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New Subscription Rates – 1984

THE Annual General Meeting of the Institution of Royal Engineers, held in June 1983, has approved the recommendation of the Council of the Institution that the subscription rates for Non Active List (NAL) Members and Associate Members should be increased by 20%. Because their subscription rates are linked to their basic rate of pay, which is subject to annual "inflation linked" increases, subscriptions of Active List (AL) Members of the Institution are not affected by the AGM decision.

The current subscription rates came into effect in 1981. There had been no increase in rates in the previous five years and to meet ever increasing costs, it was then necessary to increase rates by nearly 100%. The rates then approved were designed to meet the increasing costs for the next three years and this they have done.

For the period from 1984 onwards, the Council had to choose between recommending a moderate increase now or delaying the matter and being forced to recommend a more substantial increase later. Their choice of the former course was endorsed by the AGM.

The new rates which come into effect on 1 January 1984 for NAL and Associate Members with be:

General List Commissions		*Quartermaster Commissions*	
Major Generals and above	£19·20		
Brigadiers	£18·00		
Colonels	£16·80		
Lieut Colonels	£15·60	Lieut Colonels	£14·40
Majors	£14·40	Majors	£12·00
Captains	£12·00	Captains	£ 9·60
Subalterns	£ 9·60		

Associate Members £6·00 (receive Journals only)

The AGM also agreed the Council recommendation that the "over-70" option should continue. They were conscious that some NAL Members, who no longer have second incomes, might find the new rates embarrassingly high and might be forced to resign from the Institution which would be regrettable after a long association. Under this option Members over seventy years of age on 1 January 1984 may remain Members at their current rates provided they notify the Secretary that they so wish.

Most Members of the Institution covenant their subscriptions. At no cost to Members there is a significant, and legitimate, advantage to the Institution as every £1 subscribed is worth £1·43 on current Income Tax rates. Members who covenant will be invited to complete new Deeds which abrogate their existing Deeds, and a new R 185, to take advantage of the increased subscriptions.

To implement the decisions approved at the AGM the following action is required:

(1) *Active List Members*

(a) If you pay your subscription through APO ("Day's Pay Scheme") – *NONE*

(b) If you pay the Institution directly you will be told your annual rate (0.67 day's pay) and will receive a new Deed and R 185 for payment and completion respectively.

(2) *Non Active List Members and Associate Members*

(a) If you are already an over-70 rate Member – *NONE*

(b) If you wish to opt for the over-70 rate – *Inform* the Secretary who will so arrange

(c) If you subscribe through a Bankers Order (BO) direct to the Institution – A new BO, Deed and R 185, made out at your new rate, will be sent to

you in September/October for completion and return to the Secretary

(d) If you pay your subscription by cheque or cash direct to the Institution – You will be reminded of your new rate in October/November and will receive a new Deed and R 185 for payment and completion respectively.

(e) If you pay through Treasurer Corps Funds by a Consolidated Bankers Order (CBO) there are two alternatives:

(1) *If Corps Treasurer has been authorized by you to increase your CBO unilaterally* and inform your Bank accordingly action will be taken to adjust your CBO to include the new rate unless Corps Treasurer is told to the contrary by 1 November 1983. A new Deed and R 185 will be sent to you, early in 1984, for completion and return to the Secretary.

(2) *If Corps Treasurer does NOT hold your authority to vary your CBO* a new CBO showing your new rate will be sent to you, late 1983 early 1984, together with a new Deed and R 185 for completion and return of all three forms to Corps Treasurer.

1984 Rates for "Publications Only" Subscribers

The 1984 annual rates will be:

RE Journal	– £6·35; widows £4·00
Supplement to Journal	– £3·00; widows £2·00
RE List	– £2·50; widows £1·75

Postage and packing will be charged in addition to these rates *EXCEPT* for widows, serving and former members of the Corps. The surface mail annual rates will be:

RE Journal	– UK £0·85;	Overseas £1·85
Supplement to Journal	– £1·50;	£2·05
RE List	– £0·30;	£0·40

The invoices for 1984 which will be sent out November/December 1983 will show the new rates.

1983 Corps Annual General Meeting

ADDRESS BY ENGINEER-IN-CHIEF

At the Annual General Meeting of the Corps, held on 17 June 1983, the Engineer-in-Chief, Major General M Matthews spoke on Corps Affairs.

Introduction

When my predecessor spoke to you at the Annual General Meeting last year, our thoughts were dominated by two subjects; The Falklands Campaign and The Reorganisation of the Corps, and it was right and natural that his address should reflect this.

Now, this year has seen even more Sappers in the South Atlantic than last year, and since the fighting finished the overall priorities there are ALL matters of Engineer concern. The phrase "Fortifications and Works" may have an old fashioned ring about it, but slightly amended, it is remarkably descriptive of the needs of a garrison in a distant place, with little infrastructure, few local resources and a much increased population.

But today much of the life of the Corps is devoted to activities, which are not directly concerned with the South Atlantic or with reorganisation. So this year I will cover a wider field.

I should warn you that I might be embarrassed if everything I say today is quoted in public, it is intended for Corps ears only and you will find that the report in the Journal will have the more sensitive parts omitted. I intend to cover:

The Falklands
Reorganisation
Sappers World Wide
Corps Affairs

Falklands

First the Falklands. This is well covered in this month's Journal but I am sure I should say something about it this afternoon.

This time last year marked the end of the combat phase of the war in the Falklands, a phase in which the Sappers as a Combat Support Arm played their traditional roles, with great distinction. In addition logistic engineering had been an essential activity from the beginning; but since the fighting stopped it has dominated.

Even before any British Forces were ashore, logistic planning for the future garrison was well advanced. I will take one example; accommodation. Everyone had seen pictures of cold and miserable Argentinian soldiers huddled together in tents. We were determined to do better for ours. We also knew that the civilian population of the Islands was under two thousand, so there would be no question of billeting four thousand soldiers in existing buildings. We were therefore required to plan and provide hutted accommodation for three thousand men. There are approved scales which include allowances for offices, stores, kitchens, ablutions and so on. These we used as a basis for our calculation. We already held a reserve of hutting, but most of these huts were Nissens and Twynhams, built of panels on skeleton frames. These had been used for many years in many parts of the world, but they would be very difficult and tedious to construct in the high winds that are a feature of the Falklands climate.

What we needed was hutting which could be rapidly erected, if possible without the use of cranes, with a high standard of thermal insulation and integral heating. Obviously we had to scan the civil market, and we were lucky. *PORTAKABIN* had a large stock available after a cancelled order. You may think that Portakabin were in luck too! Specialist hutting came from *PORTALOO* and *PACKAWAY*. As well

as the structures themselves we had to design and procure stores for the essential camp services: water, electricity, heating and sewage. A few containerised generators and some switch gear had been dispatched early in the operation, but they would not be enough. The Military Works Force therefore had to design power stations housed in Packaway hutting units. What I believe you will find remarkable is that this design and procurement had to be done without reconnaissance on the ground.

After the Argentinians surrendered (on 14 June 1982) Sappers were, naturally, amongst the first troops to enter Port Stanley and the CRE (Works) flew in by helicopter almost "before the ink was dry on the surrender document". In the town itself the electricity and water supply systems were badly damaged. Fortunately despite the Argentinian occupation, the Public Works Department was still "ticking-over" so reliable first-hand reports were available.

The water treatment plant had received a direct hit and was in a sorry state. The roof was partially destroyed and the tanks were holed. One of the large sand filters had shifted on its seating, breaking all the connecting cast iron pipes. The electricity supply to the plant had also been cut. But all the troubles were not at the plant. It was found that there was a large break in the rising main between the plant and the town, the result of a chance hit by a shell on the buried pipe. There is not time to describe how these problems were solved and what improvisation was required to overcome the shortage of materials. I will give you one incident showing that even "the simple things in war are difficult". Some seals urgently required for the water system were flown to Stanley by Hercules aircraft but could not be found. It was later discovered that they had been brought by the very first Hercules to *land* at Stanley: but had been air-dropped before it had landed. The package was eventually located in a minefield, and some finesse with a helicopter was needed to recover it!

After water, the next essential service in the town was the electrical supply. The Argentinians had tried to burn down the Power Station but had been only partly successful thanks to the bravery of the Stanley Fire Brigade, who had carried live ammunition from the burning building. The Power Station staff were able to sort out the generators leaving the Sappers to tackle the distribution system which was in tatters. One of our Clerks of Works and a number of Sappers worked up the poles in appalling weather, often late into the night. There were few spares and repair materials available, so restoration was a gradual process. But in just over two weeks all parts of the town had been reconnected.

Needless-to-say there were innumerable other repairs, to buildings, roads and so on which were done as and when effort was available.

The extent of the Corps commitment to the Royal Air Force is not always appreciated. Although the association goes back to the start of military aviation, it was in the early 1960s that the Corps assumed official and formal responsibility as the construction support engineers of the Air Force. This is a "growth industry", and I shall return to it later. The support given to the RAF during the Combat phase of operations was described last year and has been well acknowledged. In the period after the surrender there were two urgent requirements for Sapper work on Stanley airfield. The first was to establish a land base for the Harriers embarked on HMS *Hermes*, the second to repair the runway so that Hercules could land and take off.

The Harriers needed a base independent of the main runway and major installations so that they could continue to operate while the repair and development work was in progress. Preparation for the Harriers included laying light aluminium matting for a Short Take-off and Landing Strip and parking areas. Prefabricated hangars were erected and an emergency bulk fuel installation was constructed.

Although the Argentinians had succeeded in landing Hercules on the main runway right up to the end of the fighting, this did not mean that our Hercules could do so. Their aircraft could travel light, whereas ours needed to be heavily laden with

fuel for the long haul back to Ascension Island if, as has happened, they could not land in the Falklands. The single crater made by the bomb dropped from the Vulcan was impressive enough to make us (if not everyone) glad that only one bomb, out of dozens, had actually hit the runway. The Argentinians contrived dummy craters to make us believe that the damage was more extensive than it was.

It was fortunate that the Argentinians had brought, and left behind, useful quantities of American made aluminium airfield matting as most of our British matting had been lost on the *Atlantic Conveyor*. Our problem at this stage was primarily lack of plant and suitable fill. For repairing small holes, scabs, caused by shrapnel and cannon fire, good use was made of our recently introduced method using magnesium-phosphate cement mix, ten tons of which had been sent with the Task Force for this purpose. The powder and liquid can be mixed in a bucket, the mix placed in the hole and trowelled off. It hardens, according to the temperature, in about half an hour. Over one thousand scabs were repaired in a very short time. The northern half of the runway was repaired in three days and the first Hercules landed, on schedule, on 24 June. The second aircraft on the 25th, brought back Mr Hunt (as he then was) the Civil Commissioner. The repair of the rest of the airfield was completed by the end of June.

In this condition the runway withstood seventy-seven sorties of heavily laden Hercules and hundreds of Harrier movements before it was closed for the major task of developing the airfield to take sustained operations by transport aircraft and fast jets. This required a stronger and longer runway, and more extensive parking and dispersal areas. Fuel installations, hangars, airfield lighting and arrester systems also had to be provided.

The plan was to be in two phases; first to cover the original runway with American AM2 aluminium matting, to give it additional strength. The second included a two thousand foot extension of the runway so that fast jets such as Phantoms could operate. Planning and confirmatory reconnaissance were greatly assisted by the excellent briefing our people had received in the UK from members of the Engineer and Railway Staff Corps who were the consultants who had originally designed and supervised the construction of the airfield in 1977. On the other hand they were hindered by large numbers of mines and other explosive nasties, especially on the beach areas from where it had been hoped to win the gravel and sand. Ghastly weather with high winds and blizzards made even reconnaissance difficult and promised very difficult conditions for the actual work.

The troops for the construction arrived in mid-July. The stores for the airfield, amounted to nine thousand tons, nearly half of this being aluminium matting, purchased from the US Marine Corps, while the fighting was still going on. There were also about 250 major items of construction plant. Unloading stores without alongside docking facilities was a considerable problem. Rafts and powered lighters were made to operate into slipways that our Sappers themselves had to construct as none of the existing jetties could cope with the loads. Some equipment items were very heavy and awkward – none more so than the rock crushers – the heaviest bit being forty-three tonnes. Getting the four crushers up the slipways and steep hills leading up from the waterfront was a considerable effort. Overhead power supply lines were turned off and cables had to be carefully lifted as the large loads passed underneath. In all the off-load and sorting process took three weeks and it was completed by mid-August. Quarrying, stone crushing, obtaining aggregate, in general proved again and again one of the most difficult tasks in the whole operation.

Another particularly difficult problem arose in the construction of aircraft arrester gears. I should describe the type of arrester system being used. Basically it consists of a wire across the runway. The landing aircraft hangs down a hook to catch on the wire and bring the aircraft to a halt – many of you will have seen aircraft landing on aircraft carriers doing this. The hook wire is stretched across the runway and attached to nylon tapes each side. These tapes are wound onto drums which are

connected to large paddle wheels immersed in water mixed with anti-freeze. The paddle wheels revolving in the water slow the aircraft down. Our problem was to anchor this system down. It hd to cope with a 20-ton aircraft landing at about 150 knots. The sub-soil was very fine uniform peaty sand, and it was waterlogged, the result bding rather like thick soup. In this ground massive concrete anchorages needed tonbe buried well below the surface. However this sort of ground does not permit an excavation to stand safely. Fortunately the problem had been foreseen and several complete well-point systems for ground water lowering had been sent. This allowed excavation down to seven feet below the normal ground water level in good conditions.

The AM2 aluminium matting is a most successful method of surfacing an airfield. The problem at Stanley was to achieve a surface of adequate strength to lay it on. When other methods proved unreliable it was decided to use crushed rock – as I have said, one of the critical materials. The actual laying of the mat is not technically difficult. Nonetheless it was extremely arduous for the troops laying the tens of thousands of individual panels. Each panel, measuring 12ft by 2ft, weighed 144 pounds. It was a good two-man lift. Shift working was employed with three hours on and nine hours off – three hours at a time was found to be the sensible limit. It was generally windy and very cold. All squadrons plus the Queen's Own Highlanders and many other groups were involved in laying the mat. In the final stages with the completion of the extension for fast jets in sight we even had the crew of HMS *Illustrious* lending a hand – the sooner the extension was finished of course the sooner they could head north!

The first phase, over-slabbing the existing runway and apron, was carried out during a twelve day closure of the airfield in August 1982 (this was when the RAF and the postal arm of the Royal Engineers hit the limelight, arranging air snatches of mail bags because the Hercules could not land). The pilots soon gained confidence in the strip and it has generally performed well. We have had problems with the bowing of the panels caused by aircraft braking and the impact of heavy wheels on touch down. Of course, the runway mat is anchored by burying at each end and there are pickets along the edge but there is a degree of free play between panels and constant movement. We have also had a settlement problem in the area of the Vulcan bomb crater repair. We have twice needed to lift the mat in the affected area, re-pack underneath and make good.

The second phase, extending the airfield surfaces into new areas, followed on, with the airfield back in operation for Hercules. Although there were certain technical problems, the task was completed in mid-October (1982), two months after the airfield work started in earnest. Quite an achievement in two months!

After the airfield, the next priority engineer task has been providing accommodation for the garrison to an acceptable standard. This is obviously a matter of great concern to the Commander British Forces, to the Chiefs of Staff and to Ministers. There was a short run of bad publicity in some of the National newspapers. This has died down as all the troops are now reasonably housed for the Falklands winter.

I mentioned hutting and essential facilities earlier, to emphasise that the problem had been foreseen from the start. However solving it, and to semi-permanent standards is a major task. Apart from the erection of hutting much work is required for the services. It was decided at an early stage that all heating would be electric. This has led to sizeable power stations at each camp. Water treatment plants are also required and the systems are pressurised to avoid high level storage tanks. There is no sewage treatment generally, but sewage ejector plants are incorporated, discharging into the sea or over the *cud*-side.

To move soldiers into comfortable accommodation quickly and to supplement the camps and accommodation ships we have made use of a floating hotel or *COASTEL*, hired from Sweden. It is in essence a large dumb barge with modular accommodation units. It needs to be firmly moored, and in Stanley there were con-

siderable problems in providing wharfage and bollards to take side-wind loads of up to 400 tons. The Coastel can accommodate 900 men. It produces its own water from an inboard purification plant, and is self sufficient for electric power. Sewage is also treated. There is a walk-on walk-off facility. A second similar vessel has arrived and will be occupied next week by 37 Engineer Regiment. This has squash courts, a swimming pool and other recreational facilities. A third such vessel, British built, is near completion at Lowestoft and will be sent south in a month or so.

The Sappers have built a radar site on the top of a mountain in East Falklands. The task of lifting all the kit and material some 1500 feet, mainly by Chinook, was formidable. The construction in high winds, rain and cloud proved one of the toughest construction tasks the Corps has taken on for some time.

I will not go into any detail of the many lesser tasks being performed by Sappers, but I would like to stress again that in the Falklands there are virtually no local resources and no local labour. Everything that is needed has to be sent in, and everything that needs to be done means someone, probably a Sapper, sent in to do it.

This is probably the right moment to tell you what troops we have in the Falklands, and how they are organised. In the Falklands summer we have six Field Squadrons and in the winter, three. This is a large slice of the Corps, as we have so many other responsibilities. PSA are under orders to take over the duties of the Military Works Area beginning in April next year. The Chiefs of Staff have ruled that the coming Antarctic summer is to be the last "summer surge" with the six Field Squadrons. This means by next May we will, I very much hope, be down to our long term force level, which is to be one Field Squadron and one Support Squadron.

I come now to the really gigantic task which has still to be tackled. The construction of a Strategic Airfield, capable of taking wide-bodied jets so that reinforcements can be sent rapidly to the Islands if the need should arise. The Chiefs of Staff decided that such a vast undertaking could not be carried out by the Corps without an unbalancing expansion in our numbers and without sacrificing our ability to perform our Priority One role – support of other Arms and the Royal Air Force in a European war. So after the completion of the recce by the Corps it has been decided that the work will be carried out by civilian contractors under the control of PSA. Tenders have been received but further decisions were delayed by the General Election.

Although the fighting has been over for a year there are still activities where our Sappers' lives and limbs are at risk. We have been working continuously since the surrender on clearing the Islands of what is now called Explosive Ordnance. That not only includes what we used to know as Bomb Disposal but also embraces battlefield clearance in the many places where battles took place.

Another major problem is the clearance of the minefields. There is a fundamental difference between minefield breaching in battle and mine clearance in peace. In war speed is what matters and soldiers have to take risks. If one takes too long detecting or clearing mines then the chances of being hit by a bullet or shell inevitably increase. But in peacetime we cannot take risks with soldiers, and if we declare an area clear then civilians will expect to be able to walk the area in complete safety.

Immediately after the war we set in hand, together with Chief Scientist (Army), three lines of research. A means of detecting all mines known to have been laid: A means of mechanical clearance: A means of "course detection", ie, a way of finding areas of mines of which no record or knowledge existed.

The first of these is still in hand, and I hope that the scientists will give us a "magic" detection means by next October. The other two have been eliminated from our Falklands programme. Until we have a reliable means of detection the policy is to clear no minefields unless there is an over-riding military reason to do so, and none is foreseen.

REORGANISATION

And now to my second subject, Reorganisation of the Corps. Last year General Sinclair explained in some detail the various changes that were planned or in progress. They were grouped in three sections by their causes.

– The reorganisation of 1(BR) Corps including the return of HQ 2 Div and 24 Inf Bde to the UK.

– Measures to save manpower in HQs in UK.

– Provision of funds by the Air Force Board for an Airfield Damage Repair capability in the UK.

The regrouping in 1(BR) Corps affects both our Regular and TA Units. In BAOR, in essence, we have reorganised the manpower of the four divisional regiments to form five regiments. Three of these provide divisional support on a scale of one squadron per brigade. The other two are Corps troops. But we are not reverting to the term "Corps Engineer Regiment". The Amphibious and Armoured Engineers remain much as before but a third Armoured Squadron, 77, started to form on 1 October 1982 and should be fully equipped by 1 April 1984.

The new structure is now in being: the (so-called) fifth regiment, 23 Engineer Regiment, was reformed at Osnabruck on the first of June. Each Division, in addition to its Regiment has its own field support squadron, and its CRE, (renamed Commander Engineers). The new arrangement should provide greater flexibility and the extra RHQ should ease communications and command problems. My recent tour in Germany has reinforced my view that in making five out of four we have stretched the elastic very tight. But I very much hope that, following the recent changes, we can have a period of stability and consolidation, world wide.

In the TA, the exchange of roles between 29 and 30 Engineer Brigades has taken place exactly as explained last year. The Commander 29 Engineer Brigade is now Commander Engineers Corps Rear Area. The change is, as many of you will remember, the logical sequel to the setting up of HQ 2 Division, the Corps rear division, together with its three Brigades in what might be described as "29 Brigade's part of the UK". 30 Engineer Brigade provide the Engineer Support for British Support Command from the Channel ports to the Corps Rear Boundary. This came into effect on 1 January this year. The consequent regrouping took place at the same time:

– 73 Engr Regt to under command HQ 29 Engr Bde

– 74 Engr Regt to under command HQ 30 Engr Bde

– 106 Fd Sqn to 72 Engr Regt, giving that Regiment the extra squadron it needs for its role in the Corps Rear Area.

As a result of the measures to reduce numbers *in* HQs in the UK the post of Chief Engineer (old terminology) UKLF was abolished on 1 October 1982. Because of the increased commitments of the Corps within the UK, a new HQ, HQ Engineer Support was formed on the same date, commanded by the same Brigadier. In December he moved with his staff from Wilton to Tidworth.

On a happier note; the steps to provide a realistic ADR capability in UK are progressing steadily if not at lightning speed. Commander 12 Engineer Brigade (ADR) raised his flag at Waterbeach on 1 October 1982 and the concentration there of units concerned with ADR has made a good start. 48 Field Squadron already at Waterbeach became a Field Squadron (Construction), that is an ADR Squadron, and 51 Sqn at Ripon became 24 Inf Brigade's Field Squadron.

At a very successful, and well attended, ceremony at RAF Leuchars on 26 March 1983, 277 Field Squadron (ADR)(V) was formed from the old ADR Pilot Scheme. I say "old" with some feeling, as it was intended to last as a pilot scheme for two years, but only became "legitimised" as an established unit after well over four years. It is greatly to the credit of all concerned that it not only survived, but actually thrived on its borrowed kit and uncertain status. It has certainly earned its place as the first of many TA ADR Squadrons. 216 Fd Sqn (ADR)(V) was formed at RAF Waddington on 1 April 1983. We have firm authority to raise four more

such squadrons, with a promise of a further two, to be formed at the rate of two each year. This is a good start but there are, I believe, many more airfields in UK which need an ADR capability.

