b loads to go to 1 and above plus daily consumption.
Day 1: 'A' team plus four Sherpas move to 1.
Day 1 to Day 3:

Available Manpower				*Effective Loads*
Climbers/ Sherpas ×	Rest Days ×	Sherpa Loads ×	No. of days available to carry	
15 (Cl.)	.50	.66	3	15
54 (Sh.)	.75		3	121
				136 less 10%* = 123 loads
				− 4 loads (consumed)
				119
				− 48 loads stay at 1
				71 loads to go on

Calculation of food/fuel consumed at
1 and above for Day 4 on: 45 people × 5 lbs = 7 loads per day
Time taken to clear base with 30
Sherpas at Base: 251–119 = 132 loads to be shifted from Base =
30 (Sh.) .75 = 23 loads per day
less 10%* = 20 loads
− 7 loads consumed at 1
13 loads per day with stockpile to go on

Therefore it will take 11 days to clear Base Camp of all non-consumable items and consumable remains.

Day 5 to 7 from 1:

10 (Cl.)	.50	.66	3	10
28 (Sh.)	.75		3	63
				73 less 10%* = 66 loads
				− 2 loads consumed at 2
				64 loads to go on

Day 8 to 12 from 1:

5 (Cl.) from Day 9 on				
5 (Cl.)	.50	.66	5	8
24 (Sh.)	.75		5	90
				95 less 10%* = 88 loads
				− 11 loads consumed at 2
				77 loads to go on
				141 loads accumulated at 2

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* Inefficiency factor

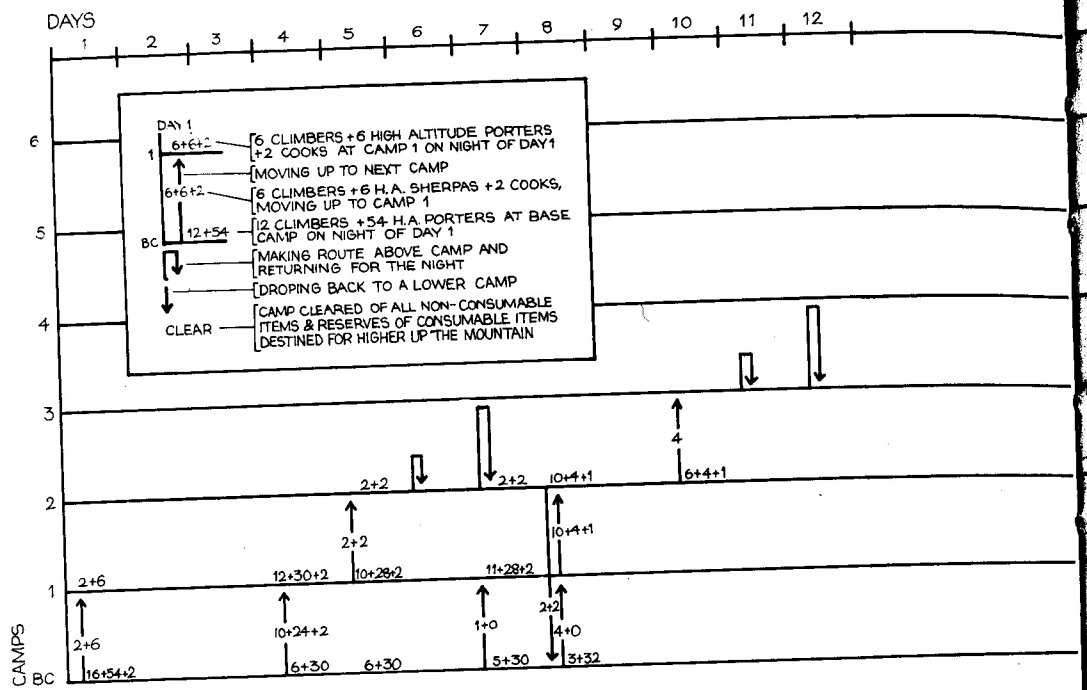
Daily consumption at 1 and above, including
B.B.C. team—71 people = 11 loads food/fuel
1 load film stock
12 loads per day

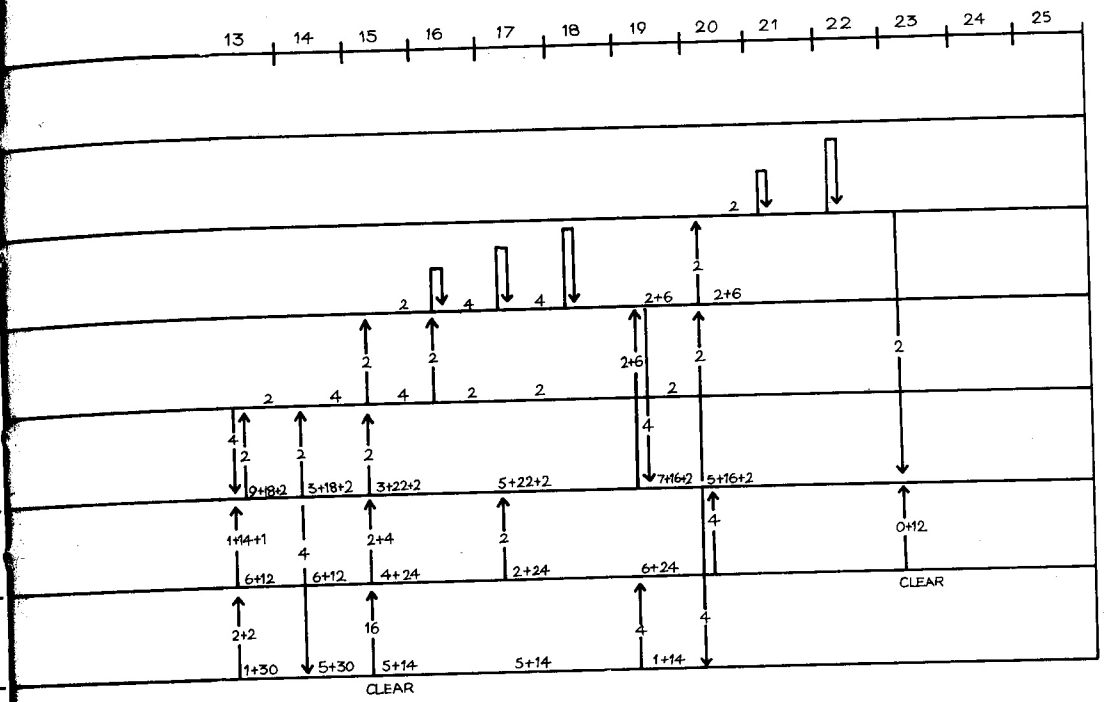
Daily consumption at 2 and above, including
B.B.C. team—41 people = 6 loads food/fuel
1 load film stock
7 loads per day

Day 13 to 15 from 1 to 2
Holding consumption rate plus a bit more taken up with the many things I can't have accounted for, from Mick's false teeth to a forgotten pair of boots.

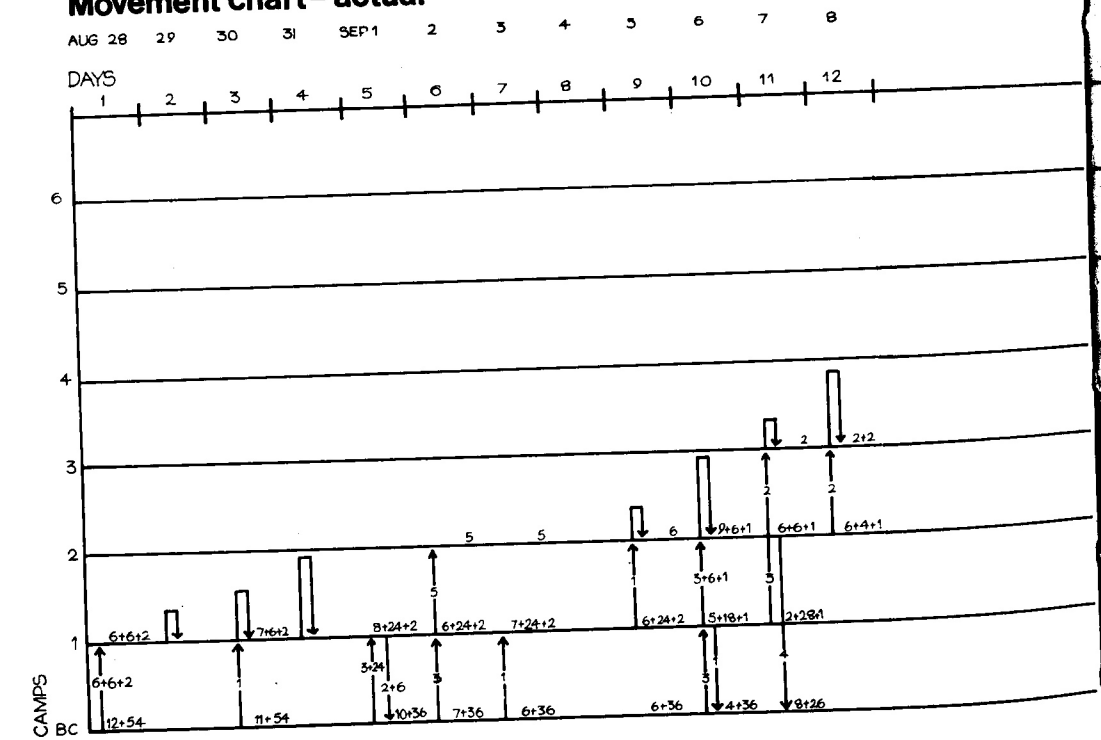
Day 16 to 22 from 1
Time taken to shift 66 loads to Camp 2 to clear 1:
204 − 138 = 66 loads. After consumption at 1, 10 loads per day
7 days to shift

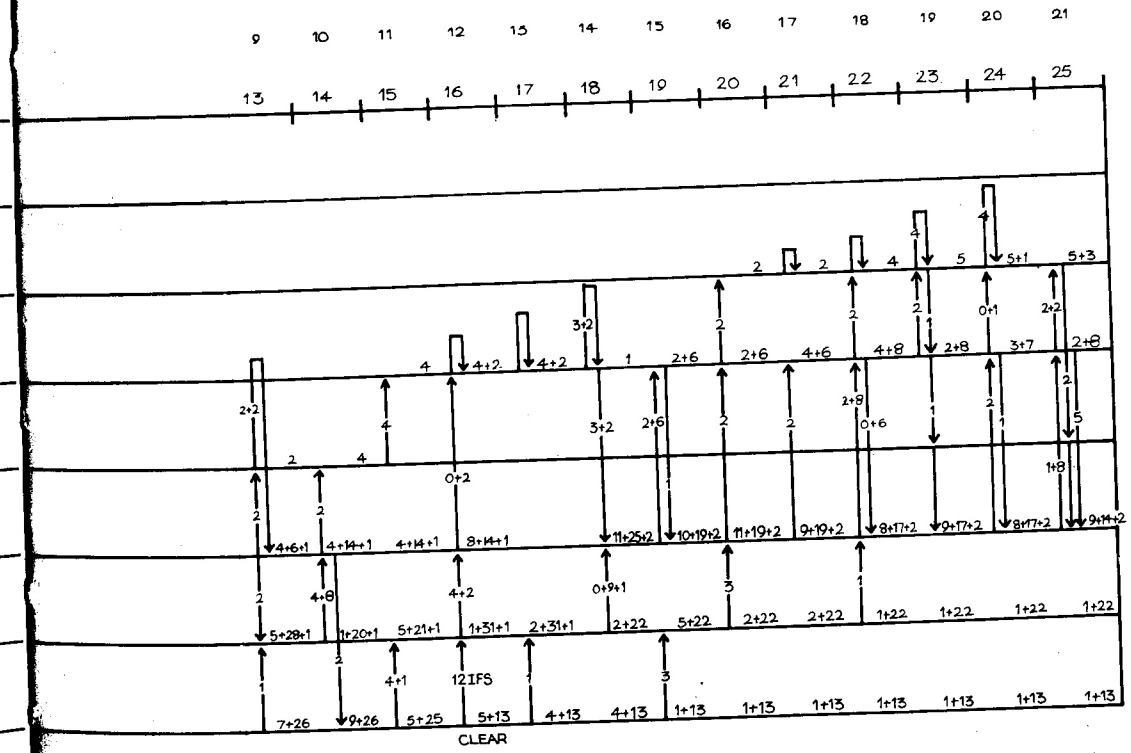
Movement chart – predicted

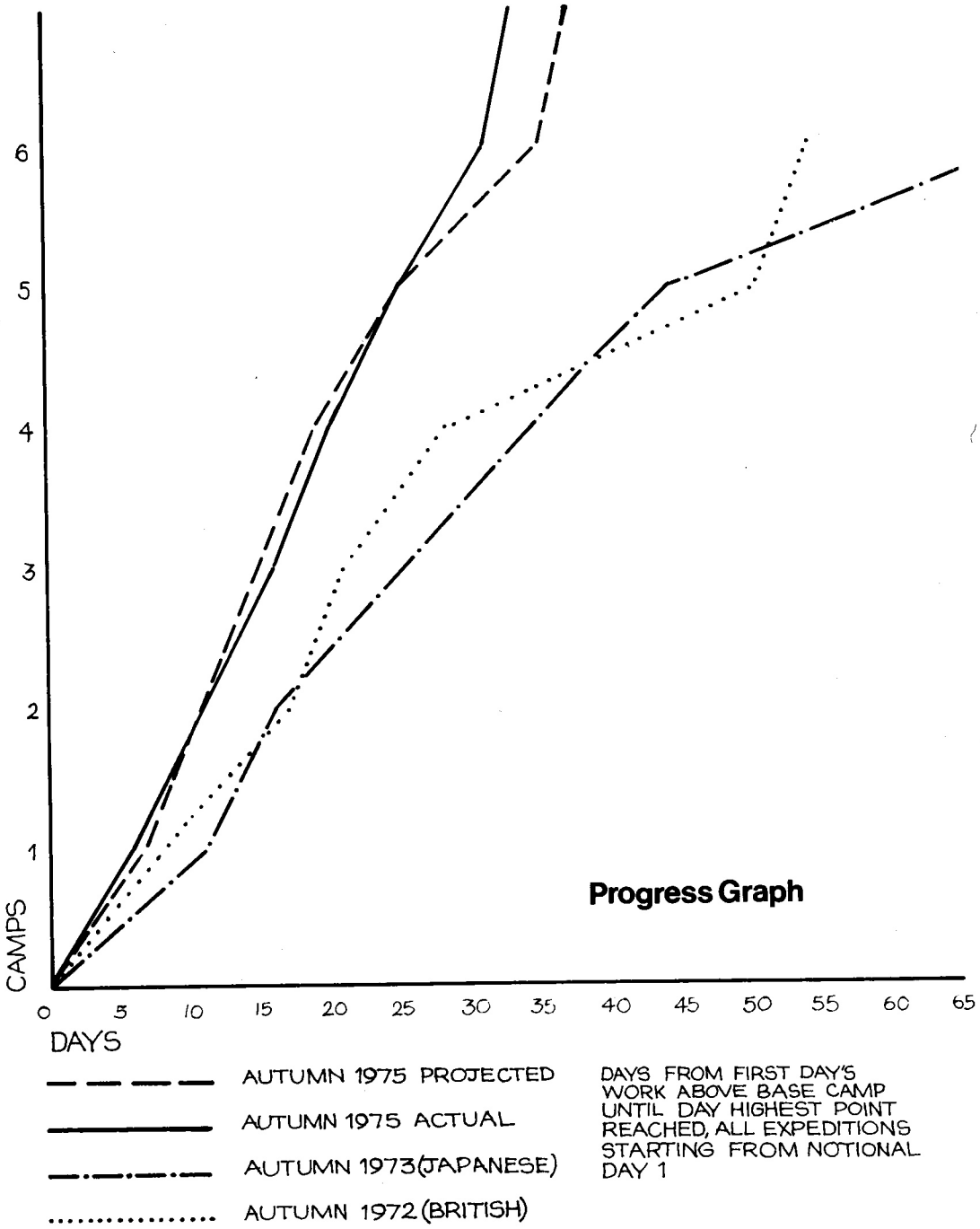




Movement chart – actual







FACING *Pete Boardman on the summit, and Pertemba raising the Nepalese flag.*

OVER *Pertemba following up the South East Ridge, taken from the same viewpoint as the double-spread photograph following p. 144, which shows how seriously the weather has deteriorated.*

These calculations gave me the most effective initial strategy for shifting all the gear we needed from Base to Camp 2. We followed it very closely on the mountain as comparison of the predicted and the actual movement charts, below, will show.

Above Camp 2 we altered our plans a great deal, changing the sites of Camps 4 and 5, introducing the concept of two tents at Camp 6 for the second and third summit bid, allowing four men to take part in each bid. I was able to cope with these changes even in the rarified atmosphere of Camp 5, because of the depth of planning and thinking earlier on. You can always change and modify a plan, but without one, you have nothing on which a change can be based.

Our rate of progress up the mountain was also very close to what I had predicted. See the progress graph on page 168. This, of course, was greatly helped by the fact that the weather was kinder to us than to either the Japanese in autumn 1973, or us in autumn 1972, being settled right up to the storm that terminated the expedition, with sunny, windless mornings and snow most afternoons. This weather pattern had been indicated bv a rainfall analysis I had made from the different sources that were available.

In my innocence I had originally imagined that the computer would be able to tell me how to plan the expedition, an illusion which I suspect is shared by most laymen. Whilst planning our 1972 expedition, Ian McNaught Davis, a climbing friend of mine and managing director of Comshare, had suggested that we might like to use one of his computers to help in planning. Because the expedition had been organised in such a rush, we had been unable to make full use of this facility; it had, however, shown me its value as a means, not so much of finding the perfect logistic answer, but one of checking out one's own planning thinking.

In the spring of 1975 Ian McNaught Davis once again offered his help making available one of his programmers, Stephen Taylor, and through the spring and early summer we played out a series of computer games, simulating the movement of men and supplies up the mountain. We never actually reached the top, since we always seemed to get stuck in a logistic bottleneck round about the time that Camp 4 was established, the reason being that I was moving my men and supplies by intutition rather than by logic based on a clearcut formula. I only created the formula described above after three abortive attempts. Stephen Taylor now describes his approach to the computing problem.

WRITING AND WORKING THE PROGRAMME

by STEPHEN TAYLOR

Initially, the problem seemed quite daunting, and far removed from my usual fare of business and OR models. Closer inspection revealed the critical similarity: despite the fact that the problem involved climbers and Sherpas, and tents and whatever else, I could consider the whole thing as a problem in stock control. I had seven camps on the mountain, and men and equipment to put in them, plus some rules governing how I might move them around. All my model had to do was to accept instructions regarding the movements, check that the rules weren't being broken, and keep track of where everybody and everything went, including the food, which disappeared.

We managed to break the equipment into four categories: tentage; food and gas cartridges; oxygen cylinders; and climbing gear.

The last time anyone saw Mick Burke, when Pete Boardman and Pertemba met him just below the summit.

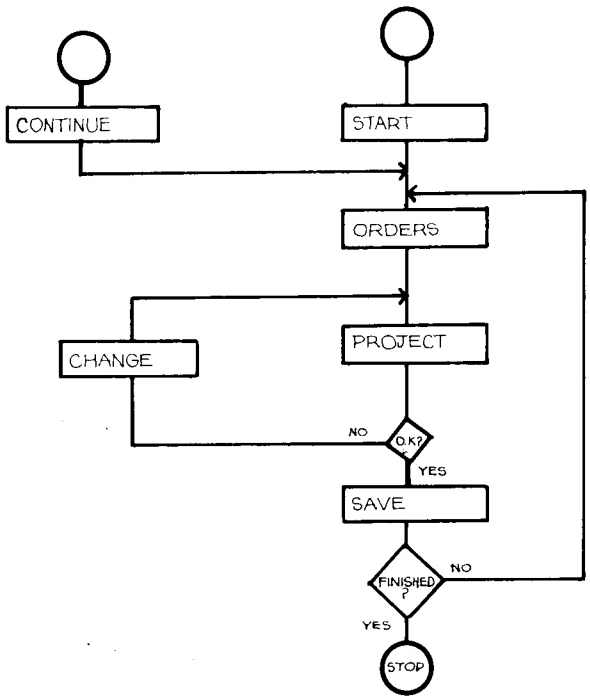
These four categories had to be treated differently. Tentage determined how many people could sleep in a camp. The food and gas cartridges were consumed at a reasonably predictable rate, which depended upon altitude. The same went for the oxygen cylinders except that the rate was different, and they didn't start to be used until Camp 5. The climbing gear was mostly hammered into the mountain, but without an adequate supply in the highest established camp, the lead climbers would have been stranded. Every member of the expedition was allowed a limited allowance of personal baggage, which was kept with him wherever he went, but we didn't have to account for this in the model: every time someone moved camp, he didn't carry anything other than his bedroll. We expected that only European climbers would need to use oxygen at Camp 4. All these rules had to be built into the model.

The model was constructed around five system arrays. These were:

1. MOVE—this array held the current day's orders, i.e. the proposed movements of men and materials both up and down the mountain.
2. POSITION—this array held details of the numbers of men and weights of equipment of different categories for each of the seven camps.
3. NPOSITION—a "working" array which held the results of performing the moves held in MOVE in the situation described in POSITION. The program validated this position and checked back with the user before saving the old POSITION and overwriting it with NPOSITION.
4. HISTORY—this was a 3-D matrix which consisted of successive POSITIONs laminated together to form a "history" of the stock positions on the mountain.
5. STRATEGY—similar to HISTORY, this matrix consisted of successive layers of the MOVE arrays.

At the end of a "run" we were able to have the HISTORY and STRATEGY arrays printed out, and these constituted a plan for the assault.

In accordance with the current dogma of system design and programming, I took as structured an approach to implementing the model as the limitations of APL would permit. The main features of the model were the seven APL functions START, CONTINUE, ORDERS, PROJECT, CHANGE, SAVE and DISPLAY; and I arranged them like this:



Briefly, the effect of each function was as follows:

1. START—initialises the system variables for the beginning of the expedition, putting correct supplies in Base Camp (Camp 0). After initialisation, it called ORDERS.
2. CONTINUE—similar to START, but continued work on previously defined HISTORY and STRATEGY arrays, allowing the user to take up a plan where he had left it.
3. ORDERS—this function handled and prompted for instructions from the user, and built them up into the MOVE matrix, displaying the final MOVE array, and calling CHANGE if the user was dissatisfied with what he had asked for.
4. CHANGE—an editing function which handled changes to be made to the MOVE array.
5. PROJECT—this function calculated the results of making the moves described in MOVE on the postion as described by POSITION. It stored the result in NPOSITION, and checked for mistakes, issuing warnings, and invoked CHANGE if errors were found, or if the user was dissatisfied with the results of his instructions. This was an iterative function to the extent that the user could continue to modify and "project" the results of his orders until he reached the position that he wanted.
6. SAVE—a simple function that laminated MOVE and POSITION onto STRATEGY and HISTORY respectively, overwrote POSITION with NPOSITION, and reset MOVE and NPOSITION at zero.
7. DISPLAY—a utility function to print the system matrices. Having been passed a matrix as its argument, it determines from the size of the matrix whether it is MOVE, STRATEGY, HISTORY, or POSITION/NPOSITION, and prints the array using an appropriate format. Although all the supplies were stored in the system as weights, DISPLAY, by reference to a number of tables within the workspace, was able to show weight of oxygen as so many bottles, weight of food as so many man/days (it varied with height ...) and so on. It was an enormous help during development of the model to be able to print out (intelligibly!) any of the system arrays with a single command, as for instance "DISPLAY POSITION".

RUNNING THE MODEL

Ideally, I should have disappeared into a hole in the ground sometime in the spring of 1975, and emerged after a suitably short period with a fully documented and tested model to hand over to Chris, who would then be freely and easily able to play with it until he had evolved his Master Strategy.

Often as we were working on the model, I was debugging and reprogramming as we went along; something that is only really feasible to my knowledge in APL. There were many times that the entire program seemed to be held together with string and recycled chewing-gum; but the overall soundness of the structured approach held up and allowed me to extricate myself from some very messy situations. An immeasurable help was the compactness of the APL code—the seven main functions comprised no more than 150 lines of code—and the amenability of the APL interpreter to my amending the program in the middle of its execution.

I had originally visited Chris Bonington in March to discuss the model, and I returned with a trial version in April for three days. On this occasion, I took with me a portable computer terminal, which I was able to use via the telephone. Time was getting short and subsequent sessions were held by telephone, late at night, with me sitting at a terminal in the basement of Comshare's London office, and Chris doing all the hard work up in Cumbria.

I'd like to emphasise that last point. Once the model had been written, the hard

work really became his department. I would be sitting at the terminal "driving", with a book in my lap, and Chris would telephone me with his proposals for the next moves. I'd type them in, and read back to him the results. I could then go back to my book, while Chris struggled with the next set of moves. As a model, the program in no way solved his problem—it served as a tool for discussing it, handling the very tedious and involved calculations concerning weight allowances, food reserves, and gear and food consumption.

And so the work went on, usually late into the night and small hours, exploring Chris's ideas and strategies, and trying to identify critical points, phases in the climb which were very sensitive to variation. It was during this period when I was acting as a "chauffeur" that I carried out the second part of the study.

By the green glow of a terminal screen, about midnight on a May night, I shuffled the seventy-eight cards of the Waite Tarot deck, and spread them out in the Grand Cross reading to see what could be read of the expedition's future. The prognosis was excellent, with strong indications of success based on the united efforts of a balanced team, and fame at the end. For the interested, some of the details were:

Significator	The Fool
Beneath him	Two of Swords
Crowning	Three of Pentacles
Covering	Ace of Swords
Tenth card	The Sun
Ninth card	Ace of Pentacles

The final plan, as used on Everest, was never tested on the computer model before the expedition left; and I think that this gives a clue to the real benefits of the study. Chris handed me a copy of the Final Solution just before he left, announcing blithely that he'd reconsidered his plans and had come up with a new one. Momentarily, I was appalled. Was he going to reject the results of all the work that we had done?

In fact not. The Final Solution was very much, I think, the child of the work that Chris had put into the study. The process of exploring and testing his ideas on the logistical problems had yielded the insights into the problem that we had originally been aiming for, and as a result of this he was able to construct the strategy that was so successfully employed, confident in his ability to modify it in action. My biggest thrill of the expedition was a card from the mountain reporting that Camp 4 had been established at the same time that Base Camp was cleared—a point which had been established as critical. My personal satisfaction at the end came from the realisation that Chris had been able to use his resources so that the climbing problems were not unnecessarily complicated by logistical ones; and in doing so had managed to take the biggest expedition by the hardest route in the shortest time—to the top of Everest.

ANNEXE A: OUTLINE PLAN OF THE MOUNTAIN (prepared August 1974)

1. *Team strength to go to Camp 2 and above*
   14 climbers (European)
   2 climbers (European) based on Camp 2
   2 climbers (European) based on Base Camp
   26 Sherpas shared between Camp 1 and Base
   34 Sherpas available for Camp 2 and above

2. *Forcing the Ice Fall*

It is impossible to determine when we can start climbing the Ice Fall. This depends on

the pattern of weather during the monsoon. We should be in a position, however, to start work on the Ice Fall from 25th August. It should not take longer than 5 days.

3. *Making route to Rock Band, once Ice Fall has been climbed*
We shall have 3 parties of 4 climbers each who will take turns in making the route up to Camp 5.

Party A makes the route from Camp 1–3
Party B makes the route from Camp 3–4
Party C makes the route from Camp 4–5

We push the route out as quickly as we can—avoiding any delays.

4. *Build-up of supplies to Rock Band*
This build-up is made as fast as possible by Sherpas and climbers not involved in lead climbing, Sherpas and climbers moving up to high camps in such a way as to enable the forward momentum to be kept up—in other words, Advance Base is built up at the same time as supplies are shifted from it up the face.

5. *Carrying policy on Face*
Camp 3 is used solely as a staging post. Sherpas prefer to carry straight through to 4 from 2 and have a rest day in between. In autumn 1972 very few Sherpas did more than two carries from 2 to 5 without coming down for a rest at 2. We shall make 4 a much more comfortable place in the hope of getting at least three carries from Sherpas. We should try to maintain 2 climbers and 6 Sherpas at Camp 4 while building up Camp 5 and 6. There will be space for 4 climbers at Camp 5.

6. *Forcing Rock Band*
It is impossible to tell how long this will take. We want to start work on the Rock Band as quickly as possible. In the first instance, therefore, a pair will go up—then a foursome—to work on it.

7. *Fixed-roping above 6*
This will be carried out by four climbers operating from 5, once the Rock Band has been fixed roped, using 1,000 feet of 7 mm rope, which should reach most of the way across the traverse.

8. *Establishing Camp 6*
Camp 6 will then be established by climbers and Sherpas making one carry and on the following day the summiters supported by two moving into the camp.

9. *Resting*
Climbers can rest at either Base or 2. If there is to be a prolonged rest it is best for climbers to return to Base.

10. *Oxygen policy*
Sherpas do not use oxygen till Camp 5 and above. Climbers do not use oxygen until Camp 4 and above. It is not necessary to use oxygen at Camp 4 for sleeping, but there is enough there for anyone in a bad way to use it.

11. *Tentage Plan*

Camp 6	1 assault box	Sleeps 2
Camp 5	2 face boxes with platforms and reinforced nylon covers	Sleeps 4
Camp 4	4 face boxes with platforms and covers	Sleeps 8

Camp 3	2 boxes (for staging)	Sleeps 4
Camp 2	4 super boxes	Stores, mess kitchen, but can be used for sleeping in emergency
	4 face boxes	Sleeps 8
	8 Vango tents	Sleeps 24
	4 tunnel tents	Sleeps 8
		40
Camp 1	2 super boxes	Sleeps 16
	2 Vango tents	Sleeps 4
		20
Base	2 super boxes	
	3 big bell tents	
	3 cook shelters	
	10 Vango tents	

		Weight/ lbs	Oxygen	Gas	Food
ABOVE CAMP 6					
1st assault	4 bottles oxygen	48	4		
	120 m 7 mm climbing rope	8			
	Karabiners & pegs/stakes	5			
	Pack	3			
	Oxygen system	3			
	Bivvy sack	1			
	Movie camera & magazine	5			
	Still camera	3			
	2 × 38-lb loads	76	4	—	—
2nd assault	Same as above				
	2 × 38-lb loads	76	4	—	—
TO CAMP 6					
For 1st assault	Assault box	30			
	Camp kit, inc. stove etc.	5			
	2 man-days food	5			2
	4 carts. gas	3		4	
	1 bottle oxygen	12	1		
	2 men's personal gear	30			
	Radio & batteries	3			
		88	1	4	2
For 2nd assault	2 man-days food	5			2
	4 carts. gas	3		4	
	2 men's personal gear	30			
	1 bottle oxygen	12	1		
		50	1	4	2
	TOTALS TO CAMP 6:	290	10	8	4

Payload for 1st assault, allowing 20 lbs per man:
8 loads

Payload for 2nd assault, allowing 21 lbs per man:
6 loads

TOTAL LOADS TO CAMP 6
= 14 loads

		Weight/ lbs	Oxygen	Gas	Food
CAMP 5–6					
Fixing 6+ from 5	3 × 120 metres 7 mm rope (972 ft)	24			
	10 snow stakes	10			
	16 karabiners	3			
	4 deadmen	4			
	4 bottles oxygen	48	4		
		89	4		
	4 men carrying 22 lbs each				
Fixing 5 to 6	3 × 200 metre 8 mm ropes	78			
	600 ft 9 mm climbing rope	20			
	Assorted ironware	20			
	5 × 4 man-days 20 btls. oxygen	240	20		
	8 man-days carry for 1st assault				
	8 bottles oxygen	96	8		
	4 man-days carry 2nd assault				
	4 bottles oxygen	48	4		
		502	32		
AT CAMP 5					
4 men					
8 × 4 man-days work	2 face boxes with platforms	200			
	2 camp kits plus foams	40			
4 × 4 man-days reserve	48 man-days food 3 lbs	144			48
	96 carts. gas	60		96	
48 man-days	Sleeping oxygen & spare—24	288	24		
	Radio & batteries	12			
	Medical kit	6			
	Film stock and cameras	60			
		810	24	96	48
Less personal gear—20 lbs each					
	RUNNING TOTAL TO 5	1,685	70	104	52
	Payload of 30 lbs—56 loads				
CAMP 4–5	4 × 200 metre 8 mm ropes	104			
	Ironware	20			
	32 climber trips with oxygen —32 bottles	384	32		
		508	32		
AT CAMP 4	4 face boxes with platforms	400			
	4 tent kits	20			
6 Sherpas	140 man-days food	420			140
2 climbers	280 carts. gas	175		280	
60 man-day carry	Radio & batteries	16			
	Medical kit	10			
80 man-day rest	Spare oxygen (16)	192	16		
	Film cameras and stock	90			
	RUNNING TOTALS TO 4	1,323	16	280	140
		3,516	118	384	192

		Weight/ lbs	Oxygen	Gas	Food	
	Payload of 30 lbs—118 loads					
CAMP 3–4	8 × 200 metre 8 mm		208			
	Assorted ironware		20			
			228			
AT CAMP 3						
Used as staging	2 boxes		120			
post—	2 camp kits		40			
Sherpas carry	Radio & batteries		10			
from 2	Medical kit		6			
	40 man-days food		120			40
	80 carts. fuel		50		80	
			346		80	40
	RUNNING TOTAL THROUGH 3	4,090		118	464	232
	Payload of 30 lbs—137 loads					
CAMP 2–3	2 × 200 metres 8 mm rope		52			
	Assorted ironware		15			
			67			

With bad weather there could be greater delays, demanding more food and fuel.

AT CAMP 2	4 super boxes	480			
	8 Vango tents	240			
	4 face boxes	240			
	4 tunnel tents	80			
	4 lightweight tarps.	40			
	Medical kit	80			
	Kitchen kit	80			
	Lighting	20			
	Radios & batteries	50			
	Office	40			
	Tool kit	40			
	Extras	300			
	Spare oxygen (25)	300	25		
	560 man-days reserve Camp 2 food (4 lbs)	2,240			
	560 man-days reserve kerosene	600			
	80 man days reserve mountain rations	240			80
	160 reserve carts.	100		160	
		5,170	25	160	80
	Allow 40 lbs per man personal gear going to 2— 50 men	2,000			
	RUNNING TOTALS TO 2	11,327	143	624	312

ABOVE *The wreckage of Camp 2 after it was hit by the air blast of a huge avalanche from Nuptse on the night of the 27th September.* BELOW *The rescue party returning to Camp 2 after bringing back Adrian Gordon on the same night.*

		Weight/ lbs	Oxygen	Gas	Food
	Payload of 35 lbs—324 loads				

(I have not allowed for day-to-day servicing of food and fuel—allow an average population of 42 consuming 5 lbs per day of food and fuel = 210 lbs per day—6 loads)

CAMP 1–2	Marker poles (200)	200
	8 ladders	160
	3 × 200 metres 8 mm rope	78
	Assorted ironware	20
		458
AT CAMP 1	2 super boxes	240
	2 Vango tents	60
	Kitchen kit	40
	70 man-days reserve fuel/food	350
	Radio & batteries	20
	360 man-days food/fuel to feed men carrying to 2—5 lbs	1,800
		2,510
	RUNNING TOTAL TO I	14,295
	Payload of 35 lbs—409 loads	

ANNEXE B: *WEIGHT DISTRIBUTION*

A. NON CONSUMABLE

1. Ropes and fixings

To camp	*Net weight to camp*	*Accumulative*
Camp 6	32	32
Camp 5	159	191
Camp 4	124	315
Camp 3	228	543
Camp 2	67	610
Camp 1	458	1,068

2. Tentage and camp gear

Camp 6	48	48
Camp 5	318	366
Camp 4	506	872
Camp 3	176	1,048
Camp 2	1,690	2,738
Camp 1	360	3,090

B. RESERVES—Consumable items at camps when fully established.

1. Oxygen

Camp 6	10 bottles	120	120
Camp 5	12 bottles	144	264
Camp 4	16 bottles	192	456
Camp 2	32 bottles	384	840
Camp 1	4 bottles	48	888

Oxygen used in initial run out from 4 to 5 and then in movement of climbers from 4 to 5, can be drawn from reserve, which will automatically be topped up allowance for basic consumption.

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2. Food/fuel

For Camps 1 and 2 this represents 4 lbs food plus 1 lb kerosene.
For Camps 3 to 6 this represents 3 lbs food plus 1 lb Camping Gaz.

Camp 6	2 m/d	8	8
Camp 5	20 m/d	80	88
Camp 4	42 m/d	168	256
Camp 3	7 m/d	28	284
Camp 2	530 m/d	2,650	2,934*
Camp 1	160 m/d	800	3,734

265 man/days mountain ration and 318 man/days Camp 2 ration—because of different weights there is a discrepancy in no. of man/days at 2.

* To be divided into a third mountain and two thirds Camp 2 rations.

C. TOTAL WEIGHTS AT CAMPS

		Lbs	*Loads/lbs*
Camp 6	208	208	11/20
Camp 5	701	909	31/30
Camp 4	990	1,899	64/30
Camp 3	432	2,331	67/35
Camp 2	4,791	7,122	204/35
Camp 1	1,666	8,788	251/35

CONSUMPTION RATE WHEN CAMP 5 IS FULLY OCCUPIED

	Daily Consumption										
Camp	Cl.	Sh.	Cks.	B.B.C.+ H.A. Sh.	Total	Items	Wt. per unit	Wt. each Camp	Loads at each Camp	Acc. Wt.	Acc. Loads
5	4	—	—	—	4	6 btls. oxygen	12	72			
						4 man-days ff	4	16			
						Film bats		10			
								98	3 × 30	98	3 × 30
4	2	6	—	—	8	1 btl. oxygen	12	12			
						8 man-days ff*	4	32			
								44	—	142	8 × 30
2	7	28	2	8	45	45 day ff	5	225			
						1 load film		35			
								260	8 × 35	402	12 × 35
1	2	12		2	16	16 man-day ff	5	80	2+ × 35	482	14 × 35
Base	4+2	14	10	2	32						

* B.B.C. team responsible for getting film up to Camp 4 from 2 with their 4 H.A. Sherpas.

ACKNOWLEDGMENT TO SUPPLIERS

We were able to organise the expedition with the help of a very small administrative staff, thanks to the hard work of the secretaries of the organisers, many of whom carried out the work in addition to their normal jobs without any extra pay, and also to a high level of automation in my own small office.

IBM loaned us two typewriters, the 82 Selectric and a memory typewriter. I used the latter machine to draft this book. Everything you type goes into a computer-type memory, which can then be recalled. This makes it neat and easy to correct the text alterations, but with the memory typewriter I could make my alterations, switch it on to automatic and have a page of typescript hammered out for me as I sipped my coffee.

Rank Xerox very kindly loaned us a 660 Copier/Duplicator, which proved invaluable for duplicating newsletters, lists and letters. Sinclair gave us their Cambridge Calculators. These proved invaluable throughout the expedition, being used by our treasurer Nick Estcourt to calculate VAT and add up endless invoices, by myself and my secretary to make over a thousand currency conversions into Indian and Nepalese rupees for our import documents, and on the mountain itself to calculate Sherpa wages and expedition logistics.