INSTITUTION OF ROYAL ENGINEERS

Established 1875
Incorporated by Royal Charter 1923

Patron: HER MAJESTY THE QUEEN
Chief Royal Engineer: Lieutenant General Sir Scott Grant *KCB*

COUNCIL

PRESIDENT

Lieutenant General Sir Anthony Pigott *KCB CBE* ... 1997

VICE PRESIDENTS

Colonel C P R Bates ... 2002
Brigadier A E Whitley *CBE* ... 1999
Brigadier D R ff Innes *ADC* ... 2002

MEMBERS

Ex Officio	*CRE (Theatre Troops)*	Brigadier G C W Dodds *OBE*	
	Comdt RSME	Brigadier C M Sexton	
	Comd Geo Engr Gp	Colonel R N Rigby	
	Regt Col	Colonel P Lodge	
	Col Engr Svcs LAND	Colonel A P Burnside	
	Col RE MCM Div	Colonel G C Watts *MBE*	
	CRE 3 (UK) Division	Colonel I M Caws *OBE*	
Elected Members		Lieutenant Colonel C J Rose	1998
		Lieutenant Colonel M W Whitchurch *MBE*	2000
		Lieutenant Colonel M A Wood *BEM*	2000
		Lieutenant Colonel R H Brown *TD*	2000
		Major I A McDougall	2000
		Colonel M R Cooper	2002
Coopted (non-voting)	*Corps RSM*	Warrant Officer Class 1 C Barton	
	Secretary	Lieutenant Colonel D N Hamilton *MBE*	2000
	Treasurer	Lieutenant Colonel J M H Townsley	2001
Corresponding Members		Colonel W A Bailey *MBE*, BLO Fort Leonard Wood, USA	
		Lieutenant Colonel L W Chapman, BLO Pionierschule, Munich	
		Lieutenant Colonel P E Crook, BLO Engineer School, Angers	
		Major A M F Honnor, Exchange Appointment, Australian SME	
		Major A D Boyle, Exchange Appointment, Canadian SME	

BUDGET, INVESTMENTS, MEMBERSHIP, SCHOLARSHIP, MEMORIAL AND PUBLICATIONS COMMITTEE

Chairman	Colonel C P R Bates
Vice-Chairman	Colonel P Lodge
Members	Colonel A P Burnside
	Colonel I M Caws *OBE*
	Colonel G C Watts *MBE*
	Colonel I M Tait
	Lieutenant Colonel C J Rose
	Major I A McDougall
	Warrant Officer Class 1 C Barton
Secretary	Lieutenant Colonel D N Hamilton *MBE*
Treasurer	Lieutenant Colonel J M H Townsley

INSTITUTION OF ROYAL ENGINEERS' STAFF

Secretary & Editor RE Journal	Lieutenant Colonel D N Hamilton *MBE*	Tel: ATN (9) 4661 (BT 01634 82) 2298
Assistant Sec, Publications:	Captain J E Borer	Tel: ATN (9) 4661 (BT 01634 842669/82) 2299
Administrative Officers:	Mrs J Ellender & Mrs M Reddick	Tel: ATN (9) 4661 (BT 01634 82) 2298
Fax:	ATN (9) 4661 (BT 01634 82) 2397	

All correspondence in connection with editorial matters should be addressed to the Secretary, Publications, Institution of Royal Engineers, Ravelin Building, Brompton Barracks, Chatham, Kent ME4 4UG.

Editorial

ONCE again, sufficient articles have been received to enable the production of a balanced *Journal* covering a wide range of subjects and time frames. Sadly there is only one article from a junior officer, but Ben Day's story about the reproduction of the Ironbridge clearly demonstrates that our young officers are still well up to the unusual challenges that sometimes face the Corps – not necessarily on the battlefield.

The debate on the MBA is continued, both as an article and in the Correspondence pages, and Jeffrey Lewins continues his "mines" series, turning this time to phoney minewarfare. Memories of the distant past are evoked by Nick Hayes and his tale of the Siege of Malegaon, and the not too distant past by Major General Fursdon and Colonel Peacey. Their articles will be appreciated by the majority of our readership – indeed the thoughts of the Assistant Secretary went straight to "buffalo steak banjos" at Crown Camp at Kok Talat on seeing the photograph of the Post Crown road! The "50 years on" series is continued by Colonel Dan Raschen, Major Peter Edmonds and Captain Bill Howe; the latter's story of the Forestry Companies vividly illustrating a little known activity of the Corps in World War 2. Lastly, Brigadier Merrell, Colonel Rose and Captain Clarke remind us of some of the other activities with which the Corps has been involved both recently and over the years.

The Correspondence Pages also cover a wide range of subjects and we are especially indebted to Dick Leonard for his reminder (or warning!) on the possible advent of Quartermistresses, although we do have a few years in hand before the first one arrives!

The proposed review of our publications was delayed due to operational reasons and will now be carried out over the next twelve months. If you have any ideas on how our publications could be improved please forward suggestions to the review team, via the Editor. It is hoped to include limited colour in future editions of the *Journal*, so please try to illustrate your articles with this in mind, although I must emphasize that we are in no way trying to compete with *Sapper* Magazine.

ISSN 0035-8878

THE ROYAL ENGINEERS JOURNAL

© Published in April, August and December by the Institution of Royal Engineers, Chatham, Kent, ME4 4UG.
Printed by Stephens & George Magazines, Goat Mill Road, Dowlais, Merthyr Tydfil, Mid Glamorgan, CF48 3TD.

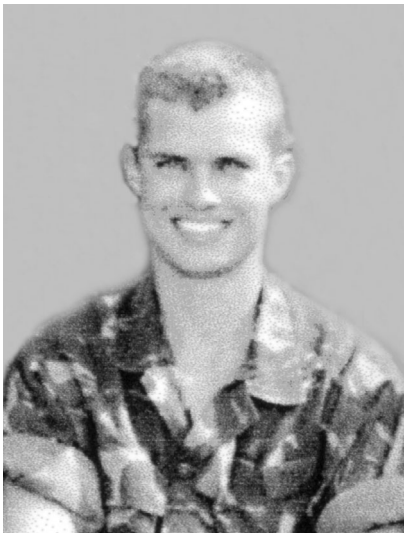
Volume 116 August 2002 No 2

Contents

3500

Timewatch: The Mystery of a Television Programme

LIEUTENANT B J W DAY MENG



Lt Benjamin Day studied for a Masters degree in Civil Engineering at University College, London. He was commissioned in August 2000 and after 128 Troop Commander's Course was posted to 38 Engr Regt. He has served in Afghanistan with 51 Field Squadron (Air Assault) as Support Troop Commander.

INTRODUCTION

DEBORAH Perkin, BBC producer, sat in front of me. "What we want to do is build a half scale replica of the Ironbridge at Telford, using 18th century techniques." It was the first bridge of its type, utilized the largest pieces of cast iron then in existence, and heralded the start of the Industrial Revolution. How hard could it be? Little did I know that the project would balloon from five to ten days and at its height, would involve over 1.5 km of cordage in the air.

The BBC approached the MoD with a plan for the new Timewatch series. After a few weeks bouncing around, it was given to 2 Tp, 51 Fd Sqn (Air Asslt). Since an officer with a civil engineering background was required, I, although Sp Tp Comd, was nominated. As usual time was against us; five weeks were left before the build was due to start, as was the lack of any discernable plan.

HISTORICAL BACKGROUND

IN the late 18th Century there was a wealth of crossing points over the Severn in the vicinity of Madely Wood. The increased industrial traffic of the time was outgrowing the capacity of the ferries which were dependant on the unreliable river. A permanent crossing was clearly required. An Act of Parliament was passed in 1776 after the initial idea had been proposed in 1773 by Thomas Famolls Pritchard, a local architect. His initial design of 1775 was not built, but it was his suggestion to use iron, the first use of structural iron on this scale anywhere in the world[1]. The Act of Parliament stopped any ferry from operating within 500yds of the bridge site and allowed the bridge owners to charge to a toll, thus defining it as a business venture rather than engineering philanthropy.

In 1775, Abraham Darby III was commissioned to build the bridge, and his initial estimate put the price at £3,200. Though work began in November 1777, the ironwork was not constructed until 1779 being erected in just three months during the summer whilst the river was at its lowest thus causing minimal disruption of the river traffic. The bridge did not open to traffic until 1781, as the approaches and abutments had not been completed.

THE CONSTRUCTION PROCESS

DESPITE there being very detailed financial accounts of the construction, down to the £15 spent on "celebratory ale", there are precious

[1] It should be noted that the Chinese had built short span iron footbridges before this, though they were not widespread.

few accounts on the techniques used in construction. One from 1789 states:

> *"…a large scaffold being previously erected, each part of the rib was elevated to a proper height by strong ropes and chains, and then lowered till the ends met in the centre. All the principle parts were erected in three Months (sic) without an accident either to the work or the workmen, or the least obstruction to the Navigation of the River."*

This points strongly to them using some form of scaffold, though how and where has proved a contentious issue ever since. Polish timber was shipped in from Gdansk for the project, though the total cost of the timber being £53 against labour costs of £2430, would suggest that a major scaffold was not built.

The only known picture of the construction is by Elias Martin, a Swedish professor with several architecturally accurate paintings to his name. This shows a frame stretching the full width of the river with the ironwork being constructed before the abutments were erected, and this ties in with the financial accounts of the construction sequence. It was this Martin picture that the BBC wanted us to prove or disprove depending on our success or otherwise with the project.

Planning

THE BBC wished to make a programme that detailed the path of discovery that the principle characters would take during the course of the construction. Their general concept was to have a military engineer and taskforce to provide expert knowledge on the lifting techniques, and a young civil engineer to look at the construction process. The envisaged start state was for all the characters to have completed a period of research to get themselves into the mindset of the times. This done, all would appear onsite to find a pile of timber, a pile of rope and twelve rather large, heavy lumps of cast iron to be transformed into a bridge! However, I was due on leave so SSgt Thomas MBE was left holding the baby. He spent three sleepless, fraught and troublesome weeks together with Maj Mark Bumett of 512 STRE attempting to persuade the BBC that in order for planning to go ahead, a plan had to be in existence. I had already visited both the RSME and the Corps Library and had established that the Corps had no timber large enough to cope with the load or the spans needed, nor were contemporary books to be found. The derrick/shears/gyn question thus went unanswered.

The location for the build was the Blists Hill Open Air Museum. This is within the Ironbridge Gorge museum collective and also has a canal of the right width for a half scale replica. The original had been planned for a span of 100ft, though due to irregular shrinkage of the iron this increased to 101ft. Ours was to be a 50ft 6in span, with all dimensions halved to give a quadrant weight of 0.61 tonnes. In reality, the ironmonger had cast the quadrants ½" larger than specification giving a weight of 0.86 tonnes.

Meanwhile the BBC had recruited into the fold Mr Jamie Hillier of Buro Happold, the Supervising Engineer for the roof of the British Museum's Great Court. Jamie was a character with whom business could be done, and this was to prove very useful later on site.

A final plan was resolved to use two derricks, one on either bank and each 11m high (Figure 2). These would be used to lift each quadrant from a barge positioned in the centre of the canal and then spin the iron into position. A lightweight timber frame nicknamed the goalposts would be erected at full span, with blocks attached in the corners. These lifting points would then be used to elevate the quadrant. The process would then be repeated on the opposite bank until the two ends met in the middle, at which point a lucky unfortunate would have to make their way into the middle in order to place in position the three securing bolts. Due to my shirking on leave, SSgt Thomas did not hesitate in nominating me to be that man, a decision I thanked him for on many occasions!

Stores were slowly procured, with the larger spars being left to the BBC to source. The design required each to be 10m long with a diameter no smaller than 300mm. Those produced were 11m long with a diameter between 350mm and 450mm, leaving us with an agreeable factor of safety, but an added problem in the erection procedures, given that the largest was a 20 man lift. Another problem encountered was the preoccupation for genuine 18th Century materials, such as natural fibre cordage and in particular, wooden blocks. The producer was insistent that these be used, so the Corps was scoured and a blank drawn. The buck was then passed to the BBC who managed to get a set from the Cutty Sark. As these were museum pieces, we could not use them without a load test

certificate, which they were not strong enough to be granted. In the meantime Arwell Jones, the BBC's long suffering procurement man, had at great expense ordered 24 wooden double blocks from a ships chandler. They arrived on site on the first day only for us to discover that they were designed for use with modem, more flexible, nylon cordage. Manilla is not so flexible and the radius of curvature was too tight, causing the cordage to jam. Prior planning and preparation paid off as we had taken a full set of modern metal blocks, just in case.

The final problem that I shall mention is that of Steel Wire Rope (SWR). We had managed to negotiate the use of SWR for some of the guys that would not damage the view aesthetically. This agreed upon, Maj Bumett completed all the calculations and the design was finalized with 20mm SWR. I now refer you to the pamphlet on 'Basic Field Engineering' and the paragraph on SWR in particular. "The common sizes (of SWR) are 12 to 24mm diameter in two mm increments"[2]. The largest size available in the logistics chain is 16mm. But more of this below.

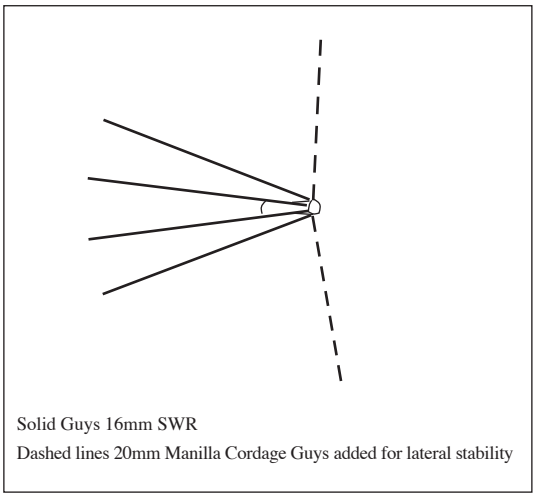


Figure 1 – Plan View of Test Load Derrick.

THE BUILD

9 OCTOBER 2001 saw the nominated troop arrive mob handed to shatter the serenity of Blists Hill Victorian Village and establish stores areas for the next day. First on the agenda was the erection of a proof lift of 5 ¾ tons to demonstrate the manpower that would have been required to lift the original quadrants into position. As already mentioned the designs had specified 20mm SWR, which was found not to exist at the stores depot. This led to me becoming rapidly reacquainted with SWR calculations to redesign the guys for the stores we did have. The re-jig was then put into action and the derrick erected. Lateral stability proved problematical and two extra guys, perpendicular to the line of the derrick (see Figure 1) were attached. A couple of test lifts were completed with the aid of a strain gauge to ensure the system was working and we then awaited the film crew. Unfortunately by then there was not enough light for them to operate and the lift proper was delayed until the following day.

Of greater concern was the discovery that the footings for the ribs, due to have been completed a week before, were less than a third finished. The brick caisson was only was on its first run although after the addition of a Class 1 bricklayer to the team, the work rate increased rapidly. Rarely has a sapper worked so quickly with a trowel in one hand and a pint glass in the other, pressed there by the insistent local labourers. Also of concern was the curing time of the concrete. The original schedule had allowed for seven days of curing, whereas with the delay we would have only two. The specification had been for a 10 N/mm^2 mix, but the reduced curing time required a 30 N/mm^2 to be poured the following day. The second redesign was completed though it was by no means the last

The morning of 11 Oct arrived covered in a thick mist that lent a spooky aura to the deserted Victorian Iron Foundry, and gave the steam driven fairground carousel a ghostlike appearance. This was the morning of the test lift, and the great and the good of the museum had been dragged in to help. The film crew duly turned up and the lifting began. It was at this point the phrase "can you do that again please?" first came to the fore, as the crew wanted to get seemingly endless continuity shots. This was to become the bane of our lives throughout the manual lifting shots. The load was however successfully raised, and work on the main project began.

As the main site was prepared, work was slipping behind schedule. The BBC admitted the schedule was based on the budget to hire the

[2] ME Vol II Pam 1 Basic Field Engineering 1996 Part 1 Materials and Techniques. Ch 3.

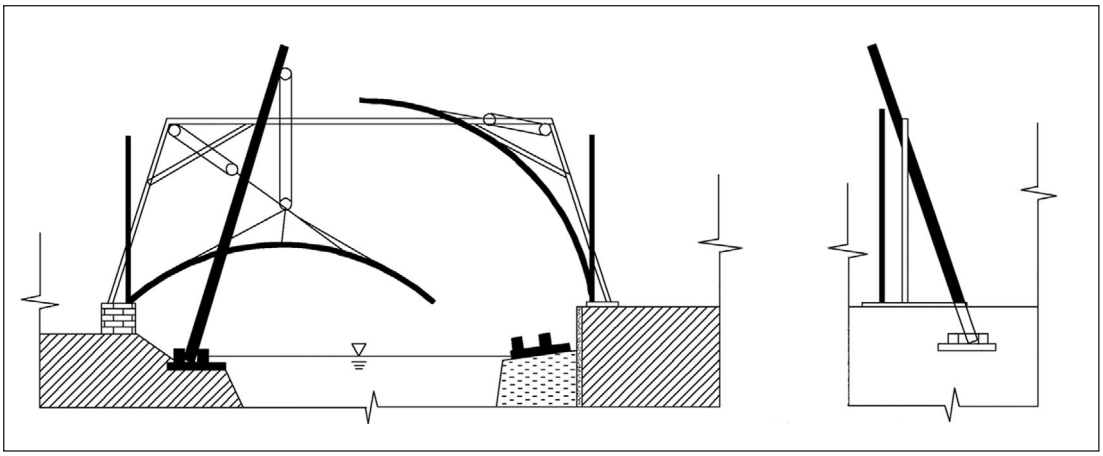


Figure 2 – Elevations of the "Goalpost" theory.
Note how the geometry would preclude the derrick, rib and goalpost from being in the same plane, hence making alignment extremely difficult.

film crew, an ominous premonition. Work continued with Jamie Hillier looking increasingly engrossed in his calculations in the old tram car that served as our office. At the evening meeting he outlined his concerns as to the geometry of the proposed plan.

The goalposts to be used would have to be shifted to support and lift each quadrant in turn. This meant that it would have to be positioned between the derrick and the final alignment of the rib, (see Figure 2) whilst it must be high enough for the crossbar to allow a person to be able to reach the apex to place the pins in. In order for this to work, the derrick would have to be able to swing underneath the goalposts. However, with the uprights slanting to prevent the crossbar from falling under it's own self weight, there would be no way for the spars to be manoeuvred under the crossbar. Due to the short planning time this geometry had not been fully explored and another drastic change of plan was called for.

In the original picture by Martin (Figure 3), a lifting system could be seen that appeared to span the entire river. It consisted of two slanting uprights joined by a crossbar with additional diagonal bracing. On first inspection it had not been readily apparent as to how this would have allowed the necessary degrees of freedom to both lift the quadrants into position, and then raise them to their upright state. With the thought process that had been completed to this point, it became apparent that such a frame had exactly the geometry needed. The junction of the diagonals with the crossbar indicated the initial lifting position (to lift the quadrants from the barge and locating the toe in position (see Figure 4)), with the raising into position provided by a secondary block and tackle system secured to the tops of the spars (Figure 4). This now promised to be the most likely route to success.

Jamie Hillier and Maj Bumett again redesigned, with the focus being on the crossbar. As there was no timber long enough to span the gap in a single go, and no other means of securing it to the spars other than square lashing, the frame had to be constructed horizontally and then lifted into position. A very long day was spent doing this; it proved to be an extremely tricky process, and by

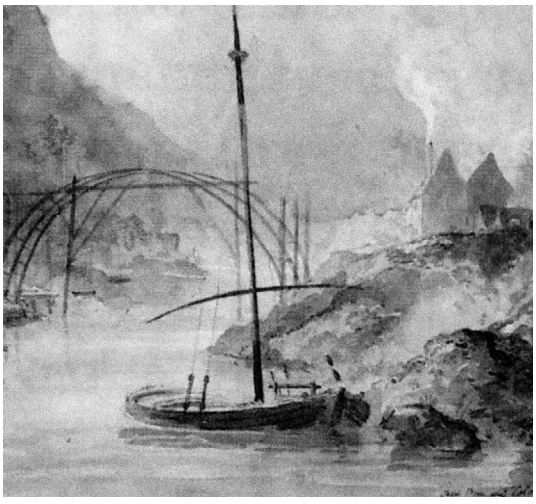


Figure 3 – From Sketch Book of Elias Martin.

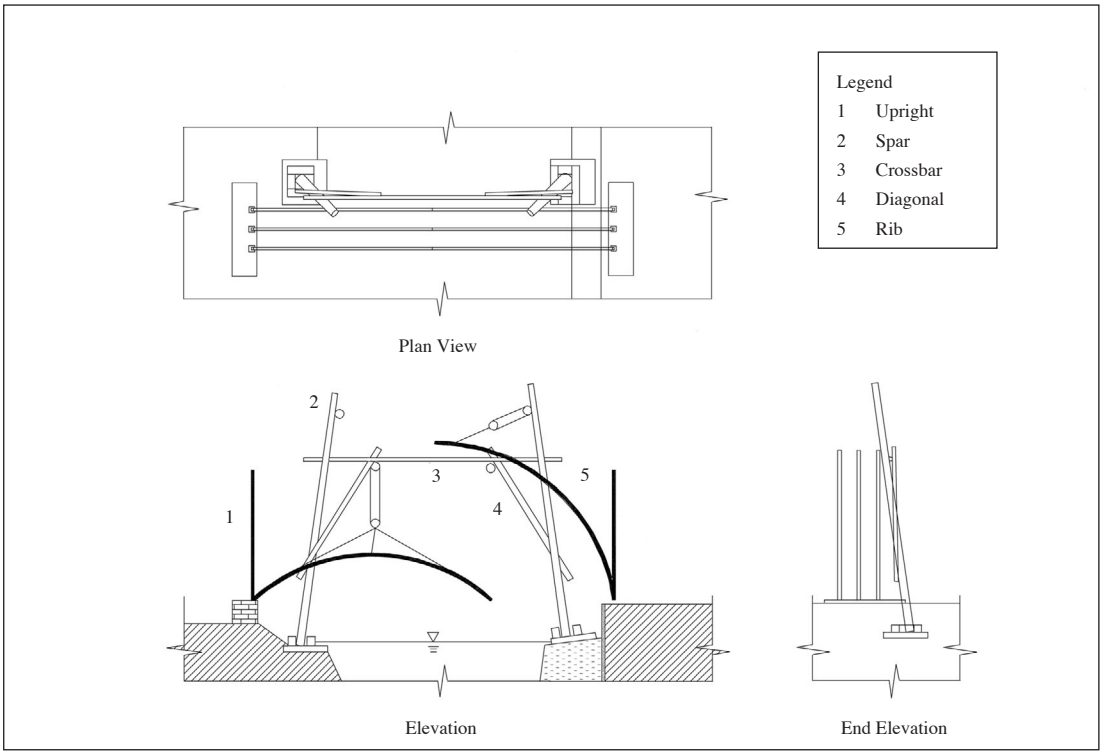


Figure 4 – Third-angle Projection of Frame as built.
Simplified for clarity. All of the supporting guys and hand lines have been omitted. Only a single rib (two quadrants) is shown in the elevation, whereas three are in the other views. Only selected block and tackle shown in elevation.

10pm working under arc lights, we had managed to create a method of works that would have allowed us to raise it using 18th century techniques whilst straddled across the gap. Unfortunately time was against us, and the BBC were keen for things to progress, so the decision was made (not without some relief from the troop) to bring in a crane the following day to allow work to advance.

The crane arrived next day into the extremely restricted site, and this facilitated the speedy erection of the frame. Extra guys were added to counter the self-weight of the crossbar. With the frame lifted into the air we could finally appreciate the geometry of the whole system, especially the 3-dimensional nature of the loading. Two primary concerns that came to light were firstly, the thrust acting down the line of the diagonal, and secondly the torsion placed on the crossbar and how this was transmitted into the diagonals. Lt Col Wright of the MWF, pointed out that the square lashing joining the diagonal to the spar would probably not be capable of holding the large compression forces acting along the line of the diagonal. In true sapper style, we improvised, adapted and overcame by inserting a 12mm steel bar through the centre of the joint, grouting it into position. The lateral torsion was then alleviated through the addition of a bolt to the end of each thread, although on the far bank it wasn't possible tighten this all way, providing a useful benchmark to monitor movement. By the end, the diagonal had moved some two inches away from the spar, thus proving the need for the reinforcement.

Another adjustment to the design to counter lateral torsion from developing within the frame was the addition of an extra guy to the initial lift point. The stretch within the manilla cordage allowed some torsion (as indicated above) but a significant proportion was alleviated through this additional rope.

After lunch the frame was ready to position the iron. All the pieces were loaded onto a barge via a single derrick some 300m away, and the barge was walked down the canal – in itself a slow process. The six iron uprights (three on either bank) were the first to be positioned, and indi-

The first two ribs as constructed using 18th century techniques, prior to joining.

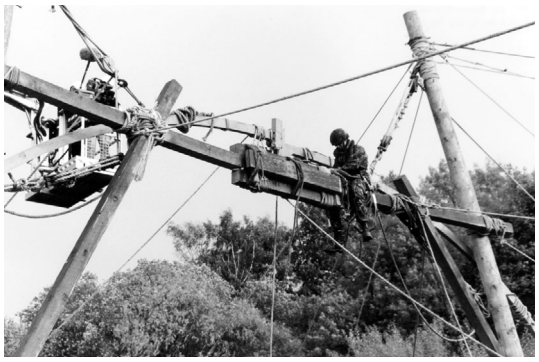
vidually secured. In addition the quadrants were offered in pairs to ensure they would fit together. The design of the ribs had been provided by English Heritage from surveys of the bridge. The construction meant that the exact design of the crown joint could not be determined, so a best guess resulted. During the test fitting the accuracy of the casting was proved as the joint was an extremely tight fit. It was therefore decided that the flanges would be removed to allow the construction in the air to be completed more easily. The first quadrant was then lifted onto the barge and secured for the evening.

One area which caused trouble throughout was the rope twisting with the block and tackle. The use of triple-triple blocks allows an anti-twister to be included in the reeving, but the BBC wished the lifting to be hard work (for realism), thus double double blocks were used throughout. With no anti-twist possible, on several occasions this led to the new rope twisting so badly that the system was locked solid. The method of freeing this off was for an individual to climb level with the top of the twist and place a crowbar in the rope and untwist it by hand; a time consuming process. An old Naval hand brought in by the BBC told us whenever the Navy brought a new rope into service, it was first stretched for several days, being re-tensioned each day. The effect of this was to take out much of the stretch, and also the ropes were far less inclined to twist after this treatment. A useful tip, but for us too late.

The next morning dawned much as the others had done, misty and damp. After an initial site inspection the troop set about lifting the first quadrant into position. This went particularly smoothly in comparison with what had been accomplished previously, with the dual lifting positions proving to be especially effective. The geometry was such that the angle of pull from the top of the derrick allowed the quadrant to be elevated at the correct angle, whilst still putting enough horizontal force on it to ensure it remained seated in its footing. The second quadrant was then transported to the frame and lifted and by 1400 hrs it was time to marry the two together.

So Troopy was dispatched to the top of the frame, and my three hour sojoum on the cross bar began. The joint had been lubricated by lard prior to erection but it was no easy feat to insert the three bolts into position. After an hour I was joined by Cpl Lidster, and between us it took another two hours before the quadrants were joined and all the bolts tightened. We had thus proved that the theory was both plausible and workable, no mean feat.

The original plan had been to erect all three ribs using the eighteenth century techniques. However the multiple changes had meant that the frame had been constructed out of material chosen for another design. The crossbar was two 6” square baulks spliced together, which was more than adequate for bending in the *xx* direction but the geometry of the other ribs would have caused it to fail in the *yy* plane, a fact not realized until the frame was is the air. Time permitting, the ideal solution would have been to strip out the frame and replace the crossbar with a single piece of timber for the full span. This would have led to a two day delay in the construction which the BBC could ill afford, so the decision was made to erect the rib nearest the frame first, preventing us from lifting any of the others into position with this technique. Luckily



Lt Day preparing to join the ribs.
It was to take two people three hours to do this.

the Blists Hill Museum was very keen to have all three ribs constructed and with the BBC already over budget, they stepped in with the funding for two 80t cranes and a cherry picker to secure the pins in position.

It took another two days to erect the final two ribs. The slow progress resulted from the single slinging position of the crane, and the need to support the quadrants in three separate places due to the properties of cast iron in tension. It took some time to get hold of enough chain blocks to allow the length of each leg to be adjusted as required whilst dangling in mid air. After many hours of an intricate hydraulic ballet, the bridge was up and nearly complete; a very impressive sight as by this stage with all of the guys securing the uprights, the quadrants and the frame, a total of over 1.5 km of cordage was strung across the site.

The frame looked so impressive that the museum curators requested that it, together with the ribs, be left up as it clarified the construction process. Another day was required to lash the three ribs together and consolidate the guys, replacing the many with far fewer SWR lengths for semi permanent usage. At 1300 hrs, 18 October 2001, 2 Troop, 51 Field Squadron (Air Assault) drove away from Blists Hill Museum, tired, relieved and anxious to see whether the camera had got their good side.

Conclusion

A PROJECT such as this is so far detached from the day to day work of an engineer squadron that I would recommend it to all. Both practical and theoretical combat engineering and artisan skills were tested to the full. Problem solving happened at all levels, with two notable obstacles being overcome through suggestions from the most unlikely sapper.

After a period of contemplation on the project, I would recommend the following points to anyone involved with either the making of a television programme, or with using cordage for lifting:

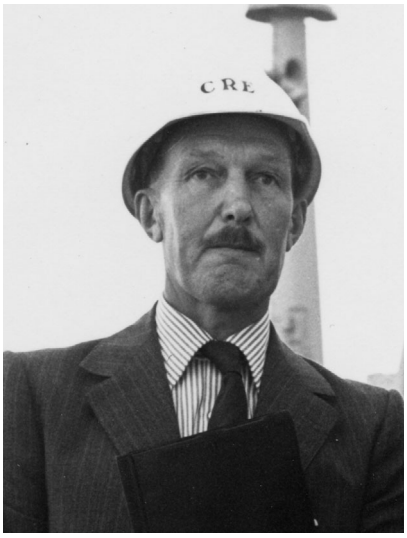
1. Test build. No matter how much the producer wishes to follow the learning curve as your troop discovers the problems, insist on a copy of the design early, so that you can conduct a test build. Our producer has now vowed it will be many moons before she makes another engineering documentary, due to the stress involved. Some of this would have been alleviated if we had been able to discover many of the problems beforehand. In the end all our trials and tribulations were left on the cutting room floor anyway.
2. For derricks, ensure that there is at least one guy rope per 90 degree quadrant to give the necessary control over the lift and positing.
3. Pre-stretch all new cordage prior to use, especially if it to be used as part of block and tackle. This will reduce the twisting of the system whilst under tension and the elongation under tension, leading to more control.
4. Early involvement with the filming schedule is essential, preferably after the test build to ensure that it is realistic. This will allow you to already have a knowledge of the likely timeframe for certain activities, allowing you to aid the producer with an accurate filming schedule (see point 5).
5. Beware the length of time it takes to do things when the workforce are unfamiliar with either the techniques or the materials. Take your estimate, double it and add 10 per cent and you may come close, except for the occasions when you need to halve it. Do a test build if feasible to tie these down (see point 1).
6. If possible develop the attitude that the programme makers are filming an engineering project (though one has to remember that the point of the project is to make a television programme, not construct a bridge).

The museum plans to keep the exhibit outside for two years before moving it to another site for display in a large warehouse complete with gantry to allow public access to the top. See www.bham.ac.uk/IRONBRIDGE/ for details.

The programme *"Timewatch: The Mystery of the Ironbridge"* was transmitted on 11 January 2002.

The Changing Face of "Works"

COLONEL J C PEACEY FICE FIMechE



Charles Peacey left school in mid 1946. With some family background in the Army and an interest in electrical and mechanical matters, he opted to take a War Office Engineering Cadetship rather than submit to National Service. This resulted in a 4-year short service, and later a regular commission in the Corps. In all, this provided a most enjoyable career, some of the highlights of which are described below.

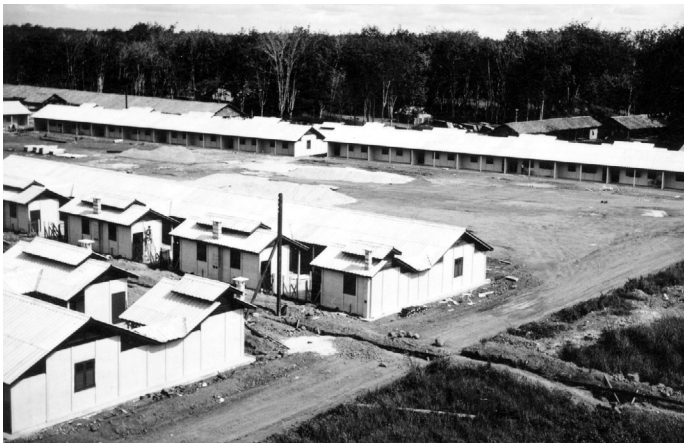
Numerous articles appearing in the Journal *over the last few years have shown how active the "Works" side of the Corps has become. This is in marked contrast to the situation a generation or so ago when there were few opportunities for professional and technical staff to gain practical experience. This article, based on my own career, indicates some of the problems in keeping a "Works" capability alive.*

The immediate post-war RE Works Services were largely static and civilian staffed, but with a number of officers and other ranks employed in the EES or Establishment for Engineer Services. The officers included many attractive Chief Engineer posts (at Colonel or above), one in each of the many UK and overseas military districts; there were also CREs, DCREs and GEs. The other ranks included Clerks of Works of different disciplines, draughtsmen and, (a most valuable trade), Engineer Clerks and Storekeepers.

Having completed an Engineering Cadetship in mechanical engineering, and attended the RE OCTU at Ripon, I was granted a short-service commission in the Corps in August 1949. Soon after, I and several others assembled at Chatham to attend No 1 RE Junior Officers Works Course. This lasted some six weeks, during which we were taught about works accounting procedures with all the many forms, works diaries and contracts. Long since time-expired black arts such as duodecimals and the use of 7-figure logarithm and trigonometric tables were included. Exercises included planning an extension to the then largely undeveloped married quarters estate on the Great Lines. We visited the officers' quarters then under construction on Mansion Row to be shown what to look out for in supervizing construction.

Following the course, students were posted to Works appointments, largely in the Middle and Far East. A six week voyage by troopship took me to Singapore where I was issued with a revolver and 12 rounds and packed off on the night sleeper to Kuala Lumpur (KL) and Taiping. I reported to the CRE, a Lt Col Cross, who decided that I should go on to DCRE Penang as GE on an estate of married quarters being built for Gurkha families at Sungei Patani. Bob Hussey the DCRE was a civilian, but had served as an RE major in the war. There was one other 2Lt RE at the DCRE office, also a Capt Admin Officer and a few Malayan Other Ranks (MORs). I lived in the garrison officers mess adjacent to the Runnymede Leave Centre in Penang and travelled daily to Sungei Patani in a Dodge 15 cwt with my SSgt CofW (C).

The Malayan emergency had been declared some time before, but was escalating in inten-



Gurkha Married Quarters at Sungei Patani.

sity. A battalion of 1/6 Gurkha Rifles was based at Sungei Patani living amongst the rubber trees in what had been the largely tented barracks of a pre-war RAF airfield, but they were seldom there. More units then moved in: HQ 3 Cdo Bde and 45 Cdo, 1 KOYLI, and another Gurkha battalion. A new camp had to be built on the airfield, having tented accommodation with huts for offices, stores, cookhouses, ablutions and latrines. A Braithwaite water tank and tower were constructed, as well as laterite roads. The contracts for all this were arranged by the staff of the CE Malaya at KL, but site supervision was by the CofW and me. With a staff of 30 or so local civilians, I was my own master, apart from occasional visits by the DCRE.