Now for a few words on Survey. In 1979 the Ordnance Survey was reviewed and as a result it was agreed to phase out its serving RE officers during 1983/84. This will allow the Director of Military Survey to establish two minor units alongside the Mapping and Charting Establishment RE at Feltham to give him better control of his production resources during peace and war, and to deal with the rapidly expanding, and changing, demands for geographic products and digitised data in particular. At the same time plans to locate 42 Survey Engineer Regiment with the School of Military Survey at Hermitage have also been approved. The title of the new formation will be 42 Survey Engineer Group and the move will be towards the end of 1985 when accommodation will be ready.

Another of our capabilities which I believe needs urgent enhancement is Explosive Ordnance Disposal. The only RE Regular Army EOD Unit, now 33 Engineer Regiment (EOD), has had no significant change in its small Establishment since it was formed thirty years ago, when it was thought that its sole task would be to clear up after the Second World War. Almost continuously over the past twenty years its commitments have required additional manpower to be injected by various expedients so that its actual strength has seldom been less than double the established figure.

Now the threat from Warsaw Pact air-delivered weapons, scatterable mines, bomblets and other explosive devices is greater than ever, and the Falklands experience has provided a jolt. Our current capability to dispose of them is meagre to say the least. We are therefore preparing a case for a regular establishment of over 200 all ranks for 33 Regiment, and have already obtained temporary manpower cover for that number using some of the Falklands allowance. Although the Falklands justification is only temporary, we need at least two regular squadrons in the long term and I am confident that we can make the increase permanent. If my plans succeed we will have two Regular Squadrons and four TA Squadrons. Certainly an improvement.

Sappers World-Wide

The next part of my talk will bring you up to date with what the Corps is doing in other parts of the world.

First, Hong Kong, which I visited last November as DPS(Army). 67 Gurkha Field Squadron have recently moved into their very fine new barracks at Perowne. The Sappers out there, like the rest of the Army, have been kept very busy patrolling the border and the sea approaches to the Colony. I was most impressed with the boat patrols run by the Regiment. 33 Engineer Regiment (EOD) are currently undertaking the challenging task of clearing an old, abandoned, burnt-out ammunition dump near Lyemun on the route of a proposed new trunk road.

We have also had Sappers in Nepal. Members of 19 Topographical Squadron worked on the summit of Dimba (11010 feet!) with a splendid view of Mount Everest.

11 Squadron have recently returned from Kenya where they were involved in building a camp for the Kenya Army.

As usual the Sappers have been involved in many parts of the Middle East:

(1) We have a field squadron second-in-command in the Omani Engineers, and next week we will have two of them.

(2) We have a Sapper supervising the building of the new Qatar Defence HQ.

(3) The last member of our team with the Saudi Arabian National Guard, known as SANG, leaves next week.

(4) We have a Colonel, Lieut Colonel, Captain and two SNCOs working with the UK team running one of the hospitals for SANG.

(5) In the Lebanon a party of Sappers from Cyprus prepared the accommodation

for the British Armoured Car Squadron in the Multi-National Force.

(6) In Sinai we have a GE.

(7) Major (Retd) Arthur Hogben and Major John Rogers (21C 33 Engr Regt (EOD)) were part of an international team that went to Egypt recently to discuss mine clearance in the Western Desert.

(8) In Cyprus, besides the usual work we have been doing for many years, we have recently been clearing Greek and Turkish mines along the Green Line.

Moving West, in Gibraltar the Sappers continue to be responsible for the power station. 1 STRE will be carrying out some combat engineer training in the UK later this year. To maintain the force levels in Gibraltar a UK based unit will be sending out the equivalent number of personnel (up to twenty) to continue the artisan commitments.

Moving South, in Sierra Leone a composite troop built two Bailey bridges and refurbished eight timber bridges, earning themselves a great reputation in that country.

Moving further South, at Halley Bay in the Antarctic, a detachment from 24 Squadron was involved in building an unusual accommodation complex on behalf of the British Antarctic Survey.

Swinging North again, in Belize roulement squadrons have continued to maintain camps, and do a number of small construction tasks as well as acting as infantry.

In Canada 59 Squadron on this year's *WATERLEAP* is currently working on power and water supply and roads for the Canadian Forces.

In June last year a troop of 10 Squadron converted a WW2 German Gun Casement at Merville France into a Museum for the Airborne Assault Normandy Trust.

In Northern Ireland, where we have come down to just 33 Squadron and a roulement troop from Germany, our tasks have been as varied as ever with search playing a major part.

In addition to their normal world wide responsibilities, the Postal and Courier Service

– are now supporting both Civil and Military communities in the Falklands:

– they are operating in the Lebanon and in Sinai

– and during the last year they have supported thirty-six overseas exercises.

Here in the UK you cannot have failed to hear of the Corps' involvement in the recovery of the *Mary Rose*.

CORPS AFFAIRS

And now to my final section: Corps Affairs.

Without a doubt one of the challenging events of this last twelve months has been the decision to move the Corps Museum from the Old Chapel in Brompton Barracks where it has been for more than seventy years to the Ravelin Building. You will have all seen the article in the *Journal* on the subject and next month the *Sapper* will be carrying the appeal to the rest of the Corps. We have certainly set ourselves to a tough target but no greater than our predecessors in 1912 when they set up today's museum. As the articles stress, if we are to have our exciting and greatly enlarged new Museum, including for the first time an outside display of military engineering equipment and vehicles, we will need to attract much support from Business and Industry. However, before we "go public" we must show that we as a Corps have made a real effort and produce the initial £60000 or so. So if any of you have not already sent in your donation please do so.

My next item of interest is that during the last year we have set up a Soldiers' Charitable Trust on similar lines to the Officers' Trust. In the past most soldiers contributed one day's pay to Corps benevolence and a few contributed 60p a year to sport. This meant over 80% of Corps contribution for sport and overseas expeditions, came from officers' subscriptions. Now the money subscribed under the day's pay scheme is divided in the proportion 75–25 between Corps benevolence and

Corps activities which include sport, expeditions, the *Sapper*, the bands and the museum. Because of a successful drive to increase the number of our soldiers who subscribe, now around 90%, and to encourage them to covenant their subscriptions, we will be able to ensure that the amount given to Corps benevolence will not be less than in the past and we will have some £50000 to spend on Corps activities.

Turning to sport – we have had another excellent year. Pride of place must go to 21 Regiment who won the Army Rugby Football Cup 8–4 against the "Dukes"; the first time the Corps has won this trophy; though as you would expect I must mention that 9 Squadron were runners-up in 1948. Our Soccer teams yet again did well with the Training Regiments being runners up in UK, 28 Amphibious winning in BAOR and losing the Army Final to the School of Electrical and Mechanical Engineering, Bordon. Our canoeists did remarkably well in one of the toughest ever Devizes – Westminister races, producing the best Service crew and winning the overall Team Event against a field which included Royal Marines and SAS. Cycling prospers with Corporal Forbes of 40 Army Support Group winning the Germany championship. The Water Polo Team of 21 Engineer Regiment represented BAOR in an International Match in Holland. The Corps has repeated its success in the Army Fencing Championship. For the second year running 25 Engineer Regiment have won the Six-Man-Team Championship and have again been selected to represent the Army at the Royal Tournament. Our Olympic hopes prosper. Captain Mike Mumford our Pentathlon hopeful was sixth in the championships in Italy recently. Sapper Stirling, aiming for the 1988 Olympics, set up a new BAOR hammer record at Sennelager and is now rated tenth in Great Britain.

Before I finish I will ask your help with the one major problem we face as a Corps; that is a shortage of young officers. Recently we have been as many as fifteen short a year. If each of you would encourage just one high grade young man to join the Corps, we would have the problem beaten. I would be grateful for whatever you can do.

In conclusion I would like to give you my impressions from the visits I was fortunate enough to make in my first two months as E-in-C, to many units of the Corps in the UK, BAOR and the Falklands. I can assure you that I found all of them in tremendous form, and this came as no surprise. Wherever they are, they are doing a magnificent job, and this was no surprise to me either. Over the last year the three Services, and indeed the nation, have realised just how much they owe to the Corps. You, like me, can be truly proud to be a Sapper.

Transition to Peace

MAJOR S W HESKETH RE B Sc

The Author was commissioned into the Corps from RMA Sandhurst in July 1969. After attending 43 YO Course, he went as a Tp Officer to 9 Indep Para Sqn RE. He attended 26 Degree Course at RMCS Shrivenham where he was Vice-Captain of the 1st XV and gained a 2(1) in Applied Science. He was then a Tp Comd in 11 Fd Sqn and returned to 9 Sqn as 2IC in July 1976. He was AI Fieldworks at RSME for a year and then, after failing the Staff College exam for the second time, became GSO3 Ops/Trg in Gurkha Fd Force in New Territories Hong Kong. He has commanded 60 Fd Sp Sqn since February 1982 and leaves in October 1983 to take up a staff job in BAOR.

Introduction

During July 1982, 60 Field Support Squadron was warned, at short notice, to deploy to the Falkland Islands, to take over from 61 Squadron as the in-theatre support squadron. Information on our future tasks was in short supply and centred around scant information gleaned from an all-arms briefing given by busy staff officers at HQ UKLF. It transpired from this briefing, that we were: "to do the usual support squadron tasks, but on a larger scale than normal".

The Squadron deployed from Waterbeach on 8 August 1982, spent the night at Air Mounting Centre (AMC) South Cerney and early on 9 August we flew by RAF VC10 to Ascension Island via Dakar in Senegal. On 10 August, the 10-man advance party was flown on to Stanley airfield by a RAF Hercules aircraft, while the remainder of the Squadron moved down under the 2IC on MV *Norland*.

When the advance party arrived at Stanley airfield, "bruised, battered and bewildered" by a 14-hour Hercules flight we soon became aware of the extent of the task we were to take over from 61 Squadron: it was far beyond the scope of any support squadron task we had undertaken before.

It was obvious that we had arrived at an interesting time in the Falkland Islands campaign. It was nearly two months since the ceasefire and all the Task Force units less RHQ 36 Engineer Regiment and 61 Field Support Squadron had returned to UK. Before our arrival the Corps had been heavily involved in the rehabilitation of Port Stanley, some minefield clearance and Airfield Damage Repair (ADR) tasks to make the airfield useable again. When we arrived 50 Field Squadron were busy battling with the problem of extending the airfield to receive the Phantoms. During the advance party phase, I was given several very full briefings by the CRE (Colonel Derek Brownson), the CO 36 Engineer Regiment (Lieut Colonel Geoff Field MBE) and the OC 61 Squadron (Major William Thackwell). It was plain from these briefings that while the Corps at all levels was coping well, the G3 and G4 Branches in HQ British Forces Falkland Islands (BFFI) were having great problems in allocating priorities to the seemingly endless numbers of tasks which required engineer effort. Without a doubt, though, the runway extension was the priority one operation.

During our tour from August 1982–February 1983, we initially supported four field squadrons increasing to six field squadrons during the Falklands "summer", which started in early November. The main tasks undertaken by the field squadrons

Transition To Peace, Major S W Hesketh RE B Sc

during 60 Squadron's time in the Falklands Islands were:

(a) Explosive Ordnance Disposal (EOD) area clearance and minefield fencing.
(b) Extension of the airfield runway.
(c) Construction of airfield hangars and other services such as bulk fuel installations and electrical services.
(d) Construction of the settlement camps.
(e) The *Coastel* approach roads and anchorage.
(f) The *Op Zeus* radar task.

In this article, I propose to give an insight into the intensive support squadron operations we conducted. I would like to cover our experiences in the reverse of the usual order, ie:

Plant Troop
Resources Troop
Squadron Headquarters

A map of Port Stanley showing our main locations is Illustration No 1.

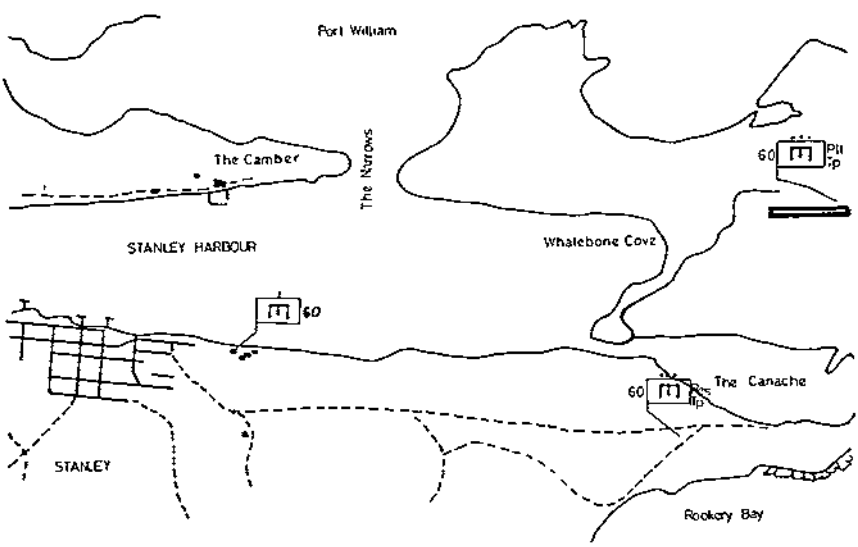
Plant Troop

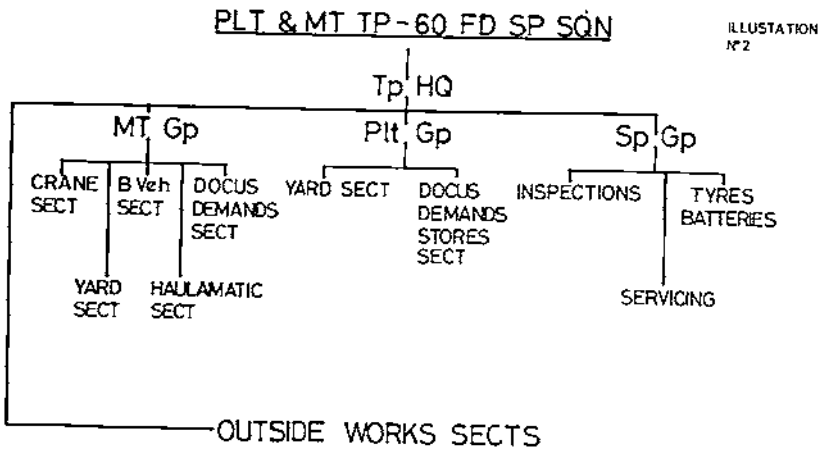
Virtually all engineer tasks on the Falkland Islands were plant intensive. On our arrival, the majority of the plant effort was being directed towards the runway extension and the quarry. To assist with this, a centralised plant support organization was in operation.

The support squadron ran a plant park with theoretical control of all "C" vehicles, Engineer Construction Plant (ECP), Plant Operator Mechanics (POM)s and Drivers for daily works. In my opinion, however, at this stage of the proceedings there were too many constraints for the plant park system to work well. The park comprised machines which the field squadrons had put off the road during works and well over 50% was Vehicle Off Road (VOR). The REME workshops, the RAOC stores section and the central servicing bay were operating at much less than optimum efficiency because no covered accommodation was available for them. The plant troop office and Complete Equipment Schedule (CES) store were housed in two dilapidated Nissen huts, which were insufficient for their needs. Clearly, a solution to these problems was a top priority. With the subsequent arrival of two additional field squadrons and the formation of 37 Engineer Regiment, there were even

ILLUSTRATION N° 1

LOCATION MAP





greater demands on the plant than before. In early September, CO 37 Engineer Regiment formalised a park system in which all POMs and Drivers were placed under operational control (*opcon*) plant troop 60 Squadron and the troop was made responsible for the management of all C vehicles and ECP. Both men and machines were allocated to tasks by the plant troop commander in line with the priorities laid down by RHQ 37 Regiment. The park organization we developed is shown at Illustration No 2.

While the command, control and organizational problems were being ironed out, the task confronting the troop commander (Lieutenant Geoffrey Dodds) and the military plant foreman (WO1 F Inman) was to restore the normal, peacetime systems of plant management. Obviously, during the war, many short cuts had been taken to keep the engineer effort going. This continued in the aftermath; there was a tremendous backlog of Unit Monthly Inspections (UMIs) and spares demands to catch up and we also had to find all the machines on our liability. As an example of the sort of problems encountered, 30 Squadron found a Light Wheeled Tractor (LWT) at the Meteorological station when constructing accommodation; no one had been aware of its existence until then! It took several months of hard work to sort out the documents and redemand all the spares used in the war and its immediate aftermath. Once in operation, the plant park helped to improve the overall standard of plant management, particularly during the intensive period in September and October when the airfield runway was being extended to accept Phantom aircraft.

In addition to the improvements in plant management described above, physical improvements to the plant park and its environs were undertaken by the yard section. Many of these tasks had to be done between 2359 hours and 0800 hours to fit in with machine availability. The park was extended, hard-core laid to improve the working area and a perimeter fence erected to improve security. A *Rubb* shelter was erected for use as the central servicing bay. This was done by the servicing and inspection team themselves, under supervision by an expert from 3 Squadron. Given the low temperatures and prevailing winds, little incentive was required! A *Portakabin* was erected for use as the troop office. Sundry containers and the two Nissen huts were racked out and organized as proper stores. All this was done on a self-help basis, often outside programmed working hours, because equipment required for these tasks was often required for "higher" priority tasks during normal working hours.

As mentioned earlier, one of the biggest problems was the serviceability of C vehicles; of thirteen Medium Wheeled Tractors (MWT) it was rare to have more than seven serviceable. There were many contributory factors to low serviceability,

the three mains ones were:

(a) *Operator Daily Checks.* Despite all the training given at RSME to everybody in the Corps, operator daily checks were still viewed by many people as "down-time". Hence, on jobs where there was great pressure for early completion, these checks were neglected by POMs and their officers and NCOs with a consequent reduction in machine serviceability. Some neglect, misuse and damage reports following plant maltreatment were raised by REME, but these were ignored and this lowered standards still further. No disciplinary action was taken following such practises as leaving concrete mixers with half the last mix still inside.

(b) *Shortages of Vital Spares.* During the war, large quantities of C vehicle spares had been sent down to the islands on a predicted usage basis. Immediately after the war ended, the RAOC stores section had experienced great difficulty in gathering together all the spares and setting up a viable operation. During this post-war period, the stores packs had been opened and plundered on a "free-for-all" basis to keep the machines running during the intensely busy period in June and July. The RAOC stores section had not been aware of the nature and quantity of their spares from the outset, and hence had been unable to re-indent for the stores pillaged from the spares packs. When they were finally set up in late August/early September serious deficiencies in the stores were discovered. For example, there were enought LWT filters to last until approximately 2000 AD, while only one set of cutting edges for the Heavy Crawler Tractors (HCT) was in stock, ie, enough for about 24 hours' working in the quarry.

(c) *Size of the C Vehicle Workshop.* As well as the physical problems of covered accommodation for the workshop, there were not enough fitters. Each squadron had brought its own Forward Repair Team (FRT) and these were lumped together to form 37 Engineer Regiment Workshop REME. There was, however, more than a Regiment's worth of plant (some 300 plus vehicles and ECP) and the workshop was not big enough to support its dependency. The fitters found themselves in the invidious position of reacting to events the whole time without being able to start a programme of preventative maintenance.

Despite all these problems, the plant work was generally completed on time, because of sensible allocation of priorities by engineer staffs at all levels and the desire of everybody involved to get the tasks completed. However, the feeling was prevalent at the time that a lot of hard work was caused by people allowing well proven systems to be ignored.

Resources Troop

On arrival, the engineer park was still in the embryo phase of being set up on a

Photo 1. The crushers in October showing a half-erected Rubb shelter in rear

bare, hog's-back feature on the road leading to the airfield. The area had been used previously as an airstrip and was universally known as "tin-strip". It was bleak, windswept, and restricted by minefields and swamp. There was little covered accommodation. In August the weather conditions were indescribable, our predecessors had had two cases of hypothermia!

Because of the urgency of the immediate post-war off-load from ships, the park was badly laid out and security and stores control were both poor. To get tasks finished quickly, units had become used to driving straight on to the park and helping themselves to stores, in the same way that plant spares had been plundered. No engineer workshops facilities existed. There were a few Pierced Steel Plank (PSP) tracks but Mechanical Handling Equipment (MHE) tended to bog-in with alarming frequency once they had moved off these. The troop headquarters itself was co-located with Sqn HQ which made control of the park very difficult, as Sqn HQ was twenty minutes drive away over poor roads.

Despite this rather desperate scenario, Lieutenant (now Captain) Eddie Banks, resources troop commander set-to with a will to improve the situation. His main priorities were:

(a) *Provision of Covered Accommodation and Engineer Workshops.* One of the more pressing problems was to turn the real-estate and its mountain of stores into a properly functioning engineer park, recognised as such by everybody else on the Falkland Islands. To this end, I moved resources troop headquarters away from Sqn HQ and located it at the engineer park. The troop commander quickly appreciated the need to house his troop HQ in an office and also to set up the engineer workshops. By dint of ingenuity, improvisation and hard work he produced some buildings very quickly. Once the workshop was completed in early September, it was in operation on a 24-hour basis for the rest of our tour, doing sundry tasks such as rebuilding crusher jaws, prefabricating formwork, and even manufacturing unit signs! The organisation of resources troop, on completion of the workshops is shown at Illustration No 3.

(b) *Quantifying the Materiel Assets.* On taking over from 61 Squadron there were 11 000 tons of engineer stores on the park. Not all items were identified or accounted for. The troop resources specialists started to try to identify all the materiel, bring it to charge and store it in an easily accessible fashion. In addition to

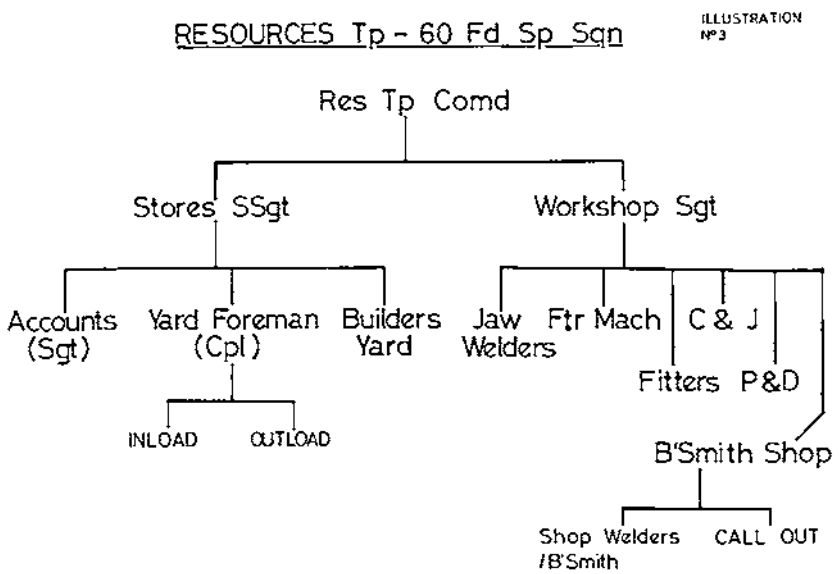


Photo 2. Entrance to Engineer Park showing the improved office and workshop accommodation

the physical problems of identification and accounting, quantifying the extent of the support squadron holdings was a major undertaking. During the war, stores had been despatched from UK in haste. In transit, stores had been stolen, damaged and lost through enemy action. Also, understandably, stores had not been recovered from task sites after the war. Armed with a "best guess" from HQ E-in-C, resources troop tried to quantify our holdings. The SSM (WO2 Tarr) was enlisted to assist and spent a great deal of time doing helicopter recces to find stores. During this phase of our transition to peace, I felt the lack of an Automatic Data Processing (ADP) facility for engineer resources most keenly. The current system of vouchers, though adequate, has several failings. By comparison, the RAF computerised system appears to offer great benefits at a relatively low cost. After the visit of Lieut Colonel Roger Garnett in mid January 1983, the deficiencies between our holdings and our liability published by HQ-E-in-C were identified. I was then ordered to start write-off action for stores and equipment we could not find. The total write-off amounted to £1·8M.

