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(Established 1875, Incorporated by Royal Charter, 1923)

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Editorial

LOOKING FORWARD - A POSITIVE APPROACH

SOME quotations have a real message, some raise a chuckle and a few do both.

"Capitalism is the exploitation of man by man;

Communism is the exact reverse"

THE humour of quotations is a personal thing; some catch the imagination and some do not. Graffiti is often considered to be a low form of quotation; it depends on your sense of humour, the appropriateness of the original comment and, in particular the riposte – an essential part of the technique

"My Mother made me a homosexual"

This could be a cry for help; but under it was written -

"If I give her the wool will she knit one for me?"

There is one quotation which is important, humorous and above all relevant today "I am neither for nor against apathy".

The attitude of mind, exemplified by this quotation, is the cause of many of todays problems.

The August Supplement carried the report of the Annual General Meeting of the Institution. The President made the point that we must have some changes in the Institution if we are to fulfil our obligations to our Members. We require changes for the better and not just changes

"... we tend to meet any new situation by change; and a wonderful method it can be for creating the illusion of progress while producing confusion...."

with Apologies to Gaius Petronius Arbiter Better for whom? Better for what? For Members of the Institution who, after all, pay for the services provided? Better for the Corps, past, present, future and regardless of rank? Are the requirements compatible? With thought and patience it should be possible to make the necessary changes for the benefit of all. We simply must become more forward looking.

The Journal publishes the articles submitted to it. This does not mean that we sit, wait and pray for copy. We actively encourage people to write for us by personal contact and, where necessary, by bringing pressure to bear where we can. The type of article submitted is therefore some indication of the attitude of Members and of Military Engineers in general. An examination of recent Journals shows an increasing tendency to look back in time. This may in fact produce a more interesting Journal for general reading but does it advance the cause of Military Engineering? No, it does not. It requires a more forward looking approach to do this. Where are we going? Where should we be going? How are we to get there? Articles which stimulate the reader to think of the future, which in turn should generate a lively and provocative correspondence, are a must if we are to fulfil our role.

In this issue of the Journal the Engineer-in-Chief has driven off from the first tee of the *New Course*, Major Seekings has hit the approach shot and Engineer Support Group have sunk the putt for a birdie on the first hole. 2nd Armoured Division have driven off on the second hole, a 220 yard par 3. They had problems, should they take a No. 4 wood or a No. 1 iron and go for the green, over the hazards, or should they play safe and short? It is hoped that Members will tell us what they should have done and where the ball landed. It is also hoped that we will get some volunteers to play the next shots.

In our efforts to be more forward looking, however, we must be realistic and remember the words of Samuel Butler in his *Note Books* where he wrote:

"All progress is based upon a universal innate desire on the part of every organism to live beyond its income."

1978 Corps Annual General Meeting

ADDRESS BY ENGINEER-IN-CHIEF

At the Annual General Meeting of the Corps, held on 28 June 1978, the Engineerin-Chief, Major General C P Campbell CBE, spoke on Corps affairs. He said:

It is usual on this occasion for the E-in-C to give a substantial "tour d'horizon" of Corps affairs during the preceding twelve months. This year I propose to give a rather shorter than normal review of such events as I want to devote some time to talking about the future. In this sense I rather see myself as the company chairman reporting to the "shareholders" not only about past performance but also about future prospects.

A REVIEW OF THE YEAR

By comparison with 1976/77 which was so full of royal occasions including the Jubilee, the past twelve months have been rather more prosaic. That is not to say that the Corps has had an uneventful time. Business has been brisk. We have been, as ever, much in demand.

Operations

Firstly our operations. Northern Ireland continues to dominate our commitments. Regiments from BAOR are deployed to the Province in the infantry role; 4 Armd Div Engr Regt has recently finished a tour in Armagh and 3 Armd Div Engr Regt will be following them in the near future although to a different area. In the combat engineer role we continue to provide two field squadrons on roulement (one from BAOR and one from UK) in addition to the resident field squaron. Amongst their tasks have been protective works including the hardening of the base at Crossmaglen against PIRA mortar attacks and the search for weapons and explosives on which there is increasing emphasis. Indeed the Corps leads in the field of Search and has the responsibility to train the Army in search techniques. Last year some seventy two RE search teams and about 316 all arms search teams were trained by the Corps and this is necessary to meet the Army commitment in the Province where at any one time twenty five RE and 132 all arms teams are deployed. The evidence produced by these teams is a vital part of the strategy of bringing terrorists to trial through the courts.

We have recently concluded our commitments in the Oman where for some years we have been supporting the Sultan's Armed Forces. In Belize we continue to give support to the garrison in an uneasy situation. The future here is not clear but we seem likely to be committed to providing a force varying from a troop to a squadron for some time to come.

I could not taik of our operational commitments without a brief word on the part the Army played in the firemen's strike earlier this year. This task affected nearly all regular units in the UK. It lasted, as you may recall, about ten weeks and resulted in the deployment of sappers to widely dispersed locations in the British Isles. They were greeted by the local communities with enormous enthusiasm and generous hospitality all of which reflected the strong national feeling for the way in which the Army had stepped into the breach. Inevitably there were some penalties notably in interruptions to recruit training. Happily we have caught up with the backlog. Logistic Engineering

As construction engineers our order books have been full. Not only have we provided works forces but we have responded to requests to provide small teams of specialists in rather out of the way places such as St Helena, the Falkland Islands, Rodriguez Island and Funafuti Islands. I will now illustrate some of our work with the following examples:

(a) In Germany, the Commander 1 (BR) Corps personally gave orders for a priority programme for the construction of shelters so that essential vehicles could be

protected from the weather in as many barracks as possible. This is a wide ranging commitment which has involved a large number of sappers in 1 (BR) Corps and they have been hard at it throughout the year.

(b) In Northern Ireland an urgent operational requirement was approved for the construction of a Close Quarter Battle Range. 38 Engineer Regiment deployed a squadron to the task in April 1978 and thus far work is ahead of schedule and if all goes well the project could be finished by the end of this year. It is a realistic urban street façade some 500m in length together with briefing and control rooms for the target system.

(c) In Saudi Arabia we have a team of seven officers and eleven warrant officers acting as technical advisers to the National Guard in their dealings with a major foreign engineering consortium. The present contract is for about £500m and includes a 500-bed hospital at Riyadh with an associated medical city to house 2000 people. A Royal Residence complex is also being constructed at Riyadh. At Jeddah there is another hospital and medical city. This project continues to provide excellent large scale professional engineer training for the Corps and is an interesting accompanied posting.

In addition we have been involved in the usual construction exercises overseas – for example in Canada and Kenya.

Finally we have assisted the Property Services Agency in a variety of ways and in so doing have helped to make the money available for defence works go further. All of this construction work is of course valuable training and experience for all our units.

Restructuring

Turning to reorganisation, I can tell you that this is virtually complete. Details were given last year so I won't go into them again. Rather sadly HQ 12 Engineer Brigade has disappeared and with it a Brigadier's appointment. The Engineer Support Group has moved from Woolwich to Barton Stacey and taken under command the Military Works Force. District HQ in UK now directly command not only the four regular regiments but also the two TAVR Groups. This arrangement has much to commend it because I believe it will enhance the integration of regular and volunteer effort with benefit to both. While talking of the TAVR I am pleased to tell you that the former 131 Parachute Squadron has, on the disbandment of 44th Parachute Brigade TAVR, been assigned to Commando Forces with the new title of 131 Independent Commando Squadron RE(V). Manpower and Equipment

Looking at the manpower scene you may recall that my predecessor made officer recruiting his top priority. I am happy to say that his hard work is paying off because we now have an encouraging number of young men joining the Corps with the better quality coming from amongst those who have been awarded an Army bursary or cadetship to a university. But there can be no let up and all of us have a part to play in ensuring that the Corps will be in good hands in the years to come. This is a point that I will return to later.

The numbers and quality for the junior entry to Dover and Chepstow have continued to be very good. Until a few weeks ago I would have said the same about the adult entry at Cove, but recent recruiting figures show a decline. It would be well therefore to sound a cautionary note now for if this recent trend continues the Corps will be below target by this time next year. Wastage and Premature Voluntary Release by purchase is a cause for serious concern and we, like the rest of the Army, are having our problems. Our losses at the end of 1977 were up on the previous period. Thus far this year the position seems to be steadying. While this trend is to be welcomed it is far too soon to say if it will be maintained because we cannot yet be certain what the long term effects of the Pay Review will be.

We have been at work over the past year finalising details of a new career structure for our soldiers. It is a complicated subject which I cannot possibly go into fully now. I can assure you however that it is an attractive concept which should be greatly welcomed by the Corps and should help to alleviate a number of current matters of concern. Units have been given a copy of our planning paper setting out the details and I expect formal Ministry of Defence instructions to be published later in the year.

In the equipment field there is little to add to the report of last year. I took delivery of the first production model of the Combat Engineer Tractor for the Corps in May and I hope that some of these machines will be in the hands of the troops in BAOR by the end of the year. We are engaged in a study of bridging for the '80s in conjunction with the Americans and the West Germans. These studies will come to fruition during the next year when we will have to make up our minds on such issues as the successor to the M2 amphibious bridge.

Survey and Postal

Despite staff reductions under the Army Restructuring Plan, survey activities continue world-wide as usual. Field survey detachments from the UK worked in Kenya, Cyprus and Northern Ireland and teams from 512 STRE fixed doppler stations in fourteen countries including Egypt, the Sudan, Portugal, Iran, Puerto Rico and Cuba. Updating of large-scale maps of Northern Ireland and maps of Belize continues. However, the supply of geographic data in computer compatible form is now the biggest growth area. Survey data now forms an integral part of modern weapon systems, and survey are working on co-operative projects with the RAF, the USA, Germany, Italy and the Netherlands. The development of cartographic processes (including the use of lasers), mostly resulting from clearly stated air requirements already show advances which in the near future will result in improved mapping for land operations. Survey is also, of course, heavily involved with the Ministry of Defence evidence for the Government Review Committee on the future direction and funding of Ordnance Survey.

A resumé of the years events however brief would not be complete without mention of the Postal and Courier service. It has been a heavy year for them covering the normal commitments as well as special exercises at home and abroad and it is a compliment to them that so much of the Army takes their service for granted. *Regimental Affairs and Sport*

An innovation this year, as you have heard from the Chief Royal Engineer, is the introduction of a new two-tier system for running Corps affairs, namely The Chief Royal Engineer's Committee (which replaces the old Corps Committee) and the E-in-C's Regimental Committee. My committee, which is a totally new body, is designed to draw together at working level various shades of Corps opinion, including the TAVR, on how best to run our Corps family affairs. The new machinery will improve inter-communication and give an overall central drive to Corps policies.

So far I have talked only of work and you might be wondering whether we have had time for anything else. I am a great believer in the maxim that "life is for living" and I encourage people to strike out in adventurous fields and in sport. There I can happily tell you that the Corps is active in many extra-mural fields with individuals participating in ocean racing, in climbing expeditions in The Himalayas, to say nothing of the Corps involvement through Lieut Colonel John Blashford-Snell in the forthcoming international world-wide series of expeditions under the title of "Operation Drake" which has the patronage of HRH The Prince of Wales.

In the field of sport during the past year we have provided the captain for four different Army Teams. As these were the major sports of Rugby, Soccer, Hockey and Cricket, I believe this could well be a record achievement. *Summary*

All told it has been a full and demanding year for all units. There has been considerable movement of squadrons due to restructuring both in UK and Germany and with a continuing high work load everyone has been under great pressure. I am in no doubt that they can all be justly proud of their achievements. For my part, although it is both flattering and gratifying to know that we have so much that others want it is my concern that we keep a sense of proportion and do not get overcommitted. I would not wish to have another year like this last one because too many units had to sustain very tight programmes with no room for flexibility. Therefore for 1979 and 1980 I am taking action to adjust those commitments which are within my control. Unless commitments are carefully watched we run the risk of seriously overstraining our resources and in these days when manpower is at a premium we pay unwelcome penalties and compound difficulties over training for our operational roles, separation of families and poor unit administration.

SHAPING THE FUTURE

In the next part of my talk I want to look forward and consider how we should be shaping the future of the Corps. I will cover a number of points and if I may, share a few thoughts and discuss a few questions with you – not all of which have immediate or easy answers. I realise that I shall be saying things which will be familiar to the older and wiser heads than mine in the audience but they need to be stated afresh at this time as we consider the evolution of the Corps into the 1980s. Besides I am directing my remarks not only at this audience but at members of the Corps generally who will read my words, in due course, in the *RE Journal*.

Structure and Balance

In the first part of my talk I showed how the Corps as a body of professional military engineers meets a wide range of commitments. Firstly as soldiers, for example, in the infantry role in Northern Ireland, secondly as combat engineers and thirdly as construction engineers. This is quite apart from the specialisations in the survey and postal fields. There is nothing new in all this; indeed it is the sort of thing we have been doing for years. Nevertheless I am quite clear, and I do not think anyone in this audience will disagree, that it is for the good of the Army that we continue in the future to give across the board support and moreover it is in our best interest to do so. It is after all our primary function. However as the Army becomes smaller so does the Corps in proportion and thus it becomes increasingly more difficult to ensure that we meet the multiplicity of our commitments in full to the satisfaction both of the Army and ourselves. To be effective we have to be well balanced so that we can meet the numerous calls that come our way and we must gain as much experience over the full width as we can in peace. This is one reason, for example, why we take on construction tasks for the Property Services Agency and welcome the unique engineering opportunities offered in Saudi Arabia because in war we could find ourselves running major installations and being responsible for their maintenance.

I referred to balance a moment ago and this will be a recurring theme in what I have to say. Achieving the right balance whether in training, in equipment development, in organisation or deployment, between the tactical and the technical, between close engineer support on the battlefield and construction engineering, between being a soldier and an engineer is a problem which besets the Corps as much today as I believe it has ever done. It applies whether one is considering an individual, or a unit, or the outlook of the Corps as a whole. It is very relevant to our future development.

Rather like a raft the Corps must be stable and buoyant with the link between our military and our engineering skills being a vital part of the structure. Over the years much has been done to weld the Corps together and keep it well balanced. It is essential that this balance is not upset and that we remain one Corps. However I sense dangers which could unbalance the trim. The first is that the Army, pre-occupied with priority one commitments, might say that we should reduce or play down our technical engineering skills and concentrate on combat engineering. In no time at all I suggest that we would rapidly become a Corps of pioneers. The opposite danger which might trigger the first, is that we might be drawn or pressed into taking on more construction engineering, possibly outside a service environment as some other armies have done, thereby forgetting that we exist primarily to support the services and particularly the Army. If we keep the balance about right we shall play

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our full part and have influence where it matters.

How does the Corps raft look at the moment? We have just had a major rebuild through the Army restructuring programme and therefore we have a new craft which needs to be thoroughly tried out. We need a period of stability in which to settle down and see how our new organisations work. But we cannot just stand still; we have to think now how best the Corps should evolve through the 1980s. This is a complex matter which is aggravated by some capability gaps which have arisen now because of manpower economies. The most important of these is armoured engineers where the restructuring programme has reduced us to one squadron. This is a matter which I am dealing with now and I hope that as soon as more manpower can be made available, and the signs are hopeful, I shall be able to form a second squadron. There are other areas such as Explosive Ordnance Disposal and Airfield Damage Repair but time precludes me from going into these any further.

Communication and Influence

Our raft is of no value unless it is in touch with the banks. In this sense one bank is the rest of the Army and the other is the civilian engineering world. I have some doubt whether we in the Corps are sufficiently in touch and playing a full part in Army developments. For instance I see the really critical problem on the battlefield as being one of how to stop large concentrated formations of enemy armour moving at high speed and backed by formidable quantities of artillery. In dealing with this problem are we truly making the most effective and imaginative use of our own developments in organisation and equipment to ensure that there is, for example, a quantum jump in the speed of barrier creation? I suspect that we are placing too much reliance on conventional minefields and not looking forward and opening up our minds to new ideas, or even taking a fresh look at old methods such as anti-tank ditches. I believe that we must make a more conscious effort to bring all our developments into the tactical thinking of the Army. Not only should we give sapper advice but we must play a full part in the development of tactical thought. We ought to be listened to - we are after all the only arm which can change the face of the battlefield. It is our raw material. Unless we have this influence we are in danger of declining and becoming a second or third-class Corps.

Another doubt I have is on the other side of the raft where over the years we have made increasing contact with the civilian engineering world. It is not so much that the more technical side of the Corps is not in touch with civilian engineering developments but do we take enough advantage of these powerful links? Do we get inspiration from them to be able to live up to our reputation for flair and innovation? Or are we too insular? Do we pay too little attention to encouraging officers and men to think ahead beyond the strict confines of their daily work? Do we give them enough time to develop and promote ideas? Perhaps the lines of communication are blocked because of the pressures of everyday life at higher levels. I am not attempting to answer these points now but I will be dealing with them over the course of the next few months and shall welcome any ideas and thoughts which will help me.

I am certain that there is enormous scope for ideas and they have to be given air. At my conference this November I intend to take a lead in this direction by getting people to look ahead and re-think their ideas as we study "War in Europe", now and in the future. This should provide ample scope, for those attending, particularly the younger element, to launch out with constructive ideas. Indeed you might say that "ideas" will be the theme of the conference. In particular on the last morning I intend to hear ideas on the ways in which we in the Corps can best bring our influence to bear on the Army.

But my conference apart I wish to open up our internal channels of communication particularly by using the Institution and the *RE Journal* as mediums for encouraging debate and discussion and nurturing new ideas. Valuable work is going on behind the scenes with the President and Council of the Institution to promote a forward looking image. Officers

I will now return to the manpower scene and discuss the importance of investing wisely in the right quality of officers who will steer the Corps in the future. The Corps must be appealing to the young. We must not be seen to be taking ourselves too seriously – a charge that is often levelled at us with some justification. In this respect an outgoing divisional commander in 1 (BR) Corps recently said in public that while he much admired the Sappers he felt that we did ourselves less than justice by too often hiding our light under a bushel. In a similar vein we have something of a reputation for being slow starters at Camberley. Such modesty and reticence is unbecoming and we perhaps have lost something of the flair which characterised so many of our great men. Life must be fun and exciting in the Royal Engineers and I am a firm believer in giving the young their head, and letting them flex their muscles and be adventurous.

I talked earlier about our improving officer recruiting position and I want to return to that topic now. The view is often expressed that it is of the utmost importance that the Corps should have a very high percentage of young officers with engineering degrees. Whilst acknowledging the importance of academic training and achievement I believe it has to be seen in perspective. What I want above all is to recruit good young men who are fit to lead and work in the Corps. If we get young men who are first class officer material, experience shows that we will naturally get those who are either graduates or potential graduates. I don't believe therefore that we need to get too fussed about the percentage of officers who have degrees. The problem is being able to spot good young men early in their lives, particularly while they are still at school, and then direct them towards the Corps. In this respect all of us, retired and serving alike, have a very important role to play to supplement the formal recruiting channels.

Once within the Corps it is my responsibility to prosper the careers of all officers to the limit of their merits and abilities. I will pay attention to those who early on show outstanding ability and I will follow a policy of advancing their causes vigorously so that they will be well placed to reach high places both inside and outside the Corps.

One cannot talk about young officers without saying something about their training. It is a much debated subject and I am concerned that a satisfactory balance is struck between training and regimental service early in the young man's career. There is a gap between the new Sandhurst courses and what is taught at Chatham. I am examining this now and the YO course is being fashioned to meet the needs of the young man on his first posting as a troop commander. This training will include some essential knowledge of construction engineering, and will provide a foundation for more advanced professional engineer training later in his career.

Before concluding I will mention briefly another matter which is of concern to me and influences my thoughts. Say what you will, times *have* changed and I sense that the young officer of today is more conscious of his career prospects and the quality of life that he finds in the service than I was at his age. Moreover he tends to marry early in life and his wife naturally enough frequently wishes to pursue her own career. This is not surprising; it is after all no more than a reflection of the attitudes of modern society. These are points which I have to bear very much in mind when considering the direction the Corps should take in the next decade. *Conclusion*

Earlier in my talk I used the raft analogy and I am now going to conclude in the same vein. In the past couple of years the Corps has been through some very choppy waters with the effects of reorganisation, the substantial commitments of Northern Ireland, and some unexpected loads such as the firemen's strike. There has been precious little freeboard and while some of the load in the form of commitments within my control can and will be shed, we will not see any substantial improvement until the Northern Ireland situation eases. Nonetheless we can all be very proud of

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the Corps' achievements in this difficult period and we can take heart from the warm congratulations of senior commanders on the way in which we have met our commitments.

But now is the time for looking forward and not backwards. My concern is to steer the restructured raft on a positive course into the next decade. We need a period of stability to do so and I will do all I can to achieve it. There will have to be some changes and adjustments but I will see to it that these are evolutionary and not radical. We must remember that our prime function is to support the Army and therefore the Corps must be well balanced in order that we can all play our full part in the Army and have influence where it matters.

The raft is of no use unless it is in touch with the banks. As the Army moves into the 1980s all of us must see to it that we look ahead and bring our inventive developments and ideas to bear on the tactical thinking of the Army at all levels. There is a lot to be done and we must think big and let our ideas range far and wide. We must capitalise on our powerful links with the civilian engineering world.

The future of the Corps will rest in the hands of our young officers of tomorrow. It is our business to see to it that the Corps is appealing to the young and that we attract the right quality. Having got them, it is my responsibility to see that their careers are prospered and that those who show outstanding talents are pushed forward and allowed to run free thus giving them the best possible chance to get to the top in the Army.

Finally let me say that I will always welcome fresh thought and helpful ideas whether they come from the Regular Army, the TAVR, from young soldiers or retired officers.

All in a Day's Work

PAE

SHOULD anyone seek Fort Sandeman he or she should look at the northern part of Baluchistan, that part of the world – according to the Pathans, who inhabit it – which took the refuse that was left over when God made the world. Except for the occasional oasis, such as Quetta, Baluchistan consists of large areas of desert waste and barren hills with thorny bushes only suited to the teeth of goats or camels. There are occasional small fields, watered by light winter snows and doubtful summer rains; but with a population of less than one individual to the square mile these are very few and far between. A couple of miles from Fort Sandeman ran the Zhob river, from which the Political Agency took its name. The waters of this sluggish river were so impregnated with salts as to render the river useless for any form of vegetation. Nevertheless, these "desert and mountainous wastes" were inhabited by tribes of Pathans in the centre and north of the province, those around Fort Sandeman, (previously named Apozai), being the Shirannis, the Khibzais, the Jogezais and the small tribe of Mandu Khel.

Although never described as such, Fort Sandeman could be regarded as a crossroads. An earth road ran for about 200 miles to Quetta in a south westerly direction and northwards to the Waziristan border sixty miles distant. But twice a year, almost at right angles to this main axis, large nomad tribes would emerge from the hill ranges on the Afghan border, pass through Fort Sandeman and disappear through a narrow gorge, some twenty miles distant to the Derajat plain on the banks of the Indus, re-appearing in the spring.

To observe the King's peace in this thinly populated region a small garrison was stationed at Fort Sandeman. It consisted of three battalions of Indian Infantry, a battery of mountain gunners and a flight of RAF. There were, of course, the usual ancillary services. Here also was the Political Agent (PA) and his staff whose task was to maintain reasonable law and order, according to tribal custom, among the local tribes. To assist him in dealing speedily with any situation was located the headquarters of a Frontier Corps, the Zhob Militia, which also maintained garrisons in small forts in various parts of the agency.

Also in this garrison, was, of course, a Garrison Engineer (GE) with an AGE. One might well ask why there was such a large Sapper contingent for such a small garrison. But in those "bad old days" the Military Engineer Service (MES) in Baluchistan also acted for the Public Works Department (PWD) and indeed eighty per cent of the GE's budget was derived from PWD funds for such purposes of construction and upkeep of roads, the maintenance of civil and Militia buildings and so on. Indeed, in this agency there were over six hundred miles of earth roads, all of which had to be kept in a reasonable state of repair.