Operations against the "bandits" as they were called were usually on a platoon or company scale. A large part of my work became arranging the construction of ablutions, cookhouses and latrines in the forward bases of such units, usually in the factory areas of rubber estates. Although military vehicles were supposed to be escorted in such areas, this was seldom feasible and I was young and naive enough to go off on my own or with a few MORs borrowed from the DCRE staff in Penang.

On one occasion I was required to carry out a recce for a possible airstrip in Kelantan, on the other side of Malaya. The first step was to see the site by air from an Auster, with a second Auster escorting us as the area was so remote. I then flew to Kota Bharu by civilian airline and travelled on by jeep and foot with a Malay Regt escort to carry out the recce proper. On our return to KB we had with us a sakai tribesman who had been picked up in the jungle and had to be taken to Police HQ for questioning. Poor weedy looking man, he was roped around his neck to an escort just as in pictures in Victorian story books. The airstrip was never built, but the area has since been opened up with a high speed motorway passing through it.

By this time I had applied for a regular commission. It was felt that I had been on my own too long and needed regimental experience. I was therefore sent down to Singapore to join the Engineer Regiment. I was given some limited responsibility for a few local troops but was actually employed with the Engineer Base Workshops. This was still in temporary requisitioned accommodation; the principal task being the reconditioning of a wide range of equipment, shipped in soon after the Japanese surrender. It had been left out in the open ever since, where it had soon rapidly deteriorated.

Operational requirements then took priority over career planning and after only a few months I was sent on a course on road and airfield construction at the Australian SME, near Sydney. It had been decided that communications needed to be opened up in Malaya as a means of beating the terrorists. On my return to Singapore, I was sent up-country again as a GE, first based at the DCRE near KL and later with 48 Bde in Kuala Lipis; but nowhere near any road or airfield work! Temporary camps again took up most of my time, but the terrorist activity was stronger in these areas and armoured car escorts were usually compulsory. I left Malaya in May 1952 having never once used my revolver in anger; nor having even received any instruction in its use. Malaya had all been great fun, but I had worked very much as an individual rather than a member of a Sapper unit.

Having passed my RCB and completed a Junior Officer course at Chatham, I was posted to 10 Trades Training Regiment in Kitchener Barracks, becoming the Assistant Technical Training Officer (ATTO) in the RE Park. I was in effect the 2IC of the Workshops where tradesmen were trained at Class III, Class II and Class I levels. I also lectured on trade employments and some technical subjects to YO, JO and long courses.

It was then thought once again that I needed regimental experience in a field troop, so I was posted to 32 Engr Regt at Nienburg where, because of my background, I joined 45 Fd Pk Sqn as Tp Comd of the Stores & Wksps Tp. This was another largely technical post with responsibility for managing bridging and fieldworks material, especially arranging its loading for exercises onto RASC convoys and its offloading on return. My regimental activities were restricted largely to being mess treasurer and running the unit stables.

A short all-arms tour followed, as a testing officer at the WOSB at Barton Stacey. Assessing and reporting on groups of officer candidates for two days at a time was not particularly inspiring, although the systems applied were later of some value in writing confidential reports.

It was clear to me by this time that my future lay in the professional engineering side of the Corps. I applied and was selected for No 7 Long Engineering Course, starting at Chatham in September 1959. At that time a single course was run each year for both Civil and E&M students and the practical attachments were arranged to suit the aptitudes and interests of individuals. I opted for the civil engineering side and served a contracting attachment on the construction of a major pre-stressed concrete quay on Teeside, followed by a consulting attachment helping to design a bridge, (which was never built), on the M4 in Berkshire. The monthly reports which students were required to submit to Chatham helped to keep ones eyes open to what was being done, and why, and formed a sound record of the experience gained. The practice in clear and precise written expression was also most useful.

Following the course I was then posted back to Chatham as an instructor in the Design Wing of the Engineer Planning School (previously the Civil Engineering School and later the Construction School). As well as teaching engineering design principles to YOs and students on long courses, we ran courses on the construction of temporary camps for overseas operations. Papers were written on the need for YOs and others to be given instruction on logistical matters, and for units to maintain pools of qualified and up-to-date construction tradesmen. This was difficult for them to achieve at the time with the military philosophy concentrating on preparedness for all-out warfare in North West Europe. Where camps and infrastructure matters were contemplated at all, they were usually the maintenance of routes and construction of transit facilities in the L of C and rear areas.

It was during this appointment that an emergency occurred in British Guiana (now Guyana) and a battalion of Foot Guards had to be sent to reinforce the resident battalion. RE Works Services had by then (mid-1963) been disbanded and no capability existed for emergency military works. I was detached from Chatham at a day's notice and sent out with the Guards to arrange with the local Public Works Department (PWD) for the construction of temporary camps. Many of the necessary stores were not available locally and signals had to be sent to the Chief Engineer at Wilton to arrange for delivery via the RAF. I was eventually replaced by a CofW and returned to Chatham.

Even works types however, are reasonably smart, for I was selected as one of the party to represent the Corps at Churchill's lying in state in Westminster Hall. This was a moving and memorable occasion.

My next posting was to my squadron (equivalent) command as OC of the Engineer Base Workshops in Singapore. This had moved from its previous location and was now in purpose-built accommodation within the Engineer Base Installation, then commanded by Lt Col Harry Realf. Apart from a 2IC and a draughtsman, my staff was entirely civilian; Chinese, Malay and Indian. There was plenty of work in repairing equipment for which the Corps had responsibility (largely assault boats and outboard motors which were failing from heavy operational use in Borneo, and refrigerators). Manufacture was still an RE responsibility and the EBW designed and made equipment needed operationally. Typical production included cartridge filters for water treatment in Borneo and dummy mines. Another responsibility I had was as inspector of RE equipment throughout FARELF; this entailed regular visits to inspect bridging stores in Hong Kong and miscellaneous equipment in Thailand.

Following two years in Singapore, I was posted in mid-1967 as an ACRE to the newly formed 62 CRE (Works) at Barton Stacey, then commanded by Lt Col David Townsend-Rose. The need for a mobile and uniformed military works unit had by then been accepted, and this was the first result. It took some time for our potential to be realized, so the CRE arranged an exercise in Scotland to gain experience and to demonstrate what we could do. We carried out recces and prepared proposals for a wide range of projects,

covering different disciplines. These were mostly relatively small, with the intention that they be taken on by units and some civilian organizations for construction using military (RE) labour, often TA. Few of these were ever built, but we did demonstrate our capability both to ourselves and to others, so that further demands soon arose and we grew in confidence. We were co-located with HQ 12 Engr Bde, which was most convenient as they originated most of our tasking. Under command we had three STREs, one construction (C), one well-drilling (WD) and one bulk petroleum (BP).

Before long we took on more work, some of it overseas. The WD team was sent to Kenya to drill for water in the Northern Province. The BP team was engaged on a major TA logistics exercise in the Netherlands, including managing the construction by a TA Engr Regt and the operation of a ship-to-shore pipeline; this was followed by construction of bulk fuel storage for the RAF on Masirah island, off Oman. On the 'C' side, a second STRE was soon established. Work was done to develop planning for LofC facilities for BAOR in time of war, and a team was sent out to help the local PWD in Malta. When troubles blew up in Anguilla, I went out to do an initial recce of what might be done by 4 Fd Sqn who were already on their way there; I was followed by a small team from 62 CRE to supervise the work agreed upon. At that time few sqns had their own CofWs so they had to be detached from works units when required.

Another technical posting followed, to MEXE at Christchurch. Here I worked on a number of development projects for military equipment, including 400 Hz generators, a field bakery and piers for the Medium Girder Bridge.

Next, on promotion to Lt Col, I went to AFSOUTH at Naples to take over as staff officer responsible for NATO fuel pipelines in Italy, Greece and Turkey. This was a most interesting job, entailing extensive travelling. I led a team on annual inspections of all the major fuel depots and installations; then staffed proposals for improvements and extensions, to be funded from the NATO Infrastructure budget. Working in a tri-service international HQ was an attractive and rewarding experience.

Then back to Chatham again, this time as CI of the E&M School. Once again I was involved in trades training, but with much improved workshop facilities in place of the old RE Park which I had known some 20 years before. There was, however, still a constant battle to argue against reduction of the time spent by YOs on technical matters and to disseminate the message to units that if tradesmen are to be ready when needed, they must be given more opportunities to practise their skills.

Road Construction - Post Crown Force, Thailand.

I had already visited Malta in 1967 when we had sent a small technical assistance team there from 62 CRE. Following expulsion by the Malta Government in 1972, a team had been re-established with about 30 all ranks as STRE Malta, to provide further assistance to the PWD. This served two purposes: it provided a form of aid to Malta, furthering the wishes of the Foreign and Commonwealth Office; it also provided opportunities for professional engineering officers, CofWs, surveyors and suchlike to practise their specialities. The Corps had no major engineering projects on hand at that time; the Crown airfield and roads in Thailand, the Beef Island airfield and

Laboratory Wharf, Malta.

the airfield and other tasks in Anguilla were all finished. Malta provided just the opportunities we needed; the funds for projects were generated locally, but the PWD lacked the expertise to execute them. The STRE acted as a firm of multi-disciplinary consulting engineers, designing work and supervising its construction, some by direct labour and some by contract. I commanded this STRE from April 1975 until its demise in November 1977. Tasks varied from roads, deep water quays, industrial estates, housing and hospital modernization to feasibility studies for alternative uses of abandoned barracks. The Team's presence in Malta provided excellent opportunities for training exercises by RE TA units on work associated with what we were doing; in particular, several members of the Engineer and Railway Staff Corps and of the RE Specialist Pool came out to give additional advice when needed.

Team members wore civilian dress and worked civilian hours, but were still able to take advantage of all the military support and facilities available on the islands. This was an ideal situation especially as the scale of work was reasonably in line with the size and establishment of the Team. Its members gained considerably in experience, but without cost to the Crown. Unfortunately, British Forces eventually had to leave Malta and the STRE went with them, leaving behind not only lasting evidence in the form of completed projects but also goodwill towards the Corps.

The MoD had been approached by the Saudi Arabian National Guard (SANG) early in 1977 and asked to provide a team to supervise the construction of two 500-bed hospitals, one at Riyadh, the other at Jeddah. This seemed a suitable replacement for the STRE in Malta. A small team was set up, under my command attached to the British Military Mission to SANG. Work on a palace complex for the Deputy Crown Prince (now effectively the Kingdom's Ruler) was added to our role, including much of the detail design. The scale of work was immense and valuable lessons were undoubtedly learnt by team members, especially those working on the palace, but the scale of work was really too large for the numbers (about 20 all ranks) we were allowed to have. We had to rely almost entirely on the Saudis for administrative support, which was not always forthcoming. To make matters worse, we were in the thankless position when dealing with contractors of having responsibility without authority. We had no control over project finances, the payment schedule for which had been arranged, grossly to the contracting consortium's advantage, before our arrival. It was, nevertheless, an interesting and worthwhile yet often frustrating, appointment. As at Malta, staff gained practical experience at their specialisms without the need for UK funding of the work being constructed.

Hospital Power Station, Riyadh

My final posting was to SHAPE in Belgium where I worked for 3½ years as a staff officer in the Infrastructure Branch, acting as SACEUR's representative at the weekly meetings of NATO's Infrastructure Committee. SHAPE is a very large multinational and tri-service headquarters. Policy is deliberated at high level, often based as much on political as on military or engineering reasoning. Working at NATO and SHAPE provided fascinating insights to the way in which the different nations did or did not delegate responsibility. Although the work was largely administrative and very much long-term, there were still opportunities for providing engineering input. It took many years for possible projects to go through the necessary selection and approval procedures. Even after publication in an annual "slice" programme, projects were still at risk of there being insufficient international funds available when ready to go out to tender.

On leaving the Army at 55 with the FICE and FIMechE qualifications I had acquired during my service, I was for ten years or so the Deputy Secretary of the Association of Consulting Engineers. My career on the Works side of the Corps provided an ideal background for this post, having given me broad engineering experience as well as practice in administration. I had perhaps not had much experience in military command, but plenty in management.

The Falklands war occurred whilst I was at SHAPE, providing plenty of practical engineer-

ing activity for both Works and field units. That was followed not long afterwards by the Gulf war and then all the operations in Serbia and other parts of the Former Republic of Yugoslavia. Afghanistan now provides yet more opportunities for the Corps to demonstrate its professional engineering capability. There no longer seems a need to look for work to keep Works units fully trained. But the situation may yet change again. Should it do so, efforts will be needed to find organizations we can work for, whilst spending their money and gaining training and experience for ourselves. Engineers cannot really learn their jobs and remain proficient at them without actually spending funds and getting down to real design and construction.

The Berlin Spy Tunnel – A Memoir

BRIGADIER R M MERRELL MBE BA

The author was commissioned in 1943 and before becoming involved in the subterranean activities here described spent most of his service well above ground with airborne forces, serving in Northwest Europe, Singapore, Malaya, Java and then Palestine. After resurfacing in Berlin he held alternating staff and regimental appointments including command of 9 Indep Para Sqn RE, 53 (Welsh) Div Engrs TA and R Mon RE (M). He eventually became Chief Engineer UK Land Forces before taking up his final appointment as ACOS G3 HQ Northern Army Group. He retired in 1979 and spent the next fifteen years conducting and reporting on Public Inquiries into highway schemes.

OPERATION *GOLD*, to give this enterprise its proper title, has been mentioned or described at varying length in numerous articles and books over the years. It is now the subject of a recently published book, "Spies Beneath Berlin" by David Stafford, in which reference is made for the first time to my knowledge to the fact that a team of Royal Engineers took part in the operation. It is this that has prompted this brief description of the part played by members of the Corps. The nature of the operation precluded the keeping of any records or photographs so what follows is indeed a memoir of events which took place over forty years ago during the Cold War.

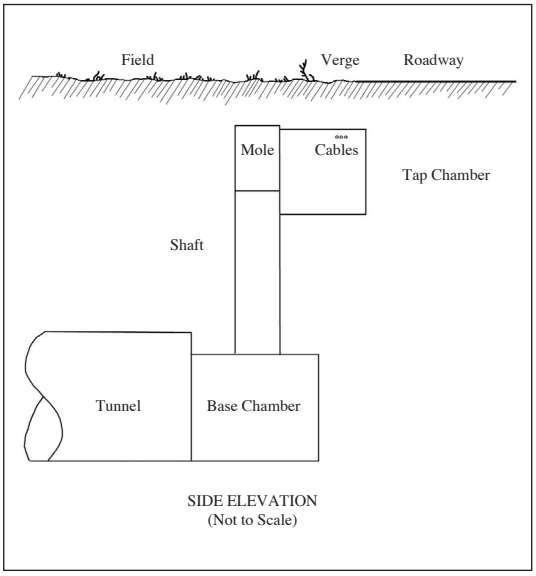
The operation was conceived jointly by the United States' Central Intelligence Agency and Britain's Secret Intelligence Service some time in 1953. It involved digging a clandestine tunnel about half a mile long from the American sector of Berlin into the Russian sector to tap three telephone/telegraph cables carrying traffic between the HQ of the Soviet Forces in Berlin and Moscow. It was decided that the Americans would provide a base near the sector boundary from which the operation could be conducted, and then dig the tunnel at a safe depth to a point near the known location of the cables. The British part would be to excavate a route from the end of the tunnel to the cables and to construct a tap chamber which would expose at least six feet of each cable. (The placing of the tap would also be a British responsibility but carried out by civilian experts). The cables were known to be buried twenty-eight inches below the verge of a minor road used by the usual range of vehicles to be seen in the Eastern sector. The soil in the area was described as being predominantly sand without clay or rock.

It is against this background that what was known initially as the Combined Experimental Unit formed up at Aldershot in late 1953 under the general direction of an SIS officer, J E Wyke, who had previous experience of similar operations on a smaller scale in Vienna. The unit consisted of an officer, a sergeant and eight men, but the only miners the Corps could muster had been trained to use heavy drills and explosives in solid rock in Gibraltar so their expertise was of little value for a clandestine operation in soft soil. A number of changes were therefore necessary in the early stages including the addition of a second officer, Lieutenant R Ford, and the reduction in the number of men to six. In this form the unit was then redesignated No 1 Specialist Team RE.

An initial site for experiments and training was established in a fenced compound within a demolition pit at what was then the RE Transportation Centre at Longmoor. This pit provided us with a near-vertical face into which we could burrow, and it was here that for several months the team, driven on by Wyke's enthusiasm and optimism, strove to solve the major problem which was how to excavate upwards to within two feet of the surface beside a road in normal use without either disturbing the surface or suffering a collapse. We had the benefit of a military pamphlet published in the 1920s which set out the tunnelling techniques used in World War I, so horizontal progress was not such a problem as we could adapt the spiling system then used. This involved cantilevering the roof forward over a supporting frame so that it was always in advance of the working face which was being excavated.

After several false starts and much frustration a solution was found to the problem of driving a vertical shaft from below by developing a device which inevitably became known as The Mole.

This was a six feet by two feet bottomless mild steel box three feet high, the top of which was



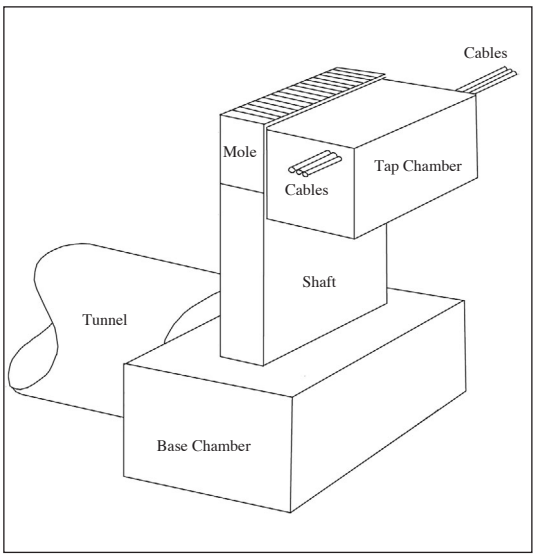
Operation Gold

made up from a series of lateral cutters interspersed with closable vanes; it combined some of the features of a barbecue grill with those of a venetian blind. The whole thing worked rather like an inverted two-man slit trench. Soil was loosened an inch or two at a time above the mole by scraping through the grill and the mole was then jacked up hydraulically until the grill again came to bear. The process was then repeated. A set of eight jacks fitted to the mole enabled it to be supported either along its sides or across its ends, so that a steel crib could be progressively built up below it as it advanced by adding long side or short end components alternately. For some reason this system became known as the boy scout's fire. Finally, one side of the mole could be detached from inside and slid down so that the tap chamber could be developed from within the mole once it had reached the required height.

The requirements of the shaft effectively determined how the rest of the task should be tackled. In time-honoured military fashion it was divided into three phases. Phase 1 would be to construct a rectangular base chamber on the end of the six foot diameter tunnel. Phase 2 would involve launching the mole through the roof of the base chamber and building up the shaft. Phase 3 would be to break out from the mole in its final position and develop the tap chamber. At every stage the excavation had to be kept as sandproof as possible, and noise had to be minimized, so no hammering or drilling was allowed and everything was either levered or jacked into position. On this basis, training, development and rehearsals continued until the Summer of 1954 when the team moved with all its specialist stores to Germany for further training in soil similar to that to be expected on the operation.

Meanwhile our US Army counterparts had been honing their tunnelling skills at Albuquerque in the New Mexico desert, and Wyke and I decided to combine business with pleasure by going to see how they were getting on. They in turn sent people over to see if we really could do what we said we could. Also during this period the American base facility at the operational site in Berlin was being built. Its principal feature was a large warehouse with an extensive cellar from which the tunnel was to be driven and in which all the excavated soil was to be stacked. Its ostensible function was that of a combined equipment depot and radar site.

The American tunnelling operation began in the Autumn of 1954 and was completed by the end of February 1955. By this time the British team was located at RAF Gatow in Berlin, where in an isolated hangar final preparations were being made while waiting to be called forward. When the time came, the team with its stores and equipment moved by night in closed US Army trucks to the operational base and drove straight into the warehouse. From a concealed OP in the roof there was a clear view



Oblique View (Not to Scale)

over open ground of the target area and a two hundred yard stretch of the road beside which the cables lay. This view of the road was bounded to the right by the wall of a cemetery and to the left by some nondescript buildings beside a bus stop. The US Army manned the OP continuously throughout the operation, and whenever a pedestrian or cyclist appeared between the cemetery wall and the bus stop the lights in the tunnel were flashed and all work stopped until the all clear was signalled.

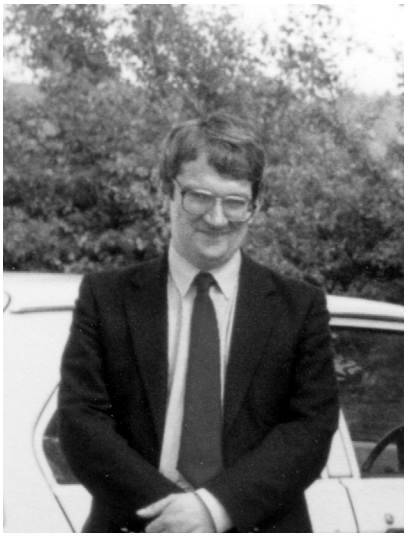
Our part of the operation turned out after such a long period of preparation to be something of an anti-climax. On the whole things went unnervingly to plan and no unexpected problems were encountered. There were, of course, moments of acute anxiety. The first was in the positioning of the mole in relation to a surveyed datum point at the end of the tunnel. If we got it wrong and came up under the cables we were sunk. If we got it wrong and came up with the cables behind us we were also sunk but would not even realize it because we would not know they were there. In the event, we played it safe and positioned the mole a foot or two short of what we judged to be the critical point. The second worrying decision was when to stop moling and secure the shaft in the hope that we had gained sufficient height to be able to bridge the cables. We had at that stage no way of checking precisely where we were in relation to them. The third and most uneasy period was during the construction of the tap chamber as we scraped our way forward, hoping with every inch gained to see some evidence of cable laying. It took us a very long three days to reach the cables which eventually appeared at about the expected depth below the roof of the chamber. This was so near the surface that anyone walking above in hob-nailed boots was clearly audible and an iron-wheeled hand cart sounded like a railway truck on a badly maintained track. The whole operation had taken us about three weeks. It may not perhaps have been a very elegant performance, but it had worked.

EPILOGUE

THE tap on the cables functioned for nearly a year until in April 1956 the Russians suddenly appeared on the scene and dug it up. By then thousands of reels of tape had been recorded and work on these continued until 1958. In 1961 the SIS traitor George Blake was unmasked and confessed that as the officer responsible for taking the minutes at the preliminary planning meetings he had betrayed Operation *GOLD* to the KGB before it had even begun. Experts remain divided in their interpretation of the course of events that followed and their assessment of the value of the operation.

The Madras Engineers and Pioneers at the Siege of Malegaon, May – June 1818

N C HAYES MA



After graduating from the University of Lancaster in 1977 with an honours degree in History and Politics, Nicholas Hayes taught full-time in a number of secondary schools. Since completing a Master's Degree at the University of Buckingham in 1992, he has worked as a researcher, part-time teacher and free-lance writer specializing in military and naval history.

THE siege of Malegaon took place during the little known Mahratta and Pindari War of 1817-1819, which witnessed more siege operations than any other campaign undertaken by the British in India. The Mahrattas were a Hindu people who occupied a large area of west and central India. They were ruled by five princes: the Rajah of Berar; Jaswant Rao Holkar of Indore; Daulat Rao Sindhia of Gwalior; the Peshwa, Baji Rao; and Appa Sahib, the Bhonsla of Nagpur. These princes and their predecessors had for some years been in league with the Pindaris, mounted marauders of all castes and tribes who terrorised central and southern India. In return for giving one-sixth of their booty to the state, the Pindaris were permitted to use the Mahratta territories as "safe bases" in which to rest and refit between raids.

From 1812 onwards, the Pindaris, aided and abetted by the princes, extended their raids into the East India Company's territory. One such raid was made in March 1816, when a Pindari band swept right across central India and deep into the Madras Presidency, plundering over 300 villages and carrying off or destroying property to the value of £100,000. Lord Hastings, the Governor-General of India, was determined to destroy these pests once and for all so responded by assembling two armies. One, the Grand Army of Bengal, totalled some 43,000 troops, and was concentrated in the north under his own command. The other, the Army of the Deccan, consisting of about 70,000 troops of the Madras and Bombay armies under General Sir Thomas Hislop, was formed in the south.

Hastings' plan was to sweep through central India from north to south and rid the land of Pindaris. This design was to some extent frustrated by the conduct of the Mahratta princes, who seized the opportunity afforded by the Company's involvement with the Pindaris to open hostilities. Holkar was the first to take the field, followed shortly by Baji Rao and then Appa Sahib. This understandably complicated Hastings' plan of campaign; to the Pindaris he had now to add the Mahrattas and the Arab mercenaries who garrisoned many of their fortresses. On 21 December 1817 however, the Mahrattas were dealt a decisive blow when in the only large scale engagement of the war, General Hislop with 5,500 men crushed Holkar's army of 35,000 at Mehidpur. Thereafter, it remained only to hunt down the bands of Pindaris and reduce the forts of the Mahratta princes.

Indian fortresses did not differ greatly from the castles of medieval Europe. They were sited with tactical skill on hill-tops, beside rivers, or, in the plains of the Ganges and Indus; on artificial mounds protected by man-made ditches, ponds or marshes. But, even in the eighteenth and early nineteenth centuries, they were still constructed with massive walls and closely grouped towers (often called bastions, even by those who should know better). The crests of the ramparts were crenellated, and two or more rows of loopholes further down the walls revealed the existence of interior galleries. Since there were no bastions, the garrison could not deliver flanking fire against an assaulting column, save imperfectly from the towers. With the exception of barbicans, outworks to command the ground beyond a fortification were also unknown. When engineers wished to endow a fortress with additional strength they simply built higher walls and more of them.

Of typical construction was Baji Rao's strong fort of Malegaon in the Khandesh, before which a British force, under Lieutenant Colonel A. McDowell, arrived on 15 May 1818.

The pioneers and sappers were commanded by five officers of the Madras Engineers. There was also a small detail of European artillery.

The fort of Malegaon, said to have been built in c1760, was garrisoned by about 450 Arab mercenaries, with a few guns. It was situated on the left bank of the River Musam, a little above its junction with the Girna. The river ran under the west and a great part of the north and south sides. The fort had two walls, with a ditch and fausse-braye in front of the inner wall. The latter was 120 yards square, with a round tower at each angle and in the centre of each side. The fausse-braye, was also quadrangular, but oblong in shape. The outer wall was of irregular form, running parallel to the inner wall on the west side only, extending some distance on the other sides, and enclosing a large piece of ground. It was strengthened throughout by round towers at irregular intervals. Towards the east, and on part of the north side, there was an additional wall built of mud, between the ditch of the fausse-braye and the outer wall. Old and much decayed, it extended from the south-east angle of the ditch as far as the works of the gateway on the north side, with which it was connected. The inner wall and the fausse-braye were built of stone, as was also the outer wall on the south side towards the river. Those parts of the outer wall which faced the town were built of mud. The height of the inner wall was 60 ft, the thickness of the parapet 6 ft and the breadth of the terre-plein 11 ft, making the total thickness of the rampart 17 ft.

The space between the inner wall and the fausse-braye on part of the north and on the west and south sides was about 40 ft, of which 10 ft was appropriated for stabling. The roof of these stables formed the terre-plein of the fausse-braye, and was surmounted by a parapet of 5 ft. The fausse-braye thus had an interior height of 15 ft, but an exterior height of 40 ft including the ditch, which, for the most part, was cut out of solid rock, without a berm. The scarp revetment of the fausse-braye was 5 ft thick.

The width of the ditch was 16 ft; its depth varied, but on the river front, where it was greatest, it was 25 ft. The space between the counterscarp and the outer wall also varied; on the west it was only 37-38 ft but on the east, more than 400 ft.

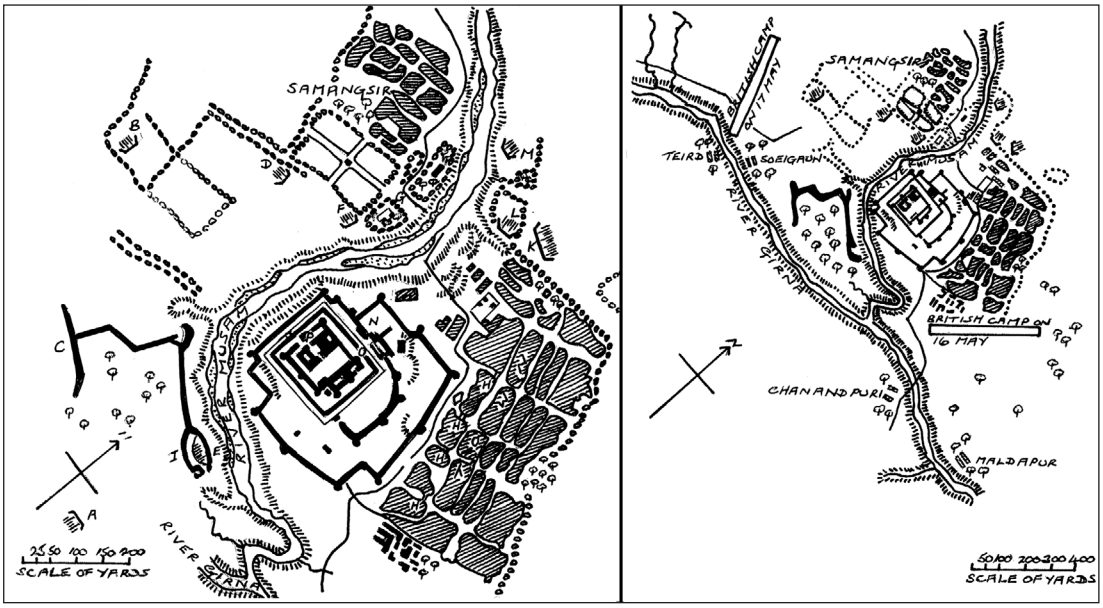
The height of the outer wall was 14 or 15 ft. The parapet was 3 ft thick, and the rampart 10 ft on the west and south sides and 14 ft on the east side. The gateways were nine in number, very intricate, and all containing bomb-proof shelters.

On the east side, the fort was much weakened by the town being within musket shot. An old rampart surrounded the greater part of the town and all entrances into it were barricaded. The defences of the fort were further impaired by the village of Samangsir on the right bank of the river, nearly opposite the outer, or northernmost, gate. A thick grove of mango trees 400 yards deep, ran along the right bank opposite the south-west angle.

The country round the fort was flat. The soil on the left bank of the Musam was of black mud one foot deep, resting on white sandy rock easily worked at the surface. The right bank was of shelving rock, covered with loose sand.

The garrison of Malegaon made no attempt to prevent McDowell's engineers from reconnoitring along the right bank of the Musam, where a good view could be obtained of the inner and outer walls on the south and west sides. Nothing could be seen of the ditch or fausse-braye. As the Arabs occupied both the town and the village of Samangsir, very little could be ascertained regarding the strength of the fort on the east and north.

The Commanding Engineer, Lieutenant T. Davies, saw that to attack the east front it would first be necessary to capture the town, which could not be done without crippling the British force. As



Plan of the Attack on Malegaon.

the same objection existed to an attack on the north front, and as the ground on the left bank of the Musam was too confined, he recommended an approach from the right bank against the south-west angle, the ground on that side of the river being the most favourable for the construction of works. Davies' plan was to erect two batteries (A & B on the plan) 400 and 500 yards from the south and west sides respectively. Battery A was to be armed with two 12-pounder guns, and B with two 18-pounder guns, two 8-inch mortars and two 8-inch howitzers. The same night a parallel was to be constructed in the mango grove between these two enfilading batteries. From the parallel, the lieutenant proposed to advance by zig-zags to the bank of the river, along which a second parallel was to be constructed. On the right flank of this last, there was to be established a breaching battery (E) for two howitzers and two 12 and two 18-pounder guns. The bottoms of the revetments of two towers on the south face, which were mistakenly thought to be of mud faced with stone, were to be loosened by the breaching battery to enable the miners to form chambers for destroying them. Lodgements were then to be established in their ruins and the intermediate curtain turned into a parallel. That part of it which lay in the line of fire of the breaching battery was to be levelled, so that the bottom of the inner wall might be seen over it. From behind this lodgement, Davies proposed to sink a shaft, and, working thence, blow in the inner curtain. He also proposed that a post be constructed opposite the outer gate on the north side to confine the garrison, but this had to be postponed until reinforcements arrived.

At dusk on 18 May, the engineers marked out both the enfilading batteries, and, 800 yards from the river, a 200 yard long parallel. At about 8 pm, the Arabs made a sortie along the bank of the river and attacked the troops covering the working party. The latter got into confusion and fled. Major Andrews of the Madras Europeans put himself at the head of sixty men and proceeded to the grove, where he was joined by Lieutenant Davies. At the edge of the grove, Andrews' party drew up, charged the Arabs, and drove them completely out of the grove, following them into the river. There, the party came under a heavy fire of match-locks from the fort, which wounded Andrews and several of his men. Colonel McDowell now arrived at the grove and ordered the detachment back. It was at this moment that Lieutenant Davies, in the act of turning round, received a musket ball through the neck. Still crying, "At them, my boys, at them!", he was carried away, but died on reaching the grove. With his death, the conduct of the siege devolved upon Ensign J. Nattes of the Madras Engineers.

During the night, an approach was constructed and a small portion of the second parallel also completed. At daybreak the enfilading batteries opened up, and were answered by seven guns from the fort. A company of infantry took possession of a breastwork (D) in the rear of, and higher up the river from, Samangsir village. At 10 pm the Arabs made a sortie to attack this post, but were repulsed without loss on the British side; the post having been strengthened after dark. The Arabs however, took possession of Samangsir village and, at 10 am on the 20th, again tried to dislodge the company of infantry at the breastwork; but they were repulsed, the post having been strengthened with two 6-pounder guns.

In the meantime, the approaches were advanced. During the night, the parallel was extended 140 yards to the right along the bank of the river, and 150 yards from the exterior of the fort. On the left of the parallel, a 6-pounder was placed to rake the bed of the river, while on the right, Battery E was prepared for breaching the opposite angle of the fort.

After daybreak on the 22nd, the guns in the breaching battery opened up, but proved ineffective against the sound masonry towers. It was therefore decided to breach the intermediate curtain and form a lodgement on its rampart. One of the enfilading batteries was converted into a mortar battery and the other dismantled. An additional post (F), was established on the bank near Samangsir to contain the garrison. Next day, the guns effected a breach in the curtain of the outer wall, uncovering part of the fausse-braye. The British now decided to breach both the fausse-graye and inner wall by firing over the breach. So, on the 24th, the breaching guns first brought down the top of the fausse-brayer then began firing on the inner wall.

At about 8 pm, a shell blew up a small powder magazine in the fort. On the 25th, the guns continued firing on the inner wall,bringing down the parapet and upper part of the revetment. At 4 pm next day, a hole was made in the centre of the inner curtain. On the 27th, the breaching battery's 18-pounders alone continued firing; all the 12-pounder shot having been expended. At 4 pm, more of the upper rampart fell down, forming, to all appearance, an excellent breach. That evening, while the guns fired at intervals to keep the breach clear, parties were told off for the attack on the fort and town.

Simultaneous attacks were to be made on the town, the breach, and the outer wall. The town was to be assaulted by a column of 500 native infantry under Lieutenant-Colonel Stewart, which was to cross the river lower down to a point 800 yards from the walls. The column for the attack on the breach, consisting of 100 European and 800 native infantry under Major Greenhill, remained in the parallel near the bank of the river. A third party under Major McBean, and consisting of 50 European and 300 native infantry, took post near the 6-pounder battery (D) up the right bank. Its task was to escalade the outer wall near the river gate. Each column was led by an engineer officer, and headed by a detachment of pioneers with tools and scaling ladders.

At 5.30 am on the 28th, after two hours fire from the breaching and mortar batteries, Greenhill's column moved to the assault. It was led by Lieutenant (formerly Ensign) Nattes, who, on mounting the breach, waved his hand to the men behind him. They, however, were unable to ascertain the meaning of this gesture, for immediately afterwards the Lieutenant was killed, being struck by seven musket balls from a retrenchment constructed by the enemy for the defence of the breach.

The column came on, but found that their scaling ladders disappeared when dropped from the top of the breach, thus proving it impracticable. Major Greenhill having been wounded, orders were given for the whole column to retreat to the trenches, which they did in a steady manner. Colonel Stewart meanwhile, had taken part of the town before day-break, and by 7 am, had occupied the whole of it with the help of Major McBean's column which, on the failure of the attack on the breach, co-operated against the town from the left.

After this setback, the attack on the south-west side of the fort was abandoned. The reasons for this were:

- The lack of guns and ammunition. The siege had been commenced with two 12 and two 18-pounder guns, which had been in action from 19 to 27 and 29 May respectively, by which time 5,800 rounds had been expended and the vents of the guns had become excessively enlarged as a result.
- The length of time likely to elapse before more heavy guns arrived.
- The threatening state of the weather and approach of the monsoon, which would render the river an insurmountable obstacle.

The three remaining engineer officers now proposed an attack on the east face where there was greater facility for mining. The town would afford ample cover and a safe approach to the outer wall, the weakness of which, on the east and north sides, had been ascertained for the first time. A battalion of native infantry was to be placed in Samangsir, from where detachments might be sent to the post (F) opposite the north angle of the fort, and to a redoubt (I) proposed near the breaching battery. The streets of the town were to be barricaded (H), so as to form a parallel. Mines were to be dug under the three towers on the eastern side of the fort, for which purpose shafts were to be sunk in the houses opposite. Eventually, lodgements would be formed in the breaches caused by these mines, by which means the enemy could be driven from the outer walls.

On 31 May, therefore, Battery A was dismantled and working parties employed in preparing materials and constructing permanent barricades across the principal streets of the town. Over the next two days, a detachment encamped 2 miles northeast of the town and a redoubt for 100 men was begun behind the old breaching battery. The British camp was moved across the river to the vicinity of the Girna, which was close to its rear. The redoubt was completed on 3 June, when two more 18-pounders arrived. Next day, an approach to the redoubt was made from the parallel, and one 5 ½ and one 8-inch howitzer opened up on the fort from the town. On the 5th, all the sappers and miners, under an engineer officer, took up quarters in the town and began sinking shafts. The mining continued next day, but the two mines opposite the two most southerly towers on the east face had to be abandoned on meeting with a hard stratum of rock. Work on the mine opposite the north-eastern tower continued slowly, the soil being rocky and hard, and, by 8 June, 30 ft of gallery had been completed a little before daybreak. The roof, which was too near the surface, then fell in, burying a european miner who was fixing a sheeting board. The resultant hole in the ground was, however, covered over without being perceived by the enemy.

Next day, a battery (K) for all the mortars and two guns was begun on the north side of the fort, 400 yards from the outer wall. This battery was completed on the night of the 10th, on which day 1/4 Bombay Native Infantry arrived from Ahmednagar with two 12 and four 18-pounder guns, one 5½, one 10 and four 8-inch mortars. The same night, these mortars were hauled into Battery K, from where they opened fire at daybreak on the 11th. At 11 am, two of the Arab powder magazines blew up at the same time, bringing down a large portion of the inner wall's eastern curtain and exposing the whole interior of the fort.

The beseigers lost no time in taking advantage of this occurrence. During the night, a battery (L) for two 18-pounders was erected in a Muslim burial ground, 320 yards from the works. Work also began on a battery (M) for four 18-pounders on the bank of the Musam opposite. It was 600 yards from the outer wall, which the gunners intended to breach at the spot where the explosions had taken place. Next day, the mine reached the foundations of the north-east tower, and the battery in the burial ground was completed. The effective fire of the 18-pounders soon induced the arabs to ask for terms, which were agreed upon. On the 13th, twenty sepoys under a native officer, were admitted into the fort; the Union Jack being hoisted on one of the towers at 3 pm. Next day, the British troops drew up in line at the outer gate, and at 9 o'clock the garrison, now 350-strong, marched out, formed in front of the gate, grounded arms, and marched to the part of the town allotted for their accomodation. They had lost 35 killed and 60 wounded during the siege. Casualties on the British side were severe; five officers killed, eight wounded and 220 other ranks killed and wounded. This was mostly due to the accurate fire of the Arabs, who picked off men who exposed themselves above the trenches. Of the five engineer officers, two were killed and two wounded.

At the beginning of the siege, the British force numbered no more than 1400 men, but successive reinforcements brought it up to about 2,600. Had an adequate force been assembled in the first place and the town – which gave access to the comparatively weak east and north faces – at once attacked, it is probable that operations would have been brought to a conclusion more quickly, and with a smaller number of casualties.

BIBLIOGRAPHY

- Lt-Col. R.G. Burton, *The Mahratta and Pindari War*, Govt. Press, Simla, 1910.
- C. Duffy, *Siege Warfare: The Fortress in the Early Modern World, 1494-1660,* Routledge, London, 1996.
- F.W. Stubbs, *History of the Organization, Equipment, and War Services of the Regiment of Bengal Artillery,* vol. II, Henry S. King & Co., London, 1877.
- Major H.M. Vibart, *The Military History of the Madras Engineers and Pioneers,* vol. I, W.H. Allen & Co., London, 1881.

Journal Awards

The Budget, Investments, Membership, Scholarship, Memorial and Publications Committee announces the following awards for
articles of special merit published in the December 2001 issue:

What's in a Name? An Examination of our Headquarters Squadrons
by Major R K Tomlinson MBE – £100
Royal Engineers and Public Order Operations
by Major A G Jackson – £75
An Examination of the ending of the Gulf War after 100 hours of Ground Warfare
by Major S P F Harris – £75
Gap Year Commission
by Second Lieutenant V Y Ahuja – £40
The Army Estate Strategy – Single Living Accommodation
by Lieutenant Colonel J F Pelton MBE – £40
A Disaster of 60 Years Ago
by Brigadier J Constant – £40
Joint Engineers in Kosovo – A NATO Perspective from HQ(5) KFOR Main
by Lieutenant Colonel R C Swanson MBE – £40

Annual awards for 2001 were agreed as follows:

Arthur ffolliott Garrett Prize
for the best contribution on the technical aspects of logistic engineering (£120):
Major R K Tomlinson MBE for
What's in a Name? An Examination of our Headquarters Squadrons
Best Article Of The Year prize (£120):
Major T R Urch MBE for
Belize – The Opportunity of a Lifetime
Best Junior Officer Prize
for the best article by an officer of the rank of captain or below (£60):
Lieutenant J E Fossey for
The First Steps Towards the Demilitarization of Northern Ireland
Best Warrant Officer or Senior Non-Commissioned Officer Prize (£60):
Warrant Officer Class 2 D C Halford for
In Search of Lost Cities

Awards for articles of special merit published in the April 2002 issue:

Joint Force Engineering
by Brigadier M F N Mans – £70
A Spark on a Wire – Live Line Tapping in Northern Ireland – £70
by Warrant Officer Class 2 R C Seymour – £70
Prime Contracting – The Story So Far
by Lieutenant Colonel S P Perkins – £70
National Service Remembered
by Lieutenant M Padmore – £40
Mine-Warfare in Korea 1953
by Major J D Lewins – £40
Battlefield Touring for Royal engineers - An Understated Method of Instruction
by Lieutenant Colonel M W Whitchurch MBE – £40

Learning to Think Differently

MAJOR S P W BOYD BSc CEng MIMechE MAPM

Steven Boyd was commissioned into the Royal Engineers in 1986. He has experience of close and air support engineering and of military engineering training. He has been fortunate to lead elements of an STRE (Wks) on operations, and to command an engineer logistic squadron and an STRE (B). It is now payback time: he is a staff officer at HQ RE Theatre Troops where he is involved with doctrine development. Temporary Deployable Accommodation and Contractors on Deployed Operations. This article results from his studies for an MBA in Engineering Management.

Introduction

Some say that Master of Business Administration courses are focussed on:

- Management, which is not relevant to Sapper officers, as they should aspire to be leaders on operations, not mundane managers.
- The commercial world, which is relevant only to those planning to leave the Corps.

This article seeks to demonstrate that contrary to these views, good management is something to which Sappers should aspire and that the Corps, not just individuals, could benefit from a proportion of its officers completing an MBA. This is particularly the case as MBA courses are not really about management models, financial analysis and the rest, but about learning to think clearly about problems. I will begin by explaining what I mean by management and showing how the management skills developed by a MBA are relevant to operations. Secondly, I will discuss some of the ways of thinking about complex issues that can be enhanced in the course of a MBA. And finally, I will suggest some ways in which the Corps might make best use of these skills.

In the April issue of the *Journal*, Brigadier Tom Foulkes[1] suggested that the Army needs more MBA graduates and that Sappers are well placed, because of their selection and training, to acquire the necessary skills. I agree with these views and believe he is right to encourage individual officers to undertake an MBA to improve their employability within the Forces and to improve their prospects on retirement. However, I believe his argument would be strengthened by examining the benefits of MBA experience to individuals on operations and to the Corps as a whole; this article will attempt to take up from where Brigadier Foulkes' left off. In the same issue of the *Journal*, Professor Peter Dell[2] presented recent research that suggests that the career patterns and aptitudes of commercial managers are becoming increasingly similar to those of the military engineer. Each requires an eclectic mixture of skills including the ability to understand the motivation of other cultures, and the courage and imagination to deal with the

---

[1] Foulkes, Brig THE (2002), "Towards Perfection" or Why more Sappers should have MBAs, *Royal Engineers Journal*, Vol 116 No 1, Chatham

[2] Dell, Prof P (2002), Assignable Aptitudes, *The Royal Engineers Journal*, Vol 116 No 1, Chatham.

unexpected. Given the increasing similarity of aptitudes, it would not be surprising if similar personal development might be appropriate for both officer and manager. Indeed, contrary to the views at the start of this article, the idea that MBA development is a good thing for Sappers and for the Corps is worth considering.

MANAGEMENT ON OPERATIONS AND THE HIGH STREET

"Management is not a substitute for leadership, but…it is an attribute of command that cannot be overlooked.[3]"
British Defence Doctrine

MANAGEMENT is not a dirty word and good management is as essential to the military in peace and war, as it is on the High Street. Furthermore, the fundamentals of good management are the same everywhere. Whilst valuing leadership, business schools and much of industry have quite a different view of management than that which might be considered its traditional role.

Traditional Manager	Leader	Modern Manager
Plan	Envision	Learn
Allocate resources	Communicate	Encourage
Control	Inspire	Handle ambiguity
Develop	Create	Break down barriers
Delegate	Innovate	Work in partnership
Provide continuity	Discover	Align activities
Manage quality	Spot opportunity	Enable

(Developed from Leadership and Management in the Changing Economy[4])

The experience of an MBA develops the skills necessary to become a good manager and encourages ways of thinking that will be equally valuable on operations as in peacetime. MBA graduates will have learnt to ask the important questions, actively examine problems from a range of perspectives, identify what can be influenced and what cannot, focus on practical output, balance risks, and develop pragmatic compromise. They will have learnt to think in a way well suited to good management and as such will bring much to military planning and to the control of operational tasks.

Foulkes' Key Qualities for the MBA Way of Thinking[1]

- Scepticism
- Pragmatism
- Compromise
- Tolerance
- Analytic Curiosity

In his recent article, Brigadier Foulkes focuses largely on the peacetime management of Defence. This is central to his argument, in that the increasing demands for better value for money are driving senior officers to learn new ways of doing business. However, his key qualities are equally relevant to operations.

- **Scepticism**. The commander should question what appears to be the case and challenge received wisdom. Through asking the right questions, he will be able identify key issues, and his own and the enemy's strengths and weaknesses.

"Computers are useless, they can only give answers."
Pablo Picasso

- **Pragmatism.** Sappers pride themselves on delivering results and in the use of initiative when necessary to secure success. Focus on output is a clear requirement on operations and is supported by mission analysis to align each small target to the overall objective.
- **Compromise.** The ability to select and accept the best compromise is an ever-present necessity on operations and is often driven by the need to balance conflicting risks. When time is short and the supply chain is long, Sappers often have to consider what is possible with the resources to hand. The best design may have to be modified to suit the most readily available construction materiel.
- **Tolerance.** The tolerance to accommodate conflicting requirements and priorities is an important quality. Indeed, the Corps' ability to work with foreign forces and host nation authorities in recent years has been a key strength of the UK military. As players on the joint operations stage, Sappers must also be

[3] British Defence Doctrine, JWP 0-10
[4] Management Charter Initiative (2001), Leadership and Management in the Changing Economy, The Management and Enterprise National Training Organisation

prepared to accept and work within the constraints of military politics.
- **Analytical Curiosity.** Finally, the search for, logical presentation, and appropriate analysis of relevant information forms a good foundation for sound operational decisions. This applies equally to the development of useful engineer intelligence as to an investment analysis for improved infrastructure.

THINKING DIFFERENTLY

"Thinking is the ultimate human resource[5]".

Edward De Bono

HOW do you think? Do solutions come in a flash of inspiration, or do you rely more on perspiration? How does our military training encourage us to think? Consider the estimate process. Is this method different to that learnt through experience as a military engineer? Engineers tend to think in pictures, to balance risks, and to actively ask "what if?" and "is there an alternative solution?" Just for a moment, think about thinking.

"Imaginative and innovative thinking is the true source of initiative; initiative generates success[3]".

British Defence Doctrine

MBA programmes provide little conventional classroom training, but aim to develop the wider personal skills required to deal with complex problems. Undertaking an MBA encourages students to examine the ways in which they think, to learn new approaches and to accept the need to seek understanding from different perspectives.

- **Logic.** Logical argument requires the consideration of all the options, evaluation of pros and cons……. and asking "so what" a lot.
- **The Opposing View.** Actively attempting to find fault with the proposed solution and examining whether the opposite could also be true can do much to confirm initial conclusions[6].
- **Unbalanced Viewpoint**. Intentionally approaching a problem from a number of unbalanced viewpoints can be illuminating[5]. What would be the opinion of the optimist, the pessimist, those considering only known fact, or those relying on only intuition and feelings?
- **Other People's Shoes.** It's easy to be clear on one's own position. What would others think? What would be the infantry / RAF / Civil Secretary / host nation / enemy perspective? Attempting to think as others might is a powerful tool and can influence our own position.

"What design would I be forming if I were the enemy[7]."

Frederick the Great

- **Experience of Others.** Others may have encountered similar problems and developed workable solutions. This data may only be available outside the accepted military knowledge base and is likely to require consideration of commercial and academic sources, to which an MBA can provide an introduction. For example, British Airways improved aircraft maintenance and turnaround times by learning from Grand Prix pit stop procedures[8].
- **Questioning Conventions.** Decisions are often made against the background of accepted understanding and assumptions. Better decisions are made when the principles and conventions underpinning them are fully understood.
- **Creativity.** The Western tradition of logical argument can exclude the original and the creative. The human mind does not always work well in this structured way and the best ideas can seemingly appear from nowhere without conscious thought[9].

"More and more has the fact emerged that a direct approach to one's mental objective, or physical objective, has ever tended to, and usually produced, negative results[10]."

Liddell Hart

- **Reality is Messy.** Real problems are complex, often have no one solution, and must be addressed in changing circumstances. The confidence to accept this reality and to flourish in situations of chaos and uncertainty is as necessary to the commercial manager[9] as it is to the fully paid-up devotee of the manoeuvrist approach.

---

5 De Bono, E (2000), Six Thinking Hats, Pelican, London
6 Popper, K (1959), The Logic of Scientific Discovery, Hutchinson, London
7 Fredrick the Great (1748), General Principles of War
8 Murdoch, A (1997), Lateral Benchmarking, *Management Today*, November
9 Claxton, G (1997), Hare Brain Tortoise Mind, Ecco Press, London
10 Hart, L quoted in Freedman L (Ed) (1994), War, Oxford University Press, Oxford

Benefit to the Corps

PERSONAL development through an MBA should not be considered as an alternative to military training and experience, but as a supplement to it. As such, as well as being advantageous to the individual, there can also be benefits for the Corps in having a number of MBA graduates among its officers. These benefits include not only increased prospects of Sappers attaining key posts concerned with the peacetime management of defence, and the development of ways of thinking useful on operations, but may also result in the improved management of the Corps as a semi-autonomous organisation within the Armed Forces. Examples of areas that an MBA graduate might consider for improvement could be:

- Clarifying Corps strategy. Ask any two officers what the Corps is for? Not what does it do, but what is it for?
- Creating a joined up policy for people management bringing together recruitment, individual training, experience gaining, and career development.
- Establishing procedures to identify and adopt best practice developed elsewhere. Many valuable lessons painfully learnt in industry may be appropriate to the Corps.
- Marketing the Corps effectively and consistently to achieve a better share of limited defence resources and to attract the right quality of recruits.

The Corps' View of MBAs

BRIGADIER Foulkes suggests that undertaking an MBA is valuable to the individual in peacetime as a supplement to the military engineering training and experience praised by Professor Dell. I have sought to show that it is also useful on operations and potentially valuable to the Corps collectively. If this is the case, should the Corps have a view on MBAs?

- Might it be appropriate to encourage selected individuals to undertake MBAs? The Corps has targets for Staff College entry and professional engineer training, and a similar approach for MBA students, together with an appropriate time bar, might be reasonable.
- Could there be benefit in appointing a Corps Advisor to assist in identifying appropriate programmes to suit individual circumstances? MBAs focused on the management of engineering might be particularly appropriate. There are a number of retired Sappers / Army officers with business school experience who might be willing and well placed to do this.
- Should the Corps consider completion of an MBA as a factor when selecting officers for staff appointments in which good use might be made of the type of skills developed? Appropriate staff jobs might include HQ EinC, the Defence Procurement Agency, the Defence Logistics Organisation, and in appointments concerned with the Defence Estate.

Conclusions

THE Corps of Royal Engineers has always been an innovator. This has been one of our strengths, but that should not mean that we should shrink from learning from others. MBA programmes incorporate many lessons from industry and develop skills that will be relevant both in peacetime and on operations. But most importantly, they encourage students to understand the ways in which they think and to use a range of approaches to successfully address complex problems. Completing a MBA is useful to the individual and to the Royal Engineers, and it may be appropriate for the Corps to form a view on its need for MBA graduates and how best to employ them.

Endnote

THE prizes in the 2002 paper competition of the Institution of Civil Engineering are:

1st Prize: One year, full-time MBA for Engineering Business Managers at Manchester Business School.

2nd Prize: Four year, distance learning MBA in Engineering Management at Bradford School of Management.

The Shackleton Patrol

CAPTAIN T P CLARKE BEng

The author was commissioned in December 1992 and after a brief stint with the AMF (L) Troop in Perham Down completed TCC 109. He was posted to 1st Field Squadron in February 1994 with whom he served on OP GRAPPLE 6 *in Bosnia. He spent November 1995 to January 1997 with the Apprentice Training Wing at Minley followed by a very interesting six months watchkeeping in Northern Ireland. In September 1997 he was appointed OC South Georgia (and Magistrate of South Georgia and the South Sandwich Islands!), from where he reluctantly returned in January 1998 for his final posting at ATR Bassingbourn. Much to his surprise he thoroughly enjoyed Bassingbourn, before leaving the Army in December 1998. After a brief stint as a missionary in an Uzbekistan orphanage, he returned to Great Britain in 1999 where he joined the Royal Monmouthshire Royal Engineers (Militia) and applied for the Prison Service. He has now had to transfer back to RARO and is currently doing time as one of the governors at HM Prison, Cardiff.*

Sir Ernest Shackleton and South Georgia

In 1915 the explorer Sir Ernest Shackleton was in the Antarctic Ocean as leader of the British Imperial Trans-Antarctic Expedition. He had received special dispensation from the King to be freed from war service – such was the prestige attached to the exploration work being undertaken.

On 18 January 1915 Shackleton's ship, the Endurance, became trapped by pack-ice which over the next ten months carried it over 1500 miles towards the Antarctic Peninsula. On 27 October, her hull was crushed and she sank on 21 November, leaving her crew stranded on the ice. They had extracted much equipment from the ship and by dragging this and the three ship's lifeboats across the ice by sledge, reached the open sea. They then took to the boats and navigated their way to Elephant Island, north of the Antarctic Peninsula. There Shackleton reviewed the situation.

No one else knew their location or of the disaster that had occurred and no other ships were in the area. If all the personnel remained on Elephant Island throughout the swiftly approaching Antarctic winter, then the likelihood was that the entire expedition would perish.

On 24 April 1916, Shackleton and five companions sailed from Elephant Island aboard the lifeboat *James Caird*. Their intention was to fetch help from the nearest known settlements which were the whaling stations on the island of South Georgia over 1000 miles away across the turbulent ocean.

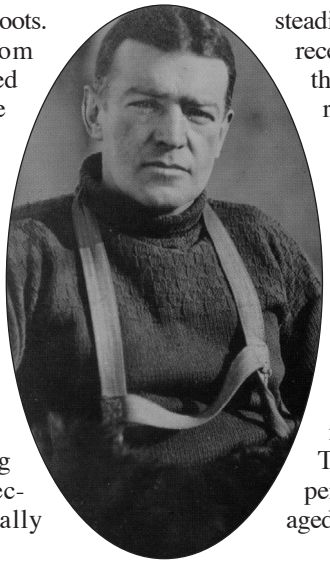
Fourteen days later, after a voyage of unbelievable hardship in an open boat across the freezing Southern Ocean, they sighted South Georgia. Two days later they managed to land in King Haakon Bay on the uninhabited south-west side of the island. They were exhausted, having been bailing continuously from Elephant Island and were also very low on fresh water, being nearly dead from thirst. Their boat was turned upside down as shelter and a basic camp established.

Shackleton knew that the settlements were on the Northeast coast of the island about thirty miles away, and that their ordeal was not yet over. Poor weather forced them stay beneath the *James Caird* for a few days, so they took the opportunity to eat, drink, rest and build up their strength.

At 0300 hrs on 19 May, Shackleton and two of his companions left King Haakon Bay on foot with the intention of crossing the island to reach one of the whaling stations on the far coast. Winter was setting in and the interior of the island was unmapped. Their equipment consisted of a small primus stove with fuel, a pot, a carpenter's adze as an ice axe, 50 ft of knotted rope, a pair of binoculars, a fragment from a chart of South Georgia and a compass. For

crampons, they put screws into their boots.

Sheer cliffs prevented them from following the coast so they climbed 2000 ft and crossed three large glaciers. They stopped only five times to eat before resuming their trek through the day and into the night. At 0700 hrs the following morning, they heard a steam whistle from one of the whaling settlements. Following its direction, they crossed the Fortuna Bay glaciers. They then had to climb up to the plateau behind Stromness before finally descending down a waterfall to the whaling station itself. They were barely recognizable as men when they finally stumbled to the house of the Whaling Manager and knocked on his door.



Sir Ernest Shackleton

The Manager, who had met them before, did not recognize them at first. Then Shackleton recounted what had happened. A whaling vessel put to sea that night to rescue the three men sheltering beneath the *James Caird* in King Haakon Bay, and three days later Shackleton left South Georgia to rescue the rest of his expedition from Elephant Island. This rescue was effected on 30 August 1916. Of Shackleton's expedition, not one person perished of those originally aboard the Endurance.

Eighty One years later only four subsequent expeditions had succeeded in following Shackleton's boot prints across South Georgia and the shadow of "The Boss", as he was known, remains upon the island to this day.

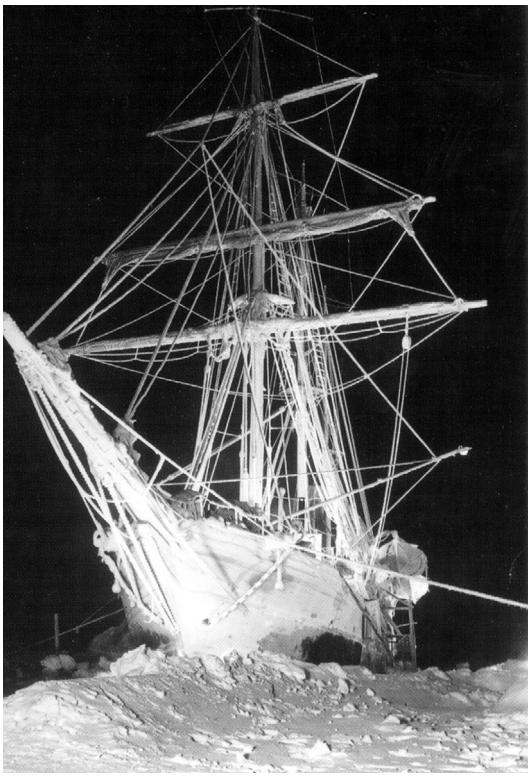
South Georgia and its Garrison

South Georgia is an Antarctic island 900 miles east of the Falkland Islands and south of the Antarctic Convergence. It is approximately 20 miles by 100 miles and glaciers, ice and snow cover most of it. It was a base for whaling in the Antarctic before the whalers abandoned it in the sixties.

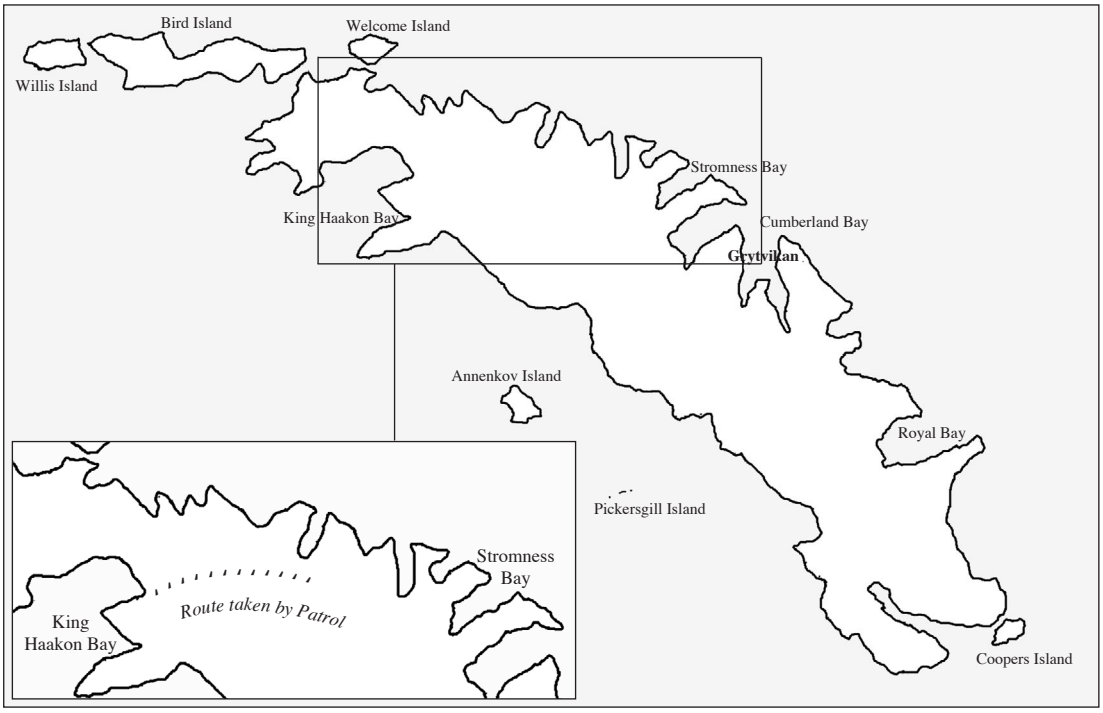
It remains a British island, as Argentina found out in 1982, their brief occupation of the island being the first and last time that British rule has been interrupted. A small garrison was put in place at the end of the conflict. Initially, it comprised the recce platoon of the Reinforced Infantry Company in the Falklands supported by sappers, signallers, marines, medics and a chef. This steadily dwindled to nothing and has now recently officially been withdrawn with the administration of the island now resting with the British Antarctic Survey (BAS).

My involvement with the island was as OC South Georgia Logistical Support Detachment (OC SGLSD) from September 1997 to January 1998. This had to be the best job going for a sapper captain as I reported directly to Commander British Forces Falkland Islands (CBFFI) who was nearly three days away by sea. Therefore as a command, it was the perfect antidote to being micro-managed. Into the bargain, OC SGLSD was made magistrate of South Georgia and the South Sandwich Islands for the duration of the tour, which involved very little apart from a rather grand swearing-in ceremony at Government House in Port Stanley.

During my tenure in command, the detachment



Endurance beset in the Weddell Sea



South Georgia Island.

consisted of sixteen men. Myself with the Detachment Sergeant Major, Sergeant Kev Holden, and six class one sapper tradesmen (Bricklayer, Carpenter, Electrician, Fitter, Fridge Mech and Plumber) made up the Royal Engineer contingent. There was also a doctor and a chef as well as two Royal Marine SNCOs. One of these was a Mountain Leader 1 (ML1) and the other was a Boat Operations Advisor (LC 1). A small R SIGNALS detachment to maintain communications with HQ BFFI made up the numbers to sixteen.

The routine maintenance of SG LSD facilities took up a large part of the working hours due to the out of date infrastructure and harsh climatic conditions. All personnel had to be able to survive and fight in an Antarctic environment and so basic cold weather training and boat handling (Rigid Raiders Mark II) were taught by the two Royal Marines. Fast boating remained a consistently popular pastime among the men of the SG LSD whereas cross-country skiing did not captivate every sapper on South Georgia. However some, including the OC, did take to it as a means of getting about, despite the fact that the skis concerned were the much-maligned "Pusser's Planks".

THE EXPEDITION

THE arrival of *HMS Endurance* complete with a detachment of Royal Marines and two Lynx helicopters in South Georgia waters inspired

Capt T P Clarke, The Fortuna Glacier, Shackleton Patrol

Sgt McGill the SG LSD ML1 to start planning a possible retracing of Shackleton's route across the island. Her two Lynx as safety cover and a detachment of Arctic trained booties meant that the way was open for an attempt to retrace the route.

Lynx recces and the other preparations went ahead apace. The party would consist of nine Royal Marines from *HMS Endurance*, Mr Tim Carr (the Museum Curator at Grytviken whose local knowledge was excellent) and from the SG LSD the LC1, ML1, LCpl Smith RE and myself. Much of the route was across glaciers and so crevasse rescue and traverse techniques were practiced. Clearance was obtained from HQ BFFI conditional on the project becoming a "patrol".

The weather conditions dictated that a window between 18 – 22 December 1997 was the best time to attempt the retrace, but the weather changed yet again and the SG LSD embarked on *HMS Endurance* a day early. I was caught out by the moving forward of the embarkation time and the tale of the frenzied whirling dervish packing of my Antarctic rucksack is another article in its own right.

Once aboard, all the finer details were ironed out as the Endurance steamed to Possession Bay from where the patrol would be flown to the drop off point in King Haakon Bay. The plan was to insert at 0600 hrs on the morning of 18 December, but poor visibility and vicious katabatic winds prevented this. However, a lull in the weather at midday meant that the patrol was quickly flown in a series of Lynx relays and dropped off high above King Haakon Bay.

As the last Lynx flew off into the sunset, a strange silence descended on the assembled ranks. The insertion had given the patrol an excellent start on the route; the kit was packed and the way to Stromness stretched away to the west. Unfortunately, Shackleton and his companions did not start their trek 1000 feet above sea level, so after much shuffling of feet the whole patrol skied down to the water's edge in order to start the retrace properly.

So as the cloud cover thickened and with a generous application of wax on the skis to assist the forward motion, we set off. For the next few miles time passed as the single file drew its way west across the frozen waste towards the distant whaling station. We were dwarfed by the pristine, unspoiled grandeur of the landscape we were crossing with endless horizons of frozen snow and rock. Shackleton was not blessed with skis as we were, but he was not cursed with radios, tents, three days rations and spare clothes either. The patrol made good progress and Sgt McGill evidently knew what he was doing as we crossed successive snowfields. The going was firm and sufficiently deep in snow to enable us to cheerfully ski across potential crevasse areas. And so we continued as the day wore on, the patrol gradually working its way across South Georgia over the series of glaciers and ridges that punctuate the route between King Haakon Bay and Stromness.

Evening came and white out conditions developed, so we continued on a compass bearing. When the conditions momentarily cleared, a quick map/compass check established that we were on course and coming off the Crean Glacier (so named after Tom Crean, one of Shackleton's companions) and near the Fortuna Glacier. Light was failing so we camped overnight in that location. This gave the patrol members the chance to savour the culinary delights of arctic ration packs in the delightful forced air/methane/naphtha/wet sock environment of a four-man tent.

It was a relief to get going again the following morning. Post card weather this time, blue and clear for miles and the skiing resumed. The morning was given to crossing the Fortuna Glacier – mile after mile of snow plateau, with the distant ridge of mountains not seeming to draw any nearer. A long morning, that did eventually end with rather an intense climb up and over the ridge to overlook Fortuna Bay. The subsequent descent to the Bay was not the controlled glide the ski school would have intended. Instead, the more inexperienced patrol members skittered, crabbed and face-planted their way down an endless slope. At regular intervals a patrol member would mutter "I have had enough of this" (or words to that effect), unclip his skis and trudge despondently down the mountainside in the wake of Sgt McGill and the more accomplished skiers.

Fortuna Bay was crossed and a glacier melt waded before the final ascent to the plateau beyond which lay Stromness. This was on foot, carrying skis because snow was now scarce and at this later stage the jovial banter was not so evident as before – no idea why...

After another eternity interrupted by false summits the plateau was reached, the view opened up and there, glittering in the middle distance lay "Jerusalem" – Stromness.

The descent to the whaling station was made ingood time. The patrol reached the whaling station manager's house at 1715 hrs and Sgt McGill knocked on the door as Shackleton had done. Nobody home this time, but then we would have been most surprised had there been. The journey had taken patrol twenty-eight hours and forty five minutes. Shackleton had taken thirty-six, on the verge of starvation, with no proper map and equipment.

All members of the patrol considered it an excellent experience and full credit to (then) Sgt McGill, the Royal Marines Mountain Leader who organized and led the patrol. While the majority of personnel in the patrol were commando trained, as a non-Lympstone sapper it was a tremendous opportunity to make a unique journey where few have the privilege to travel. As OC South Georgia, participating in the patrol crowned what has to have been one of the best jobs available to a peacetime sapper captain.

FOOTNOTE

AFTER the Great War, Shackleton returned to South Georgia for a further expedition. On 5 January 1922 whilst aboard his ship moored off Grytviken, he died from a heart attack. His body was embalmed and was en route for Great Britain, when his wife requested that he be buried in South Georgia. He was interred in the whaler's cemetery in Grytviken on 5 March 1922. "The Boss" remains there to this day, buried on the island where he had accomplished so much.

A Theory of Phoney Mine-warfare

MAJOR J D LEWINS MA PHD DSC SM PHD(MIT) PPINUCE

Jeffery Lewins was commissioned into the Corps from RMA Sandhurst on 8 Feb 1952; the first of HM The Queen's Commissioned Officers, but with the last of King George VI Gold Medals. After 8 YO course at Chatham, and service in Korea with the Commonwealth Division, he was sent to Cambridge to read Mechanical Sciences. He also took up an English Speaking Union scholarship in nuclear engineering at MIT. Returning to the army, he joined 50 Fd Sqn in Osnabruck. Staff College followed. A spell as G2 in the Lowland Div HQ at Glasgow was succeeded by time at the University of Washington, to get back into nuclear engineering. His final tour was in 2 Armd Engr Sqn at Hohne. He became a lecturer in Nuclear Engineering at Cambridge and later still, Engineering Director of Studies in Magdalene College. He has now retired, but is still Praelector of the College, which has offered pleasant surroundings for 8 YO batch reunions. He offers his apologies for referring in his previous article to 4 RTR – it should have been 1 RTR.

INTRODUCTION

MY own experience of mine-warfare in Korea has given me a respect for mines that verges on fear. It is just such an attitude that makes it possible for an enemy to employ phoney mine-warfare successfully against you. While I hope that large scale mine-warfare will not be practiced again, at least by our own troops, a few words on the theory might be of interest. After all, it might yet be practiced against us and, as you will see, the theory covers a number of topics beyond military life. These include dummy speed cameras, dummy burglar alarms and indeed one's attitude to risk on the Stock Exchange.

There is an anecdote of the relief column for the Arnhem Bridge that might well provide the epitome of phoney mine-warfare, but this time as an "own goal". The failure of the operation despite the successful *coup de main* on the bridge was largely due to the narrow, congested route and some lack of determination to press forward at all costs. It is said that near the beginning of the route, a vehicle going off the road to avoid a jam was blown up by a mine. The site was marked by our own forces: "Danger Mines. Do NOT use verges". This established a "phoney" field for the next sixty miles and could have been the most successful use of phoney mines in history. The second world war might have been shortened by six months, and a considerable increase in Montgomery's final reputation with our allies achieved, without that "success" for phoney mine-warfare.

Phoney fields are those that have the trappings of real minefields but no live mines.

These trappings might be wire and red mine marking triangles, the detritus of mine-laying such as discarded boxes, spoil on the ground, etc. Such fields are generally cheap to lay and can provide a safe route for one's own forces for, say, counter attack. If the enemy is deceived into believing them real, then he may avoid the field to the benefit of either those positioned behind it, or to those who will meet him on a more advantageous killing ground.

Equally, the disadvantage is clear. If guess or recce shows the field to be phoney, it neither protects nor canalises, and the losses may be substantial. So when might a commander employ phoney fields or treat the opposing field as phoney?

If your opponent can be fooled into getting his guess wrong, then one should be able to benefit from such mistakes. This is evidently true if he guesses that a phoney field is real, but it should also be true if he guesses a real field to be phoney. At the very least, you have gained surprise.

If a quantitative assessment can be made, then it is possible to advance a theory that leads to an optimum proportion of real to phoney fields.

Basis of the Theory

I BELIEVE the operations research analysts call this the "zero-sum, two-sided games theory". Indeed there are two sides, you and your opponent. What you gain he loses and vice versa, or zero-sum. What one would like of a theory is advice on when to lay phoney minefields and when to lay real fields; equally, when to call the enemy's bluff and when to believe that a real field exists. The theory is substantially abstracted from real life as anyone following it through will see. For those like me however who gave up playing soldiers many years ago, the matter equally describes one's approach to say speed cameras on the highways or to protecting one's house with burglar alarms.

The aim of this theory is to produce what is called a mini-max result. That is you maximize the best *guaranteed* result for yourself, even though the opponent has minimised his own losses. If your opponent plays otherwise, you could get a better result, but you have maximized your gains against his best possible play. It reduces the gambling element and is therefore recommended for cautious commanders. Like all gambling theories based on probabilities, it may take many repetitions to show up its true worth – that is you may be unlucky and hit a string of poor results, but there is no better theoretical way if you feel you should not "trust to luck".

To start with, suppose there are only the two choices (for both sides), real or phoney. If neither or only one has a choice, it is simple to determine what is best to do. This allows fairly standard mathematics to be employed. If the sides have more than two choices, or a different number of choices, there is a theory that makes use of linear programming. Equally there is a theory of non zero-sum games (where both sides gain by co-operating) and games with more than two sides. This is outside my scope but there are standard text books available for these extensions.

The analysis is really in two parts that address what proportions to play your strategies of either real or phoney over the long term, and when to play them on a particular occasion.

When to play real or phoney. Playing this game, your concern is that the opponent may successfully guess how you have decided. If he gets it right, you cannot obtain any advantage from playing "phoney". Any regular pattern of play you choose may show up and allow him to guess correctly. Thus the only way to get the best play is to make your choice "at random" and therefore with no discernable pattern, but in a proportion of probabilities to be determined by the scoring table introduced below. Assuming that your opponent has also assessed the outcomes and agrees with your evaluation, he might know what proportion of times you should choose "real" and what proportion "phoney" for a guaranteed "best" result. What he won't know is 'which is which' on any particular occasion. How should he best respond? Why, by playing to the same theory as you do. But equally, he must respond in proportions; I believe him, I don't believe him – determined by his scoring table – at random so that you in turn cannot exploit any pattern in his "play".

You need therefore a "random number generator" that will, without pattern, tell you when to play real and when to play phoney. This might be by using a computer, by cutting a pack of well-shuffled cards or by throwing dice. Do not try to "massage" the results or you will introduce a pattern for the enemy to exploit.

What proportions to play. For the present, to make a rational quantitative choice, you have to put some numbers to the different eventualities that at their simplest are four:

1. I lay a real minefield and he believes it's real.
2. I lay a real minefield and he doesn't believe it.
3. I lay a phoney field and he believes it's real.
4. I lay a phoney field and he doesn't believe it's real.

IF you lay a real field, outcomes 1 and 2 are debatable. On some occasions, one might be preferable to the other. This in part depends on the purpose of the field. It might be defensive or it might be to canalize the enemy. But think for example of his surprise at the very least, in entering what he thought was a phoney field only to find out the hard way of its reality. Or think: I lay a real speed camera and he doesn't believe me. Thus for the first two entries I would put numerical values as follows:

After allowing for the cost in time and material of laying a real field, I judge that the enemy's losses in either breaching it or being canalized by it give a net gain of 20 for item 1 when he treats the field as real. But if he treats it as phoney, (item 2), there are further elements of surprise, such as being unprepared to breach the field and delay in his timings, that increase my net gain to 30.

Outcome 3 is clearly preferable to 4 for the layer (or the householder or the speed cop). The

difference between the outcomes is large if a phoney field is laid. The phoney field is cheap and easy to lay; if it is successful and deceives the enemy, you get an excellent result. But if the enemy assess the phoney field for what it is, you pay a high price. Thus for item 3, I assess a gain of 40 reflecting the low cost of laying a phoney field. For item 4 however, I assess a *loss, and enter -50*. It is this large spread between the results that depends on the opponent's reaction that indicates the high risk of using phoney mine-warfare compared to real mine-warfare.

Consequences For me:	Treated as Real Phoney	Treated as	Your Spread	Consequences For him:	Actually Real	Actually Phoney	His Spread
Lay Real	+20	+30	+10	Assume Real	-20	-50	+30
Lay Phoney	+50	-40	+90	Assume Phoney	-30	+40	+70

Getting to a single numerical valuation is difficult; you have to assess time, logistics, monetary costs, damage done, and effects on morale at the least. But suppose a set of figures can be arrived at that represent your gains under the four outcomes: real or phoney; believe you, don't believe you. These figures might be represented as a table. The common unit of measurement does not matter as it cancels out in the end. Note that treating a real field as phoney means your opponent is surprised and so should suffer from a poor choice. If in the table you make up, your opponent does not suffer from making a wrong guess, there is no need to continue with the theory. The following theory only works if a wrong guess by the enemy is advantageous to you.

Suppose your numerical evaluation indeed shows up an anomaly in cases 1 and 2, that it is better for the opponent to guess phoney minefields even when they are real. In that case his play of "I believe it's phoney" dominates, whether they are actually phoney or real. He would then rationally play "phoney" every time (probability one), and "real", never (probability zero). Then in turn, it is rational for you to play the dominant strategy of "real" since this will return more than playing "phoney" against your opponent's rational strategy. We can call this the *dominant anomaly* and I suppose you have already examined the problem for this. Equally, if you cannot get any advantage from laying a phoney minefield, then your opponent has a dominant anomaly; he will always assume that you are laying a real field.

EXAMPLE

I HOPE that the theory can be understood from a specific example. The differences in any row of the table of results can be called the "spread", that is your gain if the enemy guesses wrong.

You will see that these numbers avoid the anomalies. It is always good for you if your opponent guesses wrong; the spreads are positive. Equally, it is *possible* to get a better result by using a phoney field that a real field. This also means, in the second table, that the spreads are both positive when analysed by your opponent from his point of view.

How is this "low-risk" solution arrived at? If you make a choice, say always play "real", your opponent wins best by assuming you have played real. In this case, his losses would be 20 rather than 30. If you play "phoney" and he guesses the other way, he can limit his loss to a gain, his gain, of forty. So if you play a mixed strategy, sometimes real, sometimes phoney, he cannot second guess you and his losses (and your gains), will be somewhere in between – depending on his own guesses. You seek to maximize your guaranteed gain against whatever your opponent guesses.

We can postulate the right result as follows. The bigger the spread associated with a play, the bigger the risk and the less the cautious commander

$$\text{Relative Risk} = \frac{spread}{total.spread} = \frac{90}{100}$$

should use that play in case the enemy guesses correctly. We can normalize the risk to a *relative risk* by dividing by the total of the spreads:

The cautious commander who nevertheless

$$\text{Play proportion } p = 1 - \text{Relative Risk} = \frac{10}{100} = 10\%$$

wants to maximize his gains is advised to use a strategy that employs the option in opposite proportions to its risk:

You can see that the theory goes wrong if one of the spreads is negative and one positive or the enemy gains by guessing wrongly. This is the "dominant anomaly" discussed above.

If then the proportion of times you play"real" is *p,*

it is 1-*p* for "phoney". Let the proportion your opponent guesses you have played real be *r,* and therefore his proportion of guessing you have played phoney is again l-*r*. What you can then "expect" over repeated plays is to gain an expectation value *E* given by the weighting of the four possible outcomes of the choices each of you make:

$$E = p20r + p30(1-r) + (1-p)50r + (1-p)(-40)(1-r)$$

$$p = 90/[90+10] = 9/10 \text{and} 1-p = 1/10$$

The proposal here is to use

Hence most of the time, (90 per cent), you should lay real minefields, and only ten per cent of the time indulge in phonies. At this

$$E = \frac{9}{10}(3-10r) + \frac{1}{10}(90r-40) = 23$$

value you have

which is notably independent of *r* and bigger than the 20 you gain by always playing real and having the enemy always assume you play real. This justifies the claim as "best value". No matter what your enemy guesses, as long as he cannot break your pattern, he will suffer a loss averaging 23 that lies somewhere between what is the best result for you (if he always guesses wrong), and what is the worst result for you (if he always guesses right) as in the original table. With another choice of strategy *p* you could be "lucky" and do better than 23, or unlucky and do worse. The theory however says you cannot do worse than 23 with this strategy whatever your opponent does, as long as he cannot spot your pattern and has to guess.

By using this result, you can expect to improve your returns from always laying real fields from 20 (at worst) to 23 (at worst), a 15 per cent increase in return in this example.

And how should your opponent play to get his best result? He too can try games theory. Since your gains are his losses, he has exactly the same analysis but the individual spreads are different[1], as in the second part of the table. His swings are 30 and 70. The total of the spreads is the same however. Thus he chooses to play that you are laying real fields for 70 per cent of the time and 30 per cent phonies. If you then depart from *your* best ratio, he can expect to improve his game but can never lose more than the average 23 gains you are guaranteed to make, *Dieu Volant.*

[1] Yes, it is the transpose of the original table of entries. And as the transpose does not change the determinant, the expected values at an optimum are the same for both players.

General Theory

OK, you want a general algebraic solution. Suppose the table of entries is the matrix

$$M = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

then the expectation value of the result for different *p*,*r* values is

$$E = (p,1-p)M\begin{pmatrix} r \\ 1-r \end{pmatrix}$$

$$\frac{dE}{dr} = 0$$

This will be independent of *r* at a vanishing first differential with

$$0 = (p,a-p)M\begin{pmatrix} 1 \\ -1 \end{pmatrix} \text{or} p[(a-b)+(c-d)] = c-d$$

r. Putting

$$p = \frac{c-d}{c-d+b-a}$$

we have

The problem is linear so that the result is independent of *r* everywhere and not just at a turning point. Hence

$$E_{opt} = \frac{ad-bc}{c-d+b-a}$$

and $0 \le p \le 1$ in view of the assumption that the opponent loses on guessing wrong. This result gives the optimum *p* in accordance with the verbal argument in the main text. At this optimum strategy,

independent of *r*. The numerator is the determinant of the table matrix, but could be positive or negative, while the denominator is the sum of the spreads, or the gains over your opponent guessing wrong. For those of you playing with your new battlefield computer, a numerical study shows the "mini-max" solution as in the figure.

The theory can be extended to cases where there are more than two choices. For example, is it a real

field with only anti-tank mines, a real field with mixed AP and AT or a phoney field? However, the approach used here in the two by two case, will not work directly for more complicated problems and a technique called Linear Programming is necessary. Nevertheless, the general result is valid in that the cautious commander employs a mixture of strategies at random, with the bigger risks or spreads played less often. Computer programs are widely available to calculate the optimum strategy for you either with matrix theory or extensions into linear programming.

Application of the Theory

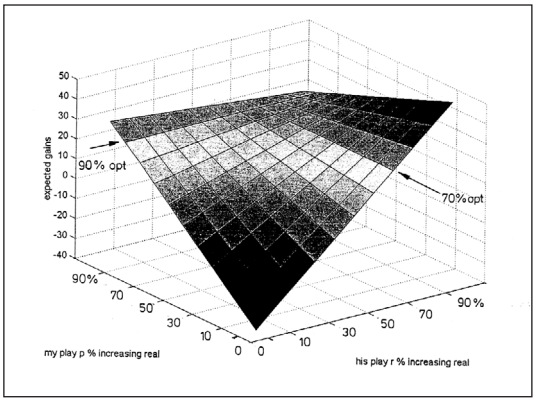
SHOULD the cautious commander take any risks? You might advise always using real minefields. But this does not really reduce risk in warfare; the figure of 20 for gains is only an average or probability and not itself guaranteed.

Then if you do choose to play "all real" in the example, your expected gain is only 20 rather than 23. Of course playing phoney has a risk and the expected gain of 23 may not turn out that way in the short term; but equally, you may be unlucky with a real minefield; and get only the expected minimum gain of 20. Note that if your opponent is led to believe you might be playing phoney, then you can gain 30 from a real minefield; but if your published tactical doctrine and your record in the campaign rule out you playing phoney, why should he risk going for the big gain and risk the corresponding loss if your field is never phoney? You are playing to improve your returns under risk-management (as practiced with more or less success on the Stock Exchange).

The practical difficulties of the theory are now obvious. I would not like to have been a troop officer interrogated by a battalion commander while laying a phoney field to protect his battalion position, on the grounds that the CRE at Divisional HQ had thrown a couple of dice (all right, generated random numbers in the battlefield computer). Equally, try persuading your neighbourhood watch that the costs are shared but you, (by chance), get the real burglar alarm and next door gets the dummy.

You might prefer to think of yourself as a lucky rather than a cautious commander, and take greater risks. After all, deceit is an important element in warfare and your "phoney" may prove convincing. Mathematics will not be your primary guide in that decision.

A general guidance on risk management does come out of the theory. The risk is measured by the spread of the results of your own action, a spread that depends on chance or the opponent. The cautious commander can be guided by choosing strategies that are played more often as the spread or risk is less. Playing only the least risky strategy will not encourage your opponent to make mistakes and is unlikely to produce the best return. These proportions of strategies are then employed without a pattern to give your tactics away, keeping your cards close to your chest.

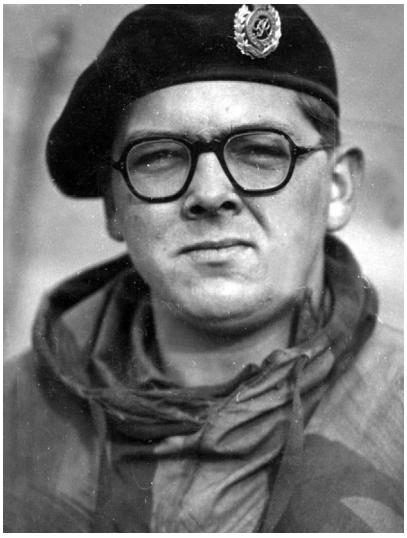


The net gain between real and phoney fields at various options (proportions) for the behaviour of you and your opponent. The optimum solution is the mini-max saddle point guaranteeing you no worse result whatever the enemy chooses. Note from the linear nature, the slopes of the surface are flat and not curved as might be expected in natural saddle-points. The "best" play can be thought of as a horizontal pivot getting neither better nor worse.

But it seems a long way from the minefields of Korea.

Korean Memories – 50 Years On

COLONEL D G RASCHEN OBE



The Army has been Dan Raschen's life. After Wellington College and Cambridge, his service in the Corps took him to Sumatra and then, aged twenty-one, to the Partition of India. His soldiering continued with coral blasting in the Central Pacific and later command of the OTC of Cambridge University and an unusual regiment in Germany. On the staff, he became involved with military equipment which, after three years as British Military Attache in Sweden, led to his being Project Manager for Infantry Weapons. His last posting in uniform was as a Colonel at the Royal Military College of Science, Shrivenham. After retirement, he remained at the College as a scientific civil servant; "the Light Weapons Design Specialist". He also wrote a book (sadly now out of print) "Send Port and Pyjamas!" which is a message he sent when in a MASH in Korea – the port arrived, but without a corkscrew! He had volunteered for Korea because he hoped for some good pheasant shooting! This is part of his tale "50 years on".

Introduction

Whether the average Chinese volunteer in Korea realized the significance of midnight on 31 December 1951 was doubtful, but the several rounds of "celebration" fire which each of our guns then fired must have left them in no doubt that something out of the ordinary was happening. Although intense gunfire was commonplace, there was something special about that New Year salute, perhaps based on the hope that peace might really come soon. Our morale was definitely raised by it, and hopefully it frightened a few Chinamen.

Operation *Dragon*

At that time, thought was being given to the useful occupation of our excellent tanks in the static war. Many were employed as mobile pillboxes on the forward hills, the rear slopes of which were scarred with trackmarks leading up to what looked impossibly steep gradients to precarious firing points on the hill crests. However useful, this was a dull and static occupation for the Royal Armoured Corps. Experience the previous winter had shown that real cold could make movement of tanks possible over frozen paddy, whereas they would have sunk into the mud in summer. The question was, could this capability be harnessed?

On the left of our divisional sector, the River Samichon came down into the Imjin from the north. Either side of it there was a wide flat expanse of paddy fields stretching over our front line, then over No Man's land and up between the Chinese held hills a mile on either side. Three miles up the valley was the village of Ku-Wah-Ri, which the air photos showed to be a place of importance in the Chinese organization and the location of a considerable supply dump, which our air and artillery attacks had failed to disrupt effectively.

The plan for the tanks was quite simple. Wait until the paddy was sufficiently frozen to support them, then stage a bold raid up the valley onto Ku-Wah-Ri. The codeword *DRAGON* was allocated to the operation and the "Skins" were keen to undertake it as their first regimental task in the war.

The possibility of the Samichon Valley proving suitable for tanks had not eluded the Chinese, who had dug a substantial anti-tank ditch across it. With the frost, the walls of the ditch would be as hard as concrete, so there wasn't a hope of the Skins' Centurion tanks crossing it unless it were bridged or broken down. In Korea, we had none of the assault engineer equipment that had proved of such benefit during the invasion of Europe seven years before, so back we went to improvisation. A small party of sappers under an officer would be needed, and Angus McKay

Capt Angus McKay Forbes, Spr Knight and Maj Derek Fletcher Planning Op *DRAGON*.

Forbes, my potential pheasant shooting friend, had been selected as the officer. The idea was that he and his assistants would travel in a turretless Centurion, known as a tug because, having more power to spare than a normal tank; it was literally used for tugging stuck or damaged tanks. On arrival at the ditch, they would then nip out of the hatches of their tug, blow down the walls and remount to await their next task.

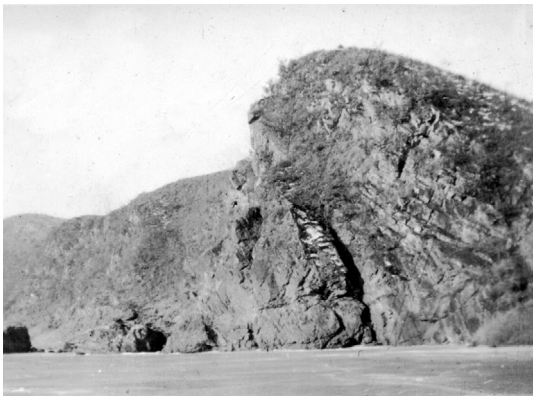
All this sounded most dangerous to me. Angus could have felt proud to have been selected for the task, but I did not envy him. For reasons which I have never fully understood, except that I had let it be known that I liked using explosives, Lieutenant Colonel Moore appointed me as his observer of the trials which Angus and a representative troop of tanks were to undertake; blowing down a short length of ditch which had been specially dug for the purpose with bulldozers. I felt honoured to be involved in any way, as Operation *DRAGON* was considered to be highly important, and was also highly secret. Security, in the sense that the whole population had understood it in the 1939-45 War, when all overseas letters had been censored and the keeping of diaries was not encouraged, did not seem to generally apply in Korea, but *DRAGON* was in a special category.

I spent a very happy series of sunny January days with Angus and the Skins, which were followed by nights that went down to zero Fahrenheit and froze the ditch walls very satisfactorily. Our methods for blowing them down gradually improved through trial and error, though there seemed to be no way of doing the job in a single blast. A two-stage procedure evolved, whereby a large special charge was propped against the far wall and fired with the sappers back by the tank. This drilled a deep hole, which was then stuffed full of further explosive and fired. The agility and fitness required to nip out of, and back into, the tug appalled me, but Angus was a fit fellow.

Camouflaged dumps in the open, like those at Ku-Wah-Ri, tended to be dull and featureless, and to destroy them would be much easier said than done. Both Colonel Eddie Myers and Lieutenant Colonel Peter Moore had spent a good part of the 1939-45 War with guerrillas, the one in Greece and the other in Yugoslavia, and they knew from personal experience that to blow up an ammunition dump was remarkably difficult. Angus was therefore told to practice, and various boxes of ammunition and explosives that could be spared were assembled and attacked with a variety of explosive devices. All most entertaining, except that most of the stack usually remained apparently undamaged, but probably in a highly dangerous state. Just to prove the cussedness of explosives, one of the blasts, initiated by carefully placed charges, detonated very little of its intended target of munitions, but lobbed a mortar bomb from it over the hill and into the next valley, where stood a much prized stack of ammunition, which was certainly not available for destruction. The mortar bomb, falling entirely at random in this stack, set the lot off, causing considerable consternation.

The lovely warm days were thawing the paddy fields upon which the whole feasibility of Operation *DRAGON* depended. Day after day, the "not before ….." date for the operation had to be put back. However, after a fortnight, both the days and nights stayed cold, but at the same time, an

Centurion Tug with Centurion MBT



Cliffs on the Imjin (12in of ice).

officer on the staff of our Divisional Headquarters returned from leave in Tokyo and reported that *DRAGON* was being openly discussed in his hotel. Even with complete secrecy, it would have been a very dangerous undertaking, and we understood that his report clinched the decision to cancel. Years later, Angus was best man at my wedding: had Operation *DRAGON* materialized, I doubt if he would have been available.

Pheasant Shooting

AFTER morning service on 20 January 1952, I was beckoned across by the CRA, Brigadier Pike. He had always had a kind word for me since the day we had tried to push his Dingo up the forward slope of a road I had been building during Op *COMMANDO*. He asked if he could take a gun across at *JIMMY*. This was a point which had been used for crossing the Imjin ice the previous winter, but because of the cliff on the home bank, had since been discounted as a crossing place. I always had a high regard for the Brigadier, but it was immediately evident that he either didn't know *JIMMY* or was badly off form, perhaps due to the sermon! A 25-pounder gun weighed over two tons, and even if it could be swung over the cliff, would almost certainly fall through the ice which had never quite thickened as expected. "Not a hope, Sir", I said. It then transpired that he meant a shotgun, and invited me to join him. As all days were working days, we in Korea had waived the English law that game may not be shot on Sundays. The CRA said it would be nice if I could advise him where the minefields lay. We were six in the party; the CRA, the CO and 2IC of the British Fd Regt RA, another Gunner officer, a New Zealand signals officer and me. For beaters we had the Brigade Major RA and five batmen. We must have seen fifty birds, and the bag was ten, of which I had five and lost another. I should have had twice as many, but it was still a most enjoyable afternoon. The last day of the season was marked by another shoot of six guns; General Cassels and his ADC, the CRA, two other officers and me, plus some batmen to beat. The General said that he was very glad to see a Sapper, as on a previous excursion, he had found himself against a minefield fence and wasn't sure if he was coming out of the field or going into it. Sensibly, he then walked along the fence until he was sure where he was. We shot nine lovely pheasants, but lost several others due to the absence of dogs.

A New Queen

ALL in the Commonwealth Division were saddened to hear news of the King's death, and were rather worried that Princess Elizabeth was so young. It took the Gunners very little time to organize a 101 gun salute in memory of the King and a second salute to the new Queen. There was a certain satisfaction in knowing there was no need to fire blank ammunition for the occasion!

Conclusion

I LEFT Korea in February 1953 having exceeded the maximum war zone tour of 18 months by one week. After two full seasons of pheasant shooting, I could hardly complain!

Portrait of a Regiment

MAJOR GENERAL EDWARD FURSDON CB MBE DLITT

General Fursdon enlisted as a Sapper in 1942, attended Birmingham RE University Short Course and was commissioned in 1945. He served with the West African Engineers as a Tp Comd in India, Burma and The Gold Coast: thereafter in UK, Singapore, Canal Zone and Cyprus as Adjt 35 Engr Regt, Op Musketeer *Port Said 1956, Kenya and Op* Vantage *Kuwait 1961 as OC 34 Indep Fd Sqn, Borneo and UK as 2i/c 38 Engr Regt, BAOR as CO 25 Engr Regt, COS/Dep Comd Land Forces Gulf, HQ BA0R, Service Fellow Aberdeen University, MOD Director Defence Policy (Europe & NATO), MOD Director Military Assistance Overseas and finally Senior British Officer Rhodesia/Zimbabwe. In 1980 he became The Daily Telegraph Defence Correspondent, later joining the defence magazine world. He was very lucky to have covered events in NATO; Africa; the Near, Middle and Far East; The Falklands and South Georgia; The Iraq/Iran War, the Contras in Honduras, Northern Russia, The Gulf, Bosnia and Kosovo.*

INTRODUCTION

THE sheer scale and panache of the Sapper Regimental Bridging Gallops which, leapfrogging from river to river, tore across the West German countryside in the late 1940s had to be experienced to be believed – and rightly became legendary. By the 1960s the focus of BAOR's Sapper regiments was exclusively on the Cold War – constantly training to support their field formations in fighting an enemy advancing en masse from the east in either a nuclear or a non-nuclear context.

25 Corps Engineer Regiment, comprising 12, 30 and 39 Field Squadrons and located in Roberts Barracks, Osnabrück – which it shared with 2 Div's 23 Engineer Regiment – was under command of HQ 11 Engineer Group at Hameln. It was later to lose 30 Sqn and be retitled 25 Engineer Regiment. Its Cold War role should hostilities break out, was to deploy immediately and lay obstacles in certain eastern parts of West Germany; a task it regularly recced and practised. A mini operational deployment exercise for BAOR units was practised many times a year and initiated without warning by the codeword "Quick Train" given over the telephone. The exercise was usually called at night and demanded immediate regimental deployment to a staging area five to six miles away where a unit's speed of turnout and its operational readiness was assessed by a special "Quick Train" staff. A major recurring worry for a CO was whether there would be enough drivers in camp for the vehicles and, if so, how many would be over the drink and drive limit!

As a 1960s CO, I was responsible for nearly 800 men and over 300 families. This was nothing compared to the problems which derived from the biblical truth that "no man can serve two masters", especially when there were more than two; all with different agendas and priorities. My constant task was juggling to keep my regiment balanced between the differing simultaneous requirements of Comd 11 Engr Bde at Hameln, the Comd and CRE 2 Inf Div at Lubbecke, Comd 6 Inf Bde in Münster, Comd 12 Inf Bde, who was also my Garrison Comd in Osnabrück, the CCRE 1 (BR) Corps at Bielefeld and the Chief Engineer BAOR in Rheindahlen, any of whom at different times would task me direct.

With 23 Engr Regt diverted to build an airfield near Münster,we deployed on all 2 Division's FTXs, especially bridging and ferrying the Weser and the Leine, and experienced the nail-biting excitement of having to get the last brigade tanks across the river, break bridge and haul in the pontoons before the pre-negotiated river closure ended at 5.30 am. At that precise moment, a train of powerful Rhine-type tugs with fleets of enor-

mous loaded barges would sweep round the nearby upstream bend at speed, hell bent for such places as Hamburg. They were quite unable to stop, fully ready to smash their way through any pieces of expensive Sapper bridging equipment left in their way. We had annual Bridge Camp at Hameln; sent squadrons away to Bavaria for civil aid tasks and to German and French training areas; ran the Annual RE Games at Osnabrück: supported 2 Divison's Ski Meeting at Oberjoch; played our excellent Fijian sappers in the rugby team; helped the RE Sailing Club at Kiel; deployed as Damage Control on other Division's exercises and built a mountain road in Central Norway. Life was never dull for any of the 1960s BAOR Sapper regiments; nor is it any less hectic for to-day's Sappers – just different.

As CO, I knew from its busy lifestyle that my regiment's instinct was highly tuned to carrying out its varied roles and that there were related issues about which it felt strongly. That said however, there were times when I wondered how accurate and widely spread was the confidence base and accumulated hunch from which, in its name, I so readily answered questions on the broader Army and Corps issues. In the Sixties, just what did the regiment really think about the wide spectrum of questions from on high which had to be so quickly answered? And would its view be robustly argued in the remote echelons of higher debate, or was the whole exercise something of a pre-determined "one way street"? Just how dead keen or phlegmatically disinterested was the officer, NCO or sapper about his environment, equipment, dress or future? What subjects did they feel really strongly about? In short, taking into account its identity, personality and profile, what exactly would a Portrait of my Regiment look like?

In painting any portrait, one needs to start with a skeletal outline of one's subject onto which a subsequent lifelike interpretation of personality can be laid. Because a regiment is a constantly evolving and a strong, living military entity, dynamically changing with the reality of differing circumstances, experiences, deployments, compositions, moods and attitudes, its portrait has to go beyond a mere psychological personality profile and be finely drawn in revealing its underlying characteristics and ethos. This was the challenge I set myself; and you must remember that the time frame was the Sixties' "Old BAOR School" environment of the Cold War.

The Regimental Framework

CLEARLY the many Research Annexes, Appendices and Charts which contributed to my Portrait of a Regiment would have no place in this limited summary. However, it may be of some Sapper historical and military sociological interest if I highlight some of the more interesting items which my research revealed, relevant both to the regiment's skeletal framework and overlaying personality. First, what was the portrait worth? The regimental pay and allowances bill was some £593,000 a year. Starting with some £700,000 capital worth of vehicles, weapons and equipment per squadron, then adding the annual cost of barrack accommodation, maintenance and depreciation, food, fuel, electricity, personal clothing and equipment, the CO was personally responsible for a Regimental Portrait worth some £2½ million in capital investment, plus about £1 million for its annual maintenance: yes, an expensive portrait – even at Sothebys!

Second, what was the regiment's geographical centre of gravity? Army folklore has often held that Sapper regiments have mainly been Scottish, Welsh, Geordie or Yorkshire. A breakdown of my regimental strength showed that 81 per cent were from England; 9.5 per cent from Scotland; 3.4 per cent from Wales; 2.6 per cent from Northern Ireland; 0.9 per cent from Eire; and 2.6 per cent from overseas Commonwealth countries. Detailed examination of the English content revealed that Yorkshire topped the poll with 15.4 per cent followed by Lancashire 8.5 per cent, Kent 7.9 per cent, London 5.9 per cent, Hampshire 4.9 per cent and Durham 4.6 per cent. The only English counties not represented at all were Buckinghamshire and Huntingdonshire. The low numbers from Scotland and also from the traditional Sapper stronghold of Wales, was surprising. On the other hand, an unexpected revelation was the wide geographical spread of the regiment's Sappers from the Commonwealth – namely Australia, Barbados, Cyprus, Fiji, Guyana, India, Jamaica, Kenya, Malta, Mauritius, Nigeria, Pakistan, South Africa and Trinidad. The average age within the regiment was just 21.

Over 300 families in station was a large number, and looking after them took up an appreciable amount of the CO's time. One factor of particular importance to regimental morale was the welfare of those young wives – some aged only 18 and recently married – who, for the very

first time in their lives, found themselves living away from 'Mum' or 'the street' in a strange foreign country with a different language and culture, and with their husbands so often away on exercises. Many rose excellently to the challenge, but a few – less resilient – needed especial regimental encouragement and help which was initially given, in this era prior to the introduction of Families Officers, by the OC, SSM and other squadron wives. One unexpected and never explained conundrum arose with the Regimental Wives Club. With three squadrons in the regiment, the average attendance at meetings was 25; on reduction to two squadrons, with the total of families falling from 300 to 126, the average club attendance remained exactly the same, maybe validating the group psychology theory that around 20 is the maximum size of any group for useful and enjoyable productivity!

Much of a CO's time is spent talking ad hoc to his Sappers; in the barracks, when building a bridge, in the cookhouse, in fact anywhere at any time of day or night. But there are also formal interviews: some individuals he requires to see; others ask to see him. In my first year I had 367 interviews and in my second year 332. What were they about? Over the two years the annual subject average was promotions 97: careers, prospects, commissioning and confidential reports 55: officer, WO and SNCO arrivals and departures 43; engagements, terms of service, redundancy, discharges and transfers 77; postings, volunteers, ERE, employment and courses 43; disciplinary (but excluding CO's Orders) 28; congratulations and permission to marry six; and two welfare cases referred from squadrons. The greatest number of interviews stemmed from the direct and indirect side effects of official turbulence – distressing because the welfare of the individual lay at the core of nearly every case.

My next step was to acquaint myself with the regiment's pattern of disciplinary behaviour, since this might well be an important background dimension to my portrait. In summary, one squadron proved 113 charges in one year and 107 in the next; the other proved 73 and 78 respectively; and RHQ's record was 53 and 38. Overall, petty military offences such as failing to attend, conduct to the prejudice, disobedience to standing orders, etc, dominated and accounted for 67 per cent of all charges. Absence without leave came next with 14 per cent; traffic accidents were 12 per cent; stores offences 3 per cent; civil offences 2 per cent; and the balance of 2 per cent included the very rare instances of drunkeness. The average age of offenders was around 19 and almost without exception they were unmarried. For nearly all it was their first or second offence but for one sapper it was his 17th! Squadron OC's awards covered a wide spread of restriction of privileges, fines, stoppages of pay and, where detention might be warranted, a few rare remands for the CO. For NCOs there were reprimands; and in one squadron, four reversions from lance corporal to sapper.

Thus far I had covered the more introspective dimensions of my regiment. It was now time to explore the vital dimension which would give my portrait character and strength, namely the motivation of the officers, WOs, SNCOs, JNCOs and Sappers who together constituted it, and with whom the CO must be well in tune. Any portrait had therefore to reflect the up-to-date views of all these groups, and that became my next challenge. Deliberately not using any central rostrum, I decided to lead a series of eyeball-to-eyeball no-holds-barred separate discussions with my 19 officers, 46 WOs and SNCOs, and with 48 JNCOs and sappers drawn from ongoing Cadres. They would be seated in comfortable chairs with me facing them, informally perched on a table top. A number of officers and WOs from other nearby RE units asked to sit in as well, and they made useful and welcome contributions to the discussions.

After an understandably slightly hesitant start, we were soon discussing very frankly an extraordinarily wide spectrum of Army, BAOR, Corps and regimental matters, helped considerably by using the classic Hertzog Behavioural Science technique of classifying 'Satisfiers' and Non-Satisfiers. Some sessions planned for an hour ran on for much longer, one for two and a half hours! At the end of each one I gave out forms for the private anonymous recording of any further views. My opening step was to investigate the past, present and likely future motivation of the various hierarchical groups within the regiment. In the short space of this thesis I can only summarize the results of my different discussions.

The Officers

My first group comprised regular majors, captains and subalterns; SSC and SRC officers; and captain/major quartermasters. 62 per cent were from State schools: 38 per cent from Public schools.