During the early months of the tour, the pressure on resources troop never slackened. In addition to the problems of stores identification and the pressure on the workshops described above, there was always the pressure of stores being in-loaded from ships to the engineer park. In all, approximately 30000 tons were moved from ship to engineer park during the period late August-Mid November. Once the pressure of the in-load was lifted, the pressure on the troop to out-load stores to the settlement camps commenced. During this phase of operations, the following main problems were identified:

(a) *Stores Consignment.* Stores were consigned to the Falkland Islands initially in task packages. As projects progressed, stores were sent down in smaller quantities, by sea or air. Often stores arrived without vouchers, mixed in with kit for a variety of tasks and in boxes without identifying markings on them. This increased the difficulties of providing the field squadrons with the right kit at the right time.

(b) *Lack of Manpower.* A resources troop is woefully small and when the workshops are in full swing there is no General Duty (GD) manpower for the general day to day "humping and dumping" of stores. RPC manpower was rarely available to assist; without labour the present troop establishment cannot sustain protracted operational or semi-operational support.

(c) *Bulk and Complexity.* Given the wide range of diverse projects and the numbers of field squadrons at work, the sheer volume and variety of stores created their own peculiar problems. For example the variety of equipment included Sykes

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Photo 3. The Plant Yard viewed from the south of the airstrip

pumps, Oerlikon welding sets, Expeditionary Rotary Hydraulic Arrester Gear (ERHAG), Auxilary RHAG (ARHAG), United States RHAG (USRHAG), Portaloos, Portakabins, Emergency Fuel Handling Equipment (EFHE), 150 generators and Harrier stores to name but a few; add to this the fact that recognition of stores by any stores organization is a function taken for granted by the customer, and you can see the challenge faced by the troop.

(d) *Packaging of Stores.* Damage and theft in transit were two of the most frustrating problems encountered during the tour. Stores were packed, as a rule, in boxes which were too large for in-service MHE to handle and too fragile to protect the stores from theft or damage during the 8000 mile journey from UK. It was soul-destroying to see dozens of bags of special cement, transported at vast cost and effort, ripped open and rendered useless during the off-loading at Port Stanley.

Despite all these problems or rather challenges, if stores were actually present in the Falkland Islands, then user units were issued with them, during all hours of the day and night. A vital factor, which eased our load considerably, was the excellent service received from Central Engineer Park (CEP) Long Marston throughout our tour.

Squadron Headquarters

In the initial phases, Sqn HQ was very busy. We inherited office accommodation in the YPF fuel farm, the former Argentine fuel supply depot situated on the seashore by the off-loading ramp used by Port Squadron RCT. The fuel farm was shared with the RAOC POL Platoon. The QM's department, which included the catering section and squadron dining room, was housed in a complex of Falkland Islands Company (FIC) buildings. These buildings had been previously used for oil storage, and the cookhouse was rather aptly situated in the old FIC slaughterhouse – a leaking, draughty wooden hut. After the initial, mandatory reshuffle of the offices in the YPF building, resources troop HQ was despatched to live at "tin-strip" to try their hand at Antarctic survival.

To cope with the longer-term nature of our occupation of the Sqn HQ/echelon complex, I decided, in conjunction with the QM (Captain Norman Humphreys), to give a high priority to improving our facilities. The QM and his team, in addition to their normal work load of bringing the G1098 up to scale, spent a great deal of time in physical improvements to the stores by manufacturing shelves and racking. Simultaneously a new cookhouse was designed and built. An old Nissen hut, previously used for storing animal feed was emptied and gutted. It was then completely relined with plywood, electric strip lighting was installed and proper facilities were

installed for the cooks. These included a US Army M59 cooker, a heating range, running water and a hot plate. The hot plate was made using 3 Field Squadron's well proven design. Once this cookhouse was in operation, the standard of the food improved dramatically and so did the soldiers' morale.

On the "G" side, the Squadron 2IC (Captain Philip Crook, who had literally been pulled off Junior Command and Staff Course (JCSC) to join us at AMC South Cerney) was getting heavily involved in the operational side of plant-tasking and also providing the interface with Port Squadron RCT for the inload of resources from merchant shipping to "tin-stop". While all this was going on, I was selected by the CO and CRE from a host of eager squadron commanders to command the quarry and crusher squadron, which had previously been commanded by 50 Squadron. This squadron comprised one field troop from each of 3, 30 and 50 Squadrons under *opcon* Sqn HQ 60 Squadron. I commanded this ad-hoc unit from 1 September to 1 December 1982. During this time, our main task was to produce 1000 tons of crushed rock per day primarily to support the airfield and *Coastel* tasks. It was a time consuming task and one fraught with problems. For most of the time the troops were working in shifts on a 24-hour basis. A wag from 50 Squadron called it "Rock around the Clock".

I do not intend to go into any great detail about the technical side of this task as this has already been covered by Lieut Colonel Ievers in a previous article. Suffice to say, that we managed to produce our quota of rock. On good days, leading up to the arrival of the Phantoms, in excess of 2000 tons per day were produced. The main problems were caused by lack of expertise in quarry operations at all levels and poor equipment serviceability, exacerbated by the 8000 mile L of C. This additional task extended the Squadron during an already difficult period. With the arrival of the "surge" squadrons in November and December 1982, our plant and resources efforts were taxed even more heavily. On 1 December 1982, the quarry and crushers were handed over to 24 Field Squadron and for the rest of our tour, we concentrated on providing plant and resources support to the field squadrons until we handed over to 15 Squadron in early February 1983.

Conclusions and Lessons Learned

The tour in the Falkland Islands was hard-working, testing and challenging. During our six months there, we had to transform an organization still on a war footing to a functioning peace time organization, simultaneously supporting up to six field squadrons on project work.

We learned a whole host of lessons, some trivial and some which I consider to be very significant:

Manpower. There are too few soldiers in a support squadron. There is little GD

Photo 4. The Vehicle Off Road (VOR) Park in snow!

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capability particularly in resources troop. As we found to our cost, if RPC labour cannot be provided then the effectiveness of any resources organization is badly denigrated.

Priority of Works. Due to the large number of operational tasks the engineer support organization was given a low priority for works and materiel. Nearly all the improvements we brought about were done on a self-help basis after planned working hours. I felt at the time, and still do feel, that the setting up of the support organization should have been given a priority for works in keeping with its importance. At times, the engineer effort limped a little because we could not get the equipment or materiel to assist us in our task and could not support our fellow Sappers to the best of our ability.

Equipment Management. All squadrons in the Falkland Islands during our stay seemed poor at equipment management. I feel this is probably a follow-on from our modern combat engineer training which lays the emphasis on speed at all costs. For the brief period of a modern exercise, the results of bad management and maintenance rarely become apparent. In FI, the problems caused by this attitude became too apparent. Operator checks and daily servicing are not downtime!

Use of Established Procedures. On our arrival in Port Stanley, many of the normal, established engineer procedures were being ignored, eg, units were indenting through RAOC for ECP spares rather than to Long Marston. If our procedures are too difficult to adhere to in war, then perhaps they should be reviewed.

POM Continuation Training. It was noticeable generally how poor field squadron POMs were by comparison with their counterparts in ADR or support squadrons. POM continuation training is a vital thing, which appears to have been overlooked by some units, probably because it is difficult to arrange sensible continuation training for small numbers of POMs, *cf* eight POMs per Field Squadron, sixteen POMs per Support Squadron and twenty-two POMs in an ADR Squadron.

Responsibility for C Vehicles. Having seen how vital plant was in the Falklands, I now firmly believe that the repair and maintenance of C vehicles should be done totally by RE fitters in an RE plant workshop and C vehicles spares should be supplied by Long Marston. The current functional division of responsibilities between RE, REME and RAOC did not work well when under extreme pressure.

ADP. The Corps must catch up with civilian firms and other services and introduce greater use of ADP into RE resources. In particular, the current manual system is ineffective if stores arrive before the appropriate voucher.

Packaging. Stores must be sensibly packed and secured in packages which can easily be lifted by in-service MHE, especially vulnerable stores.

Quantity of Materiel. The quantities of engineer materiel used were enormous. I'm not sure that any of us have "aimed off" for how much materiel a squadron will use when it is at full stretch on L of C tasks in a limited war.

In summary, I would like to say that the paragraphs above are my own views on what I saw during my six months in the Falkland Islands. Inevitably, a whole host of people will disagree with the conclusions I've drawn, either because they know more about that particular subject than I, or their perception of the problem differs from mine. Hindsight, as our American friends say, gives everybody 20/20 vision. Perhaps I am being wise after the event. However, I feel that the Corps would be wise to take lessons not just from the conflict but from the period of intensive engineer operations since the war ended. For me, too many of the dire predictions made by Colonel Mike Addison in his "Sappers Fit For War" article published in the *RE Journal* in 1979, turned out to be correct. Like all Arms we should try to learn everything we possibly can from *all* phases of war. The transition to peace is a phase which seems to offer more problems than many others. For me, it was like trying to run a Basic Fitness Test (BFT), while putting my trousers on!

* * * *

Battle Baffles or Obstacles on the European Battlefield

MAJOR C E E SLOAN RE, B Eng

Major Cedric Sloan joined the Sappers as a Direct Entrant and has served in Regimental posts at Osnabruck, Chepstow and Waterbeach. His staff appointments have been on the General Staff at 11 Armoured Brigade and 1 (BR) Corps. He currently commands 42 Field Squadron RE in Hameln.

"There is no doubt that a cunningly prepared scheme of demolitions is one of the greatest delaying factors there is. If these form a *deep* belt over a wide front they can stop all movement." Lt Gen BL Montgomery, Comd 5 Corps, 31st March 1941.[1]

Turn, Wheel, Turn. The Great Wall of China, even Hadrian's Wall, were unsuccessful exercises in containment. More recent experiences, such as the Maginot Line, the Stalin Line and the Bar Lev Line, have illustrated the inadequacy of linear obstacles against modern, mechanized forces. Yet too many soldiers, and Sappers are no exception, continue to view a future battle in Central Europe as being fought from behind an apparently impregnable strip of minefields and demolitions. Unfortunately, our potential foe has developed the tactics, equipment and organisation to breach, outflank and envelop such a defence. The well publicised reorganization of 1st British Corps (1(BR)Corps) into larger and more flexible armoured divisions presents the opportunity for a fresh look at defensive concepts to meet this progressive enemy challenge. Central to any study of defence is the use of obstacles. Perhaps it is time to review our attitude towards the employment of obstacles, to remind ourselves of the basic principles of their use and to search for improvements in our current ability to meet a dynamic tactical requirement.

A New Perspective. A champion of the forward linear obstacle would defend his preference with the opinion that an enemy must concentrate to breach the defences. Once the enemy has chosen this point of entry, and made its location obvious by his attempts to effect a breach, the defender will be able to concentrate his own forces to defeat the incursion. This is an attractive concept, but does not translate easily into the situation facing 1(BR)Corps. It is NATO policy to defend well forward, thus any linear obstacle defending the front of a Corps must be close to the Inner German Border. This places the obstacle in possible view of the potential enemy, defensive positions are likely to be in artillery range of the Border, and Soviet movements, manoeuvre and logistics can be concealed within East German

Battle Baffles Or Obstacles On The European Battlefield Major CEE Sloan RE B Eng

territory. These factors do not include the over-riding consideration that the local superiority which a Soviet attacker might accumulate would permit more than one major breaching operation, in addition to several deceptions. The defender would be unsure, until too late, which breach was intended to be the major entry point. A fortunate guess, leading to the successful reclosure of a breach, would still not prevent a rapid switch by the enemy to force his formations through a lesser protected sector. The majority of the effort expended upon the main forward obstacle would have been wasted on an ineffective positional defence. A simple analysis of troops to task appreciating the area of ground to be protected, points to the need for greater emphasis on mobile defence.[2]

The essential dilemma in applying the concept of mobile defence to a real situation is the precarious balance between denying the enemy his mobility whilst maintaining that of the defender. In such a fluid battle, the requirement to deploy reserves on counter-moves can be over-riding. If too much emphasis is placed on counter-mobility, this will limit the opportunity for a flexible response to an unexpected enemy manoeuvre. If too little is provided in the way of obstacles, then an otherwise acceptable enemy infiltration may escalate into acute dislocation of the defence. A Sapper adviser must ensure, therefore, that he completely understands the tactical commander's design for battle in order to achieve the correct correlation between mobility and counter-mobility in the engineer plan. Understandably, subordinate commanders and engineers may dislike this direction to leave gaps in their defences and obstacles, preferring to close all possible approaches into their areas. Clear direction and subsequent verification will be necessary to prevent purely defensive preparations being pursued at the expense of offensive opportunity.

Before indicating how obstacles may be used to provide the desired effect, it is well worth reminding ourselves of the potential capabilities of Soviet forces in this area and to recap on the roles and siting of obstacles.

Soviet Obstacle Crossing Capabilities.[3] The simplest way to overcome an obstacle is to avoid it. The tank and motor rifle divisions of the Group of Soviet Forces in Germany (GSFG) are particularly well equipped with reconnaissance forces able to detect battlefield obstacles. Thus, main forces may be diverted around obstacles and, where this is not possible, the reconnaissance elements provide the first stage in the process of defeating the barrier. More and more vehicles in each division are becoming tracked. This increases the general potential to overcome natural and artificial obstacles without Soviet engineer assistance. Equally, the ability of tank or artillery gun fire to smash obstacles, and that of helicopters to fly over them, add to this combined arms capability. When a deliberate breaching operation is called for, their engineers may use some or all of the following specialist equipments:

(1) KMT 4 mine ploughs or KMT 5 plough/roller combinations.
(2) BTR 50 PK mine clearing hose.
(3) MTU tank launched bridges.
(4) TMM and KMM truck mounted bridges.
(5) K61, PTS or GSP amphibians.
(6) PMP pontoon bridging.
(7) Engineer plant.

These considerations point to the need for a variety of carefully sited obstacles designed with skill to surprise and defeat a wide range of Soviet troops and vehicles. The potential enemy expects considerable hindrance, we must ensure he is not disappointed.

The Basic Principles. There are surprisingly few official references to consult on obstacles. This definition is taken from a Military Engineering pamphlet: "Tactical obstacles are those placed in the enemy's way in order to prevent or delay his movement, to divide and disperse his attack, or to shepherd him into positions where he will be particularly vulnerable to attack." Mobile defence calls for extensions to this definition, which should include:

(1) Filter obstacles, to separate tracked from wheeled vehicles. This is especially

important as a measure to prevent the resupply of artillery and tank ammunition.

(2) Denial obstacles, to prevent enemy occupation of a certain area, eg: high ground or helicopter landing zones.

(3) The use of obstacles to deceive the enemy.

(4) The requirement to provide obstacles quickly in support of counter-moves.

It is interesting to compare the current effects desired of obstacles with those thought necessary in the early days of anti-tank minefields. The results of a study in 1939 revealed that:

(1) Minefields are a form of obstacle and must be sited in conjunction with the tactical plan and must not interfere with the defenders freedom of action and plans for counter-attack or counter-offensive.

(2) They must be under the small arms fire of the defender so that they cannot be removed by men on foot.

(3) They must be sited to guide the attackers into lanes and areas where the enemy can be dealt with most suitably by our fire and troops.

(4) They should, where possible, be concealed and come as a surprise to the attackers.

(5) Dummy minefields could be used to frighten the enemy off certain lines of advance while leaving them still open to the move of our own armour.[5]

How relevant these rules still seem today! They fit nicely into a concept of mobile defence which seeks to hinder an enemy's progress, to deflect him into areas of our choosing – where his manoeuvre is constrained and the obstacles protect our positions, to hold his weakened advance at a critical point and yet still allow our reserves the freedom of movement for the required counter-blow. In essence a system of baffles, where the ebb and flow of battle may take place, but is ultimately contained.

Obstacle Siting. It is inevitable that, on a battlefield where armour has predominance, the anti-tank minefield features strongly. However, the minefield is but one type of obstacle. Other artificial obstacles would be demolitions (craters, tree-

Photo 1. The wooded hillside – a good natural obstacle.

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Photo 2. A typical canal obstacle – if the bridge is blown

felling), barbed wire structures, road blocks (trees, demolished buildings, vehicles, rubbish skips) and the modish anti-tank ditch. In addition to these we can utilise natural obstacles which are, regrettably, poorly understood aids to the defender. For example: all slopes will cause heavy vehicles to reduce speed, as will all but the smallest ditch, stream or embankment; rivers will require some form of effort on the part of an attacker to prepare for crossing, even bridges left open by a withdrawing defender will become choke points for hasty pursuers; woods and villages will force an enemy to move warily and any stretch of water or pit area will deflect the axis of advance. It follows that any attempt by the defender to improve these hindrances will be of benefit to him, if it forms part of his obstacle scheme. Whatever type of artificial obstacle is to be employed within this scheme, its detailed siting should be governed by the following considerations:

(1) *Reinforcement*. Slopes, steps, ditches, soft going and other natural restrictions can be used as the basis of the obstacle to be reinforced by artificial means.

(2) *Bonding*. Artificial obstacles should be used to link natural features.

(3) *Complexity*. The difficulties facing a potential breaching party should be increased by providing combination obstacles, eg: an anti-tank ditch within a minefield on the home bank of a canal.

(4) *Concealment*. Reverse slopes, hedges, buildings, bends in roads, can and should be used to conceal obstacles from an enemy until he is upon it. This will aid deception, prevent forward planning of a breach and provide a useful element of surprise. Irregularity in an obstacle will assist in its concealment and prevent an attacker from deducing the defenders' fire positions.

(5) *Covered by Fire*. As a minimum, any obstacle should be covered by indirect fire. Fire cannot be brought to bear unless the obstacle is capable of being under constant surveillance and this should be considered during the design phase.

(6) *Strength*. The obstacle must be capable of achieving its aim. A simple crater in a forest ride will defeat a recce vehicle, whilst a key tactical minefield will be required to close a valley on a main enemy axis.

(7) *Tactical Seeing*. Only those obstacles required by the tactical plan must be provided, They, in turn, must produce the required effect and not inhibit our own operations. There is little point in laying deep minefields, for example, which

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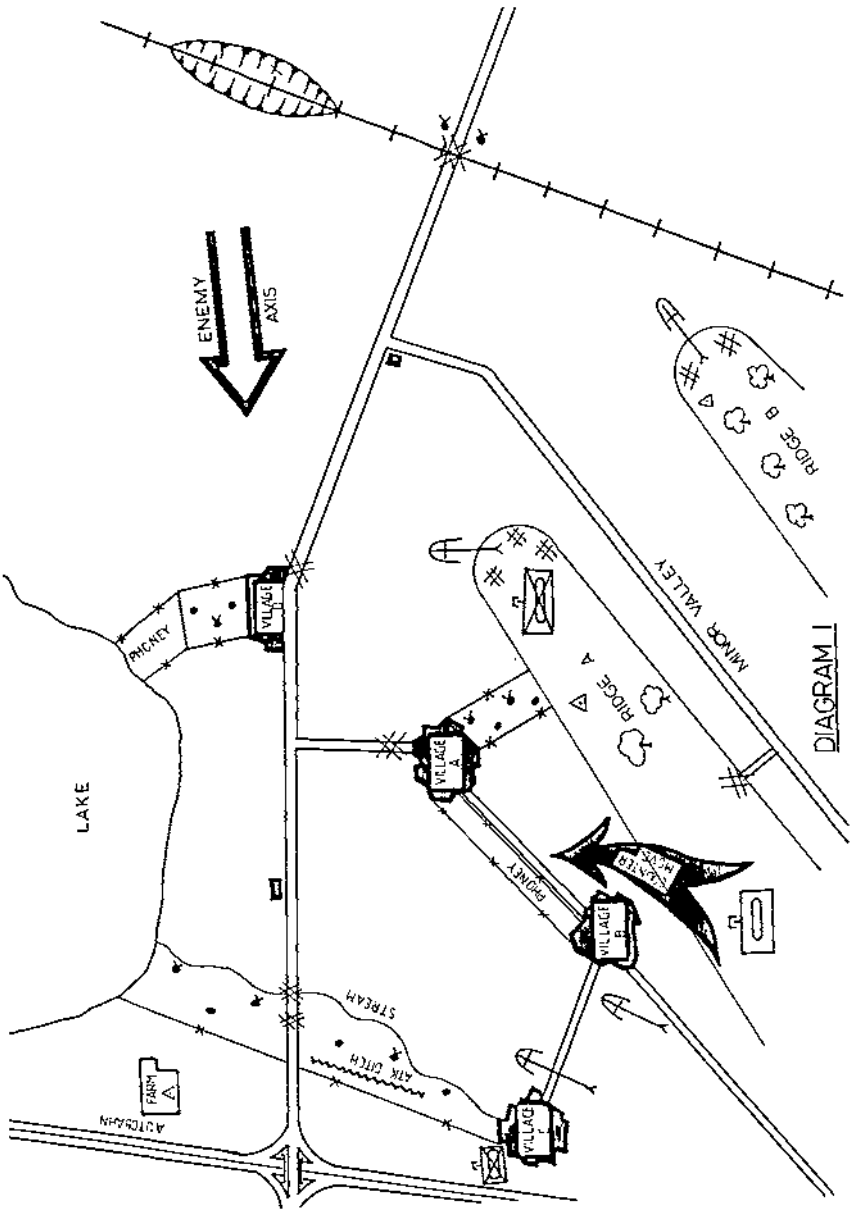
ENEMY AXIS
RIDGE B
MINOR VALLEY
RIDGE A
VILLAGE A
VILLAGE B
VILLAGE C
VILLAGE D
PHONEY
PHONEY
LAKE
STREAM
AIR DITCH
FARM A
AUTOBAHN
DIAGRAM I

extend out beyond the ranges of defending weapons, or traverse a potential counter-attack route.

The Obstacle Plan. Mobile defence, and its associated concept of baffle obstacles, should be viewed benevolently by combat engineers. The tactical plan may seem difficult to grasp, with its multiple options of counter-attack, counter-penetration or counter-stroke, yet this very difficulty is a blessing in disguise. As discussed earlier these options require unimpeded mobility for our own forces, which should suggest fewer obstacles on the battlefield. Limited engineer resources can thus be concentrated where they will most assist the commander to achieve his immediate aim.

A simple illustration of how obstacles may be used to support a counter-move option is shown in Diagram 1. Here it is assumed that the enemy wishes to reach the autobahn as an initial objective. The defending commander has too few troops to fight a positional defence and has opted to lure the enemy into a major tank ambush. The ground of tactical importance is Ridge A, however, enemy infiltration into the minor valley will be acceptable. The forward edge of Ridge A is defended and the combat team has carried out their own route denial. Sappers were tasked to:

(1) Use the railway line as a filter obstacle to prevent wheeled vehicles passing: a crater on the only road suffices.

(2) Delay the enemy advance in the open ground: real and phoney minefields between Village D and the lake will force the leading elements to slow down and converge between Villages A and D.

(3) Protect the move of the reserve force: a small minefield linking Village A and Ridge A achieves flank protection and deflects enemy away from the important ground. The phoney minefield between Villages A and B provides the reserve a clear frontage.

(4) Halt the enemy before the autobahn: a tactical minefield, linking the lake and Village C, combined with a stream and anti-tank ditch, will provide a difficult breaching problem for enemy engineers, yet offer protection for the depth combat team.

The purpose of the example is to suggest how obstacles can be used to delay, deflect, deceive and hold an enemy advance in support of a tactical plan. Without any explanation of scale, enemy strengths or engineer support it may still be apparent that the Sapper works involved remain considerable. Current organisations and equipment are capable of meeting the obstacle requirement, when well planned in peace and a period of tension permits preparation. Nevertheless the real test of mobile defence is how successfully the forces can react to the unexpected. Armoured and mechanised forces can be despatched quickly to counter a threat and Sappers can move with them. But once there, can they contribute quickly and effectively to the all arms battle? Regrettably, the answer must be no.

The Future Capability. Despite the mobility of armoured personnel carriers (APCs) and the power of combat engineer tractors (CET), field squadrons continue to depend heavily upon manpower and individual skills to complete their tasks. Fundamentally there is nothing wrong with this, as the soldier remains the most flexible and important asset on the battlefield. However, the imposition of rapid obstacles ahead of an advancing enemy requires the maximum amount of technological and mechanical support to the Sapper. Of course, such assistance could be usefully employed in the more deliberate obstacle plan to achieve the completion of the scheme more quickly. Whilst this is an attractive option, it would be unrealistic to hope that a major re-equipment programme could be feasible in the near future. The purchase of new items may therefore have to be limited to those required to support counter-moves.

In addition to the purely practical means of providing Sappers with a rapid obstacle capability, which are discussed later, there are steps which could be taken by tactical commanders to meet this aim. All will result in a reduced work load for

Photo 3. Definitely minefield country – but only if it is part of the tactical plan

engineers, releasing them to concentrate on the essential, rather than dispersing on the desirable:

(1) *Reserve Demolitions.* The lack of major linear obstacles and the accepted necessity to maintain unimpeded movement of our own forces suggest that there will be a much reduced requirement for reserve demolitions. These are expensive undertakings in terms of preparation time, explosives used and tied manpower. Any desire to dispense with them should be positively encouraged.

(2) *Phoney Minefields.* Once an enemy has experienced the horrific effects of modern anti-vehicle mines, he will be unwilling to be cavalier when dealing with future minefields. The phoney minefields can therefore become a potent weapon against his mind and an effective deterrent to his progress. Tilt fuse masts, manufactured in peace-time in workshops, and left conspicuously in phoney rows, will reinforce his reluctance to proceed. Tactical commanders should be convinced of the worth of phoney minefields and be willing to accept them in defensive schemes.

(3) *All Arms Tasks.* Assault troops and pioneers, in particular, must take a greater responsibility for obstacles in battle group areas. All soldiers should be able to lay, arm, sign and record mines and be able to effect simple route denial. Road blocks, nuisance mining and protective minefields will all add to the maze of obstacles which a potential enemy will face in an advance. Sappers released from these tasks, and from the requirement to blow preliminary demolitions (another task within the capability of all arms), can subsequently be used on the major framework of the obstacle plan or deployed to meet an emergency.

Once combat engineers are free to assist in the counter-move, their planning and equipment must be as equally quick and effective as the remainder of the force. However slick our manual procedures for design, resource allocation, and preparation of obstacles may be, they will all benefit from a degree of automation and mechanisation. Hence the purpose of the following paragraphs is to recommend what improvements are necessary and feasible to raise the standards of rapid obstacle development.

Terrain Information. The Terrain Analysis teams deployed at Corps and Divisional Headquarters have already made an impact. Their detailed work on specific ground-related problems has resulted in new information being available to tactical planners. From their efforts a new appreciation of the difficulty of the "going" can be obtained. Yet this can be taken further. It is possible to model the terrain's natural resistance to any form of vehicle and thus estimate how far an

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enemy may have advanced in a given time – without artificial hindrance. Time/movement contours can then be drawn, to show areas where an advance would be deepest. This information immediately reveals the very areas where artificial obstacles are most needed. On occasions when time is at premium, such as the unexpected break-through of an enemy force, the availability of these time/movement overlays will save precious hours of reconnaissance and map appreciation in deciding the position of blocking obstacles. These details could be held in digital form on field computers.

Resource Allocation. Royal Engineers have been closely involved in the development of *WAVELL*, the tactical command and control computer system. This is not surprising as there are considerable resources to be managed in the field by HQs RE. The provision of intelligent Wavell terminals in the Stage II system offers an opportunity to expand our use of this current technology to include real-time planning and resource allocation. There is no difficulty in writing a program which designs a minefield and states the manpower, time and stores options to meet the input requirement. Thus time/movement graphs held on the computer would identify where a minefield should be positioned, the computer will say what is required to lay the minefield and from its own memory it will know what is available, and can therefore recommend the best plan to follow. All of this, in less than the time it will take to type the requirement on the terminal keyboard! A similar program would provide rapid demolition planning, if microfiche demolition reports were to be transferred onto Wavell.

Scatterable Anti-Tank Mines. Common sense will reveal that scatterable mines can never replace the standard mine, but they are an essential supplement. When such mines are used in a disruptive, interdiction mode at long range, they are clearly not a Sapper responsibility. They must be our responsibility at combat range. In the close vicinity of the enemy, if not actually in the face of the enemy, the delivery system must be mobile and capable of operation from under armour, and the mine-throw should be in hundreds, not tens, of metres. The latter point is important to maintain the security of the dispenser vehicle, whilst meeting the need to scatter mines in depth. The delivery of this type of mine in front of an advancing enemy is very much more in keeping with mobile defence, than attempting to organise the construction of a rapid barmine obstacle in their path. Consequently the provision of a remotely delivered mine system at field squadron level will meet an evident need and contribute strongly to an all arms action.

Rapid Cratering. How long has the camouflet been in service? Any weary Sapper is likely to say much too long! Despite the welcome addition of the explosive Rapid Cratering Kit (RCK), cratering continues to take considerably more time than it need to in this technical age. Augers, mounted on the back of an APC and powered by the machine, seem to offer a simple mechanical solution. Alternatively, an improvement on the RCK would be to turn the concept into a single initiation, two-shot device, which requires the minimum of manual intervention. Either of these improvements would give combat engineers a true rapid cratering and route denial capability.

Explosive Ditching. Neither CETs nor existing plant can claim to provide anti-tank ditches as quickly as they may be required in front of an enemy thrust. Equally, any reduction in the time spent on anti-vehicle ditching in the planned framework of obstacles would also release the plant for other important tasks such as digging-in guns or headquarters. Yet there is one means of achieving rapid ditch obstacles that is not yet in service. This is through the laying and detonation of buried explosive piping. Trials have been conducted and initial estimates show a distinct time advantage over normal ditching methods. An additional benefit is that there is no ditch, and hence no hindrance to the movement of friendly troops, until detonation. Other political and tactical advantages will be accrued should this useful technique be developed.

These suggested improvements are not radical nor are they impractical.

Photo 4. "What I really need is a powered auger!"

However, they are essential if we are to play our full part in the mobile defensive battle. The present organisation of Sappers in 1(BR)Corps is both flexible and resilient, yet the capability to effect rapid obstacles is limited. The introduction of new equipment and techniques to meet the desired capability will not necessitate a major change to current organisations, but will result in increased effectiveness and confidence. Unfortunately, success in achieving the aim of providing a multiplicity of different obstacles, in support of a complex defence plan, will highlight a difficulty not yet mastered. This is the problem of how to record and report these obstacles and ultimately disseminate that information down to the lowest level which requires such details.

Obstacle Reporting. Currently, the only rapid method of disseminating the details and locations of obstacles is by passing grid references over the radio. These, of course, must be sent in code, and then decoded. There is plenty of opportunity for errors to arise in their passage and the more complex minefields may require long transmission times. Equally impractical are the methods of distributing overlays or *TACIPRINT* maps, as they will take much too much time and reproductive effort to permit dissemination down to section, tank or SP Gun level. A valuable attempt to overcome this problem was made in *MAGIC* (Minefield Approximate Grid Indicator Coordinates).

Several defence electronic firms already offer tactical message devices, which communicate over existing combat radio links. They consist of a simple keyboard and digital display, with a memory facility. The obstacle details can then be keyed into the device, checked for accuracy on the display, stored until several minefield or demolition configurations are entered on the memory and then disseminated widely in a burst transmission. This is but one use for such devices, which have been considered for many roles including mortar and artillery fire control, stores demands and patrol reports. The introduction of the *PTARMIGAN* trunk communications and *BATES* artillery control systems, allied with the expansion of *WAVELL*, provide a robust and comprehensive, high technology framework.

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Photo 5. "Well, Comrade Driver, do we go through it or round it?"

within which tactical message devices can readily operate. They would provide an almost instantaneous, all-informed means of obstacle reporting.

Deep and Devious. The opening quote to this article was delivered by Montgomery, having recently and successfully withdrawn his division through Dunkirk in the face of the German *Blitzkrieg*. He had experienced, at first hand, an armoured onslaught under enemy air superiority. Exactly the situation that 1(BR)Corps could face in similar terrain. His advice to site obstacles in depth, with cunning, must be relevant in Europe today.

Hopefully, this approach to obstacles in the context of mobile defence has been adequately presented in preceeding paragraphs. The evident necessity to maintain a reasonable balance between mobility and counter-mobility points to a system of obstacles more analogous to baffle plates than mighty dams. Inherent in this concept is the need to close gaps quickly, when the unanticipated has arisen. This is where attention must be focused in the future in order to provide Sappers with a rapid obstacle capability and an equally rapid means of relaying obstacle information.

Nevertheless, the solution to providing an effective obstacle scheme is not merely dependent upon the provision of new equipment. It begins with the combat engineer taking an active part in the initial formulation of a tactical plan. This will ensure realistic tasking of engineer effort and an unambiguous appreciation of the commander's aim. Inventiveness and imagination are then required to translate this aim into a series of obstacles which will surprise, deceive and hinder an enemy, whilst offering the minimum constraints to our own forces. Beyond this the Sapper must expect the unexpected. He should be prepared for his carefully designed scheme to be overturned, and thus hold his mind open to a selection of alternative options. Options that may have to be developed with an intense sense of urgency. When matters are so urgent it will be too late to ponder the problem, perhaps this article has provoked such thought now, to facilitate action later.

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The Lieutenant of HM Tower of London

LIEUT GENERAL SIR HUGH P CUNNINGHAM KBE

"Fortress, palace, home of the Crown Jewels and national treasures, arsenal, mint, prison, observatory, zoo and tourist attraction, the Tower of London has known them all during the 900 years since William I began the building to secure his own Capital and Kingdom."

So wrote His Royal Highness the Duke of Edinburgh in 1978, the 900th Anniversary of the building of the White Tower. Cut out "tourist attraction" and you find John Stow (1525–1605) writing much the same when describing the Tower of London towards the end of the reign of Elizabeth I. But even in those bygone days there were tourists of a sort; the Royal Menagerie, which had its first elephant in 1255 and lived in the Tower for 600 years before moving to Regents Park to form the London Zoo in the mid-19th century, attracted many visitors. It is certain too that since 1189 at least, the Lieutenant of the Tower has played his part to one degree or another in implementing, controlling and observing the variety of uses to which this great Royal Palace has been put.

The first Constable was appointed by William the Conqueror and it seems reasonable to assume that he had a second-in-command. There is however, no record of the appointment of a Lieutenant until 1189. Records remain sparse until the reign of Henry VIII, but from then until the present day the office has been continuously filled.

The Lieutenant's responsibilities seem always to have been those of a second-in-command to the Constable. In practice this has meant that when the Constable did not live in the Tower his responsibilities and his privileges devolved upon the Lieutenant. Whilst a number of later Constables took positive command of the Tower it seems clear that from Elizabeth I's reign onwards Constables gave up living in the Tower and local command devolved on the Lieutenant who lived in the Lieutenant's lodging (the present day Queen's House). During this period the Lieutenant enjoyed many of the Constable's privileges; the sale of the warders' appointments; the fees paid by State Prisoners (£20 for a duke, £15 for an earl and £10 for a baron or a knight); a toll on wine, oysters, mussels, cockles and rushes from ships entering London; all cattle falling off London Bridge, or carts falling into the Tower moat (*ME mote*) became his absolute property.

In the 16th and 17th centuries, however, records show that the Lieutenant had some additional and less attractive duties; in particular he was responsible for State Prisoners and their warders and was as well the Commissioner to Torture. In this latter respect there are a number of recorded instances when the Lieutenant was instructed to have the "Duke of Exeter's Daughter" (the rack which tortured by stretching the body) or the "Scavenger's Daughter" (an invention by a Lieutenant during Henry VIII's reign which tortured by crushing the body) ready for use in the examination of prisoners. From the days of William and Mary the Lieutenant gave up living in the Tower and the appointment became increasingly honorary.

Today the Lieutenant is a retired Army officer whose main duties are to act as Trustee on a number of Tower Trusts, to play an important part in the Installation ceremony of the Constable and be abreast of Tower policy and matters and thus available in case of need to take over the Constable's duties. In exchange for these responsibilities, the Lieutenant has a number of privileges of entry to the Tower which more than compensate for the duties. Any retired officer who is honoured by Her Majesty by being selected for the appointment of Lieutenant of Her Majesty's Royal Palace and Fortress of the Tower of London is fortunate indeed, he is permitted an association with one of our great national treasure houses which for over 900 years has occupied a unique place in the tempestuous ups and downs of the Nation's history.

The Royal Engineers Officers' Widows Society

MAJOR GENERAL A E YOUNGER DSO, OBE, MA

SOMETIME in 1983 there occurs the bicentenary of the first meetings of Sapper Officers at which the decision was taken to form a "Society for the benefit of the Widows of the Officers of His Majesty's Corps of Engineers". It took two years to work out the full details and, at last, a Deed of Settlement was produced which became effective on 7 April 1785. This appears to have been agreed to by the whole Corps, which amounted to sixty-eight Officers, of whom thirty-nine were married. (Of course there were no Other Ranks in the Corps at that time. It was not until 1856 that the former Companies of Artificers, but then the Royal Sappers and Miners, were merged with the Officer Corps and were honoured with the title of Corps of Royal Engineers).

Since 1769, Sapper widows had received a pension from the King. For example, a Mrs Bruce, widow of a Chief Engineer, was given £30 a year, but this was not particularly generous, even allowing for the value of money in those days. It speaks well for the *esprit* of the Corps then that members decided to assume collective responsibility "for the better support and maintenance of our widows". The amounts that each Officer agreed to subscribe were not inconsiderable, being 3d for every one pound of their pay, plus a levy, depending on rank, of:

Chief Engineer	£10	Captain-Lieutenant	£5
Colonel	£ 9	First-Lieutenant	£4
Lieut-Colonel	£ 7-10s	Second-Lieutenant	£3
Captain	£ 6		

Unmarried Officers paid half the levy.

It is interesting that the rank of Major did not exist in the Corps until 1872. In that year a Queen's Warrant promoted First Captains to be Majors and Second Captains, as Captain-Lieutenants were then called, to Captain. Majors were to be paid 15/- a day, equal to £273-15s a year. The subscription to the Widows' was still at a rate of 3d for each pound of pay, plus £6 for the married Major or £3 for the unmarried, making a total of £9-8-6 or £6-8-6. These sums equated to 12½ and 8½ days pay respectively. For one unit of subscription the Major of today is only asked to give the equivalent of half a day's pay if he is married, or one quarter if single.

The original Deed laid down that the Society would give widows £30 a year, to be paid out quarterly, and that "it is very probable that at the end of ten years the Fund will admit of the pension being augmented to £36 per annum". It was deemed to be prudent not to raise the pension to this higher rate until the accumulated investments had reached £14 000. In the event it took sixteen years to achieve this figure, and in 1811 the pension was increased to £40. By 1875, after 100 years of life, the pension had risen to £55 and now, after nearly 200 years, it stands at £180, plus an immediate grant of £500 on the death of a member.

It speaks volumes for the continuing good sense of the administrators of the Fund that its assets are now more than one hundred times larger than the original target of £14 000. At the most recent Trustees meeting, on 17 January 1983, the Chairman was able to announce that the current portfolio had reached almost £1.6 million, a figure that has been achieved with subscription rates that have hardly changed at all over two centuries, and in fact in some cases may even be lower in actual amounts than they were in 1785. If this standard of financial management can be maintained in the years ahead, members can expect to see a steady rise in the amounts of pensions and grants.

In the early days, the total amount subscribed each year was only just greater than that demanded by the widow's pensions. In 1812, for instance, widows

received £7757, a sum that was almost exactly covered by subscriptions. The cumulative investments, all in government stock, brought in an income of another £4900, which covered overheads, plus a small excess of income to be invested. To take an example 160 years later, in 1972 widows received £30 947 but subscriptions only amounted to £8865, whilst £22 897 was found from investment income. Today investments bring in just over £50 000 per annum. Of course the need for widows' pensions is quite different now. Recipients of King George III's original pensions would be very jealous if they could hear that when a modern Sapper dies his widow will receive a statutory pension, plus up to one half of her husband's pension, provided he had completed the qualifying service for it. However, this still represents a considerable drop in income, and the member of today can be justifiably grateful that a Fund, much of which was accumulated before he was born, exists to help his widow.

The size of the Society has always been modest. From the start of sixty-eight members, by 1815 it had risen to 237, of whom fifty-eight were married. In the following years of peace the ratio of married to single crept upwards, as might be expected. By 1830 there were 263 members, with 130 married, and in 1853 344 members, with 179 married. The Corps increased slowly but steadily in size up to 1914, when there were 1207 members, of whom 748 were married. Until then membership seems to have been approaching a hundred per cent, and it was still very high in 1939, but since the end of the Second World War numbers have decreased and in recent years have dropped below the 800 mark, compared with an eligible strength of about 1,500 serving and rather fewer retired Officers.

Casualties among married Officers in the wars after Waterloo were surprisingly light. The records show the following numbers killed;

Crimean War	1854–55	8	Matabeleland	1896	1
Ashanti	1874	1	South Africa	1896–1902	4
Zululand	1879	2	Somaliland	1902	1
Egypt	1882–1914	1			

Records do not include details of any casualties suffered by unmarried Officers during these operations. When the Great War came thirty-five married members were killed and, once more, an unknown number of unmarried.

The Society seems to have been well thought of, if only from the fact that Sapper Officers who resigned their commissions early regularly accepted the option open to them to continue as members. When this occurred, a member was obliged to increase his subscription to that of the rank he would have held if he had continued to serve. Promotion in those days was by time and was slow to say the least. In 1830 an Officer could expect to serve for four years as a Second Lieutenant, seventeen years as a Lieutenant, nineteen years as a Captain and finally up to sixteen years as a Lieut Colonel. If he lasted the course, he would have been well into his seventies before he retired.

After much discussion between the Wars, it was agreed that an immediate grant should be paid to all widows on the death of their husbands. This is now a major feature of the Fund and one of its great strengths, since a widow can be left in a most difficult and precarious position, particularly if her husband has died suddenly or without making sensible provision for her or both.

Many Sapper widows have benefited from the Fund for periods of half a century and over. The record is held by a Mrs M A A Yorke, whose husband died in April 1817, while she lived on until October 1885, having drawn the pension for over sixty-eight years! No other form of insurance would have done this for her, nor would it have paid an extra benefit for her children up to the age of eighteen. The average length of time for which widows have drawn this most useful increment to their finances since 1860 seems remarkably high, being just over twenty-one years, a benefit purchased by their husbands with no great hardship. It looks as though only the most resilient women are good enough to be wives to Sappers!

The original Deed for the Fund specified that there would be five Trustees, the

Chief Engineer, three other Officers to be elected at an Annual Meeting, and the Agent to the Corps. This Agent was the man responsible for collecting subscriptions from Officers and for all dealings with widows. Since 1875 the post of Agent has been held by a member of Messrs Cox & Co, Bankers, who became Messrs Cox & King and then Cox's & King's Branch of Lloyds Bank. For a paltry sum, successive Agents have taken charge of all these payments, as well as acting as Secretary at meetings of the Trustees. It is not too much to say that the smooth and steady success of the Society over certainly the last hundred years owes more to those who held the post of Agent than to any other. The Corps is deeply indebted to them for the marvellous work they have done for it.

Many legacies from both Officers and their widows have been left to the Fund. This generosity has been greatly welcomed but it has sometimes led to difficulties for the Agent and the Trustees. This is well illustrated by the correspondence over a legacy of £1500 given by Mrs M E Logie Pirie. In 1930 she informed the Society of this generous gesture and said that interest from it was to go "to the most needy widow on your list". However, when she died in 1934 it transpired that a general clause in her will stated that all her gifts were to be considered "void and of no effect if any recipient were a member of the Roman Catholic religion . . . or married to a member of that religion". Furthermore, if any recipient should "become a member of the Roman Catholic religion . . . or shall marry a member of that religion . . . then his or her annuity or interest shall cease as if he or she were dead."

Legally, the income from such a bequest for purely charitable purposes could claim relief from Income Tax, while the remainder of the Fund, which came under a different tax category, could not. Hence, after much correspondence with the authorities, the Society decided to set up a separate Benevolent Fund, which would be truly charitable, and therefore free of tax. This was later renamed the Samaritan Fund, which now stands at £165,000 and the income from this provides a means of helping to alleviate the problems of the ever increasing numbers of very old Corps widows.

Conclusion

Any endeavour designed to help people must move with the times or it will die. In recent years the Society has developed considerably, such as by permitting members to take up to ten units of subscription, instead of only one. Also the idea of commuting the pension for a lump sum has been introduced, but still the simple procedure is retained of accepting any Sapper Officer, regardless of the age of his wife when he eventually marries, a fact that makes it unique in the insurance world.

Minutes of Meetings held in recent years seem at first sight to reflect the development of a changing attitude to the Society. The original motivation of helping the widows of one's brother Officers, and incidentally one's own widow, appears to be reversing towards an attitude in which the primary influence is "what's in it for my wife?" Yet, when asked, Officers do show a most positive and generous attitude in accepting that the lucky survivors in any conflict should help the families of those less fortunate. The old sense of responsibility is still there. Perhaps the Corps has been mistaken in trying to put the Society over to young Officers in terms that are too materialistic, an approach in which it is bound to run second best to the huge insurance companies, with their glossy brochures and smooth advertising techniques.

Over two centuries the Corps has shown that it can manage financial resources well. Now that the sum invested is so substantial, the important thing is that membership should be kept up, because, whatever its assets, lowering the membership continually must drain the life from the Society. Our forbears showed a praiseworthy urge to watch over not only the wives of their own generation but of ours as well. We, in our turn, must do our best to match their vision with a determination to carry the work forward for the benefit of those who will follow us.

* * * *

Unit Training in BAOR—How to Defeat the Ostrich Complex

MAJOR M A EVANS RE, B Sc

The Author was commissioned from RMA Sandhurst in July 1966. He attended No 22 Degree Course at RMCS Shrivenham. He was a Tp Comd in 60 Fd Sqn. Sqn 2IC of 11 Fd Sqn and then returned to the RMAS as an Instructor in New College before attending Army Staff Course No 14. Since Staff College, he has served in 1 Armd Div HQ as GSO2 and has Commanded 39 Fd Sqn in BAOR. He is now in MOD.

INTRODUCTION

In an ideal world unit training would follow a regular pattern. It would flow from individual through section, troop, squadron and regimental training to formation field exercises. Training is a command function. Unit and sub unit commanders would work to clear, achievable and stimulating aims. They would train their own men with lively programmes, conceived and planned well in advance. Commanders would have their own training in CPX's, TEWTs and Study Days carefully dovetailed into the flow of activity. Time would be available for reconnaissance, stores preparation, briefing and debriefing of all involved in the cycle. The end product would be a very well trained unit, closely knit and confident in its ability to carry out its role.

Sadly however, many units seem to fall well short of this ideal. Problems created by restrictions on fuel, track miles, ammunition, stores and training areas have led to an air of helplessness in progressive training or worse still to the idea that the ostrich has got it right! The restrictions are here to stay; so the ostrich approach must be beaten. How can we make the best of our resources? The purpose of this article is to present unit and sub unit commanders with some thoughts on the basic principles of planning training and to provide a few suggestions on how to beat the restrictions.

THE DESIGN STAGE

There is no single panacea to the malaise of badly planned training but there is one stage in the process which if properly done will produce a big improvement. It is the basic design or training appreciation. This design stage is a commanders personal responsibility and it presents an opportunity for a mind clearing exercise. There is no short circuit; to take one would be to "situate the appreciation" and would quickly result in a meaningless sequence of disjointed events with subordinate commanders and staff lacking direction.

The first step in the design stage is for a commander to select the basic training aims for his unit for a particular period of time usually at least one year ahead. These aims must be kept simple, relevant to the unit and above all achievable so that people will feel that they have reached a goal. This does not mean that training should not be ambitious, on the contrary, to be stimulating it must be demanding, but the aims must be kept limited. If the unit role covers many facets then it might

be better to concentrate on a few and avoid the temptation to cram in too many. The others can be left to the following year or examined in terms of a one or two-year cycle. These basic aims must then be placed into a strict ranking order so that the end product of this first and most important step is a short list of aims by priority.

The next step is to identify the aims and events imposed on the unit from outside. There will be the normal mandatory training requirements and in addition there will be a list of Site Guards, TEWTS, CPXs. FTXs, Northern Ireland tours, Falkland tours and Training Directives all issued by the next higher headquarters. Some of these dates may not be known but at least a bracket will be available. Some features may clash with the earlier short list. Conflict could occur in both the aims or in time, and resolution will mean referring back to the higher commander. At the same time, the higher commander should be asked to discuss his priorities and he may willingly adjust these in the light of particular unit problems. His directive, perhaps daunting reading at first, has to cover many units at different stages of training. The end product of this second step should be a combined, balanced list of aims and key events in priority order.

The third and final step of the design stage is to work out the sequence of events required to meet the aims. For example, if an objective is to be able to carry out a combat team quick-attack in under half an hour from contact then it will require periods of section, troop, platoon and combat team training with several field exercises. Each event needs time and all must be fitted into a balanced, flowing programme. It should be possible to select a high point in the period. This would be a point towards which most of the training would be directed and it would draw together several strands of activity. By working back from the high point, the programme will achieve the required balance and flow. Care must be taken within a unit to allow for varying standards, for example two companies may have just been to BATUS (British Army Training Unit Suffield) and it may be some time before the others have the opportunity.

The design stage should now have produced a sound basis for more detailed planning. But it is this design stage which seems to be missing from many programmes today and yet to plan without it is like writing an appreciation without an aim.

TRACK MILEAGE AND FUEL

The varying restrictions on track miles and fuel present one of the biggest problems in planning unit training in BAOR. It might appear that a reasonable start point would be to assume that the unit would receive the same allocation of both commodities as in the previous years but this is not always the case. By now every unit should have accumulated data on detailed usage. For example, figures should be well known for consumption on a regimental call-out practice, for a two-week combat team training package, for routine barrack maintenance of vehicles or for a Brigade CPX. This data is useless if it cannot be retrieved easily which means that each headquarters needs to identify the information it should hold for a sensible allocation of fuel and track miles. This, in turn, means that manpower and time must be allocated to the collation of the data and monitoring of consumption. The penalties are more than offset by the resulting rational distribution of the resources. The US Army has for many years controlled fuel and track miles on this functional basis because of their financial accountability and we might well benefit from US experience. It would be interesting to ask who holds this sort of information in British units.

Each event in the programme needs to be carefully checked for the amount of fuel and track miles that it will or will not need. The use of rail flats or transporters must be examined and so must the use of wheeled vehicles instead of tracks. Once again, balances will have to be struck, for example between economies found by using rail flats with the time penalties involved in loading and unloading. But eventually the detailed allocation must be on a functional basis and it must be carefully monitored. It is common to find reserves at every level but all headquarters

must guard against holding too large a reserve only to find that they all distribute them together late in a training year. Nothing can be more frustrating for a unit than to find that, after it has pruned training and carefully husbanded its resources throughout a year, it should be given a large amount of fuel to consume in the last weeks of March.

STORES AND MATERIAL

The heading Stores and Material covers a wide range from live or blank ammunition to bridges or spare parts. Expendable items such as ammunition should be allocated on the same functional basis as fuel and track miles; essentially one of distribution to meet the priority demands. Returnable stores are less straightforward to manage and will often involve a higher headquarters in resolving conflicts in allocation. Engineer stores are a good example; in general each regiment or indeed squadron will have periods of concentrated use of large amounts of stores including mines, bridges and trackway. A limited number of these equipments are held and clearly all regiments cannot use them at the same time so the periods of concentration of regiments must be staggered. This links back to the design stage and the need for close consultation with higher headquarters. Shortages can be overcome by slipping dates or by local manufacture but eventually a situation will arise when the material needed cannot be obtained in sufficient quantity. When this happens, a commander must decide whether or not training on the reduced scale is worthwhile. It is often better to delete training rather then make it unrealistic for lack of stores. The cancellation, with its penalties, must be made known to the higher headquarters so that corrective action can be taken for the future.

TRAINING AREAS

Early planning will allow plenty of time for booking military areas and for "443" action. The allocation of military areas should be dealt with in much the same way as returnable stores, that is to say not everyone can use them at once. There is a lot of scope for saving time when planning the use of training areas. Most units keep records of their exercise packages for particular areas and these could be drawn into area libraries or simply lent between units. When military training areas are not going to be available at the right time then the use of "443" areas offers some excellent alternatives. However, such areas suffer from the obvious limitations on damage, particularly to crops. But by careful thought in the design stage it is possible to avoid the critical damage periods and get excellent training. January and February are usually free from hindrance. This reinforces the need to avoid binding the training programme to a calendar year or even to a one year cycle.

MANPOWER

The apparent lack of men on first parade is a constant headache. Leave, courses and centrally employed soldiers take a heavy toll on troop and platoon strengths. Team training is disjointed and almost unworkable unless leave is stopped, centrally employed clawed back and all but career and pay qualifying courses suspended. But given the 25% manning threshold if too much time is booked for maximum attendance then it becomes impossible to give everyone their full leave entitlement. About two months of blocked time is a maximum. Provided that the programme is published well in advance, no-one will feel hard done by. Indeed the converse is often true, men welcome the opportunity to plan holidays or leave and courses can be booked to fit the programme. Ironically it is often courses that require the longest lead time of all the programmes elements.

ALL ARMS TRAINING

The best training is often that conducted within the unit itself. Small scale exercises have few overheads and a lively pace can be maintained. Eventually the scope has to be broadened to include all arms training but it is important to wait until the various elements have done their own work-up training. Also, because armoured vehicle training is a heavy consumer of fuel and track miles, it may well be that some elements have not done as much training as they would have liked. A period of all arms training should therefore include at its start an opportunity for a short

period of special to arms training. Supporting arms should receive, as part of their functional allocation, an allowance of fuel and track miles to take part in all arms training as well as their own special to arms training.

A logical progression from basic all arms training is formation FTXs. However, it is generally true to say that the larger the exercise, the less value it is to individual units. Also, the overheads of umpires, controllers and damage repairers have increased heavily over the last few years. Perhaps the time has come to have a fundamental review about large FTXs, not only in terms of manpower but also the timing. There is a case for suggesting that the largest routine FTX should be at Brigade level. Brigades are once again tactically balanced and although their logistic support is largely inorganic, it could be tailored to support such exercise. Winter should also be examined for FTXs both for reduced damage and for cold weather training.

COMMANDERS

Good forward planning will generally reduce the overcommitment of commanders at all levels. However, commanders themselves have to be trained and time must be allowed in the programme. One fortunate aspect of the training of commanders is that it can be done with very little consumption of fuel, track miles and stores. But it will remain essential that commanders plan their own time carefully and allow for events that absorb management, for example audit boards, TEWTs, PQS training, CPXs, confidential report writing periods, operational recces, parades, inspections and open days. It is equally important that commanders at all levels remain practiced in the art of delegation and avoid overcommanding. Junior commanders will have to learn to manage resources carefully and keep equipment serviceable and the sooner they are given the responsibility the better. Also, commanders and staffs should beware the pitfall of trying to fill what appears to be blank spaces in unit training programmes.

THE UNEXPECTED

It would be unreasonable to expect any training programmes to survive without occasional changes or additions but a carefully designed programme can cope with the unexpected more easily. There is a strong case for building buffer time into a programme so that it can absorb minor fluctuations. But when cases occur of significant change, then such changes should be based on the assumption that something else will have to be deleted. This will almost certainly involve balancing the merits of the change and consulting the next senior commander on the implications. But the whole point of forward planning is to reduce the number of overlooked, last minute commitments and only cases of genuinely unpredictable change should be considered. This is not to say that the programme should not include an element of surprise. It is perfectly possible and often desirable to throw a surprise exercise but the commander must plan it carefully and it must still fit into a logical flow.

SUMMARY

The essential features of a training programme are that it should have clear, achievable aims and be carefully balanced in its flow to reach those aims. Priorities should be given so that limited resources can be properly allocated and made available at the right time and in the right place. Any skimping in this important design stage produces a cluttered, disjointed programme which inevitably leads to a dangerous spiral in which commanders spend more and more time unravelling the hand to mouth affairs of their unit instead of planning ahead. This is, to varying extents, true of commanders at all levels and it is soldiers who suffer. Fuel and other commodities are very scarce but that does not provide an excuse for bad planning.

Once the design has been completed it should be presented to the next senior commander; he has to be involved because training is one of his principal functions.

To step off the spiral is not as difficult as it may seem, to do so may mean cancelling the diary for next week but the whole of next year would benefit.

Satellite Point Positioning Equipment

MAJOR I F G WHITTINGTON RE, B Sc, MIOP, MBIM

Commissioned into the Corps from RMA Sandhurst in 1966 the Author served in Airfield Squadrons both before and after obtaining his B Sc (Eng) from RMCS Shrivenham in 1971. An Army Survey Course in 1973 was followed by three years as an Assistant Divisional Officer at the Ordnance Survey before commanding the Cartographic Squadron of the Royal Australian Survey Corps while on a two years exchange appointment. On returning to UK in 1979 he spent 2½ years in MOD Svy 2a before moving to Washington DC, late in 1981, to assume his current appointment in HQ 512 STRE, which celebrates its 20th Anniversary this year.

The United States Navy (USN) Navigation Satellite System, TRANSIT, has been in continuous operation since 1964. Initially it was used only by USN ships

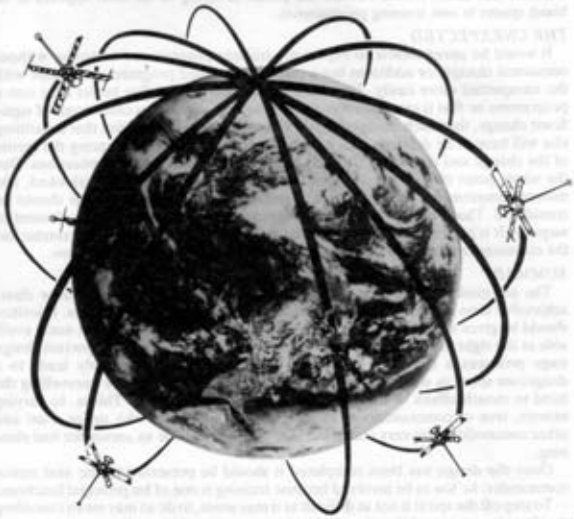

Figure 1. TRANSIT satellites are placed in circular polar orbits about 1000km above the earth

and submarines to provide navigational fixes throughout the world, but in 1968, the first manportable receiving equipment became commercially available. This equipment could be set up at a remote site to gather and record satellite doppler data over extended periods of time. When this data was reduced, a three dimensional point position fix of great accuracy could be produced.

The TRANSIT satellites in polar orbit, at an altitude of about 1000km (Fig 1), enable a fix to be obtained at about ninety minute intervals from their 150MHz and 400MHz frequency transmissions at any point on the earth's surface, in any weather, twenty-four hours a day. The system is designed so that each satellite transmits timing marks at two-minute intervals and a navigation signal that describes the satellite's position at each timing mark. By receiving these signals, the observer learns the exact position of the relevant TRANSIT satellite and, as the receiver equipment accurately measures the distance between the known position of the satellite and its own ground position, the co-ordinates of the ground station can be computed.

FIELD OPERATION

The equipment is operated in the field by a two-man survey team with a minimum of special-to-equipment training. Once programmed by the operator, the receiver is capable of anticipating the arrival of an appropriate TRANSIT satellite

Figure 2. Magnavox MX 1502 Receiver/Processor

Satellite Point Positioning Equipment 2

and will only run itself at full power during the actual satellite pass. As it records the satellite data in its memory, it simultaneously writes the information on the built-in cassette tape. The tape is then partially rewound and the record checked against the memory. Should there be any difference between the records, the system "alarms" to alert the operator to take corrective action. In addition, the system provides a real time display that the operator can use to ensure the validity of the data and to provide a manual record in his surveyors field notes.

The MX 1502 automatically tracks the 150MHz and 400MHz phase-modulated satellite signals, enabling the processor to correct for ionospheric refraction and to compute the satellite's true position. During an average acceptable satellite pass, the satellite will remain above the horizon for about twenty minutes during which time it will have provided a base line of some 7000km. From the doppler shift, the MX 1502 will automatically calculate the exact position of its ground station, relative to the path of the satellite. The real time display on the MX 1502 can be programmed to provide either three dimensional or two dimensional results in the Universal Transverse Mercator (UTM) grid reference system which is the system used on the majority of NATO land maps. The point position co-ordinates displayed, accurate to ±5 metres, can then be used as a reference point for other conventional surveys. Alternatively, the data recorded on the tape cassette can be post-processed to provide the greater absolute or relative accuracies mentioned above. With suitable ancillary equipment, the tape cassette can be read onto ITT standard five-hole paper tape for direct transmission over TELEX or signal channels to provide for rapid post-processing of the data.

FUTURE DEVELOPMENTS

The United States Air Force (USAF) is currently developing a satellite navigation system, NAVSTAR Global Positioning System (GPS) that will eventually replace the USN Transit system. The concept of the GPS system is similar to that of the NAVSTAR system but more comprehensive. It will be a world wide system, supported by eighteen satellites in high altitude orbits of 20 000km, designed to give an observation time to each satellite of about eight hours (compared with the twenty minutes obtained from TRANSIT). The GPS receiver is designed to be able to listen to a number of satellites simultaneously, hence will provide a more accurate position fix in less time. Current prototype receivers are similar in size and accuracy to the MX 1502, but the production sets are intended to be no heavier

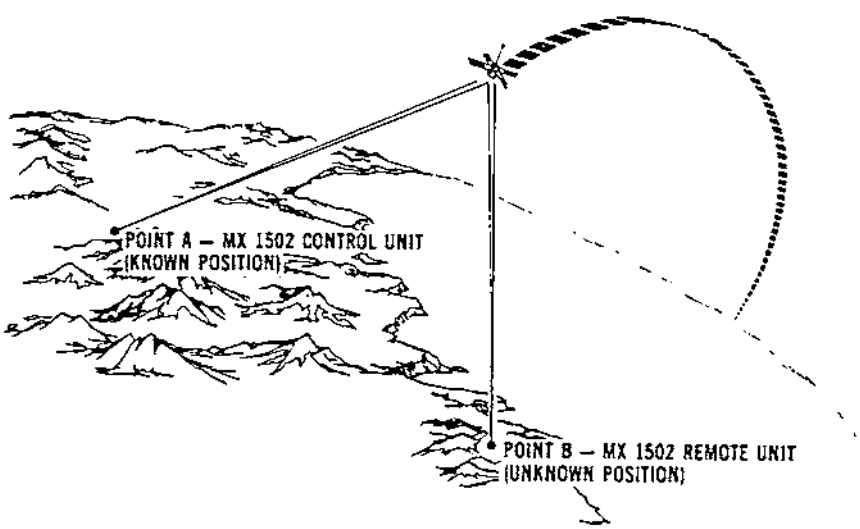

Figure 3. Translocation technique

Figure 4. MX 1502 Field Section

than 4kg and about 200mm square. It is intended that the real time accuracy obtained from a GPS set will be similar to the post-processed accuracy of the current MX 1502.

SUMMARY

The Magnavox MX 1502 satellite receiver provides a two-man survey team with a portable equipment capable of providing a real time point fix to ±5 metres. The doppler data recorded on the cassette tape can then be post-processed on a mainframe computer to give a DGPP fix to ±1·5 metres. By positioning one MX 1502 on a known base station and a second MX 1502 on an unknown station, the position of the unknown station can be translocated, by post-processing of both tapes on a desk top computer, to a relative accuracy of ±0·5 metres.

DOPPLER GEODETIC POINT POSITIONING (DGPP)

The distance between the satellite and the receiver is deduced from observations

of the doppler shift on the incoming signal, which is a unique function of the observer's position and the known orbit of the satellite. As the satellite approaches the receiver, the observed frequency of the incoming signal is artificially increased by more cycles per second being received than were transmitted. This increase is due to the shrinking distance between the satellite and the observer causing the satellite to catch up with its own signal. In effect, as the approaching satellite covers a distance equal to the wavelength of its signal, one additional cycle of the signal is received by the observer. This increase in frequency, known as the doppler frequency count, is a direct measurement of the change in distance between the satellite and the receiver over the period of time of the doppler count. In addition, the unique point at which the satellite is at its closest point to the observer can be detected by the doppler shift point when, as the satellite passes its zenith and then starts to move away from the receiver, fewer cycles per second are received. This is the doppler effect that is best known from the change in pitch of a train whistle as it passes through a station.

MAGNAVOX MX 1502 SATELLITE RECEIVER

Second generation satellite receivers have now become available commercially. One such set is the Magnavox MX 1502 illustrated at Fig 2 which has recently been brought into operational use by 512 Specialist Team RE. 512 STRE is a tri-service unit, that operates world wide from its base in Washington DC, undertaking geodetic surveys using DGPP techniques to strengthen or extend existing survey control networks. The MX 1502 is a compact, versatile satellite receiver that can determine, with the first acceptable satellite pass, its position to within ±30 metres anywhere on the earth's surface. This first rough position is sufficiently accurate to verify that the correct ground station is being occupied. Thereafter, the position accuracy improves with each successive pass of a TRANSIT satellite, to give a real time accuracy, in three dimensions, to ±5 metres from 25-40 acceptable satellite passes. This absolute accuracy can be further refined to ±1·5 metres by post processing the data recorded on a mainframe computer.

A greater relative accuracy can be obtained by positioning one MX 1502 receiving at a known datum station, while a second receiver occupies the unknown station(s) (Fig 3). The data from both instruments can then be post-processed on a desk top computer to provide a relative accuracy of the unknown station to ±0·5 metres.

The Magnavox MX 1502 has been designed by the manufacturer to be rugged and portable. It comes in two manportable containers, one containing the receiver/processor (19kg, 406mm × 353mm × 302mm) and the other containing the antenna/preamp (7·7kg, 597mm × 241mm × 241mm). In addition a conventional 12VDC 100 Amp-Hour battery is required to power the equipment.

UNFICYP—A Sapper's Eye View

CAPTAIN D G H PHILLIPS RE, B Sc

EVER watchful, ever present, around the clock 365 days of the year, the soldiers of the United Nations Force in Cyprus keep the peace between the Turkish Army and the Greek National Guard. The battle lines have been drawn in this configuration since the Autumn of 1974 when the news media of the world presented film to the masses, showing a classical bridgehead operation involving paratroops and marines landing on the beaches of northern Cyprus and the refugees of war trickling south or north depending upon their allegiances and the European dependants standing on the beaches, waiting for a British Frigate to whisk them away from the "invading" hordes. Most people understand and recall the events that resulted in this action by the Turkish Mainland Army whose masters sent their Peace Keeping

Intervention Force to occupy and protect the Turkish Cypriot inhabitants. Recently some people saw parallels to the Falklands crisis, not least the Field Commanders of the Turkish Army.

But what is the Sapper involvement in the United Nations? Everyone in the Corps has heard of the Cyprus Squadron–62 Cyprus Support Squadron based at Dhekelia; but not many know of the two Royal Engineer Detachments with the UNFICYP troops on the Central Plain. The two Detachments fulfill separate functions and are based with the roulement Sector 2 Battalion and the UNFICYP Support Regiment, respectively.

The Sector Engineer Detachment has the role of directly supporting the Infantry Battalion by repairing and maintaining all Observation Posts (OPs) and Base Camp Areas, together with all services to those structures, for example; the electricity, gas, water, sewage and minor repairs to fuel points. This Detachment must also construct one major and several minor projects during its six months stay on the island. It also provides the normal Sapper Operational Engineering Support to the Battalion and indirectly supports other Nationalities. The strength of the Detachment is only one Officer, one SNCO and ten ORs. The tour is a challenge to each individual, of his knowledge and expertise on a wide variety of specialist subjects and gives each Sapper a chance to become fully integrated into the ways of a modern Infantry unit.

The second Detachment is found in the Support Regiment. Its role is to maintain and service all DOE acquired kitchen appliances throughout the Force and provide Engineer Support to the Headquarters using both civilian and military labour.

Each Detachment works for a single co-ordinator called the Force Engineer, a Canadian Engineer Officer with many years of experience, but are responsible to different Commanding Officers. An arrangement which, as every Sapper knows, causes dilemmas of direction.

The job of Sapper within the Force is a much envied by all, from the lowliest Infanteer to the highest Officer because we have a constructive, and sometimes destructive, role which leaves its mark on the land either in the form of buildings or facilities, or roads and fences. Others succeed by doing "nothing", that is to say, a soldier who stands in an OP all day and sees nothing or hears nothing contravening

Photo 1. Ever watchful. Ever present. Observer at OP B23

UNFICYP-A sappers eye view 1

Photo 2. OP B23. Scene of many protests about water poisoning by UN soldiers. There is no need to add that these rumours are untrue

the Cease Fire agreement between the two opposing forces, has succeeded in keeping the peace. A difficult imbalance to contend with in the bars at night!

But the tour must be regarded as an experience of a lifetime! The friends made; the situations and feelings experienced; the memories that will be kept for the rest of your life. During the last winter tour, when members of 52 Field Squadron (Construction) RE were sent in support of the 2nd Battalion, (The Queens Regiment), they had the experience of previous Squadron involvements, and even members of the previous winter tour to rely upon, for the important facts of survival—the best eating places, the best bars, the most topless beaches for when the weather improved—and a knowledge of the job which is normally unavailable because so little information has been put on paper.

To say that we landed on our feet is an understatement. The villagers of the local area quickly associated themselves with us and the friendships made with the communities of Cyprus will always be memorable. But even more so, the interactions between the various Engineer contingents within the Force. It has become almost unwritten in the acceptance of the social group known as ENGCON. The parties and "BBQs", the inter co-operation and sharing of knowledge between the different nationalities, Danes, Swedes, Austrians, Canadians and ourselves, meant that each contingent had a library of knowledge unsurpassed for a Detachment of only twelve persons in each Sector.

However, the greatest breakthrough and experience of the whole tour was the invitation to dinner with the Turkish Engineer Company. The guidelines are very clear. No fraternisation with either side in unequal shares. In the British Sector this was achieved and showed the cordiality of the relationships that existed. The Turkish Forces have never been much for fraternisation, especially because it would weaken the channelled awareness of their soldiers to the prevailing situation in their area. But for many reasons, most of which resulted from contacts with their various military agencies, the barriers to friendship were dropped and the British and Danish Engineer Officers became frequent visitors to the Turkish Engineer Mess at Morphou Bay for lunch, dinner, parties and celebrations. The information gained, the trust achieved and the assistance with technical problems freely given.

UNFICYP-A sappers eye view 2

Photo 3. The good times and the bad. A tower OP at B33 with a safety bunker underground for when shelling starts

made the task of keeping the peace from a Sapper point of view an easy task.

The life of a United Nations soldier is mundane and boring, it has its difficulties and its problems, and requires a dedication to the aim by everyone for that hope of peace to be achieved. But it has its fantastic high points exemplified the day the Turkish Liaison Officer arrived at our base carrying a bottle of Raki to celebrate my promotion. The soldiers of 52 Sqn Winter UN Detachment wished the men from 20 Field Squadron RE, who relieved them in Cyprus, luck when they arrived and hope that they feel like volunteering again when they return. An opportunity of a life-time never to be missed!

UNFICYP-A sappers eye view 3

RE Sponsored Units—An Explanation

LIEUT COLONEL H E VIALOU CLARK RE, B Sc (Eng), C Eng, MICE

The Author is CI CVHQ RE. He was commissioned from Sandhurst in 1960 and after taking a degree at RMCS joined The Gurkha Engineers on active service in Borneo. He was 2IC 30 Fd Sqn in 1968 and then attended the Long Civil Engineering Course. Tours as an AI at Chatham and OC 522 STRE (Const) followed. He returned to command 67 Gurkha Fd Sqn in 1974 and was then posted to DCRE/AWO PSA Nepal. In 1979 he was promoted to Lt Col and became the first CO of 40 Army Engr Sp Gp in Willich.

In 1983 the Territorial Army celebrates its 75th Anniversary. There will be much publicity given to the occasion and plans are afoot for the Royal Tournament to include a pageant depicting the invaluable contribution the TA has made to the defence of the Nation. Despite all this there remains much confusion in the minds of Regular Officers as to the roles, conditions of service, motivation and desirability of maintaining "weekend soldiers". This short article attempts to add to Brigadier Willmott's article, June 1982 issue of the *RE Journal*, and to concentrate on the Sponsored Units of the Royal Engineers.

Sponsored Unit's history dates from comparatively recent times. In 1950 the RE Supplementary Reserve (SR) Permanent Cadre formed in Deverell Barracks, Ripon. In the following year this Cadre, which was later to become known as Central Volunteer Headquarters (CVHQ) RE, raised 111 Engr Regt (SR) from the ashes of 111 (South Midland) Fd Engr Regt (TA), and 130 Construction Regt (SR). Other units were raised at the same time but have since been disbanded. In 1952, 120 Construction Regt was added and the Geologists Pool followed in 1953. In 1957, 501 STRE (Bulk Petroleum) and 503 STRE (BP) were sponsored by Esso and British Petroleum and between 1960–1978 the remaining units and individuals were added. TA soldiering remains today a growth industry. We raised the first Sponsored Airfield Damage Repair (ADR) Squadron on 1 April 1983 and will raise two more thereafter for three years. CVHQ will recruit and administer these new units and their technical training will be controlled by HQ 12 Engr Bde (ADR) at Waterbeach.

As the years go by and their history becomes longer I believe we can become prouder of our achievements. The units form vital parts of complex military ORBATS dedicated to the defence of NATO. Technical expertise is, in many cases, as good as or better than anything found elsewhere in the Corps. Military awareness is not so good but renewed emphasis is being given to this essential aspect. The wastage rate of trained soldiers has always been lower than in "Independent" (or non-Sponsored) units—about 10% against 30%. This inevitably means more effort can be devoted to progressive training. The quality of the man we recruit is, by virtue of our huge nationwide recruitment area, likely to be somewhat better than in the case of those units restricted to much smaller geographical areas.

RE Sponsored Units-An Explanation Lieut Colonel H E Vialou Clark RE B Sc C Eng MICE

What Sponsored Units exist and what do they do? In theory, and in many cases in practice too, most officers and soldiers joining Sponsored Units bring with them from civilian life engineering skills which, when properly harnessed, can be used to the benefit of the units they join. This is particularly so in the case of the Specialist Teams RE (V), (STRE(V)). The reader will perhaps be surprised to note the large number and variety which are established and which exercise their talents in the various functions suggested by their titles. 501 STRE (Bulk Petroleum) (V), 502 STRE (BP) (V) and 503 STRE (BP) (V) recruit almost exclusively from Esso, Shell and British Petroleum respectively. Two of them support RAF (G) in war on our four main airfields, and one the United Kingdom Mobile Force (Land) (UKMF(L)).

504 STRE (Power Station) (V) is a unique small unit which goes to war with the UKMF (L) and is capable of operating small static and field power stations and repairing underground and overhead high tension lines. Most of the men are recruited from the Central Electricity Generating Board. 505 STRE (Engineer Procurement) (V) also goes to war with the UKMF (L) but provides direct support to 111 Engineer Regiment (V) about which more later. This STRE consists of only one Officer and four SNCOs and is responsible for obtaining engineer material from the host nation.

506, 508, 525 and 526 STRE (Works) (V) operate in the Rear Combat Zone (RCZ) and Communication Zone (Comm Z) in BAOR forming an important part of the Military Works Force. They combine the three major engineering disciplines of civil (C), mechanical (M) and electrical (E) engineering which are so vital in war. 507 STRE (Railways) (V) has the important role of the maintenance and repair of permanent way in British installations in BAOR. As one would expect most of its men are recruited from British Rail. In addition there is a small band of, as yet, unestablished TA Well Drillers who form part of the regular 521 STRE in war. The established strengths of each STRE vary slightly according to discipline but are between twenty and thirty-two, except in the case of 505 STRE as previously mentioned.

The last group of specialists is the Engineer Specialist Pool (ESP). This consists of sixteen Officers all of whom have reached notable positions in their civilian occupations and who operate as consultants to the Corps. There are six Geologists, two Quantity Surveyors and eight C, M and E specialists. The Commander ESP, a TA Colonel, is responsible to Commander CVHQ RE (a regular Brigadier) for the correct deployment and technical capability of the ESP and all STRE (V). A Deputy Commander, also a TA Colonel, has the ultimate responsibility of advising Commander CVHQ on all RE Sponsored Unit matters.

Turning now to the only RE Sponsored Regiment, 111 Engineer Regiment (V). It consists of 34 + 551 officers and men who form the RHQ, 120 and 130 Fd Sqns (V) and 198 Engr Pk Sqn (V). The aim is to recruit only those soldiers who can bring with them their civilian skills which can be put to use in a unit. In the '70s this was not always achieved but now, largely due to a vastly increased waiting list, the imbalance is being corrected. Those skills which the Corps demands but which have no civilian equivalent, such as Combat Engineer and Combat Signaller, are taught on successful completion of the recruit course. This article is not the place to discuss the finer points of each course or subject. Suffice to say that in the main it takes a man one year to become a trained soldier (having passed his recruit course) and a further three years to become fit for role (having achieved Class 3 level in his trade). Recruit training is undertaken by 1 Trg Regt RE and the bulk of the remainder by the small CVHQ staff at Minley Manor. Regular attenders and those with long service eventually reach Class 2 and 1 standard. By this time we hope that promotion has kept pace with trade qualifications and so whenever possible these men are used as instructors.

As explained in Brigadier Willmott's article, obligatory training consists of a Spring and Autumn weekend and a fifteen-day annual camp. In the Spring, trade

training is undertaken and in the Autumn the military survival skills are taught and practiced. Annual Camps for each unit are planned on a three-year cycle. For two years the units train in their operational theatres usually as part of a major FTX and in the third year STRE(V) go to such places as Cyprus, Hong Kong and Gibraltar and 111 Engr Regt train together under command of the CO. In 1983 111 Regt trained in Scotland along the Southern Uplands Way. In the case of Officers, WOs and SNCOs we expect an additional attendance of two, three or more weekends and in most cases this is achieved.

I suspect most Regular Officers who have had no contact with the TA will wonder, as I did, what motivates this assortment of Geordies, Cockneys, Channel Islanders, Norfolk and Devon farmers, hoteliers, plumbers and dental hygienists. The reader who desires a precise, all enveloping answer will, I fear be disappointed. There are some who join for the beer, the adventure and travel to sunny climes and others for the pay. Some want to "get away from the wife" and others wish for different or additional responsibility. I have known some who desire the prestige that rank can attract and others who enjoy the thought of having "something after their name". The majority join because there is a deep-rooted desire to be members of a well-lead team of like-minded friends who respect each other and who can understand the importance of what they are doing.

Countermobility – The Third Dimension

LIEUT COLONEL J D R STREETEN RE MA

The Author started his Sapper career as a Tp Comd in 9 Indep Para Sqn following 2 years at Sandhurst and 3 years at Cambridge. A Long E&M Course, a tour as 2IC 60 Fd Sqn at Maidstone, and a spell as an Instructor at RSME accounted for the next 5 years, after which he attended the Staff College. He graduated from Camberley into a staff appointment in HQ E-in-C and was then posted to 64 Amph Engr Sqn as OC. He then served 18 months on the staff of the Battle Group War Game at RARDE before taking up his current appointment in July 1982 as the Army DS at the RAF Staff College.

A "FLYING TANK" is how the Soviet *HIND* helicopter was described in a recent issue of the *Journal of Recognition*. The Royal Armoured Corps may not like this description, but there is no doubt that the heavily armoured Hind is a formidable combination of firepower, protection and mobility which would present a serious threat to NATO forces in any conflict with the Warsaw Pact. Since its appearance in 1974, it has undergone four stages of development, and it is believed that so far more than 1000 have been produced. Together with the lighter but no less deadly *HIP* (over 7000 of them), they provide the Warsaw Pact with a highly effective fleet of battlefield weapon systems.

Countermobility The Third Dimenstion Lieut Colonel J D R Streeten RE MA

The inherent complexity of helicopters, their expense and the problems of pilot selection and training would seem to go against Soviet military philosophy for straightforwardness. Yet Russia is leading the World in battlefield airmobility. Their interest—and investment—in these machines must therefore indicate a strong commitment to what the helicopter offers them. In the broadest sense, it gives them a means of exploiting the low-level airspace immediately above the battlefield as a medium in which to move and operate. This low-level airspace, or "boundary layer" as I prefer to call it, has great significance. Not only does it permit the movement of airborne vehicles over the battlefield, but it also provides them with a degree of cover from fire and view offered by ground features. Thus by flying in the "nap of the earth", a helicopter can use ground features to give a covered approach, yet not be constrained or impeded by the nature of the ground surface—or by our obstacles.

As one of our principle roles on the battlefield is countermobility, should we not be concerned that the enemy now possesses a mobility we cannot counter? We plan to spend a great deal of time and effort constructing obstacles and reinforcing natural ones, but they only affect ground vehicles, leaving helicopters the freedom to move about the battlefield at will. The purpose of this article is to explore the possibilities of extending our countermobility efforts upwards into this boundary layer.

At this stage, I should perhaps suggest that those of you that have no time to dwell upon the borders between practicality and fantasy may like to return to the contents page and find some other article with more substance!

Before addressing the issue directly, it is worth examining in more detail what Warsaw Pact systems might use this boundary layer both now and in the future. The Hind (Photo 1) operating in the anti-armour role is an obvious example, but we could see it doing tasks other than tank hunting. Capable of carrying four anti-tank guided missiles, four 32-shot pods of 57mm rockets, four conventional iron bombs, four podded guns of unknown calibre, a 23mm radar-directed gun turret, and eight to twelve ground troops, it is clearly a versatile beast. When teamed up with

Photo 1. The Russian HIND Helicopter

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HOOK, for example, which can carry sixty-five troops or 40 000lb of cargo, it could form part of a river-crossing force, or a *coup de main* designed to seize some objective well behind our FEBA (Forward Edge of Battle Area). But helicopters are not the only machines we could expect to see using this low-level airspace.

Soviet fixed-wing aircraft will also be there. Missions being flown over the battlefield would include close air support, recce, and battlefield air interdiction, and also aircraft transiting to and from deeper objectives beyond the battle area. The Soviet pilots are not yet adept at really low-level flying, but there are good reasons why they are likely to get better at it. *Firstly*, modern air defence systems are forcing aircraft to fly lower in order to escape detection and survive. This was well illustrated in the Falklands War; the Argentinian aircraft which successfully attacked ships were flying in over the sea almost at wavetop height, and our FGA Harriers came in at well below 100 feet. *Secondly*, recent technological advances such as fly-by-wire controls and terrain-following radar are making it easier for the pilot to maintain these really low altitudes.

The final category of user of this low-level airspace is remotely piloted vehicles—RPVs. They too are vulnerable to attack at higher levels, and in many cases the need to close with their target require them to stay low. However, their small size and the fact that they are unmanned make this less of a necessity. Nevertheless, one of the early efforts of extending countermobility into the air was directed at RPVs, as we shall see. And in a future war we can expect to see a much greater use being made of these flying robots.

A capability for us to degrade the enemy's use of this airspace could thus be significant, not only at the local, tactical level, but also strategically. You may argue that it is the job of our Air Defenders to deal with enemy aircraft which overfly our airspace, and indeed it is. The trouble is that even the most skilled operator using the most sophisticated air defence weapon will have great difficult acquiring targets within this boundary layer. Terrain masking, limited lines of sight, fleeting exposures and the resulting problems of target identification and recognition will limit his performance. Even if we could surmount these difficulties, we would never have sufficient air defence assets to cover our entire front effectively.

No countermobility plan is going to stop these enemy aircraft, but if we could somehow obstruct the boundary layer and thus persuade him to fly a bit higher, we could perhaps improve the effectiveness of our air defences. To see if we can do this economically, we should perhaps examine some of the principles on which we plan our surface obstacles.

Apart from their actual stopping power, we can categorize obstacles under two headings: passive/active and overt/concealed. The term passive can be applied to an obstacle which is not itself capable of inflicting a kill (for example an anti-tank ditch), whereas a minefield exemplifies an active obstacle. Apart from the attritional value of an active one, it has a useful psychological effect: the concept of making an enemy "mine-conscious" is well-known to us. As well as promoting caution, which we hope would slow the enemy down and give him one thing more to worry about, an active obstacle will have an enhanced stopping power, even when its presence is known. For example, if you were a tank commander faced with the choice of crossing a minefield with a probability of 20% of killing you, or an anti-tank ditch with a 90% probability of stopping you, which would you choose?

An overt obstacle is one that is known—or should be known—to the enemy. An obvious classification perhaps, but it is worth considering it further. Any obstacle, however well concealed, will eventually be detected, but it is the time at which the enemy finds out about it that is the important factor. A river may be a superb obstacle, but his prior knowledge of it will allow him to make detailed plans well in advance of his offensive action and allocate resources for dealing with it. An anti-tank ditch is likely to be evident from air reconnaissance, and even a well-concealed minefield is likely to be discovered by his recce elements early enough for plans to be made to breach it. The only type of obstacle that can really take the enemy by

surprise is the sort that can be rapidly emplaced late on in the battle. By achieving surprise, an obstacle's effectiveness or stopping power can be multiplied several times, simply because the enemy will not have allocated appropriate assets to deal with it. Thus a small minefield of remotely delivered mines, suddenly laid in the path of an advancing tank company, may have more stopping power than an anti-tank ditch several miles long.

From this brief examination, we can conclude that we are likely to get more value for money from an obstacle which can kill, which can be concealed and which can be positioned rapidly. With this thought in mind, we are now ready to return to the problem of the boundary layer.

On the basis that "nothing is new", it would be prudent to see if history can come up with any suitable aerial obstacle concept. The First and Second World Wars saw two such devices. The *first* was an "aerial minefield". Mines strapped to balloons were released from various points on the ground into the path of an enemy air raid in the hope that mine and aircraft would meet. It was only tried once – and unfortunately it failed. The *second* scheme was the wire apron supported aloft by barrage balloons used in the defence of London in 1918 (Photo 2). This was effective in that it induced the enemy to fly in the narrow range of heights between the aprons and the ceiling of their machines. Our own aircraft patrols had only to watch that comparatively narrow zone, and the main difficulty of the defence—of making contact with the enemy—was reduced. Barrage balloons (Photo 3) were also used in the Second World War, perhaps most extensively in the defence of London from the V1 flying bombs (Photo 4). Clearly they had no psychological value, but by all accounts they were successful in bringing down several of these early RPVs.

Have these ideas any merit for our purpose? The great difficulty with the aerial mine is getting it to make contact with the aircraft. Maybe there is a future for some sort of jumping mine which is triggered by an aircraft flying low overhead, although I would suspect that the complexity and cost of such a system would be very high. I

Photo 2. A Balloon Apron used for defences of London 1918

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Photo 3. A Balloon Barrage of WW2. Each dot in the sky is a balloon!

prefer to take a closer look at the concept of using wires. Obviously, the great weakness of the barrage balloon system lies in the balloons themselves: easily detected and shot down, expensive and cumbersome to deploy. But if we leave the problem of supporting the apron aside for a moment and turn our attention on the wire obstacle, we find it has considerable merit.

Firstly, it can be classed as an active obstacle. A helicopter flying into a wire is unlikely to survive. Helicopters can be fitted with wire cutters, but these are only effective on horizontal wires. To cut a vertical wire, the cutting device would have to be mounted forward of the rotor disc—an almost impossible requirement. Low-level fixed-wing aircraft are also unlikely to survive, but for different reasons. They do not have that fatal device of a rotor to wind in the wires, but their high speed and proximity to the ground demand sensitive flight control which is likely to be sufficiently upset by a wire strike to induce a crash. They, too, could be fitted with cutters, but at great cost to their performance.

Secondly, the ability of an obstacle such as wire to achieve a kill without the use of explosives does have a particular advantage, not least of which is its acceptability to a civilian population on whose territory it is deployed.

Thirdly, its detectability. From the air, wires are almost invisible, as the many peacetime aircraft accidents will bear testimony (Photo 5). Furthermore, they are almost impossible to detect at a distance by radar, infra-red or any other modern-day sensor device.

Fourthly, aerial wires could be erected quite quickly (compared with a minefield or anti-tank ditch)—assuming of course that some suitable supports could be magically provided. And a wire obstacle could probably be removed in quick time, and then redeployed, giving some scope for surprising the enemy.

Finally, wire is a low cost, low technology material which can be procured and handled with little problem.

Having established that wires seem to have some merit as aerial obstacles, we should now return to earth and consider the practicalitites. We want to present in the flightpath of our target aircraft a suspended wire obstacle, the most effective configuration being perhaps vertical wires at spacings of, say, 30m. One way of sus-

pending these would be from a single horizontal wire spanning two supports. Obviously, the greater the span, the more extensive and effective the obstacle can be, so ideally we would wish to use light, strong wire. Steel wire rope—as used in 1918—is suitable, but a new fibre made from an aramid polymer is worth looking at. Made by Dupont under the name of Kevlar, it is amazingly strong. In terms of strength-to-weight ratio, it is seven times better than steel, thus in theory it would enable us to construct a catenary seven times longer than one of steel wire rope.

The big question is: how could we support our wire obstacle? Balloons are out, so too are kites and, I would hasten to suggest, other aerial vehicles. The aprons of 1918 reached a height of 10 000ft, but if we were more modest in the height and extent of our obstacles, maybe we could find a suitable method.

Firstly, the height. The purpose of the 1918 aprons was to force the enemy to fly to the limit of his machine; on the other hand, the purpose of our obstacle would merely be to induce him to fly above that boundary layer so he can be acquired by our air defence weapons. So how high would it have to be? It depends on the ground features; it could be as low as 50ft, or as much as 200ft.

Secondly, the extent of the obstacle. The original idea of the aprons around London in 1918 was to seal the capital from attack, but this was never achieved. To erect an aerial obstacle along the whole length of the FEBA would likewise remain a pipedream, but if our objective was merely to cover certain routes, we could still achieve much. By inducing enemy aircraft to fly the more exposed routes, this could again increase our chances of engaging him.

Our problem is now down to a more manageable size. We would like to erect wire obstacles across certain routes which are masked by ground features, and the height of the obstacles need only be as high as those ground features. Could we not therefore use these ground features to support our wires? I recently took part in a US Army wargame in which *RED* launched a devastatingly successful *coup de main* by flying helicopters along an autobahn cutting, below the level of the ground on either side (which was held by *BLUE*). As the autobahn had been well cratered and

Photo 4. Parts of the many flying bombs brought down by balloon defence of London (WW2)

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Photo 5. The remains of a SCOUT Helicopter which fell foul of an overhead HT wire

mined, it was discounted as a likely approach and was not effectively covered. Had an aerial obstacle been suspended across the cutting from the banks on either side, the helicopters would have been denied their covered approach and they would not have achieved surprise. In a similar way, it might be possible to wire off firebreaks through woods, river lines, and even streets, by using the flanking features as supports. In urban terrain modern high-rise apartment and office blocks offer particularly good scope for this, as do existing masts, church towers, factory chimneys and similar features. Apart from the sheer convenience of using existing features to support our wires, a further advantage is that they would not be conspicuous as supports and would not reveal the location of the obstacle.

