

THE ROYAL ENGINEERS JOURNAL

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- Subject. Articles should have some military engineering connection but this can be fairly tenuous, especially if an article is well written and interesting.
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Editorial

THERE always seems to be an imperative to change things, often it seems for the sake of it, although there are times when change is necessary because the facts used to develop concepts and plans have altered. In everyday parlance, the goal posts have moved. Well, they certainly have as a result of the Strategic Defence Review, which has set out to define more clearly the role of the armed forces in the 21st century and to redress some of the imbalances that exist in its present structure and capability. There is much to be done to achieve the transition to the new strategy so the time is past for any new initiatives and let us hope it is "steady as she goes" from now on.

In echoing the words of the incoming president of the Institution of Civil Engineers, Roger Sainsbury, in his inaugural address, steady as she goes does not mean standing still. There is a need to have time to put into practice the initiatives already agreed. The philosophers and dreamers have had their day; now it is the turn of the engineers to make it all work!

The concept of close support engineers was introduced in the 1980s when a possible confrontation between Nato and the Warsaw Pact countries was still taken seriously. Events since then, notably the Gulf War and Bosnia, have shown that the threat of high intensity conflicts is ever present. "Close Support Engineers Continued" follows up the article in the August 1998 *Journal*, the author making some observations, in his inimitable style, on close support doctrine based on his considerable experience gained during a tour at the Combined Arms Training Centre and elsewhere.

Some of us have a belief that, given sufficient funding, emerging technology can crack any problem. Frustratingly, in the field of mine detection, there appears to be no easy answer. "Developments in Mine Detection", written by a Sapper now working in industry, emphasizes the requirement to interface technology with the operator on the ground and also points to the need to have a long term and sustained approach to the problem, if there is to be any chance of an effective solution.

The RE TA has taken a leading role in forming the new Civil Affairs Group established in April 1997, and brings to it considerable professional knowledge of engineering. "Extended Military Role for Engineers in Bosnia and Herzegovina" describes how the work of the Civil Affairs Group is being put into practice in the reconstruction of a war-torn country.

"Some thoughts on Wider Peace-kceping and the Key Role that Military Engineering Plays" is a well-researched article by one of our younger officers. We need to encourage more of them to write. A bit of persuasion by COs would not go amiss.

Military engineers in countries within Nato have always had common bonds which have transcended any differences in language and equipment. "German Corps of Engineers: New Tasks, New Challenges" is an authoritative account of the way German Engineers have evolved since the unification of Germany to meet the new challenges facing them. We have a lot to learn from each other.

Few Sappers are better known than Gordon. Kitchener - and Blashford-Snell! Whilst the latter is best known for his intrepid expeditions to the far corners of the world, both the former captured the imagination of Victorian England with their brilliant military exploits in far flung outposts of Empire. All are mentioned in this Journal, "The "Cult" of General Gordon" relates how much Gordon was revered in his time, whilst the book review of the latest biography of Kitchener is itself an excellent portrayal of one of the most distinguished of all our great military leaders. "The Kota Mama Expedition 1998", although not about Blashford-Snell, is a tribute to his inspiration and leadership in encouraging young adventurers and young scientists to take on new challenges and find out more about the world we live in.

As the impact of the Strategic Defence Review makes itself felt, the New Year will no doubt bring more challenges. The Corps is well placed to meet them, to bring its influence to bear on the Army as a whole (many Sappers are now in key appointments in the corridors of power) and to go on from strength to strength.

The editorial staff join me in wishing you all a very Happy Christmas and a prosperous New Year.

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Engineer in Chief

BRIGADIER A E WHITLEY CBE ADC



BRIGADIER Albert Whitley, who assumed the appointment of Engineer in Chief (Army) in September 1998, spent his youth playing rugby, climbing mountains and serving with the Commandos. In one of his two troop command der tours he was lucky enough to command Condor Troop RE in Arbroath. He completed

three operational tours in Northern Ireland and four winter deployments to Arctic Norway. He served at grade 3 staff in HQ 3 Armoured Division and HQ 3 Commando Brigade RM separated by a tour as 2IC 5 Field Squadron. After attending the Army Command and Staff Course, Camberley, he was posted as Deputy Chief of Staff G4 UK Mobile Forces, a job for which he was appointed MBE. Command of 5 Field Squadron in Iserlohn, Germany, followed providing close support to 6 Air Mobile Brigade, subsequently 6 Armoured Brigade. He became a member of the Directing Staff at Staff College in 1991 following which he commanded 26 Engineer Regiment until its disbandment in May 1994. This was the last of four tours in 26 Engineer Regiment. He then became Assistant Chief of Staff G3 Plans HO Allied Command Europe Rapid Reaction Corps (ARRC). This latter appointment was devoted to planning for Bosnia and Herzegovina, first the Vance Owen Peace Plan, then the NATOassisted withdrawal of the UN forces and finally the Dayton Agreement and the subsequent deployment and year-long employment of ARRC in Bosnia. He took over as Chief Engineer HO ARRC for the last month of the ARRC's tour in Bosnia. As Chief Engineer he planned both of the major Corps warfighting field training exercises post Bosnia.

He was appointed CBE in January 1997.

Brig Whitley is married to Jutta and they have a nine-year old son.

His interests include sailing, tennis and military history.

Brig A F Whitley CBE ADC Engineer in Chief p172

Close Support Engineers Continued

MAJOR M W WHITCHURCH MBE



"Sticky" was commissioned from the ranks in 1979. His early service was with mechanized and armoured engineers leading to a wonderful second tour as Training Major in the expanding 32 Armoured Engineer Regiment as the "Close Support" concept emerged. Service in the Gulf War was followed by command of the Berlin Field Squadron. This led to a splendid tour at the newly formed Combined Arms Training Centre where he was able to help train a wide part of the Army. It was while at this delightful place that he was recommended for appointment to MBE. He is now thoroughly enjoying himself as Regimental Second in Command of 22 Engineer Regiment when he is not reading history, writing articles, skiing or doing battlefield tours.

This article extends the discussion given by Jonathan Welch (August 1998) and Chris Sloan (December 1997).

THE STORY SO FAR

BOTH Chris and Jonathan wrote their thoughtprovoking articles on how we conduct close support. The following is a reaction to those articles and seeks to improve our theory and practice of close support. By this I mean practical improvements in our organization, leading, equipment and training. It is aimed at all readers both serving and otherwise in the hope it too provokes more discussion which improves military engineering in the close support role – that is within the division and brigade.

NOTE NO 33 – COMMAND OF ENGINEERS WITHIN THE DIVISION

"Sans Doctrine Les Textes Ne Sont Rein"

CUBUENT Doctrine (or theory) contained in the note mentioned above, which evolved in 1994/95, provides a welcome explanation on how we command engineers in a division in the post-Options Army. For those who did not serve before 1990 be in no doubt that a regiment supporting a brigade is a lot better than a squadron. The reality of a "brigaded" squadron was that it worked well enough except for two problems. First, when additional RE came into the brigade, the brigaded squadron HQ became very overworked (and sometimes ineffective). Second, the OC was never able to get out and grip the squadron because he had to accompany the brigadier as well as help out in brigade HQ. Having lived (and suffered) under the old system I commend current practice.

Let us look at the first contention.

WHAT GROUPING SHOULD A SQUADRON HAVE AND CAN IT SUPPORT MORE THAN ONE BATTLEGROUP?

For those who do not have access to TD Note 33 the key paragraphs are printed here:

Paragraph 7

"The close support engineer regiment commanding officer will decide engineer groupings according to the factical plan and the brigade commander's main effort. Although there are many permutations, some of the principal options are as follows:

 Using close support squadrons compassed of both armoured and field troops.

b. Deployment of pure armoured and mechanised field squadrons to undertake specific tasks under brigade command.

c. Grouping armoured or field troops under TACOM of battle groups for more general tasks.