For over half, it was their own free choice to join the Army. A quarter had been influenced by a member of the family, usually someone already serving; one had been motivated by his school Combined Cadet Force and another from undertaking his National Service. Nearly 100 per cent had joined for the general attraction of leading a military as opposed to a civilian life and to fulfil an ambition to travel. Between 50 per cent and 25 per cent "couldn't bear the idea of a civilian job – or the thought of it": they had wanted job security, to play sport, have the companionship of a communal life and to gain responsibility in a man's world. Some 15 per cent had wanted "to get away from home and be independent"; and 5 per cent had wanted to gain a University degree, "to get to know and be able to handle men", or gain experience in works services.

Interestingly, the original motivation of half the officers – all regular subalterns and captains – had now changed, as revealed by the answers to the subsequent question "Why do you now stay in?". Some 74 per cent gave job satisfaction: "enjoying their life and work", "enjoying a position of responsibility", "the attraction of Service abroad", "the variety of a Service job as opposed to a civilian one", "better off and generally happier in the Service than I would be in civilian life". Between 50 per cent and 25 per cent gave "Service to Queen and Country", "still hoping for chances of adventure and excitement to come along", "the pay and allowances – especially education allowance", "the married quarters provided", "the benefits of Mess life", "the money advantage of overseas service", "the desire to do a worthwhile job", "better opportunities for interesting holidays", "the professional challenge", and "pride in the Service and for its internal loyalties". At 10 per cent came "Better mates to work with than in civvy street" and "my wife wants me to stay in"; at 5 per cent came "just waiting for my gratuity"!

The obvious question to follow on from this was "Where would you really like to go from here?" – extremely important in the context of the future of the Corps. Only three junior regular officers wanted to qualify as professional engineers – one as a civil, one as a nuclear and one as a mechanical engineer; two wanted to become professional surveyors and one a plant engineer. One QM wanted to be a member of the Institute of Purchasing and Supply. The clear majority wanted to be straightforward military engineers – all arms combat sappers – and it was for this that they had joined. Interestingly, 60 per cent wanted to qualify for membership of the British Institute of Management (as it then was), an interesting reflection on the growing awareness of this particular Institution. In the military field, 50 per cent were interested in the staff college, two wanted to become pilots and seven wanted official German/French language training. Nearly everyone wanted further instruction in staff duties and military law.

As regards Sapper work and training, their most popular first choice was for major independent regimental or squadron combat engineer tasks as undertaken from time to time in such places as Norway, Kenya and Canada. Second came all arms combat team exercises – everyone wanted more of these if only the tight BAOR timetable could squeeze them in! Third, but much less popular, was for deployment on major civil engineer tasks abroad like *CROWN* or *BEEF ISLAND*. Lastly, surprisingly, and well below everything else, came "Military Aid to the Civil Community" tasks within the UK.

In essence Hertzog's Theory of Motivation mentioned earlier is concerned with satisfiers and dissatisfiers related to the individual and his work environment. Positive attitudes are obviously beneficial to motivation; absence of them does not necessarily give rise to negative attitudes. Hertzog states, however: "It is only in true satisfiers that a man will find the source of his motivation, to fulfil himself as an individual – unique in potentialities and within limits of reality". For this part of the exercise it was important to separate the officers into their four groups since their four viewpoints would be, by definition, very different. It would take up a disproportionate amount of space to list here every satisfier or dis-satisfier the officers gave, so only the more important (and a few of the more 'off beat') ones follow:

Regular Subalterns and Captains. The main satisfiers were: variety of worthwhile jobs; individual responsibility; command of an efficient and successful sub-unit; and pay and allowances. Major dis-satisfiers were: irritation with Army administration; fundamental inference of dishonesty in accounting procedures; too much paper work; over-administration: administration umbrellas; MPBW restrictions on unit redecoration; audit and inquiry procedures; the idea of becoming a Europe-based Army; lack of enough time or opportunity in BAOR to train properly on one's own as a complete field troop; eroding of field troop strength for regimental domestic and

ERE commitments and resultant lack of men in field sections; too many 'last minute' change of troop plans, the result of 'instant work' ordered by higher HQs above regimental level who apparently did not appreciate, or just ignored, the regiment's problems; and status of the Army as seen in UK.

Regular Majors. The main satisfiers were: professional pride in success; variety of job; challenge; way of life; successful progressive development of YOs and NCOs; "The Army is the best club in the country; it is largely composed of similarly minded men; friendships are stronger forged in it than outside." Major dis-satisfiers were: insufficient time and opportunity in BAOR to train men and sub-units properly in their combat engineer skills; higher HQ's lack of understanding and appreciation, hence their issue of tasks at short notice regardless of regimental problems; lack of visits by headquarters staff officers; constant "chop and change" from "on high"; and the idea of becoming a Europe-based Army.

SSC/SRC Officers. The main satisfiers were: challenge; working in squadron-size unit where success or failure of work done is immediately apparent; pay and allowances; and Mess life. Major dis-satisfiers were: too little professional training; the idea of becoming a Europe-based Army; status of the Army in the UK; and inadequate time to train properly.

Quartermasters. The main satisfiers were: pay, allowances and pensions; security; married quarters; Mess life; reporting system; recognition and appreciation of work well done; and definite opportunity for advancement in the Service. Major dis-satisfiers were: uniform, (particularly woollen pullovers); not enough time to train properly: units expected to train in too many things at once; low clerical standards in training; low standard of recruits ex-training brigade; lack of men in field sections; overwork by management, too little by the men; and not enough evening activity, eg education classes or social life.

Many of the points recorded above confirmed only too well the well known frustrations of a BAOR CO both as regards training and working strengths, and of the way one was forced to perform the "one wheel bicycle act" of maintaining continuous balance despite pressures from all directions. Others were only to be expected as characteristics of the groups concerned. What was unusual was the depth of feeling about the status of the Army in the UK, and dissatisfaction with the idea of becoming a Europe-based Army. All had validity, and were well based upon the thoughts and experiences of current regimental soldiering at 'boots and gaiters' level.

As a change of tack, and to introduce more controversy, the next part of the study was to find out attitudes to three important but emotive topics which, at that time, were of current Army top-level attention. The first was whether there was still a place for a Long Service and Good Conduct Medal (LS&GC). In fact there was a large majority in favour of this. The principal reason given was that it set a high standard at which to aim, and it was a well-merited reward for excellent service done over the years. One interesting point raised was that certain civilian organizations which specialized in employing ex-servicemen demanded the LS & GC qualification as evidence of reliability. One modification was suggested, however, that under the then terms of service it should be awarded at the 12-year point. Not so many men in the future, would be staying in the Army for as long as l8 years and such a change in its terms would bring it into line with many other long service awards. The 18-year point would merit a bar. (Note. In 1978 Defence Council Instruction (Army) 4/78 reduced the years of qualifying service for the award of the LS & GC medal from 18 to 15 and introduced a clasp for a further 15 years service).

The second controversial item was the quartermaster commission, which some sections of the Army felt was now superfluous in the era of the special regular commission. However, in 25 Regiment, approval for its retention was all but unanimous. The great majority however, wanted a change in the quartermaster's field of responsibility. The principal reason advanced for "no change" was "depth of experience" in that the QM commission retained in the service specialist skills based on a very long span of invaluable knowledge which the normal SRC officer could not hope to achieve. There was strong feeling however, that the commission should not be given just as a reward for service; that was the function of the LS & GC. In responsibility, the nearly unanimous feeling was that the QM should be given normal powers of command when necessary, and be given all the executive responsibilities equivalent to a SRC officer in relation to accounts, cash, inquiries, courts martial, etc, plus opportunity for staff employment.

The third subject was the old chestnut of discipline. The discussion points in themselves would merit a separate article but in synthesis, one half considered Army discipline to be too lenient, one third considered it satisfactory for the Army of 1969, and two officers felt it to be unsatisfactory in its present form. The major points which emerged were: COs powers should be increased in certain

areas, to allow him to deal with some "cut and dried" cases now mandatory to be tried by courts martial; reluctance by some SNCOs to enforce minor discipline – they turn a blind eye and do not set a proper example; lack of status and support for Junior NCOs attempting to do their job; technical 'types' who think the Army's discipline is not for them; 'pocket hitting' by fine meant little to the average soldier; and ineffective minor punishments.

The points made revealed nothing new or startling, and merely confirmed attitudes with which nearly all COs of the Sixties were familiar.

Improvements to the System. In the final part of the study, the officers were given free rein to recommend any improvements to the Army in general. or the Coprs of Royal Engineers in particular. There was a wide variety of ideas and no inhibition shown! Those suggestions subsequently accommodated by the Military Salary Review of April 1970 (and there were many), have been omitted from the lists given below. A selection of suggestions is given below by groups:

Regular Subalterns/Captains. Wanted more chances to do independent satisfying troop tasks; less "white tape" exercises in BAOR; more non-gladiator sport; more time for the troop commander to train his troop properly; more men actually in the field sections; better office equipment, eg troop typewriter, desk, filing cabinet; more delegated powers as a sub-unit commander; men on long courses and in ERE posts to be held on Depot not unit strength; to salvage the status of the JNCO; to rotate Sappers between BAOR and Strategic Reserve every two years, (a big boost to morale); to increase an OC Sqn's powers; longer and tougher JNCO Cadre courses; better training equipment, eg trade training stores and also no more 37 pattern equipment; the regiment to be given fewer tasks and the opportunity to do them well; to improve the working dress for officers; abolish pullovers as an officer dress; and minor permitted variations in dress for regiments/squadrons to improve morale and the competitive spirit.

Regular Majors. Wanted more squadron independence (as always!); better and newer equipment; better quality of recruit; more unit financial discretion and control of its own expenditure (eg office aids); increased financial powers; better and more office machinery; more secure speech equipment; relaxation of saluting in barracks only; a reversal of the current diminishing opportunities in BAOR "to get away from it all", be independent, enjoy soldiering and "have fun"; official telephones for field officers; and increased MFO allowances.

SSC/SRC Officers. Wanted increased financial powers for OC squadron; to abolish No 2 dress; and to change from khaki to green and introduce 2-tone jacket and trousers.

Quartermasters. Wanted the eventual formation of a Quartermaster Corps in the Army; to increase delegated financial powers; more delegation of responsibility to SNCOs; widening of pay differential between sapper and lance corporal; re-introduction of more standard PT into the Army; restriction of the wearing of British Warms to field officers only, as it used to be; abolition of the pullover as an officer dress, and to create more variation between officer and soldier non-combat uniform.

Many of the suggestions made, in the severe Service financial climate of the Sixties, were of course subjective pipe dreams; others were familiar BAOR cries. Of all the officer groups, the regular subalterns/captains took the greatest interest in this section, and many of their contributions were thoughtful, well-intentioned and realistic.

The Warrant Officers and Senior NCOs

The WO and SNCO questionnaire was similar to that used for the officers, and the findings of its different sections are summarized below.

Recruitment. The overwhelming majority of both WOs and SNCOs had joined the Army on their own initiative. A little less than half had family connections which influenced this choice; and a little less than half had joined as a result of the experience of National Service. Only four had been influenced by friends, and one by service in the Army Cadet Force.

Original Motivation. "Opportunity for travel" (72 per cent) was very clearly the winning factor for original motivation, followed in second place by the chance to learn a trade. The attraction of the military way of life, and the expectation of adventure and excitement, were the only other two really significant motivation factors. The minor scores covered the usual pattern of security of job, responsibility in a man's world, independence from home, and a few isolated factors such as being orphaned, "only framework available at home" or "the hope of housing".

Present Motivation. Two-thirds of the men interviewed had changed their original motivation. Amongst the sergeants, 85 per cent stayed in because of job satisfaction, and 75 per cent considered they are better off and happier than they would be in civilian life. The only three other significant factors contributing to current motivation were: the variety of service life, as opposed to that in a civilian job; enjoying a position of responsibility; and the benefit of married quarters.

Amongst the individual factors came the interesting and unusual ones of: "Personal pride – to leave now would suggest my initial enlistment was a mistake"; "My children now have a much better start in life than I ever had"; "I am under contract to complete

my time. I will leave and search for the adventure and travel which, regrettably, I have not yet found".

The warrant officers and staff-sergeants, being perhaps a little older, produced a slightly different view on their current motivation. For them the outright winner (89 per cent), was "enjoying a position of responsibility". The other significant factors were much the same as for the sergeants, but additions included "the attraction of service abroad" and "the pay and allowances". Only one individual quoted pension as a motivating factor.

Motivation towards the Future. Promotion, obviously, was the prime future motivator, though this was not universal in either rank band, being only 70 per cent for warrant officers and staff-sergeants but 85 per cent for sergeants. 58 per cent of the warrant officers and staff-sergeants hoped to be commissioned (SRC 35 per cent, QM 23 per cent, SSC Nil). Clearly the sergeants wanted to be better trained and qualified (65 per cent), whereas with the warrant officers and staff-sergeants only a minority (23 per cent), saw their future in this way; many of the latter were, of course, well qualified already, but for some, perhaps, it was too late. Most men, understandably, were keen for their training to equate to, and be acceptable to, their equivalent civilian trade counterpart.

Militarily, by far the most popular motivating demand was for more large regimental engineer projects of the *CROWN, BEEF ISLAND* style. Independent squadron-size tasks came next but a long way behind, and there was surprisingly little enthusiasm for any increase in combat engineer tasks or all arms exercises; naturally in BAOR and particularly in a brigade engineer regiment, there were plenty of the latter anyway.

The major satisfiers were: pay; allowances; married quarters; Mess life; terms of engagement; freedom to plan and organize a task, and then be left to get on with it; the chance to see the results of one's own ability; satisfying "end-product" worthwhile tasks; left to make ones own decisions; commanding men; wide spectrum and challenge of the WO; being treated as a responsible adult; and opportunity for advancement. Major dis-satisfiers were: current uniform; inadequate working uniform, especially for duty work (MT and plant); the idea of becoming a Europe-based Army; too much paper work; standard of recruits ex-training brigade; too little professional training; lack of men in field sections; "We train in too many things"; inadequate time for basic individual training; inexperienced young officers; inexperienced junior NCOs; lack of best modern tools for the job and insufficient pay differentials in rank/trade.

Improvements to the System. As with the officers, the motivation answers produced nothing startling, but certainly confirmed very strongly the way in which men thought about things. Having deliberately stirred up individuals into sorting out their ideas, the next section gave them full rein to suggest how to put to rights the Army in general, and the Royal Engineers in particular. A selection of the wide variety of suggestions is: better office equipment; storemen to be properly trained by RAOC; units to be scaled for better classrooms; more modern equipment and thorough training to match it, particularly in the MT/APC/Plant field; better information to the individual on career planning; be able to devote more time to the fundamental basics of soldiering; improved uniform – No 1 dress style to be changed to collar and tie pattern, No 2 dress to have a white shirt and black tie, No 1 dress hat to be khaki, brown shoes not black and greatcoats for winter work; improve and scale unit training libraries properly; better barrack room furnishings for the single soldier; improve MT cleaning facilities, eg, "Steam Weaver"; RSM to have minor summary powers for trivial offences; allow unit tradesmen to delve more into the mystery of the equipment they use, rather than it always going off to second line workshops; abolish "Q" adaptability for promotion at SNCO level, the "Q" should be a professional RAOC NCO to run centralized unit accounting courses; obtain a good portable welding kit; and re-classify in trade every two years, or every three if employed away from the trade.

Having invited suggestions over a wide field, the next part asked for recommendations peculiar to WOs and SNCOs themselves, by way of perks, privileges, dress or anything else which might improve their status. A few men said quite firmly that no more should be done in this field : "Its the badge of rank that counts" or "I dislike special privileges". However, the remainder produced a large response which was mainly centred around the highly emotive subject of dress. Some suggestions were very wild: "special two-tone American-type uniform for SNCOs" or "a UN colour beret", and entirely self-centred in the context of the Army as a whole. Many others were very practical and sensible and a number reflected the changing social patterns of the day: Mess kit to be issued to SNCOs free of charge, or else to be given an allowance against income tax; officer-type hat, gloves and cane for WO2s; brown shoes not black; option to wear officer-type side hats; British warm for WOs; brown leather gloves with No 2 dress; barathea SD for all WOs.

Suggestions made on other topics were: SNCOs to be able to report sick as officers do, and not have to queue; SNCOs to have more preference in posting whenever possible; troop staff-sergeant's courses at RE Records; SNCOs to be told by RE Records on reaching his ceiling, and have the opportunity to retire then; WO/SNCO's Mess member's 'pint pot' to be taken by him from unit Mess to Mess, and not left behind on departure; troop officer should be able to invite his troop SNCO into the Officers Mess bar; single

WO/SNCO accommodation should include an individual gas ring or the availability of a simple cooking stove; and rules regarding the entertainment of lady guests should be broadened.

Taking the special issues, a majority of exactly 2:1 was in favour of the continuation of the LS&GC medal. As was to be expected, arguments for and against were put with feeling: "One's sense of responsibility develops late"; "it is alien to the new Service image"; "Medals should be for bravery only"; "100 years out of date"; "The new rules ruined it"; "Sheer Hypocrisy"; "Deprives one of a civvy job because of a youthful prank (certainly not a crime) early in life"; "a farce"; "it proves nothing"; and "only a substitute for a gold watch". Such were typical of the "red corner" approach. The "blue corner" faction commended it as an achievement, a pride booster when nearing discharge, an ego-satisfying award, something which helps to keep up standards, and conferred a status which is "something to be listened to" and emphasized it as an essential qualification for certain civilian jobs. The constructive suggestions were that the terms might be re-examined in the context of long service only, and it be awarded at the 12-year point.

The majority of sergeants thought that the day of the QM commission was over. They felt that his job should be open to all officers (normally SRC officers), that he should be able to command and be normally accountable. They felt that the retention was an undue complication, and that there were "an abundance of miserable QMs"! The very great majority of warrant officers and staff-sergeants on the other hand, (as would be expected), considered the QM commission was a good thing. They felt it was the experience which counted: he was "Chief Steward to the CO". Some advocated it being reserved to a Corps "Q" ladder of promotion from sapper to lieutenant colonel. A few foreshadowed the dawn of a Quartermaster Corps.

Discipline today was generally considered by all to be much too lenient, and the majority felt that this all starts to go wrong by softness in very early training. One sergeant put it well: "Discipline today must not be manufactured for its own sake; the target is self-discipline naturally acquired, because it is necessary." All agreed that the modern youth needed different handling from their own recruit experiences, that modern discipline placed a far more demanding problem to officers and SNCOs alike in its application, and that the current expectations of soldiers coming out of training brigade and the realizations of men in units was far from right.

JNCOs and Sappers

I DECIDED to split my 48 representative JNCOS and sappers into two groups of 24. I did this because proven experience dictates that 48 is far too large a number of people with whom to hold intelligent constructive dialogue, and in the special circumstances of what I had arranged, I felt that individuals in a group of 12 or less might feel inhibited both with me and their 'mates' in exposing what they really thought about things. Before starting, I told each group that at the end of our discussion, anyone could ask me – on a totally informal and direct basis – any questions they liked about any aspect of the Army about which they felt strongly, wanted clarification or sought information. It would be an open and "no subjects barred" session, one in which, in the event, 'the lads' responded very frankly in a well-articulated manner. With each group, such was their interest in making the most of their opportunity, that each session overran its allotted time by well over an hour!

In summary, the JNCOs and Sappers main satisfiers were a secured independence; opportunity for adventure; job security: regular pay; comradeship; the opportunity to catch up on any educational deficiencies or other disadvantages of coming from a broken home; travel; a challenge; the prospects of advancement; "a better way of life than out in civvy street"; good opportunities for sport; family housing; and "escaping from the pressures of civvy trade drug culture". Their principal dis-satisfiers were lack of artisan trade practice; "too much being buggered about"; being given wrong advice about trades at their initial selection interview; lack of expected adventure; imbalances over pay; too much plain combat engineering and too little project work; "being treated like a child, having first to gain the OC's permission before marrying a foreign national or entering into a Hire Purchase agreement with NAAFI"; no married allowances and no allocation of married quarters if married under the age of 21; service under 18 years of age not counting towards a soldier's service or pay, although doing the same job; no official working time off to train in a sport in which they excelled; "you are told to make your barrack rooms homely, but prior to every barrack room inspection you have to take down all decorations, pin-ups etc off the walls and locker doors. If the people living out had to do this they would rightly be deeply offended"; a Sapper now needs a second locker in order to accommodate all the Army kit he now has to have, quite apart from his own personal possessions.

I then had over 40 questions put to me in response to my earlier invitation to the two JNCO and sapper groups. The answers to a number of these had already started to come out in the discussions of dis-satisfiers already mentioned; and inevitably some were domestic complaints about different squadrons operating different procedures as regards duties, times of parades etc. But there was a wide variety of new subjects raised, a selection of which follow: "Why shouldn't soldiers be allowed to communicate with the Press when they have genuine complaints – or is the British Army afraid of criticism?"; Why was conscription stopped in the British Army – will it ever be brought back again?"; "Why isn't there an Army Standing Order scheme whereby any soldier who shines in a particular sport can be pushed on to his greatest heights by having time off for training, and have PRI assistance without a load of unnecessary messing about before a petty sum is given over?"; "Just over a year ago sub-units formed their own clubs and bars, the purpose being to enable members of the regiment to relax tension in camp, and so save having to go outside causing trouble with the local civilians and German authorities. Why now is the regiment cracking down so hard on incidents involving personnel in a drunken state when, 12 months ago, we were encouraged to drink in camp ?"; "How long must a soldier serve in BAOR before he gets a posting to another place outside Germany, and just how are postings worked out as to how and where a soldier comes and goes?"; "How does the Army work out trade classifications and restrictions for trades which are recognized by the trade unions in 'civvy' street?"; "The British Army takes great pains to ensure that the physical condition of its members is of a reasonably high standard – a very necessary thing if we are to function competently and I accept this. But does the Army take steps to ensure the emotional condition of the soldier, which is just as important as his physical side. If his emotional problem is big enough, it can have a big effect on his physical condition; for example the classic 'Dear John' letter can represent a real emotional tragedy. It would appear that the Army looks upon a case like this with very little concern, refusing the soldiers' request for compassionate leave on the grounds that his girl friend or fiancee is NOT a member of his family, oblivious to the fact that this girl perhaps means as much to the man emotionally as any member of his own family. Of course, if given these facilities, they could be abused but I feel sure that this could be overcome to accommodate what I believe many soldiers think of as an important problem in Army life"; "Why is a soldier punished for having his No 2 dress tailored to fit him, providing he looks smarter?"; "Is there any disciplinary reason for short hair cuts?"; "Why isn't an admin discussion given to everybody, putting other ranks in the picture as regards promotion, courses, leave etc?"; "Why do JNCOs not come on cadres instead of sappers when some JNCOs have not yet done a cadre?"; "Why can't 25 Engineer Regiment Sappers have 'Boston haircuts"?; "What is the difference between AWOL and desertion?"; "Why is a tradesman not paid for his trade until he has been promoted, and what is the reason for him being promoted so quickly? Does all this make him a better leader of men – a man who can take responsibility etc just because he has an understanding of technical subjects?"; "Why does the Army cater for the minority rather than the majority in disciplinary matters – for example with the 2am curfew? Why should 100 men suffer for the stupidity of one?"; "Why are barrack rooms so bare, overcrowded and uncomfortable to live in? Surely if a soldier was given something to take pride in, it would be looked after. Why is there so much uniformity in living conditions ? Why should a barrack room be something to sleep in and nothing else? These days more soldiers come from good homes and are used to good living conditions. The fact that barrack rooms are more like cells encourages a soldier to treat them as such. If a living-in person visits a married person living out, I'm sure he wouldn't flick ash over the floor, stub the butt out on the carpet, and wear greasy overalls whilst sitting on their chairs. 99 per cent of soldiers have manners, but apparently these are just not needed in to-day's Modern ******* Army".

Concluding Thoughts

My Portrait of a Regiment was now as complete as I had had time to paint it. Studying the finished canvas, some parts of it were very familiar from the past; other areas revealed new colours, shades and blends: and here and there new detail. Overall I was happy with the outcome because I felt I had learnt so much more about my regiment, particularly its thoughts about the present and future of

the Army in general and of the Corps in particular. Whereas much was already good, significant parts of the portrait revealed that much more needed to be done by the Ministry of Defence to fulfil the rising expectations of the soldiers to match the fast-rising standards of the nation's civilian society from which they had been recruited, and to bolster all ranks' subsequent retention in the Service.

Some people may well wonder why this portrait is only surfacing now, 34 years after holding the discussions upon which it is based. The answer is that had I made it public on its completion, my portrait might well have been wrongly misinterpreted in some Sapper circles as being a deliberate major ego-trip PR plug for my regiment vis-à-vis the other five excellent and equally hard working regiments commanded by my fellow BAOR COs of that day. As it is, the Corps' history over the centuries is very well covered as regards wars, campaigns and unusual instances of bravery and operational deployment. My hope in making the portrait public now is that first, with this passage of time, it is now accepted as a straightforward military sociological record which, together with its back-up research charts and annexes, might find a place in the Institution of Royal Engineers' archives as such, complementing the Corps' operational BAOR history of that period. Second, that it could act as a Sixties benchmark against which any future regimental portraits could be compared.

The changes in so many aspects of the Army in general and of the Corps in particular since I painted my portrait in the Sixties, have been momentous. Since my retirement I have been honoured and privileged to have lived with or worked alongside Sappers (including Gurkha Sappers) for twenty-one years as a defence correspondent – notably in BAOR, Belize, Bosnia, Canada, the Falklands, the Gulf, Kosovo, NATO, Norway, South Georgia and the UK – and have witnessed these changes first hand. Today, for instance, we have the 'mix and match' type of deployment of RHQs with a variety of squadrons, troops and specialist teams under command. Whereas many of the traditional Sapper working conditions will never change, those of living, feeding and welfare make life in the BAOR Sixties resemble a Dinosaur era! I was delighted to find that to-day there are high-powered CGS/AG teams touring the Army investigating how to put right many of the points brought up in my portrait discussions. A wholly new design of single soldiers' accommodation is starting to be built; *Soldier* magazine now has Letters pages and a monthly round-up of soldiers' views of topical matters such as whether partners should be allowed to live in married quarters; and there are now many female Sappers. All this is very welcome and hopefully will attract more good quality recruits and boost retention figures.

What was very evident to me in my defence correspondent travels, however, was today's Sappers' very high level of professional competence: self-confidence, assurance and willingness to undertake any task, be it a traditional Sapper one or not; successful improvisation, innovation and resourcefulness; successful integration of female Sappers; and readiness to take responsibility which showed so clearly at every working level from the individual sapper upwards. For instance, when the CGS and the British Ambassador visited the Mabey-Johnson Lendrim bridge under construction near Mrkonjic Grad, the visitors were briefed on the project quite brilliantly not by the Sapper CO or officer i/c bridge, but by a SNCO; both said later how impressed they had been by him. Concerning female Sappers – again in Bosnia – I visited 61 Field Support Squadron's plant troop, commanded by Captain Rachel Semple, deployed on the CHICANE task of repairing a huge crater on Route Gull. Replying to a question, Plant Foreman SSgt Nigel Husk told me, *sotto voce*, "The lads think she's fantastic". That's a real tribute to its female troop commander from a tough plant troop!

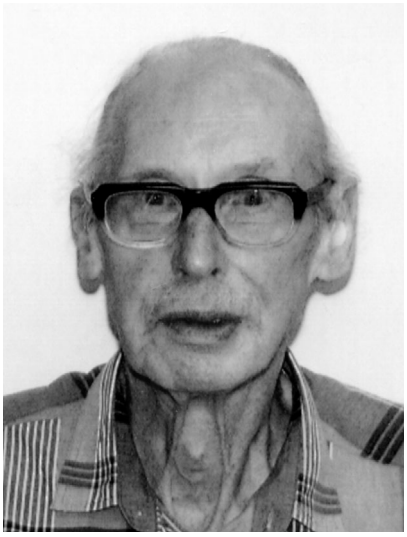
I earnestly hope that perhaps some future CO will one day have the time to paint a portrait of his regiment, maybe in late 2002, some 34 years after mine, and then again in 2036. Such portraits are necessarily rare acquisitions, and too good to miss.

The Corps needs them as part of its history.

Note: *The above article is an abridged version of the original study which has been deposited in the RE Corps Library.*

Memoirs of a Tunnelling Officer during the Second World War

MAJOR P E EDMONDS



At the outbreak of the Second World War, Peter Edmonds was a student at the School of Metalliferous Mining at Camborne in Cornwall, preparing for the third and final year of his course. Early that week in September 1939' he went from his parent's home in Dorset to a Reception Centre at University College, Southampton to enlist in the Royal Engineers. Because he was an engineering student, he was turned down and advised to complete his course. Back in Camborne he received a postcard from the Centre saying that the policy had changed and that he was, after all, acceptable. He returned and was enlisted and his training started in November 1939 at No 4 TBRE, Colchester. He was orginally employed in Bomb Disposal, but upon arrival in Gibraltar, his mining background made it almost inevitable that he ended up as a tunneller. In retirement, Peter lives in Castor Bay, Auckland, New Zealand.

Introduction

At Colchester, one of my fellow trainee sappers was Jonah Maunsel, middle aged and whose christian name was probably a nickname derived from the character in Dornford Yates' novels. Much later I learned that he had been a regular in the First World War, had been badly wounded and invalided out of the army. He had gone to South Africa to regain his health and worked at a variety of activities, including mining, and I believe, acting. He returned to England in the autumn of 1939 and reported to the War Office. His file was produced and he was offered an immediate commission in the Intelligence Corps as a mail censor which he declined. He then went to a recruiting office and without mentioning his previous service, enlisted in the Royal Engineers. I have a photograph of our recruit party taken in December 1939 when we passed off the square, and there at the right front stands Jonah, six foot three and the smartest on parade. Shortly after that he disappeared and I next saw him in the autumn of 1941 as a major commanding a tunnelling company in Gibraltar.

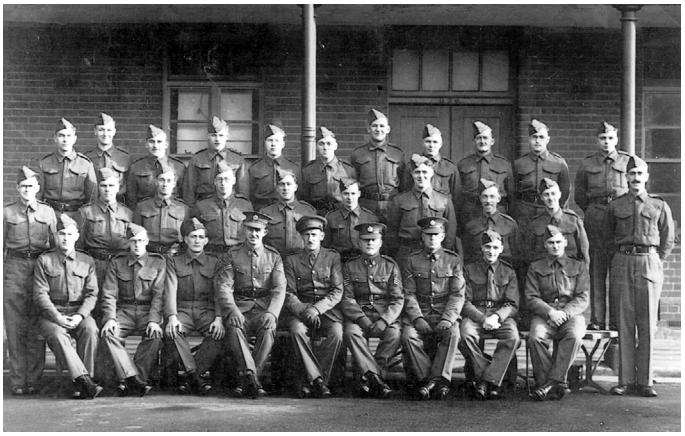
I was posted to 141 OCTU RE, Shorncliffe, commissioned and joined 3rd TBRE at Ripon. In October 1940, I volunteered for Bomb Disposal, and joined 651 BD Coy in Blackheath, London, which in January 1941 was redesignated 25 BD Coy and based in Eltham.

To Gibraltar

In September 1941, together with a sergeant and three corporals with BD experience, I was posted to Gibraltar as a BD officer and joined 1st Fortress Coy. There was already a BD officer there, presumably a second was required in case of a siege. The only bombs that had fallen on Gibraltar were French in revenge for the sinking of their warships at Mers el Kebir in July 1940 and an action off Dakar in September 1940.

Gibraltar Fortress at that time was under the command of Lord Gort. Until Dunkirk he had commanded nearly 300,000 men of the BEF in France, now he had a position which was normally given to a senior officer nearing retirement. His 2IC and commander of land forces was Lt Gen Mason-MacFarlane and his Brig (Admin) was Parminter, both of whom had served under him in the BEF.

The colony of Gibraltar is four and three quarter miles long, north to south, three quarters of a mile wide and 1400ft high to the crest of the rock. The naval base was an area enclosed by breakwaters in which a whole fleet could ride, a



December 1939. 4 TBRE Colchester Recruit Party after Passing Off the Square. Author mid row, fourth from left. Jonah Maunsel mid row standing extreme right.

graving dock and underground storage for ammunition and fuel.

The fortifications had hardly been improved since Victorian times, with the exception of five 9.2 inch coastal guns on the crest of the rock, and 6 inch guns in Princess Caroline's Battery facing Spain. After the fall of France the garrison had been increased to four infantry battalions, several artillery regiments, and some tanks. The defences on the landward side included anti-tank obstacles because the Spanish government was favourable towards Germany. There was therefore the possibility of a *coup-de-main* attack by German forces through Spanish territory. The two sapper fortress companies, 1st and 32nd had been joined by the tunnelling group, an airfield construction group and an army troops company.

Nearly all women and children had been evacuated and civilian males had to join Civil Defence or the Defence Force.

Each morning, eight thousand Spanish workers of both sexes crossed over to the Rock from La Linea and Algeciras and each evening departed again, laden with loaves of white bread, English cigarettes and any other marketable objects they could conceal about their persons. (Donald Darling: *"Secret Sunday"*, 1975)

Fresh water supplies came from rain catchment areas which had been constructed on the east side of the Rock. The water was stored in large underground reservoirs which had been excavated by civilian contractors before the war.

The Admiralty had employed contractors to drive a tunnel under the Rock from the dockyard on the west to the beaches on the east, and excavate some storage chambers. The BD NCOs who had accompanied me went to work at their trades. I would have liked to work at mine.

From Bombs to Tunnels

It was the custom for newly arrived sapper officers to be asked to dine with the Chief Engineer at Engineer House. When asked about my background I mentioned the School of Mines and wondered if there were any vacancies in the Tunnellers. There were, so I joined 180 Tunnelling Company. Up to the outbreak of war, Gibraltar Garrison had two RE units, the 1st and 32nd Fortress Companies. From June 1940 after Italy joined the Axis powers, there was a clear threat to the Rock, so the two Fortress Coys were brought up to war establishment. In addition, Three British Tunnelling Companies, (172, 178, and 180) plus 1st Tunnelling Coy RCE were popsted in. The CRE was a Canadian, Lt Col DM Thomson MC known as "Tommy the Tunneller".

Our first OC was Maj ARO Williams, after whom the new underground road from Europa flats to Catalan Bay had been named "Arow Street" He was Royal School of Mines and former trouble shooter for Consolidated Gold Fields. The 2IC, Capt Patterson, had mined metal in Cyprus with Turkish labour. The section officers were "Spet" Spettigue, Royal School and former underground manager of Rio Tinto, and Geoff Paskins, graduate civil engineer who had tunnelled under the Thames for a new tube line.

I had taken over from a former Inspector of Mines in West Africa who was urgently required to return to that job. The rank and file were mainly coal miners, with the exception of one of our best drillers who was a London milkman! The soldiers were accommodated in a primary school, and the officers' and sergeants' messes were in other requisitioned buildings.

We worked on a three shift system, changing shifts after each weekend.

The equipment was mobile compressors of various makes, each producing 200 cfpm at 80 psi, grouped to form a compressor station. With pressure loss in the connections the pressure at

the working face was less than 80 psi.

Holes were drilled dry, using hand held jackhammers. The medics had decided that as the rock was limestone with no silica present, there was no danger of silicosis.

In contrast, the Canadians were compelled to drill wet, using bar mounted drifters. The only water available in Gibraltar for any purpose except drinking or cooking was salt sea water. This caused problems for the Canadians. The reason for them to drill wet was political. In the past Canadian miners had been ravaged by silicosis, because mine owners had preferred them to drill dry, which was simpler and quicker. Only after strong union action and ugly strikes had drilling dry been made illegal.

The explosive used to blast the rock was polar ammon gelignite. The brand was 808, rather more rubbery than some gelignites. Detonation was usually by safety fuze, and detonators, although electric was sometimes used.

Narrow railtracks were laid in the initial tunnels which were usually 6 ft by 6 ft. Mucking out of the broken rock was done by hand or by Eimco loader. These ran on the track and were powered by compressed air, The hand mucking out was usually done by teams from other arms, mainly infantry. A task system was operated. Each member of the team was required to fill five tubs. With five men in the team the task was 25 tubs. If an officer came with the team, and he lent a hand, he was not counted in the task total. Most officers worked with their men. The saying was: "Fill five and file off (or words to that effect)".