The distance between suitable natural supports will often be too great, so perhaps we should consider the possibilities of providing our own. We do not have to look far to find some possible contenders. Modern mobile cranes with telescopic booms can reach heights approaching 100ft, and tower cranes used on construction sites can go much higher. Rapidly erected radio masts are now available that can reach similar heights.

The actual mechanics of using the supports, of securing the horizontal wire, of tensioning it, of securing the vertical wires to it, would be fairly straightforward Sappering of the sticks and string variety. Trials would have to be carried out to find the best techniques of erecting the wire obstacles, and no doubt some research would need to be done on the size of the wire itself and the best configuration. Perhaps if trees were the means of support, the obstacle could be laid by a helicopter flying over them, paying out the wire from a drum. If cranes were used, the wire could be laid out on the ground—along a road perhaps—and then simply lifted up to the required height and then tensioned. The ubiquitous Tirfor jack would no doubt feature, particularly if buildings were used for support, and civilian cars might even find a use as a means of tensioning the cable and as anchors.

How effective would they be? Would they really achieve anything? I do not believe that by erecting aerial obstacles—assuming they are a practical proposition

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—we could ever deny the enemy use of the low-level air space. But if we could somehow make it a more dangerous place for him to fly in, maybe he would think twice before using it. Even if we only succeeded in persuading him to select the second-best route, we would perhaps achieve something.

A practical proposition or a flight of fancy? I am not sure—and I will leave it to you, the reader, to decide. I am confident of three things, though. *Firstly*, the airspace immediately above the battlefield is becoming more and more important in the context of the land battle; it has even been suggested that he who controls this airspace controls the battle. *Secondly*, the Hind threat alone is a disturbing problem which so far has no satisfactory solution. *Thirdly*, if we as Sappers do not give some thought to counter the enemy's new-found mobility in this boundary layer, nobody else will: I would suggest the ball is definitely in our court.

Exercise Larchpole 82—Second Time Lucky?

CAPTAIN R M IRON RE, BA

Capt Iron was commissioned in June 1975 and attended 59 YO Course. He was posted to 73 Indep Fd Sqn RE in Osnabruck from where he went to Cambridge University to read Engineering. In July 1980 he was posted to 3 Fd Sqn RE in Tidworth with whom he has travelled to Northern Ireland and Kenya. This article was written just before the Author went with 3 Sqn to the Falkland Islands.

EARLY in 1980, 3 Field Squadron were warned for a tour in Kenya, starting in January 1982. We were to start construction of a Kenyan Army School of Infantry at a place called Maralal in the Northern Region of Kenya. In due course Detailed Recce Teams from Barton Stacey were to be seen skulking and surveying around the forest near Maralal; a couple of months of hectic work with calculators and drawing boards back at Barton Stacey saw the production of the Detailed Reconnaissance and Planning Report—three volumes packed with information from soil stability to local ladies.

Armed with these weighty tomes the Confirmatory Recce Party made its way to Nairobi, via RAF, for a two-week stint in October 1981. Much further work was carried out: seeking for sources of building materials, attempting to borrow cranes and tippers, looking for water, and, not least, attempting to get money out of the Kenyan Army. Armed with suntans, recce photographs of the local game, and a longing to return for the project we flew back to Tidworth, leaving behind our Resources Sergeant to start the procurement and stockpiling of building materials.

Back at base everybody was beavering away at producing exercise instructions, detailed manifests and carrying out pre-project training, when the Signal arrived: "Maralal is cancelled . . .". The OC showed considerable restraint, beat his head against the wall three times, and went to see the Chief Engineer who thankfully, gave his permission for the OC to try to organize another exercise in Kenya. The Kenyan Army had apparently run out of money and had changed priorities, so we

Exercise Larchpole 82 Second Time Lucky Captain R M Iron RE BA

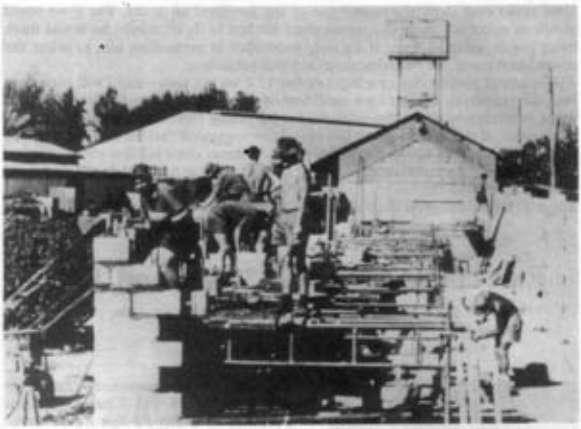

Photo 1. "The walls were built remarkably quickly and accurately"

decided to try and do some work for the British Army. Fortunately, the permanent British Army presence, the British Army Training and Liaison Staff Kenya, (BATLSK), had previously applied for a rebuild of their accommodation and the PSA (yes—they even exist in East Africa) were keen that Royal Engineers should take on the work, as local contractors who had tendered for the job could not reduce their prices down to the £25 000 maximum that had been allocated.

So, armed with little more than a thumb nail sketch and a brief from the PSA, that amounted to "if BATLSK are happy, we're happy as long as it costs less then £25 000", I, as Project Officer, and the Clerk of Works once again found ourselves on board with the RAF for another week in the sun. At Kahawa, the home of BATLSK, we did much pacing and measuring. Finally the Clerk of Works announced "It should fit in here". Having done one or two recces for subsidiary works we hurried back to England so that the Draughtsmen could prepare the drawings.

The work involved the dismantling ("Can we make it a demolition?", Support Troop were heard to ask) of the existing timber huts, the ripping up of the old concrete pads, and then the construction of a single storey 50 × 8m building consisting of dining room, canteen, store, ablutions and a 4 × 6-man rooms. Subsidiary works included the laying of drainage runs and the complete replacement of the water supply—a task which was to keep our Plumbers scratching their heads for some time.

The Advance Party of 65 "all ranks" worked hard with only Christmas Day and New Years Day to relax. Among the pink knees, camp structures and marquees sprung up around the BATLSK with such speed that little signs started to appear on each structure: "This Is Another Jomo Jolly Development" (named after our worthy QM and Advance Party Commander, Captain (QM) Keith Jolly). By the time the Main Party had arrived we in the Advance Party were looking healthily tanned, and had started on the dismantling of the existing buildings.

Work progressed slowly at first, while our newly arrived, white skinned "tourists" got acclimatized to the sun and Tusker Breweries. However, after a week we

Exercise Larchpole 82 Second Time Lucky 1

were ready to start pouring our foundation slab: this took four nights. We only poured in the late evening and at night to avoid over-rapid curing of the concrete; this also allowed the Carpenters to knock up the formwork during the day. After allowing a short period to allow the concrete to "go off", ("Ten minutes will do in this heat" said one "Brickie" optimistically), the Bricklayers poured onto the site, led by Sergeant Thorley, an Instructor from AAC Chepstow, and aided and abetted by a number of Apprentice Tradesmen.

The walls were built remarkably quickly and accurately, despite the poor quality of the blocks and Sergeant Thorley's attempts to teach the Project Officer how to do it. The walls were capped everywhere by a ring beam. This posed some problems and resulted in a lot of sore thumbs for the "Chippies" who had to design the formwork to go around all the piers. However, this again was done surprisingly quickly, using the same formula of formwork erecting by day and pouring by night. It was during the construction of the ring beam that our "Trojan Horse" was used—a scaffolding tower on wheels that was ponderously trundled the length of the building as the ring beam progressed.

At this stage we were some six days ahead of schedule, much due to the hard work and enthusiasm of the work force. These spare days were to come in useful in the project as more problems were encountered.

While all the above work was continuing, there was a small band of Carpenters, working secretly behind the MT shed, producing the roof trusses. As these were of necessarily heavy construction we required a small crane: we searched all around Kenya for an available small crane but with no success. Eventually we had to settle for a large one: the Kenyan Air Force lent us a 65-ton crane used for clearing crashed aircraft. It just fitted inside the main gates, but it carried out the job admirably. Soon a swarm of Sappers could be seen fixing purlins, ceiling struts and finally asbestos sheeting.

At last Sergeant Readman, another Instructor from Chepstow could get in with his Painters and Decorators. The final internal fixings and decoration required a high level of co-ordination between the trades, with Electricians, Plumbers and Carpenters all on the receiving end of the Painter's wrath because of dirty thumb prints on the new paintwork. At this stage with some two days to go before the final

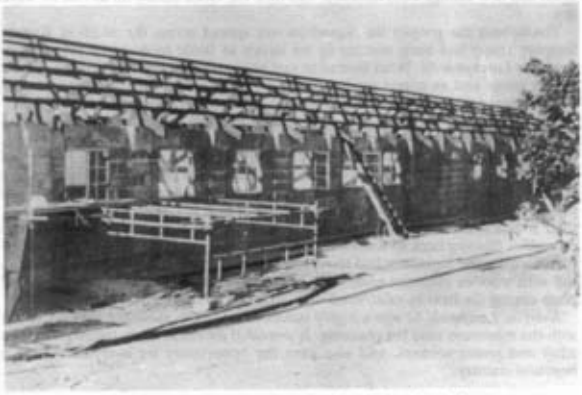

Photo 2. The trusses and purlins in position. Note the ring beam

Exercise Larchpole 82 Second Time Lucky 2

Photo 3. The completed building. L to R: WO2 Newcomb, CW (C); Author; Sgt Collins, Site Foreman

handover, we had our only major problem on the project: attempting to install the sanitary fittings it was found difficult to persuade the locally produced plumbing fittings to stay watertight. Late night attempts at gluing, silver soldering and finally kicking it, were to no avail, and it was an embarrassed Project Officer who had to explain on the Handover Ceremony that the plumbing wasn't quite complete. However, during the last few days of the exercise the whole system was stripped out again and new fittings were installed; this time the Gods smiled on us and we were dry.

Throughout the project the Squadron was spread across the width of Kenya. Support Troop had been sent up to the desert in Isiolo to do some preparatory work for *Larchpole 83*. What looked at first like sand sculptures turned out to be a gallery range and an access road. 1 Troop was also mostly independent, carrying out maintenance work to the drainage at the Agricultural Showground at Nanyuki.

Luckiest man of the Squadron was the Signals Staff Sergeant. He managed to persuade the OC that his talents were best employed running the R and R Centre at Mombassa. This was arduous duty that apparently involved much testing of temperature of the sea, and also imposed great strain on the eyeballs with German tourists insisting on bathing topless. This august Journal would, unfortunately, not permit publication of the photographs of the R and R Camp. Many others took their R and R on safari, with tales of maneating roars at night and meetings with crocodiles filtering back to Kahawa.

Eventually the Squadron had to return home; arriving reluctantly at Brize Norton with wooden elephant under arm and spear in hand we looked oddly out of place among the heavily raincoated white-skinned RAF staff.

Exercise Larchpole 82 was a highly successful exercise, mounted at short notice with the minimum time for planning. It provided excellent trade training for both adult and junior soldiers, and also gave the opportunity for everyone to see a beautiful country.

Exercise Larchpole 82 Second Time Lucky 3

"It makes one proud"

This extract is from a letter sent by the Chief Officer on a BP tanker just leaving the Falklands.

"THERE had been a fatal accident on *British Forth* and, of course, tankers carry no doctor. The weather was quite abominable, driving sleet and snow as well as almost gale force winds. HMS . . . tried to co-ordinate efforts to get a doctor. The sending up of a helicopter in these conditions was impossible. The . . . took 1½ hours to get a boat into the water and then its engine broke down. The heroes of the situation were two Sappers who volunteered to take a jet boat out. It should not have been near the water, let alone on it. Yet they managed to get to the . . ., collect a doctor and get him to the *Forth*".

Correspondence

Captain W R Varley B Sc, Tech Dip TP, C Eng, FICE, AMIHE
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Harrogate, N Yorks HG2 9HB

REMINISCENCES

Sir,—Brigadier Myers (*March 1983 Journal, page 68*) made no mistake; accurate reminiscence is essential to the historian. Interesting though they are, the letters about Arnhem concern a battle and operation which could not, and would not, have been given to a Sapper to control. Of greater interest to the Corps and of value to historians would be recollections and observations on the 1941 Malaya/Singapore disaster.

Here was a defence which could in theory have been commanded by a Sapper. In fact the ultimate responsibility was Percy's but surely not every senior British Officer who preceded or accompanied him could have rejected or ignored the Engineer advice if it was given. Were the engineering opportunities for buttressing the defence not identified by the Sappers? Was the Sapper advice not put together, or put together badly, or wrongly timed? Has Brigadier Simson said all that can be said from the Sapper point of view (and let it be recalled that not easily did he find a publisher for his book).

No way could the Sappers have guaranteed success at Arnhem but I suggest that given the chance we could have avoided failure at Singapore.—Yours faithfully,
W R Varley

CORRESPONDENCE—THE RE JOURNAL

From: Major D M R Batterham RE

Sir,—The format in which this letter is written is quite incorrect by service writing conventions, but is the one used by our leading newspapers.

I wonder if using it would improve the look of the correspondence section of the Journal? I personally find that I automatically associate the signature and address block with the letter *above* and not the one *below* to which it relates.

Yours faithfully,
D M R Batterham
RE Training Development Team,
Chatham, Kent, ME4 4UG

Captain C G Brodley MBE, B Sc, AFAIM
9 Lloyd Street
East Malvern
Victoria 3145, Australia

COMPUTERS FOR THE CORPS

Sir,—Sometime during 1965 somewhere in BAOR Lieut Colonel J A Burton RAOC lectured a Sapper Seminar on computers. Computers then were very new and useful for calculating pay and counting things. The Sapper Seminar was unimpressed!

A Subaltern at the time, I was very impressed and wrote an article for the Journal (December 1966). In the next issue a more senior officer—a major, I think—published a letter which said, in effect, that I should find out more about computers. Advice I have attempted to follow.

In early January of this year, whilst talking to Colonel Jimmy Chater and Lieut Colonel Steve Gilbert, the conversation touched on the use of computers in the Corps and Steve Gilbert suggested it was time for another letter. When I got home, toward the end of January (well, it is quite a long way) I looked for the original article. All that turned up was a yellowed draft which said:

"Having programmed the commitment several things may be determined. Can the task, as envisaged, be done at all? The mere provision of demolition firing parties is likely to commit a substantial amount of engineer labour from the outset. If not practicable, what targets may be eliminated with minimum effect? What is the effect of complete sub-units being wiped out and the best way of plugging the gap without prejudice to the entire task.

"Have areas of responsibility been defined in the most effective manner having regard to the targets within the area and the men and materials available to it. It is to these tasks that Engineer staff officers are trained but having arrived at an appreciation there is no certain way of testing it."

In 1965 much of that was guesswork. Computers, however, are very good at two kinds of problems. The highly repetitive, such as calculating pay and problems where the number of variables is so large (as in the quotation above) as to defy human analysis.

The letter Steve Gilbert suggested would not have been written had it not been for the publication of Captain Bowen's article in the *March 1983 Journal* "Computers for the Combat Engineer" and Lieut Colonel David Grove's article "Lessons from Exercise Red Claymore" in the same issue.

The computer programs available for plotting minefields, ordering stores, designing an MGB and calculating explosive requirements may make life easier but these were things that we could do anyway. They help but do not alter the situation in any significant way.

Colonel Grove, on the other hand, says that the Red Claymore obstacle contained "forty kilometres of tactical minefield and 250 demolitions". Now there *is* a scheduling, provisioning, resource allocation problem.

In the second paragraph of his article, Captain Bowen says that the Corps is currently studying the application of computer technology to the control and deployment of engineer resources. One hopes by this is meant the sort of problem that Colonel Grove faced.

Since 1965 (and before) every major bridge in BAOR, every conceivable bridging site on the Weser and Leine, every demolition belt in the Teutoburger Wald has been reconnoitred and surveyed time and time again. The manning tables and establishments are known, reasonable estimates of build, laying and preparation times can be estimated—not in general terms but by Grid Reference—all the data is there. What a very model for a Modern Major General!

It would too, help with the deployment of Battle Casualty Replacements, the

subject of correspondence between Colonel (now Brigadier) J B Wilks and Major C M Davies in the same issue.

It really needs to be done and computers, as I have discovered since, can do it.—Yours faithfully, C G Brodley

A Woman's Role?

Dear Ms Pankhurst,—Yes you certainly do have a problem and how sensible of you to write about it. If I may say so, you appear to be over-anxious to make your point and altogether over-defensive. What a pity you are so negative about this crusade of yours. There are lots of intellectual innuendoes and subtle complaints, but sadly very little to indicate that you are anything but rather muddled and introspective about your role in life—or, more accurately, in your husband's life.

Forgive me! I must stop being personal. May I, instead, offer some gratuitous and well-meant advice in the form of this open letter?

(1) Relax, stop feeling like a convicted prisoner and start looking up and around you.

(2) Stop thinking that the whole world, or Army, or even Royal Engineers is watching you. You could retire to that nice little thatched cottage in the country and get away from it all. As you know very well, your husband will succeed in his profession without you—he always has and always will. How happy he will be is quite another matter. At all costs, he will do better without you if you are intent only on cruising along on your present tack.

(3) However—have you stopped to think what you are doing to yourself and your children? Why did you get married to "your man" in the first place? As we now all known, it was not the uniform that did it. Perhaps you actually loved him! Such a thing has been known to happen in the past. Anyway—it is too much to suppose that this is now the case to judge by your reluctance to share your life with him and allow your children the benefit of a two-parent upbringing. Pity.

(4) I am . . . gradually . . . coming to my main point, which concerns your influence on all the other wives who love and live with their husbands in the Army. Presumably, by adopting the name Pankhurst, you intend to champion a cause—or do you? I can only assume that your article was written for that reason. Anyway, assuming you are trying to, why don't you start by recognizing that there are hundreds of soldiers' wives who face similar frustrations to yourself? So what? Well, I would ask: what sort of message would you give them? I mean not the officer's wife, but the less well-educated, less self-sufficient, hard-up soldier's wife. Is your advice: leave your husbands, let them soldier on alone, go home to Mum, keep your heads down and try to bring up the children without their Father as well as you can? If so—you are succeeding—keep it up. But has it occurred to you that among this large number of wives are many who, like you, simply cannot cope with the pressures of what they have married into, but who actually want to try, and who therefore seek interest, companionship, advice and encouragement?

(5) Now, Dear Ms Pankhurst—why don't you channel some of your obvious talent and energy to the good of these less-able and less-vociferous wives (if indeed you must channel it anywhere)? Not because it will be good for your husband—he is obviously a flier anyway, or thinks he is—but because you might, who knows, actually end up by achieving some beneficial results. What about this new suffragette organization, The Federation of Wives' Clubs? It is crying out for people like you. You might even succeed in creating enough of a fuss for all Army wives to be given a vote on whether they think married Commanding Officers should for preference be accompanied by their wives. The result would certainly be interesting!—Yours, in the hope that my advice is taken in the spirit in which it is given—positively, optimistically and with a twinkle in the eye, "Uncle" Asquith.

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Continuing Trials on Medium Girder Bridge

Sir,—I read with interest the article in the March edition of the Journal by Lieut Colonel D A Grove, when he was CO of 26 Engineer Regiment, and was particularly interested in the paragraphs about rapid launching and delaunching of Medium Girder Bridge. This reminded me of the trial undertaken by my Troop in 1 Field Squadron in 1975. In order to minimise the time a bridge projected over a gap making it vulnerable to air attack, construction began a half-span back from the home bank. The components were assembled in the normal way with panels being added on and the bridge being cantilevered off the building frame. Eventually the bridge (less the launching nose) was completed and now reached the home bank edge just under the end of the bridge. With this configuration the complete bridge could be rapidly launched and delaunched as a complete unit. The only preparation required was to push out the launching nose. This trial was also linked to the idea of providing some concealment to the construction team by hiding the whole operation under a "Harrier Hide' (basically a very large camouflage net on 10ft poles). While the complete-bridge launch concept worked well, the restrictions imposed by working within the confined space of the Harrier Hide meant build times were increased.

I have related my experience because I became concerned when reading the article that trials were being repeated because, over the course of time and with a change of military staff, experiences were being forgotten. In this particular case the two trials were practicing different techniques. However one must guard against "re-inventing the wheel".

I have been in contact with MVEE Christchurch over this matter and they were pleased to receive the feedback.—Yours sincerely, J F Prain

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Joint Professional Meetings

Sir,—The attendance at Joint Professional Meetings (JPMs) depends upon a number of factors such as interesting subject, well known speaker, popular location and attractive social aspects (wives invited, supper afterwards etc). The success of the meeting should be measured, however, not just by the number attending but by the reaction following it and the enthusiasm for subsequent events.

Unfortunately several JPMs I have attended were unsuccessful, in my view, because of what the speaker said or failed to say. These meetings attracted large audiences mainly through the nature of the advertised subject, but in the event they consisted of unleavened accounts of activities and technical detail without that extra something that transforms a monologue into an entertainment.

If the following well-established guidelines were borne in mind by speakers I am sure the overall value of JPMs would increase:

(a) Tailor the subject matter to the audience. Place the emphasis appropriately, depending upon whether the audience consists, for example, of engineers, quantity surveyors, young graduates or leaders of industry.

(b) Give the background to the subject, outline the challenges or problems and explain the solutions in such a way that the speaker relates to the audience and the

talk is seen to have a cohesive form.

(c) Illustrate the talk with slides and props. Exhibits in the foyer beforehand give a taste of things to come.

(d) Avoid excessive adherence to detail.

(e) Do not spend too much time on any one theme.

(f) Two speakers are often better than one; a change of voice is always welcome.

(g) Discover the intricacies of projectors and lights *before* the show and at the same time run through *all* the slides!

There are of course lots of other ingredients of a successful talk but the points above are the particular ones I believe need more attention. Please don't misunderstand me though; JPMs are usually tremendous fun and every bit worth the effort put into them.—Yours faithfully, J M Bickford

Brigadier E G Willmott OBE
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Should Civil Engineering Die at RMCS?

Sir,—Professor Wood's article in the March issue sits awkwardly with those on combat engineering. He implies that Sappers need a university education coupled with RSME training in military engineering.

I am concerned that our officers should be fit to perform the Corps' role on the battlefield—wherever that may be. The Memoir for Brigadier McMeekan describes one scenario and others are illustrated elsewhere by your contributors.

I contend that most Sappers need an engineering degree, not necessarily from a university, and the aptitude to apply engineering principles in action. It is by no means simple to apply the basic procedures, drills and techniques so well taught by RSME; engineering aptitude coupled with leadership of a high order is needed as Lieut Colonel Grove illustrated in his article and as recent articles on our work in the Falklands show.

Brigadier Killick's study on RMCS, to which Professor Wood referred, was initiated from a desire that RMCS should justify its existence by showing the benefits gained from Army funding of the establishment. If the Army decides that RMCS is reckoned to be the best place for degree training in certain disciplines then we should follow suit; as Professor Wood indicates, it would be ridiculous if the Corps went off alone. I need hardly add that RMCS will remain for the Army Staff Course, for MSc work and as a centre of excellence for procurement management training for all three Services and the civilian component.

On the topic of a Military Engineering Course with Civil, Mechanical and Electrical options, I support Professor Wood's proposed syllabus. If the "professional" Institutions will not recognise the consequent degree under present rules, then we should influence them to do so and change the rules. As the Finniston Report indicates the first degree should be appropriate to the needs of the individual. Later we can "add on" post-graduate education for those who need greater specialisation by utilising the current Army Staff Course and the "pqe" training now done by the Corps, R Signals and REME. What Professor Wood's proposed Course will do is better fit our officers to handle, as engineers, the complicated machinery now in use in BAOR and also ensure they do not shy at electrical and electronic problems they face on the battlefield.

So, let us have most of our Sapper graduates with their education founded on an engineering degree appropriate to their needs, ie with mechanical, electrical and electronic engineering allied to a civil base. Let the degree be granted by the institution deemed best able to produce the graduate officers we need from the recruits we get—and RMCS seems highly suitable. Let the degree meet our needs

as professional military engineers and then add on post-graduate education for those who need to specialise and become "pqe".

The post-graduate education could be at RMCS since it has excellent facilities and already does Army Staff Course and MSc work. The staff at RMCS thus have the prospect of providing first degree engineering education and specialised professional engineer, Army Staff and MSc training. The post-graduates will be eager to be updated in modern techniques and develop their knowledge based on practical experience. Coupled with the need for staff at RMCS to keep abreast of modern weapons and remain at the forefront of management training, this post-graduate training offers an exciting challenge to the academics to which I hope they will respond.

To my mind, Civil Engineering should not die at RMCS but metamorphose into an element in the proposed Military Engineering Course and into a new "pqe" post-graduate course.—Yours sincerely, Ted Willmott

Memoirs

BRIGADIER J V C MOBERLY DSO OBE

Born 13 June 1904, died 17 December 1982, aged 78

JAMES VINCENT CHARLES MOBERLY,—"Jim" within the family, "Tiny" to all his Service friends, was commissioned on 26 August 1924. Throughout his service he was different to most others—and determinedly different—well qualified therefore to be a Sapper! Clever, able and quick he perhaps scorned the capabilities of others and did not hesitate to show his feelings in a lighthearted way which did not hurt but gave rise to much amusement. His views, fearlessly and freely expressed, tended to endear him to his subordinates rather than his superiors—particularly as his views, often in opposition to authority, were more often than not proved to be correct.

As a YO at Chatham he gave the impression that he took life very cheerfully, nothing seemed to worry him, and he had little time for the over-serious and over-conscientious of his contemporaries. He was extremely talented at bridge and at all games which involved hitting a stationary ball, such as golf or billiards, but not those which required strenuous exercise.

In 1942, he was appointed CRE IX Corps Troops where his Chief Engineer was Pat (later Major General) Campbell. They were a formidable pair! In a very short time they transformed the unit into a creditable fighting force, well prepared for its first action in Tunisia a few months later. That it could go into battle so quickly after the torpedoing of two of its transports *en route* to North Africa was an early measure of his success. Tiny had enormous zest and energy and was a superlative trainer who could put a sharper edge on any unit. He was awarded the OBE for his part in the Tunisian campaign. Later, in the Italian campaign, Tilly became Chief Engineer V Corps. He was just the man for the job of pushing, as rapidly as pos-

Brigadier J V C Moberly DSO OBE

sible, up the Eastern side of Italy where obstacle crossing against a determined enemy was the main problem. Technically skilful and resourceful he was also adept in maintaining good relationships with Divisional Commanders. Inclined to be impatient he found it difficult to suffer fools gladly, but when confronted by reasoned argument he was always ready to compromise. His sense of humour was ever present—once at a Corps HQ morning conference, during a period when the condition of roads was a constant headache, he reported "the path between here and 'A' Mess is barely passable to determined infantry".

He was kind, patient and understanding to his staff and always went out of his way to ensure that his intentions were made crystal clear. When things went wrong, he willingly accepted his share of the blame. Time was always short. To conserve it he insisted that he did not wish to hear about things that were going right—it was when things were going wrong that he wanted to know. There is no doubt in the minds of those who served with him that he saved many lives by his approach.

One cannot pay tribute to such a man without relating some of the stories regarding his prowess at the bridge table and on the golf course.

At the bridge table in the Mess in his younger days he was the scourge of hardy old warriors long senior to him and more experienced—peppery too when dealing with one they might consider a young upstart! At the bridge table, and on the golf course, he could judge the odds to a nicety. It was during this period that he also represented the Corps at billiards against the Gunners.

But it was at golf that he really excelled—he won the Army Golf Championship in 1928. He was very competitive by nature, no quarter was given or expected, and gamesmanship was all part of the game in which self confidence plays a significant part. He was at his best playing in a high wind. On one occasion he was playing against a Walker Cup player in the British Amateur Championship in a gale—with three to go the match was all-square. Tiny told his caddie to give him his putter (a putting cleek) and to take all his other clubs back to the clubhouse. Tiny was an expert with this club. His opponent was nonplussed and Tiny won! He will be remembered by many for his disconcerting ability to knock putts into the hole from all over the green while continuing to talk nineteen to the dozen. When years eventually dictated that he could no longer command the power and skill of his younger days he was quick to put away his clubs for ever. To him golf was a competitive necessity and not a social pastime.

In summary it could be said that Tiny's somewhat unorthodox attitude to life concealed a highly intelligent and quick mind which made him a cheerful, effective and conscientious officer with a splendid war record. Life was never dull with him around.

Tiny's wife Brida predeceased him so it is to their family that we extend our deepest sympathy.

DLGB, BJC, JGC, CPJ, KHS

MAJOR C A BRAMWELL

Born 8 May 1927, died 26 January 1983, aged 55

The Address at a Service of Thanksgiving for the life of Major C A Bramwell was given by Major J A E Hathrell OBE RE (Retd), Managing Director of Thos Storey (Engineers Ltd), a member of the Acrow Group of Companies. With permission it is reprinted below.

CHRISTOPHER ADDISON BRAMWELL, or as he was known by so many of us—simply as Chris—was born on 8 May 1927. The families of both parents have long histories of military service and it was very natural that Chris would look to the Army as a career. He was educated at Rugby School where he not only attained academic dis-

tinction but was chosen for his qualities as a leader—even in those early days—to become Head of House.

In 1945 he joined the Army, gaining entry as a volunteer and attending a concentrated University course at Kings College, Cambridge, where again he distinguished himself as a student and colleague to many who were to become brother officers. He was commissioned into the Royal Engineers and even as a young Subaltern showed great potential not only in command but as an imaginative and innovative engineer.

He served for twenty-two crowded years in both regimental and staff appointments in India, Egypt, Cyprus, Aden, Hong Kong, Borneo, Thailand—as well as the United Kingdom. Almost immediately after commissioning he found himself as Second-in-Command of an Independent Plant Troop building major strategic roads in the New Territories of the Colony of Hong Kong. Later in Cyprus, he commanded a Field Squadron RE building emergency camps gaining much valuable experience in building construction, drainage and water supply.

He was selected for entry to the Staff College, Camberley, at a time when competition was very great. There again he acquitted himself with great credit and became a *psc* and subsequently a diligent and dedicated Staff Officer. As DAQMG with the Middle East Command in Aden he planned and progressed major projects working closely with contractors, consultant architects, local government officials as well as his military colleagues. Following this period on the Staff he again returned to regimental life as Officer Commanding 59 Field Squadron RE who were deeply involved in the building of a permament airfield in Thailand and the construction of camps and roads using many new engineering techniques.

He was throughout his military service both loved and respected by brother officers and men alike, and it is clear that had he chosen to remain in the Service, he would have risen to the highest of ranks. However, at the age of forty and in the rank of Major, he decided to widen his horizons into the world of business and joined our Company.

I remember his first visit to our offices when the then Managing Director and I both recorded that we thought that Chris would be a great asset to our Company and subsequent events proved that to be so true. He brought to his work a wealth of general engineering experience and was soon embroiled world wide in bridging projects. It was however his dealings with other people that became the major factor in his success. Colleagues, friends and clients alike found him a most generous spirit. He was both compassionate and considerate and scrupulously fair in all things—with an integrity that is often regrettably rare in the business world. He became a Director of the Company in March 1978 with responsibilities for sales and engineering throughout the European Common Market and much of the Middle East, and was often called in to help world wide. He also had additional responsibilities in the development of our bridge systems to meet changing demands—and in this he was always full of new ideas. Wherever he travelled he was always highly regarded: he won new friends not only for himself but for the Company and he will be long remembered by those many friends around the world whose lives have been enriched by knowing him. Even during his final illness he inspired us all by his courage and quiet strength.

When we recall him in our thoughts and prayers—with inevitable sadness—we should also remember—with thanksgiving—Christopher Addison Bramwell—brother officer—colleague—but above all friend and gentle man.

JAEH

LIEUT COLONEL P W LAWRENCE

Born 30 December 1880, died 28 January 1983, aged 102

PERCY WILLIAM LAWRENCE celebrated his 102nd birthday on 30 December 1982 and was probably then the oldest living Sapper in the ranks of ex RE and RCE.

He was born in Stoke, Kent and for a short while after leaving school he was a reporter on the *Chatham News*, which brought him in close touch with the Corps. He was so impressed by the victorious return from the Sudan of Lord Kitchener, that when the returning RE Troops from that campaign marched into Brompton in 1898, he followed them into the Barracks and enlisted.

His early service as a Sapper involved Submarine Mining of the ports for which the Royal Engineers were responsible. He vividly recalled his service under Queen Victoria and the military participation in the celebration of the Queen's Diamond Jubilee.

In 1901 he volunteered for service in Canada and joined the RE Troops stationed in Halifax, Nova Scotia where he was involved in the port defences. In 1906 on the formation of the Canadian Forces he transferred to the Canadian Engineers continuing on in Halifax.

Colonel Lawrence was keenly interested in electricity which was being researched at that time and educated himself thoroughly in that field. He rose through the ranks and was commissioned in 1917. His technical knowledge led him into the field of searchlight defences in support of Coast Artillery Batteries in addition to Submarine Mining. He took part in the fortification and searchlight installation of the Halifax batteries at Sandwich, York Redoubt, Connaught, Ogilvie, Ives Point and McNab. These were six-inch and nine-point-two gun batteries. He also helped in the installation of the harbour boom defences.

After the School of Military Engineering was established at Halifax he was placed in charge of it, and served there until 1937 when he retired in the rank of Lieut Colonel having thirty-eight years service.

He retired to England to live in Gillingham, Kent, and later in Hove but on the outbreak of World War II he returned to Canada and in 1940 rejoined the Royal Canadian Engineers at the Royal Canadian School of Military Engineering at Petawawa. From there he was posted to Ottawa, where he took over the administration of the Corps in which he had served for so many years. He retired again in 1943 on reaching compulsory retiring age.

Colonel Lawrence was a keen marksman and participated regularly in the Dominion of Canada Rifle Association competitions. He was also an exceptional athlete, he raced the *penny farthing* and the *new* bicycles in Chatham and Halifax and was a keen and accomplished ice hockey player, playing at "cover point". He rowed and played squash, holding the Halifax Garrison Squash Championship in his time. In later years he played golf regularly. In 1914 he married Doris Christie Marks who died in 1978. He is survived by his four sons, Colonel Maurice Lawrence, CAF, Squadron Leader Kenneth Lawrence DFC, RAF, Captain Reginald Lawrence RCOC and Lieutenant Edward Lawrence RCE.

On attaining his Hundredth Birthday the Military Engineers Association of

Lieut Colonel P W Lawrence

Canada, presented him with a scroll, commemorating his service and life under six reigning monarchs.

PAC

Book Reviews

THE EYE IN THE AIR

PETER MEAD

(Published by HMSO, Price £10·50)

BRIGADIER Mead traces the history of air observation and reconnaissance in the British Army from 1785 to 1945, including balloons, kites and aeroplanes operated by our Corps prior to the formation of the Royal Flying Corps.

The greater part of the book is, of course, devoted to the First and Second World Wars, so that the part played by our Corps is covered within the first 44 pages. Even so, the Author gives a concise and factual account of the early period. For those with a special interest in the subject there is a very useful and extensive bibliography.

Brigadier Mead retired from the Army, in 1964, after a tour at the head of the Air Corps. Prior to that appointment he had considerable experience of air reconnaissance and observation, having served as an Air Staff Officer in 1944 and later commanded an Air OP Squadron. He has used this considerable air experience to good effect in writing this book, which covers types of aircraft and their development, unit organisations and their roles and tasks, as well as the tactical impact of air observation. An unusual book about a previously little known subject.

JTH

AND WE SHALL SHOCK THEM

THE BRITISH ARMY IN THE SECOND WORLD WAR

GENERAL SIR DAVID FRASER GCB OBE DL

(Published by Hodder and Stoughton. Price £12·95)

THIS book is not an essay on grand strategy. It is about the British Army's character, actions, failings and achievements in WW2. It is impressionistic rather than analytical. The Author in his Preface states that much has had to be omitted and that it is not intended to be a comprehensive history.

The book opens on 11 November 1918 when a triumphant British Army led the Allies to victory in WW1, it refers to the policies which ensured that by the time a British Expeditionary Force saw action in 1940 the new German Army was superior in almost every respect. As the catalogue of defeats mounted so lessons were learned and the tide turned in 1942 and led to eventual triumph again.

In describing operations the Author has made little distinction between the activities of the "Commonwealth" Army and those of our Allies—indeed it was impossible so to do. The victory was an Allied victory, but the book is about the British Army and the Author has done well to separate without offending. He believes, as did Lord Tedder, that it is the problems of the early stages of a war which should be studied and he devotes much of the book to this phase.

And We Shall Shock Them is a thoughtful account of the British Army in WW2. It is well worth reading.

EEP

BEFORE ENDEAVOURS FADE

ROSE E B COOMBS, MBE

(Published by Battle of Britain Prints Ltd, London. Price £4·95)
(Completely revised enlarged Edition published 1 March 1983)

FROM the Belgian coast at Nieuport, across the fields of Flanders, over the valley of the Somme and down the line to the Argonne: all the major battlefields of the First World War—Ypres, Arras, Cambrai, Amiens, St Quentin, Mons, Le Cateau, Reims and Verdun—are criss-crossed in this book over more than twenty different routes, each clearly shown on a Michelin map. In both the rear areas and up at the front, every significant feature is described in a background history full of detail and information that would otherwise remain unknown amongst much that would remain unseen. Photographs show fields and woods that were fought over, and pill boxes mouldering in the undergrowth, memorials—splendid and simple—and photographs the zig-zag of trenches, pockmarks of shells, and craters blasted by mines can still be seen after sixty years of ploughing.

A standard work of its kind, and indispensable for anyone contemplating a tour of the battlefields in Belgium and France, this book combines the years of knowledge, travel and research of its author, Rose Coombs, who worked at the Imperial War Museum in London for more than forty years and has made more than a hundred visits to the areas associated with the Western Front.

PB

SALUTE THE SAPPERS

COLONEL NEIL ORPEN and LIEUT GENERAL H J MARTIN

(Published by War Histories Advisory Committee, Johannesburg and obtainable from The Sappers Association, PO Box 6782, Johannesburg, RSA 2000. Price sea mail £15.00, or airmail £32.00)

Salute the Sappers forms Volume 8 of the Official History of the South African Forces in World War II. It has been produced in two parts, the first covering the activities of the South African Engineer Corps up to and including the Battle of Alamein, and the second carrying the story on to the end of the war in Italy. The price shown is for the two parts, or complete volume, and not for each part.

The first real challenge to the Union came when Italy entered the War in June 1940, and a force was mobilised to take part in the East African campaign. From the engineer point of view this involved a commitment, quite apart from combat engineer support, of opening up communications and providing water over hundreds of miles of arid undeveloped bush and mountain country. This commitment involved the recruitment of eight Road Construction Companies, a Railway Group of two Railway Construction Companies and a Harbour Construction Company, three Works Companies and a Water Supply Company, all of whom were volunteers. Many of these units moved on to the North African theatre after the Italian surrender in Eritrea, where they were joined progressively by other specialists units recruited in response to the ever increasing demands of the campaign.

One of the more notable engineering achievements in the Middle East theatre was the construction of the Haifa–Beirut–Tripoli railway in 1941–42, a strategic requirement to connect with the existing railway system running northwards from Tripoli to Turkey and Iraq. The SAEC were given the Haifa–Beirut section while the Royal Australian Engineers took on the remaining section from Beirut to Tripoli. There was one obstacle in the Australian section which was beyond their resources, this was the Cheka Headland. This could only be overcome by extensive tunnelling. In response to a request from General Auchinlech (C-in-C Middle East) to General Smuts a special unit, 61 Tunnelling Company, was formed from personnel in the Witwatersrand mining industry, and sent to Beirut to do the job. The main tunnel through the cliff was about 1500 metres long, and the work included

6500 metres of approaches, including another shorter tunnel. The line was opened to traffic in December 1942, a remarkable achievement.

The Road and Railway Construction Groups went on to Italy, where they did yeoman work in repairing the extensive German road and rail demolitions, and in subsequent maintenance of communications as the campaign progressed.

Some measure of the involvement of the Divisional and Corps Engineers of the SAEC, described in detail in this history, can be gleaned from the number of gallantry awards which included 5 DSO's (one with bar), 52 MC's (two with bar), 2 DCM's and 65 MM's (two with bar).

The scope of engineer support provided by South Africa comes as a revelation, even to those of us who served in the Middle East and Italy at that time. It is the more remarkable as recruiting in the Union had to start virtually from scratch, on an entirely volunteer basis. They came from the industries and mines of the Union, and from Government Departments such as Railways and Harbours, Irrigation and National Roads. They brought with them a wealth of engineering experience which enabled them to make a major contribution to the Allied Victory.

GWD

Errata: Part 2 p 68 & p 320 for "William Bailey" read "Sir Donald Bailey"
p 275 & p 310 for "Godfrey Fawcett" read "B T Godfrey-Faussett"

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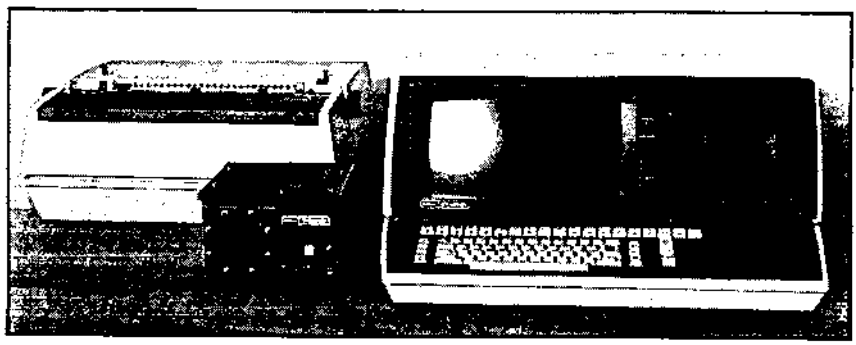

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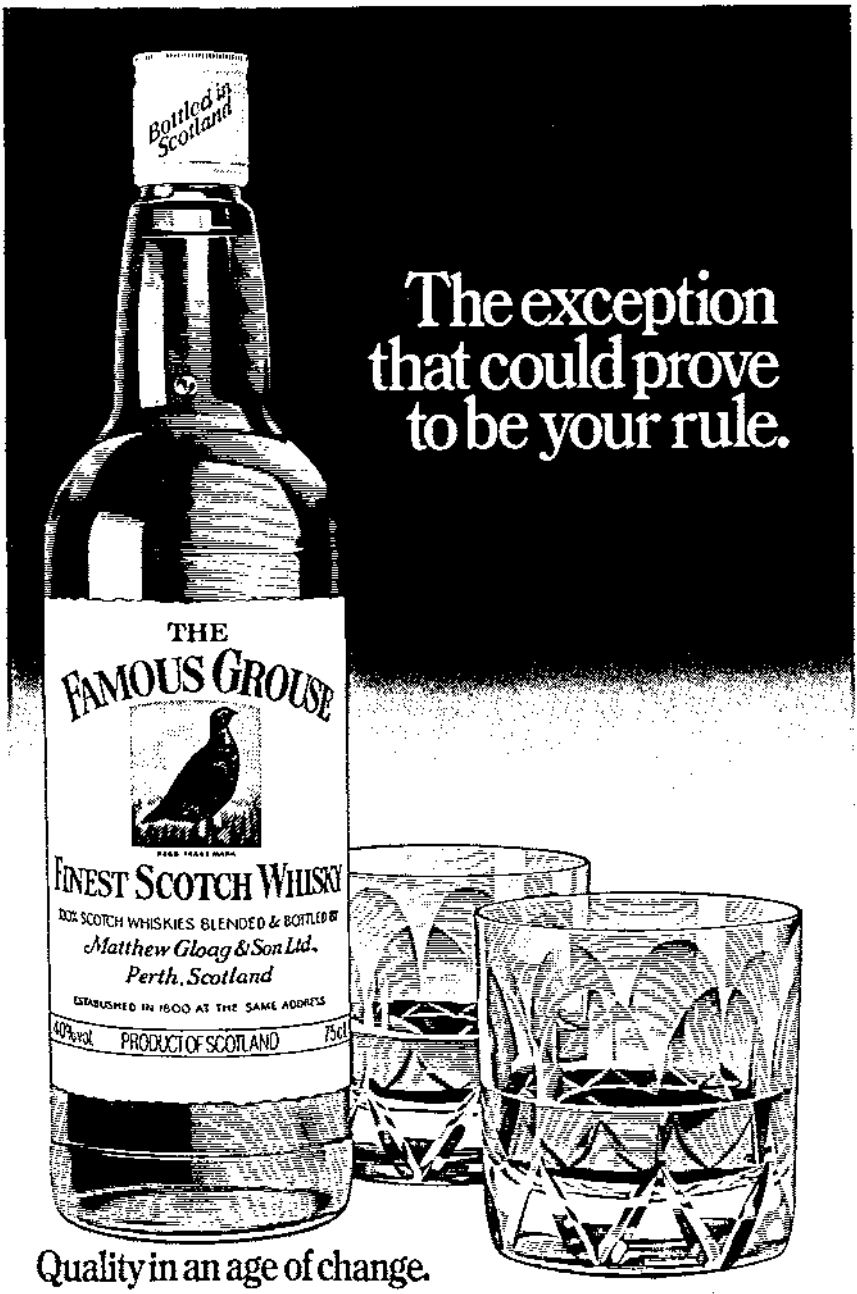

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