And here I must enter the scene together with the villain or hero of the piece – according to fancy – Zachhariah, my Mandu Khel car driver. Twenty miles distant a new mountain road was being constructed and frequent inspections of the work were essential. Summoning my driver on one Thursday morning I told him that I wanted the car to visit this work on the following day. "Sahib, I was going to ask for leave on Friday and Saturday" was his reply. To Muslims Friday was their holy day and as the inspection was not vitally immediate I agreed to this request but he had to be back on Saturday night so that I could visit the work on Sunday. He promised to be back in time as his village was only a dozen miles or so distant.

Sunday morning came round and in the usual way I was awakened by Rustum Khan, my Bangash bearer. He knew about my proposed trip so I enquired if my driver was ready to leave at half past nine. Rustum Khan looked at me for a moment. "Sahib, Zachhariah is in gaol." At this astonishing remark I indeed sat up. "Sahib, it is said that when he went on leave to his village he killed a man."

This was infuriating news. Of course I could motor to visit the work without a driver but now there seemed to be the beginnings of a Pathan blood feud with my driver the focus of attention from the aggrieved side; and Heaven only knew what would be the ultimate outcome. "Sahib, you could write to the Political Agent." I did.

Shortly afterwards a pleasant reply came from the PA. He had only just heard of the affair. Of course, I would understand that he was unable immediately to release my driver and offered me his own. He also added that the matter would have to be tried by Jirga Law as the alleged offence had taken place outside cantonment limits and that he would give me news as further developments occurred. A Jirga was the council of Pathan tribes, consisting of all the head men of each tribe. Here would be decided tribal matters, great or small, including such matters as murder, adultery, theft and so on. Apparently in this case the PA was assembling a Jirga, consisting of the head malik of each of the Shiranni, the Jogezai and the Khibzai tribes, being the largest tribes in the region. In addition the Subcdar Major of the Zhob Militia, the senior Viceroy's Officer of the Militia would also be a member of the Jirga.

As there was little chance of him absconding Zachhariah was released a couple of days later so I summoned him to ascertain how I could help. Normally a cheerful little man with a sense of fun, now he was as sullen and taciturn as only a Pathan can be. No; he would not give me details of what had occurred. No; I could not help. No; no one could help him. Summoning Bangal Khan, my badragga bodyguard who was a pal of Zachhariah, I enquired if he could not find some method of helping. "Sahib," he sighed, "Everybody in the office and outside has tried to help but without any result. We can only hope that the Jirga will be lenient."

The day arrived for the meeting of the Jirga which was to assemble in the office of the PA, who would preside. Seated in my office I tried to concentrate on the work of the day when Bangal entered. "Subadar Major Gul Khan of the Zhob Militia wants to speak with you." I knew Gul Khan fairly well but could not help wondering why he wanted to see me and on this day. I was not long left in doubt. "Sahib, you have got to help in this case of Zachhariah" were his first words. I explained how I had tried but that my efforts had had no effect. "No, sahib," he continued, "Zachhariah has got to plead guilty" was his next statement. "Sahib, I will explain" he remarked when he saw the look of utter amazement on my face. And he proceeded to calm me down. "If he pleads Not Guilty and the Jirga agrees, there will be a blood feud. If however, he pleads Guilty, there will be a fine which will be paid to the tribe of the dead man as compensation and there will be no feud. That is our law."

I enquired as to the amount of the fine. "Two thousand rupces" was his reply. "This sum represents the value of three virgins and five camels, which used to be the old fine." By now I was becoming inured to almost anything. I awaited details. "It will be done like this. Your contractor will pay the fine for him and it will be repaid by the following method. You are shortly going on leave for three months;" I nodded; "In your yard there is a lorry that requires repair and has no driver. Zachhariah will be taken on as its driver and so will draw a lot of extra pay. I hope, Sahib, that the lorry will not be repaired too early." Again I nodded my head. By now I had been so brain-washed that I could agree with almost anything short of felony. At any rate lives would be saved. I then received further orders. "Sahib, you must make Zachhariah plead Guilty." I again had explained what had happened earlier. "He must say *qusurwār* (guilty) and not *bequsār*", (literally "without guilt"), was the direction. He went on "I shall listen for the word *qusur* and hope that I shall also hear the ending*wār*". He then left; at any rate my driver had one friend among the judges.

Bangal Khan again entered. "Khan Zaman, head malik of the Khibzais, wishes to see you." "Good heavens another judge." I only knew the Khan Bahadur slightly so the usual Pathan greetings were lengthy, after which he took a cigarette. "Sahib, I have come about the Jirga, it is a bad business." There seemed to be annoyance that the Garrison Engineer's driver had been accused. Once more I had repeated to me almost word for word what the Subadar Major of the Militia had said and again I was admonished that my driver should plead guilty. Tea was brought, another judge was on "our side" and shortly he left.

Now I could get down to the day's work. But; No. "Sahib, Khan Bahadur Mohd Khan of the Shirannis wants to speak to you." Clearly this morning I was to change my profession to that of solicitor to my driver. I knew Mohd Khan pretty well as he had done some work for us. Again tea and cigarettes; again the same arguments and once more the same admonitions and another judge left.

One more Malik was left but as I only was slightly acquainted with him I did not expect a visit. But I was wrong and shortly after this visit The Nawab of the Jogezais was announced. The meeting was just as long and now I was getting a little tired of the same instructions, all of which I promised faithfully to observe. At any rate the PA would not be coming so I could now have words with Zachhariah.

Again I faced this stubborn little man across my table. I explained what I had been told by the members of the Jirga. I explained what the awful effects on his family would be if he pleaded Not Guilty. I explained blood feuds in detail as far as my memories and imagination allowed. Time and again I reviewed the whole proceedings that had occurred earlier in my office. So at last I got to the "nitty gritty".

"All that you have to do is to say, Qusurwar." At first there was a blank refusal. Again I went over the matter and slowly I began to see that the whole business was beginning to take effect in his very thick skull. At last he agreed; but grudgingly. Anyhow he promised to say the correct word at pleading. We parted and all I could then do was to wish him the usual Pathan farewell "May good be in front of you".

By the Grace of God, all was well. At any rate the Jirga heard the correct plea, as the PA recounted to me later on.

Later, meeting the Subadar Major of the Militia, I enquired as to how the matter of the Jirga had proceeded. "Well, sahib," he smiled. "Perhaps our hearing was not so good but we certainly heard the word *qusur* and assumed that it was followed by the right ending." Lives were to be saved so certainly the ending justified the means.

Next day my very well paid driver reported for duty as if nothing had happened.

"Whither the Corps?" . . . A Requiem

MAJOR (Retd) DAL SEEKINGS BSc, DMS, AMBIM

"WHITHER THE CORPS" was published in this Journal in December 1958. No article since then has generated so much interest; it was discussed at the E-in-C's Conference that year and the March 1959 edition of the Journal carried no less than twenty pages of letters on the subject.

The article, by Brigadier J B Brown, was written in the light of the decision of the Weeks Committee to remove Works Services from the Corps. Brigadier Brown's hypothesis was that, in order to maintain its prestige and strength, the Corps had to increase its general level of professional knowledge and ability as civil engineers. The alternative, he argued, was for the Corps to become more and more preoccupied with field engineering, the final result of which would be a Corps of specialist pioneers and not engineers.

No-one, then or now, would disagree with the need for the Corps to maintain its prestige and strength and few would not agree that this prestige and strength depends upon the professional knowledge and ability of the Corps. But to-day this professional ability – and I use the term "professional ability" in a wider sense than that of the "civil engineer" – is in doubt and should be a cause of concern to all thinking officers.

In this article I wish to draw attention to some serious deficiencies in our professional ability, deficiencies which, if not made good in the immediate future, will lead to a diminution of the standing of the Corps and a subsequent loss of influence in the Army. I am conscious that, having retired prematurely, I lay myself open to the charge of expressing "sour grapes". This is not the case; I offer these opinions because I have a concern for the future of the Corps and, having retired, am freer to express my personal views on the subject.

Let me return to 1958 and examine some of the statements made in the debate of that time – a debate which also reflected concern about the professional ability and standing of the Corps. Brigadier Brown headed his excellent article with this unattributed quotation:

"The influence which the Corps of Royal Engineers can exert on the policies of the Army, and the weight which its recommendations carry in the councils of the Army, depend directly on the status and prestige of the Corps as a whole, and these in turn depend directly, and almost entirely directly, on the professional skill of its members."

As a statement this is unarguably true. It was the Brigadier's subsequent interpretation of the term "professional skill" to mean "skill as a civil engineer" which, as can be seen with to-day's hindsight, led to the too narrow conclusion that the future prestige of the Corps depended upon the loss of Works Services being made good by other tasks to enhance those civil engineering skills which, even then, were acknowledged to be declining.

The following extracts are taken from Brigadier Brown's article and the subsequent correspondence:

"... the main duty of the Corps can only be to assist the Army in its operations in the theatre of war and its peacetime activities must be directed to that end ..." and:

"By 'real engineering' is meant the practical handling of men, materials, equipment, machinery and transport with basic knowledge and real experience of their natures."

(Fabius M Cuncator in a letter dated 13 Jan 59) "There is, of course, no doubt that in any major war the proportion of divisional engineers to other engineer units is very small (sic). It is also true to say that the work of divisional engineers can be divided into two categories, equipment engineering and basic field engineering. The former, which includes bridging, demolitions, mine laying and lifting and water supply in the field, and which is popularly imagined to be the sole work of the divisional engineers, can in fact be carried out, and has been carried out, by any unit which has been trained in them."

("Whither the Corps?" RE Journal Vol LXXII page 356)

These statements still hold good and I particularly like the definition of "real engineering". What was not realised twenty years ago was that the Army's main requirement of the Corps was to become one of field – now called combat – engineering. This shift of emphasis occurred when our contribution to NATO became our prime defence priority. To-day, the Army requires the Corps to be able to undertake the classical battlefield engineer tasks – mobility, counter mobility and protection – in support of BAOR. This is not to say that there is no requirement for other engineer work; we have to provide ground support for Harrier, undertake rapid runway repair and have the ability to do other comparatively simple engineers; indeed, I welcome the idea, discussed in a news article in *The Times* on 6 April 1978, to use Army engineers to assist in some of the major construction projects in the Middle East. This can do much to improve our expertise and to give our professionally qualified engineers practice in their trade – practice which, according to *The Times*, is needed:

"The Ministry (of Defence) has little experience of commercial contracting and some in the industry believe that the Royal Engineers would themselves need a good deal of coaching."

We must maintain a level of civil engineering knowledge and ability but it is not easy to decide how widespread this expertise needs to be. However, there is no doubt about the need to be fully trained and competent in combat engineering. It is by these skills that the Corps is now judged by the rest of the Army. We must be able to lay mines, demolish bridges and, in "peacetime", undertake relatively simple engineering tasks in Ulster and the developing countries (tasks which, incidentally, have considerable relevance to operations in Europe once the initial conflict is over). If the yardstick the Army uses to judge the Corps is that of its skills as combat engineers, how well does the Corps measure up?

We ought to be good; Brigadier Brown implied that any unit trained in combat engineering could carry out the work and there is much truth in this. The Medium Girder Bridge, compared with Bailey or Heavy Girder, is simple to construct; minelaying with the Barmine Layer and Ranger can not be said to be difficult. But all too often our standards in these fields are insufficiently high and we sometimes demonstrate an unfortunate lack of competence. We "get by", but there is, in some parts of the Corps, increasing concern at our lack of skills in "real engineering"... ie: in our "ability to handle men, equipment, materials and transport with basic knowledge and real experience of their natures" (qv). Why? If the "tasks of divisional engineers can be carried out by any unit which has been trained in them", why should there be a problem?

The truth is that, while the equipment we use has made the job on site easier, the need for experience and ability, particularly in our Young Officers, to bring the men, materials and equipment together at the right place and at the right time has not changed. Indeed, the contemporary need for speed places even greater demands upon junior commanders, and their skills in "real engineering" must be very high.

Sadly, we are failing to give our YOs the knowledge and experience they need in order to develop these skills. Last year the RSME YO Course was re-examined in the light of complaints from Commanding Officers that YOs lacked basic military knowledge and "tactical awareness". These deficiencies are serious; without the requisite knowledge and skills how can we expect to reach the standards in our battlefield tasks which the Army requires? And if we fail in this respect, the fear expressed in 1958 of the Corps being relegated to the status of a service will become a reality.

I do not believe that the deficiencies, which undoubtedly exist, are the fault of the

YOs themselves. They stem from inadequate training, particularly in practical experience in the field. The Corps has failed to respond to the changes in the Sandhurst curriculum and the more general reduction of opportunity to hold field exercises. To-day's YO Course, even after last year's review, is still much the same as it always has been. Attempts to alter or improve the Course seem doomed to failure because the Corps has still not identified what YOs need to know and how they should be given this knowledge. Why is there no proper job specification for the post of troop commander? Without this there can be no real knowledge of what training the YOs need. I am not advocating a slavish adoption of the Systems Approach to Training for our Young Officers; this approach may not be suitable for such a complex training task. What I do believe is that the Corps must decide how to train its YOs in the light of:

* A job specification and training requirements for the post of troop commander.

★ The limited knowledge and experience imparted at Sandhurst.

* The limited opportunities for YOs to gain practical experience on exercises.

The Chatham YO Course must become part of a coherent programme which begins at the RMA and continues in the unit after the RSME Course. Indeed, the unit training is vital. The Hameln bridge camps of old were excellent training; each year YOs received about six weeks of uninterrupted experience of "real engineering" at Hameln. How many YOs to-day receive such a grounding?

By expressing concern about the lack of military knowledge and tactical ability of our YOs, Commanding Officers are recognising a shortfall in professional skill which is reflected in almost every activity of the Corps. Such a shortfall will affect the ability of the Corps to provide the engineer support that the Army requires. The prestige and influence of the Corps will inevitably decline once such a lack of ability is recognised.

This, then, is the lesson to be derived from 1958. It is not a question of the civil versus the combat engineer; it is a question of being able to provide the engineer support the Army requires. To equip ourselves to do this it is essential that the Corps devises a new, coherent training for its young officers with the aim of making them real engineers – officers who have knowledge and experience in the practical handling of men, materials, equipment, machinery and transport. In short, the Corps must ensure that its young officers have the professional skills they need to do their job.

The Use of Computer Based ADP Systems in the Royal Engineers

Logistic Management Information Systems

COMMANDER ESG AND FRIENDS

INTRODUCTION

For many years the uses of electronic computing and calculating facilities, as described in *Royal Engineers Training Note (RETN) No 26(S)*, have been a familiar aspect of the everyday scene in the Royal Engineers. However, the significant progress that has been made towards the introduction of computer based Automatic Data Processing (ADP) systems to provide management information for the Engineer Support Organisation is not generally known.

This article describes in outline the systems which are being adopted by the Corps, how it is to participate in these and the progress made to date.

PRELIMINARY STUDIES

The two objectives set for the preliminary studies were:

(a) To provide better management information to senior management than that available from the existing manually operated procedures

(b) To provide some measure of ADP Inventory control.

As a result of studies, authorised by the Army Department ADP Committee (ADADPC), to assess whether the systems being developed for RAOC managed equipments and stores could also provide a management information system for the Engineer Support Organisation, it was decided that:

(a) RE should adopt the VESPER system (Vehicles, Equipment and Spares Procurement and Economic Repair)

(b) Inventory control for the Engineer Support Organisation should be achieved by RE participation in the Army Central Inventory Control Point (CICP) system. This latter system is currently being improved in readiness for the next generation of computer to be installed at Bicester in the early 1980's and is to be known as SYSTEM 3. Considerable refinement of the programme facilities within SYSTEM 3 will cater more readily for RE requirements than has been the case in previous RAOC systems.

VESPER

VESPER is a computer based management information system sponsored by the Quarter-Master General (QMG) and run on the RAOC computers at Bicester and Chilwell on behalf of the Directorate of Supply Management (Army) (DMS(A)). It has been designed to provide the information required by the Army's equipment managers to enable the best decisions to be made on the procurement, repair and disposal of the Army's high cost and operationally important range of vehicles, equipment and major assemblies.

Items covered by the VESPER system are those which can be tracked by a registered number down to unit level. They include all A, B and C vehicles, C vehicle ancillaries, Engineer Construction Plant (ECP), trailers, some trailer and truck mounted equipment, fixed and floating bridge sets, boats and propulsion equipment, fabric tanks and barges, pumps, generators and certain material testing equipment. These items are known as Category 1(A)1 items and include those subject to statutory control.

All the items referred to in the preceding paragraph have forecast requirements and are held against a stated liability covering the next ten years. The current assets within the VESPER system are matched against the forecast liabilities which, together with information regarding wastage and dues-in from trade, identify any surpluses or deficiencies in each of the years covered.

It is planned that the VESPER system will be expanded during the next decade to cover items which need only to be tracked by quantity (as opposed to registered number) down to unit level against a forecast liability (Category 1(A)2 items). This category will include items held by RE units, eg weapons, radio sets, etc.

A further category to be included in the VESPER system (Category 1B) is not expected to involve RE.

The VESPER system was adopted for RE supplied Category 1(A)1 equipment in March 1976. The criteria used for selecting the equipment to be included in the system were:

(a) The equipment is subject to casting, and/or

(b) The equipment manager has a requirement for the equipment or set to be tracked down to unit level.

There are a variety of information points available to management which, with the full co-operation of units, will enable an accurate picture to be presented of Category 1(A)1 equipment locations, serviceability, utilisation and deficiencies. It is therefore incumbent on units to ensure that immediate notification of Category 1(A)1 equipment receipts and change of condition is reported to Vehicle Branch Chilwell.



Figure 1. Proposed Army CICP Communications (Simplified Diagram). DSM(A) – Directorate of Supply Management (Army); DEF STATS – Defence Statistics; COD – Central Ordnance Depot; CVD – Central Vehicle Depot; CAD – Central Ammunition Depot; LE(A) – Logistic Executive (Army); DCC – Data Communications Centre; ICP – Inventory Control Point; CICP – Central Inventory Control Point.

SYSTEM 3

The SYSTEM 3 design is based on the use of a powerful computer installation at Bicester to undertake the procurement, provision and accounting functions for the primary depots. The primary depots outside Bicester will each have a small computer directly linked to the Central computer for input and output of information and to process certain depot functions required by RAOC (see Fig 1). SYSTEM 3 will then eater for Category 2/3 items, ie all those not tracked by VESPER as Category 1 items.

The Bicester computer will also be linked to computers at the secondary depots, Viersen, Berlin and Hong Kong. This will enable the stock levels at the secondary depots to be maintained at an optimum level based upon demands received from these and other factors. The computers at the secondary depots similarly will provide for maintenance of stock levels at Ordnance Field Parks (OFPs) via Data Communication Centres (DCCs).

Demands from all catalogued stores from units will be made through a DCC where available, alternatively by post direct to Bicester in UK or, in BAOR, to the supporting OFP. Where the demand cannot be met at the lowest level (ie OFP or equivalent) it will be extracted automatically to the next higher level for provision. If, on reaching a primary depot in UK, the item still cannot be met from stock then reprovision action will be taken.

The existing system for processing demands for RE material is shown in Fig 2. The stock accounts for both Engineer Resources (Long Marston) and 21 Army Support Squadron are at present held on manual account cards.

The account held at Long Marston is to be converted to the Army CICP SYSTEM 3 in 1983/84 for all NATO Stock Number (NSN) items within the Catalogue of Royal Engineer Material (CREM). It is expected that Willich stocks will be similarly converted by 1984/85. When this is done, all demands for these items will follow a similar procedure to that adopted for stores of RAOC origin. The proposed system is shown in Fig 3.

Engineer Resources are due to have a terminal linked to the Bicester computer which will enable the issue vouchers to be printed at Long Marston. Visual Display Units (VDU) strategically placed within the depot will facilitate an efficient enquiry service.

It is currently proposed that 21 Army Support Squadron stock account should be maintained on the Viersen computer, issue vouchers being printed at Viersen and passed to Willich. In addition, it is anticipated that there will be a need for a VDU link in Willich, with print out facilities, thus forming a further enquiry point in BAOR.

BEYOND 1985

Once the present RAOC computers have been replaced, there will be scope to integrate VESPER and SYSTEM 3 so that the whole range of material is monitored by ADP.

The benefits that will accrue to the Army and to the Corps from adopting these two systems include:

(a) Improved accuracy of accounts

(b) Immediate and accurate response to queries

(c) A common system of demand and supply from all units requiring either RE or RAOC items



Figure 2. Present RE Manual System.

(d) Facilities to provide management information that could not be provided cost effectively by any manual system.

SUMMING UP

Both VESPER and SYSTEM 3 have been developed against the parameters applicable to the RAOC inventory of equipment and stores. Consequently the systems are:

(a) For VESPER managed equipment, tailored to items repaired by REME and making use of information provided under the REME Feedback of Repair Workshop And Reliability Data (FORWARD) system. FORWARD does not cater for items repaired by RE

(b) For SYSTEM 3:

(1) Orientated mainly to direct issues to units whereas RE inventory management involves a high proportion of loan issues.

(2) Not able to cover fully all the types of loan that are necessary to RE.

The adjustments and enhancements to the VESPER and SYSTEM 3 facilities which are needed to meet RE requirements more closely have been identified. The system development team at the Directorate of Supply Computer Systems are carrying out further analysis to meet RE needs.

The benefits that will be provided by a computer based management information system are outlined above (Beyond 1985) and can be summarised as better management control through better information.

The Corps are now making use of VESPER and are making preparations for joining SYSTEM 3. It is therefore the responsibility of all of us to have a proper understanding of the functions, limitations and capabilities of computer systems which affect us. Similarly, it is essential that we in the Corps are aware that our present shortcomings are likely to prevent the managers of RE material from having the best information with which to manage.

We must therefore be forward looking and be prepared to use these computer systems effectively for, without the willingness to make such systems succeed, there



Figure 3. Proposed RE ADP System.

DCC - Data Communications Centre; ICP - Inventory Control Point; CICP -Central Inventory Control Point; NSN - NATO Stock Number. remains the danger of the Corps failing to make progress in the application of the computer to its tasks, and even of failing to remain compatible with systems being developed in numerous parts of the Services.

Royal Engineer Contacts of a Sapper-Manqué

SIR HAROLD J B HARDING DSc, BSc, F Eng, FICE

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"Your Journal depends for its existence on articles submitted for publication –" as it says on the back cover of your March issue. This article is humbly submitted to mark the much appreciated honour of being made an Honorary Member of the Institution and to give examples of personal contacts between the Civil and the Military for more than fifty years.

ON entering the City and Guilds Engineering College on October 1917 we were at once directed to join the London University (Senior) Officers Training Corps for part-time training in the evenings. On becoming eighteen (I was born 6 Jan 1900) we were transferred to full time training with the LUOTC at their HQ behind the now-vanished Imperial Institute until the War Office directed us to appropriate Officer Training Centres.

I was in the Engineer section, others were Gunners, while the Arts students were relegated to the PBI. At my medical at the Duke of York's Headquarters I was gaily rattling off the carefully learned bottom line on the sight card when the MO said "Sorry Chum, but we have turned the card round!" I was graded "B1 – Garrison Duty Abroad."

Because of the semi-débâcle of March 1918 such as I were turned, by a stroke of the pen, into "A1 Infantry". I found myself in "A" Coy No 2 Officer Cadet Battalion (OCB) billeted, if you please, in Queens College Cambridge with an officer's uniform provided free by the best tailor in Cambridge. My friends went to the Royal Engineers Training Centre at, somewhat inappropriately, Kelham Theological College. So I became a Sapper-Manqué.

There were three battalions of OCBs over all the Cambridge Colleges, mostly highly paid Aussies and New Zealanders. It was suggested that this was to civilise them. Half of my company were callow youths and half from overseas, including two VC's! We all expected to end up in France but the war petered out and we stayed until the end of the year. Those of us who were students were the first out, sent to the Crystal Palace to be de-mobbed with a gratuity of £4, a book of dole tickets etc, given a Commission for one day and transferred to the "Z Reserve". So back to the College just where we had left off. As time went on we were joined by more genuine ex-service men, many of whom had been Sappers.

I had determined to try to be a Civil Engineer from the age of ten after steeping myself in the three volumes of Engineering Wonders of the World, but earlier events helped this along. A reminder of this occurred on an early visit to RSME at Chatham when a wave of nostalgia was caused by seeing the battle honour WEPENER on the Boer War Memorial. (The papers at the time called it the Siege of Wepener, which was a small Orange Free State Dorp on the border of Basutoland, two miles from the left bank of the Caledon River.) In actual fact this was the Defence of Jammersburg Drift, which should not be confused with the Defence of Duffers Drift,¹ a wonderful little book by Backsight Forethought, which became a text book in many armies. I believe the author, BF was, in fact, General Dunlop Swinton whose prophetic book, the pre-war *Green Curve*¹ by "Ole Luk Oie", was so good. They are well worth reading.

My nostalgia was due to having lived for nearly two years at Jammersburg Drift from 1904–1906 with my uncle Jack Robertson, over whose lands the action was fought. He and his pioneer Scottish brothers had built their own dams, made weirs and channels in the river, built mills and roads and also opened up a chain of stores in Basutoland. One of our pleasures was to climb the *kopje* opposite the house. It was crowned with a ring of small semi-circular breastworks of rocks each of which was filled with expended Lee-Metford cartridge cases. These we scooped up by the hundred to use as toy soldiers as we were short of toys. On returning there fifty years later I still found three cases. I took a poor photograph which shows on one rock scratched names and an undecipherable reference, possibly to a regiment, the date 1901 and names of Payne, Murphy and Walker. On the same rock "pity the starving (undecipherables)." It must have been hot and dry on that kopje. Has the Corps any record of that action?¹

Another memory is of buying a second-hand book in 1911, Modern Warfare¹ by Ubique. He must have been a Sapper. (Do Gunners write books – all over the place?). This was published in 1905. The first four chapters described examples from the Boer War of the work of Infantry, Cavalry, Gunners and Engineers. Then came a serious study of an imaginary European War. The Germans would invade Belgium without declaring war to get at the French; Britain would send out an Expeditionary Force under (yes) Sir John French. Various incidents were invented, including a chapter on Royal Engineers building a trench system with dugouts and sandbag redoubts. Lord Kitchener was to come across with a new Army Corps of 100,000 men so the Germans decided to go back home. (Shades of Ian Hay's *The First Hundred Thousand*¹) Yet long-haired BBC young men tell us that the 1914 war was unexpected!

In 1913, "in that hot bed of the Classical Education, Christs Hospital," an engineering side was ordained and I was one of the first to sign. For one term I made the bed and cleaned the shoes of Brigadier R M A Welchman before going on strike. Many years later I caught up with other contemporaries, the late Brigadier Cavendish on our road work in Persia 1956, and in recent years nucl collaboration with my friend Brigadier John Edney when we were both independent Consultants. In that highly disciplined school they still march into the Dining Hall every day to the massive school band.

In 1922 I got my first job, on the Tube extension from Euston to Camden Town with the contractors, John Mowlem and Co. This entry into the small closed circle of London tunnellers brought contact with elders who had served in France in RE Tunnelling Companies, who had experiences to tell. Then after fourteen intensive years came a more active contact.

In 1936 I became Agent on the tube extension under Stratford Marshes for the Central Line. This consisted of 10,000 rings of tunnel in compressed air by ten shields from three shafts, the longest compressed air tunnel to date. London Transport had let out many contracts at one time, so the specialised tunnel chainman was in very short supply. I had two, one who considered himself the "King Pin of Chainmen" upsetting my young Engineers by dumb insolence and attempted blackmail. So, on my drive to work across London, I called in on the Royal Engineers Old Comrades Association Office at Earls Court and asked if they could supply me with three young ex-Sappers. These were promised for next day. Without troubling to interview them I drove on to Stratford and sacked the chainmen to their utter astonishment. The young Sappers quickly learned the specialised work and were invaluable. One of them had been given a compassionate discharge at his Mother's request. He had been driving an adapted Ford car along Sir Gerry Duke's Palestine railways in order to blow himself up before the train following him. In 1939 the IRA were letting off bombs in Underground Station cloakrooms. I received anonymous letters telling me that this young man was in the IRA so I asked him who could be writing anything so absurd. He said that it was his Mother who objected to him getting married! After WW2 all three returned safely and we promptly made them Foreman-experts in Special Process work.

In 1939 when the War started I was over age and in a reserved occupation, and was given several responsibilities beyond daily work. We pressed on to complete the Bow-Leyton Tube so that the length which did not run along under the main LNE Railway could be used as an air raid shelter.

Between Dunkirk and the fall of France I was sent to organise local digging equipment to dig trenches around Seaford to upset the landing of enemy planes. As quickly as one RE Officer appeared to direct us he promptly vanished, such was local confusion. One driver was working on the Seaford Golf Course when he was approached by two little men in bowler hats. "I am the Secretary of the Club and this is the Borough Surveyor. If you could dig your next trench forty yards further on it would not spoil the drives from the fourteenth tee." He obliged.

Next at a days notice I was told to organise fifteen local builders and contractors to build a defence line from Eridge to Newhaven. We were building anti-tank gun pillboxes for non-existent anti-tank guns when we got a message from the DFW, "Stop! Stop!! you have been given the wrong drawings." The anti-tank trench was dug using the plant transferred from our Staines Reservoir contract. How long it would have held up the enemy is dubious but it did a lot for local morale while the Battle of Britain proceeded over our heads. Owing to pressure of work the RE Officer who had started us off was transferred and we were left to a young Canadian Scottish Captain whose tendency was to get us to site pillboxes with the door towards where it was hoped the enemy would advance. On one occasion he leaped gracefully over a stone wall, his kilt billowing around him but landed sitting in a bed of nettles. This settled a well known question. The answer was in the negative!

A pleasant interlude was being taken to an important demonstration. Many "Brass Hats" were in evidence culminating with the arrival of Sir Alan Brooke in full Martial Panoply attended by a mass of motorcycle outriders. My colleague Glossop whispered - "Just one Heinkel and what a twinkling of gaitered legs." First, an anti-tank device for closing roads was tested. A block of concrete was built on each side of a narrow road with a vertical slot on the inner face. As the German tanks bore down upon it a few devoted souls were to rapidly drop six lengths of railway rail into the slots and beat a hasty retreat. A medium tank was present to carry out the test. The driver drove at the rails and bounced off. This greatly pleased the designers! On a second attack the affair was demolished which greatly pleased the sceptics! so everyone was happy!! We continued to build it however. One problem was how to block tanks running along railway embankments; I suggested that they should found the concrete blocks on bored piles. I then found myself organising the few rival firms who dealt with twelve-inch piles, then the only size. The light piling tripods could be hastily removed when the flag man warned of a train approaching. The Grand Finale to the demonstration was provided by a gang of Canadian Sappers. They had brought along an EX diamond drill. They bored horizontally below the ground until about fifty yards of hollow boring rods had been installed. Into this they poured some liquid explosive and touched it off. Up went a long curtain of earth twenty or thirty feet high leaving a crude form of anti-tank ditch. Unfortunately about twenty feet of steel drill rod also went up; it looped gracefully through the air until it settled across a pylon line of High Tension cables. The consequent fireworks were most gratifying! The Brass Hats departed in haste!!

In the hurry to make the defence line little effort was made at camouflage for the first few weeks. I am told that German records show that we made so much mess when constructing our flimsy defences that they thought we were making something formidable and this helped to discourage them.

When Goering turned his attention to London 1 was rapidly recalled to carry out

one of my selected duties - to mend bombed sewers and tunnels, mostly in the East End and the Docks, which provided ample employment.

From then on, contacts with the RE increased. In one case an unexploded bomb ended its swerving path below ground under the only tank for testing ship models, at the National Physical Laboratory, this caused concern at 10 Downing Street. The bomb passed through twenty feet of Thames gravels, containing ten feet depth of ground water, before coming to rest in the London Clay thirty four feet below ground level. A Bomb Disposal Section sent to deal with it were given a set of Moore Trench Well-point equipment. As they had no instructions how to use it they put all the well points into one four feet square hole to no effect. As, three years before, I was one of the first people to use this plant I was sent down to advise. The first thing to do was to jet down the well points with plenty of spread around a hole twenty four feet by eight feet. The clay was reached with two settings of timber runners but, naturally, there was about a foot of water over the clay which will always pass the points when they reach impervious ground. This discouraged the RE Officer but I told him to put on his gumboots and dig out a grip for a sub-drain under the water along the foot of the runners to a sump, to be dug in one corner. When a snorer flexible suction was connected to the well point suction main and dropped into the sump the water disappeared at once. I then insisted on the sinking of a box-timbered shaft to a depth which would give at least five feet of clay above the top of the heading which then could be driven along the trace until the bomb was reached. One precaution was to keep the timbering two feet above the clay so that men could get out if the pump broke down (Fig 1). This all worked out so well that the RE wanted to paint my mud guards red to match theirs but I did not think that my firm would approve.

From this I was asked to give a one-day teach-in to Bomb Disposal Officers on the use of well points and problems of excavation. This took place in the Duke of York's Headquarters, which by then was entirely windowless. My firm decreed that I could be contacted at any moment to give advice free of charge if needed. This led to a number of interesting contacts with Major Yates and his merry men. Although the Army must have enlisted many timbermen and tunnel miners it was surprising how few such talents were provided for the gallant Bomb Disposal Sections. At times they were in more danger from their own excavations than from the bomb they were seeking. I then served with Sir Andrew MacTaggart and W H G Roach as a Committee of the Federation of Civil Contractors which drew up a code with drawings of a standard form of timbering for the Bomb Disposal units.

Then came the "incident" of Sloane Square Station. One evening a bomb hit the four-floor steel frame building which had been built across the mouth of the west tunnel and had only been opened a few days before. This bomb also broke down the arch of the tunnel and wrecked the last coach of a train leaving the station. The concrete floors dropped and formed a three decker sandwich with about sixty passengers still between them. I was sent to clear it up. Thirty Indian Pioneers shovelled up all the debris which filled up the track and platforms. The problem was the steel frame which had come off its foundations and was tectering on the edge of the tunnel. The whole had been clothed with reinforced concrete which held it together as the horizontal members were not riveted to the columns but sat on angles held by two erection bolts. I was sent ten invaluable Sappers who brought their own burning gear. We erected a fifteen ton scotch derrick in the side street. I decided that the only safe way was to take the frame down by horizontal slices. The sappers swarmed up flimsy ladders, suspended the top horizontals from the derrick and cut away the concrete and burnt through the steel columns just above the next horizontal members. The derrick then swung this dangling mass on to the street where a tractor crane dragged it across the road and dumped it in the middle of the Square. This was repeated down to ground level when the mortuary squads could get to work. The trains were running again within ten days, due to the Sappers. The method used would give a peace-time Factory Inspector kittens!

Another assignment was to be ready to replace any bombed Ministry of Transport



Fig 1. Ground-Water lowering by Well-points for Bomb Recovery at National Physical Laboratory, Teddington.



Fig 2. An open-jointed sub-drain, alongside the bomb, defeated the Well-points until it was blocked off.

bridge in Kent, Surrey or Sussex with Callendar-Hamilton bridging, though this never arose. One had to keep tabs on a scatter of the firm's Foremen and Gangers who had gone through a short course of training at the Roads Research Laboratory. The most daunting target was the Rochester road bridge so, during the raids, my No 2 and I went to study it. Eventually we found that all the Callendar-Hamilton bridging material for its replacement was stored under the north abutment – well on target!

Later on the building of eight Phoenix monoliths for the Mulberry Harbour brought about many contacts, both Regular and Temporary, from Sir Bruce White downwards. The real problem was to empty the South (wet) Dock of the Surrey Docks. The way out through the Greenland Dock was easily closed by a row of steel piles and a mound of rubble. There was only one pair of gates left in the entrance lock from the river. This faced the wrong way if the dock were emptied. A wall of rapidly cast concrete blocks had to be built under water while a train of lorries were tipping in 40,000 cubic yards of bombed brick rubble from the vast pile on the site of the Great Exhibition in Hyde Park in order to eventually form a base for the units. On a request for help we were sent five Royal Engineer trainee-divers who behaved impeccably.

The contacts after the war came with the arrival of RE Majors accepted by Contractors and Consultants for their Long Course training which gave much pleasure to both sides as well as variety. The long-course Majors were useful. Contractors' engineers of the same maturity are often overstretched. In one case good use was made of a foot-loose Major. On one highly complex, below ground cooling water system he was able to devote his whole time to a day-by-day study of progress, methods, problems met, plant behaviour and handling, costs and such useful details including criticism. The firm benefited from his report while he kept a copy for himself (and the Corps).

The first V Bomber was being tested at the Vickers runway at Wisley, which was made of tarmac over gravel. Each time the plane took off a fleet of steam-rollers puffed onto the runway to roll out the wrinkles caused by the take off so that the plane could land. Soil Mechanics Ltd were given the urgent job of scarifying the runway and renewing it by cement stabilisation. At that moment Major J Cottington was sent to us and as we were short of staff we at once put him in charge as our Agent. This was so successful that I believe he became the RE expert on soil stabilisation on his return to duty.

In due course I was elected to the Council of the Institution of Civil Engineers in 1949. I found among some senior members of Council, then and previously, a prejudice still lingering sub-consciously against the Royal Engineers. Some complained that in 1914, when they held Temporary Commissions and were stationed at Chatham, they were segregated to eat at separate tables and felt snubbed by the snobbery of the pre-1914 Regular Officer. Some of us made considerable efforts to induce the Council to be more receptive to Sapper candidates.

In 1951 my contacts increased considerably by being commissioned as an (Honorary) Lieut-Colonel in that exotic body, The Engineer and Railway Staff Corps RE, TAVR and in 1956 was promoted to Colonel. I trust that our history, All Rank and No File1 by Major Townsend TD, is in your library. The ERSC was founded over 100 years ago in the days of the Volunteers and fear of the French. It consisted of a restricted number of top Consultants, Contractors, Railway Managers and Engineers and those from the main Dock Companies. In those days they were all free enterprises. As individuals they were thus free to give advice, without fees, to the Army Council who were thus saved from having to become officially involved with firms or companies. Among other things the ERSC had drawn up, from its expertise, movements for an Expeditionary Force before 1914 which involved a multiplicity of independent companies. In 1954 I chaired an ERSC sub-committee set up to advise the War Office on the storage and distribution of cement in the Field, chiefly cement in bulk for rapid stabilisation by mechanical plant. Our advice was not to spend money on unwieldy steel contraptions which become out of date or rust away. Better to store in waterproof bags which could protect cement and after use - the troops. We were thanked for saving many thousands of pounds. The enjoyable Dinner Night is the annual parade of the Staff Corps, always graced by members of the Army Council, Engineers-in-Chief and other romantic figures.

Some years ago I was asked to lecture to young officers at Chatham, on the Channel Tunnel if I remember rightly, and was kindly put up for the night by the Commandant. He had not heard of the Staff Corps so I referred him to the Army List! Talking of the Channel Tunnel, during the 1958–1960 Site Investigation I paid several visits to Chessington, (the Ordnance Survey, not the Zoo!) and Officers helped to connect our survey to the OS and the National Grid. The distance to France seemed to be a military secret! In the large survey in 1964 they were again most helpful. In addition the Franco-British Commission de Surveillance was chaired by the late Colonel Denis McMullen backed by Colonel McNaughten who kept us strictly on the rails.

For over twenty years, before and after becoming a Consulting Engineer in 1956, I had many delightful examples of hospitality at the RSME Chatham, as a guest of long-course Majors, as a Member of Council and, in 1963, as President of the Civils and with the Engineer and Railway Staff Corps. Also special treatment with my son, after his passing out parade during National Service. Later while working on the Clyde Tunnel he carried on for some years in the Army Emergency Reserve with holiday courses at Ripon, rising to the dizzy rank of Captain RE (Temp?).

One particular occasion proved memorable. In 1966 I was invited to dine at Chatham and stay with the Commandant. Three days before I had been suddenly appointed a Member of the Aberfan Disaster Tribunal. At his house before dinner there was naturally some discussion and I said that it was a pity that the Government did not make more use of the RE for investigations in such cases. The Engineer-in-Chief told me to let him know if there was any way in which the Corps could help. I had persuaded the Treasury Solicitor to engage Professor Bishop and his staff to carry out an independent site investigation on behalf of the Tribunal. He rang up from the site and asked if I could find him a tracked vehicle as it was almost impossible to get about the mountain and the slipped area. I at once rang up the Engineer-in-Chief. He replied - "I have just been sent two articulated tracked vehicles from Canada for intensive testing. They are at Brecon, I will have them sent over tomorrow." They worked all through the winter on the mountain and were quite indispensible. What gave the most personal pleasure was the way in which personal contact had produced instant results without recourse to the usual channels. Finally the Royal Engineers again came into action in helping with our survey and in producing aerial photographs taken over the years over Aberfan.

As a footnote may I acknowledge kind help from your Librarian when composing the chapter on Tunnels in *The Works of Isambard Kingdom Brunel*¹, and when organising the Exhibition at the ICE and the Science Museum to celebrate the 150th Anniversary of the Thames Tunnel. IK's father, Sir Marc Brunel, had driven a heading under a dock at Chatham. I wrote that his work at Chatham brought him into contact with the Army whose Sappers and Miners were also trained in the accepted methods (of timbered headings) used by Vaizey and Trevithick. Then followed a quotation from *The Attack and Defence of Fortified Places*¹ 3rd edition 1770 by Professor Muller of RMA Woolwich, provided by your Librarian. We were also able to make use of detailed prints, which he sent, in the introductory panel in the Exhibition. I must apologise that we also drew a cartoon to attract the young – of an 18th century Engineer "Hoist with his Own Petard."

¹ In RE Library.

The New Armoured Divisional Engineers

Part I – Operational Considerations

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INTRODUCTION

IN September 1976, the 2nd Division restructured under the Army Restructuring Plan to become the first of the new armoured divisions. In the same month, 23 and 25 Engineer Regiments, and 43 Field Support Squadron amalgamated to become 2nd Armoured Division Engineer Regiment. The new division was trialled in the latter quarter of 1976, and has since taken part in a number of exercises during the past eighteen months.

Before discussing the new armoured divisional engineers, it is necessary to look first at the organisation and *modus operandi* of the new armoured division. It can then be shown how engineers fit into the order of battle and how they support the division. However it would be wrong to assume that all divisional engineers will necessarily develop their operational concepts and procedures along the same lines. The differing roles of each division, the different terrain over which they have to operate, and the personalities of divisional and engineer commanders will all have an effect on the way in which such things are developed. *Organization*.

The outline organization of that part of a division which is stationed in West Germany in peacetime is shown in Figure 1. It comprises an armoured reconnaissance regiment with medium reconnaissance and close reconnaissance capability; two armoured regiments each with four armoured squadrons; three mechanized battalions each with four companies, supported by medium mortars and anti-tank weapons; two artillery regiments equipped with air defence and anti-tank weapons in addition to conventional artillery; an engineer regiment of three field squadrons and a field support squadron; and an army aviation regiment with two mixed squadrons of helicopters. Finally the division has logistic units integral to it, of which there are now one of each type.

The two armoured regiments and three mechanized battalions have between them a total of twenty squadrons and companies, and depending on the nature of the ground and the enemy threat, it would be normal to form twenty Combat Teams from them, each containing some tanks and some infantry. These in turn are grouped under an armoured regiment or infantry battalion headquarters into Battle Groups, of which there are normally five. A sixth can be formed using the headquarters of the armoured reconnaissance regiment. The battle groups will include a troop of the close reconnaissance squadron, anti-tank support and defence against low flying aircraft, and they will be given artillery, engineer and air support as necessary. Battle





Groups are flexible in their composition and can be grouped as the situation requires.

When a division goes to war it receives reinforcements from two sources; first, from Corps Troops which are under Corps command in peace and which join the division when it deploys for war and for peacetime training; and second, units and individuals from both regular and reserve forces in the UK. These reinforcements represent a considerable increase of men, guns and anti-tank guns to the division. Command and Control

The GOC and his staff exercise command of the division in the field from Divisional Main Headquarters (Div Main), which now operates on light scales and consists of the operational staff of the headquarters and its supporting arms. The logistic units of the division are commanded from Logistic HQ which is normally within a reasonable distance of the Operations Centre, and the two together operate as one headquarters. The GOC can also exercise command of the division forward of Div Main from his Hard Rover Group.

The GOC delegates operational command of a number of battle groups and supporting arms to his two Task Force commanders for specific operations. Task force headquarters comprise a small group of armoured command vehicles which are manned by the staffs of the two peacetime garrison headquarters in the divisional area, supplemented by the command cells of their supporting arms - artillery, engineers, signals and army aviation. The actual numbers of guns, engineer troops and army aircraft supporting the task force will vary according to the type of operation and the number of battle groups under command.

Operational Handling.

One possible layout for defence would be to have two task forces up, each with two battle groups under command. The forward defended area would contain main and alternative positions across the whole front, where each task force is responsible for part of this area. The actual composition of the task force and its battle groups would depend on the ground and the enemy threat, and it would take into account the requirement to protect reserved demolitions and to maintain a divisional reserve. The latter would be held directly under divisional command for such tasks as reinforcing the forward battle groups, and undertaking pre-planned counter attack and counter penetration tasks. In addition to this the task force would if resources permit maintain a small uncommitted reserve.

Divisional headquarters would normally be situated centrally and far enough back from the FEBA as to be out of range of most of the enemy artillery. Also in the divisional rear area would be found a Rear Area Security Force with responsibility for anti-airborne and anti-heliborne operations, and for the protection of the main supply routes (MSRs); some divisional artillery such as that required for the protection of reserved demolitions on the MSRs; all engineers less those operating in the task force areas; and Royal Signals communications centres. The main logistic units would be well forward in the divisional area under command of Logistic Headquarters, with the heavier elements back in the Divisional Administrative Area.

It would be wrong to assume that divisions would always operate in this configuration in a defensive situation. The GOC might equally well give one task force commander responsibility for the whole of the front leaving the other in reserve to prepare an alternate position, or retain part of the forward area under his own control, or any other combination. It is this flexibility of command at task force level, coupled with the central command of logistic units at divisional level, which distinguish the task force concept from that of the former divisional organization in which the composition of the brigade groups was normally fixed.

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Organization,

The outline organization of the new armoured division engineer regiment is shown in Figure 2, together with examples of units which might reinforce it in wartime. Each field squadron now has three field troops and a field support troop



Fig 2 Outline organization of Armoured Divisional Engineers

which in the next year or so will be equipped with Combat Engineer Tractors. The Field Support Squadron still has a Resources Troop, Plant Troop and Bridge Troop, but it is now administratively responsible for regimental headquarters and the Workshop. The organization of the regiment is remarkably similar to that of the regiments which supported armoured divisions in the early 1950s, although of course the new regiments have considerably more armoured vehicles and radios, and consequently more technical support.

Armoured engineers come from 26 Corps Armoured Engineer Squadron, and join the division for training and on deployment for war. A regular or TAVR reinforcement regiment could join the division within a few days of mobilization. Both regular and TAVR reinforcements regiments are non-mechanized and therefore better suited to employment in the divisional rear area, although they could in some situations be used further forward.

Command and Control.

Prior to restructuring, the engineer organization paralleled the tactical organization with a CRE at divisional headquarters and a small regiment supporting each brigade. Engineer headquarters were co-located with tactical headquarters, and communications followed the chain of command. A similar situation existed prior to 1969 when brigades were supported by squadrons. The new armoured divisional organization has one regiment of three field squadrons with which to support two task forces, and this produces something of a dilemma in command channels.

There are a number of ways in which command and control can be exercised, of which it is proposed to examine three: to retain the peacetime chain of command through regimental headquarters; to split regimental headquarters into two parts and use each to provide a permanent advisory cell at task force headquarters; and to integrate the operational staff of regimental headquarters with HQRE so that squadrons are controlled from divisional level, leaving the remainder of regimental headquarters to coordinate resources and equipment support. The advantages and disadvantages of each of these options will be examined in turn.

Option 1. In this option the squadrons are commanded through their normal regimental headquarters, with the headquarters of the divisional regiment controlling engineer support in the forward area and that of the reinforcement regiment controlling engineer support in the rear area. This would be a sound arrangement if one task force always operated behind the other so that each regiment was supporting a task force. Unfortunately this is not always the case, and it does not suit the configuration described earlier of two task forces operating side by side nearly so well. In this configuration there would be three squadrons controlled by a regimental headquarters, working across the front of two task forces. This option has the great advantage that the peacetime organization of the regiment remains unaltered – an advantage not to be discarded lightly. The manning, equipment and communications of the regiment are all geared to this organization, and if there were no other factors involved it would be the obvious option to choose. Unfortunately it suffers from one major disadvantage, namely that the operational chain of command, which goes direct from divisional headquarters to task force headquarters, is completely separate from the engineer chain of command which goes from the CRE through regimental headquarters to the squadrons operating in the task force area. Because regimental headquarters is not co-located with a tactical headquarters, the Commanding Officer will not be able to keep up-to-date with the tactical picture and decisions and he will be unable to make use of the excellent communications which are set up between divisional and task force headquarters. Orders from the CRE will take longer to reach the squadrons because they will have to go through regimental headquarters, and the CRE will therefore be tempted to by-pass the Commanding Officer. Furthermore when the GOC's Rover Group is located forward with a task force headquarters the CRE will automatically be by-passing the Commanding Officer and his headquarters.

Option 2. One way of overcoming this disadvantage is to split regimental headguarters so that half the headquarters is co-located with each task force. The two halves would be commanded by the regimental second-in-command and the Operations Major respectively, leaving the Commanding Officer of the divisional regiment free to control engineer operations in the forward divisional area. The Commanding Officer of the reinforcement regiment would command his own squadrons, in the divisional rear area. This arrangement is similar to the command arrangements which existed just prior to restructuring in that a mini-regimental headquarters is co-located with each task force headquarters. It has the immediate advantage that engineer headquarters are again co-located with tactical headquarters. They are thus able to make full use of the tactical communications which are set up between divisional and task force headquarters, and to keep abreast of the tactical pictre and decision-making. It has the further advantages that each task force commander is supported by a permanent advisory cell, and that the squadron commanders operating with the task forces are left free to command their own squadron. The main disadvantages of this option are that it is still introducing a level of command - the mini-RHQ - where none is strictly necessary, and at two over three it is still a somewhat untidy arrangement. Furthermore it is not easy to split the manpower and equipment of regimental headquarters into two parts, and there are at present insufficient command vehicles and communications to be able to do this really satisfactorily. Nevertheless it may on balance be a better arrangement than that of the first option.

Option 3. In this option the operational staffs of regimental headquarters (Tac RHQ) are integrated with the CRE's staff to form a unified Engineer Operations staff at divisional headquarters. The remainder of regimental headquarters and the support squadron combine to form Engineer Main, and this coordinates resources, equipment and workshop support to the field squadrons. Engineer support to the tactical battle is controlled at divisional level by the CRE at divisional headquarters, and at task force level by two task force squadron commanders from their command vehicles in the task force headquarters complex. Task force squadron commanders command all engineers operating within task force boundaries, and they therefore exercise command in a similar manner to task force commanders in that they could command anything from one troop to perhaps four or five depending on the number of battle groups in the task force and the type of operation it is going to be carrying out. The Commanding Officer is free to get out on the ground to ensure that engineer operations are executed in accordance with the divisional plans, and to grip the situation when necessary. He would deploy forward to command a major operation involving two or more squadrons. This option has the important advantage that the CRE and his staff at divisional headquarters have a direct operational link to the squadron commanders operating in support of task forces, and since both are co-located with tactical headquarters they are always fully in the tactical picture and decision making. The CRE and his staff also have direct access to the other squadrons operating in the divisional area and are thus able to coordinate engineer activities throughout the divisional area of responsibility. A further advantage of this

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option is that the task force squadrons can maintain a close liaison in peacetime with the garrison headquarters they support in war, and this should considerably ease the transition to operations. The main disadvantage of this option is that it ties the command cell of task force squadron to the task force headquarters complex. The squadron commander himself will spend much of his time out on the ground commanding engineer operations, leaving his second-in-command or operations officer behind to advise the task force commander. Nevertheless occasions will arise when he is required in both places at once. Another disadvantage, which also applies to the second option, is that the operational control of engineers at divisional headquarters is separated from the AQ function at Engineer Main, although in practice the two will always be fairly close together.

Operations in the Divisional Rear Area.

Once the forward obstacle plan has been completed, it seems likely that most of the engineer work will take place in the divisional rear area. This could include the maintenance of main supply routes, counter attack and counter penetration routes, the preparation of alternate positions, the provision of firing parties on reserve demolitions and support to ADM missions. The third squadron in the divisional engineer regiment together with any reinforcement squadrons would normally be tasked for these operations. A major operation involving two or more squadrons, such as the preparation of a secondary defensive position, would probably be commanded by the Commanding Officer of the reinforcement regiment. *Armoured Engineer Operations*.

Armoured engineers are primarily required to carry out operations in the face of the enemy. In the sort of defensive layout considered, a possible deployment might be one section to each task force, and one with the divisional reserve. Troop headquarters and some reserve bridges would normally be located at Engineer Main. Tasks might include the traditional ones of covering reserved demolitions using the demolition gun and providing an alternative route if the existing route is destroyed; extricating forward combat teams to their alternate positions; and guaranteeing a route forward for the divisional reserve.

CONCLUSION

The new armoured divisional engineer organization appears to be well suited to supporting the new armoured division, and sufficiently flexible to cope with a variety of defensive configurations. There are sufficient engineers in the reinforced division to carry out the foresceable tasks, provided that the reinforcement regiment deploys in time. The organization does however pose a dilemma in command and control channels because regimental headquarters does not fit naturally into the tactical chain of command. There are a number of ways of getting round this of which three are described on this paper. The third option may possibly provide the best solution. It is similar to the system of engineer command which was used during World War II, in which the CRE commanded engineer support to the tactical battles from divisional headquarters and brigades were supported by their affiliated field companies. It worked then, and it could be argued that the principles of engineer support to the division have not changed greatly during the intervening period. The system chosen must however inevitably depend to a large extent on the role and *modus operandi* of the division being supported, and such things have a habit of changing.

Part II – Regimental Command in Peace

LIEUT-COLONEL E G WILLMOTT RE, MA

In peace the aim of a Commanding Officer is to have a happy and efficient Regiment in which the Regular volunteer soldier and his family wish to serve whilst training for war. A principal ingredient for success in meeting that aim seems to be a sensible delegation of authority so that officers, in particular, feel they are doing a responsible job in control of their destiny and able to deploy their administrative and leadership talents to the full.

Fortunately, those who drafted the Army Restructuring Plan recognised the need to use the full capabilities of officers, adopted it as one of their main principles and gave commanders at regimental and squadron level an increased span of command. As mentioned in the first part of this article, the principle led to the present organisation of a Regiment with four Squadrons and responsibility for engineer operations over the whole divisional area. Within the Field Squadrons, OCs have Support Troops, and take under operational command all engineers working within their area of responsibility; in addition two of the OCs provide advice to Task Force Commanders. OC 43 Field Support Squadron administers almost 300 all ranks and OC REME Workshops has 17% more men on his establishment and has 30% more equipment to repair than hitherto.

The author commanded 23 Engineer Regiment for eight months before taking command of the newly formed 2nd Armoured Division Engineer Regiment and is thus in a unique position to comment on some of the effects of the restructuring. By way of background to this part of the article it is worth noting that the Regiment was manned and equipped to its full war establishment in October 1976 and supported 2nd Armoured Division for four weeks in an intensive series of exercises designed to trial the new organisation. From February 1977, the Regiment trained for a Summer tour in Northern Ireland in which an Arms Group of three Field Squadrons (12, 16 and 39) served in Belfast in the infantry role whilst 43 Field Support Squadron, organised for the engineer role, supported 8 Infantry Brigade in Londonderry.

The purpose of this part of the article is to outline the system of command used in barracks in 2nd Armoured Division Engineer Regiment. The article subsequently identifies areas where overstretch has been reduced or increased and offers suggestions for remedying ill effects.

DELEGATION OF COMMAND

An interesting effect of restructuring was that authority and responsibility had to be delegated so that officers could cope with the workload of commanding and administering the Regiment. Officers who might normally be wary of delegating found that they had to trust subordinates to get on with tasks. Such delegation isolated those who were weak but gave much satisfaction to the majority. Since the function of a commander is to be responsible for all aspects of the operation, training, morale, welfare and administration of his sub-unit, it follows that OCs especially accepted with pleasure the trust placed in them when full authority was delegated; it is they who now hold the men and equipment under their charge ready for war. An extra benefit resulted from the closer involvement of Squadrons with the Task Forces in operational planning since there was a consequent closer identification of all ranks with their war role, a freer flow of information, unrestricted by "post-officing" through RHQ, and higher efficiency which arose when the reconnaissance effort of Squadrons was harnessed to planning. As a result of delegation Squadrons take a greater share of responsibility than hitherto for training their men, for equipment management and for certain administrative functions within barracks.

Training. Apart from REMRO nominated courses, OCs have the authority to decide which of their soldiers, and indeed how many, should attend courses and receive other training in order to keep their establishments filled with men trained for their war role. In addition, OCs continue to run their Squadron and Troop training. Measurable standards have been laid down in the Regimental Training Directive and are monitored by the production of bi-monthly Data Returns. Thus courses run centrally by the Regiment, or at the Combat Engineer Training Centre (Hameln) are loaded by OCs wishing to meet set standards rather than by dictate from RHQ. This system produces well motivated students attending courses with the full support of their OC and is tailored to suit the fluctuating levels of commitment of

Squadrons to tasks throughout the year. Already this direct involvement of OCs with the detailed training of their men has highlighted deficiencies in the provision of drivers and signallers and resulted in detailed proposals for improvement.

Equipment Management. OCs are required to monitor the serviceability state of vehicles, equipments and tools listed on their Unit Equipment Table and ensure they are all in a fit state. No longer is equipment maintained by any central organisation in the Regiment although a Central Servicing Facility exists to support Squadrons. To aid them in their work, OCs have full control of their SQMS's and MT S Sgts and use their Second Captains to take day-to-day executive decisions affecting their Q and MT departments. High standards are assured because the QM does quarterly "systems" checks of accounts to ensure correct action is being taken by the SQMS. Also the Technical QM provides weekly returns of equipment availability to the Commanding Officer and holds regulations are understood and correctly applied, monitor standards and allot priorities; he acts as the link with outside agencies on policy matters, future planning and combat supplies replenishment. The only centrally controlled facilities run by the Technical QM are the Servicing Bay and the POL and Ammunition Stores.

Administrative Functions. A major change occurred in the administration of the Regiment with the delegation of authority to OC 43 Field Support Squadron for finding the plant and engineer resources support required by Squadrons; RHQ influences the provision only when there is a conflict of priorities. 43 Field Support Squadron account for stores sent to Squadrons and deal direct with OCs whilst keeping RHQ informed of progress and, in particular, of losses. Another major change came when Squadrons relieved the QM of those responsibilities which do not demand an officer of his standing nor the need for continual attention; thus Squadrons provide the Fire Officer, the Messing Officer and the Officers' Mess Private and Public Property Member; RHQ Troop Commander is Assistant Unit Families Officer - doing much of the "leg work" when a family difficulty is raised by Squadrons to the attention of the QM who is the Unit Family Officer. In addition, OCs have the accommodation stores within their barrack blocks on charge and thus ease the workload on the small staff with the QM who account for accommodation stores held in the many central facilities and several Garrison buildings. And, on the A side of administration, OCs provide full draft Confidential Reports on officers having first discussed points mentioned therein with the officers concerned so as to reduce the time spent in drafting by the Commanding Officer. OCs also warn L/Cpls and Sappers for reduction in rank or removal from the Service for inefficiency or misconduct. To digress at this point, the RSM and WO1 Staff Assistant provide valuable assistance to the Commanding Officer by writing notes on NCOs Confidential Reports which add an extra dimension to the pen pictures of OCs; in addition, these two WOs interview all soldiers seeking Premature Voluntary Release and give assistance to the OCs and the Commanding Officer by rectifying minor grievances and by eliciting the reasons for such applications.

Having noted specific instances of delegation it is worth commenting at this stage that, in the author's view, such delegation is essential if OCs, and their officers, are to develop that confidence they need to have when they conduct engineer operations over a large area of responsibility in the chaos of war. Furthermore by developing their awareness of the state of training in each Squadron and enforcing a close interest in equipment management, the principle of controlled delegation makes Squadrons more ready for war. Of course, delegation to the extent outlined above has only been possible because the much larger numbers now in the Engineer Regiment cause extra duties to fall less heavily on individuals; only nineteen men per Squadron are centrally employed; a major and his team deals with only two Audits every six months and Orderly Officer duties come round less frequently. Another benefit arising from the larger size is that the Messes are run properly since enough time can be devoted by those responsible for management; also excellent sports

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teams can be more readily put together without the need to borrow gladiators from sister Regiments. A further benefit is that Squadrons can be tasked more evenly since two Field Squadrons have affiliations with particular garrisons and naturally cover such garrison tied items as RCDS and NDC demonstrations leaving the third free to cover miscellaneous tasks, the most notable of which in 1977 was Operation Tortoiseshell in which 16 Field Squadron erected almost 200 bays of garage accommodation for vehicles in five locations throughout the Divisional area in two months.

A direct consequence of the larger organisation and of the delegation of more authority to OCs is the removal of the officers in RHO from the detailed day to day management of individual items in the Regimental programme; these officers are now able to plan ahead, coordinate activities and administer those facilities which must be run centrally for efficient management of scarce resources such as the Training Wing, the Guardroom, Gymnasium and the Clothing Store. Certainly the Second-in-Command has a most important executive and coordinating function since he ensures that the officers of RHQ are fully briefed and working together in the same direction as the Squadrons to meet the Commanding Officer's wishes. He also controls the peacetime tasking of Squadrons and coordinates the master Programme of Events. The executive function of the Second-in-Command is so vital to the smooth running of the Regiment that his time is almost solely devoted to that aspect of his responsibilities, since it is to the Second-in-Command that the QM and the Technical QM turn for detailed guidance as they implement accommodation and re-equipment plans. The Operations Major has also been found to be essential since he complements the Second-in-Command bringing to RHQ the necessary breadth of experience and leadership ability to tackle such matters as courses, exercises, and training policy and also cope with the detail involved in operational reconnaissance, operational planning and the production of Operation Orders for mobilisation. It is the Operations Major who acts as the "umbilical cord" linking HQ RE with the reality of life in the Regiment by visiting for a whole day each week to interpret plans and provide the information without which both HQ RE Staff Officers and the officers in RHQ would be unable to function. As part of his team the Operations



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Major controls the Regimental Signals Officer (who doubles as RHQ Troop Commander) and the Intelligence Officer who is co-located at HQ RE with the CRE's staff to provide essential continuity by linking closely to the Divisional Operations and Intelligence Staffs

Experience since September 1976 has shown that the delegation of command functions to OCs within the Regiment has created confidence within the Squadrons. An element of healthy competition has emerged together with a welcome sense of comradeship amongst OCs as they grapple with similar responsibilities and share experiences. Similarly, the Senior Captains within the Regiment have formed a strong identity of purpose. Tangible benefits have resulted from the extra effort all ranks have been prepared to devote to the cause of their own Squadrons, noticeably in standards achieved on the Periodic REME Examination of Vehicles and Equipment and during tests held in the regular Section Competitions. By harnessing the emotion of Squadron identity to stimulate all ranks in their work, the policy of devolving command authority has achieved excellent results. But before euphoria takes over it is worth reiterating that targets have had to be set in Training Directives and control mechanisms have had to be established to monitor standards and measure results. As Mr Michael Edwardes, Chairman of British Leyland, once said: "Plans, however ambitious, can be achieved, first if they are quantified, second if a timescale is put to their achievement and third if you get your executives chipping away at each detail of that plan so that a part of that plan is one man's particular baby."

OVERSTRETCH

As with any new organisation some parts of the Regiment have not been able to cope with the workload expected of them when planners devised the structure. Attention has already been drawn to the relief given to the QM and the Technical QM by the delegation of some responsibilities and authority to Squadrons. In addition it was necessary for Squadrons to provide a TQMS for the Technical QM and a Senior NCO to run the Central Accommodation Stores Account for the QM. Justifications have been made too for a Specialist ACC Messing Officer, a Unit Families Officer and a Project Liaison Officer who will be needed to coordinate Works Services costing DM30 million to be implemented within the barracks occupied by the Regiment over the next three years.

Also within RHQ, the A Staff found their doubled burden of work beyond their capacity. The Paymaster had to shed responsibility for small Garrison minor units, call for extra Pay Clerks and take a Squadron Senior NCO to run the Regimental PRI. Both the Adjutant and the WOI Staff Assistant found the going very hard, particularly due to the work arising in BAOR with the Police Adviser, and with the greatly increased number of Confidential Reports. It has been proposed that an officer Assistant Adjutant be re-established to cope with disciplinary matters including Courts Martial and SIB Reports and be sufficiently aware of the A work to stand-in whilst the Adjutant gains the "credits" essential to his carcer by attending staff qualifying courses. The WO1 Staff Assistant is still essential in the A office since he is responsible for manning the Regiment – no mean task with our trickle posting system – and for processing annually some 300 Confidential Reports each of which require detailed checking, typing and retyping.

Mention has already been made of the extra burden of work carried by OC REME Workshops since he and eighty one men look after over 300 prime movers. Justifications are in the hands of the staff to establish a young officer to act as Second-in-Command, a senior NCO to act as Executive NCO, two clerks to cope with his administrative non-technical paperwork including Part 2 Orders, and two cooks to enable him to be self sufficient in the field. With this staff OC REME Workshops will be able to relieve OC 43 Field Support Squadron of most of the routine administrative duties arising from the soldiers in REME Workshops. Also OC 43 Field Support Squadron has had the burden of administering RHQ Troop



Photo 2. Some of almost 200 garages built by 16 Field Squadron - Operation Tortoiseshell.

relieved by the employment of a Field Squadron Senior NCO as RHQ Troop Senior NCO to assist RHQ Troop Commander.

EFFECTS OF RESTRUCTURING

When this article is published, the new organisation will have been functioning for about two years and survived much Command Post Exercising in BAOR. Several establishment changes have been recommended as outlined above and some implemented. Even so, in the author's opinion the restructured organisation of the Engineer Regiment is better than the previous one since it has been possible, indeed essential, to delegate authority with the consequent gain in efficiency as the emotion aroused by Squadron identity has been harnessed to the overall task of keeping the Regiment well administered and trained for war.

In the field, the deficiencies of the organisation, as presently manned, arise in only two areas: firstly, Squadrons need an Operations Officer to assist the Squadron Second-in-Command in his function of providing advice to the Task Force HQ and acting in an executive capacity for the OC; secondly, Support Troops need a Resources element consisting of a Senior NCO and two Storemen to assist the Second Captain, located at Squadron Echelon, with the task of identifying, cross loading and disseminating engineer stores, mines and explosives.

CONCLUSIONS

By and large, the new organisation works well in peace and on operations. The Commanding Officer and the various OCs have interesting and satisfying commands. The extra burden placed on the A and Q staff within RHQ and the lack of Resources trained men in Squadron Support Troops needs alleviating by the provision of extra established posts and both OC 43 Field Support Squadron and OC REME Workshops need additional assistance. Should the manpower situation within the Army ease in the future then soldiers should be established to relieve most of those centrally employed whilst in barracks, including the four misemployed WO/Senior NCOs and many of the seventeen men found from each Squadron.

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Estimating Energy Consumption in Existing **Buildings**

MAJOR M R GIBSON RE(V). CEng, MIEE, MCIBS

INTRODUCTION

METHODS for estimating fuel consumption in buildings are required for at least the following three purposes:-

(1) To identify existing buildings with a high energy consumption so that the limited money and staff resources available can be concentrated on these to reduce consumption and therefore cost

(2) To identify prospective energy costs for buildings

(3) To be able to calculate what the energy consumption should be for buildings given known parameters, and to be able to estimate the effects on energy consumption of changing those parameters.

BACKGROUND

Fuel unit costs vary so frequently that an increase in costs between similar periods in different years can easily hide a saving in energy use while a steady annual fuel bill will normally indicate an annual reduction in the energy used. Figures are only meaningful if they are related to known parameters.

It is useful therefore to have a reference on which to base estimates for fuel consumption of buildings and for this to be of the right order of practical accuracy to be used as a reference rather than a design guide.

As an example it can be considered that most office buildings are much the same in general construction, glazed area, occupancy, heat gains and heating and hot water requirements. Provided that these parameters are defined any figures produced for this so called typical building will be of sufficient practical accuracy. Differences from the defined parameters can result in adjustments of the figures produced for the typical building.

It is most convenient to be able to evaluate fuel consumption against gross floor area since this is easily measured, and floor to ceiling heights do not vary much in modern buildings.

METHOD

Table 1 gives estimated fuel consumption per unit area of a typical office building for heating only and for heating plus domestic hot water (DHW) requirements.

The figures were produced by calculating the fuel consumption for a multi-storey building of known construction taking into account the heat loss per unit area from a large number of sectors of the building on different floors, including the ground and top, and for all aspects. Considerable effort was made to ensure that the various parameters used in the calculation were typical and realistic. It was found that energy for domestic hot water is typically 10% of the total heating requirement.

The method of control of any heating installation has a considerable effect on energy consumption and in particular the time control of the "on" period. Consequently four typical forms of control have been considered and their various effects show in the figures produced in Table 1 under these headings:-

(i) Continuous Heating (24 hours/day 7 days/week)

(ii) Night Set Back (temperature of the hot water in the heating system reduced after normal occupation hours)

(iii) Fixed Time Start (start and completion of heating period controlled by a time switch)

(iv) Optimum Start Control (start of heating period automatically adjusted to suit the internal and external temperatures, fixed time end to heating period).

The fuel savings attributable to these various forms of control related to constant 176

	Internal Temp °C	Continuous Heating	Night Set Back	Fixed Time Start	Optimum Start
	N.	ATURAL GA	S, Therms/m	2/vr	
	18	12.1	11.2	7.9	7.9
Heating	20	14.2	13.2	9.3	8.4
	21	16.1	14.9	10.5	9.5
Heating	18	13.3	12.3	8.7	7.8
and DHW	20	15.6	14.5	10.2	9.2
·	21	17.7	16.4	11.6	10.5
OIL, 35 sec 1/m ² /vr					
	18	33.5	31.3	22.1	19.9
Heating	20	39.4	36.8	26.0	23.4
	21	44.5	41.6	29.4	26.4
Heating	18	36.9	34,4	24.3	21.9
and DHW	20	43.3	40.5	28.6	25.7
	21	49.0	45.8	32.3	29.0

Table 1. Estimated Fuel Consumption for Typical Office Building.



Table 2. Fuel Savings related to various forms of control for a Typical Office Building

heating are shown in Table 2, and these figures were used to provide the information listed in Table 1 for these controls.

It has been assumed that control of the internal air temperatures is affected either by internal thermostat control or by external weather compensated control of the hot water flow temperature.

Table 1 provides an indication of the annual fuel consumption for a building but it is often useful to be able to anticipate the monthly consumption or to compare actual monthly consumption with a projected figure. This can be done by taking published monthly degree day figures, which are themselves a measurement of the "coldness"

ESTIMATING ENERGY CONSUMPTION IN	EXISTING	BUILDINGS
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	%	Av Monthly
Month	Full Load	Temp °C
September	4.00	13.3
October	7.65	10.6
November	12.50	7.1
December	13.90	5.2
January	12.70	6.1
February	13.95	4.2
March	14.40	4.4
April	9.96	8.4
May	5.30	11.1

Note: Degree days 1975/76 Midlands was 2379 (°C) Table 3. Monthly Load Forecast, based on Degree Days 1975/76

Av Monthly Temp °C	Therms/m ² Natural Gas	Litres/m ² 35 Sec Oil
1	3.90	10.83
2	2.87	8.33
3	2.30	6.60
4	2.00	5.73
5	1.68	4.55
6	1.38	4.03
7	1.14	3.14
8	0.94	2.59
9	0.82	2.28
10	0.76	2.00
11	0.69	1.77
12	0.56	1.59
13	0.50	1.41

Notes: 1. Factors to be used for fuel consumption at other internal temperatures: $18^{\circ}C \times 0.85$

31 PC	V 1 10
21 C	~ 1.10

2. If no DHW reduce readings by 10%

3. For other forms of control apply factors from Table 2

Table 4. Monthly Fuel Consumption related to external temperatures, using Fixed Time Start Control for Heating and DHW with internal temperature 20°C

during the period concerned, and comparing these with the heating season total to provide a percentage. This can then be used to give an indication of the prospective fuel consumption on a monthly basis, or to forecast annual consumption given the figure for any month.

This information is given in Table 3.

Since the monthly degree day figures are temperature dependant, the average monthly temperatures appropriate to the months are shown for the year considered to allow deviations to be taken into account.

Table 4 is a separately calculated table giving, for the same typical building, fuel consumption per unit area at various average monthly temperatures. Using the factors given, this table can be used to estimate fuel consumption over a large range of conditions.

It is of interest that although the monthly degree day figures vary from year to year the annual total is surprisingly consistent.

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The additional fuel required to maintain an internal air temperature in excess of the "norm" of 18°C, allowable in Government Offices for instance, can be shown to be as much as 17% for every degree C. This value depends on various factors and actually increases as the internal temperature increases. If a value of 15% per °C is remembered some idea of the cost of comfort may be realised.

EXAMPLES OF TABLES IN USE

The aim is to estimate the fuel consumption in buildings and the effect on fuel consumption of internal and external temperatures and forms of control. Office Building

Gross floor area	$12.500m^2$
Fuel	35sec oil
Controls	Weather compensated day- time control and optimum start switching
Reqd internal air temperature	18°C
From Tables	
Fuel consumption should not be more than	21.9 l/m²/yr
·	= 273,750 l/yr
at a cost of say 8.0p/1	= £22,000yr
An increase in internal air temperature to 20°C	
would increase the fuel consumption by	47,5001
at a cost of	£3,800yr
An increase of 1 hr per day in heating time	
increases the fuel consumption by approx	200 I/day
at a cost of	£16/day or £3,000/yr
Estimated fuel consumption in November at an	
average external temperature of 7.1 °C from Table	e 3 12.5% × 273.750
	= 34,2001
or from Tables 2 & 4	33.400 - 9.8%
	= 30.1001

A number of buildings have been checked using these tables and previously acceptable fuel consumption figures have been vastly improved following detailed critical examination of hydraulic and electrically operated controls.

It is considered that any other "type" buildings can be treated in the same manner and similar tables or graphs produced for them. This has been carried out for a large light construction Hangar or Store Shed and it is estimated that heating to, say, 12.8°C should use about 100 l/m²/yr for constant heating for a thirty five week heating season assuming two air changes per hour.

ELECTRICAL SERVICES

The same method can be applied to checking the electrical consumption in crtain types of building. The electrical load in an office building can be considered to be predominantly due to lighting. Lighting layouts are very typical and the electricity consumption due to lighting only can therefore easily be estimated. A figure of 24.75 watts/m² to produce 300 lux is typical and has been used.

Estimates of the number of hours to be reasonably allowed for lighting to be used vary. Lighting design technical literature gives figures based on occupation times before and after survise and sunset and a figure of 800 to 1000 hours per year has been used for comparing estimated with actual electricity consumption for office buildings. The results produced are sufficiently accurate to draw attention to the considerable savings that can usually be made.

The additional electrical loading in an office building is very small or has such a large diversity compared with the lighting and if 10% of the lighting load is allowed for small power, boiler pumps, lifts etc, the total consumption and maximum demand can be estimated. Abnormal known electrical loads then can be added if necessary.

CONCLUSION

Care has to be exercised in using these tables and in interpreting the results. They must not be seen to produce highly accurate or infallible results but where before there has been no readily available method of assessing whether actual results were good or bad or what order of costs results from variations in internal or external temperatures, intelligent use of these tables must be an improvement.

Note: Tables 2 and 3 apply equally to domestic premises. Tables for houses in general, as opposed to the offices referred to in the article, are not really practicable largely because of the variation in design and occupancy.

The message to all users is in Table 2 (which shows the fuel savings which can be attained if the best form of control for a specific requirement and set of circumstances is selected) and in the last sentence before the "Example".

This article is based on an original paper published in DOE Construction No 16 of December 1975.

How to Become Regular

SAM

In these days of sophisticated personnel selection it may be of interest to record my experiences of a War Office Selection Board convened in India, in 1944, for the purpose of granting Regular Commissions to those whose Commissions were for "Hostilities Only".

Early in 1943 I was serving in India and was encouraged to fill up a form applying for a Regular Commission. In due course I was interviewed by my Commanding Officer and shortly afterwards I was sent for by the local Signals Colonel for interview. I had put down R Signals as my second choice because I was told I *must* have a second choice.

During my interview with this gentleman it transpired that the only thing I knew about signals was the morse code, flag signalling and heliographs, all of which I had learned as a Boy Scout. I certainly found it difficult to distinguish an ohm from an amp – what did it matter – electricity was not used in Burma much. Finally the Colonel said "What made you put down Signals as a second choice." "Because I was told to" I said. "I want to be a Sapper and if I can't become one I don't want to be a Regular Soldier." "In that case," he said, "we have both wasted a great deal of time." The interview was over!

I heard no more for more than a year and most of the time had been spent in Arakan. I had almost forgotten about a Regular Commission and assumed that I had ruined my chances anyway. The Field Company in which I was serving had withdrawn to a spot halfway down the Arakan peninsular for retraining and rest when the OC sent for me and said I was required to attend a Regular Commission Board (RCB) at the Maharani Palace in some suburb of Calcutta and I would get seven days to get there and back. Not having had leave for a year I was delighted and started the long trek to Calcutta – by road to Chittagong and rail onwards.

I was delighted to find that the Maharani's Palace was about the size of a country house with a big garden not more than two miles from the Grand Hotel, a short tonga ride up Chowringhee. There were about twenty four candidates, all dragged back from units in XV Corps, and eight of us were Sappers. It was a great re-union and we went straight out to the good restaurant Firpo's and finished very late at the Grand Hotel.

The next morning we were solemnly welcomed by a General, no less, even in war time, a Brigadier and three Lieut Colonels and split up into syndicates. We did

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masses of arithmetic and metric tests and "what do you finish the series with". All very difficult when your problems for the last two years had been how to cut a tree from the jungle and turn it into a pile and decking to form a bridge out of it.

Then we had a test with a series of vertical poles and some planks and a piece of vital equipment to get across an imaginary river using barrels. All good combat engineer stuff – halfway through I fell into the supposed crocodile infested water and collapsed in peals of uncontrollable laughter. The appointed leader, a Signals Officer, looked coldly at me and said "We must push on; leave him alone he's had it" or words to that effect. It must have been the wrong approach as he failed miserably later. At the time the Supervising Officer wrote madly on his millboard.

In the evening many of us visited the bright lights of Calcutta as we had got to know each other better. I had teamed up with a huge Guardsman. He was brimming over with energy and leadership and led us into some extraordinary places. In fact his knowledge of Calcutta outstripped his good sense. He left our party unobtrusively and was no more seen until dawn the next day when we let him into our Palace. He had been picked up by the Military Police in one of the more notorious streets of the city. He had explained what he was doing in Calcutta to a Captain who had allowed him to go home on condition he saw the doctor the next day. This turned out to be a very severe punishment as the doctor operated on him with a sharp edged corkscrew which left him a sorer and wiser man.

The next day more intelligence tests, like putting dots in squares and circles round things and then lecturettes. In the afternoon we had to get a barrel across a minefield on which stood two palm trees with a cradle stretched between them. Equipment given was a long piece of rope. Up to this point nobody had shown any inclination to make me a syndicate leader and I was happily enjoying my RCB leave. However, as chaos was reigning I said that I thought the solution was simple. One just threw the rope over the cradle, caught the loose end and tied it to one tree with a quick release knot, climbed up the rope – hauled up the barrel and threw it over the minefield and jumped over oneself, releasing the rope as one went.

Our Supervising Officer was writing on his millboard "Initiative", I thought, "Ability to make a simple plan quickly", "Leadership". The other members of the syndicate looked at me sourly. "Can you do that?" "Of course, we do things like that in the Sappers every day." Silently they handed me the rope, I cast it like a breast line over the cradle and caught the swinging end deftly and quickly tied it round the tree. "There you are," I said, "all ready to take the first man over". "You go first", someone said. "All right," I said, and jumped high upon the rope towards the cradle. It should have been all right but I had tied the knot the wrong way round, my weight released the knot and I ended up on my back in the minefield once more in helpless laughter. The supervisor decided that we had done enough and we went back to tea.

The next day an obstacle course had to be completed including the use of short planks to cross a ditch too wide to jump (is this where the expression "as thick as two short planks" originates?), and we were finally interviewed by the three most Senior Officers in turn before lunch. After lunch we were called in and given a slip of paper PASS or FAIL.

To my amazement I had a PASS – on asking around I found that all the Sappers had passed. Sadly my Guardsman friend had failed – I think the RMP must have reported him.

I am sure that RCB is not quite like that now and I suspect everyone takes it more seriously than we did. After all we didn't know whether we should survive the war and whether when it was over we would want to stay in the Army. I could not help feeling that Combat Engineering must be the ideal training for an RCB – that and an untroubled conscience.

When my Regular Commission came through some years later I found it was dated from my 21st Birthday and so lost two years seniority, most of it operational. That's life!

Geology in War

LIEUT-COLONEL E P F ROSE TD, RE(V), MA, D Phil, FGS, MIWES

INTRODUCTION

THE Corps has a new textbook on geology: Applied Geology for Engineers, sponsored jointly by the Ministry of Defence and The Institution of Civil Engineers.⁸ This manual supersedes Military Engineering Volume XV, Application of Geology,⁹ and is intended as a guide to geology for the practising engineer, civil or military, and to undergraduate students of engineering or engineering geology. In consequence, strictly military applications of geology mentioned in the earlier volume have no place in the new manual.

In peace-time, there is little difference in principle between tasks undertaken by military and those undertaken by civilian geologists. Military geological tasks during the last decade have recently been reviewed¹³ and from this review it can be seen that although Corps construction projects may be smaller in scale or involve structures of shorter planned duration than some of their civilian counterparts, the geological applications are essentially the same. In war-time, however, there are applications of geology that are particular to military operations. The role of the military geologist during operational conditions has been documented frequently in published literature, but the relevant articles are generally old, scattered and outside the scope of military engineering libraries. The purpose of this article is therefore to provide a brief historical review of "military" geology and an introduction to its literature, to complement the recent "civil" engineering geology accounts⁸. ¹³ which are now readily available to Corps members.

MILITARY GEOLOGY IN THE 1914-1918 WAR

According to Lieut-Colonel A H Brooks,¹ the Royal Engineers can claim creditable association with two early advances in the field of military geology. The Corps included amongst its members Major-General J E Portlock, who was amongst the first to recognise that a knowledge of geology would be of aid in war. (His *Rudimentary Treatise on Geology*¹⁰ indicated that "The soldier...may find in geology a most valuable guide in tracing his lines of attack and defence".) The Corps also employed the first geologist to receive a military assignment for work in his own profession. (Captain W B R King, RWF – who was appointed Geologist to Engineer-in-Chief, GHQ, France, in May 1915 to give advice on questions relating to water supply in the area then occupied by British troops in Northern France and Flanders, and also to collect information regarding the existing and available sources in the ground ahead of the lines in the event of an advance through Belgium).

Brooks has described the pre-1914 development of military geology in the armed forces of Britain, France, Germany and the USA, and the subject has also been more briefly and generally discussed by C E Erdmann.² These authors conclude that, despite the work of a few far-sighted individuals, there was no systematic attempt to apply geology to military purposes until the First World War. Then, despite the earlier recognition within the German Army of the value of geology,⁷ it was the British Army which organised the first geological staff. Fortunately "In general, the work of the British geologists excelled that of the Germans".²

Amongst publications which refer to the work of geologists during the war, two are particularly significant. That by Lieut-Colonel A H Brooks (Chief Geologist, American Expeditionary Force) gives an account of the work of the geological staff of the British, American and German forces on the Western Front. It is comprehensive, detailed and well-illustrated. The other paper, by Captain W B R King,⁵ also concerns the Western Front but is restricted in scope to the activities of British geologists. It is important not only as a full account of British operations, but because of the critical discussion appended to it, contributed by several senior British officers. This paper was the precursor to a fuller, but not so widely circulated, account of geological work on the Western Front.¹⁸ This full account of work under the direction of the Engineer-in-Chief, BEF, details British geological work relating to watersupply, mining, field positions, and winning of raw materials. It is well illustrated with maps, diagrams and photographs. Brief background information on the establishment and operation of the British geological staff is included, as is information on geological establishments in the German and American Armies, and a suggested geological establishment for the British Army, first proposed in September 1918 "at too late a date to materialise".

The British geological staff on the Western Front comprised only three officers: Captain King, who served from 1915 in the Engineer-in-Chief's Office; Lieut-Colonel T W Edgeworth David, who arrived in May 1916 with the "Australian Mining Corps" and was later that year posted to the Inspector of Mines Office; and Lieutenant Loftus Hills, who worked under Colonel David from September 1916 supervising test-boring for dugouts. However, there were other qualified geologists serving with the tunnelling companies who were able to make good use of their particular expertise. During October 1918, two such subalterns of the Australian Tunnelling Companies were lent to GHQ to aid in the preparation of geological maps required with the advance into new country.

The work of Captain King was principally related to water supply, that of Colonel David to mining and dugouts. Since they were under separate command, their fruitful co-operation was a fortunate accident, occasioned by nearby offices and the personalities of the men concerned. This co-operation, and the relatively simple geology of Northern France and Flanders, enabled them to cope with work which would otherwise have been impossible with so small a staff. They stressed repeatedly that "Far more efficient work could have been done wit a larger staff",⁵ but to no avail.

Following the example set by the British Army, the geological section of the American Expeditionary Force was established as part of the office of the Chief of Engineers in September 1917, with Lieut-Colonel A H Brooks of the US Geological Survey in charge. Authorisation had been obtained for the assignment of eighteen geologists, including five to each Army or one for each Corps, but the armistice was signed before complete organisation had been accomplished and before much practical work could be done. At the time of the signing of the armistice, nine geologists were serving with the Force: five at General Headquarters, two with the First Army, one with the Second Army, and one with the water supply section.

In the German Army, Captain Walter Kranz of the Corps of Fortification Engineers had arranged special courses in military geology for other engineer officers and published a short article calling attention to the use of geology in war.⁷ He advocated the recognition of military geology as a special profession, and that such specialists be supplemented in time of war by calling into military service other geologists from civil life. Kranz may have influenced the Minister of War to request before the Reichstag in 1913 that a geological service be organised for each Army Corps, but little was done until pressure from articles in technical journals and even the daily press showing the application of geology in war stimulated the appointment of geologists as such. By February 1916, twenty geologists were employed on the Western Front, and by the end of hostilities the German Army was employing about 100 geologists there, having made professional use of some 250 geologists during the last year of the war. Cynical engineers will no doubt correlate this widespread employment of geologists with the subsequent defeat of the German Army!

Life was not, however, always easy for the German geologists. Brigadier-General J E Edmonds has described⁵ how when the Germans had twenty to thirty geologists on the Western Front, the Lille museum was used as a base. "The morning after General Harvey blew up Messines ridge there was trouble.... A German General appeared at the museum with his staff; the geologists were brought before him; they were called to attention, and he cursed them up hill and down dale, because they had

not informed him that General Harvey was mining underneath the German mine system, and had led him to believe that mining below it was impossible. He ordered all the geologists over forty to be sent back to Berlin, and those under forty to the front. The moral perhaps is that it is better to employ two first-class geologists ... than twenty second-class ... ones."

Reviewing the use of geology and geologists made by the forces of these three nations, Brooks' concluded that "The fact that a knowledge of geology may prove to be the decisive factor in a given military operation was made evident only during the late (1914-1918) war and by no means found general acceptance among military leaders." Moreover, "while the science was definitely recognised in several of the armies, it was by no means developed to its full usefulness, not so much because of the failure to organise geologic staffs or to give support to geologic investigations, as because of the failure to apply the results achieved and to seek the advice of the geologist on problems that clearly lay within his field. Relatively few officers of the high commands of the several armies that employed geologists had any adequate conception of the application of geology to military and engineering problems. So far as geology was thought of at all, it was regarded by many as a purely speculative and abstract rather than as a practical and concrete science. The geologic officers of all the armies had to spend much time and energy in combating such ignorance and prejudice. This made the service particularly hard for it was discouraging to see the cheerful undertaking of impossible projects, involving the needless expenditure of time and energy and only too often useless sacrifice of lives, which could have been avoided by a little elementary knowledge of geology."

In support of his assertions, Brooks cites amongst other examples troops ordered to intrench near Verdun in rock which could not be excavated with the light tools available (troops who in consequence sustained a large loss of life); front-line dugouts situated without regard to ground-water conditions; scarce transport used to bring road metal from afar when there were readily accessible sources nearby; and important installations sited without regard to essential sources of water.

Less emotively, Brooks describes how geology found its principal application in the war in forecasting the physical conditions to be encountered in the execution of military projects, such as construction of fieldworks, movements of troops, erection of engineering structures, and determination of sources of water, road metal, and other mineral supplies. That "The value of geology to the military commands is directly proportional to the accuracy of the deductions made by the geologist" is readily admitted, with the proviso that "This accuracy will evidently be controlled by the simplicity or complexity of the problem presented and by the opportunity afforded for detailed observations."

The use of geological information in the siting and construction of fieldworks such as trenches, dugouts and mines was of particular importance in the 1914–1918 war, and the subject is described in detail by Brooks. He summarises this use of geological data as:-

"(1) Geology will make it possible to take advantage, so far as the tactical situation permits, of the most favourable physical conditions.

"(2) A knowledge of the geology will to a large extent, prevent the undertaking of projects that are impossible on account of the physical conditions underground.

"(3) The information gained about the depth of the groundwater or of waterbearing strata by the use of geology will determine in advance the type of cave shelter which can be constructed and whether mining is practicable.

"(4) By the use of geologic facts it will be possible to forecast the kind and quantity of materiel necessary to execute any project of fortification. This will include the tools and other mechanical equipment, such as ventilators, boring machines, and pumps, revetting material for trenches, and timbers for dugouts and mines.

"(5) A knowledge of the geology will make it possible to learn in advance the character of the material to be excavated, and this is one of the factors determining

the time needed to complete the project."

Brooks also describes the relevance of geological information in manoeuvring, water resources, transportation, construction, mineral resources, and sundry miscellaneous applications, all by reference to case histories from the Western Front. His account is therefore an important as well as readable record of military geology at that time. His final conclusion is timeless, and bears repeating:-

"Geologic knowledge must be considered as part of the preparation for war. Geologic preparation for war may be classed under three headings:-

"(1) The general principles of geology and their application to war must be made a part of military education.

"(2) Peace-time preparation should include the collection and co-ordination of geologic data relating to all possible theatres of operations.

"(3) A staff of geologic engineer reserve officers should be organised. This should be made up of experienced professional geologists who should receive the special peace-time training necessary to develop them to their full usefulness when called into active service."

Similar conclusions were reached by Sir Aubrey Strahan (Director of the Geological Survey of Great Britain) and Lieut-Colonel Edgeworth David. They describe how the Germans were at an advantage in many ways, and able to inflict losses on British forces "as a result of being strong on the geological side." In consequence, Colonel David recommended that in future there should be a war-time organisation of:-

(1) At least three geologists attached to GHQ or Staff of Engineer-in-Chief

(a) For water supply

(b) For field positions (Dugouts, subways, etc)

(c) For mining of raw materials, road metal, concrete material, etc

(2) One geologist at least attached to the staff of each Chief Engineer of every Army Corps.

Sir Aubrey Strahan⁵ was concerned about peace-time organisation, recommending that "The experiences of these men (Captain King, Colonel David) should be passed on to the next generation, and whatever and whenever the next war may be, let us not be unprepared, either in the training or organisation of a geological staff." "A small staff for this special work", to be trained during Territorial service, was suggested.

Following the 1914–1918 War, there was thus general agreement on how "important geological information has proved to be" in a military context; regret that "we had not more geological information before the war started" (General Liddell⁵); and acceptance of the need to organise a peace-time staff of reserve army geologists in preparation for potential future hostilities.

MILITARY GEOLOGY IN THE 1939-1945 WAR

The recommendations of 1919/1920 were soon set aside. There was widespread relaxation of military geological thought and effort. Interest in the military use of geology waned and all but died out, except in Germany. An analysis of literature on military geology (Table 1) tabulated by CE Erdmann² indicates the trend. Erdmann points out the persistence of German interest in military geology, the sharp increase in number of titles immediately preceding the outbreak of war, and the appearance of articles of book length in Germany – practical handbooks^{16, 17} on military engineering geology, "the evidence of sound military collaboration, and an increasing awareness of the possibilities of using geology in a war of manoeuvre. Obviously the Germans recognised some geologic application that would promote the conduct of the war they were planning so carefully."

In Germany, the use of military geological maps was advocated.¹⁵ Moreover, according to P H Price,¹¹ German papers covering all phases of military geology indicated, as early as 1933, a revival of the geological corps and its development to a known geological section of nine men to each Army. Use of geologists was wide-

GEOLOGY IN WAR

Period	United States	British Empire	France	Germany	Others
1910-1914	0	1	3	2	0
1915-1920	26	4	1	28	
1921-1925	0	1	2	9	0
1926-1930	0	0	0	9	0
1931-1935	2	0	0	10	4
1936-1942	10	2	2	20*	5
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 Table 1. Analysis of literature on military geology, indicating origin and frequency of titles (from Erdmann, 1943)

* German literature up to 1939 only.

spread. Indeed, by 1942 some 600 German geologists were engaged in North Africa and Italy.

In contrast, there was at this time no geological unit in the United States Army.³ "The United States has never supported a strong peace-time military organisation, although history has demonstrated that we have thereby neither avoided war nor deterred others from going to war" "and the geologic staff disappeared from the military set-up in the pre-war period." American geologists were not slow to point out this deficiency. Enthusiastic accounts which detail the strategic worth of geology, projected roles for military geologists, and proposed organisational structures were given by P H Price and H P Woodward¹² and by K C Heald³.

Price and Woodward concluded that "It is unfortunate that persons who have had no training in or contact with the field of geology do not properly appreciate its greatest usefulness. Geologists themselves, especially the American and British-but not German or Japanese - have been slow to organise an educational geologic program to augment the military and naval services of the country, and the latter have been slow in making immediate adequate use of the important knowledge which the science of geology and the country's trained geologists can supply." To demonstrate the usefulness of geology, Price and Woodward cite twelve examples in which geology could contribute to the interpretation of terrain for military manoeuvres; ten examples relating the application of geology to conversion of ground for military use; four examples involving maintenance of supplies and communications; seven miscellaneous geological applications; and ten examples involving expansion of normal domestic geological activities. They specifically recommended that "An organisation should be set up within both the Army and Navy to create and direct a geologic corps for advice, consultation and technical geologic application." "A selected group of mature trained geologists should be assigned positions in the military organisations, with sufficient military or naval ranking that their technical advice carries adequate authority."

Similar views were argued independently by Heald.³ He recommended that "there should be both staff and field geologists with our forces in every separate area." "The first requisite is competent geologists with both scientific and administrative skill in staff positions. It is axiomatic that the most complete and effective application of a science can be realised only under the direction of executives skilled in that science ... only a geologist can apprehend what geological information is obtainable and how it may be applied ...". The recommended roles of the staff geologists were to organise the work of the field geologists and to organise geological information for military use, particularly in map form. Field geologists were to advise troops on factors affecting ground conditions, water supplies, site selection and natural resources.

Pressure from geologists such as these, and pressure too from the US Corps of Engineers, reputedly dissatisfied with the geological information it was getting, resulted in the formation of the Military Geology Unit of the United States Geological Survey. An early product of this Unit was an article by C E Erdmann² surveying the employment of geology in war with special reference to the tactical situation. "Approaching the subject theoretically, from a military rather than an academic viewpoint, the first problem considered is whether our present undistinguished use of geology in war results from some inapplicability inherent in the science itself, or whether a more rational analysis will not disclose wider fields of application by recognition of hitherto unsuspected correlations with the principles of war. After preliminary definitions of war, the principles of war, geology and military geology, the development of military geology is outlined to show what aspects have been most useful and the phase of warfare to which they are best adapted. This reveals that there has been but little actual tactical application of geology in mobile warfare or a war of manoeuvre, and that its employment has not been worked out satisfactorily in the United States Army, although it has been developed to some extent by the Germans. Hence in our current engagements geology scems not to be utilized fully because of the erroneous belief that it cannot be applied with sufficient rapidity to keep pace with the course of modern combat." "Terrain is . . . the common denominator of geology and war." "When all other things are equal, victory will come to him who makes best use of the ground."

Erdmann defines military geology as "the application of geology to the art of war", and divides it into three branches:-

(1) Economic geology of war materials (ores, fuels, etc)

(2) Geographic applications (in strategy and logistics)

(3) Military engineering geology (essentially applications of peace-time civil engineering; water supply, heavy foundations, construction materials, etc, with much greater emphasis on expediency).

He relates geology to the principles of war as summarised in American training manuals, and concludes that geology contributes information relevant to principles of Mass and Economy of Force, also Movement, Surprise, Security and Simplicity. He endorses the earlier view of Brooks that "geologic maps will in time be considered almost as essential to offensive and defensive operations as are topographic maps."

Though Erdmann's approach is theoretical, and he makes no organisational recommendations, he does list the qualifications of a military geologist. "In the first place, he should be a professional geologist of the widest range of sound training and field experience in aerial mapping, engineering geology, geomorphology and the geology of unconsolidated materials. Particularly desirable are the qualifications of the engineering geologist.... Secondly, he must be a soldier with qualifications that fit him for the Corps of Engineers. In addition to the basic training he should have an additional background of staff training and experience, for his function will be chiefly advisory and reconnaissance; but he must be able to fight and lead troops if through the fortune of war command should descend to him.... He should know accurately and in detail what troops can and cannot do so that impracticable and infeasible suggestions may be avoided."

In fact, the organised American geological staff authorised during the 1914–1918 War was never reinstated, and in World War II very few geologists received commissions as such.¹¹ Some 2,000 men with geological training were scattered through the US Forces, but seldom effectively used as geologists. Geological expertise was provided through civilians of the Military Geology Unit of the US Geological Survey, and a few individual servicemen who were able to make good use of their geological knowledge and training.

C B Hunt⁴ has described both the principal applications of geology to military problems by American forces in the 1939–1945 War, and the organisation and function of the Military Geology Unit to that end. He concludes that "During World War II geology won its spurs as an important scientific tool in both planning and operations by the United States Army. This growth of geology was due to increased appreciation on the part of our military leaders of the importance of scientific techniques and information, and to the increased appreciation on the part of our scientists of the usefulness of their abilities in the solution of a large variety of very practical problems. It can fairly be said that at the beginning of the war neither the military leaders nor the geologists fully appreciated the manifold applications of geology to military problems."

According to Hunt, three important ways in which geology can be used by the Army are;-

(1) In map interpretation, of both geological and topographical maps, for strategic terrain appreciation (ie an estimate of the terrain situation as it affects the movement, cover, and concealment of troops and supplies); water supply; site selection (for bivouac, depot, quarry or gravel pit, source for water, airfield, road); and source of materials.

(2) In photo interpretation, of aerial photographs, to assess ground conditions for tactical purposes.

(3) Through a consultancy service in the field, to advise local commanders on the properties of ground to be won or already occupied.

These needs were met for the last three and a half years of the War for the United States Army through the Military Geology Unit. The Unit was kept administratively within the US Geological Survey, but 90% of its work was for the Military Intelligence Division, Office of the Chief of Engineers. The primary function of the Unit was to produce "Terrain Intelligence" reports, consisting of a series of maps and explanatory tables, each stressing a special terrain topic such as terrain appreciation, rivers, water supply, problems of road and airfield construction and maintenance, trafficability for vehicles, engineering properties of the soils and rocks, distribution and availability of construction materials, fuels, and mineral resources. Over 300 reports were produced, involving some 5,000 maps, 4,000 photographs, 140 terrain diagrams, and 2,500 large tables of text.

The reports were prepared in Washington, for use there by the War Department, or by General Headquarters in the Theatres. Part of the staff was trained in library work and served as bibliographers. They extracted data from the Geological Survey Library, Library of Congress, Department of Agriculture Library, Map Library of the Army Map Service, and, when necessary, from other sources. The data were passed to teams of three to six scientists representing different specialisations in the fields of geology and soil science. Scientists were selected on the basis of wide field experience and their ability to work without translators, each geologist having a reading knowledge of at least two foreign languages. Work produced by the teams was supplemented by that of scientific illustrators, and reviewed and edited by further geologists before submission in its final form.

To meet the problem of servicing the needs of tactical planners in the Theatres, teams of geologists were detailed from the Unit in Washington and attached to the staff of the Theatre Engineer. Such teams were actively engaged in three Theatres – Southwest Pacific Area, Central Pacific Area, and European Theatre of Operations. They provided the same sort of information as was provided in Washington, but in much greater detail and designed for tactical planners. Teams in the Theatres provided three kinds of service:-

(1) Preparation of both strategic and tactical reports on terrain and ground conditions in the operational area.

(2) Serving as technical advisers to officers preparing orders for a given operation.

(3) Accompanying Engineer troops engaged in the operation so as to provide technical assistance on the ground in the combat areas.

Hunt records that Unit personnel worked closely with other service departments, and with the Geologic Section in the British Joint Army and Navy Intelligence Service. Co-ordination was aided by exchange of personnel.

Applying geology to the solution of military problems involves consideration, firstly, of the techniques and uses of geology and, secondly, of the administrative procedures by which the necessary information can be furnished to the right office at the right time without imposing a burden on an already complex military organisation. Hunt observes that the latter is a more knotty problem than most civilians appreciate. He recommends that the pattern set by the Military Geology Unit be retained for future operations, but enlarged. Thus such a unit should be based at the Geological Survey, but responsibility for authorising the work and defining the needs of the Armed Services be vested in the Office of the Chief of Engineers. At lower levels of command, the main centre for geological work in a given military unit should be in the intelligence section of the Chief Engineer for that unit. The needs of a Corps could be met by a geologist, or geologists, on the staff of the Corps Engineers. When geological service is needed by a lower unit, the need could be met by the temporary detail of geologists from GHQ.

"No fixed number of geologists can be recommended for these various posts. War Department needs must be governed by the size of the Theater of War and the pace and kind of military operations. The same applies to the needs of a Theater of Operations, to an Army, and to a Corps. But assuming operations of a magnitude comparable to World War II, it is safe to conclude that a few hundred geologists could profitably be organised to service War Department activities, and several score could profitably be organised in each Theater of Operations."

CONCLUSION

The published articles on which this review is based detail "the sort of thing the geologist thinks he could do or should do if opportunity were provided"² in a war-time situation. Proposed war roles for geologists have therefore been described frequently. But, as C E Erdmann² has pointed out, "no matter how valuable these services at times might be, such articles seldom reach the military man, or carry conviction when they do, because they fail to correlate what seem to be obvious geologic applications with the principles of his profession, and help him to fight better and win battles." In consequence, the Allies began both World Wars lacking the substantial and organised geological expertise of the opposing forces.

The First World War was, in Europe, relatively static. Applications of geology as documented in the literature therefore relate primarily to fieldworks. In contrast, the Second World War saw a more mobile pattern of conflict in Europe. Applications of geology to terrain appreciation therefore assumed a greater importance. In both conflicts, provision of potable water was an important requirement, and stimulated the preparation of a range of hydrogeological maps.⁶ By the end of both conflicts, the military value of geology, if judged from the increase in number of military geologists employed, was generally accepted.

Numbers of geologists employed, and the organisation of geologists, have differed between wars and between countries, yet the type of geologist and his military role have remained essentially the same. The functions of the geologist have been to interpret ground conditions, predict site locations, and to locate groundwater and "mineral" resources. This generalisation appears to be widely applicable, even though the primary literature cited here is biased towards American sources, and to the European theatre of operations. The Americans have more readily published details of their thoughts and activities than the British, and though there were military geological units at work outside Europe (such as the geologists and the South African geological section serving in North Africa in the 1940's), published accounts¹⁴ are generally more of technical than historical interest.

An important geological lesson learnt during the wars was that a geologist needs basic data to interpret. In war, speed rather than economy is of high priority, so the data need to be adequate and accessible. It has been emphasised^{1, 3, 11} that such data should be collected and evaluated during times of peace. Because of its potential benefit to the civilian community, "Such information, properly utilized, may aid in the prevention of war."¹¹ However, if war comes, geological information will be invaluable in the reparation phase which follows it.

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Jump

COLONEL E JACOBS-LARKCOM, CBE

FROM 1942 until carly 1945, I was in command of a group of British officers attached to one of Chiang Kai-Shek's armies. My task was to train the Chinese in both conventional and guerilla warfare, supply them with arms and equipment, and advise their units in the field.

Towards the end of 1944 we were working in south-western Chekiang. Over the previous three or four months, the Japanese armies had pushed their way south from Changsha in Hunan, and north from Canton until their columns met. The road to Chungking was thus cut, and the only communication left with our supply base was by the occasional light aircraft which braved the Japanese fighters to land at one of the few small airfields available to us. We could no longer receive supplies from outside, and therefore were unable to continue to fulfil our mission.

I was then ordered to report to Lord Mountbatten, Supreme Commander South-East Asia, at Kandy in Ceylon, and discuss with him the future of our little group. I was flown out at night over the Japanese lines to Kunming, thence over the "hump" to Calcutta, and eventually reached Kandy uneventfully. After a full discussion "Supremo" decided that our group should be withdrawn and re-deployed elsewhere, leaving behind a token party of volunteers who would help our Chinese friends in the production of such war equipment as could be made from improvised local resources, and harass the enemy where possible. As was so often the case the Americans came to the rescue, and after a day or two managed to provide a large transport plane to fly the party out of Kunming, some 350 miles westward where their future role would be determined.

The first hop, over the Japanese lines to the American controlled airfield at Chihkiang in Hunan, was safely accomplished. The next day another American aircraft was allocated to negotiate the second leg to Kunming. The weather report was very bad, and prudence would have precluded flying. However the American pilot announced: "I've got a date tonight in Kunming (he pronounced the *Kun* to rhyme with *bun*, instead of with the *oo* of *look*); I'm going – anybody coming with me?" Of course all twenty of my officers said "Yes", and together with an American flight sergeant, duly embarked.

After taking off the weather steadily deteriorated. As the cloud base lowered, course was maintained solely by reliance on instrumental flying. Suddenly the plane ran into one of the terrible tropical storms that occur in those wild mountainous regions. It was struck by lightning, and every instrument, including the compasses, was put out of action. The pilot chewed gum and bravely flew on, as it would have been suicidal to break cloud and attempt to find somewhere to land in that death dealing mountain district. After eight hours flying - by which time it was dark - the pilot (still chewing gum) entered the body of the aircraft and said: "Well boys, we're 20,000 feet up somewhere over Asia, and there's no more gas. Guess we'd better jump." There were parachutes for all and - instructed by the sergeant - everyone jumped. One of our majors had hesitated and at the last moment turned back saying "I must get my hat". The sergeant, who was a tall and powerful man, twisted him round and gave him one powerful kick in the backside. The major took off and landed safely - without his hat. Indeed all landed safely except the pilot, who landed in a tree and remained suspended until his parachute could be freed when daylight arrived. The senior officer, who was a Chinese speaker, took charge.

The first task was to collect the party; the next to find out where they were. Collecting everyone did not prove difficult. The terrain was typical paddy field country, and all had landed within two or three miles of each other. Then to find out where they were. Cautiously, as they might have been in Japanese held territory, one of our Chinese speakers, disguised as best he could as a civilian, and without wcapons, set out to see how the land lay. He made his enquiries at a nearby village, and to his relief and amazement was told by the friendly peasants that he was about thirty miles *cast* of the airfield from which he had departed. And this after eight hours flying! During the blind flying period, the aircraft must have made a complete semi-circle, returning almost to its starting point. The neighbourhood was free of Japanese and two days later the whole party, including the pilot on an improvised stretcher, returned to Chinkiang, little the worse for their experiences.

You can imagine my feelings, and those of the staff at South-East Asia Command, during the three days we were without news. So far as we were concerned, the aircraft had simply taken off and disappeared. I had fully expected never to see again any of those loyal and talented friends who had worked with me and shared my life for two years. However, after those three days of intense anxiety, the good news of the party's safety reached us. A fortnight later I rejoined my group in Kunming. A short period of training in American weapons followed, after which I and my group were re-assigned to Hsi An in NW China, there to work under Colonel David Barrett, a well-known American officer and Chinese expert.

After we had re-assembled, I naturally watched my group individually to see if any of them had been badly shaken by their traumatic experience. One or two frankly confessed that they were now afraid of flying. Although no-one hesitated to fly if so ordered, I did my best to put those whose nerves appeared to have suffered most on to road convoy work, in order to avoid further mental strain until the period of shock had passed over. Others did not admit fear, but I could read the nervousness in their eyes, and did my best to spare them flying. Yet another section appeared to be entirely unaffected and acccepted flying as part of the job. Amongst these was Stanley "T" - as I shall call him - a very gifted Lieut-Colonel. In due course, I went ahead to Hsi An with the advance party, and took Stanley with me. We flew in two hops, staying one night in Chengtu at the British Consulate, where at that time there was a resident vice-consul with his wife. The end of the war was now in sight and soon after VJ Day, I returned to Chungking prior to final dispersal. This time Heft Stanley T behind in charge of the rear-party. With him was Captain "B". Stanley was to close down our establishment in Hsi An, and bring back our vehicles loaded with as much of our equipment as could be salved. After the lapse of a fortnight, all was ready to go. Stanley ordered "B", who openly admitted his dislike of flying, to take charge of the road party, and decided himself to fly on ahead to prepare for its arrival in Chungking. Again bad weather was encountered and in heavy cloud, the aircraft flew into a mountain side at a height of 8,000 feet. All on board were killed.

I learned afterwards, from the wife of the British vice-consul in Chengtu, that on the morning of our outward flight from Chengtu to Hsi An, Stanley had broken down in her presence and confessed to an overpowering fear of flying. He had at all times completely concealed this fear from me. I have no doubt that before the fatal return journey he chose to send his subordinate by road, and forced himself to take the journey by air. Truly a fine character and a brave man.

Early Days

MLC

SOLZHENITSYN in his August 1914 commented on how well the Russian Army trained its young officers in their first two years – but how surely it ruined them in the next twenty. Judging by the performance of the Russians in August 1914, this may have been fair comment. One wonders whether the subsequent careers of those seeming paragons of virtue – the products of the Military College, Kingston – would have turned out better under similar circumstances. The *RE Journal* of both 1877 and 1878 carried fulsome reports in praise of the Cadets, and it was appropriate that Queen Victoria bestowed the "Royal" title in June 1878.

In 1878 reports from the RMA, Woolwich, as in 1877, were not so flattering. It seems that although the Cadets had approached "excellence in such pursuits as demanded manly attributes, there had been a falling-off where mental facilities were required such as in subjects of a scientific character". A message from the Duke of Cambridge reminded them that mere pluck and energy would little avail an engineer in the hour of danger, and he hoped that "not only would they continue their studies after leaving the RMA, but when the time came for them to uphold the reputation ... etc, etc, they would not be found wanting". And who would disagree!

The RUSI had the same message for the soldiers. In a lecture about the best tactical formation to be adopted by the Infantry when, due to the increasing range of small arms, deployment had to take place far from the objective, one of the conclusions reached was that the men should be educated more for individual than collective action. Whatever the fate of the Russian soldier may have been before Tannenberg and elsewhere, the strict "collective" tactics pressed on the British soldiet on the Somme (and elsewhere) had much the same result. Enormous casualties. Was it not the Canadians who fared very much more successfully at Vimy?

An article in the Annual Review for 1878, in describing the "wonders of modern

science", commented that the soldier "now has his field telegraph (sometimes laid under fire), his rifle, the result of scientific inquiry, his guns specially tested as to their trajectory by an instrument devised by a mathematical clergyman, while the microphone had been suggested as a means whereby he can hear counter-mines being made. The Navy had its steam engines (some of which have lesser steam engines to start them). Torpedoes had their heads stuffed with some chemist's contribution, and a torpedo had been described as having more sense than most soldiers." It seems that with all this great progress, it certainly behoved the RMA cadets to apply themselves as diligently to their scientific studies as to their games!

Solzhenitsyn notwithstanding, it is not everyone that the Army succeeded in ruining. In 1878, Lieutenant Watson RE presented to the HQ Mess the portrait of Heathfield by Joshua Reynolds. Heathfield, as we all know, defended Gibraltar in the Great Siege. As the Journal commented – "as an engineer officer he made the best use of the fortifications and was one of the few generals who have successfully defended a fortress."

The Russo-Turkish war gave rise to much comment in the Journal. The importance of the intelligent construction and use of even quite elementary earthworks was a recurrent theme. Reasonably enough, the whole concept depended on the immediate availability of that valuable article – the spade. Was it to be carried on the man or in close support transport? If the soldier's spade was only of second importance to his rifle, it did not make sense that, whenever he could, the Russian soldier first threw away his spade and then his greatcoat. The realistic answer was not better discipline but the immediate supply of intrenching tools carried in a close support cchelon. One Russian General also complained bitterly that in an Army of 20,000 men there were only thirty-five sappers without a single Engineer officer, "although our Academy of Military Engineering produces men by the dozen every year." The Journal does not relate whether, as once in the British Army, the officers came from one corps and the other ranks from a different organisation, and that to bring the two together was beyond the capacity of some SD branch in Moscow!

In the April 1878 Journal appeared a truly spirited account of how a force of 2,800 Turks, defending the mountain approaches into the Sofia Plain, fought to a standstill a Russian force of nearly 40,000 men. This small action illustrated just how a General with a firm grasp of tactics, and with the right qualities of personal leadership and powers of decision, can be worth some thousands of men. In this case the Turkish Commander was one General Baker, who, when as a Staff Officer in Aldershot and after a long career in the British Army – he had commanded the 10th Hussars – had been arrested for indecently assaulting a young woman in a railway carriage. He received a year's imprisonment and was cashiered. Baker subsequently entered the Turkish service where he certainly proved his true worth. He died some years later when in command of the Egyptian police.

In this series a recurrent theme has been how little the Journal of those days seems to have reflected the great achievements and opportunities then open to the Corps. The present reader must be fair, and not expect that an enterprise scarcely eight years old (although the *Professional Papers* had been published for some fifteen years) should have been a mixture of today's *RE Journal* plus *The Sapper*! For all that, it is unfortunate that so little impression is given of what the Corps, comprising, as it did, of NCOs and other ranks beside individual officers, was really like.

The Country, no doubt, still at that time looked to the Navy for its defence and salvation, and not at all to the Army. It could have been true that the professional background and training of the Infantry and Cavalry were inferior than, for instance, that of the Artillery and Engineers, and that despite the abolition of purchase (in 1870) the former were still considered to be mere amateurs and gentlemen, who involved themselves in Colonial wars but were not really essential to the defence of the Country. This might have given rise to a subconscious feeling of "who is interested in the Army anyway?"!

If the Engineers were, in fact, more professional (which they were) and their

social origins and outlook were more free of those overtones of class and snobbery, which came from the system of purchase, it is a pity that the Journal had to consist mostly of a string of secondhand reports and comment. Not that it was either snobbish or class-ridden - the Journal seems to have been just plain dull!

Be that as it may, many generations of sapper officers have, and no doubt will continue to approve of the decision at the 1878 AGM, to spend the balance of the Burgoyne Memorial Fund on a silver statuette for the HQ Mess. This was to be designed by the sculptor also responsible for the public statue in London. The alternative, to place friezes round the base of the statue depicting scenes from the life of Burgoyne, was rejected. How right they were!

An Ordnance Survey Division Officer 1925–30 Five and a Half Years on 25 inch to 1 mile Revision

BRIGADIER CEFTURNER CBE DSO

INTRODUCTION

A FTER two years of study at Cambridge and Chatham I was posted to the Ordnance Survey and was offered the alternatives of York or Bristol, the HQ was at Southampton. I chose York, a happy decision.

So, from September 1925 to December 1930, first in York and then in Edinburgh, I was in charge of what was called a Revision Division. In turn I was Division Officer "Three Division" and "Five Division", DO3 and DO5, for short. My official duties were almost entirely concerned with revising the 1/2500, approximately 25 inches to the mile, cadastral maps of the East of England and later, curiously enough, not Scotland but Lancashire! DO3 was based on York and DO5 on Edinburgh where the administration of some half a dozen field parties and the supervision of the drawing of plans, the computation of field etc acreages and the checking of parish etc boundaries were carried out. There were side-lines to the job as well.

About sixty men were employed in each Division, about half of them were serving Royal Engineer NCOs and men. The other half were civilians, many of whom had served twenty-one years in "the ranks". They could then, subject to satisfactory work, be employed until the age of sixty or sixty-five. With the chance of employment from boyhood, (as we started some of the staff at the age of fifteen I seem to remember), to retiring age, being on the Ordnance Survey offered a promising career for life, much sought after. It resulted in a high standard of men, with the inevitable occasional exception. These civilians had their own Whitley Council Lodges and provided my first experience of dealing with that form of Trades Unionism.

The earliest Sapper Survey unit was the 13th Survey Company and I commanded it as well, my serving soldiers being borne on its strength. These men whether they knew it or not, provided the nucleus for survey duties on active service and for that, had to be trained in topographical work at a smaller scale. "Revision" was a simpler though painstaking operation in those days with no air survey to help.

Occasionally, therefore, I and some of the men attended military courses, usually at Bembridge on the Isle of Wight, in the use of the theodolite and plane table with the odd more ambitious war time-type exercise thrown in. We also had to be able to use our rifles and so, once in three years, a fortnight was set aside for Drill and Musketry Courses to polish up our military knowledge. When on these courses we were, I believe, paid by the War Office who, through the usual channels, organised these affairs. Normally we were the servants of the Ministry of Agriculture and Fisheries who paid us. In fact subalterns received 1/6d (now 7p approximately) a day more than in a normal Sapper job. Small as this must now seem, it was an attraction at the time.

THE TASK

My task included travelling round the country by rail, with one's push bike in the guardsvan, or one's own car to visit the field parties who conducted their business on their own bicycles. The amount I spent on these journeys was limited to some £50 a year, (often exceeded), but the actual mileage paid was more generous than under War Office rules at the time. There were busy days in the office too when deciding on "progress" by each individual, ie, whether his work was expeditiously up to scratch! I had certain funds at my disposal to encourage fast and accurate work in the field and powers for deducting the revisers' emoluments. These provided a great incentive and occasional rancour.

Among the official assignments which came my way one resulted from an order to report on the County of Lincolnshire (in 1928 or 29), as regards the next revision of its maps. Revision of the 25 inch map had got sadly behind hand due to the first war and it was felt that only selected areas where considerable changes had occurred should be dealt with next time. I was given no guide lines but invented a method of my own based on the number of "improvements" I noticed on each 25 inch sheet when on a rapid drive in rural areas. In towns and their outskirts obviously there would be need for revision. I selected a "scale" of so many new buildings etc as justifying revision. I believe this was accepted at Southampton for other reconnaissances. Anyhow, I was later asked to report on the four Northern Counties of Scotland - a pleasant task in May 1930 when "Bill", later Lieut General Sir Harold Williams, accompanied me as a co-driver. He was on leave from India and in my Sapper batch. Traffic in those days just permitted one to drive along with a map board on one's knee and half an eye on the country on either side. One could go at one's own pace without upsetting other motorists. Travelling Allowance accrued in Scotland paid for our honeymoon!

Archaeology was part of my job in that any historic site, fort, castle, Roman Villa etc, came under scrutiny at every revision. Since the last one many years before, an archaeological officer had been appointed on the OS at Southampton. We were lucky that the man was as well-known in that field and as charming as was O G S Crawford. I understand that he and one or two other civilian officers – one a distinguished mathematician to help on geodesy etc – were much resented by the senior Sapper officers then at Southampton (now all dead). Crawford, in particular, felt this keenly and I hope our personal friendly relations showed that anyhow subalterns were prepared to work with "frocks". ("Frocks" being the term of disdain used in the first war by soldiers for politicians and other civilians they had to work with. We've come on a long way since, thanks be. In fact wearing plain clothes, except on military courses, made one very civilian-oriented).

This digression leads to how I became interested in the subject and carried my activities further than the routine check required for revision purposes. In fact I produced unofficially a new map of Roman York, as much excavation was being carried out in the 1920s. I made friends with Dr Kirk of Pickering, whose name is perpetuated in York as the Kirk Museum, as well as with one Ormerod, Professor of Roman Studies at Leeds University.

I found I had plenty of time on my hands to amuse myself and improve my military and survey knowledge. My letters home describe the many friends I made and interests I built up – not perhaps ones a normal army subaltern would indulge in – archaeology, church affairs, stalactites in limestone caves, railway bridge engineers and Quakers. Sappers were known as "Mad, Married OR Methodist". Gunners as "Poor, Proud AND Prejudiced".

I was determined to get into the Staff College. York and later Edinburgh being Command Headquarters, provided facilities for working for the examination. Thanks to the Shanghai Defence Force draining Northern Command of regular

AN ORDNANCE SURVEY DIVISION OFFICER 1925-30

troops, I found myself selected as a Brigade Staff Officer during three successive Territorial Army Infantry Camps. Although the regular troops returned mainly to Catterick within a year, I had established myself first as Staff Captain and later as Brigade Major to the 146th West Yorks Brigade of the 49th West Riding Division TA. I was fortunate in the two regular full colonels who commanded 146, Alan Hunter and M R Walsh – both *psc* infanteers. They helped me enormously towards obtaining, on my third attempt for Camberley, that one mark ahead of the next of some seventy Sappers who failed to get a competitive vacancy. (The brighter, if less studious, candidates got nominations.) Some people may think the time I spent on this private soldiering should have been better used on survey work. The Director General of the Ordnance Survey (Brigadier H St J L Winterbotham CMG, DSO, who came on the scene during the last of my 5¹/₂ years on the OS) disliked Staff Officers and resented the fact that I had achieved my aim. He took off the list every other Sapper on the OS who was studying for the Staff College.

But I did not hunt, as did most young officers in England – nor shoot much, ih Scotland. Moreover, I spent much time and effort on running unofficial courses in Topo Survey for my men. I had been particularly lucky to have been "lent" one summer to the War Office, to help Martin Hotine on his research into producing maps from air photos. This science was in its infancy. The year before he had introduced the "Arundel" Method of mapping from over-lapping vertical photos and achieved considerable accuracy. In 1927 he was anxious to see what errors would creep in when dealing with really hilly country. So photos had been taken in Scotland in Glen Clova and I joined him then as his "intelligent coolie" to help lump theodolites and aneroids up and down mountains and book his readings etc. Like many really brilliant brains he was absent minded about simple administration. I never forgot to order our packed lunches!

It was fascinating and I persuaded a friend in the RAF at Catterick in the Afmy Co-operation Squadron to take photos of an area in Yorkshire and later in Cumberland where I carried out "Arundel Methods" with the help of my NCOs and Sappers. Although I got permission from HQ Ordnance Survey at Southampton to run these courses and they were mildly encouraged, they were entirely outside what I was expected to do. They took up much of my spare time in organizing and, I hope, bore some fruit.

Finally, when in Edinburgh, I prevailed on the University authorities there to start a Survey Section in the OTC Engineer Unit. Their annual camp I attended on my leave, but I kept Southampton informed. In this venture I had adequate, if not very enthusiastic, backing from MI 4 at the War Office. Part of our honeymoon unfortunately coincided with this camp, which proved somewhat of a "busman's holiday" in consequence. My bride was wonderfully forbearing. Silloth was hardly a beauty spot to start married life inf

GENERAL STRIKE - MAY 1926

Everyman's Encyclopaedia: "Strike, The General (1926), sympathetic strike by the trade unions of Great Britain, undertaken in support of the Miner's Federation in their dispute with the coalowners. In consequence of the obviously unsound condition of the coal-mining industry the Government had, in 1925, granted the owners a year's subsidy to enable them to carry on without insisting on a reduction in miners' wages, at the same time setting up a commission under the chairmanship of Sir Herbert – later Viscount – Samuel to inquire into the state of the industry. The commission recommended on 6 March 1926 that a scheme of reorganisation of the industry be put in operation as soon as practicable. The Government subsidy was due to expire in May 1926, and the owners posted notices of this and of their intention not to continue to employ the miners thereafter except at lower rates, but they made no definite proposals until after the expiry of the notices, and then did not include any plans for substantial reorganisation. In consequence the TUC called a conference of its constituent unions and reported that it could see no alternative to a general

sympathetic strike as a means of furthering the miners' cause. The executives resolved that a strike be called as from midnight 3-4 May.

"The vast majority of the organised workers ceased work, though essential services were partially carried on by volunteers acting on plans outlined by the government in the light of the miners' strike of 1919 and the railway strike of 1920. There was a general absence of disorder, and no concerted attempt to effect a political coup. In the absence of newspapers the government took control of the radio, and issued a journal of its own, the *British Gazette*, whilst the TUC published *The British Worker*. Sir Herbert Samuel was invited to a negotiating committee – which included miners' representatives – to interpret certain parts of the report of his commission to act as mediator. The *Samuel Memorandum* was prepared as a basis of settlement and accepted by the TUC in the belief that it would be acceptable to the government, but when it was presented to the executive of the Miners' Federation they refused its terms, notwithstanding that it had the backing of its own representatives on the negotiating committee. The TUC, feeling that the other unions had gone as far as they could in supporting the miners, advised the executives of its constituent bodies to call the strike off, and it ended inconclusively on 13th May.

"The legality or illegality of the General Strike was widely discussed and Sir John Simon, in particular, put forward a closely reasoned argument for its illegality. This view found no general support amongst lawyers and the fact that it was considered necessary to make sympathetic strikes illegal by the Trades Disputes Act – repealed by the Labour Government in 1946 – appears to afford evidence that the General Strike was not contrary to law. It had involved over 2,000,000 employed persons and caused the loss of about 162,000,000 working days."

It was interesting being in the North of England during those historic days. The strike was in support of the miners already "out" on account of the owners threatening to lower their wages. It was before coal mines were nationalised. General "Tim" Harrington was GOC in Northern Command and must be given great credit for his statesmanship. Time after time he refused calls for military assistance from mayors and other authorities when things looked ugly. He realised that the presence of the soldiery might make things worse, at any rate at that juncture. But he had been reinforced with regular battalions as I personally knew. I was checking 25 inch sheets at Beverley when troops arrived in Aldershot and District buses.

But on my more mundane stamping ground I had to take certain action. In Fishergate House, my office, we kept the rifles belonging to the 13th Survey Coy. These I transferred to the safer keeping of a nearby unit. Then there was the question of isolated sappers revising, in uniform, in industrial areas such as Hull whom I moved to more rural parts. Jim Aldous was running a course on the Isle of Wight and I was temporarily in charge of his Norwich (DO4) Division. But I had complete confidence in a delightful, Irish, Division Sergeant there – CSM Boyd DCM. On another occasion he had behaved magnificently when that Office caught fire.

My biggest problem arose, towards the end of the strike, when a delayed order, CC910, (issued on 10 May) arrived from Southampton (on 13 May) regarding OS Civilians volunteering for other strike-breaking dutics. Skeleton services throughout the country were being kept going by undergraduates and other amateurs running railway trains, newspapers etc. The Director General wished that men on the Survey who wanted to take up other such national tasks should not only be allowed to but be encouraged to do so. In fact I was told to record on every civilians's confidential document, known as his Qualification Return, whether he had or had not so volunteered. Feeling among my civilian staff was obviously divided in its sympathies. Although I did not know it at the time, the Staff side of the National Whitley Council had instructed their members to do nothing outside their normal work. In fact I ignored the DG's circular (CC910 of 10 May). For one thing, by then there were plenty of volunteers. For another I sensed what ill feelings would arise over such adverse entrics in a man's QR. Leave was cancelled which led me disobeying another order! My Division Sergeant, another Ulsterman, heard that his mother was ill at home. I sent him off in plain clothes,

On a personal note, my mother was staying in a private hotel in York when the strike started. For some reason she had to get home. She missed the first opportunity, though her luggage got on a train. A day or so later I put her on the one-train-a-day going south which steamed in from Scotland. She shared a compartment with a stranger who turned out to be The Macintosh of Macintosh. As a precaution against possible stone throwing he had barricaded the windows with the seat cushions. It shows credit on all concerned that my mother recovered her belongings at Kings Cross.

As regards sabotage the worse incident on the railways during the strike occurred in Northumberland, near the (then) small town of Cramlington. A few weeks later, on my official duties, returning from Edinburgh, the strike over, our train crawled past the scene of the disaster as the repairs had not been completed. A stranger travelling with me told me the story, and a lot of other interesting things besides, which I have recorded elsewhere. My records show I was also Acting DO5, the Edinburgh Division Officer being away.

I reckon no other country could have survived such an ordeal without bloodshed or far worse disasters. But then when the police organised football matches against the strikers what else could one expect? I am glad that some twelve years after I was able to hear first hand accounts of the Invergordon Mutiny – an even more serious threat to the country – and able, after research, to clear the good name of my uncle Arthur Scott, whose battleship was one of the first to refuse to sail. Statesman-like à la Tim Harrington, he rebuked one of his officers who was about to draw his pistol.

REFLECTIONS

Looking back, it seems incredible that never once can I remember a telephone call to or from Southampton, even during the General Strike. There was one instrument in Fishergate House, on my desk. Routine returns to HQ were probably typed by the Division clerk, whose main job was concerned with the men's pay. Otherwise all correspondence was done in manuscript, much of it in DO (demi-official) letters. Dictation was unknown.

Memoirs

MAJOR-GENERAL W H OXLEY, CB, CBE, MC

Born 2 January 1891, died 23 January 1978, aged 87

WALTER HAYES OXLEY was an officer of very considerable distinction. Educated at Eastbourne College and the RMA Woolwich he was commissioned into the Royal Engineers in 1911. Most of his service in the First World War was in Egypt, Palestine and Macedonia, where he won his Military Cross.

In the Second World War, he commanded Infantry Brigades in Malta and Britain before returning to Malta in 1943 as its GOC. The war in Europe over he was appointed Head of the British Delegation to the Allied Control Commission in Bulgaria.

He retired from the Active List in 1948 and went to live in Charminster, near Dorchester, where he farmed and indulged in his hobbies of fishing and shooting. Friends and colleagues have written of his many qualities and of the support and charm of his wife. I was posted to the Training Battalion (TB) in 1934 as a newly married subaltern, when Oxo was CO. He and his wife were extraordinarily kind and hospitable to us youngsters. Mrs Oxley tactfully began the education of my bride in the duties of an Army Officer's wife, to the great benefit of many wives and families of subsequent generations who served under us. Later (? 1937) Oxo was promoted, and was duly "Dined-out" in the HQ Mess. I remember part of General Bond's speech. After extolling the well-known virtues of Bovril-so cheering, invigorating, stimulating, etc – he finished "..., and anything that can be said in praise of Bovril is equally true of Oxo".

АWК

What one remembers most vividly about Oxo was his boisterous and cheery laugh. During his term as CO of the TB at Chatham – when I was his Adjutant – the TB achieved a standard of smartness in every way comparable with the Brigade of Guards. Oxo himself set an example of soldierly bearing worthy of the Battalion he commanded – without ever losing his sense of humour.

ACS

Oxo had an infectious humour and was a keen supporter of us all and was much respected by all members of the Training Battalion.

JRCH

Serving in the Training Battalion at Brompton Barracks when W H Oxley – affectionately called Oxo – commanded it, was an experience not to be missed; and I was lucky enough to see this remarkable man from the vantage points of Acting Quartermaster, Party Officer, OC Shornemead Fort and OC "A" Company. He was a handsome figure, glittering with medals from the First World War. He had a gruff resolute manner and shrewd judgement; but geniality and humour were never far below the surface, and men instinctively liked and trusted him. He was a man of the world, at home with all types, so that everyone felt that whatever happened there was someone in charge who would see we were never "done down".

Oxo was an "outdoor" soldier. He was the supreme decentraliser; always alert, usually a step ahead of everyone else, never in a hurry, never ruffled; always, apparently, able to spare the time to listen to anyone who wanted support or help. He was constantly to be seen about, though he seldom interfered with what was going on there and then. He preferred, it seemed, to speak to you next time he saw you. He always showed he was proud of the Battalion, and we learnt to show we were proud of it too. There was not much going on that he did not know about; and when things went right he always saw you got a pat on the back. When the GOC came to see Shornemead Fort, Oxo came with him. Somehow, without apparently doing or saying anything, he contrived to arrange things so that I got all the congratulations. It was only when I thanked Oxo later that he said: "Well, I hope you remembered to thank your CSM". He said it in a gruff way; but somehow there was a delightful twinkle that made us both laugh. He knew the debt we owed to those magnificent pre-war Warrant Officers and NCOs. And he felt it part of his duty to ensure that I knew it too.

In those far-off days it was quite obvious that there would soon be another war against Germany, and that we had nothing like the right equipment with which to fight it. There was not much that we, in the Training Battalion, could do about that; but there was one thing that Oxo could do, and that was to see that regular Officers' Training Days were arranged, and that we were intellectually stimulated to think about how warfare should be conducted. Not for Oxo the lessons of the Somme, but the lessons of the *Blitzkrieg* to come. He instituted many original indoor exercises, and often he had them directed by quite junior officers – Captains or Lieutenants even – though he took pains to go through the questions thoroughly beforehand with the youthful Directors. He used to sum up himself at the end, and many of the lessons he brought out came true. I remember one in particular. We studied what would happen if the Germans, having defeated France, attempted to invade Southern England; and we found out for ourselves what I, for one, had never realised before –

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MEMOIRS

and I suspect many others had not realised either – namely: that the result would largely depend on which side won the air battle that must precede such an undertaking. Looking back on it, that seems to me a very enlightened view for a man who had probably never been up in an aeroplane in his life. But then Oxo was a most enlightened soldier.

Out with the Drag, Oxo was usually to be seen amongst the first two or three riders; for he rode in a straight and confident manner, imparting courage nd confidence to his horse as a good horseman always will. He could crack a whip, blow a hunting horn, or shout "View Holloa" with the simple assurance and flair of the genuine countryman. He was a good shot and one of the pillars of the Garrison Shoot (which, incidentally, made it much easier for Young Officers, who also went shooting, to get away punctually on shooting days); and he remained a keen fisherman to the end of his life.

As a subaltern, in about 1935, I was invited by the Oxleys (with their small daughter) to join a party in Scotland for a fortnights shooting and fishing; and there I made the acquaintance of another Oxo: the happy family man. Here, in the company of much older and more experienced men from several walks of life, the Oxleys made me feel entirely at home; and I look back on that leave as one of the many good experiences I owe to an outstanding Commanding Officer. I salute him as one of the best COs I was ever privileged to serve; and I rejoice that he and his devoted wife had fifty-seven happy years together.

MCAH

MAJOR-GENERAL I H F BOYD, CB, CBE, BA

Born 21 December 1907, died 6 January 1978, aged 70

IAN HERBERT FITZGERALD BOYD was educated at Fettes, went to The Shop in 1926 and was commissioned into the Corps on 1 September 1927, just getting the last vacancy. He joined 18 YO Batch, took a Degree at Cambridge and went to India in 1930. After an attachment to the Bengal Sappers and Miners he went to "Works" on the North West Frontier serving in Peshawar and Nowshera, and in the Mohmand campaign of 1933. After a Long E & M Course in UK he returned to India again. The outbreak of war in 1939 found him in UK on leave but he returned to Works in India. He suffered the mortifying experience of not being posted to a field company, at first because he had had no experience as a Subaltern in one, apart from his initial attachment, and later because he was allegedly too old for one. So he applied for, and got, a vacancy on a war course at the Staff College, Quetta, just before he reached the age limit. This got him no nearer active service as he was kept on as an instructor. In 1944 he was appointed CRE 459 Forward Airfields Engineers, which he took to Burma and led from Imphal down to Magure under 33 Corps, an experience far more to his taste.

Just before the fall of Rangoon he was flown back to India to plan the airfield part of Operation Zipper, the re-invasion of Malaya. He assembled and trained 472 Army Group RE, one of two AGRE's in XIVth Army, but the Japanese surrender came a matter of days before the Group embarked. He handed over 472 to its rightful commander (G A T Pritchard), who had been on special duty in England, and resumed command of his old airfield engineers before returning, in 1946, to the SME Ripon and became the first CI PRA at the SME.

In 1948 he started a run of AA&QMG in the War Office, Colonel Q (Movements) at GHQ FARELF, and DQMG BAOR in 1954. He was at HQ BAOR for the move from Bad Oeynhausen to the magnificent new camp at Rheindahlen, and also at the time when Western Germany ceased being an occupied country and regained her independence in 1955. Both events ensured a busy time for "Q", as did the despatch of units from BAOR to the Suez operation in 1956. He returned to the Far East as Chief Engineer in 1957, becoming a Sapper again to his great delight. He returned to Germany in 1959 to become Chief Engineer BAOR and Chief Engineer Northern Army Group, the latter appointment bringing him into close contact with the NATO and Allied Engineers. He was in fact, the senior engineer officer in Europe serving as such.

After retiring in 1963 he became Chairman of the RE Officers' Widows Society and later joined the Corps Committee as Chairman of the new Finance Sub-Committee.

An embarrassment of tributes have been paid to Major General Boyd, some edited extracts follow:

18 YO was a very small Batch – only ten of us – and Ian would never have made "Sappers" had not a couple of misguided oafs elected "Gunners". I often described him as "Bottom of my Batch, but by far the most intelligent chap in it!" I feel sure the remainder of 18 YO would go along with this assessment. After our first term at Christ's, I persuaded a slightly reluctant Ian to accompany me on an Officers' Christian Union Ski Party in Switzerland. He never really took to skiing, but he did discover a new and vital meaning to his Christian Faith. Later he told me that this fortnight had "changed his whole outlook on life." A year later he, in turn, persuaded two Sappers to join us on this same Ski Party (Denis Price and Ken Shepheard). Little did we dream that all four of us would one day retire as Major-Generals.

After Chatham our ways parted – Ian to India, I to Ceylon: he to fight under Bill Slim in the "Forgotten Army", I under Monty in the British Liberation Army. Many years later, Ian bragged to me about a very large bridge he had thrown over the Irrawaddy (365 yards long – easy to remember!) and I had to cut him down to size by reminding him that in the BLA we measured our bridges in miles (My Tync-Tees bridges at Rees were precisely a mile long!)

It was a great joy to me - to be teamed up with him again in our penultimate appointments - he as CE NORTHAG/BAOR and I as Chief of Staff NORTHAG (incidently Denis Price was also at HQ BAOR, and Ken Shepheard down the road as CCRE at Corps HQ). Ian was an outstanding CE of a NATO formation. A linguist; a born leader of men; an outstanding Sapper; and - perhaps above all - an enthusiast; he earned the greatest respect from his German, Dutch and Belgian Sappers.

Ian was a most likeable person, with a great sense of humour and a deep sympathy and understanding, and he never lost or discarded his early faith. I feel sure that, in the last great river crossing he undertook, a strong hand will have hauled him ashore, and he will have received that greatest of all commendations, "Well done, good and faithful Servant."

We - the few survivors of 18 YO - offer Dorothy and their three children and grandchildren our deepest sympathy in their loss of a beloved husband, father and grandfather.

RWE

Ian was a man of many parts. To hold down and carry out so ably the senior posts he held in the Corps required professional abilities of a high order and the personal qualities which made him stand out above his contemporaries. He was larger than life size, there was nothing petty about him. This showed when, as a GC at the Shop, he realised that there was fierce competition for the last few Chatham places. He had to show great determination to gain his commission in the Corps – there were only two marks in 20,000 between us in the end.

He was always great company, an intense interest in everything around was coupled with the ability to grasp the essentials and disregard the rest. A splendid sense of humour kept everything moving and he could laugh at most things including himself. To be invited to his and Dorthoy's home was a joy.

Always interested in sailing he became a fine seaman based on his early days cruising and racing on board *llex* or *Theresa* from Chatham. He did a lot for Corps sailings in Germany from the Forces Yacht Club at Kiel.

Ian always had deep religious convictions. As a young man he was an ecumenist at

MEMOIRS

a time when the meaning of that word was hardly understood. He was more interested in leading a Christian life than in the means of attaining it.

His interests after he retired were many. Besides keeping in touch with many Corps activities he was in business in London for some time, and very amusing about it, became Chairman of the local Conservative Association and was a keen and fine shot.

As a YO Ian radiated friendliness, good humour and sincerity, especially to two young Canadians whom he dubbed "the blackfoot". He had a happy knack of takingthings calmly, but not failing to take them in, and to get results.

From the Mohmand campaign of '33 I retain a vivid picture of Ian arriving now and then from Peshawar at our dusty road sites, in immaculate uniform and gleaming red car brimful of great bundles of five-rupee banknotes which he tossed nonchalantly to the SDO's for distribution.

I would like to pay tribute to two aspects of his life of many facets. The first was his dedication to the cause of the RE Widows both in controlling investment to keep pace with the fall in the value of money and in presiding over the Council of the RE Widows Society in managing the disbursement of the money so raised. At the time of his death he was engaged in setting up a new system to improve subscriptions and so increase markedly widows benefits. As a member of both activities I bear witness to the great loss that we all suffer from his death. The second is his love of shooting. Again, as a member of the Gravetye Shoot, his skill as a marksman and his enjoyment of each day in the country up to the Saturday before he died will be long remembered by all participants of a Shoot that he did so much to set up and to keep in being.

During my time as Chief Royal Engineer Ian Boyd was a Colonel Commandant of the Corps – Representative in 1969 – Chairman of the Finance Committee and Chairman of the Officers' Widows Society. That he should undertake such wide responsibility in Corps affairs – and distinguish himself greatly in all of them – showed just how deep a feeling he had for all aspects of Corps life and the personal responsibility which he believed he had to further its well being. He was particularly interested – and gifted – in financial matters and so his management of Corps Finances and the Officers' Widows Society was particularly successful. Ian, though lighthearted in his approach to all problems, was conscientious to a fault and never spared himself. We owe him a great debt.

Ian Boyd joined the Council of the Royal Engineers Officers' Widows Society in the Spring of 1963. Initially with his vigorous support and, within a few years, under his outstanding Chairmanship, the Society underwent a metamorphosis. From a traditionally invested Regimental Fund in a moribund condition it became an outstanding performer, international in its outlook, enterprising, entreprenurial, reflecting naturally enough many of the sterling qualities of its Chairman. Ever conscious of the conflicting calls upon the Society, from the needs of the elderly, to the changing circumstances of the younger officer, he coupled the qualities of compassion and understanding with a firm leadership.

It would be impossible to write an obituary of Ian Boyd that was not an eulogy, yet the latter would not endear itself to him. Fulsome in his praise of others, he was a modest man, full of good humour, tolerant of others mistakes but not his own. A friend to all who knew him, a Champion of the "Widows", he will be sorely missed.

Perhaps the only tribute he would accept, "A most efficient man."

BMA

DJW

CPJ

EWS

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RLB

BRIGADIER BE WHITMAN

Born 6 April 1903, died 26 February 1978, aged 74

BERTRAM ELLISON WHITMAN, "Whitboy" to his many friends, was educated at Blundells where he was awarded both Rugger and Cricket colours and was a school monitor. He passed directly into the Shop where he achieved a high enough place to be selected for RE and where his natural bent for leadership gained him the post of SUO and the award of Sword of Honour. He was commissioned in 1923. After two years at the SME he went to India and served with the QVO Madras Sappers and Miners until 1933 except for a six month spell as GE Bombay. Between 1933 and 1938 he did various jobs at home including Adjutant of the Depot Battalion where as one friend put it "he first befriended me when I was a young officer and whisked another off to a dinner and night out in town and a *Milk Train* return journey." It was this quality of interest in, and care for, those under him which made him such a splendid Regimental leader.

Returning to India and his beloved S&M he soon got command of 13 Field Company where the war found him. The Company was ordered to Malaya when the Japs were sweeping all before them. He protested vigorously at the folly of sending in good units to certain defeat and was told that the unit had to go but he need not! What a proposition to put to one of Whitboy's calibre. They suffered severe casualties and became very strung out. He refused to obey an order from a local Commander to retreat immediately with such men who were with him and returned to the front to try to extricate his partners. He failed in this and was captured with them. Being somewhat recalcitrant he spent much time in Changi jail and suffered more than most.

One day, when he was CE FARELF, he passed the Kuala Lumpur jail with a friend and remarked "I was in there for several weeks. They put me in front of a firing squad three times. They were trying – as I thought – to obtain information regarding explosive charges that had been laid by us and I refused to tell them. The third time, it occurred to me that all that they were wanting was knowledge as to how we laid explosives. So in pantomime I went through the motions of laying a charge and lighting the explosive, all in dumb crambo. They were delighted and that was the end of firing squads for me."

It speaks well for his morale and physical fibre that he survived this period to become Commandant QVO Madras S&M Engineer Centre, (where he was the last British Commandant), CE Salisbury Plain District, CE Cyprus and finally CE FARELF in rank of Brigadier.

The constant theme running through all this time was of his care for his subordinates, (though he could be tough with just cause but instantly forgave), and his intolerance of fools in high places – not an unusual characteristic of our Corps. He once told a C-in-C that whenever a General moved a unit unnecessarily and caused expense he should lose a medal.

During this period with National Service men on the strength of RE Units he made a point of knowing them all. Visiting the families of those on his staff and playing with the children was one of his greatest pleasures.

He retired to Clyst Hydon with which he had had a long association and lived in a flat at the Manor. When the Manor had to be sold he bought it to preserve the Hall and Manor for village use, he could not bear the thought of it being allowed to disintegrate or put to some unworty use. Before he died he was to see the new Village Hall in full use. A leading light in local affairs he was an active member of many local committees and for several years the Rural District Councillor for Clyst Hydon. He also took a great interest in his Old School. He was for some years on the Committee of the Peter Blundell Society and until his sight deteriorated he regularly visited Blundells to watch rugger and cricket matches.

What characteristics emerge from this picture?

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His great loyalty, to his King and his Corps, to his subordinates and his superiors, to Clyst Hydon and above all the Huyshe family and his beloved Manor. His courage in all circumstances. His subordination of self, kindness, love of children and interest in the young. He had twelve Godchildren and kept up with them. His scorn of shoddy actions. His love of manly sports and his zest for living.

He would not wish us to grieve, he would rather delight in our gladness at having known him, truly a "gentle giant".

ES de B, PVH, PAE, EEP

COLONEL G H VAUGHAN-LEE, OBE, CEng, FICE

Born 31 May 1900, died 18 January 1978, aged 77

IN the summer of 1941, having been sent to Iraq ahead of our Division to help with desert defences covering Basra, we became temporarily "spare" when, owing to a change of plan, all work was suddenly stopped. (They were in fact eventually built north of Mosul). C R E Shaiba therefore received the unexpected windfall of a "Madras" Field Company to help him with the building of a Base Area in his "parish" – a parish consisting of flat, scorching hot, sand-blown desert and containing the anachronisms of a tree-clad and well watered pre-war RAF Station, a fort of the Ottoman Empire, wherein were kept some of his engineer stores, and the ruins of a mud-brick tower reputed to have once been both the home of Sinbad the Sailor and a lighthouse in the days before the silt of the Tigris and Euphrates had put the sea-port of Basra fifty miles inland.

The CRE, for whom we laid water mains and built concrete shedding and who I was never to meet again while actively in the Corps, was a brusque but friendly and helpful, bristly moustached, red-faced officer called Vaughan-Lee.

In 1951 I did, however, meet the name again when on my long Civil Engineering Course. I was attached to the Westminster firm of Consulting Engineers, Coode & Partners, which his father, one of the Partners, had joined in 1889 and with whom he was destined to "clock up" seventy-one years' service before his death in 1960. Among the "Old Man's" wide range of engineering achievements had been many of the "between-the-wars" Nile barrages – when he had at times been mistaken for a German owing to the Egyptian and Sudanese habit of calling him "Von" Lee – and his son, who also joined the firm upon his retirement from the Army in 1952, was eventually to follow the "barrage" tradition.

It was also because of barrages that I joined the firm in 1962 to become Gerald Vaughan-Lee's "Staff Officer" – or in the parlance of Victoria Street "Partner's Assistant" – to deal with the contract administration for the six huge river headworks that were to form part of the Indus Basin Project, one of the largest irrigation schemes of all times. ("The Land of the Five Rivers" – *RE Journal*, December 1967).

He was still brusque, but equally still helpful and always prepared to listen to one's ideas – though not of course always to accept them. Working for him as I did, until his retirement from the firm in 1968, I was to get to know what an acute mind he had and to appreciate his skill in handling not only the technical and administrative problems of six major contracts, but also the volume of paperwork resulting from World Bank sponsoring and Pakistani Clients – each with their own general consultants – plus numerous contractors from numerous countries. All of the many problems he handled with speed and *panache* and at times with a touch of the old *Koi Hai* that betrayed his years of Indian service.

Two particular skills that always impressed me were his detailed knowledge on matters electrical and mechanical – what he had learnt on his far distant E&M Course had obviously stayed (he was also pretty shrewd on civil engineering) – and his, at times irritating, habit of being able to flick through a contract document and pick out the one printing error that, after hours of careful checking, I had missed. I am told that his father also had this disconcerting qualification.

Bluff and fair, easy to work for and no good at small talk so that at times I would be taken out to lunch with a visitor in order to spare him having to make any.

GH

LIEUT-COLONEL J B SUTHERLAND, DSO, OBE

Born 6 October 1904, died 6 May 1978, aged 73

JAMES BURLEIGH SUTHERLAND graduated from RMC Kingston in 1926 and took a commission in the Royal Engineers where he served until 1952 when he retired and returned to Canada.

In Canada "Birdie" was employed as a civilian officer in the Department of National Defence. He helped organize the Inspection Staff for the Works Service of the Royal Canadian Engineers where he remained until his retirement in 1963.

Birdie Sutherland saw more active service during his Army career than most officers can hope to experience. He spent most of his time with the Madras Sappers and Miners and following anti-terrorist service in Midanpore, Bengal in 1937 he returned to the Northwest Frontier where he won the DSO, while still a subaltern, in action under Brigadier Maynard CB DSO MC (RMC No 490). At the outbreak of WW2 Birdie was in Egypt with his Field Company where he served in the campaign which drove the Italians out of Ethiopia and later in the Western Desert before being recalled to India. Sutherland was on a reconnaissance of Abu Atol in the Indian Ocean as a base for the Navy, following the loss of Singapore, when the Japanese fleet swept into the Indian Ocean and were detected by another RMC Ex Cadet Len Burchell. Following this Birdie raised and commanded an Engineer Battalion in Burma until 1944 when he was selected to command a Beach Group for the landing at Singapore. VJ Day forstalled the invasion and Birdie was sent home suffering from malaria plus the effects of six years almost continuous fighting service.

For family reasons Sutherland refused a posting which would have given him promotion to Colonel and retired to Canada in 1952. Birdie died peacefully in his sleep fading away in the accepted manner. He is survived by one son and two daughters.

HAD

LIEUT-COLONEL R DINWIDDIE, MA

Born 21 November 1907, died 9 February 1978, aged 70

RONNIE DINWIDDIE and I passed out of the RMA Woolwich together in Robbie Ewbank's Batch (18YO) and were commissioned on I September 1927. On completion of our training at the SME Chatham and at Cambridge, where an honours degree was a necessity, we parted company as he chose a posting to India whilst I chose a Field Company in the UK. We next met in India in 1934 where he was serving with the Royal Bombay Sappers and Miners and I had recently joined MES Southern Command as AGE Poona. The following year we spent much of our long leave together hunting big game in the Melghat Forests of Berar, Central India. Then the next year, when he was serving on the NW Frontier and I had moved to the Additional Garrison Bengal, we went off on leave together to Japan where we all but got arrested on suspicion of spying.

Thereafter we lost touch until after the War. When we next met he had been a POW of the Japanese but with his broad smile, his fiery but kindly temper and his determination and his inward strength of character he had been able to survive unchanged the horror of the Far Eastern POW Camps and their sadistic guards. He

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actually finished the War in Manchuria!

I last saw him on 1 September 1977 when there was a reunion luncheon at Minley Manor for officers who had been commissioned from the RMA Woolwich fifty years earlier. He was then a sick man with a very bad heart but he was as interested as ever in current affairs and was still full of plans for the future. He was an exceptional man.

RWO

Ronnie Dinwiddie was a father figure to many Long Course Officers. As an RO in the RSME he "looked after" the students on attachment to Civil Firms. In conjunction with the Instructors he visited potential sites and firms and reported back, he negotiated accommodation for the students, he kept them up to date with the contents of ACIs and DCIs, he monitored their "travel claims" and showed them where they had underclaimed, he fought for their rights. They all had cause to be grateful to him.

He was a stubborn man: once convinced that an injustice was being perpetrated he would never give up. Right was right, wrong was wrong – there was no middle course with him! He worked directly to me for over six years – he drove me mad on occasions – particularly on motor mileage claims for others – but I wouldn't have had it any other way. You knew where you were with him and he was an able and loyal staff officer.

To Mary his wife, Angus his son and Janet his daughter go our deepest sympathy.

LIEUT-COLONEL R R L PETERS, MA

Born 13 October 1917, died 4 March 1978, aged 60

DICK PETERS died suddenly and tragically at Masjed-i-Suleiman in Iran: suddenly because his death was quite unexpected, and tragically because his life's work was far from complete. He had four separate careers, excelling in all of them. First and foremost he was a soldier and Sapper. Then he became an instructor in Mathematics at the REME Apprentices College at Arborfield where he could use his great talents in teaching young men to best effect, while at the same time playing a full and distinguished part in local Government as the Chairman of the Fleet Council. And fourthly he became one of the small band of latter day evangelists of the British way of life and traditional British standards when he took over, at the age of fifty-eight, the general administration of the Education Department of the Shah of Iran's Technical High School in Southern Iran. Fate, his own hard work and his high personal standards prevented him from completing any of these four careers as he would have wished. "Those whom the gods love die young."

Dick arrived at the Shop from Tonbridge in 1936 as the Jerdal Scholar in Mathematics, as a games player of repute, and as an obvious leader. He was perhaps unlucky not to have been made SUO; he was a very effective JUO and passed out tenth thereby winning his Commission in the Corps in the summer of 1937 and going on to Trinity Hall Cambridge for the university part of his YO Course. All his Batch were envious when, in the summer of 1939, he was selected to go out to Sierra Leone before war was declared and long before any other member of the batch had been posted. Unfortunately over-work in the difficult climate of West Africa, helping to establish the Cape Route to Suez, so damaged his health that it put him at a disadvantage in the scramble for post-war promotion. He felt his lack of operational experience so deeply that he left the Corps in 1960 to take up teaching. He first accepted the challenge of becoming a lecturer in Mathematics at Farnborough Technical College before moving to the REME Apprentices College at Arborfield where he taught for fifteen years. At the same time he threw himself heart and soul into the local affairs of Fleet. From 1963 to 1974 he and Anne, whom he married in 1941, provided the dynamic in the Fleet Council for which the people of Fleet will

always be grateful. He also became Chairman of the local British Legion Branch,

Two years ago he decided he must widen his horizons once more and go back to the type of life he had intended to lead as a Sapper. He joined the Millbank Technical Services to help develop technical education in Iran. Initially he was adviser to the Iranians in Mathematics, Physics and Chemistry. Within a short time he took over the Education Wing administration at the Technical High School, catering for 2,400 students. It was in this capacity that he made an enduring mark on Anglo-Iranian relations, welding together the two races, British and Iranian, in the true tradition of the Corps over the centuries. His wide teaching and administrative knowledge, his warm hearted desire to help the students and his unflagging energy did much to further this post-Imperial British enterprise in Iran and earned him the admiration and affection of both the British and Iranian staffs. He had just been asked to extend his tour at Masjed-i-Suleiman when over-work took its final toll.

Dick died, after a short illness, with Anne and their three children near him, and he was buried with military honours, as a distinguished Sapper, in the quiet cemetery at Masjed-i-Suleiman amongst earlier generations of Britons who had brought something of the British way of life to Iran. His epitaph was spoken later at his Memorial Service in Fleet by the Vicar of Fleet Parish Church where Dick and Anne used to worship, and where he was Sidesman for many years:

"My abiding memory of Dick is of his essential integrity and goodness. He was someone who never did a shabby thing in his life. His word *was* his bond. He was someone who could be trusted completely. He was a hard worker, giving a fair day's work for a fair day's pay, and expected the same of others. He was too a very modest man and that is always the case with great men and women ...".

WGFJ

MAJOR P H GORDON, CBE, MC, MA, CEng, FIEE, Finst Pet, DL, JP Born 6 December 1916, died 28 March 1978, aged 61

PAT HUNTER GORDON was killed in a car accident near Fort Augustus, Invernessshire on 28 March 1978. Pat was one of those genial and open-natured people who are liked and respected wherever they go, and he will be particularly missed by those who knew him at Chatham and Cambridge before the war. His contemporaries at that time – whether at the "Shop" or as a YO (he was commissioned in August 1936) will hold his memory in particular affection.

Pat retired early -in 1950 at the age of thirty-four -but in the very best traditions of the Corps, his subsequent career was long and distinguished. He returned to his native Scotland, where he made his name both in business and as an honoured public figure. For his public activities he was awarded the CBE in 1976, and in 1975 he became the prospective Conservative candidate for Inverness-shire.

Pat joined a Field Company after his YO Course and was awarded the MC in France in 1940. After further war service in the South Pacific and a period on the E-in-C staff in the War Office, he went to the Staff College, Camberley, as an instructor. It was from this latter appointment that he retired to join the family welding business in Inverness, of which he later became Chairman and Managing Director. During his time, the firm expanded considerably and became an exporter of specialised welding machines to many parts of the world. He took an active part in organising the orderly development of oil-related industry in the North. His public activities included being Chairman of the Highland Region of the Scottish Council (Development and Industry) and for many years he was a member of the Highland District Committee of the Scottish Board for Industry. He was a member of the Forestry Commission's Regional Advisory Committee for the North of Scotland, the Nature Conservancy Committee for Scotland and the North of Scotland Hydro-Electric Board. In recent years he also became well known for his active, and

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successful, campaign to develop the A9, in particular for crossing over the Beauly, Cromarty and Dornock Firths. He was a Deputy Lieutenant and a Justice of the Peace.

His very considerable abilities, together with his integrity, sense of humour and concern for others made him into one of whom the Corps can well be proud. His loss will have been felt by many, and our sympathy especially goes out to his wife, Valerie and his four sons and two daughters.

MLC

Book Reviews

TANKS AND OTHER TRACKED VEHICLES IN SERVICE

B T WHITE

(Published by Blandford Press Ltd. ISBN 0 7137 0851 4. Price £3.95)

THIS latest addition to the Blandford "Mechanised Warfare in Colour" series describes and illustrates most of the important tracked fighting vehicles in service today.

A brief introduction, drawing the attention of the reader to some of the problems encountered in the design of a modern armoured fighting vehicle, is followed by sixty four coloured plates illustrating sixty four vehicles used by some twenty countries. A description of each, (sometimes with cross-sectional drawings to give an indication of the interiors), is supported by appendices on camouflage and comparative data in tabular form.

The author (who has six previous books on tanks etc to his credit) admits to problems on what to include and exclude. He has however included the FV180 Combat Engineer Tractor and the Chieftain Bridge Layer (AVLB Chieftain Mk5), which are of particular interest to the Corps, and the remote controlled "Wheelbarrow" miniature tracked vehicle used to help deal with terrorist devices.

It is essentially a handbook for the student of the contemporary military scene and for the enthusiast model maker but many more will find it very interesting and readable.

EEP

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IRON DIVISION The History of the 3rd Division Robin McNish

(Published by Ian Allen Ltd, Shepperton. Price £3.50 from HQ 3 Armd Div, BFPO 106, plus 60p P & P for addresses outside BAOR, or £5.95 at booksellers)

WHEN one reads that a Staff Officer, who is neither an author nor an historian, has been "tasked" to write the history of a division of the British Army covering a period of 168 years, with the additional limitations of cost, which means space, and time, which means research, the mind boggles at the possible end result.

Let me assure potential readers, however, that the result is most successful and that Robin McNish is to be congratulated on producing a story which gives the real smell of battle by drawing heavily on first hand accounts, some obviously published for the first time. Historians will be exasperated by passages quoted without attribution, and absence of a bibliography; but they must remember the author's aim "to produce a book which would interest and inspire present and future members of the Division". In this he has fully succeeded, especially with the high proportion of space devoted to excellent maps, reproductions of orders, letters, prints and photographs.

This is a unique story in that none other exists which tells that of a division of the Army, albeit with no official continuity beyond a chance number from the time it was first created to the present day. It gives a most interesting worm's-eye-view of the campaigns in the Peninsula, Waterloo, Crimea, Boer War, 1914/18 War, 1939/45 and the operations in the Canal Zone, Port Said, Cyprus, and Ulster, as seen through the eyes of the commanders and soldiers of headquarters and units of the 3rd Division; in the case of the Boer War this view is very limited owing to the disasters which befell it. It also gives a unique account of the close liaison established with 38 Group RAF in the variety of air-portable roles which the Division was given during the last quarter of a century in both training and operations.

There are perforce minor omissions and errors in a work such as this and it is a pity there was not time to seek advice from more sources to correct such mistakes as "2nd/58th" on p 16 which should be "2nd/83rd" and "Spry's" on p 17 which should be "Barnes's" etc as well as the description of the original 1940 divisional sign on p 6 which is incorrect. A secret memorandum entitled "G H Q Corps and Divisional Signs" published in 1940 described the 3rd Division sign as "Three adjacent black triangles on a red disc", hence the appearance of an inverted red triangle in the centre, and this is shown correctly on p 165 on Montgomery's car pennant; it was adapted later for wearing as a shoulder flash in the triangular form shown on p 6, which will continue to be worn by the new 3rd Armoured Division in Germany.

The Commanders who have shaped the Division, such as Picton, Haldane, Montgomery, Rennic and Stockwell, naturally figure prominently, but it is appropriate that the Commander of the Iron Division, who leaves an abiding impression, "Bolo" Whistler, should himself have come from a regiment nicknamed "The Iron Regiment".

PSN

BRITAINS ARMY IN INDIA FROM ITS ORIGINS TO THE CONQUEST OF BENGAL JAMES P LAWFORD (Published by George Allen & Unwin. Price £7.95)

THE late James Lawford was a regular Indian Army officer and a Cambridge History Graduate. He was finally a lecturer at the RMA.

This is not strictly a book about the British Army in India as the title implies but rather a study of the campaigns fought by the East India Company's Army in the seventeenth and eighteenth centuries. Opening chapters are set in Moghul India with its powerful Portuguese influences and featuring the rise of the Mahrattas as a force to be reckoned with. One is reminded of the significant French influence on the development of the very disintegrated India of this period. The East India Company seemed to make sensible efforts to avoid conflict with France at first but ill-considered Naval operations in 1746 caused the European War to spill over into India. Thereafter the reader is taken through a series of battles in Southern India and in Bengal culminating in the firm consolidation of British power in the three Presidencies.

The author has a somewhat concentrated and detailed way of describing operations which
BOOK REVIEWS

requires pretty intense reading. Nevertheless, the descriptions of the battles of Plasscy and Wandewash are excellent. There are also several classic illustrations of the dangers of misunderstanding and downright obstinacy between Naval and Army officers which were probably exaggerated by the current communications difficulties.

This is not an expensive book by present day standards. It has been carefully written by a learned expert on the period and those interested in Indian History will find it well worth reading.

DJNG

COMMANDOS AND RANGERS OF WORLD WAR II JAMES LADD

(Published by Macdonald and Jane's Publishers Ltd, London. Price £7.95)

JAMES LADD is a military historian specializing in amphibious warfare. His Assault from the Sea 1939-45 (reviewed RE Journal June 1976), was well received partly because of his devotion to accurate research but also because of his ability to write fascinating accounts of exciting and strategically important events.

Amphibious raiding techniques were developed from the experience gained by British (including Australian!) Commandos, American Rangers, US Marine Corps Raider Battalions and other Special Service Forces in world-wide actions. Although the aims, training and operations as well as the methods, weapons and special equipment are described and explained the book is mainly about the people involved.

In this type of book the big problem for the Author is how to present the material. James Ladd has combined a geographical and chronological technique which works well as the story is supported by clear maps, organization diagrams and photographs and each chapter is preceded by a background setting to give proportion.

In the Foreword Earl Mountbatten writes:

"Today we are used to the daring exploits of 007, James Bond, but the story of these gallant raiders, Commandos, Rangers and those associated with them, is even more exciting and gripping, for these were real men facing real dangers. It is time their story was told and James Ladd has done it well."

Whom am I to disagree with his assessment?

EEP

LABORATORY WORK IN CIVIL ENGINEERING SOIL MECHANICS BRIAN VICKERS (Published by Crosby Lockwood Staples. Price £3.95)

As most young civil engineering graduates and technicians will remember, the lectures they attended were well supported by numerous texts. Laboratory work was not so supported. This book is the first of a series designed to fulfil this need. The series is designed to give the student the opportunity to study his laboratory work in advance as it will provide adequate associated reading matter and theory to put the tests in context. The author has been concerned with the teaching and development of civil engineering courses and for the last ten years he has played a leading role in the development of a Soil Mechanics laboratory. He is currently a Senior Lecturer in Civil Engineering, specialising in Soil Mechanics and Foundation Engineering, at Bolton Institute of Technology.

The aim of the book is to meet the needs of students reading civil engineering. Each chapter outlines the theory and the purpose of the various types of test; followed by the procedure and explanation of the equipment used. Each test is summarised and its value is discussed.

The book achieves its aim and in addition provides a useful quick revision for the graduate and technician who is a little rusty because of "long service in non-engineering appointments". EEP



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