180 Coy was working at the south end of the rock driving a tunnel northwards with the sea on our right or east side. Every so often a short tunnel would be pushed out eastwards to the cliff edge for ventilation and so that the spoil (broken rock) could be tipped into the sea.

Our tunnel eventually broke out onto the road running along the bays on the east side of the Rock. It was then increased in size so that an Army three ton truck could drive along it. Galleries were driven to the west, and these were enlarged to accommodate Iris, Romney and Nissen huts. These would be used for storage.

After France fell in summer 1940, and there was a danger that Franco would join Hitler and that Gibraltar would be besieged, all remaining women and children and most male civilians were evacuated.

Supplies of ammunition and tinned food for one year's consumption were stored. The garrison used up the tinned food supplemented with fresh food brought in from Spain. Regular shipments of tinned food kept up the level of reserve. We fed better than the civilians in UK, but the diet was monotonous. Soya link sausages were one of our bugbears.

Gen Mason-MacFarlane encouraged the tunnellers, on whose progress the defensibility of the fortress much depended, and ordered that we should have extra rations.

The task for our drillers had been agreed at fifty feet of holes drilled per shift, each hole being four to five feet deep. The bits were detachable and sharpened at a central blacksmith's shop. Our ability to complete the task depended on the air pressure at the face, the sharpness of the bit and the skill of the driller. Most drillers could complete the task in three or four hours of the eight hour shift. Coming from a London under daily aerial bombardment, where the BD sections were working flat out, it seemed ludicrous that sappers on the Rock should only be working three or four hours a day. When I mentioned this to my seniors they suggested that I should talk to the men in my section and see what their reaction was. This was quick and foreseeable. How were they to know that the air pressure would be good, that the bits would be properly sharpened and that there wouldn't be fissures in the rock making drilling more difficult? In any case they wouldn't trust me to be a fair arbiter. "You belong to the bloody boss class" they chorused.

Most of the tunnelling officers had been metal miners working overseas with native labour. Our rank and file were mostly coal miners, staunch union members and Labour Party supporters. When they had arrived in Gibraltar they were assured by a bluff Tommy the Tunneller, "Work hard and you'll all be home by Christmas." Which Christmas was unspecified.

By 1942 Tommy had been posted away and succeeded by ARO Williams He in turn was succeeded as our OC by Dai Williams, a Welsh coal mining engineer.

Morale Boosting

Dai quickly determined that the morale of the troops needed a boost. Pay day was Thursday, on which evening the canteens were liberally supplied with beer. By Sunday night the beer

and the money had run out, so Monday evenings were always the blackest of the week.

Dai announced one evening over dinner that he had an idea to brighten up Mondays. We would invite people interested in all the political parties to speak to all ranks, one each on successive Monday evenings. As I was the Current Affairs officer (in addition to my section duties), I was to organize this. He found the first speaker, for the Conservatives. (Dai, was probably the only Conservative supporter in his Welsh valley).

I asked for confirmation: "All political parties in Parliament?" "You heard me. Get on with it, Edmonds." Luckily this instruction was given in front of the whole mess. As "citizen soldiers" (see below), we sometimes didn't obey the tradition: "No shop to be discussed in mess."

The first Monday was a great success. The Conservative speaker was from the Fleet Air Arm; a former journalist and parliamentary candidate. There were many questions, but no heckling.

The following Mondays produced supporters of the Labour, Liberal and Commonwealth Parties, (the latter with one MP). after which Dai said, again at dinner: "Now we shall have to think up another diversion.

"We have one more party to come, Sir, the Communist." (also with one MP, for East Fife).

This speaker proved to be a fiery little corporal from the RAF. He was listened to in respectful silence, recited a poem about Cossacks in the snow and called for a Second Front now. Uncle Joe would have applauded, but our solidly Labour audience didn't want a bar of it.

A New Chief Engineer

The CRE was sent on a visit to Malta, to advise on the tunnelling programme there. During his absence, Jonah Maunsel acted for him. By then, we had a new Chief Engineer, Brig TWR Haycraft who decided that the tunnellers were overrated, did not work any harder than anyone else and did not deserve extra rations. He also complained about damage to equipment caused by careless handling, and issued an order pointing out that regular sappers were noted for their devotion to maintaining the tools issued to them and that this example should be followed by we "citizen soldiers".

The tunnellers were required to produce a weekly report together with a plan showing the progress of the tunnels. It was customary for major items to be named after distinguished persons or senior officers. Hence Churchill's Chamber (a bunker for tanks), Gort's Hospital (the underground BMH, opposite the existing BMH, being built by the Canadians), Macfarlane's Raise, Hay's Level, etc.

Jonah Maunsel duly had this report produced, hand carried to the Chief Engineer, who carried it to Gen Mason MacFarlane (who was now Governor and C in C, since Lord Gort had gone to take command of Malta).

The plan showed the huge new underground headquarters (which would be used later by General Eisenhower during the landings in North Africa). Sanitary arrangements were provided including a septic tank. This was newly named "Haycraft's Hole. The General chuckled when he saw this. "I knew you had a sense of humour, Haycraft". Jonah Maunsel was sent for by the Chief Engineer and stood before his desk rigidly at attention, all six feet and three inches.

"No offence was intended, Sir, any more than in your remark about 'citizen soldiers". The brigadier soon left us to head an important project elsewhere.

The hardest worked troops in the garrison were probably the infantry. Apart from providing working parties for the tunnellers they had to collect and dispose of garbage, provide curfew patrols, perform training and take turns in standing to in their trenches and firing positions at night.

A new Inf Bde Comd took over. (There were two infantry brigades, North and South). He naturally wanted to see all his troops on parade as soon as possible. The only day on which this would be possible was a Sunday, so he decided to have a Church Parade.

One of his battalion padres went to see him – a Welshman, from a coal mining background. He used to come to the tunnels with the working parties and muck in with the lads. He explained to the Brig that he had a church service every Sunday and all were welcome, but he would hate to see a formal parade instigated. He got short shrift.

Next, a senior padre, the Deputy Assistant Chaplain General, came to support his colleague. He got no further, even after saying: "Is this parade for the glory of God, or for the glory of Brigadier B-?"

His parting remark was: "I shall take the service myself. My text shall be "Jesus wept",

The service went ahead, without the text. I understand that it was the last formal church parade on the Rock for a long time.

Entertainment on the Rock

Entertainment in messes and billets was provided by "radio diffusion", a form of cable radio. A central receiver tuned in to the BBC Home Service, and the programme was reticulated to loud speakers throughout the Garrison. A popular programme was "Forces Favourites" which once a week was aimed at Gibraltar. Relatives of servicemen stationed there would be asked to send in their requests to the BBC and the lucky ones would have their choices played, with a honey voiced woman announcer identifying the relative and the respective serviceman.

As a morale booster the BBC flew the announcer to Gibraltar where she visited a number of typical units in turn. When 180 Coy was selected to host this VIP we were given clear instructions: "Officers hold back, she is there for the troops".

She lunched in the Sgt's Mess, and a young sergeant escorted her to the tunnels where my section was working. I watched them go up to the work face where our cockney ex-milkman was drilling. The noise in that confined space was deafening, and the limestone dust was like a smokescreen. When the driller paused he turned round and saw this most attractive lady, who chatted to him, and noted his home address. She finished by asking him: "What is the first thing you'll do when you arrive home?"

"Spend a week in bed." Was the reply.

"Oh I see, have a rest after all this hard work."

"No. A week in bed wiv the wife."

She chuckled understandingly.

"But if you write to her, don't tell her what I said."

Relieving the Monotony

Since tunnelling progress depended so much on compressed air, a shipment of powerful Ingersol Rand compressors arrived from the US. Each produced 500 cfpm, and were nicknamed Blue Trains because of their colour.

Jonah Maunsel organized a stunt to see what footage of advance on a 6 ft by 6 ft tunnel, could be made in a week by teams from all three British companies. Each selected a team. Jonah's started at midnight on the first day. The face had to be blasted and the broken rock mucked out. Thirty minutes advance notice was phoned to the next team, who would start on a clean face, with the track laid up to it.

At the end of seven days of this sort of relay race the teams and the organizers were happy to return to the usual routine. Some quarters derided this stunt, which did not produce any world shaking results. We were lucky if we got a hundred foot advance, but it was something different, and broke the monotony. I can't remember the figures but I can still smell the odour at the face towards the end of the week in spite of forced ventilation, high explosive, Eimco oil and sweat.

The Canadian Tunnellers

No 1 Canadian Tunnelling Coy was eventually sent back to UK, to be replaced with No 3 Coy. Some of us went into their working area during their absence. It was a sad sight. The large bar mounted drifters would be ideal for drilling through hard rock like granite, often found in metal mines. For the comparatively soft limestone of Gibraltar they were much too cumbersome. Anything made of steel was starting to rust because of the salt water pumped through the drilling equipment to keep down the dust.

I had previously done a stint as stand-in for the assistant adjutant at Tunnelling HQ, and had seen the weekly reports which included the total cubic footage by each of the companies. It was noticeable that these totals were consistently less for the Canadians than for the British. I asked Col Williams why this was. The heavy drifters using sea water were slow. The underground hospital contained a number of small rooms compared with the huge storage chambers the British were producing; and the rock in this area was very badly fissured compared with the fairly homogeneous rock in the areas where the British were tunnelling. The location of the underground hospital had been chosen to be directly opposite the existing one for ease of evacuation from one to the other, therefore the achievement of the Canadians was actually remarkable. Volume 8 of Corps History records that the GOC of the First Canadian Army personally presented each Canadian who took part in the enterprise with a silver watch fob. This consisted of a medal superimposed on a Gibraltar Key.

Corps History also records that an average of 36,000 cubic yards of rock was removed per month during the second half of 1942, and during the war years, the total amount excavated was 1,087,905 cubic yards – equivalent to a tube railway tunnel 10ft in diameter stretching from London to Liverpool. This was still less than a thousandth part of the volume of the Rock.

JOINING THE STAFF

On a personal level, in about early 1943, an Army Council Instruction (ACI) was issued inviting those serving on an emergency basis to apply for post war regular commissions. My short sight had debarred me from a peacetime commission but the new medical requirements allowed for short sighted persons with correcting lenses to be acceptable, so I applied.

At about the same time, the existing SO3 RE in the Chief Engineer's office was due to return to UK for a junior staff course and needed to be replaced. I was selected for "on the job" staff training in 'Q' Branch of Fortress HQ. I thus exchanged the good honest dust laden ambience to assist a staff captain in the intricacies of quartering and travel agency work. It kept us busy – people were constantly coming into Gibraltar from UK, or across the Spanish border (escapers and evaders), or from further down the Mediterranean, who needed to be accommodated and for transportation to their next destination arranged.

One of the most difficult problems regarding morale was to provide some form of sport for the troops. There is nothing the average squaddie prefers more than to kick a football about. In the whole of the garrison there were only two full size sports pitches. One belonged to the Navy who kept it jealously for their ships' companies.The remaining one was for the Army, but was only available to the "gladiators" who would practice to be selected for their battalion or equivalent teams who would play in a league competition.

Several of the smaller sapper units had access, as we did, to a primary school play ground, so we had a league of "playground hockey". While playing this I was clumsy enough to badly twist one knee which swelled up like a balloon. Orthopaedics did not appear to be a strong point of our medical system. After draining off the fluid, my knee was encased in plaster and I was able to work, but after several weeks and two sets of plaster had been used, the muscles in that leg had wasted considerably. I took up jogging, at first being able to run about fifty yards before breaking into a walk for the next fifty.

The Independent Company, our local commandos, had built an assault course up the side of the Rock with ropes for the steeper sections. At first I used this going down hill, before becoming strong enough to climb it up hill.

The view from the crest of the Rock was breathtaking, the whole Naval Base with warships within the breakwaters, the "roads" where merchant ships were anchored, and in the distance Algeciras.

On Sundays, if Force H was in harbour, there would be "divisions" on the flight deck of the aircraft carrier – a church parade with the Marine band, whose music could be heard from 1400 ft above.

Being "elevated" to staff duties opened a whole new world. To quote again from Donald Darling: "Gibraltar had everything in the early 1940s and only those afflicted with chronic claustrophobia and no imagination could bemoan being stationed there."

IN LIEU OF WOSB

MANY members of the garrison were bored stiff.

The invitation to apply for regular commissions could have been a case in point. In the UK and North Africa, candidates went to War Office Selection Boards which lasted three days, and were held in London and Cairo. Had those on the Rock believed that an application would result in a trip to UK or Egypt, the response would have been huge, even from those who had sworn never to wear khaki a moment longer than necessary.- after all, one could always change one's mind.

But in Gibraltar we had the old fashioned type of interview lasting a few minutes before a board headed by Maj Gen FG Hyland, ex RE, commanding ground troops, Brig Clifton, Chief Engineer, and Lt Cols of artillery, signals and infantry. Gen Hyland was known for his opinion that staff work was the epitome of military experience.

The first comment from him was: "I see that you are presently doing a training staff attachment. What will you do when that is completed?" "He is going to work for me" said the Chief Engineer.

The general's second comment was regarding my BD experience. "When I was commanding at Chatham there was an UXB in a certain position and I was surprised at the way the BD officer tackled it. I would have done so and so.", said the General.

"I would have thought that such and such would have been the answer", said the Chief Engineer.

I didn't agree with either of my seniors, but had the wit to keep quiet.

"Excuse me Sir, but we have several more candidates to examine this afternoon." bravely said the Lt Col RA, as it looked as if there would be a long discussion.

So I was dismissed having hardly said a word.

A few weeks later I was informed that I had been accepted by the War Office.

I was finally gazetted with seniority as Lt from early 1941, which would make me junior to any sapper officer who had been commissioned from Woolwich, but I had successfully come in through the back door to a career from which my weak eyesight had previously barred me.

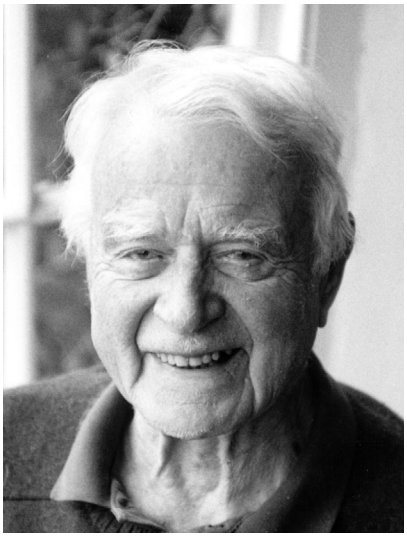
In late 1943, the three British tunnelling companies were sent home and most of the coal miners were discharged to work in the coal mines. One company was reformed under Jonah Maunsel with Geoff Paskins as his 2IC to work in Burma on quarrying for road construction.

A new tunnelling company, No 179, then arrived equipped with fresh machinery to complete the tunnels. The OC, Maj WH Wilson, was a former lecturer at the Royal School of Mines. He later published a detailed account of the tunnelling on the Rock in the journal "Transactions of the Institution of Mining and Metallurgy – 1945-46 Session.

In early 1944, the Chief Engineer, by then Brig. WGR Nutt, kindly wangled a posting for me to Italy, so that I could finally get some experience in a theatre of war.

Royal Engineers Forestry Companies 1940 – 45

CAPTAIN B W HOWE



Captain B W "Bill" Howe joined the Territorial Army in April 1939 as a Bombardier in a newly formed Royal Artillery Searchlight Regiment. He commanded a searchlight detachment and drove ration lorries until August 1940. His civilian occupation had been Assistant Agent on a large estate near Lewes and this led to him being identified as suitable for a commission in one of the RE Forestry Companies which were about to be formed. The officer in charge of formation was Colonel Lloyd, Professor of Forestry at Oxford University and the CO of Oxford UOTC. Within a week of being interviewed by Col Lloyd, Bill was a Second Lieutenant with No 130 Forestry Company based at The Swan Hotel in Halifax; his four years with Westminster School OTC being considered suitable training in lieu of OCTU! He served in forestry units in England, Sierra Leone and Italy during the war, and his story, as related in an interview with Mr Tony Bugbird, provides a fascinating insight into one of the lesser known activities of the Corps.

Introduction

At the beginning of August 1940, I was surprised to receive a letter from the Royal Institution of Chartered Surveyors of which I was and still am, a member. It said that the War Office were forming a Forestry Company, Royal Engineers, and were looking for likely people to serve as officers. Since my record showed that I was knowledgeable in forestry matters, would I be interested? To cut a long story short, I jumped at the offered chance to be in on something new. I was interviewed at an office in Marsham Street, Westminster, by a Colonel Lloyd who was Professor of Forestry at Oxford University and also CO of Oxford UOTC. Within a week I was Second Lieutenant B W Howe RE, and had been ordered to report to the Swan Hotel in Halifax at the end of September 1940 after seven days leave to get a uniform.

Formation and Deployment of the Forestry Units

Three forestry companies had been formed: Nos 129, 130 and 131. I was in 130. 129 and 131 were deployed in the Forest of Dean, but I and my company were sent to Ollerton in Nottinghamshire. We were to work in The Dukeries for the Home Grown Production Department of The Ministry of Supply. Our principal task was the supply of pit props for the coal mines, but we had a detachment at Newark who operated a sawmill, cutting down oak trees and making them into sleepers for the London and North Eastern Railway (LNER).

A fourth company, No 769, was formed in Italy later in the war. There were also six commonwealth units, three each from the RAE and RNZE. One of the New Zealand companies was based in Slindon Forest, near Arundel in West Sussex.

The establishment of a company was one major, one captain, four lieutenants and 97 men. The main trades of the men were axe-men, sawyers and millwrights, plus of course the usual lorry drivers and other support staff. The OC was Major Ronald Hodge and his 2IC was Captain Roy Duffell. The other lieutenants were Hugh Edwards and two commissioned sergeants, one whose name was Batchelor. The name of the other escapes me, but he had transferred to the British army from one of the forestry companies of the Australian army.

Deployment Overseas

The arrangement at Ollerton continued from the end of September 1940 to October 1942 when we received orders to proceed overseas to Sierra Leone. The Admiralty had asked for us because

Lt H A Edwards in tented office, No 2 River, Sierra Leone April 1943.

Freetown was a major naval base for anti-submarine patrols, and also a staging post for convoys going round the Cape to the Middle East. Troop ships and their escorts refuelled and replenished with fresh water there before continuing their long journey around the Cape.

We left Ollerton on the 23 October 1942. I can still remember that it was a brilliant night with a full moon. We did not know it of course, but it was also the night when the Battle of Alamein started under that same moon. Our port of embarkation was Avonmouth where we boarded the Shaw Savill liner, *Tamaroa*. We then sailed up to the Clyde to join a convoy going round the Cape. We arrived at Freetown on 13 November which, unknown to us, coincided with the "Torch" landings on the North African coast.

We discovered that our role was to provide timber for the Navy to construct deep water wharves where the corvettes, frigates and destroyers of the anti-submarine patrols could tie up. They were at that time anchoring in the estuary with communication to the shore by lighters.

As there was no shipping available to import timber, it was decided that our role should be to develop the resources of the Colony. This would involve constructing one or more sawmills. We then had the job of finding a site for a sawmill and also the location of the forests which were to be exploited. We had the co-operation of the Forestry Section of the Colonial Office although there was no existing timber industry and no sawmill facilities. We were in fact, developing something completely new and we had to train a lot of native labour to help us achieve our aim. We then discovered that our sawmill equipment and the steam engines for providing power to the mill were being sent to us direct from Canada. A few months later were told that it had all been sunk by a U-boat en route and it was many more months before any equipment arrived. In the meanwhile, we had constructed roads into the forest, about 20 miles south of Freetown.

On the coast there was a densely forested area with some enormous trees called Ekki (also known as Hendui). The timber was hauled from the wood, usually with a caterpillar tractor using wire hawsers with C-hooks and S-hooks. It was then loaded on to a trailer via a ramp. A rope was placed around the tree trunk and it was rolled up the ramp, the tractor being positioned on the opposite side so that it pulled it up on to the platform of the trailer. Initially, all handling was manual until the equipment arrived. The wood was so hard that one pass through a saw on a rack bench and the saw had to come out and

African sappers of 130 Forestry Coy hauling logs before the arrival of mechanization.

The officer's mess staff, 769 Italian Forestry Coy, Bibbienna Sawmill, March 1945.

go to the saw-doctor – it was like cutting into steel. This was the wood it was intended should be used to form the piles for the wharves.

Our first jobs were to make roads into the forest for timber extraction, prepare a site for a sawmill and erect the buildings to house the sawmill. All this took many months. We also developed a forest area up-country, near a place called Malawi, which has been in the news recently in connection with rebel activity. Eventually, after the building had been erected, our equipment consisting of a rack bench and steam engines etc. did arrive.

Leave and Posting

By this time, it was time for the first officers to go home on leave. In peace time, no British soldiers were expected to serve in Sierra Leone for more than twelve months. In war time, this was extended to eighteen months and as there were six officers, it was decided that two should have leave at fifteen months, two at eighteen months and two at twenty-one months. I and the Australian who had been commissioned were first and he and I sailed in a Belgian boat in January 1944. I remember saying to him that I was going to take my kit home with me as I bet we wouldn't be returning to Sierra Leone; he reckoned we would. I took my kit, but he didn't. En route, the boat called at Dakar, Casablanca, Gibraltar and the Azores and eventually joined a homeward bound convoy which had come round the Cape. We arrived in the Clyde on the 2 February 1944.

When I got to my wife's house in Newick in Sussex, there was a telegram waiting for me saying, "Report to Colonel Lloyd immediately on arrival". So up to London I went and was told "You won't be going back to Sierra Leone, I am sending you and your Australian colleague to Italy where we want to form an Italian Forestry Company". At the end of my forty-two days leave, I reported to the RE Depot at Ripon in Yorkshire where I was told that I would be joining a ship at Liverpool to go to Naples. My Australian colleague had had the same instructions, but his kit was still in Sierra Leone!

We sailed on the Union Castle liner, *Durban Castle*. By then, the Straits of Gibraltar and the North African coast were clear of the enemy, the Salemo landings having taken place six months earlier. We arrived in Naples on Easter Day 1944.

We disembarked on to the upturned hull of a bombed hospital ship and were sent to a transit camp. The camp was at Nola, about fifteen miles from Naples, on the side of Vesuvius. The volcano had erupted just before we had arrived and the whole of the area to the East and South of Naples was covered two to four feet deep in ash. Nobody knew why we had come, why we had been sent or what we were supposed to do. After a few days, we learnt that our OC in Sierra Leone, Major Ronald Hodge, would be arriving with twenty of our NCOs and men and that we were to form an Italian Forestry Company RE. The reason for the formation of the new company was that shortly after the Salerno landings, one of the New Zealand forestry companies had been sent to Italy, but early in 1944, the New Zealand government requested their withdrawal because they wanted them in the Pacific. Major Hodge and the men duly arrived, complete with my Australian colleague's kit.

Whilst we were at Nola, a 140 strong company of Italian soldiers arrived for attachment to us. We learned that they had been interned by the Germans when Italy surrendered and had then been interned by the British when they liberated Sardinia. They were in a terrible state – their clothes were in rags, they had no laces in their boots; they were in a very neglected state. Our

newly formed unit, known as 769 Italian Forestry Company RE, was sent to the Gargano Peninsula which, if you can visualize a map of Italy, juts out into the Adriatic, about two thirds of the way down. There we spent the whole of the summer of 1944, requisitioning and operating both state and privately owned saw mills.

The nearest large town was Foggia, about seventy miles away. Soon after our arrival, I read in an Army Council Instruction that our Italian soldiers were entitled to new uniforms from the British Ordnance Depot. I went to the nearest depot at a town called Barletta between Foggia and Bari, and drew uniforms, boots and other items of clothing for a hundred and forty. We then re-equipped the Italians with all the new clothing for which they seemed extremely grateful.

I should say at this stage that we found these Italians extremely co-operative and helpful. We had two Italian officers attached to us, both of whom were completely useless. We complained about them and asked for two more to be sent. The new pair were even more useless so we just ignored them and dealt directly with the Italian Sergeant Major who was a fairly elderly man but was very efficient and very co-operative.

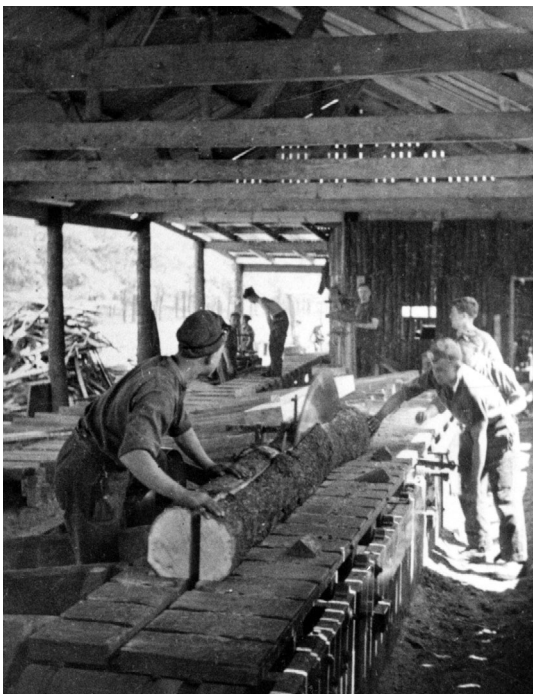
During our time on the Gargano Peninsula, we had very nearly one thousand civilians working for us and it was my job to pay these men in allied military currency. I used to go round in a jeep, unarmed, with just a civilian interpreter. We never had any trouble at all; everything went extremely smoothly, which I think was a tribute to the co-operation of the Italians.

In October 1944, we moved up into Tuscany to Bibbienna, twenty miles north of Arezzo and on roughly the same latitude as Florence. We took over a state owned sawmill; officers and men all being billeted in the attached buildings. I cannot remember where the timber came from that we were sawing, or to what use it was put. I do recall that we had a detachment at Camaldoli in the mountains to the east of Florence where there was a monastery which appeared to own a lot of the forest around it.

There were some magnificent silver fir and from this we obtained piles nearly seventy feet in length for the Americans to build the very first bridge over the River Po as the Allies advanced northwards. We had great difficulty in getting these very long lengths out of the mountains round the hairpin bends, but managed it with the aid of some tank transporters. They were duly delivered to the Americans and that, in my memory, was one of our main achievements.

We remained in Bibbienna until 1945 when the company was disbanded. I don't know what happened to my colleagues or to the Italian soldiers. As an illustration as to how well we got on with the Italian soldiers who were attached to us in Italy, I still remember the morning of Christmas Day 1944 when the Italian Sergeant Major wanted to see me. My immediate reaction was that there was some trouble he wanted to report or discuss with me. When he came in, I noticed he had a brown paper parcel under his arm and the reason he wanted to see me was that the parcel contained a beautifully made walnut tray which had been made by one of his men who was a cabinet maker in civilian life – he had made it from an old plank he had found in the saw mill. The Sergeant Major said he wanted to present me with the tray as a Christmas present from his men. I felt very touched at his kindness and ever since have thought what a wonderful illustration it is on how well we got on together.

I last saw my Australian colleague just before he was sent to Greece to make a survey of the timber resources there. I kept up with him after the war – he came over to England two or three



Sawing timber at Budby Mill, Ollerton, August 1941.

times and on each occasion he came to stay with me. Most unfortunately he was killed by a drunken driver in Adelaide in 1997.

In order that I could keep my rank as Captain, (I had been promoted in Sierra Leone in 1943), I was posted to the Engineer Section of Allied Force Headquarters at Caserta, about fifteen miles from Naples. The palace there was Field Marshal Alexander's headquarters. I had nothing to do and was completely bored. About a fortnight after my arrival, the Germans in Italy surrendered and the war in Europe came to an end. I remained at Caserta until August when I was suddenly sent down to the very toe of Italy, into Calabria where there was a large forest area. This area had been divided between the British and Americans and I was sent to the British section which was near a town called Serra San Bruno. Again I really had nothing to do because there was a very competent British NCO who was in complete control and I had no wish to interfere. There was also a pioneer captain who controlled of a detachment of the Royal Pioneer Corps. The British headquarters was at a port called Crotone, halfway between Reggio and Taranto.

Demobilization

I HAD only been there about a month when my demobilization orders arrived. Because I had been in the Territorials and actually in the Army when war was declared, and also by then being 35 years of age, I was in a very early release group. I remember the CO at Crotone sent two trucks to fetch me in case one of them broke down with the roads being in such a terrible state with ruts and potholes. They took me to Crotone where I received orders to return home in a Lancaster bomber from Brindisi. I happened to know that these bombers had had a number of accidents ferrying people to and from the United Kingdom so I decided to ignore my orders and travel home by rail. I entrained at Crotone and at Taranto, I asked the the Railway Traffic Officer (RTO), when the next train was going to Milan. "Oh", he said, "you want to go to Milan – you are the very man I am looking for", He had a train of empty coaches going up to Milan that night and couldn't find anybody to act as OIC Train. I discovered that there were more personnel coming back from leave in the UK than there were returning home, so this train of empty coaches was going up to Milan to bring the men back to their units. I had a most comfortable journey on the empty train, and on arrival, was sent to a transit camp. I was expected, but was informed that I would have to wait here for a few days as there had been a very severe gale in the channel and all sailings from Dieppe to Newhaven had been cancelled. Whilst waiting, I had a couple of trips out to Lake Como. I think it was on the fourth morning that I was told that I would be on a train leaving for Dieppe the next day. Again, we had a most comfortable rail journey from Milan. When we went through the Simplon Tunnel and stopped at Brig in Switzerland, the train was boarded by ten Swiss soldiers who told us that we were strictly forbidden to leave the train because it was in a neutral country and we were all in uniform. They all distributed a lot of tourist literature, including maps of Switzerland, hoping we would come back as soon as possible. We eventually arrived at Vallorbe on the Swiss/French frontier in the evening and two or three stations further on into France we stopped where the ACC had set up a field kitchen. The whole trainload was given dinner on the platform, very efficiently and beautifully prepared. We re-boarded the train and carried on. At Pontoise we all detrained at another ACC location where we were given breakfast, and arrived at Dieppe in the afternoon.

I remember we sailed on the Southern Railway ferry *Dinard*, and arrived at Newhaven at about 6 o'clock in the evening. We spent the night at a transit camp near Reading. The following morning we were distributed according to where we lived and I went to Guildford where I was given my demob suit. I arrived home at Lewes that same afternoon as a civilian; that was the end of my army service.

The Product of the Work

WHAt was done with the timber we produced in Italy? The army's appetite for timber was vast, not only for building camps but also for rebuilding the hundreds of bridges which the Germans had destroyed in their retreat up the spine of Italy. Railway sleepers in vast numbers were also required because the Germans had destroyed all the tracks as they retreated.

A Word on The Forestry Men and Their Equipment

I HAVE mentioned the names of the officers I served with, but you may find it interesting to have an insight into their qualifications for the job.

The OC, Major Ronald Hodge, worked I believe for a firm of timber importers in Glasgow. He had no experience of working in the woods or of timber extraction and sawmilling etc., but he proved to be a very efficient OC. He was a major from 1940 and still held the same rank on demobilization in 1945, which shows how difficult promotion was in these small companies.

The second in command, Captain Roy Duffell, worked for a firm of Swedish timber importers in the City. He knew about timber imports but had no knowledge whatsoever of working in the woods and of actual sawmilling.

Of the lieutenants, one came from Berwickshire and was a public works contractor. As far as I know, he had no experience of forestry work at all, but he proved a very competent and sensible chap, but as he was over 35 years of age when we went to Sierra Leone, he did not come with us. The commissioned sergeant, Batchelor, worked for an uncle who had a sawmilling and timber business in Maidstone, Kent. He was our expert on saw milling and timber felling. The other lieutenant was Hugh Edwards, who, like me was a Land Agent. Although we parted company in January 1944 when I came home on leave from Sierra Leone, we kept up with each other and have remained firm friends ever since. He, again, never got promotion – he remained a lieutenant until the end. After the war, our lives followed an almost parallel course. When I was appointed Agent to the Sheffield Park Estate in Sussex, he was appointed Agent to the Audley End Estate in Essex. When our jobs came to an end at the same time, I took over the Home Farm at Sheffield Park, and he bought a farm near Horsham in Sussex. In both cases, our sons have carried on and now today in the year 2002 when I am 92 and he is nearly 94, we still see each other quite regularly.

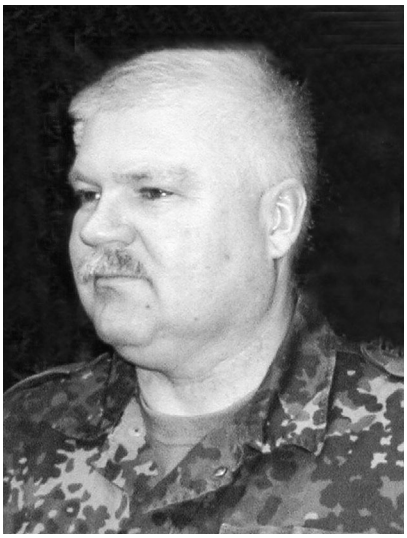
The inventory of the equipment of a forestry company rather surprised me because it contained so many items which were peculiar to the requirements of a timber merchant. It included Hoppus tables for measuring the cubic content of round timber, measuring tapes for measuring the quarter girth of round timber and scribes for marking the bark of standing timber. The main items were axes and saws. One must remember that in the 1940s, there were no chain saws; they were not introduced generally until nearly twenty years later. All timber felling had to be done by axemen and sawyers and the variety of saws in the equipment comprised not only cross cut saws for felling, but also circular saws for the rack benches in the sawmills, the standard size usually being 4 ft in diameter.

The equipment also contained a full range of saw doctors' tools, including the various sorts of metal and rubber hammers for tensioning saws, and almost everything one could think of that would be necessary for timber felling.

British Contrasted with German Military Geologists and the Battle of France, 1940: No Comparison?

COLONEL E P F ROSE TD MA DPHIL MCIWEM CGEOL FGS
OBERSTLEUTNANT D R GEOLOR DR RER NAT DIPL GEOL D WILLIG

Ted Rose was effectively the senior Royal Engineers geologist from 1974 to 1990. Pen pictures associated with previous RE Journal *articles document his Territorial Army service and academic career. Still lecturing on geology at Royal Holloway, he currently serves as Deputy Chairman of the University of London Military Education Committee, and as the University's representative on the Reserve Forces and Cadets Association for Greater London.*



Dierk Willig served as a tank trooper from 1978 to 1980 before beginning a career as a reserve army officer. After studying geology at the University of Würzburg from 1980 to 1986, he worked as a geologist in a civilian drilling company before appointment to the US Army Hanau MILCOM as an environmental engineer in 1988. In 1989 he moved to a new appointment, as the military geologist at III (GE) Corps in Koblenz, transferring to a similar post at II (GE/US) Corps in Ulm in 1993. As a military geologist lieutenant colonel he has been deployed with missions of the German armed forces to Somalia, Bosnia-Herzegovina, Croatia, FYROM, Albania, and Kosovo.

ARTICLES in the *RE Journal* have demonstrated that the British army has long made use of geologists, from 1809 to the present (Rose, 1978 a,b, 1997; Rose & Hughes, 1993 a,b,c), yet even in wartime, their numbers have always been very few. The German army however, has long made operational use of large numbers of geologists. The stark contrast is illustrated in this paper by reference to western Europe in the early years of the Second World War. The legacy of the two very different traditions is still evident within NATO.

THE BRITISH BACKGROUND

IN the First World War, the British army pro-

gressively increased the total number of military geologists it deployed as such: one in 1915 (2Lt W B R King); three in 1916 (Major T W E David, Lts W B R King and C L Hills); five in 1918 (Lt Col T W E David, Capt W B R King, Lts C L Hills, G A Cook, and C S Honman). All were based on the Western Front, primarily at GHQ, British Expeditionary Force (Anon., 1922; Rose & Rosenbaum, 1993a). All were under Sapper (Engineer-in-Chief or ultimately Inspector of Mines) command, although none of them wore a Sapper cap-badge. All returned to pre-war civilian life at the close of hostilities. The army ignored the warning then that "should the British Empire in the future become involved in another war there can be no question but that the existence of an adequate Geological Staff *from the commencement* [original italics] would be the means of much saving of expense, labour and life" (Anon., 1922, p. 68). Also ignored was the recommendation to organize a peace-time staff of reserve army geologists in preparation for any future hostilities (Strahan, in discussion with King, 1919, pp. 215-221).