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Maj M W Whitchurch MBE Close Support Engineers Continued p173

However, the most common groupings, unless operations dictate otherwise, will be for one armoured engineer and/or mechanised field troop to be placed under TACOM of each battlegroup with the remainder of the armoured engineer squadron under OPCON of the brigade. The mechanised field squadron may conversely operate as a complete sub-unit also under OPCON of the brigade. Groupings could also include other elements such as Vehicle Launched Scatterable Mine System, plant and combat engineer tractors".

Now, Jon Welch considers paragraph 7 to be flawed. Let us therefore review it by going back to fundamentals.

WHAT WE ARE ABOUT

OUR role as Royal Engineers is to change the face of the battlefield to suit the commander's aim. Readers will know that to achieve this a wide mix of tasks are undertaken, including fighting if need be.

HOW WE OPERATE

ROYAL Engineers have to go where the work is. By doing so we observe six of the ten immutable principles of war: Maintenance of the aim; offensive action; concentration of force; cooperation with other arms (and services); flexibility and economy of effort. Here arc some examples: In 1995, 35 Engineer Regiment from Hameln left 20 Brigade and went to the Former Republic of Yugoslavia for some four months (now this regiment was in addition to those already there). By contrast 5 Field Squadron left 1 Brigade for six months to serve as infantry in Belfast from 1997 to 1998. Finally G3 (or G) snobs will note that 6 HQ Squadron was sent to Kenya in the construction role in 1998.

Deduction? Royal Engineers go where the work is.

YES, BUT WHAT ABOUT THE BATTLEFIELD? "Organisation adapted to circumstance." (With apologies to J F C Fuller.)

I CONTEND that from the foregoing our organization of RE work across the brigade will be driven by the same standard factors: the commander's aim; the operation or phase of war; the ground; the enemy's form; time; space; weather and state of own forces. With these general factors each specific problem has to be considered. A little thought shows that there would be occasions when the brigaded regiment (in defensive operations) could work its squadrons independently. The field squadron is on the obstacle plan whilst the armoured engineer squadron is forward with the screen and guard. By contrast (in offensive operations) where a deliberate attack over an obstacle is involved, concentration of armoured engineers in one squadron with the field squadron following on with route improvement may be the best plan. It was thus at Le Havre in 1944 and the Siegfried Line in 1945. On the other hand it may be that mixed squadrons in an advance phase against a poor quality enemy that is disorganized (like the Iraqis in 1991) may be best. Own force casualties (and aged Chieftain's that break down) will also be a factor.

CAN A SQUADRON SUPPORT MORE THAN ONE BATTLEGROUP?

FIRST, look at the factors listed above and you will see that a squadron may well have to support more than one battlegroup. Again G3 (or G) snobs should note that the brigade has the services (brigade support group, or brigade admin area as it was known), possible artillery (field, locating and air defence) formation recce and aviation. Now they may all need RE support at some stage. This point emerges on any brigade trainer and certainly on a field exercise. For example, 5 Field Squadron had a troop plus working in the brigade support group for nearly three weeks on the 1 Brigade exercise this year whilst its parent squadron was elsewhere. In defence it may make sense to allow a field squadron to work across two ground-holding infantry battlegroups (fixing) whilst the armoured engineer squadron is supporting the armoured and armoured infantry battlegroups. It is the armoured and armoured infantry battlegroups that will need to manoeuvre in order to strike the enemy. So what about the new armoured brigade with its one RE squadron to each of its three battlegroups? Again look at the factors together with a specific problem in mind and maybe this will work. Equally remember that other elements of the brigade may have a higher call on the Sappers and regrouping will be needed. Mechanized brigades certainly have to support more than one battlegroup because they have three infantry battalions as well as all the rest. I have deliberately kept clear of peacetime establishments, grouping and stationing as it merits special consideration and is worth separate discussion.

In answer to the question, it is thus too much to say that a squadron cannot support more than one battlegroup: it did so before 1990 and it may well have to again. That said, one squadron with its effort supporting <u>one</u> battlegroup has a relatively simpler task and possibly more tempo should other factors permit. **Deduction:** The CO's estimate (appreciation as it was called) decides how his regiment is organized for work in the brigade. **Proposal:** That *TD Note 33* should be re-written to show:

"The close support engineer regiment commanding officer will organise his Regiment in relation to the factors of role (construction or combat engineering or fighting as Infantry), enemy, ground, time and space, weather, own forces including Commanders intent), and the operation or phase of war.

a. Using close support squadrons

composed of both armoured and field troops. b. Deployment of pure armoured and mechanised field squadrons to undertake specific tasks. c. Grouping armoured or field troops under

TACOM of battle groups for more general tasks. However, the most common grouping, unless operations dictate otherwise, will be for one armoured engineer and/or mechanised field troop to be placed under TACOM of each battlegroup with the remainder of the armoured engineer squadron under OPCON of the brigade. The mechanised field

squadron may conversely operate as a complete subunit also under OPCON of the brigade. Groupings could also include other elements such as Vehicle Launched Scatterable Mine System, plant and combat engineer tractors."

The abiding principle remains that engineers go where the work is in accordance with the higher commander's intent.

BUT HANG ON STICKY, WHAT ABOUT THE PROBLEMS CITED ON PROCEDURES AND REGROUPING?

JONATHAN Welch justified why a squadron cannot move across a battlegroup: because regrouping is too cumbersome and because battlegroup procedures are too specialist.

Let us first consider regrouping

REGROUPING

Yes, it is difficult. So why do it? Because casualties may force you to regroup; or because of the way the Commander's plan has emerged; or to give someone else a rest; or because of what we



Dated Royal Engineers derivative struggling to keep up with up-to-date tank.

are about as Royal Engineers. So when do we regroup? First, avoid it if you can and do it only if you must because it is never as easy as it looks despite practice! Second, if you must do it, as a rule of thumb do it before an operation or afterwards but try not to do it when everything is happening. Study it and practise it. Strict drills using Army Unit Standard Operating Procedure (AUSOP) No 201 can make it more effective and timely. But how many readers have read, or even used AUSOP 2012 Exactly, very few. Let me offer two characteristics of war fighting from military history: "it is always a muddle" and "anything takes longer than you think". So if this procedure is taught and practised it will do much to make regrouping easier.

A COMMON APPROACH PROMOTES COOPERATION, FLEXIBILITY AND TEMPO

It is essential that battlegroups have common drills and unit standard operating procedures, both for the benefit of the battlegroup and for their supporting arms. Here is why: first, the realities of peace and war make for a constant turnover of individuals. In peace it is the turbulence known to us all. There is perhaps even more turbulence in war. A common AUSOP allows newcomers to be absorbed (and groups too) so they can more easily co-operate with others. It was this logic which caused Generals Farndale and Bagnall to force standardization onto the Army in the early and late 80s. The current AUSOP and the *Tactical Aide Memoire* are the result and they really do work! I

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Nice ancillaries, dated chassis, no firepower: a critical weakness,

would argue that non-standard procedures are confusing in peace and lethal in war. "Does this not cramp a battlegroup's style?" I hear you ask. Perhaps. But the limit must be that "I Loamshire" may fight as they wish provided it is done within the common framework. The litmus test is that a newly regrouped squadron can be absorbed with minimum difficulty or fuss. Like it or not war will make you regroup so you must have standardized procedures. For example, the Royal Dragoon Guards did just this in Suffield this year and it actually worked well. If these methods are not liked then change them through the chain of command. Peacetime soldiers, secure from the realities of war, should ask how they will get on when over half the battlegroup has just been replaced after a nasty battle. Along with this they have been regrouped to a new brigade. Not convinced? Then look at the histories of the two regiments cited by Jon Welch, From 1944 to 1945 1 Dorset and 2 RTR actually changed by over 50 per cent. Add turbulence with other arms and a standard common approach is the key. For another example look at the Wehrmacht and note how their common approach and standard drills resulted in some serious success. Consider this statement:

"The German is very, very quick about sorting himself out –forming new buttlegroups. This is helped by his training, which is uniform throughout all divisions". General Oliver Leeve, 1942

Finally, remember how both the Falklands and the Gulf wars brought together those who had never served together in peacetime? It will happen again. A look at the current operational tour plot proves this too Deduction? Regrouping will have to take place. It is greatly helped by the common approach of current AUSOPs which must be studied and practised. For not to do so would negate the six principles of war, which would increase the chances of failure.

So How MIGHT WE DO IT?

LET us discuss other aspects of *TD Note 33* using the "functions in combat". Here are some further ideas and thoughts.

Command. Jon Welch provided some useful points for anyone who is training in close support. He also

had a good point when he criticized the modus operandi for command and control of battle group engineers (BGE). Consider the following extract:

"COMMAND AT BATTLEGROUP LEVEL Battlegroup Engineer (BGE)

This amount of engineer support allocated to a battlegroup is not fixed and will vary significantly depending on the type and extent of engineer tasks. However, a BGE, an experienced Royal Engineers captain, will be permanently under OPCOM of battlegroup headquarters. He acts both as an engineer adviser to the battlegroup commander and also as a liaison officer of the close support engineer regiment commanding officer.

BGEs are not yet formally established but, in the meantime, officers will be found to fulfil this function from existing establishments of the armoured engineer and incchanised field squadrons. On operations their command status changes and they cease to have any affiliation. Their command chain is direct to the battlegroup commander, whilst their technical control leads directly to the engineer commanding officer at the brigade main headquarters. Whilst this clearly defines their command status, they are also available to act as a liaison officer for any engineer squadron commanders in exercise of their technical control over their own troops placed in support of the battlegroup.

The BGE is not the commander of the engineer assets placed in support of the battlegroup, but he may relay orders to them and Coordinate their activities in much the same way as the battlegroup operations officer controls the activities of all battlegroup components on behalf of his own commanding officer.

In his capacity as the liaison officer for the engineer commanding officer, he will keep the engineer operations cell at brigade main headquarters informed about

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current engineer operations, anticipate engineer requirements, bid for engineer resources, coordinate the regrouping of assets to and from the battlegroup and pass important information obtained by the engineer recee troop elements in support of the battlegroup close recee troop or platoon. He will also assist the battlegroup commander in planning operations and advise him on engineer priorities in addition to carrying out terrain analysis in support of the IPB [intelligence preparation of the battlefield] process.

The BGE will be required to speak on the engineer regimental secure command and the engineer squadron nets. Although the battlegroup command net will be monitored through a speaker, there may be a requirement to change to it for a specific operation and when this occurs communications will be maintained with the engineer regimental headquarters via the BGE's own SCRA [single channel radio access]. He will be assisted by his own AFV 436 vehicle crew and also by a SNCO or experienced JNCO to guarantee 24 hour manning.

The BGE's AFV 436 will normally form part of the battlegroup main complex. If the battlegroup commander deploys with his forward headquarters, then the BGE should be prepared to accompany him but this may be at the expense of his planning and co-ordination functions. In addition this would be difficult to achieve until he has an improved vehicle with the required mobility. If a squadron commander is attached to a battlegroup, he would accompany the battlegroup commander, normally leaving the BGE back at battlegroup main.

Role of the Engineer Squadron Commander. The need for engineer groupings to be tailored to meet any number of different options, means that it will not always be possible to maintain the accepted engineer chain of command: regimental commander, squadron commander, troop commander. It is, therefore, important to understand the role of the engineer squadron commander and the difference between command and technical control. When a 'single' troop is placed under TACOM of a battlegroup, it is commanded by the commanding officer of the battlegroup, with technical control being exercised by its parent squadron commander and the BGE acting as the link.

When more than one troop is placed under TACOM of a battlegroup, it may be necessary, but not mandatory, to appoint a squadron commander as the battlegroup engineer commander, particularly if the battlegroup is on the brigade main effort or has some other key function requiring increased engineer effort. It would also be normal for the squadron commander, in his hard rover, to accompany the battlegroup commander should he deploy to his forward headquarters, as well as taking part in any recces.

Again, when more than one troop is placed under TACOM of a battlegroup and a squadron commander is not available (there are normally only 2 in a close support engineer regiment to cover 4 battlegroups), the usual option is to accept that the troops are independently and directly commanded by the battlegroup commander."

This is too complicated for war and could be improved. My proposal is that the OC commands his whole squadron. He fights his squadron across the boundaries of two or more battlegroups and wherever RE work takes him. The BGE does as the OC requires. This keeps command simple and direct. Each OC must have two BGE parties which he deploys according to his CO's plan. This simple method gives the CO fewer points of contact and therefore makes him more effective. Can't be done? Well, 25 Engr Regt used this method of command: RHQ in HQ 12 Armoured Brigade and two squadrons out and about on a full divisional exercise in 1982 and it worked well. I would argue that the BGE is a high powered (and invaluable) liaison officer who is part of the OC's command team. Proposal. Jon Welch is right. Rewrite paragraph 8

making command at battlegroup level simple: one simple (and accepted) chain of command. The fog of war will not allow the current system to work.

INFORMATION AND INTELLIGENCE

TD Note 33 needs considerable improvement on how RE recce contributes to our role on the battle-field. Consider what is said in the note:

"Moreover, the recce troop is an effective and versatile asset, which would normally be placed under OPCON of battlegroups in support of their close recce troops and platoons. At times, however, elements of the troop could be tasked direct from regimental main headquarters or placed in support of an engineer squadron for a specific operation".

I argue that this is missing a key requirement of the CO and misses the whole purpose of RE recce. Equally the statement causes much confusion in practice as borne out in the discussion at the current three divisional engineer study days.

Let me explain: a key to any commander's success is the ability to obtain the best information (albeit incomplete), make a timely decision, and see that his command obeys that decision. Information – decision – action.

Now, every level of command (regimental – squadron – troop) must have this "information – decision – action" system. Why? Because the CO's information system (his own eyes, his RSM, his own HQ and his recce) will work to get him the best information for timely decision and action. If the CO is looking 24 hours ahead (and he must) then the squadron with its recce is looking 12 hours ahead and the troop about 6hrs ahead. Without this <u>anticipation</u>, RE work cannot be properly planned, organized or conducted. It follows that each level must have its own system if tempo is to be achieved.

But how does RE recce support the close recce? Let us be clear: RE recce is there primarily to get information for the engineer commander and may or may not work in conjunction with close or formation recce. It is not an adjunct to the RAC or infantry. Put another way: don't confuse integration with co-operation. For those who ask what formation recce is at brigade level, remember that when the cogency of the Gulf War emerged, 7 Armoured Brigade was given a medium (now called formation) recce squadron almost immediately after being warned for war. The new mechanized brigade will have a recce regiment. I predict that when the next war comes, any formation will insist on formation recce. This recce works for the brigadier. Our regimental recce works for the CO. It is not handed over to "support" battlegroup recce under normal circumstances, as stated in the TD Note.

STOP! DON'T LET THE HERETIC CONTINUE ...

By now many readers will be cross. "It's not what we do in barracks or at BATUS," they may say, But, please consider what I call the "small army syndrome": we have an Army that rarely acts above battlegroup level and consequently the true use of a close support regiment within its brigade is simply not seen, or understood. That we cannot exercise a whole brigade fully (neither on Salisbury Plain nor in Poland) remains a serious deficiency. How that deficiency is resolved is beyond the scope of this article, but exercise a whole brigade we truly must, because when we do, the dangerous and misleading practice of placing regimental recce under OPCON of BGs, as in BATUS, it will be shown to be bad practice. It may be that recce will have to be regrouped because of particular reasons but I suspect that no commander will release his recce without careful consideration. Some views from history may help. Napoleon had a system which was his "directed telescope". Recce was part of this. Consider too a view from Field Marshal Wavell:

"Two-thirds of the reports which are received in war are inaccurate; never accept a single report of success or disaster as necessarily true without confirmation". Recce must therefore confirm. Moreover it is the RSM's or CO's "own eyes" and recce which will provide firsthand information and which will always be more accurate than secondhand reports. Play the game "Chinese whispers" and the point is understood. Perhaps information and command is best summed up by Field Marshal The Lord Carver who said:

"The correct position of a commander in battle is where he can get the best information most accurately and most rapidly and from where he can get his orders... most rapidly and accurately to the critical point and it will depend on the type and stage of Battle"¹.

PROPOSAL

THAT the bit on recce is replaced with this passage:

"Recce in the regiment is organized at three levels: regimental, squadron and troop. In order to achieve tempo, each level of command has its own information-gathering system which allows timely decisions to be made. Recce at all levels helps to do this. It is stressed that RE recce has the primary role of gathering RE information. Clearly it is also responsible for other information but RE information is key. The system may or may not work with other arms according to the standard factors."

MANOEUVRE

WE are the guarantors of mobility. It really is a disgrace that our Corps still has Chieftain with no replacement until 2006. What that future replacement should be and what it should have is worth an article in its own right.

This vital matter must be gripped much more quickly than is being planned. The simple drill 4 of *TD Note 29* is an example of the value of drills and standardization described earlier. What is needed is an RE drill which covers all the business of armoured, field engineers working with recce, and A-Echelon. Jon Welch is quite right when he states that once one crossing is opened another must be developed as soon as possible.

Studies of the Le Havre assault and the Siegfried Line demonstrate how much muddle within one's own troops, and interference by the enemy, will cause crossings to fail.² As a rule of thumb three attempts for each successful crossing

¹ See the British Defence Film Library Video Tapes: C1404 and 1405. These tapes are titled: *Command of Armour*. Made in 1978/79, they are a valuable record of the experience of Field Marshal The Lord Carver, from his time as commander of 4 Armd Bde in WW2. His instruction is a **must** to study.

² See the battlefield tour guide Le Havre. Available from the Corps Library.

are essential. The laser exercises called TESEX (tactical engagement simulational exercise) also show this to be necessary.

Field Marshal Wavell once characterized war as "Wasteful and muddled". In an opposed crossing he was spot on! I commend a detailed look at Le Havre – it demonstrates all of this. Studies of the Iraqi obstacle belt in 1990 highlighted the need for more than one crossing although it was never attempted (phew!). Examples of failed crossings are plentiful in history. And, I can think of no exercise on Soltau, Suffield, or Salisbury training areas where single crossings were sufficient.

PROTECTION

I ENDORSE everything that Jon Welch describes under this heading. I make a case for deception; Sappers can make an excellent contribution to this. My squadron was able to simulate a battalion and provoke an American brigade to attack it in the Weser valley in 1993 using the techniques Jon described. It works best in the two-sided exercise, and benefits can be gained from a wellrun review afterwards.

Two other major worries need highlighting. Our all-arms air defence has been eroded since the Falklands war. No longer can we practise active air defence with the few machine guns we have left. Remember: what you do not practise you cannot do. Equally watch any video on the Falklands war and you will see how an enemy with air parity can make life hard. All-arms air defence is a lost art and our forefathers would be shocked at the current practice, or lack of it. Not our problem? Then, dear reader, you have either not done it or studied it

Equally, digging and fortification is a lost art and useful exercises like the *Bombard Op* at Larkhill, or bringing in fire close to troops dug in, really does get soldiers to realize the vital need to be able to dig. I am working up a solution and hope to return to these pages in 1999.

FIREPOWER

FIREPOWER is a function which our Corps has disregarded. We need firepower for two tasks: to protect ourselves and to help us to fight both as Sappers and Infantry. Let me expand.

Protective Firepower. Arming RE vehicles achieves two things: it gives Sappers the ability to hit back or take offensive action thus increasing their chances of survival while attempting to complete a task. I propose that every RE AFV should have at least two 7.62mm and one 12.7mm machine guns. Not to have these is foolhardy.

Soldiers in the Chieftain AVRE and CET in the Gulf felt uncomfortable not having their own weapons. Amazingly they (along with AVLB) still don't. This cannot be right and the laser exercises (TESEX) show this to be so. Remember, an enemy that is not neutralized or destroyed will destroy key vehicles like ours. Look at the Israeli equivalents and you see what I mean. They also sport 60mm mortars which deal quite nicely with the dismounted guided weapon threat. May I also propose that RE vehicles have a smoke generating system like US and Russian vehicles: something like the T72 which pushes out huge amounts of smoke with a little diesel. Why? Remember RE vehicles breach or bridge a feature which a quality enemy would register or cover with fire. Therefore every measure to protect the Sappers whilst carrying out a task is key. Equally there is no doubt that escorting dismounted field engineers can do much to protect AFVs but that depends on the standard factors of enemy and ground. What about the Royal Artillery or Infantry mortar firepower? Because RA concentrate their effort on single targets by regimental and divisional fire missions this means that someone (like us) will not always have the protective fire support that we need. Thus tempo will be reduced. To this end a "get you on" pack of private artillery is required. Here I would propose that both RAC and Infantry battlegroups are equipped with a platoon of nine 120mm mortars such as the Royal Ordnance Armoured Mortar System, Imagine 3 Armoured Engineer Squadron advancing with two battlegroups and 812 (812!) targets listed as predicted defensive fire shoots which are designed to neutralize any position which our own troop weapons cannot neutralize. If there is no manoeuvre without fire then in close support there must be no sapping until fire support is ready to go.

What about fighting as RE and Infantry? Our forefathers used firepower as Royal Engineers. They called it siege warfare and it meant that we could demolish enemy fortifications or whatever from behind armour. This was seen with the Petard in World War Two and last seen with the 165mm gun. It is a reflection of the ignorance of the realities of close support engineering that our 165mm was removed. We need this capability back on the next AVRE. Those who disagree need consider this: you are the reserved demolition



The excellent 120mm armoured mortar system, a weapon which could save a lot of Royal Engineers. (Photograph courtesy Royal Ordnance Plc.)

guard at the Reimagen bridge in 1945 – how would you guarantee its demolition? Equally how do we contribute to fighting in built-up areas without a 165mm gun? This really needs a separate discussion and I will attempt to pen a few thoughts nost year.

Proposal: That protective firepower for all vehicles is reviewed without delay.

And Infantry? In every campaign bar one we have served as Infantry. Yet nowhere is there a doctrine on what we ought to do in this situation. The last was in *Engineers in Battle in 1953*. How do we plan, organize and conduct this role? What equipment do we need or otherwise? What you don't practise you cannot do so how do we do it? This merits serious and urgent study and we need a 1998 version of *Engineers in Battle* Not convinced? Then took at any TESEX, Sappers invariably end up as Infantry at some stage. They usually get in a muddle, are not very good and lose a lot of men. A simple doctrine taught and practised would help.

Proposal: That TD Note 33 has an Annex on how Sappers fight as Infantry.

ADMINISTRATION

Jox Welch covered this function very well. I offer two points. Our REME are splendid and work hard to keep our ancient kit on the road. One German artificer who I was talking to last year was just amazed at how they keep going. The case for a Challenger 2 RE fleet is irrefutable when looked at from a REME point of view.

My second point is to reinforce the value of the HQ Squadron. I have served for one year as 2IC of 22 Engineer Regiment and am amazed at what 6 HQ Squadron has achieved in the way of soldiering (and fun). Their job has variety, challenge and enormous scope. From Kenya, Canada, to France and all over Blighty 6 Squadron has had a quality of

soldiering that many would not believe! Those who are considering what squadron they wish to command please look carefully at HQ squadrons; there's more to them than you think. With the right establishment, a HQ squadron could achieve much more.

Proposal. That the HQ Squadron establishment is improved without delay.

CONCLUSION (AND A CHALLENGE?)

I ASK (challenge?) readers to react to this (reactive?) article on any area with the idea of improving the close support function of military engineering. Those senior gentlemen of 79 Armd Div are asked to give their opinion as well as those who are serving.

Let Field Marshal Montgomery have the last word:

"Let us take stock and examine the problems. We must be clear about it otherwise we shall go wrong in our training. If our "thinking" is wrong our "doing" will be wrong. As we train our formations and units so they will do in bantle".

> Lieut General B L Montgomery Minley Manor October 1940

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"The Heathen Chinee is Peculiar"

LIEUTENANT COLONEL P O M CHITTY MBE

Very rarely will man squarely push the logic of a fact to its ultimate conclusion in unmitigated act. Kipling

IN 1949, and fresh from Sandhurst and a young officer's course, my first engineer task was to build a POW cage to hold the fleeing nationalist troops of Chiang Kai Shek as Mao's communist forces reached Hong Kong at the small border village of Sha Tau Kok. The urgency of the build was such that the cage was literally just that -a cage with a water standpipe, but food was promised.

The actual frontier lay across the middle of the main, and only, street in the village, there being no obvious border markings, but that was not my problem, as an infantry company was positioned there. Too soon, the infantry was temporarily moved elsewhere on the border, and the safety of the Colony lay in my capable hands.

The first 100 or so nationalist soldiers we took in offered no problems. They sat placidly in rows or chatted up long lost cousins through the wire. But far from the numbers tailing off as the last defeated stragglers should have come through, they kept increasing, until even recognizably formed units appeared, were disarmed and joined the rest for rice and recuperation.

Soon it was clear that these newcomers were wearing red patches on their sleeves, but by now I had disarmed quite a proportion of the communist 4th Field Army. Radioing HQ, I was told to return all the communists to China. Easier said than done, as by now they too were enjoying their first hot meal for weeks. Reluctant as the communists might be to leave, their red patches identified them.

With my all too recently Sandhurst-acquired confidence in my powers of command over disciplined and professional British troops, dealing with these dispirited and defeated Chinese amateurs would be child's play. The interpreter announced my first edict through the loud-hailer, "Anyone wearing a red patch is to report to the camp gate for return to China". My sergeant audibly groaned. Off came the patches.

Patches are one thing, but uniforms... The communist uniforms were of a slightly yellower colour, and so I could use them as my face-saving fallback. "Anyone wearing light coloured uniforms..." He groaned again. Off came the uniforms.

Not just communist uniforms, for to be on the safe side, first some of the more faded nationalist uniforms came off; then more; then all. This mass divesting reached heroic proportions, and soon to make themselves really unidentifiable, all underclothing was removed. A mass strip had started and within minutes the cage was littered with mixed and multi-coloured clothing and held about 300 stark naked men secure behind the privacy of four strands of barbed wire.

There might have been ways of separating the sheep from the goats. Some were visibly relishing the proximity of so much nude male flesh, and these I forcibly repatriated down the main street, throwing some mixed clothing after them. But then what? By careful selection perhaps I could have reduced the population crisis in China by transferring it to Taiwan?

Mercifully the infantry company commander returned. He was now responsible, not me. "But why", he asked, "are they all naked?" "They've been promised showers when you returned Sir!" My troop sergeant smiled for the first time since I joined the troop.

The "Cult" of Gordon

MR JAMES RATTUE, ASSISTANT CURATOR, ROYAL ENGINEERS MUSEUM



James Rattue was an assistant curator at the Royal Engineers Museum from 1994 to 1997, and now works at Wycombe Museum in High Wycombe,

He has long been interested in the relationship between history, culture, and material culture. The life of the Royal Engineer "soldier-saint", Charles George Gordon, is ideal for looking at this relationship.

"A nation-wide cult ... for which the only precedents must be sought in the middle ages." (Elton 1954; 431)

ON 26 January 1885, the walls of Khartourn, which had been besieged for months by the army of the Islamic leader, the Mahdi, were breached and the city's governor, Major General Charles George Gordon, was killed, Gordon was a prominent philanthropist, christian and occasional religious pamphleteer, and in some quarters a truly unreasoning faith had been placed in his abilities both as a military commander and as an imperial administrator. His death prompted an outpouring of grief and self-condemnation in Britain with blame falling on the Gladstone government which was held to have acted too tardily to save him. Within months the public view of Gordon had gathered folkloric elements which brought him to the brink of popular sainthood, an impression which intensified as the century drew on, and which only died away slowly thereafter. The legends surrounding Gordon, and others' attitudes towards him, bear striking resemblances to the beliefs and practices associated with his medieval counterparts.

GORDON AS IMPERIAL SAINT

WHAT sharply differentiated Gordon from other military heroes was the way his martial virtues. were imbued so heavily with the odour of sanctity. Within a month of the fall of Khartourn the Rev H M Butler, Headmaster of Harrow, was preaching a sermon in the school chapel and the Chapel Royal (which was published under the title *Right dear in the sight of the Lord is the death of His saints*), and stated quite openly "We are today full of the memory of one who was both a hero and a saint." Nelson, he admitted, had been treated by the lower orders with "touching idolatry", but this was of a very different order from the reverence rightly due to the moral and spiritual exemplar that was Gordon (Butler 1885; 8, 11).

Gordon's holiness was endlessly remarked on by his contemporaries. "Warrior of God, man's friend Thou livest in all hearts" declared Tennyson. In 1885 the Birmingham medallists and button makers. W O Lewis, issued a commemorative medal and described Gordon as "the Latest Christian Martyr", but left unclear whether they thought blame was due more to the diabolical Mahdi or to Gladstone. The British Museum holds four of these medallions and more are present in the Royal Engineers Museum in Chatham, Birmingham City Museum and the National Museums of Scotland in Edinburgh, "Treason, foreign and domestic, gave "To England's worthiest son an unshunned martyr's grave", wrote G W Rusden. "The record of his noble, saintly life",

Mr James Rattue - Ass Cutator RE The 'Cult' of Gordon p182 stated Lieutenant Colonel Seton-Churchill some years later, "Is still teaching many of our countrymen valuable lessons", and he subtitled his biography of the great man "A Christian Hero" (GGC400: 14; Seton-Churchill 1895: 261). Gordon's unconventional Anglicanism could appeal to other religious groups; Roman Catholics copied his notes on Cardinal Newman's The Dream of Gerontius into their own copies, and later editions were printed complete with these annotations (Anon 1991).

The more casual this image of sanctity became, the more extreme its expression. Five years after Gordon's death, one

writer lamented the fact that his "precious relics" had not been recovered, while Jeanette Fothergill, one of many poets who published odes soon after the fall of Khartoum, wrote that "Where his ashes lie is hallowed ground". This lyricism did not lessen with time: in 1909 Marie von Worst wrote from Khartoum that, "Season after season, the garden perfume and the Sudan perfume surround the place like a fragrant cerement, or swing like a perpetual censer before Gordon's memory" (Haines 1890: 130-131; GGC400: 16, 46). The attitude that Gordon was doing God's work dated to before his death: printed sheets were distributed to churches asking for prayers for his endeavours in the Sudan in 1883 or 1884 (GGC400: 16).

Nor was Gordon's martyrdom solely a matter of his Christianity. His command of foreign armies and his efforts, as Governor of the Sudan in the 1870s, to curb the slave trade had brought him to symbolize the reforming authority of Europe against the barbarity of native societies. G W Steevens, with Kitchener's army in 1898, looked across to Khartoum and felt that "in that forlom ruin, in that desolate acacia, the bones of murdered civilisation lay before us" (Steevens 1898: 312).

Modern writers have echoed the language of sanctity, but almost casually, without drawing out its implications. Gordon is described as "a sacrificial victim to a callous government ... a martyr whose death was its own victory"; and for Collini the famous painting by Joy showing Gordon haughtily awaiting death on the steps of the Governor's Palace in Khartoum is "the celebration



Place-names commemorating Gordon in Kent.

of Gordon as imperial saint, blending white mastery with New Testament humility; it would not be out of place among more canonical illustrations from Victorian devotional literature" (Johnson 1982: 302; Collini 1985). The notion reaches its (somewhat blasphemous) apogee in the plaque commemorating him in Khartoum Cathedral, which states that "Through his martyrdom, peace and security were established" (Anon 1942: 19), thus drawing the parallel with Christ not only in the manner of his life and death, but even in the redemptive quality of that death.

The words "too late" were the singular chant of the Gordon cult. The refrain first seems to occur in a poem, "Chinese Gordon", published in the the *Pall Mall Gazette* in February 1884 and composed, according to John Tyndall, by a "Scottish working man". Here the phrase refers to the possibility that the hero might have been sent to the Sudan "too late" to clean its affairs up, but it had changed emphasis by the end of the year. In September an anonymous rhyme appeared in *Moonshine*, a satirical journal, addressed to the "Prime Minister of England, whose watch is always behind time", stating:

Heaven grant that your "only General" (Sole bulwark of the State!) Write not at the end of the story The sharmeful words "Too Late"! (GGC400: 8)

Three days before the Fall of Khartoum a letter to the *Guardian* from "a Liberal, but first a Christian and an Englishman" used the phrase, and thereafter



Photograph of Gordon, (Original photograph held in Royal Engineers Museum.)

it proliferated. "Too Late! How it strikes on the ear like a knell", wrote "E.W.L." in a tributary poem: and the words appear again in "A Souvenir of General Gordon", published in Nottingham in April 1885. "Too Late" occurs on a monument at Redford in Kincardineshire, visited by Sir Charles Watson on 22 April 1886 (GGC400; 33, 9, 16-17); and the famous drawing in *Punch* by Tenniel, showing Britannia shielding her eyes in despair as Khartoum falls, etched the phrase into the public consciousness. It even appears on the commentorative medallion made by Lewis's.

The other commemorative items carry the same mixed messages of sanctity and heroism. Doulton produced a series of jugs which landed Gordon as "Hero of Heroes" and these feature a relief portrait with suitable accompanying texts. They were issued very soon after Gordon's death; both the RE Museum and the Willett Collection, Brighton, hold examples. Demand was great enough for them to be reissued in 1895 and 1902, while another jug, possibly earlier, commemorates Gordon's exploits in China (Eyles 1975: 74). McInnes of Glasgow produced another medallion commemorating "Chinese Gordon", examples of which are held in museum collections in Edinburgh, Oxford and Birmingham, while there was at least one Staffordshire china figure of the hero, and another copying Onslow Ford's memorial statue showing him seated on a camel,

This was also copied in plaster and bronze (pers. comm from Mr L Syson and Stoke Museums; GGC357, CHARE 8201.1). There were marble and plaster busts made, and Gordon appeared in a series of cigarette cards and even on a bookmark. More unusual are the printed versions of Gordon's "last message", which were commercially produced and which are often stated to be original. The RE Museum has several copies (GGC51, GGC195; CHARE 8804.9), and one was offered to it in the mid-1980s from as far afield as the Museum of the Royal Military College, Canada (RE Museum file M3/16.10). Possibly the most whimsical commemorative piece is a Victorian glass sweet iar in the form of Gordon in a fez (Wallis & Wallis catalogue, sale 252 (1979) lot 111).

As well as being commemorated in material objects, Gordon's name was also perpetuated in the built environment. There were official memorials, such as the Gordon Boys' School in Woking, Boys' Homes in several places, and a statue in Trafalgar Square designed by Sir Hamo Thorneycroft. However the less formal commemoration in minor place names is perhaps more interesting, "Gordon" street names are common in north Kent, as the map shows; there are two in Gravesend, several in the Medway area, and four in the Victorian seaside resort of Margate. Chatham has a Khartoum Road and Whitfield a Khartoum Square, while there are pubs bearing Gordon's name in Gravesend, Rochester and Chislehurst; he is also the patron of barracks in Chatham and cottages in Borden.

Whereas events in a medieval saints life would be marked with chapelries and holy wells, those in Gordon's were signified in other ways. Plaques pointed out his association with the house in which he was born in Academy Road, Woolwich, and Fort House, Gravesend, where he lived for some years; there was also a tablet in the schoolroom in Gravesend where Gordon held his "Ragged School" for poor boys, with a bust nearby in public gardens. A memorial window in St Alphege's Church, Greenwich, commemorated his baptism there in 1833, and another in Manchester Cathedral retold the story of one of his celebrated acts of philanthropy, when he erased his name from the great gold medal awarded him by the Chinese government and sold it for money to donate to the appeal for those in poverty as a result of the cotton famine. In 1910 Alderman Wise paid for a window in St Luke's Church, Southampton, which showed Gordon taking Communion as he had done while staving at

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5 Rockstone Place with his sister; and the Vicar of Heavitree, Devon, Prebendary Barnes, commemorated his friend with a tablet on a street lamp, which came to be known as "Gordon Lamp". There is even a plaque in the mess of Hyde Park Barracks to mark the fact that Gordon ate his last dinner there before departing for Khartoum (Hutchinson n.d.: 2; Anon 1983a). More general memorials not linked with specific events are common.

In the passage quoted from above, Marie von Worst called Khartoum itself "the Tomb of Gordon" (GGC400: 46) and the fact that his body was never recovered enabled the construction of what were in effect cenotaphs. The monument in St Paul's to Gordon by Boehm was in the form of a tomb, and the reverence paid to it we shall turn to later. Several members of the Gordon family, including his sister Augusta, are buried in a tomb in Southampton, but it is the General who appears more prominent than anyone physically there: his name is on the tomb, with the legend "Slain in Khartoum" (Hutchinson n.d.: 2)

We have already touched on the stories which arose round Gordon, but those of the sale of his medal and the Ragged School are entirely factual and it is difficult to categorize them as "folklore". There are other tales which fit the description rather more easily. While in China it became a point of marvel among Gordon's troops in the Ever-Victorious Army that he never went into battle carrying anything more lethal than a small cane. In fact Gordon was ready to use his revolver when the situation called for it, but he was aware that his demoralized and disorganized mercenary army would be inspired by a show of bravado (Pollock 1993: 65). However the story was relayed to Britain and came to symbolize his steady bravery and total reliance on God for his security and safety. And with God on his side, what could Gordon be but invincible - even in death? He was speared as he came to inspect his troops, a German, Herr Fricke, told a Daily News reporter, "with his stick in his hand. He never carried his sword, not even whilst fighting" (GGC400: 9). Haines mentions "the little cane he always carried into battle", and the memorial window in Greenwich shows Gordon carrying Bible in one hand and cane in the other (Haines 1890: 133). The cane will make another appearance later on.

Most of the legends, however, grew up around Gordon's martyrdom. At first there was a tendency not to believe in his death at all. "To this day", wrote Egmont Hake, one of the less florid of his early biographers, "There are many whose faith in his infinite capacity of resource is such that they have not brought themselves to believe that his disappearance is anything other than temporary, and that he will not one day return unharmed". He rubbished this idea thoroughly, but could not resist adding that "such a reappearance, as of 'a reappearing star', would be in perfect consonance with the glorious romance of Gordon's past and the surprising qualities of his genius." (Egmont Hake 1885: 214). In 1893 an Arab called Habib Salman was still claiming that Gordon was alive, and that Khartoum had in fact fallen in November 1884 (Anon 1983b: 8).

To insist on Gordon's survival was somewhat eccentric, though, and since he was as serviceable dead as alive attention was also paid to the manner of his death. Could not his body at least be recovered? C R Haines considered that it was a national disgrace that no effort had been made to regain the "precious relics." A supposed Greek witness of the murder, Demetriou Giorgio, related how:

Some say Gordon was cut up in little pieces, but others relate that they embalmed his body and took it to the Mahdi. There were bodies cut up; but I am inclined to believe that these were the bodies of the Consul and doctor, not Gordon's (CHARE 8107.10.11).

The occasional recovery of objects which could be linked with Gordon from Dervish armies kept this belief alive. In 1887, for instance, a British Army uniform case (CHARE 4801.98) was captured by Lieutenant Colonel Chermside RE from a group of Dervishes and found to be full of Arabic documents. Such discoveries enabled people to continue hoping that the hero's body might still remain, embalmed for the Mahdi to gloat over.

But the key legend of the Gordon Cult concerned his death itself, about which nothing was known for sure. The whole nexus of ideas about imperial Christianity coalesced around that single act, depicted in Joy's painting, the image of the hero awaiting his fate, Christlike, passive but unyielding, at the top of the Palace steps, while the heathen horde swirls below. This image was not predominant at first. "The stories I have quoted as to the circumstances of our bereavement are but so many in a hundred", stated Hake firmly. "All agree as to the fact of death; [but] no two are alike in detail; none is of unimpeachable authority' (Egmont Hake 1885: 214). Bordeini Bey suggested Gordon was speared, having turned from his attackers with an attitude of lofty disdain;

Demetriou Giorgio claimed he was killed after surrendering his sword; while Herr Fricke described him being murdered while he came to inspect the defenders of the city. Hake preferred an account which had Gordon fighting his way across from the Palace to the town square. By 1890 it was even being said that Gordon sat in a chair waiting for the arrival of the Mahdist army, and met his death in that way (GGC400: 9; Haines 1890: 130-131). It is difficult to suppress the thought that this story is borrowed from Livy's account of ancient Roman senators awaiting the invading Gauls in the same manner. Douglas Johnson has argued that Bordeini Bey's account was eventually preferred, despite its dubiousness, because it fitted beautifully the image of the Christian martyr which had already been established, and that this dominated public thinking until relatively recently (Johnson 1982: 28). When pilgrims came to Khartoum they sought the steps where they were told the hero feil; and when the Bishop of London consecrated the cathedral it was to this legend that he referred (Anon 1913).

More eccentric lesser stories circulated in Khartoum. By 1920 locals were relating how the statue of Gordon on a camel by Onslow Ford moved about the city at night, and a woman with a particular fondness for the General saw the statue smile at her. "Gordon's favourite tree" was also pointed out; however by World War Two it was said that this tree, over the grave of the Governor-General Mahi Bey, was a fake and that "the connection with Gordon was invented by a Sapper officer told by Kitchener to entertain tourists after the reoccupation" (GGC400: 64; Anon 1942: 71).

RELICS

"The Queen ... asked the keeper of these treasures which was the most rare and valuable of the caskets. He showed her one made of pure rock crystal, ornamented with gold and enamel. In this casket the Queen placed the small book – General Gordon's pocket Bible, annotated and marked by his own hand, and in this precious casket will remain this most precious relic of one of England's greatest heroes."

(GGC400: 4)

QUEEN Victoria had received the Bible from Gordon's sister, and wrote her a fulsome letter of thanks. The book is still in the 17th-Century "St George's casket", although the bust of the hero which, Miss Gordon reported, stood close by, is now in the Costume Museum in Kensington (Gordon 1888: xix; RE Museum file M3/14.2). The Queen was not treating the object with any religious reverence, of course – as a good Low Churchwoman – but her behaviour implied that she felt contact with the great man's possessions was somehow inspirational, and she was not alone in feeling this. Gordon was liberal with his belongings and they became widely scattered. The RE Museum today holds the world's largest collection of "Gordonia", partly inherited from the collection of the Gordon Boys School, and this reveals some interest conundrums.

Note the "little stick" which Gordon was supposed always to have carried into battle. The RE Museum holds three of these (GGC8, GGC25), each claiming to be the one borne by Gordon while he was fighting the Tai-Pings in China, plus another two without that specific attribution (GGC280, CHARE 4801.30). Two of them come with fairly strong provenances. Of course Gordon would have had more than one cane throughout his career, but these each claim uniqueness: they are "General Gordon's cane". And there are other sticks, each with similarly dubious attributions. One was sold from the Wellcome Collection in 1966, and is now in Texas; another is in Canada, an ivory thing with a shield at the top bearing Egyptian hallmarks, given to its present owner's wife in the 1930s by the Egyptian Under-Secretary of State for Agriculture, whose father got it in turn from Lord Kitchener. A third came to light as recently as 1986, having belonged to a friend of the Museum's informant, whose late husband's uncle's father was stated to have been Gordon's batman. This cane bears the device of the Scottish Rifles and its association with Gordon is pretty inexplicable (RE Museum file M3/16.10).

Another item closely associated with Gordon is the Yellow Jacket, the high military honour awarded him by the Chinese government. In 1897 the Royal United Services Institution (RUSI) put on an exhibition of Gordon memorabilia and trailed the event in the newspapers, and the Yellow Jacket appeared in the list of objects to be included, to be loaned by Miss Augusta Gordon. A few days later, a letter landed on the Secretary's desk from Lady Head. "It is only right", she stated, "that I should tell you that Sir Robert Head and I possess Gordon's real Yellow Jacket", and they later lent it to the exhibition. The RUSI was in fact able to display three "yellow jackets", including the one owned by Miss Gordon which was eventually bequeathed to the Royal Engineers (CHARE 8107.10.11). The RE Museum also has three, but



GORDON AT GRAVESEND, 1867: TEACHING THE RAGGED BOYS – HIS "KINGS" "He called them his 'kings," and for them he got berths on board ship. One day a friend asked him why there were so many pins stuck into the map of the world over his mantelpiece, and he was told that they marked and followed the course of the boys on their voyages – that they were moved from point to point as his youngsters advanced, and that he prayed for them as they were day by day." (Copy of print held to Right Eignmers Mussima)

the Head's example, belonging to Gordon though it undoubtedly did, is now identified as a "salmon riding jacket" (CHARE 8107.10.1). Gordon's medals also fall into this category. Gordon sold his Chinese medal (it had resurfaced by 1897 and was included in the RUSI exhibition) but retained the others, and was photographed wearing them several times. His Turkish Medjidieh orders were bequeathed by Miss Mary Gordon to her nephew W C Anderson and given by his daughter to the Gordon School; the School's collection also contains British and Turkish Crimea medals and a small Medjidich badge also ascribed to Miss Anderson, with rather less justification. The RE Museum continues to be offered medals claimed to be Gordon's; Crimea medals are normally unnamed and this aids the process of misattribution. However one writer states that the hero's awards were captured with a cache of treasure from a Nile steamer by Dervishes in 1894 (Chenevix-Trench 1979: 254).

It is not impossible that objects genuinely linked to Gordon could continue to reappear. In 1985 a set of Classical-style Chinese bronzes owned by a Liverpool family came to light: they appeared to bear Gordon's Chinese name and metallurgical analysis indicated that an origin in China in the 1860s was perfectly possible (Worrald 1980). On the other hand, anything from mid-Victorian China tends to be given a Gordonian gloss. In 1961 the RE Museum accepted as a gift a bronze described as representing Gordon seated in imperial robes (CHARE 2001.48), but it turned out to be a particularly nasty piece of Victorian Chinoiserie whose only resemblance to Gordon is that the figure has a moustache. In 1986 a London auction house offered two watercolours for sale, depicting Tai-Ping subjects and annotated as being by Gordon, but they compare badly with known examples of his art in the RE Museum collection: they are, frankly, rather too accomplished (RE Museum file M3/16.10).

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On the outer orbits of such relics we find the items displayed at the Edinburgh Castle pub in the later 1800s. This institution had developed its own museum in the 1840s when its proprietor, Mr Wickelow, displayed a collection of natural history exhibits. His successor, Mr Middlebrook, widened its scope and introduced "miscellaneous curiosities" which included "General Gordon's cap" and the very spear supposed to have killed him. When the collection was auctioned off in 1908, Henry Wellcome, who had an interest in acquiring "Gordonia", remarked of Middlebrook that "many of this man's curios are very doubtful", but the collector did go to some trouble to ensure that his exhibits had, at least, logically credible provenances: the spear was linked to a doctor who had worked in the Sudan (De Peyer 1980; RE Museum file M3/16.10). The words "logically credible" can less easily be applied to the little rafia box in the RE Museum which bears the name of Sir Rudolph Slatin and which contains "Gordon's last pencil", Gordon's last buttonhole and match, "Gordon's tooth" (a repellent object in a box of tooth powder), "a piece of lace off Gordon's chemise" and "a fly which landed on Gordon's nose". Given its presence in the Gordon School collection (GGC316) we may put it down to pupil hoaxers, but if so they were remarkably astute at satirising the more "genuine" relics.

PILGRIMAGE

The long-delayed duty was done. The bones of our countryman were shattered and scattered abroad, and no man knows their place; none the less Gordon had his burial at last ... We left Gordon alone again – but alone in majesty under the conquering ensigns of his own people.

(Steevens 1898: 316)

THE reconquest of the Sudan under Kitchener in 1898 was in a real sense a ritual act. When the *Graphic* reported the climactic Battle of Omdurman it chose the headline "Gordon Avenged", and Kitchener was hailed as "Gordonis Ultor" when he came to receive an honorary degree at Cambridge University. The war had been, *The Times* declared in retrospect, "something chivalric and crusading, something apart from the ordinary run of Britain's little native wars" and Steevens expressed the same notion in bloodier language: "Here, too, were boys who could hardly lisp when their mothers told them Gordon was dead, grown up now and appearing in the fullness of time to exact eleven thousand lives for one" (Steevens 1898: 311). The tomb of the hated Mahdi, who tore up the railings of the Christian church in Khartoum to build it, was destroyed in its turn and Kitchener carted off bits to fling, metaphorically, at Queen Victoria's feet: he was only narrowly restrained from delivering her the prophet's head (CHARE 7007.7). And virtually the first act of the triumphant British and Egyptian forces was to hold a memorial service for Gordon in the ruins of the Governor's Palace. Richard Caton-Woodville produced a painting of the ceremony which is in the Royal collection; and the RE Museum holds two of the drums supposed to have been played during the event (GGC394 and 395).

The reconquest was the signal for another outburst of relic-collecting. The Mahdi's tomb was the source for a lot of these souvenirs; the railings appear to have been cut up into regular segments and distributed, to judge by the surviving portions (CHARE 8401.2; GGC206, 213); and soldiers with the avenging army, such as Sapper Alfred James Peerless of the Royal Engineers, made a point of visiting it:

- 17 September Tomorrow we hope to see the remains of the Mahdi's tomb.
- 18 September Have looked for the Mahdi's tomb which the papers say can be seen for miles and miles. 5pm and no sign.
- 20 September Went to the Mahdi's tomb. A very fine building the walls were six feet thick and very large cornerstones nicely carved. The RM Artillery have been blowing it down so this accounts for our not seeing it the other day. After an hour's stay we returned. (RE Museum file M3/16.10)

However other places were more closely associated with Gordon, in particular his garden. The garden seemed to symbolize the heroic Englishman abroad: "In this garden you somehow came to know Gordon the man, not the myth, and to feel near to him. Here was an Englishman doing his duty, alone and at the instant peril of his life; yet still he loved his garden" (Steevens 1898: 315). A Captain Ferguson cut an orange stick from the Palace garden and turned it into a cane (GGC186), and the removal of roses as souvenirs was quite common: there are three in the Gordon School collection now at the RE Museum (GGC35, 317, 375). Again Sapper Peerless's diary shows how the ordinary soldiers participated in this ritual:

4 October – We asked permission to visit Khartoum which was granted. We walked for four miles up the riverside ... We came at length to Gordon's Palace where the British and Egyptian flags are now flying; ... We stood on the staircase where Gordon was killed ... From the back we entered his Garden where bonama trees, figs, orange, lime and sugar care are growing: also a nice tress tree from which we gathered some fruit and flowers to take home if possible.

From these remarks we can see how the official myth of Gordon's death had taken hold. Gordon was probably not killed on the Palace steps. Nonetheless portions of the steps were taken away like the roses and railings, and one found its way to Buckingham Palace to be enshrined in silverwork with a cross prominent at the front (GGC189). The pilgrimages continued for some time: Henry Wellcome also visited Khartourn and collected pebbles and flowers from the Garden in the early years of this century (RE Museum file M3/16.10).

The atmosphere of pilgrimage clung to lesser shrines of Gordon, too: his cenotaph in London was treated with similar respect. "Probably there is no tomb in St Paul's that receives more attention ... than that of Gordon. Pathetic little bunches of flowers are constantly deposited there, and even the spectacle of ragged urchins laboriously copying down the inscription is not unknown" (GGC400; 38).

GORDON'S ENSHRINEMENT

ALL Saints' Cathedral in Khartoum was consecrated on 26 January 1912, the 27th anniversary of the hero's martyrdom. Of course it could not actually be dedicated to Gordon, although it was dedicated to no other single person, sanctified or not. It gave the cult a climactic focus, a Holy of Holies within the holy city itself, and devoted a chapel to the martyr's memory. "Praise God for Charles George Gordon" reads the memorial plaque, "a servant of Jesus Christ, whose labour was not in vain in the Lord". The chapel widows depict four other soldier-martyrs, S S Alban, Edward, Theodore and Sebastian; it contains Gordon's prayer mat (given to the cathedral by a member of the family), and the altar frontal is lined with the braid from his tunic. Each year a wreath was placed at the plaque and a service held. The Church in Khartoum, a tourist information booklet issued to British troops in 1942, states shamelessly that "this Cathedral with this Shrine of Gordon, has been a spiritual home for those who labour in the Sudan" (Anon 1942: 19-21, 28-30: GGC400: 56-58).



- