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MARCH 1981

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No. 1

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Editorial

The Enemy Within–A Fairy Story

ONCE-UPON-A-TIME there was a Sapper called "Mr Clever". He knew he was clever because when he first joined the Corps all his seniors told him so; they had been told so by their seniors who had been told so by theirs and so on . . . It had to be true!

Unfortunately this confidence-boosting passive appreciation of his own talents led to an aggressive attitude and he began to believe that everyone who was not a Sapper was stupid. This was an arrogant impertinence even if it were true, which it wasn't, and "Mr Clever" became "Mr Too-Clever-By-Half". He began to believe that if he was sufficiently devious and drew enough red herrings over the trail he would always be able to get his own way provided he put enough thought, time and energy into his efforts.

After a while he found that it became second nature to be devious ALL the time. He did not realise that by so doing he was creating problems where none had existed before and he complicated quite simple issues out of all proportion to the likely gains or the desired results.

Engineers face challenging situations and exercise their wits and knowledge against nature as well as man-made and system-made obstructions to progress. This encourages them to be devious by nature.

Deviousness can be necessary or unnecessary, honest or dishonest, praised or despised, can make friends or enemies. It is therefore important that it only be used when justified and should never be allowed to become a normal procedure. In general the easiest way to get anything done is through normal channels, often known as the "system".

It is sometimes necessary to be devious. Members who were in Works before 1960 will be able to quote countless examples. Approval-in-Principle, Approval-in-Detail, Financial Allotments and the subleties of Parts I, II and III Funds gave considerable room for manoeuvre in the execution of work. Such deviousness was defended by the opening sentences of *Regulations for Engineer Services (RES)* which read, in part: "These Regulations are issued for the guidance of all concerned. They are to be read reasonably and intelligently and with due regard for the public service".

It is generally possible to beat the system but the risk must be considered. One will nearly always be detected. If detected during the ploy it may prevent the ploy from working; if detected after the ploy it may be that decisions taken will be reversed; the risk is that once detected all vestige of trust disappears and both the perpetrator and the *Corps* come under suspicion as "over-sharp operators."

Is unnecessary deviousness worthwhile? Why not take advantage of the systems? Why go round by the back door every time? Why risk the good name of the Corps?

All deviousness is time consuming and can only be justified if no other method can possibly succeed. Necessary deviousness, even if detected, seldom creates ill-feeling because it is accepted as being for the common good. Unnecessary deviousness when detected always creates ill-feeling as no one likes being fooled or being taken for a fool. An opponent who discovers he has been "taken for a ride" becomes a formidable enemy with a long memory. To risk making such an enemy unnecessarily cannot be in the best interests of the Corps.

One day "Mr Too-Clever-By-Half" was working on an unnecessary devious ploy on which he had spent several weeks. Unfortunately he met "Mr Cum-Uppance" and, like the King in his invisible suit, his shortcomings were exposed for all to see. Everyone said, "He got what he deserved. Sappers are all the same."

Future Military Engineering Technology

PAPER PRESENTED AT INSTITUTION OF ROYAL ENGINEERS MEETING, HAMELN, 13 May 1980

Dr P S BULSON D Sc, Ph D, B Sc(Eng), C Eng, FI Struct E, FI Mech E



Dr Bulson was commissioned into the RE in 1946 as a National Service Lieut, and served until 1948 in India and Egypt. After leaving the Army he studied for an engineering degree and then carried out post graduate research at Bristol University. He joined MEXE in 1953 and worked initially on the Heavy Floating Bridge. For the next twenty years he was associated with a number of design and research projects and gained special merit promotion to Senior Principal Scientific Officer in 1965 and Deputy Chief Scientific Officer in 1971. He was appointed Head of Engineer Equipment Division, MVEE, and Head of the Christchurch establishment in 1974. He has written technical papers and books on the stability of structures, underground structures, inflatable structures and transportable breakwaters, and lectures on

structural safety at Southampton University. He is an Honorary Professor at RMCS Shrivenham and is an Honorary Member of the Institution of Royal Engineers.

TONIGHT I am going to take a look at a few factors that might influence future military engineering technology, with particular reference to bridging. I will not be reviewing operational needs, or discussing equipment that you may see in service during the coming years, out I will concentrate rather on our longer term research at Christchurch and how this eventually might be applied.

Progress in structures depends on the development of new materials, improvements in the efficiency of our designs, mechanisation, and innovative ideas in the anatomy and stowage of the components. Each decade seems to bring a new fashion in material science. Looking back at the beginning of the century we find the timber and rope of the opening years replaced by mild steel. Then came the high strength weldable steel used in the Bailey Bridge, followed by the introduction of Aluminium decking in the Heavy Girder Bridge and the extensive use in the 1950's of rivetted high strength Aluminium Alloys in the Heavy Floating Bridge. In the 1960's the MGB was designed in high strength weldable Aluminium Alloy and in the 1970's a case was made to use Maraging Steel for the girders of the Chieftain AVLB.

Now, in the 1980's we are experimenting with composite construction of Aluminium Alloy and Carbon Fibre, taking a lead from researches in the aircraft field that have been going on for some time. In the 1990's there exists the possibility of bridges constructed mainly from Fibrous materials, and in the year 2,000, following once more the explorations of the aircraft industry, we could be using diffusion bonded and superplastically formed Titanium. Materials that are thought of as astronomically expensive now will no doubt cheapen considerably as new production methods are developed, and already the Tornado uses a welded Titanium structure for its main box spar. The Russians, too, are users of large quantities of Titanium.

Beyond 2000 we may look to the new technology of Powder metals, but it is too early yet for the research establishments to contemplete this. It is of interest,

Dr P S Bulson D Sc Ph D B Sc Eng

however, to look at the spectrum available today, as indicated in Figure 1 and 2. Figure 1 compares non-numerically the ratio of Ultimate Strength in Tension to Density of a number of materials, and it is clear that CFRP (Carbon Fibre Reinforced Plastic) shows considerable promise when compared with DGFVE 232, the MGB alloy, and the Maraging Steel of the AVLB. Apart from structural strength, the ratio of elastic modulus to density is also important, and this is shown in Figure 2. In these diagrams CFRP-3 is a somewhat cheaper, and slightly less strong version of CFRP-2.

The trade-off against high specific strength and stiffness is cost. This can be illustrated by designing a bridge girder in a variety of materials and comparing the results. If one of the concepts for the next generation of Dry Support bridge is dealt with in this way, Figure 3 can be produced. It shows the effect in terms of bridge weight of designs in DGFVE 232, the American 7075 aircraft aluminium alloy, DGFVE 232 alloy with CFRP applied as reinforcement to the main chords, Titanium, and a complete girder in CFRP. The cost index is based on present day material prices. If the first of these designs is given a weight index of 1.0, then a rule of thumb deduction is that cost increase is about double the weight decrease. However, it is frequently said that by the late 1990's CFRP will be considerably cheaper than it is today, and if this proves to be the case then the 50% reduction in weight could be achieved at little extra material cost.

Of course, cost is not the only factor in judging a new material. We must be sure that there are no technical weaknesses in its performance such as brittleness, low fatigue life, corrosion and difficulty in making structural joints. It is equally vital that the material is suitable for use by troops in practical structures, and that its battlefield



ULTIMATE STRESS/DENSITY

Fig 1. Non numerical comparison of ratio of Ultimate Strength in Tension to Density of Structural Steel, MGB Alloy DGFVE 232, Maraging Steel, Titanium and two Carbon Fibre Reinforced Plastics



(YOUNG'S MODULUS)

Fig 2. Ratio of Elastic Modulus to Density of the same six materials

survivability is not unacceptably low. For this reason our research is aimed in three lines: material properties; understanding how to design efficiently and to analyse the structure properly; and making typical components that can be tested by troops in the field.

Returning to aluminium alloys and steels, one of the difficulties we face is that the metallurgists have not managed to increase the strength of these materials by using new alloying elements without making them less ductile, and lack of ductility gives a structural designer a number of difficulties particularly in welded structures. This leads to problems such as fatigue, stress corrosion cracking, brittle fracture that were not present in the days when mild steel was our main material. This can be illustrated by considering some aluminium alloys, as shown in Figure 4, where proof strength in tension is compared to percentage elongation on two-inch gauge length. In broad terms, apart from one or two notable exceptions, proof stress × elongation remains

constant, and we hesitate from using alloys in welded structures with less than 8% elongation.

Those who provide the funds for research naturally wonder why we need to pursue this search for lighter but more expensive structures. Perhaps we should be examining structures where cheapness, not lightness, is the main criterion. Part of the background is the historical requirement for ever-increasing simple spans for assault bridges. Operational requirements must be linked to what is technically feasible, and as long as designers offer bigger spans at costs that are considered acceptable, there is a natural desire to attempt these in development. The longest tank bridge in the world is our own Chieftain AVLB, at 24.4 metres, and makes the maximum use of the payload available on a Chieftain hull. The guidelines for our recent International Studies with the Germans and Americans have suggested that 30 metres is desirable in the future. It is not possible to consider a 25% increase in span, with what could be similar limitations on payload and dimensions, without resorting to more sophisticated and expensive materials.

My second aspect was structural efficiency—keeping bridge weight down by being clever about structural design. The aircraft industry carries this to high levels of sophistication and expense, well beyond what we consider to be practical for more robust army equipment. But even if we follow their lead, more and more complex designs produce diminishing returns in the field of weight saving. This can be



Fig 3. Comparison of bridge weight and cost for different materials. (7075 is an American aircraft aluminium alloy)



Fig 4. Comparison of proof strength in tension and percentage elongation on 2in gauge lengths of some aluminium alloys

illustrated very easily by considering a simple framed structure to carry a given load over a given span. Starting from the basic geometry of a framework consisting of about seven members, and then achieving weight reduction by using more and more lighter members, until in the limit the framework consists of an infinite number of members each of zero weight (Figure 5) leads to the conclusion that however complex the framework is made, the maximum reduction in weight is 20%. This is why we have tended to look for new materials rather than use the expensive structural techniques of the aircraft industry in our designs.

Thirdly, structural anatomy, including launching and stowage geometry. The UK have for thirty years favoured the "up and over" method of launching assault bridges. The bridge girder either remained horizontal during this action, as in the Churchill bridgelayer, or was stowed upside down on the tank, as in the Centurion bridgelayer and No 9 Chieftain AVLB, or was folded by means of a "scissoring" action, as in the No 8 Chieftain AVLB. The US and the French have also favoured the scissoring method, which is normally defended in terms of ruggedness and simplicity, and the support given by the ground bearing pad acting as a fulcrum during the launching cycle. The German developers have, however, favoured the sliding launch system, as used in the Biber tank bridge. The weight that can be cantilevered without far bank support is limited by the counterbalance action of the launching vehicle. This method requires much less power to launch, but needs a more complex and sophisticated launching and coupling method. The Russians have used

what we call the "flip-ramp" system in their bridgelayer, which gives a very rugged equipment but requires hydraulic mechanism that is left in the bridge after launching. The fact that all these equipments are successful indicates the fine dividing line between the advantages and disadvantages that each possesses.

It is probable that future UK tank-bridges will employ a variant of one of these methods, but if the operational requirements staff press for longer single span bridges, we may have to resort to some form of telescoping of the major components to keep the stowed bridge as compact as possible. It will then be necessary to examine the trade-off of mobility and manoeuvreability against increasing complexity and vulnerability of the launching mechanism. The object of the Christchurch establishment's research programme is to enable these factors to be looked at free from the pressures of development, so that we can make pre-prototype demonstrator equipment to examine our ideas, and help those who have to take the ultimate decision on the trade-offs.

The anatomy of floating bridges has a similar number of variations. Floating piers can be used to support stiff girders at regular intervals; more flexible girders are supported at frequent intervals by pontoons to give the "semi-continuous" system; or the floation can be made continuous across the waterway. It was once thought undesirable to completely block the flow of water, but the success of the Russian PMP, American Ribbon Bridge and UK Air Portable Bridge has changed this view. The PMP/Ribbon Bridge configuration represents a very cost effective way of transporting floating units, complete with stiffening girders, and launching and coupling the units in one operation. However, the size of unit associated with a Class 60 bridge represents the operational limit, otherwise the folded unit gets too wide,



Fig 5. "Complex designs produce diminishing returns in the field of weight saving"



Fig 6. "Longer Bridge sections with a mechanically assisted construction method"

too high or too long to be a satisfactory logistic load. A problem with the "discrete flotation" system is the rapid fall-off in building speed as the site or the river conditions deteriorate. For floating bridges in which speed of construction is of paramount importance, it is probable that we shall persevere with the semicontinuous system, particularly if the flotation units are amphibious.

Another important factor in floating bridge geometry is the length of the ramps or landing bays. A number of attractive designs have been reduced in capability by employing short ramps, and this offers a severe restriction on the range of sites over which the bridge can be built. Future research will examine this problem, as well as the problem of inbuilt propulsion, anchoring, and stability in high currents.

The most rapid changes are occurring in dry support bridging. The Bailey Bridge and the MGB are hand-built, panel type equipments, the former employing the



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classic single girder panel, and the latter the more sophisticated two-storcy girder panel. Short length panels were chosen to enable the elements to be handled by four or six men, but this leads to frequent structural joints, which can be very inefficient in terms of weight. So we have been turning to longer bridge sections with a mechanically assisted construction method, as shown in Figure 6. This method is a judicious intermediate stage between the cheap, but labour intensive dry support bridges of the 1960's, and the sophisticated schemes that have been put forward in the recent International Concept Studies (US-GE-UK) in response to a requirement for very fast construction immes combined with low manpower. These schemes depend on the use of a Wheeled Vehicle Launcher of sizeable proportions, which carries and launches a 30 metre bridge with a crew of 2 or 3; the US demonstrator equipment is shown in Figure 7.

The user now has a wide ranging interaction between building speed, manpower cost and mobility with which to juggle, and it may be that moderation in all things is a better solution than sacrificing one factor in order to achieve the ultimate in another. This has yet to be argued when the outcome of the international studies is considered by each country in relation to its future needs.

I would now like to deal briefly with two other important areas. The rapid digging of barriers and the rapid repair of airfields. The first of these is a subject of increasing importance, and an area where we shall be devoting more research effort in the future. The Anglo Saxons are good ditch-diggers, historically preferring this method of defence to the walls of the Chinese, Romans and Russians. Digging with a pick and shovel is efficient in power/weight terms, but the speed of construction is in doubt; digging with classic earthmoving machinery can be fast, but the machines are relatively immobile. The conflicting aspects are not unlike those for bridging; speed, manpower, cost and mobility, and in order to progress we will be looking at novel methods of digging that no longer rely on brute force for their effectiveness. We shall try to use more of the installed power at the cutting edge rather than at the wheels or tracks of the machine. So far we have experimented with oscillating dozer blades, vibrating blades, variable incidence blades and blades incorporating a moving belt. None has shown the potential of the rotary drum cutter, which has now reached the stage of a pre-production machine, developed in conjunction with Muir Hill, shown in Figure 8. The rotating cutter drum acts as a milling machine, depositing the small pieces of broken soil onto a system of conveyor belts which can be arranged so that the excavated material is deposited as a "winnow" along one side of the trench, as shown in Figure 9. The dimensions of this trench are chosen to stop tanks, and cause delays while they are extricated.



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MECHANICAL DIGGING BARRIER PROFILE

Fig 9. Excavated material deposited as a "winnow" along one side of a trench

In good conditions outputs of up to 1200 cu yds/hour have been obtained, and this accompanied by fast deployment of the machine on its wheels to other sites, makes the Earthmill, as it is called, an attractive solution. Our future researches will attend to the technical areas of reliability, traction, cutter wear, control and cut geometry. It is doubtful whether any rival configuration will prove superior, and the Earthmill could be our best hope for the future. I have deliberately not discussed explosive methods of producing barriers, as this work has not been the responsibility of the Christchurch establishment for many years.

The existing system of airfield repair was developed to meet a threat postulated in 1969. It is possible to repair three craters from free falling 1000 lb bombs by four hours after the end of an airfield attack, and at the same time deal with the repair of scab damage to the runway surface. However, for the future a threat of much greater severity has been postulated, and this will require faster repair techniques and the need to clear the damaged runway of unexploded anti-personnel and anti-vehicle submunitions before these techniques can be used. Reconnaissance of the damage is also important. At present this is carried out by physically going over the site in a vehicle, but this is not allowable in an environment of unexploded submunitions, so we are studying the feasibility of non-contact data acquisition by preplaced sensors that pin-point individual craters. These will be active during the attack and feed information directly to the control centre, and it appears to us that because of the volume of data and the need for constant up-dating, automatic data processing will be required. This will indicate the siting of the minimum operating strip with reference not only to the damage, but also to the location of aircraft, level of damage to taxi-ways, and to damage in the vicinity of hardened aircraft shelters. We should then be able to present the Station Commander with a risk statement.

Clearing the runway of unexploded submunitions should be by a shovel device mounted on an armoured vehicle. Crater filling can be accelerated by using rubble and heaved concrete, which may be compacted dynamically by a falling weight compactor using a modified pile driving technique. Final flush surfacing of the craters could be completed quickly by using magnesium-phosphate cement concrete or a sulphur asphalt mix. Both materials are fast setting in temperatures down to 5°C.

These solutions are expensive, though not costly when compared with the price of the aircraft. The alternative is more redundant paved areas or runways on the airfield, or an increase in active defence. Over the coming years we shall be studying the trade-off's very closely.

I won't have time this evening to discuss our future thinking on water supply, bulk

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fuel distribution, general purpose trackways or combat digging. Perhaps on another occasion I can deal with these fascinating subjects. I hope, however, that I have given you some iden of the way we go about long term work at Christchurch, work that depends very much on the close links we maintain with the Corps. Many of my senior staff, including me, have served as Sapper Officers, and the Officers who still come to the establishment for short tours of duty have the technical knowledge and experience to become valued members of the project teams. Further, the retiring Engineer in Chief was once my tough Class Officer at Training Battalion, so I feel obliged to do as he tells me, Thank you for inviting me over this evening, and for being such a splendia dudience.

DISCUSSION

Over seventy officers thoroughly enjoyed Dr Bulsons talk in the Officers Mess, 4 Armoured Division Engineer Regiment in Hameln on 13 May 1980.

In the discussion which followed it became clear that there was considerable doubt whether there was a true appreciation in the Army of the technical difficulties imposed by the possible increase in the weight of future tanks, and in the necessity to increase the assault bridge span from its present 22 metres, which enables a crossing of 97% of gaps in the area of 1st British Corps to be made. This led on to discussion of the problems of relating the mobility of the assault bridge launcher with the mobility of the vehicles for which the bridge was intended.

The discussion having continued for nearly one hour, the meeting was closed by the Chairman, Major General J P Groom CBE, who thanked Dr Bulson for his presentation and for traveling to BAOR for the occasion.

Dominica Diary

BRIGADIER R A RICKETS



Tuesday 11 March

The Author has done more travelling than most. As a Subaltern he served with 9 Indep Airborne San, with Armid Engrs and with 23 Fd San in Libya and Egypt. He was seconded to Malayan Armed Forces during the Malayan Emergency. He spent six years in Germany with 26 Armd Engr San and as Bde Maj. He commanded 67 Gurkha Indep Fd San in Borneo and after a tour as DS at Camberley became Comdit Gurkha Engrs and CRE Far East. He was British CoS in Berlin and, briefly, Col GS at RSME before taking up his present appointment as CE UKLF. He is also Commodore of Corps salling.

Leave home 6am. Breakfast at Heathrow, £2:30. Only five months ago it was £1:60. Take off 0945. 312 tons of Jumbo jet of which 91 tons will be burned as fuel. Blinds down and lights out for the film, which seems a pity when outside is brilliant sunshine and wonderful scenery. Seven hours and we are over Antigua, a rather scruffy-looking island with stunted bushes but gorgeous beaches and many yachts below in the protection of English Harbour. A few palms here and a lot of dust, the airport similar to Brunei in the 1960s, one coffee stall and a few little shops all selling

Brigadier R A Rickets

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to 1. Gabion work on the NE Coast Road

the same "handicrafts" and duty-free liquor which the "grockles" go for at once, and tee-shirts made in India.

A further short flight and we are over Barbados, looking very English with patchwork quilt of dark and light green, the sugar plantations, again few trees but magnificant beaches. Met by Rodney Harms, DA Caribbean and also Intake 4. Twenty minutes and fifteen dollars by taxi to the Ocean View Hotel, a Raj-style old building of spacious rooms, high ceilings and slowly-circling fans, with a long wide wooden balcony over a splendid beach. We drop our kit and catch the same taxi to the Queen Elizabeth Hospital to find Captain Andy Mantell, the original Detachment and Troop Commander in Dominica who broke his neck while body-surfing and is probably lucky to be alive. Brought down to Barbados in a little monoplane chartered for the occasion by the High Commission here, he is in surprisingly good form and the members of the High Commission and British Development Division have taken great trouble to visit and look after him there. Sitting on his bed he explains, as a qualified engineer and drawing on a sheet of paper, exactly what has happened to his spine, and with stress calculations for good measure! A telephone beside his bed enables him still to keep a tentative control of his Troop one hours flight away.

Back to the Ocean View, to be joined by the 21C Barbados Defence Force, the First and Third Secretaries of the Mission, Brian and Val Thorp of Development Division, an Inspector General of Police and others, a mist of faces. We go to the Pisces for dinner but the table booked for 9pm doesn't materialise until 1015 and only then because we decide to take a hand in things and push two tables together despite the protests of the Management. A bowl of delicious prawns and salad and I get to bed at midnight local time which is 4am by my own time, having been on the go for almost twenty-four hours, and feeling very dozy.

Wednesday 12 March

A visit to the High Commissioner and then to Development Division, which is most impressive. My hotel bill is £40 for the night. At the airport we wait one and a half hours for the flight. No-one bothers to announce any reason for the delay, there is an atmosphere of lethargy and the airline officials seem more concerned with parading their uniforms and walkie-talkies to impress than getting things moving. Finally we board an AVRO 748 and an hour later land at Melvill Hall, Dominica,

Dominica Diary 1

with a rather alarming approach down a re-entrant from inland and stopping with not much runway left between us and the sea.

We are met by Captain Richard Nicholls, the E&MO who took over the Detachment after Andy Mantell's casevae, and Major George Hamlett, a tall well-built Dominican who commanded the Defence Force here in the troubles and is now the Protocol Officer. Awaiting us, after coffee in the little "VIP Room", is a huge new American Ford saloon—air-conditioned, driven by "Raymond" who had the good sense to set up his hire-car firm with the only really VIP-type cars on the island and can now charge £80 a day for their usage. Here on the North East Coast the Detachment has done a lot of work rebuilding sea defences where the coast road was washed out in the hurricane, using local labour, supervised by Sappers and Junior NCOs, and the round boulders washed down by the rivers to construct massive gabion walls which have been back-filled and surfaced. The soldiers involved have lived up here and fended for themselves, rations being delivered to them each day from the base camp on the other side of the island. A long haul.

Driving across the spine of the island the damage wreaked by Hurricane David becomes progressively worse as one approaches the little capital town of Roseau. The forest is stripped of foliage and mostly dead, the fallen trees tangled and every trunk and branch now in the clutches of creepers and bright green lichen. The palms are standing but topless. Thousands of acres of lime and grapefruit flattened, every tree uprooted and these, the very life blood of Dominica, may never be recovered. Only the bananas are growing again. In Roseau whole houses are flattened, ware houses are heaps of twisted girders and large sections of the coast road have disappeared. Every telegraph pole is down or leaning drunkenly with power and telephone lines in tangled confusion. But much has been done, particularly by this little Detachment of ours. In the first vital phase, in the closing weeks of 1979 we sent here a team of thirteen who with ingenuity, hard work and improvisation re-opened the water supply to the city, one million gallons a day, and opened the way for this main Detachment to continue in January 1980.

The Springfield Estate Guest House, a cool old timber structure, stands at the top of a forested re-entrant, looking down on the distant sea. It is very much the



Dominica Diary 2

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DOMINICA DIARY



Photo 3. Corporal Graham with the Headmaster, teachers and children of the Tete Morne School

Government hotel. Run by the wife of the former President we are also met by a younger sister nursing a baby boy who is the son of the present Prime Minister, and he too is living temporarily in a bungalow in the grounds, the whole being guarded by soldiers of the Defence Force in steel helmets.

My room juts out over the valley, a splendid view from each of three sides. It measures 40ft by 40ft, has wooden shutters, is very cool, and boasts two huge four-poster beds. The food is superb.

Thursday 13 March

Breakfast on the balcony, cool, fresh and damp from rain, with a fine view down the valley and the distant sail of a passing schooner. Off to Police HQ, a four-storey open plan concrete bedlam of policemen, policewomen and civilians all talking at once. The Police Commissioner impresses as a highly professional product of the old Colonial system. We discuss priorities for Engineer work. He would place repairs to his Police posts high in the list, higher even than schools since the ability to maintain law and order is fundamental. We have an appointment with the President at ten o'clock. The gates are opened by a smart young solider in Cuban-style steel helmet. The gardens are of course ruined by the hurricane and wrecked vehicles still litter the driveway. We are met at the entrance to the old stone and wood building by a very large smiling gentleman in the uniform of a police Lieutenant. He is the Aide to the President. He leads us upstairs to a large, airy room with faded pictures of Queen Victoria. A small elderly man in a white cotton jacket enters. His Excellency the President. The President of Dominica is elected by agreement of the political parties. He is a delightful and most courteous man and a pleasure to meet. Formerly judge of the High Court he takes the wider view. We should not involve ourselves too much in road and bridge repairs for such things are in the public eve and when a road is blocked the pressures on Government are enough to force them to take action. But when a village school has no roof there is less pressure and it is therefore these things that need our effort most. He is full of praise for the Detachment here and the work that they have done.

The Government building is crowded and busy. We have an appointment with the Prime Minister for 11 am but are asked to wait awhile. I pass the time reading the current local Democratic Labour Party Newsletter. We ask if the PM is actually in the

Dominica Diary 3

building and discover that he is not. He is still up at Springfield but would be pleased to see us there. I send a message through the embarrassed Protocol Officer, that I cannot now come back to Springfield and we go instead to the HQ of the Electricity Board to see the Director. He shows me an ultimatum from an oil company that unless their outstanding account is paid by tomorrow there will be no more deliveries of fuel-oil and since the town of Roseau is still on diesel-generated power that means blackout. With few of the regular users yet re-connected the income is not enough to pay the bill. We discuss plans and priorities for the work of our Team and his own staff in the enormous task of repairing, relaying and refurbishing the whole power distribution system of Roseau and the other coastal villages.

We spend an hour with Ivor Mitchell, Development Division's "man in Dominica" who is in effect now running the PWD here and has been a most important factor in



Dominica Diary 4

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Photo 5. Corporals Mitchell and Thompson with their "serviceable" crane

the success of our activities. With him we sort our priorities again. There are many problems. All over the Island one sees broken PWD plant and machinery—rusting hulks. The Depot is full of them, and there is hardly a machine left that works.

Richard Nicholls seems to know and be known by everyone and so for lunch we have Mountain Chicken (frogs' legs) specially arranged though out of season at the Anchorage Hotel, followed by a long drive over the mountains to the south in a Government Safari landrover to visit the Tete Morne School, now re-opened with a splendid new roof and toilet building. The children sing a welcoming song learned by heart and speeches of much feeling are made. Corporal Graham who has been in charge of the work here presents a plaque to the Headmaster and I have a wonderful half-hour being stared at and smiled at and clambered over and shown proudly their exercise books and making friends with all from fifteen down to the five year olds.

In the evening the Detachment hold a splendid party at their camp in the Sports Stadium, attended by everyone of importance or who has been of help. Some two hundred guests including the President, Prime Minister and heads of all involved departments. Surely no detachment so small in number (they are less than sixty) has ever hosted so many dignitaries. There are two bands beating out the Caribbean rhythm, a huge tent with every kind of drink imaginable, these provided by Government. Another large tent where we all sit down to a splendid dinner of steaks, chops and salads, prepared under the control of a young Lance Corporal cook. On behalf of the Detachment I present to the President a shield which holds the crests of 22 Engineer Regiment, 8 Field Squadron and 64 CRE(E&M). In return the Prime Minister presents a superb model of a fully-rigged sailing vessel, all made from bamboo and some 34t long. As the rum and the music take hold the soldiers and their guests relax. It is a most successful party.

Friday 14 March

A long drive back to the East Coast, this time by landrover which is needed for the terrible road, the old Imperial Way, to find Lance Corporal Goodall with the villagers of Grand Fond and their refurbished Health Centre. How well these lads have become a part of their communities and what enormous good it does. On the way back to Roseau we visit the new sawmill shed, an excellent steel girder construction recovered from several years lying lost in the jungle, refurbished and erected

Dominica Diary 5

under the guidance of Corporals Mitchell and Thompson, using a crane so old and eaten through with rust that I would not have believed it possible had I not seen it. Seeing the flat, bulging and misshapen old tyres and the great rusted gaps in the cab structure I said "I suppose you're going to tell me you drove it here" — "Well, Sir; as a matter of fact we did!" And they had done too.

Next the Police Training School, a very old barracks high on the hill above Roseau, looking now as if it has been subjected to a nuclear strike. All the roofs of these huge buildings have gone and some of the walls as well. The twisted remains of Police landrovers and other vehicles are scattered about. But the largest building has a splendid new roof and Lance Corporal Lloyd is there to tell me about it.

Another lunch at the Anchorage, sandwiches this time, then up to the valley to see some of the new overhead power lines and poles and also the turbo water pumps and pumphouse, then following the new power lines down into Roseau itself. Power, feeding not only light but cookers, freezers, cold-storage plants, factories and so many other systems, is our greatest achievement here next to water. On up the west coast to Portsmouth, visiting Corporal Quinn and his refurbished Health Centre there and on the way back calling in at the Coulibistri School tasks, arriving back at Springfield a little weary at 5pm. In the evening we (the whole Detachment) are entertained by the Prime Minister to a buffet supper, beer and demonstration of Quadrille dancing put on by the viliagers and children of Tete Morne, taught, mustered and led by our good friend the Headmaster who plays the accordian with enormous energy, threatening to crash his foot through the floor with every beat. More speeches of good will and thanks.

Saturday 15 March

Hotel bill for three nights is US\$215 so the Detachment Pay Sergeant has to cash me a cheque for another £150 to keep me solvent. A few final words to the Detachment, an hour wandering in Roseau and leave with Richard Nicholls and our splendid chauffeur in the "state Landau" for the airstrip via the North Coast Road. Once beyond Portsmouth there is little sign of any hurricane damage in this northern corner of the island and it is clearly the most beautiful part of the country. The road, now only of loose stone, winds through hills and valleys luxuriant in greenery-bananas, palms, grapefruit, lime and most splendid views down to the beaches and the surf.

The \tilde{DC} 3 chartered from Tropic Air of Barbados to take out the first twenty of the returning Detachment, due at 3pm, doesn't arrive. By 3.30 we discover that it is still on the ground in Barbados with a maintenance problem. It is promised now for 5.15 which will still give time for the returning party of twenty to catch the UK connection. Meantime a four-seater Beechcraft of Airserv comes in, its Captain a delightful young lady with four gold rings on her shoulder. She and her co-pilot are returning empty to Barbados so I switch allegiance from DC 3 to Beechcraft Baron and an hour later after a splendid flight above the cotton wool cumulus we land at Grantley Adams Airport. Alas a Jumbo 747 has just arrived and joining one of the six immigration queues it takes me one and a half hours to get through. A taxi driver tries for B\$22 to the Ocean View Hotel. I get another at the "regular" price.

The Ocean View is full of rich and senior citizens, but manages to retain something of the atmosphere of years ago. The plumbing is genuinely original.

But I have three days holiday now before catching the flight back to UK. And that can't be bad!

Tuesday 18 March

Twenty suntanned Sappers arrive at Heathrow by Jumbo jet. One carries proudly the fully-rigged sailing ship, given in gratitude by the people of Dominica and well-earned too. Captain Mantell has had a comfortable ride home strapped to a stretcher. The rest will follow shortly and after a break a new detachment takes over, some of whom go back at their own request.

The aid given by this little detachment in Dominica after the tragedy of one of the worst hurricanes ever known in the Caribbean will long be remembered by the islanders. The flag flies proudly.

A Facelift for Londonderry

LIEUTENANT M G MCALPINE RE, B Sc



Michael George McAlpine graduated in 1978 having read Civil Engineering, After commissioning from Sandhurst in 1979 and autending a YO Course at RSME he joined 4 Armed Div Engr Regt as a Troop Comd. He commanded the Londonderry Tp of 37 Fd Sqn during their Op Descant tour Feb 80-Jun 80.

Introduction

Having just spent a four month Op Descant tour in Northern Ireland I believe that there are two reasons why the Sappers will be busy in Londonderry over the next few years. The first, as everyone who has spent a "stag" in a drafty leaking sangar will know, is that the military structures of the past decade are beginning to show their age. With the fall in manning levels and with the general improvement in the security situation many of these buildings have become redundant. These temporary structures are now being removed and where necessary replaced by more durable ones.

The second and perhaps less obvious reason is that it is possible that we as Royal Engineers can improve public relations by removing unsightly and unnecessary structures which are a constant reminder of the "troubles". This theme can be extended to encompass the building of such structures as search bays with overhead cover. This will help to make the inconvenience of being searched at a permanent checkpoint a less uncomfortable one in typical NI weather.

It was with both these thoughts in mind that 5 Troop 37 Field Squadron set about changing the military face of Londonderry.

The Facelift

A start had been made by our predecessors 73 Indep Field Squadron. Creggan Camp was in the process of being demolished and replaced by a "super sangar" when we took over. Our first job was to finish the demolition of the camp and the construction of the sangar. It was during the latter stages of construction that we used a new material for the first time. The single skin high density concrete blockwork wall, which formed the north western face of the sangar, was proving less than waterproof against the almost horizontal sheet rain which drove against it. Traditional waterproof exterior cement based paints proved to be ineffective so the decision to clad the outer face of the wall was taken. Normally CGI could have been used but it would have produced a very austere and obviously military finish. The Design Centre Royal Iderinative.

A local firm supplied us with a textured plastic coated metal sheet with a bexagonal profile which produced a rather pleasing and practical finish. The job was completed using a cement based paint on the high density blocks. The overall effect was one of a small civilian workshop rather than an obviously military installation. It was during this final phase of construction that we were tasked with removing various redundant items of militaria from the Londonderry scene.

Lieutenant MG McAlpine RE B Sc, A Facelift of Londonderry The first to go were the sangars situated near the historic Guildhall in the city centre. They were soon followed by the removal of barbed wire obstacles from the top of the city walls, enabling locals and tourists alike to enjoy the view of the old city from those famous bastions. A start had been made, the redundant Creggan Camp had been reduced to less than 10% of its former size and the city centre had been given a face lift. Our attention was to shift for a time to the "Enclave", the rural belt sandwiched between the River Foyle and County Donegal.

To cross the border one has to pass through a permanent vehicle checkpoint (PVCP). The enclave has three such checkpoints situated near Nixons Corner, Buncrana and Muff. The remaining web of unapproved roads having been blocked since the early seventies in an attempt to monitor cross border traffic. The checkpoints each consisted of a central console, protective sangars and a set of road humps placed at the perimeter of the PVCP to slow cares entering or leaving the checkpoint.

The road humps were of a permanent type consisting of a length of box girder welded to metal stanchions set in concrete. During holiday periods the three checkpoints each had to cope with traffic exceeding one thousand cars per hour. When this volume of traffic met an obstacle such as the road humps the resultant tail back stretched as far as the eye could see. This was unacceptable, a temporary set of road humps which could be easily removed was required.

Various patent systems existed but none proved acceptable. They either had insufficient stopping power or were not durable enough. The problem of designing a temporary portable road hump system was given to our predecessors who came up with a workable design.

With one or two minor alterations an experimental set of road humps based on this design were produced. The experimental humps were installed at Nixons Corner and over the next few months they were user tested and monitored. Eventually they were given official approval and we were tasked with replacing all existing PVCP road humps with the new temporary type.

The first checkpoint to receive a complete set of new road humps was Buncrana. They were given the ultimate test when with the first summer public holiday of the year they were quickly removed by the RMP manning the checkpoint allowing a free flow of traffic—much to the delight of the public. It was also with the public in mind that the decision was made to build search bays with overhead cover at the PVCP's.

The design requirement was explicit, we were to produce a building with a planned ten year life which would be quick and simple to install and should be capable of taking a Ford Transit van leaving enough room for it to be easily searched. The size of the building was therefore dictated but in order to achieve a ten year design life the normal military CGI roof was not acceptable.

The existing roofs at the PVCP's were flat so therefore a pitched roof would have



A Facelift of Londonderry 1

A FACELIFT FOR LONDONDERRY



Photo 2. Castle Gate Londonderry. The new modern look.

been incongruous. The obvious solution was to build a felt roof. This was considered but rejected because of the inherent problems of construction during wet weather and also the long time taken to complete the job. Again the Design Centre were consulted and they recommended the use of a roofing material that had yet to be used by the Army in Ulster.

The material was Butyl Rubber, an Esso product similar to that of an inner tube of a tyre about 0-75mm thick. A local firm had been successfully using it in the Province over the past ten years. It was made to the required size in the factory so that on site it could be rolled out providing a fast and immediate weatherproof finish. This method of construction was so successful that we used it where possible throughout the tour laying over 1000m² of the membrane. Overhead cover search bays were erected at each of the PVCP's making the life of searcher and searched alike much more pleasant.

Our attention once again turned from the Enclave to the city of Londonderry when towards the end of our tour we were tasked with further renovation of the ancient city walls. During the early years of the troubles the old city had been sealed at night by the closure of the security gates which had been built into the arches of the city walls. These security gates took many forms, in particular Butchers Gate and Castle Gate which faced onto Rossville Flats also provided cover from fire. Butchers Gate, being the larger of the two also held a sangar within the arch. Both had seen their fair share of violence in the past and it is a tribute to the Sappers who had built them that they stood up to it so well. However the threat had been reassessed and it was decided to replace them with cover-from-view gates with a more civilian appearance.

The new gates were required to prevent all access, vehicular and pedestrian, when closed and at the same time providing cover from view for the Security Forces. They had to allow vehicular access when open and be free standing, not touching any part of the old archways. The main requirement however was that they should have a civilian appearance blending with their environment. The design called for centrally supported butterfly gates which would take the profile of the archways when closed and fold back on each other allowing access when open. The size of the gates (Butchers Gate being some six metres high and five metres wide) dictated a strong tubular steel structure clad with sheet metal.

A Facelift of Londonderry 2



Photo 3. Butchers Gate Londonderry. The old look after ten years of violence.

Having used plastic coated cladding at the Creggan the same firm were approached and they agreed to produce metal sheets of the required length using a dark green textured finish. The Londonderry Ancient Monuments Society were consulted and they agreed with the chosen finish. Within a few weeks the gates were completed bringing to an end our four month tour in Londonderry. Conclusion

With some careful planning and design, making use of modern material and construction methods, Londonderry has had a facelift over the past few months which points the way ahead for the rest of the Province in the field of military engineering.

A Facelift of Londonderry 3

Success Without Victory

AN ACCOUNT OF THE 1980 ARMY MOUNTAINEERING ASSOCIATION EXPEDITION TO MOUNT API IN WESTERN NEPAL

MAJOR M G LeG BRIDGES RE, B Sc, FRGS



The author was commissioned in 1965. While at RMCS Shrivenham in 1968 he took up rock climbing and, arising out of that, mountaineering. This activity has taken him to the Alps, W Greenland, Mt Kenya, and four times to the Himalayas. In between he has managed to include some soldiering, serving with 22 Engr Regt, 24 Fd Sqn, 36 Engr Regt and the RSME. A Long E & M Course attachment took him to Tasmania to work with hydro-electric machinery, and he is currently serving as a Company Commander at Chepstow.

In the years leading up to the successful ascent of Mt Everest by a party from the Army Mountaineering Association (AMA) in 1976, the AMA mounted a series of very successful Himalayan expeditions. However, Everest was a climax for many of those who took part in this series, and following it, many withdrew from active climbing and expeditioning. In 1978 Major Sir Crispin Agnew of Lochnaw Bt RHF proposed an expedition whose primary objective was to train a new group of climbers in expedition techniques and Himalayan mountaineering. The training area for this expedition techniques and Himalayan mountaineering. The training area for this expedition to be Mt Api, selected for the two excellent reasons that it was in West Nepal and it was the first on the list of peaks available. Major Agnew wanted to visit West Nepal. Needing only a simple excuse to return to the Himalayas for a fourth time, I promptly volunteered as Deputy Leader. The Sappers were also represented by 2nd Lieutenant Duncan Sperry.

Our departure from UK was hectic as the flight kindly offered by the RAF was brought forward by three weeks, reducing packing time from two weeks to three days! Confusion was heightened by the last minute withdrawal of two members of the team and the need to find replacements. However all things came to fruition and on 7 February we flew out of Lyneham in a Hercules aircraft en route for Kathmandu. Two of our twelve members were due to join us there ten days later but all of our 8000lbs of freight was on board.

Despite the charm of the Nepalese Customs and Tourist authorities, the process of importing our kit was tedious and long-winded. It was aggravated by the amazing frequency of public holidays which repeatedly brought all activity to a halt. However we had to wait for our two missing members anyway and this mitigated some of our frustration. By 21 February the team was united and all stores released and we were ready to go.

We left Kathmandu on 23 February in two hired trucks and headed for the West. To get there we had to go via Northern India as Nepal's road system doesn't cover that bit of the country. (In fact it only runs to three roads altogether). Fuel shortages

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Success Without Victory, Major MG LeG Bridges RE BSc FRGS arising from strikes in the industry complicated our journey through India, necessitating the obtaining of permits for every litre we bought. One Indian official, his face covered in shaving cream at 10 o'clock in the morning, held court over his breakfast with great dignity, and eventually issued us an authority for the issue of a permit to buy fuel. It was not immediately clear to whom this authority should be presented to obtain the permit. It subsequently transpired to be himself, now dressed and in his office and ready for the day's business!

In due course we reached Dandledhura in West Nepal after seven days and a final epic drive over a crazy road through the foothills. Left there by our trucks, the next stage was a fifteen day walk to Base Camp. Porters were hard to come by and initially we only found enough to get ten members started with about 30% of the stores. I was left with WO2 Ric Broad APTC in the position familiar to Sir Richard Burton's wife, whose duties were to "pay, pack and follow." It was five days before we could recruit sufficient porters to move the remainder of the freight, and we started our "walk in" on 11 March, more than a month after leaving UK, escorting eighty porters and accompanied by our Sirdar and one Sherpa.

The first five days of the walk took us across some wild rugged country where the vertical was more favoured than the horizontal. A road was under construction along the route on which work had been going on for twelve years. I concluded that it had been conceived by a lunatic and executed by a genius. In due course we descended into the valley of the Chamlia river which rises in the basin below Api. This river was here about the size of the Medway and we soon found that the local fisherman ran a fairly profitable business, based chiefly on the effectiveness of gelignite! The valley was scenically disappointing, lacking both the colour provided by the masses of rhododendrons found on the Everest trail, and the magnificent views, afforded from the ridge tops during the first five days, of Nanda Devi, Panchchuli, and the Api/ Nampa groups. As we went on up the valley it narrowed and the country became harsher with less cultivation. Eventually it became a gorge and we were forced to climb 1000ft above the river. Beyond that we moved through forest in the final approaches to the mountain. Late spring snow and avalanche debris covered the track as we battled through flattened copses of willow and silver birch. From 12,000ft, up to Base Camp at 13,500ft, Ric Broad and I had to plough a track for the porters through heavy snow. We reached Base Camp on a vile grey day of cold and snow on 24 March, just a month out from Kathmandu.

Base Camp was pitched on deep snow on a flat valley floor below the mountain. Beside it ran a melt stream which grew steadily with the onset of spring. In front of us reared the vast south face of Api. We had come here only with a very sketchy knowledge of the mountain, based on the reports of previous expeditions to the area. The mountain had been climbed twice before—by the relatively easy north side, and by the harder east ridge, the latter by an Italian party. Two Japanese parties had failed on routes on the west side of the mountain but both they and the Italians had shied away from the south face after a cursory inspection. The Italians sent us dire warnings of the avalanche threat of the south face—a point on which they were entirely correct. However the face offered a magnificent and classic line, and despite our lack of experience we decided to have a go at it. (Of the twelve members, only Crispin and I had been on an expedition before, and the doctor, who subsequently reached Camp 3 had never climbed at all.)

The face rose for 10,000ft above the camp to the summit at 23,400ft, so that while the mountain was not large by Himalayan standards, the face was comparable with many classic big routes. The SW face of Everest only rises 7,000ft above the Western Cwm. One obvious but dramatic and committing line offered itself to us. This started with a snow and rock ridge which sprang from the middle of the face 7000ft above us. At its top was a great ice pyramid. Above this was a steep headwall of almost bare ice, very exposed and threatened by avalanche. For a determined party a route lay upward via two hanging glaciers to the open upper face, which would have to be negotiated by the summit pair unaided. We hoped that a secure site for a camp could



Photo 1. The 10,000 feet south face of Api and basecamp. The route runs out to the right, reappearing half way up the RH side. It then follows the rock ridge leftwards towards the snow pyramid in the middle of the face at the top of the shadow. Thence up right via the two glaciers and up the middle of the shadow on the headwall towards the summit

be found on top of the upper glacier, designated the third on the route. It took us several days of acclimatisation and reconnaissance to summon up the courage to commit the team to this magnificent line and on 29 March we started on it. It was undoubtedly the hardest route that an AMA party had attempted, and considering the skill and experience of those teams who had turned aside from it, success on this face would be a great feather in our caps.

One of our recce parties had installed a temporary camp, Camp 4, near the foot of the ridge, and on 29 March I led the first climbing party up to find a site for Camp 1 and to move Camp 4 up there. We wanted a site at around 16,700ft to give us a good initial foothold on the ridge. At this time we were getting heavy falls of fresh snow

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every three or four days and for two or three days after each fall most snow slopes could be expected to be in a dangerous avalanche condition. This made progress slow and frustrating. However by sticking our necks out we found that it was possible to climb the next day-but-one after a snowfall with only moderate risk. Despite a heavy snowfall on 29 March which repeatedly buried Camp 4, flattening one tent, we succeeded in establishing Camp 1 at 16,700f on 1 April—All Fools Day. We wondered if this was significant. Great problems were encountered in finding anywhere to actually locate the tents as the ground was very steep with rock walls and 45° snow slopes. Initially we pitched two tents by digging platforms in the snow below a rock slab. Later we had three tents at this site. This camp was anything from four to seven hours from Base Camp depending on the snow conditions but there was little technical difficulty involved in the route.

The climbing started in earnest above this and, due to a change of plan, I was put in charge of the climbing party who were to find a route up the ridge to a site for Camp 2. Over this section lay the bulk of the rock problems that we were to encounter, and in



Success Without Victory 2

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Photo 3. The very steep final ascent to the top of the snow pyramid where Camp 3 was located

most places these were overlain with deep rotten snow with the consistency of damp sugar. As the altitude was still relatively low, the daytime temperatures were quite high and the hot sun rendered the open slopes dangerous and avalanche prone, at the same time reducing the climbers to enervated inertia. We therefore took advantage of the glorious full moon and started climbing by night when all was frozen and hard. This habit became fashionable and it persisted throughout the expedition. I can clearly recall those marvellous clear starlit nights with the surrounding peaks locked in frozen silence about us, looming faintly luminous in the moonlight. Rising at midnight we would set off up the ropes fixed the day before and, reaching our previous high point, we would hack and snowplough our way up through the 'overburden" of snow, searching for something moderately secure to climb on. Under these conditions a 30ft vertical pitch could assume the proportions of a major obstacle. We encountered a huge tower which took nine hours to climb and which we fitted with a fixed rope falling free for 250ft, and this became the only practical means of ascent and descent. Variety was provided by steep ice gullies and by the 400ft traverse across 70° slabs as we approached Camp 2. The weather continued indifferent to bad, and on one frightful evening at Camp 1 we were subjected to continuous

Success Without Victory 3

rivers of powder snow punctuated by two sizeable avalanches which buried both tents, knocking one of them flat. We were forced to abandon this tent for the night, after digging out its occupants, and we all four crammed into the other. As these were two man tents of modest proportions we could appreciate the feelings of sardines for their tins!

After ten days of this my party was exhausted, and we retired to Base for a rest while a second party took up the task of reaching a site for Camp 2. To save the long climb up the fixed ropes every morning, this party, under Crispin's leadership, established temporary Camp 1 $\frac{1}{2}$ below the big tower and later temporary Camp 1 $\frac{3}{4}$ above it. It took a total of sixteen days to establish Camp 2 which was placed on the only level section of the ridge at 18,500ft.



Photo 4. The upper face. Bottom left is the snow pyramid. To the right of this is a mass of rock which is surmounted by the second glacier. Above that is the ice ramp sloping up left, and right of it, the top of that is the third glacier. Camp 4 was on the third glacier. The twin lumps of the summit are more apparent on the ridge here, and from the LH side of them a steep ice rib runs almost straight down. This was the route to the summit and we stopped just above the little rock band that runs in from the right

At this point Crispin, who should have led all the way to Camp 3 was hit by a piece of ice dislodged by someone further up and withdrew to Base Camp. He took advantage of this short break to sit a law examination which had been sent out from the Faculty in Edinburgh and which was invigilated by the expedition doctor! I was sent back up to take over the leadership of this party too. Ric Broad and Sergeant John Arthy SAS made lightning progress up the ridge above Camp 2 while I was concerned with upgrading the alignment of the fixed ropes from the site of Camp $1\frac{1}{2}$ to above Camp 2, making the route porterable. On 21 April the four of us up there carried in Camp 3 which we sited on top of the ice pyramid. The speed with which they had made this possible was a great boost to the expedition morale as time was beginning to be pressing, the long delay in putting in Camp 2 had been discouraging, and the dreadful six to seven hour carry up from Camp 1 to Camp 2 was telling on those who were portering.

A new party, including Duncan Sperry, came up to replace us in the lead to put in Camp 4 and simultaneously Crispin nominated myself and John Arthy as the first summit party. Camp 3 was at 20,400ft and the top of the third glacier was estimated at 21,800ft. The intervening section of the route was all snow and ice, and involved first gaining access to the top of the second glacier via a doubtful serac wall, and then across the top of this to the bottom of a ramp. This was 900ft of steep ice leading up beside the third glacier. On 29 April John and I joined the lead party as they completed the traverse across from the top of the ramp on to the glacier. The weather was atrocious with snow falling heavily, dense cloud, and avalanches beginning to sweep the mountain. After eight hours climbing we located a hole under an overhanging serac, or ice tower, which would provide a measure of protection from the torrents of snow rushing down the face. Visibility was down to 20ft and as no alternatives offered themselves we pitched Camp 4 there.

There followed an afternoon and night of abject fear. The glacier was fairly active and shuddered and groaned periodically casting the stability of the great overhang of ice very much into doubt. As an alternative form of extermination, huge powder snow avalanches were coming down at ten to twenty minute intervals. These thundered over the top of the serac, falling in a curtain of snow just 10 feet out from the tent and throwing us into a raging windy darkness, before continuing on down the mountain, leaving us twitching in terror in the tent. Following this harrowing experience we declared 30 April a rest day and decided to leave at midnight the next night for the summit, in order to have some chance of getting back to the tent before the afternoon snowfall initiated another series of those terrifying avalanches. My diary for 1 May reads like a rather melodramatic novel. However as it is an authentic account written the day after our summit attempt I can do little other than quote it verbatim:

"The route took a rising diagonal line across the smooth snow slope which was the top of the glacier. The passage through the line of seracs at its upper edge brought one out on to the upper face proper. Seen from below this is composed of gracefully fluted ice. We were to learn about those flutings that night. Little ridges separated the flutes and the curving line of one of these led almost to the summit, passing through a band of partially exposed rock high up on the face.

"Rising at 2315 on 30 April we left Camp 4 at 0030. The night was clear and cold and the almost full moon made the scene as light as day. Our first problem was that the top of the glacier was now covered in thigh deep powder snow. I was going extremely well and broke trail for most of the way without finding it particularly arduous. We passed through the seraes at the top and came out on a bare snow slope below a small horizontal outcrop of rock. From here we had to traverse right to the foot of our ice rib. It was here that the drama began.

"I had assumed that fresh snow, falling on the steep ice face, sloughed off almost immediately causing the avalanches that had terrorised us yesterday. This was apparently not the case for soon after we emerged on to this slope, the avalanches began again, but this time in the middle of a clear night. The villain of the piece now rivers of powder snow punctuated by two sizeable avalanches which buried both tents, knocking one of them flat. We were forced to abandon this tent for the night, after digging out its occupants, and we all four crammed into the other. As these were two man tents of modest proportions we could appreciate the feelings of sardines for their tins!

After ten days of this my party was exhausted, and we retired to Base for a rest while a second party took up the task of reaching a site for Camp 2. To save the long climb up the fixed ropes every morning, this party, under Crispin's leadership, established temporary Camp 1 $\frac{1}{2}$ below the big tower and later temporary Camp 1 $\frac{3}{4}$ above it. It took a total of sixteen days to establish Camp 2 which was placed on the only level section of the ridge at 18,500ft.



Photo 4. The upper face. Bottom left is the snow pyramid. To the right of this is a mass of rock which is surmounted by the second glacier. Above that is the ice ramp sloping up left, and right of it, the top of that is the third glacier. Camp 4 was on the third glacier. The twin lumps of the summit are more apparent on the ridge here, and from the LH side of them a steep ice rib runs almost straight down. This was the route to the summit and we stopped just above the little rock band that runs in from the right

was wind, disturbing the snow lying higher up on the face. An ever-increasing, roaring cataract of snow swept down on us over the rock outerop. As we traversed towards our particular ice rib we cleared the rock, and the formation of the flutings became apparent. They were in fact ice runnels down which the powder snow rushed in rivers.

"We were very much inclined to turn back as we were being assiled by blinding clouds of spindrift, and the rivers of snow were threatening to sweep us off the mountain, when we gained the rib we sought. This lifted us out of the main stream and I decided it was still possible to go on. However a scene of awesome grandeur began to unfold about us such as I never expect to see again, nor wish to at such close range. The wind, tearing up the new snow, whitted it across the face of the mountain in ethereal writhing, twisting clouds similar to the flames of the sun's corona. On either side of us roared those terrifying rivers of snow, now developed to several feet deep and travelling at maybe 80mph only 10ft away. The whole scene was illuminated in harsh black and white by the cold glare of the moon. It was quite staggering.



Photo 5. Camp 4. The huge overhang on the right and the piled snow on which the avalanches landed

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Photo 6. Looking straight down from the highest point we reached

"With the wind came the cold. A deep seering cold which penetrated our windproofs and clothing, not like the much quoted knife, but slowly and relentlessly. Seizing the chance offered by a short Iull in the spindrift, I put on a down filled jacket or duvet, which I had always supposed would be far too hot to wear in anger, and which I was carrying for use in a bivouae. I replaced my windproof over the top and was still not warm.

"Through this assault by the elements we pressed on our way up the rib. We were climbing unroped for speed. The rib had started as a shallow rise between two runnels, sloping at perhaps 45". Initially the going was hard ice overlain by snow which provided a measure of support for our boots, but soon we were on hare ice and climbing on the front points of our crampons which was extremely strenuous. Daylight found us climbing a much more sharply crested ridge of ice at an ever

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increasing angle. I never saw that dawn. I was vaguely aware that that awful display of elemental force and darkness had given way to conventional daylight. Slowly weariness crept over us like a fog.

"As I passed through the exposed rock band, the angle of the ridge reached 65" and the snow became rotten and treacherous. Struggling perilously off to the right, I tried to climbo on the rock, but this was loose and plastered with snowmand ice. Twice I slipped but mercifully on both occasions the pick of one ice axe held on something secure. There was now about 1200ft of bare ice slope below us to the third glacier, and there was no guarantee that a falling body would lodge there. A fall would have been necessarily fatal. Returning with pathetic slowness to the ice ridge, I struggled up for a further 50ft to what I believed was part of the summit ridge, only to find that we still had 400ft to go. That finished us. John was now about 300ft below me and we were both totally exhausted. We had been climbing hard ice for ten hours through sensational conditions and we could go no further. Our progress in the last hour had been 20ft!"

As it was we took six hours to get down again, progressing with painful slowness by a series of abseils. A further hour spent in digging out the tent on arrival completely finished us so that we were incapable even of eating solid food. Only by the mercy of Providence did we get back at all for that was the one fine afternoon in three weeks. We would never have made it through the avalanches of an average day.

So ended our sixteen hour epic and the only promising attempt on the summit. A second attempt by another pair the next night ended at the top of the glacier where they were pinned down in a crevasse for three hours by avalanches, thunder and lightning. However the claim of success, without victory, is fair for we achieved our primary objective of giving our team invaluable training and experience; we proved the viability of the route although we didn't make it—by 0-4%; and we all came back alive in a season of failure and death along the length of the Himalayas. It will be interesting to see who next takes up the challenge of that magnificent route.

Ex Spearpoint 80—Battle Simulation



MAJOR C P R BATES RE, B Sc (Eng)

The Author was commissioned from RMAS in 1964 and served in Borneo with 32 Field Squadron before taking a Degree Course at RMCS 1966-1969. He then served as a Troop Commander in 8 Field Squadron, as GSO3 RE Ops/Int at HO 1 Armoured Division, and as Adjutant of 28 Amphibious Engineer Regiment. He attended Division I of the Army Staff Course in 1975/76 and was then posted as GSO2 SD at HQ NI. He assumed command of 20 Field Squadron in January 1979 and has since been abroad no less than fourteen times on reconnaissances and tours to Germany, Denmark, Cyprus, Oman, Jamaica and Belize.

Background

Exercise Spearpoint was not only the biggest exercise for many years, but was also almost certainly the noisiest. This was due largely to the use of battle simulation on a scale probably never attempted before in the British Army. 20 Field Squadron was

Major CPR Bates RE B Sc eng

given the battle simulation task, with the Independent Field Troop (AMF (L)) (Allied Command Europe Mobile Force, Land) and a detachment from the Combat Engineer Training Centre at Hameln under command. The initial planning was carried out in June 1980, during *Exercise Javelin*, the exercise designed to test the command and umpiring arrangements for *Exercise Spearpoint 80*. As 20 Field Squadron was otherwise engaged in Jamaica in June, the Regimental Second in Command attended *Exercise Javelin* and prepared the ground work. *Scope*

The bulk of our work was to consist of standard "pitches" designed to simulate the effects of artillery fire. Each pitch consisted of nine rows of nine one-pound charges. Each row was fired electrically, with the first charge being detonated immediately using an electric detonator. The other eight charges were fired through ISFEs (Igniter Safety Fuze Electric) and varying lengths of safety fuze giving delays from 30 seconds to 5 minutes. All rows were connected to a ripple switch and thus could be fired in any order and time separation. Each pitch was surrounded by a fence $175m \times 175m$, consisting of pickets and crossed yellow tape with warning notices at intervals. All charges were placed at least 50m from the fence.

Service pyrotechnics were also incorporated into some of the pitches; smoke generators were attached to one row, initiated by a detonating cord knot taped to the "window", rather than by the normal electrical means; trip flares were attached to some charges, initiated also by detonating cord secured into the trip wire clamp and knotted on one side.

Several thousand practice Mk 7 anti-tank mines, with smoke inserts, were provided; these were laid within Blue or Orange minefields, in places where the enemy was expected to attempt to cross.

In addition, HQRE 1st British Corps had made arrangements for British firms to supply various pyrotechnics for the exercise. Two firms, Haley and Weller, and Brocks supplied a total of nearly 1500 items of nine different types, free of charge. Some of these items were made up especially for the exercise. Their effects are summarised in Table A.

To add to the noise, Saab sent four Noise Generators down from Sweden. These consisted of a powerful amplifier and speaker connected to a cassette player. Tapes of ground attack aircraft, helicopters, tanks and artillery were provided, and in addition, the noise of machine gun fire or single shots could be produced electronically. The machines could be operated remotely by means of a special radio transmitter.

We tried mounting the noise generators on vehicles and used them around the battlefield, but because of the high ambient noise level they were ineffective in this role, though the operators thoroughly enjoyed the bemused reactions they attracted as they drove past a defended position in a Ferret sounding like an aircraft or a tank. We felt that the best use of this type of device would be on a small arms battle run, where the machine gun effects could be triggered in conjunction with pop-up targets. *Tasking*

The squadron travelled to Germany as part of the main *Exercise Crusader* move and set up camp in a disused and long-abandoned barracks at Lage Hohenfels. This was situated centrally in the *Exercise Spearpoint* area and was also used as the Damage Control Park. Our hosts, 2 Field Support Squadron, had set up the camp very well, and with some improvisation we had a comfortable base from which to operate.

The manpower was divided into twelve sections, each a minimum of eight plus a driver strong. The teams were mounted in 4-ton vehicles, with trailers, and each section was tasked with setting up and firing four pitches simultaneously. For guarding purposes, we were assisted by sections from 1 Glosters; in general each of our battle simulation sections was reinforced by an infantry section whenever they were working on pitches. This meant that a section could work on its four pitches in sequence, leaving a firing party of two RE and two Glosters soldiers on each. Inevitably, there were not enough JNCOs to go round, and a proportion of pitches
TABLE A

CIVILIAN PYROTECHNICS USED ON EX SPEARPOINT 80

Serial	ltem	Description	Remarks
1	Tank Strike Simulator (Haley & Weller)	3" diam aluminium cylinder with screw top. E1 initiation. Produces black smoke with red Roman Candle effect	Designed to simulate the effects of a tank being hit. Effects not very realistic though useful on 5 Nov
2	Artillery Fire Burst Simulator (Haley & Weller)	4" deep square plastic bottle with screw top. E1 initiation. Designed to produce a whistle followed by a flash, bang, smoke and a shower of peat.	Peat had dampened initiation and all failed to ignite electrically. They were fired with det cord wrapped round container or safety fuze pushed down with the compound. Both methods prone to blinds. The bursting effect quite good. With simple reliable initiation this device could be useful.
3	Viper Simulator (Haley & Weller)	20m of det cord with 5 plastic pots containing RDX attached. Designed to produce a linear explosion to simulate a mine breaching explosive hose.	We fired these in a line of 3 linked with det cord. This produced an effective simulation but a similar effect could fairly readily be achieved with Service explosives.
4	Fighter Ground Attack (Haley & Weller)	20m of instantaneous fuse with 20 small plastic pots containing powder attached. Designed to simulate aircraft cannon fire running along ground. Lengths can be joined.	Difficult to synchronize with approaching aircraft. Used effectively at high visibility stands as helicopters approached. Some lengths failed to detonate because of dampness. Useful gimmick for spectator events
5	8" Black Burster (Brocks)	8" diam black sphere. E1 initiation. Produced a flash of flame, loud bang and black smoke.	Resembles Music Hail bomb. Would make an effective tank strike simulator, preferably with striker initiation.
6	4" Ground Maroon (Brocks)	4"diam sisal covered cylinder, E1 initiation. Loud	Could be used to simulate firing of a demolition con-
7	Directional Thunderflash (Brocks)	1" diam cylinder, 2" long in aluminium container. E1 initiation. Relatively weak bang.	Directional nature ineffective.
8	Special No 6 (Brocks)	I" diam cylinder, 6" long. E1 initiation. Relatively weak bang.	An E1 thunderflash. Could be used to simulate firing of a demolition though insufficiently loud.
9	B4 Black Smoke Generator (Brocks)	4" diam metal cylinder, 6" long, E1 initiation, 2 mins of black smoke.	Quite effective.

EX SPEARPOINT 80-BATTLE SIMULATION



Photo 1. Soldiers preparing charges for a pitch

were left in charge of a firing party consisting of two Sappers and two privates.

The infantrymen worked very willingly throughout. Initially they were surprised that they were allowed to handle explosives to assist in making up the charges, but after the headaches set in (we were using old stocks of Nobels 808) they realised why the Sappers had been happy to let them do so!

Initially, we planned that work on each pitch would start two days before it was to be fired. On the first day, the fencing and electric cable would be set out and the firing point prepared. The teams would then return to camp overnight and start out the next morning to draw up explosives and complete each pitch by last light. They would then guard the pitches overnight, going to State 2 at first light the next day, and firing



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to 3. Trip flare connected to a charge

on orders. Firing cables could obviously be prepared in advance and re-used. However, safety regulations forbade the carriage of made-up charges and so all preparation of explosives had to be carried out on site. As teams gained experience, it was found to be possible for a section to complete four pitches in one day from scratch.

Tasking priorities were confirmed during *Exercise Javelin*, with a concentration of pitches being sited close to two "High Visibility" stands. These stands were estab-lished to enable various important visitors to view particular phases of the exercise from suitable vantage points. The Battle

The Aggressive Delay Phase of the exercise was curtailed to limit damage, and so our first tasks were during the Break-in Battle. For this, all sections were deployed simultaneously, preparing thirty-two pitches, six minefield breaches using Viper simulants, three areas of mines with smoke inserts and various simulations in the



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EX SPEARPOINT 80-BATTLE SIMULATION



Photo 5. Selection of civilian supplied pyrotechnics. Left to right: Viper Simulator, Tank Strike Simulator, Artillery Fire Burst Simulator, Fighter Ground Attack, (back and centre) Directional Thunderflash, (front) Special No 6, (back) B4 Black Smoke Generator, (front) 4° Ground Marcon

immediate area of the Stand. The pitches were designed to represent principally the Orange artillery bombardment. This started with an initial rolling barrage fired on a timed basis; then as Orange forces crossed the start line, fire was brought down ahead of the leading tanks, with pitches being fired on the initiative of the firing parties as tanks approached. This fire plan was devised in consultation with the Orange Artillery to simulate as closely as possible known Soviet tactics. The Viper simulants were designed to represent Orange forces using explosive

The Viper simulants were designed to represent Orange forces using explosive hose devices to breach Blue minefields, and the smoke filled mines were laid else-



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where in Blue minefields where Orange forces were simulating breaches using roller and plough equipped tanks.

These tasks so depleted our manpower that the simulations around the Stand devolved upon a high-powered team consisting of SSM, MT Sergeant and Pay Sergeant. They laid a number of pyrotechnics very close to the Stand, of which the most effective was the aircraft cannon fire simulator, which was fired as a Cobra helicopter approached, synchronized with the machine gun effects of the Saab noise generators; this caused considerable consternation amongst the spectators who visibly quailed as the cannon fire ran along the ground towards them, stopping almost at their feet.

Although it was a misty morning, the sight of 2 US Armoured Division (Hell on Wheels) streaming forward, with simulated artillery fire echoing across the battle-field, was most impressive.

Our next major task was on the crossings of the River Leine. Blue forces had laid minefields on the banks opposite some of the bridging sites, and these were sewn liberally with smoke anti-tank mines. We also set up a number of pitches opposite the crossing sites. These were fired at night during the bridging operations; the effects at night were even more spectacular with the flashes from the explosives and echoes rolling off the surrounding hills and, no doubt, rattling windows in Schloss Marienburg.

The 3rd German Panzer Brigade had now joined the exercise on the Orange side, and broke out from the Leine bridgeheads to advance in the direction of Coppenbrugge. We provided a detachment to support them with Viper simulators and smoke generators and also set up a number of pitches along their line of advance.

Further north, we were busy preparing for the second high visibility event. This was for *Operation Goodwood*, when the Orange attack was finally to be brought to a halt in Blue "Killing Areas". Again, the sequence of firing of our pitches had been co-ordinated with the Artillery fire plans, and the results were very effective, more so than for the first Stand in that the pitches were concentrated into a smaller area and some were closer to the Stand.

Operation Goodwood marked the turning of the tide, and Orange forces then started to retreat, before a Blue advance. We provided a heavy pitch concentration to enable Orange forces to break clean back across the Leine and then finally more pitches surrounding the two counter attack objectives.

In the set piece battles, it was relatively simple to order the firing of the pitches to a timed programme, or keyed to particular events. A number of the pitches were however, sited in peripheral areas of the battle. The original intention had been that the firing of these pitches would be ordered through the Artillery umpires, but despite close liaison, we soon discovered that this was not working satisfactorily. Thereafter, we always incorporated into the firing orders a caveat to the effect that the firing party should fire when advancing forces were at close proximity. For safety and security reasons, all firing parties had to be equipped with manpack radios and sets were begged and borrowed from various sources. Eventually we accumulated sufficient sets, a mixture of Clansman and Larkspur types, to provide communications to all pitches, and this provided us with a means of varying firing orders as necessary.

Blinds

Inevitably, we suffered a proportion of blinds. We had taken every reasonable precaution, by placing charges in plastic bags and covering initiation sets with clingfilm, but approximately 5% of charges failed to go off. Most of these (3%) were due to faulty ISFEs, but small proportions were due to poor crimping of safety fuse to ISFEs, failure of detonators or failure of safety fuse.

The circuits were fired by batteries and EDCs (Exploder Dynamo Condenser). Despite trials carried out in UK before the exercise, it was found that A41 batteries, when used in conjunction with D10 cable, were not a reliable means of initiation. This was no doubt due to a combination of the high resistance of the cable, exacerbated by the number of joints, and the doubtful power of batteries (all were newly issued stock, but time expired). Some of the circuits used old-style demolition cable or the newer twisted cable and these produced fewer problems. There were insufficient EDCs for each pitch, but it was found that rows could be fired reliably using freshly charged Clansman secondary batteries, or in extremis, vehicle batteries. *Planning*

Some seventy-nine pitches were sited on *Exercise Javelin* and clearance was obtained through the Chief Services Liajson Officer (CSLO). In the event a number of the pitches for the initial battle had to be hurriedly re-sited to fit in better with the planned lines of advance. All pitches were sited in stubble fields, at respectable distances from houses and roads. Subsequent phases of the battle demanded a more rapid response, as the tactical situation became more fluid. The Squadron manned a eell in the Control HQ, alongside HQRE 1 (BR) Corps, and tasking demanded close liaison with Orange and Blue Controls, the Exercise Planning Staff and the Umpires; inevitably, we were costantly pressing for information on future plans so that we could obtain clearance to site simulations in the most effective areas. In the later stages of the battle, this information was not available in time to obtain clearance through the CSLO; however, we eventually came to an agreement whereby we were given blanket authority to site pitches within areas which had previously been cleared for minelaying. In some areas, this was not available in view of the large scale of minelaying on the exercise.

For the final counter attack phase, the Blue objectives were changed radically, less than forty-eight hours beforehand, to limit damage. By hurriedly superimposing the minefield trace we were able to site twenty-four pitches en route to and round the objectives, only one of which was in the position previously cleared.

Orders were issued by Squadron HQ to Troop Commanders and firing parties on proformas, which incorporated details of pyrotechnics to be included and, most importantly, the firing orders.

The local farmers were not unduly put out by our activities. Indeed, towards the end of the exercise they came to appreciate that having our pitches on their land was a positive advantage; they kept tanks away! Conclusions

Any Squadron commander would breathe an enormous sigh of relief just to complete a potentially hazardous task of this nature without incident. I believe that we achieved more than this; our customers certainly appeared to appreciate our efforts, and there is little doubt that we made a significant contribution towards



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making the battle more realistic, if only by representing some of the fog, and noise, of war.

At the same time, we derived considerable benefit from the experience; the Sappers who participated are probably now as confident about handling explosives as any in the Corps. Heavy responsibilities were delegated down to a very low level (far lower than safety regulations normally permit), and as always, the soltiers responded very well.

During the exercise, we disposed of some four tons of thirty-five year-old explosive, all left over from the last major FTX in Germany; some of the smoke generators were equally elderly. Accessories were also used in large quantities, including nearly 100km of electric cable and 50km of yellow tape.

Exercise Spearpoint demonstrated that large scale battle simulation is a valuable adjunct to a major FTX. To be effective, considerable manpower resources and surprisingly large quantities of explosives and accessories have to be allocated, and planning has to start early. Battle Simulations take time to set up, and by their nature are not particularly flexible, particularly if CSLO clearance is required. For more fluid battles than *Exercise Spearpoint*, difficulty may be experienced in providing effects, except in certain set piece situations such as river crossings and minefield breaches. Civilian-pattern pyrotechnics provide a useful bonus, and certain of the types used have the potential to be developed into effective battle simulants, which could be set up rapidly with small danger areas; however, there is currently no substitute for the standard one poound bang!

Something of War

BRIGADIER J R T ALDOUS CBE MC DL



The Author was commissioned as 2 Lieux RE in Feb 1916 aged 17 4112, OC 22 Fd Coy R B S&M 1930–31; CRE 2 Div 1940–41; Comd 5 Inf Bde 1941–42; BGS 4th Corps 1942–43 and invalided home; Comd RE OCTU Newark 1944; BGS N Comd 1944–47; Comd 161 Indep Inf Bde Gp (TA) 1947–50; retired 1950. DL Suffolk 1964; Chairman W Suffolk CC 1965–71; High Sheriff 1969; Hon Lay Canon St Edmundsbury Cathedral 1970; Emeritus 1976. Farmer.

This Journal has sometimes seemed a collection of technical papers; and indeed engineers must surely be skillul and interested in their specialties. However, we are first of all soldiers, and the specialty of a soldier is men; and in particular the study of young men under stress. What follows is in no sense a history of any operation or of a Sapper unit, but a personal account of two or three days in the life of a very young soldier in the First World War, sixty-two years ago. There may even be lessons to be learnt.

PART 1. A DAY TO REMEMBER

"Would you like," said General Dobbie "to know how the Australians got there?" "Very much", I said.

210th Field Company was part of the 31st Division, a Kitchener Division of volunteers from Yorkshire and Lancashire. They had undoubtedly been very good, and

Brigadier JRT Aldous CBE MC DL

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perhaps those that remained were still potentially as good as many others. But the Division had been broken on the Somme in 1916, never properly reinforced, and during 1917 its morale was low and its troops of doubtful quality. The sordid monotony of trench-warfare on Vimy Ridge had done nothing to improve it. But we all felt-even down to Sapper Subalterns like me-that most of the trouble was due to a thoroughly incompetent Divisional HQ, and a complete lack of leadership and drive. Lieutenant (later Brigadier) J C B Wakeford, who was a fellow Subaltern in 210th Field Company at that time (and who has kindly looked at this paper and made several very helpful suggestions) says that the Divisional HQ motto was "Never trouble trouble till trouble troubles you!" The Divisional Commander was known only by jibes at the infrequency of his visits to the line and his sartorial perfection. The CRE (I may be doing him an injustice) was to me, no more than a name. Among this splendour (ADC's and GSO3's all glowed red in those days), only the CRA was a leader. "Stuffy" Lambert was known to everyone, he was always seen walking about in the forward areas, and his caustic but down-to-earth wit was a byword. We always felt that the Gunners of the 31st Division were excellent. As for the rest-no fighting, no drive, bad leadership: we all knew it, and knew that bad leaders make bad troops: and that bad leaders should be sacked.

At the end of 1917, the 4th Guards Brigade was formed from 2nd Irish, 3rd Coldstream and 4th Grenadier Battalions and 210th Field Company was brigaded with them. After the 31st Division this was a revelation to us. We were used at nearly all the trouble spots during the spring of 1918, first to plug the gap from the German offensive on the Somme and finally in the epic stand at Hazebrouck, where the Brigade died. At the beginning of April, the Division was in GHQ reserve near the Somme when the Germans offensive broke through the Portugese lines, east of Hazebrouck. This area was vital to the retention of the Channel ports, and we were ordered there at once. What follows is a very young Sapper Officer's experience and feelings in the last two days of the Hazebrouck battle.

All night we waited beside the road, where I fitfully dozed on a pile of stones in the rain, before our buses arrived. The Guards had just come from a Brigade inspection and were impeccable. At intervals the band of the Coldstreams marched up and down in the next field playing "Oh, oh, oh, its a lovely war". At last the buses came and we drove, via St Pol and Aire to Hazebrouck, and finally debussed on a little rise at Strazeele overlooking Vieux Berquin. On our left, were open fields and across them men were walking back—not running, nor panic-striken, but just walking in a disorganised way, spread anyhow over the fields. We understood that the Guards, who had arrived some time previously, had debussed, and simply advanced through them, semi-deployed, until they made contact with the enemy.

The Sappers did no "sapping". We never did. Anyway, we seldom had our horses, bicycles or tool-carts which were interminably on the road under the Second-in-Command (2IC), held up by appalling traffic conditions and the conflicting demands of ambulances, guns, food, reinforcements and refugees. We usually picked up two or more bandoliers of ammunition, slung them round our necks or over our shoulders, and went off to hold some flank or place where the enemy was supposed to have broken through (but hadn't). It was rather wearing to the nerves, and we had three or four casualties each time we moved, but—that was it.

Sure enough, orders came through for us to go up and hold a certain line marked on the map. Front and flanks were quite uncertain, so we were to go to a rendezvous just behind it, and await orders. We therefore posted pickets along the roads, and got ourselves into a row of empty houses. Stragglers were all over the place. Next day, nothing much happened to us, but it was said that the Brigade had been under incessant attack from three and a half German Divisions, and had suffered very heavy casualties but had given little ground. Next evening we got orders to go (via Brigade Headquarters) to help the Grenadiers consolidate part of their front line and generally do anything that we could for them. We had been moderately heavily shelled for some hours, and were quite glad to be moving.

It was a very dark night, there was a lot of shelling and houses and farms were burning everywhere, the cries of the burning animals cooped in their pens and the smell of burning flesh was intensely distressing. The Company Commander, Major David Speight, was not with us (he was probably at Bde HQ); the 2IC was presumably bogged down somewhere with our transport, and Harold Keating, the senior Subaltern, was in charge. We found our way to Bde HQ, and then to the HQ of the Grenadier Guards where we handed over thirty or forty stragglers, (Keatings' diary gives the number of stragglers handed over as 150 from all three Battalions), whom we had collected en route. The Battalion gave us two guides, who-for some unknown reason-disappeared. In the dark, we walked along a narrow country lane-about eighty of us, I suppose-and very soon we were lost. However, a straggler seemed to know vaguely the way, so we set off in artillery formation (blobs in modern jargon)-over a grass meadow rising slightly in front of us. We were rather heavily laden, carrying not only shovels but ammunition and rations for the Grenadier Guards, who we were told, were too weak and exhausted to send back for them. Suddenly, an aeroplane swooped down out of the night, and dropped two bombs on us. One fell on the leading section and another on mine, covering us with clods of earth and killing one of my Sappers. I stayed behind, for a minute, with my two Corporals to make sure he was dead, and in the dark my hand went right through his chest-an enormous wound-and came out dripping with blood. I was just straightening up, when we came under very accurate machine-gun fire. At first we thought it was a German gun infiltrated behind our line, and we took up firing positions; but then we heard the aircraft making a second run at us, and I saw quite clearly that it was one of ours. It flew off, no doubt very satisfied, back to the west over our lines. My diary is very bitter. The Sapper killed was an older man, nearly forty, married and just out from England for the first time.

Surprisingly, we found the Grenadiers. It was too dark to see much. My diary says that we found a few Grenadiers holding a series of shell-slits. They were too tired for words—just lying behind the trenches asleep, with one man here and there, as sentry. I was working for No 4 Company who were holding a line about seventy-five yards long. The Company Commander, (a Subaltern and the only Officer that I saw) told me that they had come out of the line that morning, 1 Officer, 1 L/Cpl and 8 men strong; they had been made up a bit (and I counted their strength as about twenty). He told me (my diary) that all four of their CQMSs had been killed by one shell, and that all their senior NCOs and most of their Officers had become casualities. Their casualities had been too awful for words. We joined up the slits for them, made some traverses, levelled the parapets and did what we could—but at 2ft 6in we met water, so could get no deeper. There was some shelling and machine-gun fire, but nothing very much.

Towards dawn, one of the Grenadier Officers said to Keating "will you stay and fight with us?" Keating took me aside and asked for my views. I had no idea what orders he had been given, but he seemed to think that unless he got orders from Brigade HQ to stay, he had to report back. I had no reason for not agreeing, because we were possibly the last Brigade reserve; but it was very distasteful and we didn't like it. Had we been engaged in any sort of fighting, the question of course would not have arisen. So we pulled out at 4am gladly giving the Guards what of our own rations we had. When we were about 600 yards behind the Grenadier line, I was not sure of my way and shone a torch to look at a map. Suddenly an excited machine-gun Officer dashed out of the night, seized my arm, and implored me to put out the light as the Germans were only a few yards away, and we were between the lines. I explained where the Grenadiers were and, I hope, convinced him-but this episode showed the confusion and uncertainty which was everywhere. Finally we got back to near Brigade HQ and I went in to report what we had done. I told Oliver Lyttleton, the Brigade Major, that we had saved the Grenadiers some energy perhaps by digging and had given them ammunition, some rations and a little more cover. "Where were they exactly?" he said, "we haven't really had a proper report from them". Alas, I

couldn't tell him—how could I? We were lost when we found them, and I was trained in trench-warfare on Vimy Ridge and never thought of such things. I could only give him a general idea, which he already had.

Next day, the attacks went on and the Brigade fought the enemy to a stand-still, but they were now so few that we all knew that another big attack must be the end. Early on, we were told that the situation on our flanks was obscure and that there was a gap on our right. At 11am therefore, we were sent to establish outposts and patrols on the rides through the Bois d'Aval, in case any Germans came that way. I found this rather eerie. A few shells came over-and we even heard some of our own guns firing for the first time-but no enemy. We did this all day, in two-hour shifts until that evening, at 6pm the Brigade Commander told us that the situation was critical, the Guards were cut up and many surrounded, and that we had not made contact with our flanks (Keating's diary). The 210th Field Company was ordered, together with some of the Brigade HQ personnel, to dig-in just in front of the northern edge of the Bois d'Aval, and hold on. We picked up our usual bandoliers, shovels and so on, and in the twilight left the edge of the wood under a fair amount of shell-fire, roughly decided on a line to be held, and dug as fast as ever we could, in the open, 150 yards or so from the trees. The War Diary says that "the Posts were dug under heavy shell-fire and machine-gun fire". I was standing beside the diggers when suddenly a machine-gun opened on us from a spur of the wood, in our right front about 200 to 300 yards away. I took a flying leap onto the nearest diggers, but had to get to another slit where there was more room, while bullets whizzed over us, about a foot from the ground. Another automatic also opened up on our left, but the advanced post on our right, so close to us, had our position in a 45° enfilade and it crossed my mind that here was a chance for a DSO if I went and captured the thing! However, as it was getting dark, and the enemy probably had a platoon there, and I was almost dropping with fatigue-it didn't seem very practical! We were told that there were Guardsmen on our left-perhaps they were the Brigade HQ people. Our right, where I was, seemed completely exposed. We were told at 3am that two Australian posts had been established somewhere in front, so we then felt that we should get some warning; but I expected to be attacked the next morning and probably to be overrun. I do not think that anyone visited my section although the Brigade Commander visited both Keating and Wakeford. The night passed slowly.

Sometime, just before dawn, a runner came through to say that the 1st Australian Division had reinforced us, was in position, and that we were to come in. Never have I been more relieved! It was getting light, and we crawled back across the open in little snakes—I leading one part of my section. When I got to the trees, I went on crawling for some yards-firstly because the outside trees were thin and I didn't want to be spotted by the enemy, and secondly because we were all so utterly exhausted and we hardly knew what we were doing. I then looked up and saw a very large Australian Corporal (he seemed to me to be enormous) lounging against a tree. "Bloody English Guards", he said. My hand went to my revolver and that Corporal never knew how near he was to being shot. Instead, I got rather sheepishly to my feet, the Sappers behind me did likewise, and we passed into the forest and joined up with the others. Keating must have had some orders as to where were to go, because he led us away to north-but halted at a cross-roads where we had seen shells falling almost continuously, the afternoon before. I went forward and suggested to Keating that this place was not very healthy, but by this time he was in such a state of despondency that (my diary) he replied that "as the infantry had all been annihilated, he saw no reason why we should not be, and in fact he rather thought that we ought to be". However, a minute or so later, an Australian Officer saw us and dashed across to warn Keating, who then moved us a bit up the road—but with evident reluctance. It never occurred to me at the time, but I now wonder whether he was thinking of what he had had to say to that Grenadier Officer two nights before. Anyway we moved on a little and fell out by the roadside. While we were there, some of the Guards marched past us. Not many; dreadfully tired; and last, their Commanding Officer,

Colonel Pilcher, snuffling a little I thought, with an end of one puttee undone and trailing on the road. They passed on. We got up and—with my mind full of the sight of those wonderful Battalions, each a thousand strong, marching off their Brigade inspection, so short a time ago—moved on, and on, looking for our billets. Finally we came to the right farm and saw the men into a barn. The Officers then went into the farm-house. I saw one of our Officers lean against the wall, then slide slowly down and collapse. I knew nothing more until I woke up many hours later. Not long afterwards, the Brigade Commander and Oliver Lyttleton were standing in the doorway, outwardly cheerful and composed, asking after us and complimenting us on our behaviour. They must have been just as tired as we were, perhaps more so. I have always regarded this as a fine example of leadership, and I have many times quoted it.

Eighteen years later, I was on General Dobbie's staff and had to prepare a three-day exercise, for the Chief Engineers, which he was to hold on the crossing of the Aisne. I was driving him back from London one evening, and in speaking of the war, I told him something of the last days of the 4th Guards Brigade, and of our relief by the Australians.

"Would you like," said General Dobbie "to know how the Australians got there?" "Very much", I said.

I will try to repeat his words, as I remember them. "I was then", he said, "on the General Staff at GHQ charged with the movement of troops by rail and road. We had foreseen the desperate position of the 4th Guards Brigade at Hazebrouck, and had realised that the only possible reinforcements were the 1st Australian Division. But they were away, out of the area, and there was no rolling-stock to move them. I went across to my opposite number in Q, and went over every possibility, again and again. We looked at everything—and finally, I had to accept that there was no possible way of getting the Australians moved. The rolling-stock simply could not be assembled in time. I went back to my office, and went down on my knees in front of my desk, and prayed that something might be done to help us.² Next day, the impossible happened. By some extraordinary combination of circumstances—not one, that wouldn't have done it—but several; some disobeyed orders, another had made a gross mistake, and so on. And the rolling-stock could be assembled".

"Yes", I said.

NOTES

¹ In the Official History of the Grenadier Guards 1914–18, it is correctly stated on page 44 "the 210th Field Company RE went up to help the 4th Battalion Grenadiers dig the new line". On page 41, however, occurs "The Field Company RE that was to have been sent up to help, did not appear . . ." There is some implied criticism here, and it is as well to clear it up.

There is an entry in Keating's diary which reads "I was at the time expecting to be kept to reinforce the Grenadiers (The word in my (typed) copy is "garrison", but I think that "Grenadiers" is more likely to be what he wrote), but we received no orders". I think that, in some way, the Field Company must have been promised to the Grenadiers, but that the orders were never sent, or if sent had gone astray. In any case, would not such orders have been given to the Company Commander? There is no mention of any such orders, or promise, in the 210th Field Company's War Diary.

Brigadier Wakeford however has made some comments on the last day, which put the matter beyond all reasonable doubt. His letter also paints a vivid picture of the conditions.

Comment by Brigadier J C B Wakeford CMG

On the last full day of the Hazebrouck battle, the Brigade reserves were the KOYLI and ourselves; and at one time that day the Brigade committed the KOYLI on our left, leaving only us; and we could not be engaged except by direct orders of Brigade. In accordance with Brigade orders we were strung out foxholing along roughly the forward edge of the Bois d'Aval. I had Gilmour's section and my own, and you went off with Harold Keating. (We were organized, at the time, in half-

companies. My half-company was then patrolling the rides through the Bois d'Aval on the exposed right flank.)

I was picked up by David Speight and went with him to find Brigade HQ, report progress and have our orders confirmed or amended. We found Brigade HQ empty, and no indication of where they had gone. Chandos says (*The Memoirs of Lord Chandos*, 1962) that they had gone forward to the Grenadiers, but it is a pity they did not say so at the time. David and I waited for a while in the hope that someone would turn up. I remember that I cooked some bacon and eggs, which would not have taken long. David sent me back to my half-company and himself continued to try to contact Brigade. (Until he did so, he was bound by the orders already received). We parted at about the turn of the evening light—dark under the trees but fairly visible in open country.

Much later (midnight?) the Brigade Commander came along the line, north to south, by himself except for a runner. He appeared to me to expect me to be where I was, from which I was convinced that there had been no change of Brigade plans. He told me that the Australians had arrived in the area, but whether they or the Germans would reach us first, he did not know; but in either case, he depended on us to remain firm in our position. I assured him that we would do so. We shook hands, and he said "Good-bye, John, I don't suppose we will meet again"; and off he went, on what I did not regard as a very cheerful note.

The rest you know. The Australians arrived, and we left. I asked David about ten days or so afterwards what had happened about the question of reinforcing the Grenadiers, because I myself had been badgered about it by the Officer-in-Charge of a working-party and I could not answer him. I knew that I had carried out his orders, and therefore what was the chap talking about? David did not tell me much but said that there had been a misunderstanding (on whose part?) but that it was now cleared up.

Those guns on our right. They did not sound like 18 pounders; but had I thought a sharper crack more like a French 75. It will be interesting if you ever find out who they were. JCB

12 May 1980

² I have read Sybil Dobbie's book on her father with great interest and appreciation. General Dobbie was the most inspiring commander I have ever served under—I would have done anything for him. But her book hardly mentions the Australians at Hazebrouck. Did he never speak as I have related? If her husband or anyone who knew him well should read this, I would very much like to know.

PART 2. A DAY TO FORGET

After the desperate fighting near Hazebrouck in April 1918, the 4th Guards Brigade was never really reformed. They had a month or so in the same area where they feuded almost daily with the Australians. There could hardly have existed two better lots of fighting soldiers, so utterly different in every way. However, the Guards were finally drafted away, and the 210th Field Company then worked mostly with 94th Brigade, and at times with some of the *Broken Spur* Battalions—ex-Yeomanry from Palestine who had lost their horses and had been transmuted into infantry. They had seen little heavy shelling and were very inexperienced. I was still commanding No 2 Section (Troop, to you).

The Company had been through a lot, and the reinforcements were generally of low quality. One Officer of the Company, whom I had known in England and admired very much, was Harold Keating. He was brilliant academically, had been Captain of the Oppidans at Eton; and was brave beyond all knowledge. He had been badly wounded on the Somme, I had been told, in an incredibly brave action—almost foolhardy—crawling out of the front line trench in broad daylight, and had a deep wound running the full length of his arm from wrist to shoulder made by a sniper's bullet. I was nineteen, and Keating perhaps three or four years older. We were both fairly hardened warriors. In June 1918, we had to straighten out an awkard piece of line in front of the Forest of Nieppe. Curiously, it involved an advance over exactly the same piece of ground where the 4th Guards Brigade had fought so magnificantly in April. It wasn't much, really. The first wave was to cross the start-line at 6.30am, and then Harold Keating's Section and mine had to follow behind the second wave, and put up wire for strong-points 200 yards or so behind the positions held by the leading troops. Our wire, pickets etc were to be carried by working-parties of the Broken Spur infantry, following behind us. It all sounded a bit odd, because we were to do this in broad daylight. The Sapper organisation was that—I have the operation order in front of me as I write—one Field Company (the 211th), with its OC, Major Mansel, was in charge; and detailed to the various tasks were five named Sapper Subalterns and their Sections. For example my paragraph reads:

"(3) Consolidation of strong points F (Verte Rue) and G (E29A14), 1 Section RE under Lieut Aldous RE: 2 platoons of Inf (50 OR) as carrying-party under Lieut Peate 24th RWF, assisted at each post by 2 Platoons of the 11th EY who are the garrison of each post."

It started off badly for us. My diary tells me that I went to a rumoured rehearsal the day before, but could find no-one except for the Sapper Company Commander in charge and my carrying-party Officer. However, I fixed up details with him; and Mansel (the Company Commander IC) told me of zero hour next morning and that other Sapper Sections had been up to dig shell-slits for my carrying-party and my Section, since our assembly positions were likely to be one of the enemy's barrage lines! I then went off to see the EY Commander of the Company whose posts I was to wire. He was one, Southern, whom I knew. It all reads very haphazardly, but I imagine that I must have done some reconnaissance. We had to be in our assembly trenches half an hour before zero hour.

That night, Keating and I were in a lean-to of a disused farm-house, and I had hoped to get some sleep before setting off in the early hours. As night went on, Keating bent over his lantern, covering sheets and sheets of paper; on and on in the semi-darkness went the scratching of his pen. For the "nth" time, I said "What are you doing?"—and again the answer came "Writing home". Finally, nearly midnight, and I said, "For God's sake, give it up: I want some sleep". "Nearly finished", he said, "I'm making my will".

We set off at 4.15 up the towpath, Keating leading. We knew every yard. Suddenly, I heard a splash; Keating had walked clean off the towpath into the canal, and was pulled out by his men. On we carried; and I saw my Section and carrying-party into their assembly trenches, and then with two runners went to Battalion HQ. No-one who has not heard the opening of a barrage of that size, can have the least idea of the exhilaration it causes. I was told that we had three Divisional artillerics deployed on our Divisional front and the Australian guns firing from the flank. One Battery opened about fifteen seconds before zero—and then, in one second, there was nothing in the whole world but one single roar of sound. Our leading waves were all out of their trenches and away, before the German barrage fell on the edge of the wood. Keating and I left Bn HQ after a time, and wandered about talking to German prisoners who were beginning to come in; but the enemy began searching the wood rather heavily and many people were being hit, so we returned to the Bn HQ.

In due course, reports came in that our final objectives had been reached, and as each report came in, the Sappers moved out, with their carrying-parties. Southern's report didn't come, but I arranged with the Bn Commander that I had better start off, anyway, and find out what had happened. So I sent off my two runners to bring up the men, and almost at once the report arrived. On reaching the edge of the wood, my diary reads, "unluckily some five-nines arrived on the fringe of the wood at the same time as we did, killing two Bosche and frightening us—several of the Yeomanry started running away, but with the use of much profane language, I got them together again and started across our trenches towards Verte Rue where I could see every conceivable kind of shell bursting". I should say here that I didn't know that the Ycomanry, who had never seen this sort of thing before, had been very shaken just previously by heavy shelling of their assembly trenches where they had a number of casualities. They suffered heavily during the whole operation, and deserved the greatest praise.

We had no guides, but we walked through the light enemy barrage on the edge of the Forest—a column of about twenty or more Sappers (Sergeant, 2nd Corporal, Lance Corporal and twenty men) and fifty RWF carrying wire and pickets—till we found the tape which had been laid as planned. In due course, we got near Verte Rue and I halted the men and went forward to find Southern. There he was, in the right place, and surrounded by his reserve platoon. I left my Sergeant with him, to organize his own men in wiring that strong-point, and went forward to find the other places that we had to do. I couldn't find anyone, anywhere—only a shell-hole with three terribly badly wounded men in it. So I decided on a low hedge, to give us some cover, in about the spot shown on the map and went back to tell Southern. He agreed, so I brought everyone up and we started. I then found a Corporal who seemed to think that he was in charge of the strong-point, where several men were sitting in shell slits. He told me that the Officers and Sergeants of both Platoons had been hit, so I showed him where I proposed to put the wire and he approved.

Quite soon, we came under considerable Artillery fire—which was not surprising since we were in the open in broad daylight and right up in front. Each time it died down, and we stood up, it started again immediately. So we tried lying on our backs, behind the little hedge, and battled on with the wire and pickets. After a time, some sort of gas shells were used and my diary says that I thought that one of my NCO's (2nd Corporal Verity) was going to die of choking! We stayed several hours, and I reckoned that at least one third of the time, we were lying down. We hadn't got too much wire anyway, because the carrying party had done a second trip with very few men (I was told that they had had nearly 50% casualities) and didn't come again. Finally, we had had enough-in fact, I had overdone it, and only two men showed willing for our last effort; and we did nothing then, anyway, as the fire was too heavy. I put the men into some shell-slits and went to tell Southern that I thought it not worth the casualities to continue. He entirely agreed and added (my diary) "that it seemed a silly sort of thing to do in broad daylight as we were under direct observation from the houses on the Vieux Berquin road". At that moment, a counter-attack appeared to be developing in the Gars Brugghe area bringing a lot of machine-gun bullets, so we set off in little groups of four, to the wood.

After reporting to Brigade HQ, I met Ingham (our 2IC) on the way back. "Keating has been killed", he said; "he apparently had a piece of shell through his heart, just said 'I'm dead' and died instantly. His Section has come back, but they couldn't bring him with them. They did nothing". I was horrified. His Section was to have done exactly the same as mine, but 300 or 400 yards to our right. I had seen nothing of him or his men, as the trees at Verte Rue were between us.

Next day, four of our Officers, the Company Commander (Major Speight), the 2IC (Ingham), Paget, and myself, went out to bring in his body. We went to the spot, crawling up hedges and peering about—actually stumbling on two guardsmen in the corn, terribly decomposed. But we could see no signs of him; and only drew heavy Artillery fire from the enemy and curses from our own infantry in the area, who said that we would get them all killed if we didn't go away. So we did.

That evening the CRE rang up to say that he had been found—north of where he had been hit, part-way towards where 1 had been, dead in a small shell-hole, with a shovel by his hand. We called for four volunteers from his Section to bring him in, but not one man would volunteer. So the whole Section was sent. He was brought in. He had a bad wound in his right lung, and lesser wounds in his right arm and wrist. He would not have died immediately. My diary is too venomous to quote.

We pieced the story together, like this. Four men were killed or wounded, early on, and they included his two junior NCOs leaving only the Sergeant who was recently out from England, where he had spent his war years in some reserved position, and was of little use. At the same time, or shortly afterwards, Keating himself was very badly wounded. His influence gone, the men just decamped, leaving the equipment of five men behind them. Perhaps they really did think that he was dead. It is possible that Keating was trying to get to me or the troops in that area—he knew where we were of course and was north of his own posts—and had died through loss of blood and exhaustion, on the way. I can only hope that he died soon and that he did not see us leave.

I can see him now, as he was brought in—his tin hat still on. I stood with the other Officers beside him when he was buried and, sewn up in green canvas, lowered into his grave. When the Parson threw earth on to the body, I had to exercise enormous, almost physical, self-control to prevent myself from assaulting him. That did frighten me.

One last, rather odd, entry in my diary, much later-

"17.7.18... I only realised today how much Keating's death had shaken me, as it was only today that I felt that I had thrown off the feeling of cowardice which I have had since the 28th; it is not that I wouldn't have done my job, but whereas a normal being can view the possibility of shell-fire in a logical way and realise that his chance of being shot is very small indeed, the coward thinks that the first shell is certain to hit him. I have several times had an inclination to cycle faster when going through places like Gd Sec Bois—when this has happened, I usually got off and walked; but it still doesn't make life any pleasanter and I am glad that I feel like a human being again and not like a worm".

Keating's parents showed my father parts of the letter which I had seen him writing (it had been found in his kit, of course). It was a good-bye letter, beautifully written and expressed; thanking them both for all that they had done for him, and saying that he felt like the Captain of a ship, setting out on an unknown voyage. He knew that he was going to be killed—quite certainly.

Anyone who reads these accounts might well say "How this chap does go on, about himself!" I know. I sent the papers, as a first draft, to a serving soldier of middle rank and asked him if he thought them suitable for a regimental magazine. He asked me what lessons I wanted to bring out and said that he supposed that they were thus and thus; and so it was. "But", he said, "you have left out all the bits which bring out those lessons". I told him why. "Now, look", he said, "this is about the last time when such experiences can be written. How many of you are still alive?—you were one of the youngest. What on earth does it matter to say or not to say, such things, at nearly 82?"

So, one more story. When we got back from our wiring, we sat down in the Forest to rest for a bit. I was behind a tree and overheard one Sapper say to another "if little . . . had been here, we would never have started", "Little . . . " was the name by which my predecessor in Command of the Section was known. For many years, I took this as the greatest compliment that I would ever be given—but then realised that it was no compliment at all—there was nothing special about me, it was just the truth; if that Officer had been there, they quite possibly would *not* have started. The men knew it—who else?

When I joined 210th Field Company, it was commanded by Major (later Brigadier) A B Clough, a Regular. I had not met him before, but on the first day he said to me "you are a Regular Officer, and I am very glad to see you. I want you to help me and to set an example. You will soon see why". I did; and I have never forgotten those words. Clough left early in March 1918, but we had been lucky to get a Young Regular Officer, J C B Wakeford, as a reinforcement just before Christmas.

In these stories, there are questions of the use of Sappers. It is a principle that infantry are responsible for their own close defence; but when I joined the 31st Division on Vimy Ridge in 1917, the Sappers frequently put up the wire in noman's-land, between the German and the British front lines. I was told that the infantry could not be trusted to do it. If this was so—and I had proof given me-surely the Sappers had to do it? (The Guards Brigade always did their own).

So on 28 June 1918, when the Sappers were detailed to put up the wire in that attack, it was only in the tradition of 31st Division that they should do so. Was this wrong? No—not if it was necessary.

And our use as badly armed infantry? Why not, if that was the need? So when Sappers say "that wiring, or this or that, is not their job", the answer is that our job is to do anything and everything that best helps the situation. What was wrong on 28 June was, I suggest, the whole Sapper operation.

The five Subalterns detailed by name in the Operation Order were Lieutenants Keating and Aldous and 2nd Lieutenants Fisher, Bush and Burfield. (To the six Sapper Officers taking part, three Military Crosses were given, a high proportion. If Keating had not been killed, there would surely have been a fourth). This order was signed on 26 June, two days before the attack; but Brigadier Wakeford tells me that Bush and he were on leave in Paris on that day, and missed their train and therefore missed the operation. Bush was in Mansel's own Company. This is no way to organise. Then, why did we miss the rehearsal? Did no-one realise that we should be wiring right up in front, in daylight, in full view of the enemy? The whole Sapper plan looks to me as if it had been bodged up in a hurry, perhaps as a last minute addition. Bad plans mean lives.

What of the junior Officers? Undoubtedly the youngest Regular Officer trained at the Shop (it would be Sandhurst now) had to bear a responsibility and set an example beyond anything that could be imagined in peace-time. I have regretfully used myself as a guinea-pig, for I had no other and I kept a careful diary. I was, of course, no better nor braver than any other Regular Subaltern and less so than many, no doubt—but I am utterly convinced that the further the barrel is scraped, the more the Army needs a leaven of young Regular Officers trained to the highest standards; Guards Drill-Sergeants, pictures in the Mess and tradition in the heart, impeccable ceremonial where a speck of dust is an extra drill, and so on (alas! there are no RHA Riding-Masters in these sad days!). So far, I think that we have done this; but we must beware that we are not beguiled into going "comprehensive" in another World War. I commanded the RE OCTU at Newark in 1944, and that sort of training will not do. And then, what value do we place on background, and family background at that? Will the barrel-scrapings be of better quality than sixty years ago? Read the daily press; and then answer.

Finally, does it matter that you have been reading of Sappers with rifles and the odd Lewis gun, playing at Infantry? Perhaps the fear next time will be of a human form of myxomatosis, instead of a shell through the stomach. Does it matter? The same requirements; and the same qualities.

But there are broader issues. Trenches are physical things. They cannot bite or blow you up. Their effect is what you let them do to you. As the static war continued, and the barrel was scraped ever lower in 1917 and 1918, only the highest leadership could prevent morale declining—and such leadership in the 31st Division was conspicuously lacking. If the top fails, all are debased.

Be sure that the next Great War will be unlike anything that we have seen before. Perhaps there may be little physical fighting; but the war might well last longer and have potentially more effective trenches—not dug into the ground, but into the minds of the nation. Trenches of despair and defeatism, fear of atomic and bacillic onslaughts, and the insidious burrowings of weaklings, traitors and enemies; setting much the same problems as in the 1914–18 Great War, and needing the same remedies. So let us ensure that lack of leadership at the top is punished ruthlessly and immediately. Of course, of course—but it is not easy. It was not done then, was it?

No long war ever again? It hasn't started, by any chance, has it? (Nixon is nobody's fool). Are the trenches, even now, being dug? What is Civil Defence? Static is static, and stops nowhere. In a nation at war—the new war—might not our senior Officers, disciplined and trained to lead, set the example? Might they not have a larger role to play on the national stage? Is the lesson learnt?

Visit of Her Majesty The Queen to the School of Military Survey, Hermitage, 27 June 1980

LIEUT COLONEL M J K DAVIES B Sc .



The author was commissioned in 1945 and, after a survey course and a short tour in Austria and Italy, spent 2 years as an AI at the Svy Trg Centre. In 1951, after obtaining his degree at RMCS, he returned to the School of Mil Svy for 2 years as Adjt. From 1953 to 1956 he served in the Ord Svy and then spent two years in Singapore and with 135 Corps Engr Regt (TA). He returned to the School of Mil Svy as a SI in 1959 and in 1961 was posted as DAD Svy 1. In 1964 he attended a Geodesy course at Oxford University and then became OC 14 Fd Svy Sqn in Germany. Promoted Lt Col in 1966, he served for 2 years as Geographic Officer AFNORTH followed by 18 months in the Svy Production Centre. Posted back to the Ord Svy as AD Geodetic Division in 1969, he sustained a heart attack in 1970 and

retired in Jan 1974. Since then he has been the RO author for the Survey Service.

On Friday 27 June 1980, Her Majesty The Queen visited Hermitage to open the new barracks of the School of Military Survey. Despite the wettest June in the South since 1909, the weather remained fine throughout the visit. The sun shone for most of the time but there was a chill wind.

The Queen arrived at the School at 1245hrs having stopped outside the main gate to accept a bouquet of flowers from local school children who were lining the road to the camp. The Guard consisted of one Sergeant, six Sappers and a Bugler and the road to the Officers' Mess was lined by Apprentice Soldiers from the Survey Wing of the Army Apprentices College at Chepstow.

Arriving at the Officers' Mess, The Oucen was received by the Lord Lieutenant for Berkshire, Colonel the Honourable Gordon Palmer OBE and was welcomed on behalf of the Corps by the Chief Royal Engineer, Lieut General Sir David J Willison KCB OBE MC. The Chief Royal Engineer then presented Major General and Mrs E W Barton and Lieut Colonel and Mrs T H Stewart, On her coat the Queen was wearing the RE brooch given to her by the Corps.

Before lunch, The Queen met all the ninety-two guests who were lunching with her at an informal reception. These included Lieut General Sir John and Lady Stanier, Lieut General Sir George and Lady Cooper, Lieut General Sir Hugh and Lady Cunningbam, Major General and Mrs C P Campbell, Major General and Mrs B St G Irwin, Major General and Mrs J Kelsey and Major General and Mrs B St feature of the Officers' Mess was the flowers which included displays using flowers sent specially for the occasion by the Governments of Hong Kong, Malaysia and Indonesia who had students currently at the School.

After lunch, The Queen signed the Visitors' Book and new colour photographs for the Officers and Sergeants Messes. Corporal D N Johnson RE then presented The Queen with a pictorial map of Her Majesty's visit to Eastern Arabia which he had designed and drawn. The map, featuring a number of sketches of local scenes and

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Lieut Colonel MJK Davies B Sc



Photo 1. The Queen signing new photographs for the Officers and Sergeants Messes

personalities superimposed on an outlined map of South East Arabia, was produced in colour.

At 1445 The Queen arrived at the front of the School Headquarters Building in the Royal car and was again received by the Lord Lieutenant and the Chief Royal Engineer. After the National Anthem, played by the Band of the Royal Engineers,



Visit of Her Majesty The Queen to the school of military survey 1,2 Aldershot, local civic dignitaries and their wives were presented to The Queen. The Chief Royal Engineer, in inviting Her Majesty to unveil the Commemorative

The Chief Royal Engineer, in inviting Her Majesty to unveil the Commemorative Plaque, said:*

"Your Majesty, all Sappers here today are immensely honoured, and delighted, that their Colonel in Chief is present to open the new School of Military Survey. On your last visit to the Corps at Minley your Military Engineers showed off their skills. On this occasion the Military Survey element of the Corps are about to do the same. Before I let them off the leash may I invite Your Majesty graciously to unveil this commemorative plaque".

The Chief Royal Engineer then invited Her Majesty to accept a gift from all ranks of the Corps of Royal Engineers:

"Your Majesty, as befits so ubiquitous a Corps, some of your military surveyors have recently been practising their speciality around Your Majesty's estate at Sandringham. To mark this great occasion, may I invite Your Majesty to accept the fruits of their labours; first a full map of the Sandringham Estate for wall mounting and beyond a folio of maps enhanced with additional information for special use on your estate".

Sergeant P J Markley, who had co-ordinated the production of these gifts, was presented to The Queen. The folio, consisting of a set of 1:10:000 scale grey base maps, with information about the estate in colour, together with a 1:50:000 scale index, a legend and an appropriate title page, was bound in marcoon coloured leather with the Royal Engineers monogram stamped in gold on the front cover.

Before the presentation of a bouquet of pale pink roses and alchemilla by six-year old Miss Karen Gilhespy, the daughter of Staff Sergeant N S Gilhespy, members of



Markley

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Photo 4. Lance Corporal D G Ireson demonstrates the operation of a Wild B8 precise photogrammetric plotting instrument to the Queen

the Property Services Agency and the contractors staff were presented to The Oueen.

The opening ceremony was watched by some 800 spectators, most of whom were seated in stands on either side of the main entrance of the School Headquarters Building. In addition, 350 children from local schools had been invited. Others attending included ex-Company Sergeant Major Leonard James Lowden who joined the Royal Engineers in 1912, retired in 1933 and served with the Ordnance Survey until 1954.

The Queen spent about an hour touring the Instructional Wing and spoke to many of the staff and students. The tour included visits to the Map Production Department, Exhibition Room, Air Survey and Cartography Department, Field Survey Department and the new TACIPRINT Vehicle. Her Majesty watched with considerable interest as the students, including some from Saudi Arabia, Hong Kong, Indonesia, Malaya and Pakistan, demonstrated equipments and their skills. During the tour The Queen was able to compare a display of maps of the Survey of Western Palestine carried out by Kitchener in the 1870s with a selection of recently published special military maps including some of Northern Ireland, Rhodesia/Zimbabwe and the New Hebrides.

Whilst The Queen was touring the Instructional Wing, the spectators were entertained by the Band of the Royal Engineers, Aldershot, until proceeding to the Garden Party area.

The Garden Party was held on the Sports Field. Some 240 guests, including past Commandants and Chief Instructors, past Regimental Sergeant Majors and Senior Military Instructors, representatives from all survey units and civilian and military staff of the School, were assembled in groups and The Queen spent forty-five minutes talking informally to many of those present. Her Majesty then retired to a marquee, beautifully decorated with floral trees made from greenery and fresh flowers in delicate shades of yellow, flame and cream, where she took tea with the Lord Lieutenant, the Chief Royal Engineer, the Director of Military Survey, Major General R Liewellyn Brown CB CBE, Major General A H Dowson CB CBE, the

Visit of Her Majesty The Queen to the school of military survey 4 Commandant and a representative selection of all ranks of the School and their wives. At 1645hrs The Queen said goodbye to her hosts and departed to the accompaniment of three cheers from the spectators.

It was a day that will long be remembered by all who took part and everybody present will have their own particular recollection. To those who had served at the School in its earlier days, perhaps the most striking memory is that of seeing the Royal Standard on the flagstaff with the new multi-storey school behind it. One could not but help feeling that at last the School of Military Survey had come of age and that all the struggles in the past had been worthwhile. As the Commandant wrote in his foreword to the programme "The School is ready to move forward into an era of new technology which will have a substantial effect on the requirements placed on Military Survey." The other striking feature was the relaxed atmosphere of the whole visit, particularly at the Garden Party.

At the end of the day, the Chief Royal Engineer sent the following letter to the Palace:

"Would you kindly convey to The Queen our great appreciation of the honour paid to us by her visit today to Hermitage as Colonel-in-Chief of the Corps.

"I know that all those present were very encouraged and inspired by the great interest which The Queen showed throughout the programme.

"All those in the Corps who have been concerned with the visit have shown great enthusiasm and I am sure that the news of the visit will be received with great pleasure and satisfaction by Sappers serving throughout the World.

"The whole Corps is deeply grateful to The Queen, our Colonel-in-Chief, that she was able to spend the day with her Corps and to open the School of Military Survey."



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On 1 July the following letter was received from Her Majesty's Private Secretary, then at the Palace of Holyroodhouse:

"The Queen has instructed me to write to you to express her appreciation for a splendid day at the School of Military Survey on Friday and I should be grateful if you would convey to Lieut Colonel Stewart and all his officers and men Her Majesty's warm thanks and congratulations on a most successful occasion. The Queen, as Colonel-in-Chief of the Royal Engineers, was delighted to be able to open the new Barracks at Hermitage and is very glad that the School of Military Survey should be now so excellently and permanently housed.

"The programme for the day was very well devised and executed and your Colonel-in-Chief was so pleased to have the opportunity of meeting many of the officers and other ranks engaged in military survey and to see something of their work. The period after lunch enabled The Queen to get a good picture of the wide variety of important tasks which are performed under the control of the Director of Military Survey. After her very interesting tour The Queen much enjoyed the relaxed atmosphere of the Garden Party.

"Your Colonel-in-Chief has asked me to thank you both for your hospitality and imaginative presents. The lunch was excellent and Her Majesty is so pleased with the folio of maps of the Sandringham Estate and the pictorial map of her visit to Eastern Arabia. Perhaps you would be kind enough to convey to Sergeant Markley and his team and to Corporal Johnson, The Queen's appreciation and congratulations on their excellent work.

"The Queen wished me also to thank you personally for having escorted her throughout the visit and for having helped to make this such an entertaining occasion for her. Your letter of 27 June was much appreciated by Her Majesty.

"Finally, I should like, on behalf of the members of the Royal Household, to say how grateful we were for your hospitality and how much we enjoyed the day."

* * *

The Sapper

This extract from Man of the World appeared in The Sapper in September 1899. Does this assessment still hold good?

The lady who sits next to him at a dinner party, if she has not been told more about him than his name, is very puzzled as to his profession, says a writer in the *Man of the World*. He talks art to her, and she fancies that he must be connected in some way with art; he talks literature to her, and she fancies that he must be an author, but does not like to ask any questions, for fear that he may have written a book that she ought to have read; he lets fall something that shows he is acquainted with details of building, and she is for a moment divided in opinion as to whether he is an architect or a civil engineer. At last he says something as to his regiment, and the lady, looking at his rather long-hair and turned-down collar, comes to the conclusion that he is a very clever, rather priggish young man, who spends the leisure hours allowed him by his profession in serving his country as a Volunteer, and talks to him on that assumption for the rest of dinner-time. In the drawing room the hostess, being interrogated, answers, "Why, he is in the Royal Engineers; I thought I had told you. Isn't he nice and isn't he interesting?"

* * * * *

Computer Based Control and Supervisory Systems

MAJOR M R GIBSON RE (V), C Eng, MIEE, MCIBS



Major Mike Gibson traihed as a power engineer with the Southern Electricity Board before being commissioned in the Royal Engineers in 1954 and serving in BAOR until 1957. Then followed tours as a civilian in Kenya and Hong Kong with their power companies. On returning to UK he worked for local government and a Consulting Engineer in the Midlands before joining the PSA in 1972. He is now Area Works Officer at Shrewsbury in the Midland Region of PSA. He joined the TAVR in 1969 and is now OC 504 STRE (Power Station) specialising in electrical power supplies. Interests in addition to TA are listed as two Welsh sheepdogs, walking and country matters, photography, caravanning and usual household and gardening chores.

INTRODUCTION

The introduction of new techniques in the solving of problems is always of interest and often exciting. The use of microprocessors for the supervision and control, both manual and automatic, of Electrical and Mechanical services is one such development. It is of special interest when one important outcome is the more efficient use of those expensive commodities— manpower, plant and energy.

BACKGROUND

It is well known in the Corps that the Property Services Agency (PSA) is responsible for the provision, operation and maintenance of the MOD Estate. The efficient operation and maintenance of, in particular (note the bias of an E and M engineer!) the E and M installations, is a major part of their responsibility. Any techniques to ease this burden need to be investigated and used if viable. The Central Ordnance Depot (COD) at Donnington near Telford is a high density site about 127ha in area with 13km of roads and 119km of railway lines. There are nearly 300,000m² of storage area available most of it heated and mostly in very large storage sheds storing over half a million different items. It is a very active place with nearly 50,000 tonnes of technical stores moved per annum. There are about 2000 civilians and 350 military personnel employed at the Ordnance Depot. The Central Workshops REME is co-located here and carries out major overhauls and repairs to wheeled armoured vehicles, small arms and electronic equipment. Their establishment is predominantly civilian, some 1300, plus a small number of military personnel.

For convenience, and with apologies therefore to all concerned but for ease of writing, the term Donnington will be used throughout this text and includes all units within the Donnington Garrison and co-located at Donnington. The PSA commitment is large there being seven dual fuel nat-gan/oil boiler houses, ten high voltage substations with a max demand of nearly 4MW, standby generators, air-conditioning plant, sewage works, water boreholes and all the other services associated with this kind of establishment. The problem is to not only keep the services functioning, but

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Major MR Gibson RE C Eng MIEE MCIBS

doing this as efficiently as possible and knowing when failures occur before the effect becomes obvious. This latter aspect is becoming more important with the trends to reduction in staff.

The days of sending a boilerman around the boilers and pumps night and morning giving each a polish and a friendly pat are, unfortunately, not with us any more.

THE PROBLEM

With an extensive expansion of the facilities at Donnington, a need was high-lighted in 1978 for the provision of Fire Alarms from each of the very large storage sheds back to the Garrison Fire Brigade HQ giving a precise location of an alarm initiation. This service on its own prompted consideration of multiplexing techniques since nine sheds times sixteen zones requires a formidable number of cable cores and arrays of lights and bells. When other known requirements of security alarms, plant state indication and remote load shedding to facilitate use of automatic standby generating plant were considered, there was clearly a need for a look at more modern techniques of control and supervision.

The need for a control and supervisory system was summarised as follows:----

(a) To provide alarms.(b) To relay alarms to a central position.

(c) To indicate the operational state of plant.

(d) To provide direct reading analogue information.

(e) To record and log events and analogue information.

(f) To provide automatic control of plant to pre-set programmes.

(g) To direct plant and equipment to perform a pre-determined sequence of actions.

These functions were required to be applied to the following services:

(i) PSA operational plant and equipment.

(ii) Site fire alarm systems.

(iii) Site security systems.

To fulfil the need, many different commercial systems were investigated in depth and costed. These ranged from basic alarm monitoring systems, telemetry systems with and without memory, commercial building automation systems and computer based remote control and monitoring systems for large public utilities.

SIMPLE SYSTEMS

There are a number of telemetry systems produced commercially for alarm and supervisory applications. They are based on the rapid scanning of addressed locations, these being "normally-open" or "normally-closed" voltage free contacts. Any change of state from that initially set is shown as an alarm at that particular address. The speed at which this equipment operates depends on the sophistication and facilities required and the number of points to be monitored.

These systems can be transmitted over one pair of twisted telephone type cables or co-axial cable typically by rapidly, and nowadays electronically, switching each supervised point into a dc constant current circuit. Since only the condition of the switch or contact is required it is simple for an alarm to be raised if any switch is different from its recorded position.

Transmission over GPO lines can take place by interposing Post Office approved modem interface units.

A limitation to these systems lies in the number of points which can be monitored before multiplexing and then further multiplexing takes place at outstations. There are also normally no facilities for retrieval of historical information, or access to pre-programmed features and there are limited control facilities.

COMPLEX SYSTEMS

The disadvantages of the simpler systems can be overcome by using a minicomputer or a microprocessor as the central processor unit and also by distributing the intelligence of the central processor to a number of outstations. This latter development ensures that a considerable amount of local monitoring and control is carried out without recourse to the central processor and will carry on most of its primary functions if the central unit is temporarily out of action.

It may be opportune to revise some of the computer technology terms at this stage:-

(a) A Bit is a binary digit, ie a 0 or a 1, and this is the form in which the information is transmitted; it is shown electrically as a square wave $\Box \Box \Box \Box \Box$

(b) A Byte is a number of Bits and can vary; it is usually 8.

(c) A Word is a number of Bytes; typically 2 ic equal to 16 Bits.

(d) Memory devices:

(i) Random Access Memory (RAM): Information which is variable; can be relatively easily changed by the operator and can be lost on electrical power failure.

(ii) Read Only Memory (ROM): Information which is fixed; can be retrieved but cannot be changed by the operator, can often be changed by computer off site.

(iii) Memory size: Identified by the word K; 1K of memory is 1024 Words hence 32K memory of 16 bit words = $1024 \times 32 \times 16 = 524,288$ bits.

(e) Hardware is the terminal equipment usually connected by hard wiring, eg Hard Copy Printer, Visual Display Unit.

(f) Software is the erasable computer programmes often on tapes or discs and fairly easily modified.

(g) Firmware is the permanent computer programmes established into the Read Only Memories (ROM) of the equipment. This cannot easily be modified or erased.

Differences in Central Processor Units are dependent on the size of the memory, the ability or not of that unit to accept programmed instructions and the capability for direct digital control of equipment.

It was decided that a programmable system was essential for Donnington and that although, in computer terms, our memory size requirement initially is small, the system should be expandable and there should also be a capability for direct digital control of equipment.

There is almost unlimited computer technology available subject only to cost and hardware limitations once it is decided to use a programmable computer based system and of course the flexibility of use is tremendous.

Commercially available building automation systems already have a proven technology for building services. To date most of these are computer based but these are being overtaken by microprocessor based equipments, which have the advantage that they can be tailored to carry out the functions required without over sophistication. Many of the commercially available computers were developed for other uses and are unnecessarily powerful and expensive.

At Donnington it was decided at the onset to keep the system simple; over sophistication frightens and inhibits use besides being wasteful of funds. Operation of the Donnington system has to be carried out by existing technical staff who also have to be able to carry out alterations to programme parameters, eg alterations to temperature limits and adding in alarms and sensors.

The initial requirement is for the reporting of alarms and plant state and the measurement and logging of analogue values, eg temperatures. Subsequently direct digital control will be required in response to software programmes. One advantage of commercially available systems is that programmes are often readily available off-the-shelf for many of the more usual requirements, eg electrical load shedding, energy management.

CABLES

Most of the commercial systems operate over telephone type twisted pair cables, one pair being sufficient but two pairs being preferred giving added security since monitoring can be checked over alternative routes automatically and transferred if a cable fault occurs. At Donnington a six-pair twisted cable is being installed since the cable cost installed is very little different for a few extra pairs and also because a decision might be made that the security monitoring cannot share the same pairs of cores as other services. One or two commercial systems prefer using a co-axial cable for distribution but can use twisted pairs with some additional matching hardware.

Transmission over GPO lines can take place by interposing Post Office approved modem interface units.

SYSTEM REQUIREMENTS

It was decided that the Control and Supervisory (C and S) system would not itself monitor directly Fire Alarm Points, Security Points or Lifts. Independent "Stand Alone" installations for these services are provided and new installations would be similar. The C and S System is intended to only repeat the local alarm or information at the selected "retrieval" points, eg Security Post or Fire Brigade Station. These systems do have the capability of monitoring directly all individual points on these installations but it was considered here that it was desirable to retain the independence of "stand alone" installations and reduce the dependability on a centralised monitoring equipment.

Having formed the above policy the requirements of the C and S system were considered in some depth. The main points are itemised as follows and form part of the detailed specification:

The C and S system is required to be:

(a) Field programmable and suitable for operational reprogramming on site.

(b) Display real (clock) time and calendar date which shall be continuously displayed, resettable and print out on any hard copy.

(c) Have 2 and 3-mode control capability provided for remote control of change over functions, on-off-auto etc.

- (d) Capable of resetting control points of remote controllers and dampers.
- (e) Monitor analogue and digital alarm conditions and indicate those conditions.
- (f) Remotely set analogue alarm limits and carry out digital set point adjustment.
- (g) Provide limited access facility to operator's terminal.
- (h) Automatically initiate commands in a pre-set time schedule.

(i) Automatically initiate commands on alarms of both analogue and digital origin and to commence a pre-defined programme of events.

(j) Provide a hard copy print out of alarm records and logging functions.

(k) Allow the information to be selected for print out on each printer to be easily changed by an authorised operator.

It is also considered essential that the system installed shall be part of a "family" which can be provided in say three levels of sophistication and cost, eg:

- LEVEL 1 Simple monitoring of alarms, analogue and digital information, no programmable facilities, limited memory. To be installed on the smaller sites and in important individual buildings.
- LEVEL 2 As Level 1 plus programmable facility and increased memory, ie as specified for Donnington.
- LEVEL 3 To be installed on the larger sites. To increase memory and increase range of software programmes handled, a further central processor to be installed in Area Office and several Level 1 and Level 2 systems linked over PO lines giving access to the central unit. The central unit would be powerful enough to provide and update financial information, carry out calculations and accept a wider range of software programmes than the Central unit on the Level 2 systems.

THE DONNINGTON INSTALLATION

The above gives the outline of the C and S system specified for Donnington. The completed system will comprise of 15-20 outstations linked to the Central Processor Unit by a 6-twisted pair cable network with at least one outstation linked over GPO line.

Up to 1500 data points will be required including plant state and alarms, water and air temperature measurements and logging, fire and security alarm indication, remote load shedding control, security access control systems, heating controls programmed adjustments and energy management programmes.

The information retrieval points will be at the PSA office for anything to do with plant and services, at the Garrison Fire Station for Fire Alarms with a location repeat to PSA office, and at the Security Post for all security alarms and systems.

Security information will be denied to all other retrieval positions and access to security information and programmes will similarly be only available to authorised persons.

Phase 1 of the installation consists of all the hardware and limited software:

(a) Alarm annunciator, operators terminal and vdu (visual display unit) and hard copy printer at the PSA office.

(b) Alarm annunciator and hardcopy printer, auto slide selector (slides show on a screen details required of any alarm point) in the Fire Station.

(c) Alarm annunciator and hardcopy printer in the Security Post.

(d) Central Processor Unit with sufficient memory both fixed and programmable for initial requirements.

(e) Five outstations to include facilities for handling approximately 20 points each but expandable by additional pcb's (printed circuit boards) to many more.

(f) Sensors and hard wiring to nearest outstation for a selection of alarms at each location.

The system must expand as experience in operation and use is gained.

The system to be used will have a contral memory size of 46K Bytes of Firmware (ROM) and 18K Bytes for RAM with an expandable memory on floppy discs having a potential capacity far beyond that envisaged as a requirement for this scheme.

Each outstation will have a memory of 7K Bytes ROM and 3K Bytes RAM and so will each independently have quite a useful capacity.

The cost has been kept down to about $\pounds40,000$ for the hardware for the whole system plus Phase I outstations with a further $\pounds60,000$ over the next four years to extend the system to its full capacity. External cabling costs are estimated at a further $\pounds20,000$.

CONCLUSION

The techniques examined in the course of preparing the specifications for this project are clearly going to be very important to engineers of all disciplines and will be another tool to assist us in carrying out our tasks more efficiently, perhaps even being able to carry them out at all.

The same techniques must surely be introduced with scemingly indecent haste in other aspects of our work, both in the civilian and military aspects, since the hardware is simple, the technology readily available and at very reasonable costs, provided oversophistication is avoided.

I hope that this description has been of interest to some of my colleagues in the Corps—I hope also to be able to report on the operation of the system in about a year's time.

Thanks are due to PSA for permission to publish this article and to Mr John Heathorn, a colleague in PSA, who has been equally enthusiastically involved in this project.

* * * * *

Let's Remember Bobby Maclaren

BRIGADIER TILLOYD CBE, DSO, MC



On completing an Indian tour of duty as OC 1 Fd Coy Bengal S&M in 1939 the author was posted into the Chamical Warfare Branch of the Corps. He commanded 58 CW Coy in the Dunkirk campaign, and continued in CW until it went from the Corps, unlamented, in 1943. The Group he was then commanding became one of the RE Formations allotted to Second Army for the NW European campaign with a special brief to be prepared to put top-weight Baileys across wide, floodliable rivers. Its Companies were 71, 72, 73 and 277. Included in its more than two miles of bridges were the first British BPBs over the Seine, the Rhine and the Elbe, and a 4,050-footer across the Maas in flood.

Post-war the author was CRE of one Division after another (51, 5, 1, 53), serving twice in the Mid-East. After commanding a TA Engineer Group he served as Col GS SME and, finally, Deputy Engineer-in-Chief, His writings include. River Crossings 1939–45 (1950); Engineer Training 1954; Instn CE Paper 6064 (1955)rewritaer 1957 as Twilight of the Railways. He is Founder-President of the Railway Conversion League 1958 which preaches that railways are outmoded but can become invaluable again as a source of virtually instant roads.

Os Brendon Common, high up on Exmoor, at just about the summit of the desolate Lorna Doone country, though not too discouragingly far from a road, there stands on end, on a two-foot square concrete plinth, a modest slab of rough-hewn granite, of Sapper erection: it marks where Bob Maclaren died. A pilgrim would find it a few hundred yards to the east of the B3223 Lynmouth-Simonsbath road, a little way north of the county boundary at Brendon Two Gates; he would be well advised to wear gumboots, and to take a back bearing on his car wherever he leaves it: Exmoor has its moods.

The accident fatal to Bob happened on 20 May 1941. To identify him more closely: he was Colonel R H Maclaren OBE MC, by then Commander Chemical Warfare Troops, Royal Engineers, though somehow or other one still thought of him as Bob, or even Bobby, and still does: he was very likeable. CW Troops had grown up or, rather, were still growing up around him.

When war loomed in 1939 he was a Major, commanding 58 CW Company RE—the only peacetime CW Company—at Porton. He had the mobilising of it, but it left for France in February 1940 without him; for meanwhile its wartime sister Companies had begun to come off the production line at the promptly created CW Training Centre at Barton Stacey, and Bob had been promoted Lieut Colonel to form and command the first of the Groups into which all CW Companies would be organised.

By May he had got his 1 CW Group RE into good enough shape for it too to cross to France, just in time for the fracas there. He had with him only two Companies, both new: 58 was out of his reach, up front under one of the Divisions, but the general retreat soon brought it back within range of him, and a modicum of wire palling from both ends sufficed for it to come to him as his third Company as had been intended originally. Throughout the confusion that reigned in what should have been the back areas, but soon wasn't, he was in great form. It was always a joy to run into him or see him coming, and he seemed somehow to have persuaded his Companies that it was

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Brigadier T I LLoyd CBE DSO MC

almost good fun pretending to be infantry with only an occasional reversion to type on a bridge demolition; they gave a good enough account of themselves.

It was a time of abominable "adhockery", when conglomerates of units that had been manning the innumerable depots, workshops etc, of the Base, calling themselves This Force, That Force and the other, were forming and dissolving too frequently to be kept track of. Towards the end, one of them was claiming Bob as its Commander RE, but he contrived that, for its own final battle 1 CW Group stood (literally, having had to wreck and abandon its vehicles by then), almost intact and finally quite alone, holding Mont des Cats—a veritable pimple of a hill, though scenic, rising abruptly some three hundred feet above its surroundings, with a monastery on top, five miles south-west of Poperinghe, twenty-two miles from the coast. Force Headquarters was in the monastery, but soon it had gone—dissolved? The three Companies were positioned astride the hill facing, at decently long range, a German advance coming along, improbably, from the west, even from a little north of west. Somewhat disconcertingly, Bob liked to do his rounds horizontally, straight across the open face of the hill, half-way up, despite some mischievous shelling that almost at once cost the Group a Major and a Captain.

After nightfall Bob brought the Companies news of the imminence of a general order to all Forces to break up into small parties and make for the coast. He expected the Group to get the order around midnight: there was time to plan a copybook withdrawal only terminating in a break up. However, as soon as that had been laid on there came news that the withdrawal would be postponed until late morning the next day, in broad daylight. Until that morning, when it came, the Germany artillery had been content with a slow rate of fire. Perhaps they had received more ammunition overnight; anyway the shelling increased. The rearguard was so sited that its only getaway was straight up and over the hill. When the time came for it to go the guns were fairly blazing away, probably over open sights, certainly to the detriment of the monastery. The rearguard did a classic piece of running the gauntlet; and so ended the less-than-Battle of Mont des Cats.

At least the enemy had been made to stop, and bring up artillery, and expend a quantity of ammunition. But the Group paid for it sadly with casualties that included five of its seven Majors or Captains: two killed, two wounded, one captured—the last mentioned through being too slow to the coast, having chosen not to abandon one of his party wounded.

It was intended that the small parties should head for Dunkirk but congestion with its attendant strafing from the air was at its worst in that direction. People heading for home like to keep moving, and they have to go where they can go; so it was not surprising that many of the Group's parties (including, luckily for them, Bob Maclaren) were edged off-line to the cast, finally hitting the coast close to La Panne, eight miles from Dunkirk. Daylight revealed it as a dreary: sand dunes thick with soldiery asleep or coming to; the tide well out; a stranded coaster or two, one still smouldering; a variety of small craft beached, mostly damaged; a long queue of men stretching out into the sea but not a rescue vessel in sight; and abundant litter everywhere, left behind presumably by men who had got away earlier. However there was a wellhead around which some washing and shaving began to be seen: a reassuring touch.

Getting on for a hundred of 1 CW Group sorted themselves out from the multitude to give Bob something of a command once more. From the litter it proved possible to top up their arms and equipment so that they were approximately in marching order again: ill luck no doubt some of them thought, but really it cheered all to revert to type: twenty-two miles off the leash had been enough.

A little way along there were a couple of cabin cruisers high and dry, one of them named *Pathfinder*. Bob was on to them in a moment: never could resist a yacht. He chose the more promising of the two and gathered together a working party which he set to work scooping, with almost no tools, a broad channel in the sand along which the yacht might be floated out to sea at high tide. He had a kedge prepared using the yacht's anchor, and himself saw to the winch. At high tide the winch worked well, or too well, snapping the cable more than once; the men clustered round the hull in the rain and the wind, cheerfully pushing and pulling their utmost under Bob's direction, himself at times up on the deck in a fluttering, beachcombed, green gas cape, always displaying the zest common to senior Royal Engineers when a Lance-Corporal's job comes their way. Strongly built and rubicund with sandy red hair, Bob matched the nautical conditions; a memorable sight. The sea never climbed high enough up the hull for refloat, but it had been a bit of fun at a period when only wait was the order of the day.

A stray Divisional Headquarter had set up at La Panne a day or two before and was directing things. The question was whether to wait for rescue vessels, or to plod along the beach to Dunkirk, dodging air attacks on the way. Bob wheedled permission for the Group to do the latter, not moving in too large a bunch. Split up into parties corresponding to the men's Company of origin the Group made its way to Dunkirk and embarked from the mole there, perilously but safely, if fatiguingly. Actually forty-eight of them did not have to foot it all the way to Dunkirk. About half-way there they looked back a little and saw a naval pinnace come in and get rushed by lone stragglers, mainly French; the pinnace filled up with them and returned to its parent warship lying out to sea. Would it come back? It did, but this time it had a target to steer at in the form of forty-eight men drawn up on parade, impeccably in threes, up to their knees in the surf: from the shore they may have looked rather silly, being equally a target for aircraft, but it worked. The pinnace came in nearby and the bo'sun (or whoever), glad to conduct an orderly embarkation after the previous scramble, bawled forward two men at a time until he had his full load of twenty-four. Disappointingly for the tail the little parade quickly acquired it happened only once more. Then HMS Albury, full up set off for Ramsgate.

Winter 1940–41 saw 1 CW Group located around Exmoor, with an extensive firing range up on the moor; Bob and his Group Headquarters at Lynton. A new CW weapon had been developed. Until then the Companies had been armed with the Livens Projector dating from World War One; a yard or so of wide steel drainpipe open at one end, in effect the very simplest form of mortar firing a lumpy gas-filled bomb not very far. Oddly, one was presented privately to the RE Museum in 1980, having presumably served the donor's family faithfully as an umbrelia stand for forty years or more. Also there should be plenty to be found dumped in the sea off Dunkirk, for 1 CW Group were not slow to find better uses for their trucks in May 1940.

The new weapon, in the use of which Bob had to train his Companies, was the five-inch rocket with gas-filled warhead. The rockets were set up on stands singly in lines of twenty, fired in succession from one end to the other electrically: ripple firing. Since it took a gross of them rather than a score to produce any worthwhile concentration of gas anywhere near the target, a Company needed to be completely loaded down with rockets and their stands. Having ridden up as near as prudent to the target, the men dismounted, off-loaded their trucks, carried the stands and rockets on to the firing lines and set them up, fiddling with each rickety stand in turn to get it standing firm and pointing near enough in the direction a primitive aiming device somewhat forlornly indicated; finally there were the electrics, which were the devil, especially on sodden moorland by night. All the same, the Companies became reasonably expert at it and gave many creditable displays of fireworks over Exmoor.

Bob cottoned on to a better idea. Fit each truck permanently with a mounting carrying twelve rockets, lying flat in two tiers of six, pointing ahead; aim the entire truck in the required direction; elevate the mounting to the required angle of fire and use the truck's battery for the final ripple firing. With due cooperation from higher up he added an Experimental Section to his Headquarters, under a wartime Captain with years of experience in industrial engineering; and before long, in its workshop at Lynton, this Section had produced the prototype Multiple—as it came to be called.

Meanwhile Barton Stacey had continued to churn out CW Companies formed up

into Groups of four as they emerged, and the ordained target of ten Groups was coming into sight. A Supremo had become necessary. Virtually automatically Bob, promoted Colonel, had handed 1 Group over to a successor and become Commander CW Troops RE, somewhere in London.

By early summer 1941, in the course of procuring countless other things CW Troops required, he had procured authority for the setting up of a CW School, and on 10 May he switched the Major commanding 58 Company at Porlock across the moor to South Molton to create the School there as its Commandant and also to be responsible administratively for the range and the Experimental Section, though the latter under its Captain Experimental Officer (EO) would continue direct under HQ CW Troops operationally.

Bob, having watchfully progressed the Multiple from the drawing board onwards, safely through its local firing trials, had decided that it was ready to be seen by the officers and officials of the War Office and Ministry of Supply who would accept it for production, or not: there would be a demonstration shoot for them on 20 May. By this time the EO was treating it as an any-day affair to take his Multiple out on to the range and fire it: there was no great concern in that quarter. Nor anywhere, though the School Commandant, newly responsible for the range and aware of a history of complaints from adjoining farms about rockets overflying the boundary, did concern himself to prescribe the firing point, the line of fire and the angle of elevation of the mounting. To Lorna Doone addicts it may be of interest that the rockets would be flying approximately down the length of Badgworthy Water which in reality is just a mountain stream, magnified into a raging river in the book. The locals pronounce it Badgery. One of the CW Companies had bridged it lower down in about-to-bedenuded timber country, and had done so in Kashmir fashion with abutments of tree trunks laid layer upon layer, each layer cantilevered out a little further than the one below until only a trifling gap was left to be bridged for the logging lorries. The finished bridge was a beauty: one thing the local conservationists did not complain about and it disdained the spates. To keep their hand in at Field Engineering Bob found many such jobs for his units wherever they went.

The EO had some idea of firing the Multiple on 19 May to warm it up, as it were, for the next day; but he called that off in order to work on his testing-and-firing box which had turned faulty, as those boxes often did despite their evident simplicity. Individual leads from the rockets to be fired were brought to an arc of brass terminals on the box across which the firing handle would be rotated, not too fast, to complete the firing circuit of each rocket in turn: nothing could have been simpler in those pre-electronic days.

To conclude with an account of what happened on 20 May the narrative here takes on the form of an eye-witness account checked from notes made the same day:

"I checked that the truck was correctly positioned—at map reference 205655 on a bearing of 44 degrees magnetic.

"As the twenty or so spectators arrived they assembled around Colonel Maclaren at the truck. The EO with his men elevated the mounting to the appointed 33 degrees above horizontal, finally clamping its telescopic front leg. After about a quarter of an hour spent examining and discussing the mounting Colonel Maclaren ordered the EO to set his men to work loading it with its twelve rockets.

"Discussion continued during the loading and I remember Colonel Maclaren saying that since the rockets were war ammunition, not the slightly suspect training ammunition, everyone would be able to stand quite close; the warheads had been filled, of course, with a harmless substitute for gas.

"When the loading was complete the EO removed the fuze caps from the rockets and made the electrical connections. The cables from the truck led to a firing box on the rear berm of a three foot pit some ten yards to the right of the truck, into which the EO finally went, standing facing to the rear so as to have the firing box in front of him at about waist level.

"The onlookers were standing clear, in an arc to the right and right-rear of the

truck, some thirty yards from it, Colonel Maclaren at the forward end of the arc, level with the truck. I was with him and we talked awhile, though not about anything of consequence: it was a fine sunny morning and things were going smoothly. Telling him that I wanted to be able to count the mis-fires I moved to a position more on the truck's starboard quarter.

"Presently the EO called out that he was ready to fire; Colonel Maclaren gave the order, and away went the first rocket. I was mystified when the second rocket flew higher than the first, and horrified when the third flew higher still; it might overfly the range boundary.

"I was standing straight to the rear of the EO in his pit so we were facing each other—or would have been had he not been crouched low over his firing box, staring down at it, intent on making it work. I sprinted foward towards him shouting to him to stop; but he was sending off the rockets, correctly, in too rapid a sequence for there to be any real intermission in the din: he couldn't hear me.

"Each succeeding rocket flew higher. Plainly the clamp on the mounting's telescopic foreleg was not holding and the back blast from the rockets was tilting the mounting back. Soon a rocket went nearly vertically and the next one went past the vertical, to the rear. By that time I was nearly on the EO and at last he looked up and saw me and stopped firing. I have never seen anyone look so puzzled. I saw that the firing handle on the box had reached terminal 8; no doubt the four unfired rockets tumbled to the ground off the back of the truck as we were speaking, the mounting having toppled over backwards. I watched out for the rocket that had gone to the rear, and was relieved to see it burst harmlessly, short of the public road four hundred yards behind us. The onlookers had stood their ground, and for a moment I thought we had got away with it. But then I saw that Colonel Maclaren was down.

"As was to come to light soon enough a sliver of metal had flown at him like a dart, apparently from the direction of the truck, and had penetrated into him deeply in that utterly fatal area below the fifth rib. He was on his back, unconscious. His collar had been loosened by his Sapper driver who said that it must be a neck wound. I cleared away the blood, thick there, on the left side, without finding anything. Blood continued to surge up on to his neck from under his blood-soaked clothing. Having started to search so far away from the wound I took some time to find it: a quite narrow cut in the abdomen on the right side. By then there was very little bleeding left to staunch with a field dressing. His breathing had become faint too. We tried to keep him warm with coats. Within half an hour the Medical Officer arrived with an ambulance; but it was too late. There was only the minor consolation that Bobby had remained completely unconscious throughout."

So died Bobby Maclaren. Killed in Action, as the Corps History records—in a single-line footnote that I thought hardly adequate.

Memoirs

MAJOR GENERAL SIR WILLIAM E V ABRAHAM KT, CBE

Born 21 August 1897, died 2 February 1980, aged 82

WILLIAM ERNEST VICTOR ABRAHAM (WEVA), an Ulsterman from Enniskillen, was educated at the Methodist College Belfast and the Royal College of Science Dublin. He went to Burma as a geologist in 1920 and joined Burmah Oil in 1925. From 1932–37 he commanded the Upper Burma Battalion of the Burma Auxiliary Force. At the outbreak of WW2 he was working at the Company's Head Office in London.

In May 1940 he was invited by the War Office to advise on a situation that was developing in France. His Company agreed and he was gazetted as a 2nd Lieutenant

in the RE. (This was three years after he had been a Lieut Colonel in Burma and five years later he was a Major General!!) In 1940 he attended a senior War Course, one of twelve junior Officers, irreverently known as the "Twelve Apostles", with special abilities who, due to the foresight of FM Sir John Dill, were awarded vacancies at the senior Staff College.

He served in Greece, Middle East (OBE, MID twice), Tunisis (CBE), Sicily, Burma and in 1945 was appointed Controller General of Military Economy India with the rank of Major General.

Late in 1945 he returned to Burmah Oil and from 1949 until his retirement in 1955 was Managing Director. From 1961 to 1970 he was a lay member of the Restrictive Practices Court.

It is probable that "Weva" will best be remembered for his interest in and dedication to the Burma Star Association from 1952. He became Chairman in 1966 and was knighted for his services in 1977 when he was elected a life Vice-President and handed over to his successor. He will be remembered with much affection.

BRIGADIER G C RICHARDS BA

Born 28 February 1907, died 22 January 1980, aged 72

GEORGE (GEO') CARY RICHARDS Was born in Bath. From Clifton College and then the Shop he was commissioned into the RE on 30 August 1926, and after Chatham and Downing College, Cambridge, where he graduated as BA, he was posted to Roorkhee in 1929. In 1930 he applied for Indian State Railways, one of the last two Sapper Officers to join them, and in the interim before posting was sent to Peshawar to the staff of the CRE for a minor local operation against the Afridis. After this he took local leave to join a friend engaged on the survey for a road joining Swat with Buner, the latter having been unadministered since the early 1900's. It was a strenuous fortnight up and down steep khuds, and a Spartan one too, living as he was in a shack of a local malik reputedly not above sniping by night at the infidels with whom he co-operated by day.



By the time he joined the NW Railway all construction work had been suspended due to the current depression, and Geo' found himself "Sleeper Passing Officer" in the jungle remote from civilization. After a year he was rewarded for outstanding results by another spell of the same routine, but declined, in spite of the potential to save more money, and reverted to military employment.

After service as GE Razmak from 1934, and for the last three years before WW2 at AHQ Delhi, he was posted to the QVO Madras S & M in Bangalore. There his first task was to raise 101 Railway Construction Company. Having handed it over to Dick (later Brigadier) Gardiner of Indian Railways, he raised and took overseas 58 Field Company. He began, correctly under current instructions, by insisting that 58 should be an Urdu speaking unit, notwithstanding that the language was alien to his Dravidian Madrassi Sappers. But he soon changed his mind when, ordered to Egypt, the Company was employed in teaching Gurkhas, Free Greeks, etc, to lay many thousands of somewhat dicey locally manufactured anti-tank mines and later having to work with British and NZ Infantry.

Brigadier GC Richards BA

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MEMOIRS

PAIFORCE, in Northern Persia, to which 58 Coy was transferred posed different problems. Work largely consisted of concrete for gun-pits, weapon-pits and tank traps. The very severe winter interrupted it, and activities were then bent on making living conditions as tolerable as possible. Sappers with pre-war frontier experience were accustomed to this climate, but the war-time entry had never so much as seen snow, and it is unofficially recorded that the OC with his Subedar could be seen on bitter mornings walking around the dug-in tents with a bottle of rum to prise the tyros from their bedding. There is certainly evidence that his troops loved Geo', and 26 Brigade, with whom he had been working, was unanimously dismayed at his departure back to Bangalore in 1943.

As a result of his having qualified in 1942 at the Staff College in Haifa his stay in Bangalore was curtailed after only a few months by a posting to AHQ Delhi to be a GSO1. His next appointment as CRE in Johore came in 1948, but he was destined by a severe heart attack to be invalided home to the UK after only a very short while. On recovery there followed a spell of eighteen months as CRE Aldershot, and thence he went as SORE(1) to BJSM Washington, a job involving liaison with American Army units, Engineers at Fort Belvoir, Armoured Corps at Fort Riley, Gunners at Fort Still and Fort Knox, an Airborne base at Fort Campbell, and visits to Vicksburg and to Canadian Engineer units in Ottawa and Petawawa. Major General Walkey, the then Engineer-in-Chief at the War Office, visited Washington in 1954 and had this to say:

"I congratulate you on the excellent liaison you have built up during your time in the States. I heard from every side praise in the way Sapper co-operation with the Corps of Engineers had advanced far beyond that of other arms, and was myself delighted with the friendliness which was shown us by all the US Engineers we met."

Returning to the UK in 1955 his two year spell as Commandant, Joint Concealment Centre, resulted in Lieut General Sir James Cassels congratulating him on his drive and initiative which raised the standard of concealment practice, and also the introduction of psychological warfare to a reluctant and sceptical Army.

His final posting before retiring in 1960 was as Senior Military Officer to Sir Donald Bailey, then the Chief Superintendent of MEXE in Christchurch. There his energy, firmness and tact were appreciated by all grades of staff, civil and military, particularly for his success, during the negotiations between industry and the HQ organisation, in introducing with the minimum of friction the new commitment for civil testing.

During his retirement at Abbots Leigh near Bristol he applied his talents to the Bursarship of Avonhurst School in Bristol until advised medically to leave. Also he was for nine years Hon Treasurer for St Brigid's International Hostel for Girls, likewise in Bristol, and despite increasing disability he continued to take part in local church and village activities.

These disabilities steadily progressed, involving periods of intense pain and physical deprivations. He endured them with screnity and without complaint. All in all his many friends cannot but be grateful for the luck which led to their first associations with him. He died at home on 22 January 1980.

HEMN

MAJOR A B MATTHEWS DSO, OBE, MC

Born 20 August 1892, died 29 December 1979, aged 87

ALEC BRYAN MATTHEWS, soldier, farmer, industrialist and sailor was one of the last survivors of the siege of Kut and subsequent imprisonment at Yozgad in Central Turkey.

After Oundle and the Shop he was commissioned into the Corps and in 1911 was posted to the 3rd Sappers and Miners at Bangalore. His Company was part of the Expeditionary Force to Mesopotamia sent in 1914 to secure oil supplies. Following the defeat at Ctesiphon, Alec Matthews with a Gurkha Officer and two soldiers

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undertook to destroy a pontoon bridge over the Tigris under the eyes of the Turks. For this exploit both Officers were recommended for the VC and awarded DSO's.

After the siege and fall of Kut Alec was among the survivors imprisoned at Yozgad. After a number of attempts he escaped in July 1918 but was recaptured and was awaiting trial at Constantinople when the Armistice was declared. The conditions as a POW had been such that he was invalided out of the Service.

Alec married and emigrated to Canada in 1920 where he farmed on Vancouver Island and became the squash champion of British Columbia. He was still a soldier at heart and he founded, recruited and commanded the 62nd Field Howitzer Battery, a mounted territorial unit; he thus achieved the uncommon double of having been commissioned in both RA and RE.

In 1938 he returned to UK and joined Stewarts and Lloyds Ltd and throughout WW2 was Manager, and later General Manager, of their tube and shell production plants in the Midlands and S Wales, for which service he was made OBE. He retired to Cornwall in 1947 and turned to market gardening and sailing. He was for many years Commodore of the St Mawes Sailing Club.

He was a natural, if sometimes forceful, leader among men who always demanded more of himself than of others.

COLONEL M E COE OBE, MA

Born 16 April 1936, killed 16 February 1980, aged 43

MARK EDWARD COE was educated at Norwich School, King's School Ely, RMA Sandhurst and Christ's College Cambridge.

At King's Ely his quiet nature and intelligence, mixed with a natural authority, was well recognized. Whilst there he became a Queen's Scout, a King's Scholar and Captain of Rugby. He took part in most school activities with considerable zest and it could truly be said that "he used his time fally". The same applied at Sandhurst, Chatham and Cambridge where he developed his many talents and made many friends.

In 1960 he served as a Troop Commander in 25 Corps Engineer Regiment in Germany, and welded his men into a first class team; his first military "family".

In 1963 he attended the Engineer



Officers' Career Course at Fort Belvoir, Virginia. One of his instructors at that time remarks that his practical outlook and quick intelligence put him well ahead of nearly all his contemporaries and in front of some of the instructors too! A tour at Fort Leonard Wood, Missouri followed.

In 1964 CRE Cyprus asked for him to become his Adjutant. During those days of emergency he could always be relied upon to provide a firm base. Both he and his wife Anna were particularly adept at looking after the large number of families. He also found time to be the Assistant Commissioner of Scouts and a Church Warden.

A Royal Naval Staff College Course and a tour as a GII (Int) in the Ministry of Defence was followed by his appointment as OC 32 Field Squadron based in Ripon which included a four month stint in Northern Ireland. On promotion he returned to MOD.

Colonel ME Coe OBE MA

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In 1976 he became CO 32 Engineer Regiment at Hohne, a regiment which was soon to be disbanded. He was thus presiding over three squadrons destined to move to three different formations. It was not an easy time but his cheerful "unflappability" enabled him to deal with the many problems that arose and to maintain the family spirit of the Regiment; right up to its last day—the spirit of 32 Regiment was never lost; and lives again in the re-formed regiment today.

Mark moved to Hameln as CO 28 Amphibious Engineer Regiment and Station Commander of the Garrison. In his two years with the Regiment he cemented a partnership with his fellow amphibians in the German Army and with them bridged the Elbe and the Rhine. Professionally he demanded the highest standards from the Regiment but at the same time he was concerned lest the soldiers became stale from working only on the Weser and he insisted on a complete change of scene at least once a year. In 1978 he arranged for the Summer Camp to be held at Emmerich on the Lower Rhine. His sense of adventure resulted in some fifty M2 rigs "swimming" via the Wester, Mitteland Kanal, Dortmund-Ems and Lippe canals to the Rhine and downstream to Emmerich. Taking three or four days over the journey it was a memorable experience for all despite the miscrable weather.

Mark never turned away from responsibility. He was concerned with people and understood that they had to be entertained in the broadest sense of the word. He encouraged free-time activities—clubs, games and sports—and almost every senior rank in the Garrison found himself involved in running something. It was under Mark's guidance that the BAOR Corps Enterprises Shop was born.

The concept of "The Sapper Family", an ingredient in Corps Affairs which seemed to him to be missing, was really an extension of his natural instinct. He believed that his regiments should be families. He knew the members of the regimental family and he was concerned for them as the head of any family is. But he also had an iron fist in his velvet glove and could discipline "the children" firmly when he had to; but the affection he engendered made the occasions rare.

He was a sincerely religious man with strong convictions, a man of great integrity evinced by his utter reliability. He was a thinker and was not too good at accepting the rule book if it made no sense in human terms. He questioned with an open mind and in a balanced and common sense way; and out of his uninhibited questioning came many new ideas and slants from which many have benefited.

When he handed over command in September 1979 his Regiment showed how highly they thought of him by the presentations they made. His promotion on being appointed Colonel GS 1(BR) Corps, his appointment as an OBE in the 1980 New Year's Honours List showed what the Army thought of him.

To be shot down in the prime of his life and with the prospect of a very successful career ahead of him was a dreadful tragedy. But he will be remembered by the many valuable contributions he made to the lives of others, to our Corps and to the Army, as well as by the fine example he set.

Personal tributes have been legion-

"... a sincere and loyal friend whose counsel was invariably wise and whose dependability was rock like. He should have been called Peter."

"..., with his chuckle and his zest for living, Mark not only enjoyed life immensely himself but somehow managed to ensure that all those in his company did so too."

"... he had a great gift for friendship and his circle was always wide. He was basically serious minded and determined to succeed in his undertakings, but he could always see the amusing side of life."

"... He was very family minded, whether the concept referred to the Sappers, Regiment, Squadron, Troop or his own natural family."

To Anna and the six children we offer our deepest sympathy in their loss.

MJA, JPG, JHH, ACDL, JEN, AMP, DALS
Correspondence

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FOOD FOR THOUGHT . . .?

Sir,—I make no apology for being tardy in commenting upon Major Jennings-Bramly's article, Food for Thought . . .? It seems that current copies of the Royal Engineer *Journal* travel to Australia in vessels of similar speed to those of the very first fleet!

As a student on 14 Army Staff Course at RMCS Shrivenham in 1979, I participated in an Advanced Study entitled *Microcomputers in Unit Administration*. Two points became obvious as this study progressed.

Firstly, there was a growing enthusiasm within units of the British Army for a microcomputer to carry out some of the chores associated with unit administration. This enthusiasm had manifested itself itself in several units having purchased their own . . . and this was where the second point arose. Having acquired a machine, the units often times found themselves hamstrung by the shortage of people who could talk to it and, more importantly, by the shortage of people who were capable of educating the machine to units method of operation. The machines that were successfully locally programmed were incompatible with machines or methods used at higher headquarters or, indeed, at Worthy Down. There was therefore still a requirement for a parallel paperwork system.

It was the recommendation of the study that centralized software design and support should be used and that unit personnel should be trained to use, rather than programme, the machine.

Such a system where unit machines are compatible with those in other units and headquarters reduces the tedium of routine returns and correspondence by having them transmitted in electronic form as well as simplifying internal procedures.

I commend the concept of the unit microcomputer to anyone, for it will release soldiers at unit level from the burden of administration allowing them to get on with the real business of soldiering.—Yours sincerely, R T Summerville

> Colonel J L Nicholson OBE Chawton Lodge Nr Alton Hants GU34 1SL

ESCAPE FROM SINGAPORE

Sir,—At the risk of boring your readers, I would like to add a postscript to Major Phelps' letter. (*RE Journal*, June 1980).

On the evening of 15 February Geoff Hallowes (ADC to Major General Keith-Simmons) and I were ordered to take a message to the Commander of Blakang Mati Garrison and were told that when we had delivered it, we need not return. Direct communication with the island had broken down.

We delivered the message and after many incidents reached Rangat on 20 February. At that time there were about 600 escapees in the camp which was in a rubber factory. Transport was available to move about 200 men a day to Sawahlento from where the journey to Padang was completed by rail. Two or three days after my arrival the camp was nearly empty when Lieut Colonel Dillon, who was the Senior Officer there, heard that another 1,000 were about to arrive. He had already invited me to remain as his Staff Officer; an invitation which was difficult to refuse! especially as it appeared to mean only two or three days delay. The large party arrived-mainly survivors of those evacuated in a number of ships on 13 February and sunk in the Sunda Straits. Unfortunately the lorries for the move to Sawahlento were needed by the Dutch for troop movements and it was not until 10 March that all the party

When it became clear that no ships were coming in to evacuate us all, a small number of Officers, including Colonel Dillon and I, were nominated to try and sail to Ceylon. Eventually our craft was sighted by some Japanese supply vessels on 4 April about 600 miles from Ceylon, we were picked up and became prisoners. Geoff Hallowes was evacuated from Padang, became an outstanding agent in SOE and later married Odette, GC.

There are so many "ifs-and-buts' to Geoff's and my own journey, and also to the cruise from Padang, that I can only agree with Major Phelps' comment that luck played its part in a successful or unsuccessful escape. But then so did determination and, for an example of that, An Ocean without Shores which is an account of Lieut Colonel Thorlby's efforts to sail from Padang to Australia is well worth reading.

It may be thought that there were no successful escapes by Sappers from Singapore after the Cease-fire but I know of two. One by Lieut Colonel (then Captain) G A P N Barlow who left the Singapore Yacht Club shortly before me in a properly rigged and equipped boat; the second by Lance Corporal Perkis, formerly of 30 Fortress Company, who walked through the Jap lines to Changi on 16 February and took one of the dinghies at the Sailing Club there. He was a very experienced and accomplished helmsman but exactly what happened to him I do not know, only that I was told he escaped .- Yours sincerely, John Nicholson

> Major E R B Hudson TD Hudson Enterprises PO Box Mae Ping 1146 Chiang Mai Thailand

RE OFFICERS IN COMMAND OF INFANTRY

Sir,-Lieut Colonel J R V Thompson (Journal, September 1980) asks for names of RE Officers who have taken command of an Infantry Battalion or similar in an emergency. In June 1940 I was attending a Fieldworks and Bridging Course at Chatham, and whilst sitting in the HO Mess I met two Subalterns just back from France who had a badge with the letters "PR" on one shoulder. I enquired what these letters stood for and was told "Perowne's Rifles".

The story of Perowne's Rifles has been written up. From memory the unit was formed by Lieut Colonel L E C M Perowne from Sapper L of C units and reinforcements to act in an infantry role during an emergency-the BEF was withdrawing towards the Channel Ports. Thus its commander, now Major General L E C M Perowne CB, CBE, K St J and a distinguished member of the Corps, appears to qualify for Lieut Colonel Thompson's list .- Yours faithfully, E R B Hudson

Book Reviews

WATERLOO THE OFFICIAL GUIDE OF THE WATERLOO COMMITTEE DAVID HOWARTH

(Published by Pitkin Pictorials Ltd, London. Price 0.90)

THE AUTHOR, although better known as a naval historian, has proved to be equally effective on land. He has drawn on the personal experiences of people who fought in the Battle of Waterloo and he presents a completely authoritative and uncontroversial picture of that fateful day. Having given the background the Author takes the reader to the five best vantage points and brings the battle to life. The vantage points are marked on the map in the book and by plaques on the actual battlefield.

The book is beautifully illustrated, almost entirely in colour, with reproductions of the most famous paintings of the battle.

The Waterloo Committee is to be congratulated on its initiative in sponsoring this guide which can be obtained at various sites at the battlefield and in the UK at Stratfield Saye, Apsley House, some military museums, booksellers and from The Waterloo Committee, c/o 131 Haling Park Road, South Croydon CR2 6NN.

EEP

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REVISED PRICE LIST FOR HISTORY OF CORPS

BECAUSE of reprinting the prices of Individual Volumes and Sets of *The History of the Corps of Royal Engineers* have been revised. The policy of the Institution is still to recover costs only from Members.

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ARTICLES

Articles may be of any length, but preferably not more than 6000 words. They should be typed in duplicate on one side of the paper only, double spaced with a one-inch margin. A third copy should be retained by the author for checking with the proofs.

Articles should be accompanied by a photograph of the author, suitable for reduction to two inches width, and a pen picture of his career to introduce the author to our readers.

Photographs to illustrate an article should be black and white prints on glossy paper. The size of the photograph does not matter as the size can be adjusted. Line drawings, maps etc must be in black ink and all lines, lettering etc must be bold and clear to allow for reduction in size when reproduced. Scales must be drawn and not worded.

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Articles may be submitted at any time but the following dates are *normally* the latest for inclusion in the issues shewn:

MARCH ISSUE	1 DECEMBER	SEPTEMBER ISSUE	1 june
JUNE ISSUE	1 march	DECEMBER ISSUE	1 september

For articles requiring clearance attention is drawn to Military Security Instructions Part 1 Army Code No 60723 Appendix B to Chapter 5.

CORRESPONDENCE

Correspondence is the life blood of the *RE Journal*. Correspondence on published articles is particularly interesting as it provokes further thought and widens the discussions on controversial topics. It is important however that the initial reactions to articles published should be in the NEXT Journal to maintain the interest in the subject. For this reason the submission date for correspondence *referring to articles* is five weeks later than that for articles. On average this will give correspondents about one month to react.

The submission dates for Correspondence on published articles are therefore:

MAKCH 1220F	I JANUARY	2ELLEWREK 1220E	7 JULY	
JUNE ISSUE	7 APRIL	DECEMBER ISSUE	7 october	