Capt "Bill" King returned to employment with the British Geological Survey before lecturing at the University of Cambridge and then an appointment in 1931, as Yates-Goldsmid Professor of Geology at University College London. In 1938, as war loomed, he volunteered for the Army Officers Emergency Reserve, to be readily available for call-up. Also in 1938 he persuaded one of his former Cambridge students, F W Shotton, by then himself lecturing at Cambridge, to similarly volunteer. When the U K declared war on Germany in September 1939, two military geologists were thus potentially available to the British army, although only one of them had military experience.

The German Background

THE German army ended the First World War with a military geological service organized as such, and a roll of about 250 military geologists (Rose, Häusler & Willig, 2000; Häusler & Willig, 2000). But the service was disbanded on cessation of hostilities: the Treaty of Versailles prohibiting any co-operation between scientists and the military.

In 1937 however, Professor Ernst Kraus of the University of Munich began the formation of a "Technical Military Geology Group" under the auspices of the "Army Ordnance Office" of the "Army High Command". The Group was tasked with general organization of military geology; development and testing of geophysical equipment; collection and evaluation of military geological experience; compilation of military geological data relating to foreign countries; providing military geology advice relating to fortification, building material, and water supply on the (potential) Eastern Front; studies on trafficability and the effects of bombardment; and development of equipment for rapid drilling of boreholes. It developed specialist maps (e.g. for water supply, and to guide quarrying for raw materials), and conducted field trials of the effects of bombardment on different geological terrains. Thus when war began, the foundations for an operational military geological service had been firmly laid.

As the war went on, Germany was to make use of military geologists not only in the army but also in the airforce, navy, *Waffen-SS*, and the civilian but later paramilitary construction agency *Organisation Todt* – about 400 in total (Häusler, 1995a,b; Willig, 1997; Rose *et al*., 2000; Häusler & Willig, 2000).

Deployments in France

FOLLOWING declaration of war, the British army quickly mobilized 50 per cent of its potential military geological strength: Bill King was appointed to a Regular Army Emergency Commission in the Royal Engineers and sent to France to serve as a local major on the staff of the Engineer-in-Chief, British Expeditionary Force (Rose & Hughes, 1993a; Rose & Rosenbaum, 1993b, 1998). During the winter of 1939-40 he worked on a variety of problems in northern France, such as the siting of temporary airfields, the provision of stone and gravel as construction materials and water supply, until evacuated via Dunkirk. In retreat it was his military rather than geological skills that were put to effective use: he received the Military Cross for bravery in the convoying of high explosive from Boulogne to Bailleul and Cassel (Shotton, 1963).

German military geologists were first deployed eastwards. The invasion of Poland was supported by military geologist groups (*Wehrgeologengruppen*) similar in organization to those that had supported the German army in the First World War (Häusler, 1995a). As early as October 1939 German military geologists were able to convene their first meeting to share

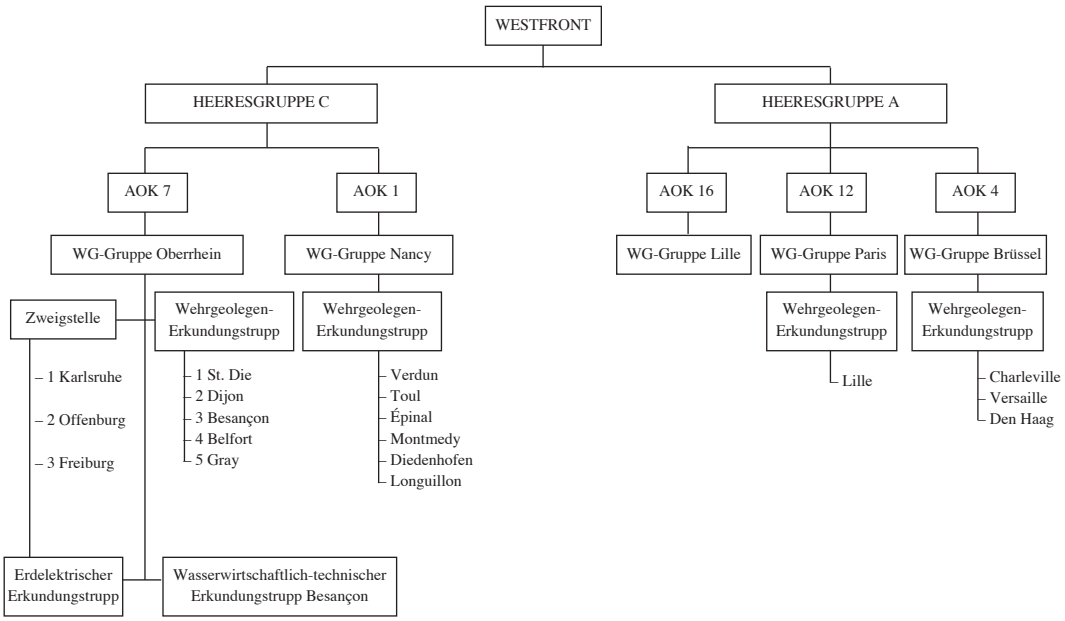


Figure 1 – Chain of command for the five German military geology groups deployed on the Western Front in Germany, France, Belgium and the Netherlands in 1940, with their subordinate branch offices and reconnaissance units. The Oberrhein group was based at Baden-Baden. For geographic distribution as at October 1940, see Figure 2. Abbreviations/translations: *Heeresgruppe* = army group; *AOK* = *Armee Oberkommando* (army command); *WG-Gruppe* = *Wehrgeologengruppe* (military geology group); *Zweigstelle* = branch office; *Erkundungstrupp* = reconnaissance unit. (From Häusler & Willig, 2000, courtesy of H. Häusler and The Geological Society.)

experience, at Mülheim/Oberhausen. Other meetings were to follow regularly, and fairly frequently. Considerable expertise was thus available for deployment westwards, when the "phoney war" came to an end.

From 10 May 1940, German forces invaded through Holland, Luxembourg, Belgium, and then France. They advanced with such speed that the British Expeditionary Force was compelled to evacuate via Dunkirk between 26 May and 3 June, Paris was captured unopposed on 14 June, and an humiliating armistice was imposed on the French on 22 June. Their advance was partly guided by a military geographical atlas (Anon., 1940) which included military geology maps prepared by the Technical Military Geology Group (*WaPrüf5[X]*) (cf. illustration on page 93 of Evans, 2000). Moreover, their engineers were supported by military geologists deployed as such.

After the fall of France, five military geology groups supported the German army of occupation on this Western Front: two linked with the chain of command of the 1st and 7th Armies within Army Group "C", three with that of the 4th, 12th and 16th Armies within Army Group "A" deployed in more northern France and in Belgium (Figure 1).

These five groups, centred on Baden-Baden, Nancy, Paris, Lille, and Brussels, embraced three branch offices (*Zweigstellen*) sited within Germany as part of *Wehrgeologengruppe Oberrhein* centred on Baden-Baden, and fifteen reconnaissance units (*Erkundungstrupps*) sited within France, Belgium and Holland. The reconnaissance units were to become converted to geographically distinct sub-offices or out-stations (*Aussenstellen*) as the occupation became more firmly established (Figure 2).

German Military Geology Groups

Initially, each military geology group was fully motorized, and comprised about nine men: the group leader, a deputy leader, three assistants (most ranked as NCOs: *Unteroffizieren*), plus a driver and other support staff (Häusler, 1995a, p.

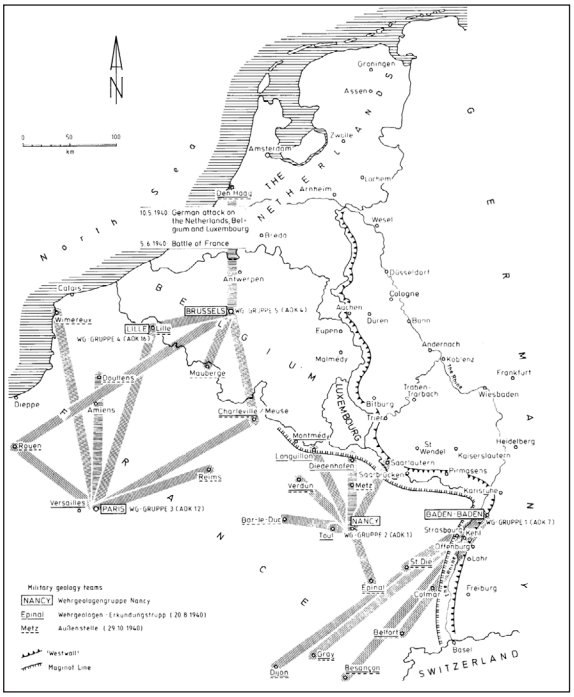


Figure. 2 – Map showing the deployment of the five German military geology groups, with headquarters at Paris, Lille, Brussels, Nancy and Baden-Baden and all with subordinate reconnaissance units (*Erkundungstrupps*) by 20 August or out-stations (*Aussenstellen*) by October 1940, following the Battle of France (*cf.* Fig. 1). Fortification positions of the German "West Wall" and French "Maginot Line" are also shown. (From Häusler, 2000, courtesy of the author and The Geological Society.)

73). During the six-week campaign on the Western Front, three-man units (geologist, driver, and clerk-draughtsman), initially in an armoured car but later in an unarmoured vehicle equipped with geological instruments, were detached from the military geology groups for operational service with the invading armies. They provided terrain assessments based on geological maps, aerial photographs, or field reconnaissance to predict road and soil conditions, water supply, potential for enemy flooding, mining, and temporary airfield construction, and the effectiveness of rivers and canals as barriers to troop movement, together with advice on the siting of base camps and winning of raw materials (von Bülow, 1941; Dietz, 1941).

These and other aspects of the work undertaken by military geologists in France, Holland, and Belgium, and those deployed in Poland and Norway, were reported in a symposium volume generated by a course for German army geologists held at Heidelberg from 14 to 20 December 1940 (Anon., 1941). This was the sixth in a series of such courses, begun in January 1940 at Aachen, and held subsequently at Aachen, Giessen, Tübingen, and Heidelberg (Häusler, 1995a, p. 68). Thirty-five papers were presented at the December course, from twenty-nine authors, generating a printed volume of over 150 pages. The papers indicated widespread use of geologists. Geological knowledge had been applied to the construction of airfields, tunnels, mine chambers, and fortifications. It had been used in the siting and construction of field positions, anti-aircraft positions, air-arm installations, and coastal defences; in the procurement of building materials and supply of potable groundwater; in assessing the effects of shells and bombs on rocky and loose soil, and of military flooding of terrain; and especially in assessing trafficability of terrain for particular military vehicles. Applications of geological knowledge to military problems by this time were thus many and varied (Rose, 1980).

Military Geologists in the German Army

In 1940 each military geologist commissioned as such into the German army wore the uniform of a War[time] Technical Administrator (*Technischer Kriegsverwaltungsrat*) whatever his age, experience, or responsibility (Fig. 3). A distinctive epaulette was used to indicate merely whether or not the wearer was at least thirty-five years of age (Kraus, 1941). Young geologists were accorded the equivalent rank of captain, older geologists that of major (Häusler, 1995a, p. 54). Graduate geologists with less than a doctor of philosophy degree were usually conscripted with non-commissioned status.

Military geologists were thus officials rather than officers, with influence in technical matters rather than authority in military command. However, they were deemed to be part of the army rather than auxiliary to it. Several uniformed organizations were designated Armed Forces Auxiliaries (*Wehrmachtsgefolge*) to give their members protection under the Geneva Convention if taken prisoner. These comprised organizations for recruits undergoing pre-military

training (*Reichsarbeitsdienst*), construction works (*Organisation Todt*), transportation (*NSKK,* and later the *Transportkorps Speer*), and other manpower with military potential (*Deutscher Volksturm*), with a combined strength of some 1 200 000 in 1939 rising to 3 800 000 in 1944; 40 per cent of the size of the armed forces. Determined that these Auxiliaries should not achieve armed forces status, Hitler decreed in 1941 that their uniforms should not be army field-grey; that they should wear rank insignia on collar-patches not shoulder straps; and that their organization identification badge should be worn on the upper sleeve, not on the right breast (Thomas & Jurado, 1992). In contrast, like all German soldiers, geologists had insignia on shoulder straps (Fig. 3), and wore the national badge (*Hoheitsabzeichen*) – an eagle in flight clutching a swastika in its talons – over the right breast.

After the Battle

FOLLOWING the French armistice, the British army attached Bill King to Northern Command for a year, and then, from 1941 to 1943, to GHQ Home Forces – which was later to become 21st Army Group, for the invasion of Normandy. In September 1940 the British army increased its active military geological manpower by 100 per cent: "Fred" Shotton was called up for active service, being granted a Regular Army Emergency Commission as a second lieutenant, Royal Engineers. Allegedly, the staff at the War Office were not sure how best to make use of his geological skills, and for a while he accompanied King undertaking ground investigations for anti-aircraft gun sites in England, before a posting in the spring of 1941 for service in North Africa that was to bring him significant distinction (Rosenbaum, 1990; Rose & Rosenbaum, 1993b, 1998; Coope, 1994).

Figure 3 – Ferdinand Trusheim in the uniform of a *Technischer Kriegsverwaltungsrat*, the status assigned to military geologists given commissioned rank to serve as such with the German army in the Second World War. During the Battle of France, from May to June 1940, he served as the "Corps geologist" with the German 7th Corps, part of the 16th Army (Häusler, 1995b). Photograph taken at Berlin-Wannsee in 1942, reproduced courtesy of Drs Ursula and Hans Trusheim

In the German army, major reorganization of the military geology groups was implemented in April 1941. The five large groups were restructured to form 25 smaller teams of military geologists (*Wehrgeologenstellen*), most of them soon to be redeployed elsewhere, mainly on the Eastern Front.

The 25 teams were increased to 32 in October 1941, 35 in September 1943, and finally to 40 in November 1943 (Häusler, 2000).

By that time the British army had also increased its military geological strength, by 50 per cent.

J V "Steve" Stephens, a British Geological Survey geologist and First World War veteran who had joined the Army Officers Emergency Reserve in May 1940, was granted a Regular Army Emergency Commission as a second lieutenant on the General List on 1 June 1943, promoted acting captain the same day, and speedily posted for service in the Mediterranean area (Rose & Rosenbaum, 1993b).

Civilian Geological Surveys

WITHIN the U K, military activities in wartime were supported by the Geological Survey (of Great Britain): an organization founded in 1835 under military auspices (Rose, 1996) but under civilian direction from 1845 onwards. Between 1939 and 1945 its activities were re-focused to generate reports, particularly for water supply and natural resources, important for home defence – as described subsequently by its director at that time, [Sir] E B Bailey (As a Royal Garrison Artillery subaltern in the First World War, Bailey had twice been wounded, losing his left eye and much use of his left arm, but gaining a Military Cross, the French *Croix de Guerre* with palms, and appointment as a *Chevalier de la Légion d'Honneur*. As the Survey's director, in the Second World War he himself contributed

on-site advice on groundwater development to the beleaguered garrisons of both Malta and Gibraltar (Rose & Rosenbaum, 1989). But the British Geological Survey then had a relatively small scientific staff: only 55 in 1937 (Bailey, 1952, p. 223), a number not greatly increased during the war.

In contrast, a National Geological Service (*Reichsamt für Bodenforschung*) was formed in Germany in 1939 from the Prussian Geological Survey (*Preussische Geologische Landesanstalt,* founded in 1873) by merger with the other eight state surveys then in existence. The 122 earth scientists available in 1938 were increased to 223 by 1941 (Günther, 1946). Germany thus had a large civilian as well as military geological service functioning from the very start of the war.

Conclusion

It is easy to contrast British with German use of military geologists during at least the opening phase of hostilities in the Second World War. There were clear differences, such as those in:

- **Preparation**. In Britain, there was effectively no military geological preparation before outbreak of war in 1939. In Germany, development of a military geology service began well in advance, in 1937.
- **Manpower**. In the British army, a single military geologist was deployed as such in 1939, and only three military geologists by mid 1943. In the German army, numerous military geologists were deployed eastwards in 1939; re-deployed westwards as five military groups (some 25-40 geologists) in 1940; increased to 25 teams (over 50 geologists) in early 1941; and to 40 teams (over 100 geologists) by late 1943.
- **Assignment**. In the British army to 1943, military geologists were not attached below army HQ level. In the German army, geologists commonly served on operations both at corps and army levels.
- **Resources**. In the British army there was no military geological service as such. In the German army, a military geological service provided (1) through 1940, opportunities to learn from shared operational experience by participation in a series of frequent military geology conferences; (2) technical direction and support from a staff unit based in Berlin; and (3) from early 1941 at least, training and equipment from a specialist base unit in Germany (as described by Häusler, 1995a,b).

It is less easy to make comparisons, but there were some similarities:

- **Engineer attachment**. Both sides placed their geologists largely under engineer command.
- **Water supply role**. Both sides made significant use of geologists in the development of groundwater to provide drinking water for troops.
- **Complementary civilian surveys**. Both sides possessed national geological surveys that functioned usefully in war as in peace - although the German survey was better resourced than the British.
- **Historical inertia**. Both sides began the Second World War geologically very much as they had finished the First. After a gap of over 20 years, the British army in 1939 deployed the same man (Bill King) in the same role (hydrogeologist) to the same place (northern France) that he had left in 1918. The German army initially deployed much larger numbers of geologists in the same way (as military geology groups) and to some of the same areas (e.g. Lille) as they had done in the First World War.

From 1943 the British army expanded its use of geologists, but as the German army then moved increasingly from attack to defence, its requirement for military geologists stabilized. Despite this change, the differences and similarities just noted were still to some extent apparent within NATO during the Cold War of 1948-89 (Rose *et al*., 2000). Traces persist to the present day (Willig, 1997).

References

- Anon 1922. *The work of the Royal Engineers in the European war, 1914-19: Geological work on the Western Front*. Institution of Royal Engineers, Chatham.
- ---- 1940. *Militärgeographische Beschreibung von Frankreich, Teil 1. Nordost Frankreich*. Generalstab des Heeres Abteilung für Kriegskarten und Vermessungswesen, Berlin.
- ---- 1941. *6 Wehrgeologischer Lehrgang in Heidelberg*. Reichsdruckerei, Berlin.
- Bailey, Sir E [B] 1952. *Geological Survey of Great Britain*. Thomas Murby & Co., London.
- Bülow, K von 1941. Wehrgeologie im Bewegungskrieg. In: (Anon) *6 Wehrgeologischer Lehrgang in Heidelberg*. Reichsdruckerei, Berlin, 11-15.
- Coope, G R 1994. Frederick William Shotton. *Biographical Memoirs of Fellows of the Royal Society*, **39**, 417-432.
- Dietz, C 1941. Wehrgeologische Tätigkeit während des Bewegungskrieges im Westfeldzug 1940 beim Fest.-Pi.-Stab 22. In: (Anon) *6 Wehrgeologischer Lehrgang in Heidelberg*. Reichsdruckerei, Berlin, 19-20.
- Evans, M M 2000. *The fall of France: act with daring*. Osprey, Oxford.
- Günther, Major A E 1946. "Report on the development of the German Geological Survey." [Allied]

Military Government BIOS report, unpublished. [British Geological Survey archive document.]
• Häusler, H 1995a. Die Wehrgeologie im Rahmen der Deutschen Wehrmacht und Kriegswirtschaft. Teil 1: Entwicklung und Organisation. *Informationen des Militärischen Geo-Dienstes,* Vienna, **47**, 1-155.
• ---- 1995b. Die Wehrgeologie im Rahmen der Deutschen Wehrmacht und Kriegswirtschaft.
Teil 2: Verzeichnis der Wehrgeologen. *Informationen des Militärischen Geo-Dienstes*, Vienna, **48**, 1-119.
• ---- 2000. Deployment and role of military geology teams in the German army 1941-45. In: (Rose, E P F & Nathanail, C P: eds) *Geology and warfare: examples of the influence of terrain and geologists on military operations*. Geological Society, London, 159-175.
• Häusler, H & Willig, D. 2000. Development of military geology in the German Wehrmacht 1939-45. In: (Rose, E P F & Nathanail, C P: eds) *Geology and warfare: examples of the influence of terrain and geologists on military operations*. Geological Society, London, 141-158.
• King, W B R 1919. Geological work on the Western Front. *Geographical Journal*, **54**, 201-215; discussion 215-221.
• Kraus, E 1941. Allgemeine Fragen der Wehrgeologie. In: (Anon) *6 Wehrgeologischer Lehrgang in Heidelberg*. Reichsdruckerei, Berlin, 5-9.
• Rose, E P F 1978a. Engineering geology and the Royal Engineers. *Royal Engineers Journal,* **92**, 38-44.
• ---- 1978b. Geology and war. *Royal Engineers Journal*, **92**, 182-190.
• ---- 1980. German military geologists in the Second World War. *Royal Engineers Journal*, **94**, 14-16.
• ---- 1996. Geology and the army in nineteenth century Britain: a scientific and educational symbiosis? *Proceedings of the Geologists' Association*, **107**, 129-141.
• ---- 1997. Geological training for British army officers: a long-lost cause? *Royal Engineers Journal*, **111**, 23-29.
Engineers Journal, **107**, 27-33.
• ---- 1993b. Sapper Geology: Part 2. Geologist pools in the reserve army. *Royal Engineers Journal*, **107**, 173-181.
• ---- 1993c. Sapper geology: Part 3. Engineer Specialist Pool geologists. *Royal Engineers Journal*, **107**, 306-316.
• Rose, E P F & Rosenbaum, M S 1989. Royal Engineer geologists and the geology of Gibraltar. Part I – Tunnelling through the Rock. *Royal Engineers Journal*, **103**, 142-151.
• ---- 1993a. British military geologists: the formative years to the end of the First World War. *Proceedings of the Geologists' Association,* **104**, 41-49.
• ---- 1993b. British military geologists: through the Second World War to the end of the Cold War. *Proceedings of the Geologists' Association*, **104**, 95-108.
• ---- 1998. British military geologists through war and peace in the 19th and 20th centuries. In: (Underwood, J R, Jr & Guth, P L: eds) *Military geology in war and peace*. Reviews in Engineering Geology **13**. Geological Society of America, Boulder, Colorado, 29-39.
• Rose, E P F, Häusler, H & Willig, D 2000. A comparison of British and German military applications of geology in world war. In: (Rose, E P F & Nathanail, C P: eds) *Geology and warfare: examples of the influence of terrain and geologists on military operations*. Geological Society, London, 107-140.
• Rosenbaum, M S 1990. Professor FW Shotton MBE FRS. *Royal Engineers Journal*, **104**, 289-290.
• Shotton, F W 1963. William Bernard Robinson King. *Biographical Memoirs of Fellows of the Royal Society,* **9,** 171-182.
• Thomas, N & Jurado, C C 1992. *Wehrmacht Auxiliary Forces*. Osprey, London.
• Willig, D 1997. *Wehrgeologie als spezielle Angewandte Geologie: Anforderungen, Entwicklung und Aufgabenspektrum dargestellt an ausgewählten Beispielen*. Doctoral thesis, Universität Würzburg.

Memoirs

CAPTAIN BRYAN RICHARDS GM

Born 21 March 1909, died 5 January 2002, aged 92

WHILE serving with No 25 Bomb Disposal Company Royal Engineers, Lieutenant Bryan Richards won the George Medal for his cool courage and determination in successfully blowing up a heavy time-bomb that had fallen on the Yorkshire Grey Dance Hall in Eltham Road, southeast London, in April 1941. In a period of intensive air raids this was the 23rd bomb he had disposed of in nine days.

This particular bomb had a clockwork fuse which was found to be ticking when first exposed on April 28, 1941. It was then left for the prescribed safety period (96 hours) and the clock stopped, although intermittent ticking continued afterwards, creating operating conditions of extreme danger. Meanwhile, the bomb had been covered by 3ft of water which had collected in the crater.

Richards withdrew his men, insisting on digging out the bomb himself. He found great difficulty in placing the detonating charge in the water and the dark so decided to go down into the crater. This was particularly gallant as the gravel in the hole was of a gluey nature and there was a very real danger of his getting stuck. Nevertheless, he managed to lay the charge successfully and the bomb was blown up in a controlled explosion at 1.40 am on May 3.

Richards was recommended for the George Cross but the Joint Services Committee decided instead that the George Medal "for conspicuous gallantry in carrying out hazardous work in a very brave manner" should be awarded. The GM citation read: "Lieutenant Richards behaved in an exemplary manner throughout the whole operation which had involved almost continuous work for over 18 hours. He never risked his men, taking the risk himself whenever it became necessary." Subsequently, Richards made a two-hour training film entitled 'The Techniques of Bomb Disposal', which continued to be used for many years after the war.

Promoted to captain, Richards was appointed second-in-command of the only bomb disposal company that landed with the Canadian forces in Normandy in 1944, and served with them in France, Belgium, Holland and Germany, dealing with all kinds of explosives, including booby traps, underwater charges on lock-gates, landmines and ammunition dumps. On cessation of hostilities Richards was promoted major and commanded a bomb-disposal company in Berlin, covering most of northern Germany.

Bryan Leolin Richards was born in 1909 in Wood Green, North London. He was articled to Buckland and Sons, chartered surveyors, After passing professional examinations and the newly instituted BSc in Estate Management of London University, he joined Hillier, Parker, May & Rowden in 1930 and moved in 1937 to the surveyors' office of the City of London Corporation as manager of its estate and valuation department. There he was in charge of many flats and houses in Southwark owned by the corporation as well as the blocks of offices in the City and riverside property.

In 1940 he joined the Army Officers Emergency Reserve and was commissioned in the Royal Engineers. After two weeks' training in Brompton Barracks Chatham, he was posted to the newly formed No 25 Bomb Disposal Company in London.

Demobbed in January 1946, Richards returned to the Corporation. Shortly afterwards he moved to become chief estates officer for the Crawley New Town Development corporation, remaining from 1947 to 1954, during the first years of the project, when the character of the town was being established.

In 1954 he joined Chestertons as a partner to undertake the work of management and redevelopment of the Church Commissioners' Hyde Park Estate, which extended from Hyde Park to Sussex Gardens and had suffered extensive war damage. He established a new office for the firm from which he ran a very tight ship. He was extremely knowledgeable of the techniques of property management, and his achievements included organizing the relocation of some 400 tenants to enable redevelopment and improvements to take place.

During this period he served for six years as a member of the Government's Central Housing Advisory Committee and sat on the London Rent Assessment Panel. In retirement after 1970 he continued as a consultant to the firm for five years.

Richards was a keen musician. At the Guildhall

School of Music from 1927 to 1929 he had studied clarinet and piano, and he played with an amateur sextet known as the Grosvenor Orchestra from 1926 to 1939.

He was also an enthusiastic sportsman, having joined the Thames Rowing Club in 1935. He became a competent oarsman, winning several cups and medals.

After the war he continued, sculling regularly until he was 80. He enjoyed the sea, cruising on the thames and Medway and across the channel, first in a 35ft timber motorcruiser and second in a twin-screwed 40ft Halmatic, in which he undertook several coastal cruises as well as visits to Germany, Sweden and Finland.

In addition, Richards was a very competent mountaineer and trekked and climbed extensively in the alps both before and after the war. He was elected to the Alpine Club in 1953 and served as president of the Association British Members of the Swiss Alpine Club from 1960 to 1962.

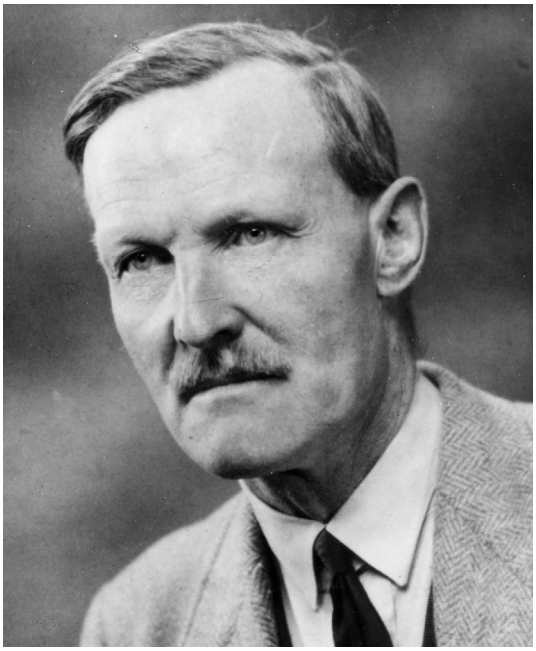
His first wife, Christine Abbott, whom he married in 1935, had been his companion on climbs in Switzerland, Norway and Austria. She died in 1979.

He married Ita Menzies in 1984. Their shared love of travel and music enabled them to enjoy visits to China, Russia, Africa and the Middle East and to attend orchestral concerts, opera and ballet. She survives him with one stepson and two stepdaughters.

Bryan Richards, GM, chartered surveyor and wartime bomb disposal expert, was born on March 21, 1909. He died on January 5, 2002, aged 92

COLONEL M C PERCEVAL-PRICE BA

Born 16 February 1907, died 6 January 2002, aged 94.



MICHAEL Charles Perceval was born in Downpatrick, County Down, and educated at Radley. With an academic gift, he won scholarships at school and passed top into and out of the Royal Military Academy Woolwich, winning the King's and Pollock gold medals and the Sword of Honour before being commissioned into the Royal Engineers on 29 January 1927. After YO training at Chatham, he continued his education at King's College Cambridge for a further two years, gaining a 1st Class Honours degree in the Mechanical Sciences Tripos.

In early 1930 Lieutenant Perceval was posted to India and joined the Bengal Sappers and Miners at Roorkee. He wrote that there was no life to compare with that of an officer in pre-war India, no troops as good as Indian troops, no sport like Indian sport, no game like polo (he achieved a handicap of 2) and no hills like the Himalayas. In explanation of the latter, he went on to say that the Mournes, to make sure of their status, are called mountains; the Himalayas, whose status is not in doubt, are called hills.

Towards the end of 1930, he was appointed a company officer in 4 Field Company at Peshawar, then commanded by Major (later Major General) Tubby Broomhall, to take part in the Khajuri operations on the North West Frontier. He returned to Roorkee with the Company in 1931 and was appointed Assistant Adjutant of the Bengal Sappers and Miners in 1934.

In 1935 he was posted to the Equitation School at Sangor and then rejoined 4 Field Company, commanding 31 Field Troop, first at Rawalpindi and then Risalpur, during which time he organized in early 1936 the crossing of the River Indus by the Risalpar Cavalry Brigade. He was appointed Corps Adjutant at Roorkee in 1937 from where he joined the 1st War Course at the Staff College, Quetta in 1940. In the same year Perceval's uncle died and he found himself the owner of Saintfield, the family estate in County Down, and changed his name to Perceval-Price. He remained in India during the Second World War, serving as an SORE at HQ East Command, as an Instructor at the Staff College, Quetta, as SORE 1 at GHQ New Delhi and finally as CRE Army Troops, Southern Command at Bangalore and Avadi.

Returning briefly to the UK in January 1945, Lieutenant Colonel Perceval-Price went back to the Far East serving in HQ South East Asia Command at Kandy, Ceylon for the final weeks of the war against Japan. He was then, for a short time, Assistant Chief of Staff with HQ Land Forces Hong Kong, as an acting colonel, before taking up his final appointment in the Army as SORE 1 at the War Office.

Although reverting to his substantive rank of major on retirement, he was granted the honorary rank of colonel and in 1947 returned to his home in County Down to take up farming at Saintfield.

He soon found himself involved in local affairs, becoming High Sheriff in 1951, a Deputy Lieutenant in 1957, a County Councillor from 1949 to 1958, Chairman of the County Education Committee from 1955 to 1958 and, one that he singled out as giving him the greatest pleasure, Chairman and Governor of Stranmillis College of Education from 1959 to 1974.

He was Chairman of the local branch of the RNLI for 31 years and also Chairman and later President of the Downshire (Mental) Hospital Management Committee from 1960 to 1983.

Colonel Perceval-Price was an amusing raconteur – he believed one should laugh at misfortunes, particularly when they befall oneself – and it is clear from what he wrote of himself that he had a self-deprecating manner and an honest,

forthright and god-fearing approach to life. Still playing cricket at age 50, he wrote "My Land Rover, crammed with half the team in the days of petrol rationing, was much more useful than me".

He and his wife, Nora Isobel (Bruce), whom he married in 1937, had seven children. She predeceased him but he is survived by six of his children.

DDA, MCP-P

MAJOR S E TAYLOR

Born 10 October 1920, died 22 February 2002, aged 81

SIMEON Edwin Taylor, the son of Drum Major Taylor DCM, joined his father's territorial regimental band as a side drummer, aged 13, in 1933. He began his regular army career a year later as a boy soldier with the Royal Engineers at Chatham. Known by all his army friends and colleagues as Buck, he showed early promise as a sportsman of some distinction.

At the outbreak of the Second World War, Buck was posted to Ripon, where he was to meet his future wife, and then served out the war years in the Middle East in Persia and Iraq. After the war he served in Northern Ireland, Singapore, Germany and the UK. In 1958 he was appointed RSM of 4 Division Engineers in Hameln, followed by a tour as RSM at Longmoor before being commissioned into the Corps in 1962. After an initial tour with Bomb Disposal at Horsham, he became the Quartermaster of 2nd Division Engineers. SEMG writes: "Buck Taylor came to Osnabruck in 1964 when I was CRE. He very quickly took a full part in the activities of the regiment, always with great humour, energy and enthusiasm. He played a robust game of hockey for the regimental team, being a hard-hitting full back. The CRE, who also played in the team, was somewhat put out to find that this energetic player, at 44, was two years older than he was!"

His next CRE describes him as one of the outstanding quartermasters of his generation. HWB writes: "Buck Taylor was the ideal quartermaster for a regiment of this kind. He thoroughly understood the needs of soldiers. He was ever patient, tolerant and constructive in his approach to problems, however novel. One of the major difficulties was keeping the young wives and families – spread out over a huge garrison and sometimes in distant, isolated, high-rise blocks – supervised and properly cared for, particularly when the men were away. Each regiment was also given responsibility for a share of the communal areas, lawns, garages, play grounds and so forth. One of the saddest episodes during Buck's time in the garrison was the death of a child when a large metal swing worked free of its ground anchors and fell over. While this was in no way Buck's fault, as the subsequent Court of Inquiry established, the incident preyed on his mind and adversely affected his health for a time....Buck played a large part in keeping up the morale of the regiment....He and his wife were excellent hosts and much sought after as guests at a variety of social functions. In a real sense they were the life and soul of the party."

Returning to the UK, Buck completed a tour with R Mon RE(M) before taking up his final appointment as the QM of The Depot Regiment at Chatham. It was during this tour that he was appointed captain of the Corps Shooting Team. HEV writes: "I found an officer who was as fanatical as I was about the importance of marksmanship as a soldierly skill. His inspirational appointment was all we needed to raise the standard of shooting in the Corps. Under his charismatic leadership the Royal Engineers won the Methuen Cup at Bisley, a prize considered to be the ultimate accolade in major competition.... He led from the front, was never down-hearted, was always more cheerful than the rest of us....He moulded a team of disparate individuals, all of whom would have gone to the ends of the earth for him."

Major Buck Taylor retired from the Corps in 1975 and settled in Gillingham, where he set up a home brew business. Selling up in 1989, he and his family moved shortly afterwards to East Sussex, where in his retirement years he pursued his hobby of model railways and enjoyed the company of his grandchildren and great granddaughter.

He married Violet (Vi) in 1941 who, together with his three daughters, survives him.

HT, DCR, SEMG, HWB, HEV, JA

CAPTAIN K C REVIS MBE

Born 21 October 1917, died 2002, aged 84

KEN Revis lost his eyesight while defusing mines on Brighton's West Pier; but, with the help of his wife Jo, he went on to have a fulfilling career over almost 60 years.

Revis became a representative of St Dunstan's charity for the blind in India, and served as a press officer for Morris Motors. He qualified as a solicitor, went beagling, learned to water-ski and flew a glider. When a programme in the television series It Happened to Me featured him in 1959, he drove an MGA sports car at 100 miles per hour on an aerodrome runway, with his wife giving him instructions at his side.

Revis also lectured on the early days of bomb disposal at the RMCS Shrivenham, Wiltshire, and was a member of numerous committees, including that for the restoration of Brighton West Pier, which is appealing for a £30 million lottery grant. "People say that I should hate the place," he would say. "I can't explain why I keep going back. I suppose it's the last thing I saw".

The son of a civil servant, Kenneth Claude Revis developed an early interest in chemistry. His mother first asked "Will it blow up, dear?" when he made some gunpowder using a formula in a book.

The question became a family joke as he conducted a series of experiments with cartridges, which eventually ended in an explosion that severely dented a garden seat. Some further experiments with hydrogen led to another explosion in which the fragments of a bottle just missed his eyes. His interest then switched to motorbikes and cars.

After leaving Bedford School, Revis trained as a civil engineer, and worked on the reconstruction of the London Bridge in Berkshire. He joined the Royal Engineers on the outbreak of war. On being assigned to bomb disposal, he tried to assuage his mother's concern by telling her: "Don't worry – I don't expect I'll ever have to handle live ones." But it was not long before he was defusing his first German bomb in a garden at Hastings, Sussex.

The 500kg explosive was buried in almost two feet of earth, and as he lay down beside the metal casing, he reassured himself that, if it exploded, he would remember nothing. Dictating a record of his every move over a field telephone, he first listened in with a stethoscope, then called for a locking ring key. Sweating slightly, he tapped the metal skin with a wooden wedge. It began to yield. Although completely alone, he was encouraged to hear a bird chirping in a nearby tree as he began to tap again. Then, with beating heart, he eased the ring free to pull up the discharger cap.

Thereafter Revis and his wife would lie in bed at night during air raids, noting the bombs that did not explode on impact in the knowledge that he might be called upon to deal with them. But he never panicked, and in the next two years calmly defused hundreds of bombs, some of them as heavy as 1,800 kilograms.

In September 1943 it was decided that the Germans were not going to invade, and Revis was asked to "delouse" the two piers at Brighton, which had been mined by the engineers of Canadian 1st Division at the beginning of the war. He had no difficulty with the Palace Pier, and then approached the West Pier by rowing boat.

Avoiding the ladder, he climbed up the diagonal crossbracings and with the aid of a map, defused six mines. "It's money for old rope, this", Revis remarked to his corporal. Then 13 mines went up in a flash.

On coming to, he could see nothing; there were deep wounds to his eyes and forehead; his mouth was torn, his nose distended; and there were many superficial wounds to the rest of his body. But he still protested indignantly to a nurse who put a sheet over him: "Take that bloody thing off – I'm not dead yet."

Revis was rushed to Sir Archie McIndoe's plastic surgery unit in the Queen Victoria Hospital at East Grinstead where he took the bed previously occupied by Richard Hillary, author of the *The Last Enemy*.

Clark Gable, the American film star, remarked when he visited the unit: "You've a very pretty wife. I do hope you will be able to see her again soon." But when the bandages came off after five weeks Revis learned that he would never see again. In the coming years he had 20 operations.

After some initial tears, he and Jo started to rebuild their life together. He learned to find his way around rooms, using his knuckles instead of extended fingers. He went to a dance. In the New Year's Honours List of 1944, he was awarded the MBE.

Revis was then sent to the headquarters of the St Dunstan's charity for the blind at Church Stretton, Shropshire, where he learned to read

Braille and to touch type. He started playing with Meccano, made a wooden letterbox, and used a capstan lathe to make throttle levers for Spitfires.

Before the war ended the chairman of St Dunstan's, the Tory MP Sir Ian Fraser, who had been blinded in the First world War, asked him to go to a home for the war-blinded at Dehra Dun in Northern India. Arriving as a captain in the Indian Army, Revis found some difficulty in understanding the Indians' easy acceptance of handicap. He was also bemused when, at the Victory Parade, two lorry loads of blinded veterans were ordered "eyes right" as they were driven past the Viceroy, Lord Louis Mountbatten.

He soon realised that he could not remain in an independent India. After he had returned home, he was offered a job by Lord Nuffield at Cowley Motors in Oxford, which employed more than 200 handicapped workers.

Once settled in the city, Revis was given a white alsation called Sandra. This resulted in a happy partnership, which had no disadvantages except that the dog wanted to guide him to work on Sundays. They were both asked to appear at a wide variety of events to publicise the work of guide dogs. Revis appeared on the BBC talent programme 'Top Town' as a singer in the manner of Bing Crosby; and every invitation seemed to lead to new opportunities.

After qualifying as a solicitor with the aid of his sister-in-law, who read his legal texts to him, he worked briefly in private practice, then rejoined British Motor Company as a press officer. He became chairman of the Bullnose Morris Club, in succession to Lord Nuffield, and took part in an international rally round South Africa as well as making a trip in an airship.

As a result of his handicap, Revis developed his other senses; he could tell if he was being driven in the wrong direction by the surface of the road, or by the feel of the sun on one side of his face. He was always conscious of the advantage that he had over someone born blind in that he could remember what things looked like. But apart from missing being able to drive a car by himself or see his wife, he used to say that he was : "just an ordinary person, who cannot see".

Revis married, in 1941, Jo Smith, who has succeeded him as chairman of the Bullnose Morris Club.

Memoirs in Brief

Major Llewelyn David Hughes MC, who died on 10 May 2002 aged 82, was educated at Newport High School, Hereford Cathedral School and University College, Cardiff. His father was a tunnelling officer in the Royal Engineers in France during World War One and his brother also served in the Royal Engineers during the World War Two with 1st Canadian Army. The advent of war interrupted Hughes' education and in 1940 he joined the Royal Engineers, being granted a commission in 1942. Serving initially in 503 Field Company, he was posted to India in 1943 to join 21 Field Company, Royal Bombay Sappers and Miners in the 4th Indian Division. He served with them in Egypt, Libya, Tunisia, Italy and Greece on almost continuous operations against the enemy. During the liberation of the small republic of San Marino in Italy in 1944, Lieutenant Hughes was awarded the rare distinction of an immediate Military Cross for a series of engineer reconnaissances which, according to the citation, he carried out with determination and a complete disregard for his own safety, showing moral and physical courage of a high order in accordance with the high traditions of the Royal Engineers and thereby "materially influenced the course of the battle". He was also wounded at this time by shrapnel. In 1945, Captain Hughes was appointed Adjutant RE of the 4th Indian Division and, after being demobilized in 1946, returned to Cardiff to complete his degree. He joined the TA, subsequently commanding 247 Plant Squadron RE in 109 Construction Engineer Regiment (TA). Having completed his degree and become qualified as a colliery manager, he returned to India to join the Bengal Coal Company Ltd , originally formed in 1843 during the time of the East India Company administration. Whilst in Bengal he met Helen Douglas and they got married in Brisbane, Australia in 1960. Tragically, she died when they returned to the UK for home leave in 1965. It was a blow from which he never fully recovered and he did not marry again. After becoming General Manager of his company, Llewelyn Hughes retired in the 1970s and returned home from India to live in Newport. He is survived by his two daughters.

Erratum

April edition: In the memoir for Professor Sir Colin Buchanan on page 80, the Minister of Transport was referred to as Ernest Sharples. This should of course have been Ernest Marples, and we apologise for the error.

Correspondence

CLITHEROE AND THE "PIONEER STUDENTS"

From: Major K J Grant TD

Sir, – In May, I attended the annual R Mon RE(M) Dining Club Luncheon. As ever, it was a well-organised and enjoyable event and of course it brought the "veterans" up to speed with what is happening in the regiment. I find it strange to be in a position where WWII persons are speedily diminishing. I remember the days when we used to look forward to seeing who would still be left from WWI – in fact whenever I see Chelsea Pensioners, it alarms me to see so many younger than I!

In the pen picture to accompany my article in the April *Journal*, I mentioned No 1 TBRE at Clitheroe and the fact I joined as a "Pioneer Student". I have often wondered if the advertising campaign in the national press in 1943 was just a means to get young architects, civil and structural engineers and surveyors into service, with the objective of turning them into 'Recce Sappers' as opposed to officers (we were made POs upon voluntary enlistment). Very few of us passed our WOSB and were, like myself, deferred to get the experience of six months in a Field Company. Of course 'ere long after leaving Clitheroe, before the six months had expired, we were on our way to Normandy. I remember meeting up with several of my contemporaries who were in other units/divs in the Bayeaux Caen area just before the battle for Caen. Without exception, we were all Recce Sappers.

The war was over before I received a posting to OCTU, which I declined on account of not wanting to jeopardize my position with the company who were keeping my job open. In consequence, I had to start all over again as a sapper when I joined the TA, and do one camp as an OR (Corporal) before proceeding to another WOSB at Barton Stacey. I didn't try anything like as hard as I did at my first WOSB at Whalley in 1943; in fact I adopted a cavalier attitude which seemed to fit the bill. Actually, I believe the first selection board got things about right. What I saw in the field convinced me that a more mature person was required as a platoon leader. I would however still like to know the policy behind the campaign to attract young professionals from the CE industry. It was well spun, but for that I would not have volunteered! Yours sincerely, Ken Grant.

ANOTHER 50th ANNIVERSARY

From: Major J D Lewins

Sir, – One tends to think that "50 years ago" articles in 2002 will be concerned with Korea, and perhaps Malaya and the various other hot spots of the time. Some of us of course were destined to visit those places after our induction into the services, which for me was the commissioning of No 8 Intake at RMAS on 8 February 1952. This was a poignant occasion for all of us, being only two days after the death of HM King George 6th – especially so for me since although I was now one of the first of HM The Queen's commissioned officers, I was the last to receive her father's Gold Medal. The 50th anniversary service of our intake was held in the Memorial Chapel at Sandhurst on 10th April this year, the day after the funeral of HM Queen Elizabeth, the Queen Mother. As a "50 years on" contribution, I append the address I gave from the lectern at the service:

> "Let us now praise famous men". I was in the Academy choir when we sang those words from Ecclesiastes just over fifty years ago here in this Chapel. Today we return, hearteningly many of us, to the RMA to celebrate not just our commissioning and offer of service to Her Majesty the Queen but for a period of eighteen months when we were enjoined by the Academy motto to "Serve to Lead". Let us remember first those who lead us and the service they did us here; our instructors, from Colour Sergeants to Commandant. My text is not from Ecclesiastes but from the adaptation by Rudyard Kipling that indeed starts with the quotation "Let us now praise famous men". He refers to the masters of his school, the United Service College, who trained their boys for a life of service entering Sandhurst or "The Shop", the Imperial Civil Service – or in Kipling's own case – to work initially in Lahore and Allahabad at the heart of the Indian Empire. The poem speaks of being beaten with many rods as part of this training. I am glad to say that I saw no sign of bullying from the staff during our stay at Sandhurst nor any physical intimidation.
>
> Of the Company, College and Academy officers who played the role of Masters in Kipling's poem, I can, however, say that I received some stern verbal correction. I particularly remember Philip Tower telling me off for a youthful indiscretion, leaving the section rifles behind, under guard, and finishing an exercise bare-handed, with a view to preserving the

rifle polish for Academy parade next day. During his tirade I was wise enough not to remark that he had himself failed to issue ball ammunition so the rifles were of limited use.

We will all have our memories of those who instructed us to "Serve to Lead". Life was busy, life was reasonably physically hard, but life was fun. Do you remember Victor LeFanu, the Assistant Adjutant, reluctantly astride his horse and his *sotto voce* "keep still you brute". Even grander, the Adjutant, Erskine Crum, who remarked on parade "There is nothing to laugh at, that Senior Sergeant in Blenheim Company". He was quite wrong of course; there was a lot to laugh at especially the driving rain and the faces of the stick orderlies as the band broke into "The Teddy Bear's Picnic" which we had put them up to on the previous mess night. The effect in slow time is even more remarkable than today's rendering in quick time. Let me take a moment to praise the band for their performance today. If the soul of a regiment lives in its colours, its heart lives in the band and it is a delight to acknowledge publicly how much the band means to us, those now and those before who have passed through Sandhurst.

There were many characters at every level in the Academy. I have treasured the PT Instructor's admonition "Press your pants and polish your pumps and get down 'ere for voluntary". But the most memorable character would surely be the Academy Sergeant-Major, Jack Lord. Coming through National Service as many of us did, I had experience of the more publicly recognised RSM Ronald Britten at Mons. The comparison, for those who were lucky enough to be addressed by both, is as between Slim and Montgomery: Britten had a mouth, Lord a soul. Jack Lord was surely a man we would wish available to lead us in horrifying circumstances as he did for his men in the prisoner of war camp. I pay my respect to him as willingly as I did to Queen Victoria under his direction.

We also learnt from each other. Sandhurst had, and may still have, the attitudes of a Public School but our intake was more catholic, including boys from grammar schools, boys who could claim no legitimacy and boys who had to strive to make the physical standards essential in a fighting force. Especially I think we benefited from having the cadets from the Commonwealth and other foreign countries and how nice to be in touch with so many today. I came from a typical grammar school and particularly enjoyed the opportunity to try out some new sports previously out of my reach; racquets with John Cornell and sabre with the late Trevor Dawson. I enjoyed and benefited from the wide range of activities that extended beyond formal instruction, including potholing at Priddy, keeping goal in the winning soccer team, chess, the Old College play and "The Polished Bun".

It is interesting to hear that with the shorter commissioning period, the academy has dropped the public school ethos of overlapping cohorts of boys – now men and women – who with juniors, intermediates and seniors could learn from each other. Some of the lessons we learnt were not to be found in any syllabus. As Intermediates in Blenheim we learnt that Seniors who missed drill parades with no medical excuse led to the company being debarred from the Sovereign's Parade competition. The episode was commemorated, to the tune aptly enough, of the Eton Boating Song, which started with Hill and Cunningham-Jardine, but whose remaining words had better not be spoken from here. Sandhurst however did not prepare me for some things. One of course is having to preach to you. Another was what to do as a young officer if you observe that your immediate superior is lying in turn to his superior. I think those lessons must come from the university of life rather than any formal academy. We had fun, we worked hard and we played hard. Many here have fulfilled the promise of Serving to Lead admirably over a period starkly delimited by the death of our Sovereign, two days before our commissioning, to the funeral of his consort yesterday, more than fifty years. We have our fair share of full generals and how particularly pleasant to hear of those from the Commonwealth and foreign countries who have made their considerable contributions to their own countries' well-being.

We were not all successful, we are not all here. And some there be who cannot be here but whose names have been read in a roll of honour and indeed in some cases can be found on the walls of this Memorial Chapel. We thank them, we honour them while we celebrate with the living our commissioning over fifty years ago. Dulce et decorum est pro patria mori – they gave full service. But Sandhurst is not principally for the past nor for the dead but for those now who are passing through its tutelage. From what we have seen of the Commandant's Parade – and how grateful we are to him and his staff to have been given this privilege somewhat late in our careers – Sandhurst has as good an intake as ever. So as a "first" perhaps from this pulpit, let me close with a quotation from Vesta Tilley, the male-impersonating Edwardian music-hall artiste:

"When people tell you that the Army's not complete, it goes to show, that they don't know
I think the Army's simply super, can't be beat. I know it's true, because I do.
Some time back it seemed to me, things weren't all they ought to be;
There was one thing that was wanted, only one, so of course that thing was done.
So it's all right, it's all right now. There's no need to worry anymore

We saw the army wasn't strong, everything was wrong 'till the day we came along
Then the band played, they all hurrayed, the War Office woke up with a fright.
We joined the Army yesterday, but the Army of today's all right!". Yours sincerely – Jeffrey Lewins.

WOMEN IN THE ARMY

From: Lieutenant Colonel (retd) R A Leonard

Sir, – I was interested to see an article by a lady troop commander in the April *Journal*. It led me to thinking about "Women in the Army" in general and one possible implication of there now being lady soldiers. As I am the curator of the Devon and Dorsets Regimental Museum, I have the facility to do a little research.

How many of your readers have heard of the Women's Forage Corps? This remarkable organisation, which ultimately numbered some 6000 members, was a little known department attached to the Army Service Corps in World War 1. Founded in 1915, it preceded the women drivers of ambulances and other vehicles as it was concerned with the gathering and transportation of forage for Army horses.

It was commanded by a General, and had a Mrs Athole Stewart as "Superintendent of Women" (what a title!). In each area of the UK, there was an Area Administrator and an "Area Inspector of Women" (what a job!). Areas were further subdivided into districts, each with a Purchasing Officer and an Assistant Superintendent of Women.

There were five grades of worker:

- Industrial members in gangs of six who worked on hay baling, wiring the bales and checking the weight of each bale.
- Horse Transport Drivers who were responsible for moving the bales of hay to the nearest railway station.
- Forwarding Supervisors (2nd Grade Officials) who worked at the railway stations checking bales and supervising the loading of railway freight cars.
- Section Clerks (also Grade 2), who dealt with all correspondence relating to the supply of forage.
- Quartermistresses who drove Mechanical Supervisors on the rounds of inspection of hay baling machines, and also distributed rations.

As can be imagined, the work was strenuous. The women wore uniforms of khaki and green with Army Service Corps cap badges and Forage Corps shoulder titles. The end of the war stopped further development and the Corps and its parent committees ceased to exist on 1 July 1920.

So, when the first Quartermistress arrives in a squadron, please don't think we will be breaking totally new ground. What goes around …! Yours sincerely – Dick Leonard.

WARTIME COMMUNICATIONS

From: Lieutenant (retd) G P Webb

Sir, – I was puzzled by the Jap comment in "The Battle on the Irrawaddy River" – "the crossing point seemed close at hand – we heard the high-pitched tone of an engine, probably a generator".

Of course! It had never occurred to me before that without a motor/generator there would be no electricity for radio transmitters or receivers, either British or Japanese.

Leading an RE platoon in Burma, I never had radio communication. We operated completely independently.

How was communication handled in '42/'43? Yours sincerely – Geoff Webb

HOW TO SEND GROUND TROOPS INTO AFGHANISTAN

From: Wesley Paxton Esq.

Editor's Note: This is the slightly abridged text of a message sent by Mr Paxton in October 2001 to the United Nations and is re-printed here with his permission. He also sent similar messages to the Prime Minister and Murray Hughes of Railway Gazette International.

Sir, – Before the situation in Afghanistan changes up a gear and risks becoming WW3, it's time to do some lateral thinking. One wonders if the food parcels had been dropped at the start of the campaign, there would have been less for the Moslems to object to. If they had been parachuted in on pallets, instead of being dropped like bombs, at least there would have been wood and parachute silk to recycle. Also, at a claimed cost of $4.25 per person per day, perhaps George Bush should change his supermarket – I'm sure Wal-Mart could feed one person for a day on less than that!

St Paul wrote in Romans Ch 12 v 20 "If your enemy hungers, feed him, for in so doing you will heap coals of fire upon his head". Just as the pen is mightier than the sword, bread might work better than bombs, and those who think there are enough fanatical Moslems in the world to carry on this

war irrespective of losses on their own side, may have a point. Even these fanatics may be persuaded to go home and share in the food aid.

Ground troops should still go in, but in the context of the previous paragraph, let us choose their weaponry with care and innovation. Afghanistan is probably the only country never to have had a single yard of railway track. Perhaps, unlike India, this is the downside of never having been a British colony. Other significant countries to have had very little or no railway, or to have dismantled their small systems completely are Somalia and Sierra Leone. Switzerland probably tops the world league in terms of use made of railways per head of population. One can nearly therefore make a crude index of civilization based on the use made of railways. A claim has also been made that after the war, we shall have to rebuild what infrastructure the Afghans had. Therefore, the only troops sent into Afghanistan should be the Royal Engineers and their US equivalents.

There are five railheads close to the frontiers of Afghanistan; two each in Iran and Pakistan and one in Turkmenistan. The station at Landi Kotal in the Khyber Pass is within sight of the border. The railway it serves was built, largely for military purposes, in the 1920s. The terminus has six platforms and is about the same size as St Pancras and was designed to enable a convoy of trains to disembark in quick succession to reinforce the border. These same facilities could also be used to rapidly unload several trainloads of humanitarian aid to be sent over the border in lorries. Railway building materials should then follow, with troops supervising the building of the railway on to Jalalabad, using the thousands of local refugees as labour. Similar new lines would reach Herat from Tayyebad in Iran, from Chaman in Pakistan to Kandahar and from Termez in Uzbekistan to Kabul. If the other lines also eventually reached Kabul, it would make Kabul Central Station possibly the only one in the world with triple gauge main lines; standard gauge from Iran, 5 feet from Termez and 5ft 6in from Pakistan.

It would take some time to build this complete network, but since many are prepared to budget for wars lasting years, it would be a pleasant change to think on a similar time scale for this. Who knows, on completion we might have the novel concept of a military organization, the Royal Engineers, being awarded the Nobel Peace Prize.

Yours sincerely – Wesley Paxton.

JOINT FORCE ENGINEERING

From: Lieutenant Colonel G B O R Jones

Sir, – As many readers are aware, a multinational team drawn from all levels and both regions of Allied Command Europe was set by the NATO Standardisation Agency's Combat Engineer Working Group to deliver NATO operational-level joint engineer doctrine. This initiative came in response to issues raised by a SHAPE engineer (Major Ed Izatt, Canadian Military Engineers) at JHQ CENT's Exercise CONSTANT MAKEFAST in June 2000 and was initiated by briefings to the Working Group by SHAPE, AFNORTH, JHQ CENT and ARRC. Regional Headquarters AFSOUTH is the custodian of the doctrine (currently in Study Draft 3) and Brigadier Melvin led the team during his tenure as Chief Engineer ARRC. As a member of the team and author of the operations chapter, I am delighted to see the extent to which developing NATO doctrine is appreciated by our Corps, as evidenced by Brigadier Mans' article in the April *Journal*, much of which is based on our Study Draft 2. It is no coincidence that the emerging NATO operational-level doctrine is readily compatible with current UK practice. Our Corps has more experience than the engineers of most NATO nations in support to force projection and the drafting team contained a significant proportion of Royal Engineers.

I am concerned, however, that Brigadier Mans' article reintroduces a confusion in terms that has caused a year's worth of debate within the NATO engineer community concerning military engineering functions and their definitions at the operational and tactical level. The article borrows the definitions we wrote in Study Draft 2 for the operational-level engineering functions "Combat Support Engineering" and "Force Support Engineering", designed to explain how engineers support the operational campaign plan in terms of the operational functions outlined in AJP 01. Unfortunately it removes the word "support" from each definition, implying that combat support, engineering and combat engineering are one and the same.

ATP 52 (now renamed AJP3.2.3.1), as readers will be aware, is NATO's tactical-level engineering doctrine. It deals with combat engineering, which includes general engineer support, in support of land forces. To date this has been NATO's only military engineering doctrine and

it is widely viewed with NATO that combat engineering is a purely tactical issue, this view being quoted to support the failure to establish an engineering focus at the strategic level of NATO command. The terms we developed for the operational level doctrine were aimed at categorizing engineer activity in a way that is relevant to the operational level of warfare. Thus combat support engineering does not equate directly to combat engineering but to any task carried out in direct support of current or imminent combat operations, and is not restricted to close operations. Support to deep operations (such as EOD or restoration of power supplies on an airfield) or information operations (such as manoeuvre of engineer assets or placement of dummy bridging in support of a deception plan) also fall under combat support, whilst not necessarily being considered combat engineering. Likewise, any activity carried out in support of the force, not in direct support of combat, is force support engineering and may include combat engineering activities such as general engineer support to rear area units, equipment bridging for logistic traffic or any obstacle clearance activity not directly associated with the battle.

In summary I would make two pleas. firstly to retain compatibility of our national doctrine with the content and intent of the NATO doctrine by accepting the terms it uses for Combat Support Engineering and Force Support Engineering and secondly to take every opportunity to endorse the NATO Doctrine's underlying theme, that military engineering has an impact at the strategic and operational levels, not only the tactical. Yours faithfully, G B O R Jones.

TOWARDS PERFECTION

From: Major J Q Killip

Sir, – I was most intrigued by Brigadier Tom Foulkes' article "Towards Perfection" or why more Sappers should have MBAs' in the April 2002 edition of the *RE Journal*. If a perfect world is one characterized by Sappers running the Army then clearly, ours is far from perfect. The likelihood of it becoming perfect in this respect is the subject of an altogether separate debate. To my mind and by similar rationale, an imperfect world might be characterized by everything being run by accountants. Such a world may, sadly, seem more familiar to most readers. Perhaps an achievable compromise is a world where, even if everything is conceived by accountants it could nonetheless be run by Sappers. That could take us at least some way 'towards perfection".

If the broad rationale behind the suggestion that the Army needs more MBAs is taken to be sound, is it not unreasonable that adequate formal training is provided to create an adequate cadre of properly trained officers? Even a perfunctory Training Needs Analysis might conclude as much. To illustrate: if the Corps needs more Garrison Engineers, it will be obliged to create more trained Clerks of Works; when the Army required more trained helicopter pilots, it opened eligibility to a broader spectrum of ranks and actively encouraged more volunteers to come forward for assessment and training. At the lowest level, the Army needs more soldiers and is trying to recruit them.

If the Army needs more MBAs, it should not be left to chance that officers heed the call unbidden and spend several years working long evenings locked away in the study while the family looks after itself. Often, officers doing this are actually more than likely preparing for a civilian career in management. Rather, attendance on Masters of Defence Administration (MDA) courses at Shrivenham and even on MBA courses elsewhere should be much more widespread. The sort of ignorance and parsimony that view this as an unjustifiable and expensive luxury or take the view that these are more *de facto* re-settlement courses than a matter of professional necessity should be stamped upon: they are, after all, not MBA characteristics.

Presently, formal staff training on the Joint Services Command and Staff Course and the Dagger Course for those Majors selected to attend it incorporates a Masters-level degree course. This course is to be replaced by a universal, much shorter course that will yield only of the order of one third of the credit towards an Open University MBA, from which officers may benefit if they have the time, inclination, support and ability to do so. Removing from so many people the opportunity to complete a Masters degree full time while concomitantly fulfilling the needs of the Army may be short sighted. Regrettably, the fact that MBA and MDA degrees are not more widely available is most likely based on financial constraints, doubtless conceived by accountants: how perfectly imperfect.

In sum, if the Army needs more MBAs, it should do something about it; what little is being done formally is, clearly, inadequate. This seems like a situation waiting for a Sapper MBA to do something about it! – Yours aye – J Q Killip

Reviews

THE DEVIL'S GARDEN
BY LYDIA MONIN AND
ANDREW GALLIMORE

Published by Pimlico,
Random House,
20 Vauxhall Bridge Road,
London SW1V 2SA.
Price £12.50 (soft back).
ISBN 0 7126 6859 4.

IN his foreword to The Devil's Garden, Martin Bell writes "This is not a book which I wish had not been written, but it is certainly a book which I wish had not been necessary. In a safer, saner world, it would not have been". The publication of this book is timely as the great public attention given to the scourge of anti-personnel mines after Diana, Princess of Wales' famed walk with Halo in Angola in 1997 has since diminished to virtually nil, despite the fact that mines have been laid in over twenty-five countries since then.

Sub-titled "a history of landmines" the book is rather more than just a history of the use of land mines. The first thirty-five pages are devoted to the International Campaign to Ban Landmines (ICBL) and to giving the views, many of which have been gleaned from previously published articles, of people who have been involved with demining and the attempts to ban anti-personnel mines world-wide. As a pure history of landmines, I prefer Mike Croll's "The History of Land Mines" (reviewed in the *RE Journal* April 1999) but "The Devil's Garden", nevertheless, produces in some detail a very interesting account of the use of landmines in more recent years.

The authors rightly comment on the hundreds of injuries still being inflicted on innocent people, and have high-lighted the fact that thousands of potential food-producing acres are denied to the needy, without entering the nugatory debate on how many mines are actually lying around: "It makes no difference whether land is rumoured to be mined, whether it has three mines or three hundred mines. From an economic point of view the effect is the same. Even the indiscriminate scattering of a few mines can render a huge area unusable".

The book also provides a very useful introduction to the development of mines and their use and gives a balanced and readable account of the activities of deminers and the pro- and anti-ban lobbies. It does not gloss over the duplication of effort, reinventing of the wheel, the waste of time and money and the very real problems within demining groups, between demining groups and of others trying to mitigate the evils of mines; but neither does it offer solutions. As one who experienced the wrong side of British and American mines laid by the rebels in Oman, I am glad that the authors did not duck recording the little-known activities of British "experts" in such places as Cambodia.

The demining activities of commercial, as well as Non-Governmental Organizations, are covered and compared: "The money-making potential of demining soon became apparent"; "If 5 – 7 million mines in Kuwait were worth $700 million how much more could be made from the reported 80 – 100 million mines in sixty-four other countries"; "The quality of much of the work was questionable. Many areas had to be re-cleared after inspections...".

The book, the title of which is attributable to Rommel who referred to the minefields on the desert plateau of El Alamein as " The Devil's Garden", also covers the activities of peripheral but essential organizations such as Jerry White's Landmines Survivors Network, Handicap International and other prostheses and rehabilitation organizations. It does not however, attend to the vexed question of the funding of demining and rehabilitation operations. The limited funds available lead to some questionable tactics in getting a share of the available money. The very odd decision of the British Government not to fund British demining organizations but to give the money to the UN means that British organizations, which lead the field in demining and have been at it longer than others, are at a disadvantage compared with those from other nations which are funded by their own governments as well as having access to UN funds.

This is a well-researched book with copious notes and a useful bibliography. I recommend you read it.

JHH

REDCOAT – THE BRITISH SOLDIER IN THE AGE OF HORSE & MUSKET

PROFESSOR RICHARD HOLMES

Published by Harper Collins,
77-85 Fulham Palace Road, Hammersmith,
London, W6 8JB.
Price £20.
ISBN 0 00 257097 1.

THIS fine book is a gourmet feast of readable military history. Richard Holmes concentrates on the private soldier, his service and circumstances between the start of the Seven Years' War in 1756 and the Indian Mutiny just over a century later. He therefore also includes Quebec, the American War of Independence, the Peninsular War and Waterloo, the retreat from Kabul, the Sikh Wars and the Crimean War.

The framework of the army described in this period was divided broadly between the continental and colonial. The continental army, as today, usually operated as part of a coalition. The point is made that in their biggest battles, Marlborough and Wellington commanded more non-British than British troops. The author moves easily from theatre to theatre to illustrate his comments. Such diverse subjects as manning, uniforms and equipment, medical arrangements, wives and families, terms of service and discipline are covered in a particularly well-informed way.

Naturally, the emphasis is on the infantry and cavalry but the Sapper reader need not feel that his Corps and its forebears play no recorded part in this panoply. We find that never having had to purchase commissions, substantive progress for sapper and gunner officers was dictated solely by the order of passing out from RMA Woolwich. It could therefore be very slow!

There is a vivid description of the blowing in of the Kashmir Gate in Delhi as a "typical engineer task". The professional rivalry between Indian and Royal Engineer officers is touched on in the quote:

> "Major Goodwin drew down the odium of all our corps by resigning his appointment in a huff: so a Lieutenant Lennox of the *Royal* Engineers (hang them all, what do they mean by coming here?) is our Chief Engineer: a very pleasant fellow, but fancy an RE Chief Engineer in an army in Bengal!"

More important is the chapter "The Imminent Deadly Breach" which well describes the breaking of sieges, taking examples from many of them. Surprisingly, there is no mention of the order to "Follow the Sapper".

Overall the reader is left with a rich picture of the life of the rank and file in an army that was astonishingly successful in many campaigns, operating with a scarcity of resources that is familiar to many today. Being largely anecdotal it is fun to read, but one is also left with a deep admiration for the author's depth of scholarship. The illustrations, chiefly reproductions of fine paintings and maps, are excellent.

This book is recommended to any reader who is interested in the early origins of much that has made today's army so uniquely excellent.

SRG

Explanation of Abbreviations Used in This Journal

ACC . . . . . .Army Catering Corps
ACI . . . . . .Army Council Instruction
ADC . . . . . .Aide-de-Camp
AG . . . . . .Adjutant General
AMF(L). . . .. . Allied Command Europe Mobile Force (Land)
ATN . . . . . .Army Telephone Network
ATR . . . . . .Army Training Regiment
ATTO . . . . . .Assistant Technical Training Officer
BAOR . . . . . .British Army of the Rhine
BAS . . . . . .British Antarctic Survey
BBC . . . . . .British Broadcasting Corporation
BEF . . . . . .British Expeditionary Force
BD/BDO . . .Bomb Disposal/Bomb Disposal Officer
BMH . . . . . .British Military Hospital
BP . . . . . .Bulk Petroleum
BT . . . . . .British Telecom
BR . . . . . .British
CBFFI Commander, British Forces Falkland Islands
CCRE . . . . . .Commander, Corps, Royal Engineers
CGS . . . . . .Chief of the General Staff
CRA . . . . . .Commander Royal Artillery
CRE . . . . . Commander Royal Engineers
DCRE . . . . . .Deputy Commander Royal Engineers
EBW . . . . . .Engineer Base Workshop
EinC . . . . . .Engineer in Chief
FARELF . . . . . .Far East Land Forces
FICE. . . . .Fellow of the Institute of Civil Engineers
FIMechE . . . . .Fellow of the Institute of Mechanical Engineers
FYROM. .Former Yugoslav Republic of Macedonia
GE . . . . . .Garrison Engineer
GHQ . . . . . .General Headquarters
GOC . . . . . .General Officer Commanding
ICE . . . . . .Institute of Civil Engineers
JU . . . . . .Junior Officer
KB . . . . . .Khota Bharu
KL . . . . . .Kuala Lumpur
LNER . . . . . .London & North Eastern Railway
LofC . . . . . .Lines of Communication
MASH . . . . . .Mobile Army Surgical Hospital
MBA . . . . . .Master of Business Administration
MDA . . . . . .Master of Defence Administration
ML . . . . . .Mountain Leader
MOR . . . . . .Malaysian Other Ranks
MP . . . . . .Member of Parliament
OC . . . . . .Officer Commanding
OCTU . . . . . .Officer Cadet Training Unit
OTC . . . . . .Officer Training Corps
OP . . . . . .Observation Point
PWD . . . . . .Public Works Department
RAE . . . . . .Royal Australian Engineers
RARO . . . . . .Regular Army Reserve of Officers
RCB . . . . . .Regular Commissions Board
RCE . . . . . .Royal Canadian Engineers
RMAS . . . . . Royal Military Academy Sandhurst
RMCS . . . . . .Royal Military College of Science
RNLI . . . . . .Royal National Lifeboat Institution
RNZE . . . . . .Royal New Zealand Engineers
RTO . . . . . .Railway Traffic Officer
RTR . . . . . .Royal Tank Regiment
SACEUR . . . . . .Supreme Allied Comander, Europe
SANG . . . . . .Saudi Arabian National Guard
SGLSD South Georgia Logistic Support Detachment
SHAPE. . Supreme Headquarters, Allied Powers in Europe
SIS . . . . . .Secret Intelligence Service
‘Skins’ . . . . . .Inniskilling Dragoon Guards
STRE . . . . . .Specialist Team Royal Engineers
SWR . . . . . .Steel Wire Rope
TBRE . . . . . .Training Battalion Royal Engineers
TCC . . . . . .Troop Commander’s Course
UOTC . . . . . .University Officer Training Corps
UXB . . . . . .Unexploded Bomb
WD . . . . . .Well Drilling
Wks . . . . . .Works
WOSB . . . . . .War Office Selection Board
YO . . . . . .Young Officer

Please note: the above abbreviations are those which appear within articles published in this edition of the Journal *only, and are printed for the benefit of our many foreign and non-military readers.*
Appointment abbreviations (which appear on the first page) can generally be found in the back of The Royal Engineers List.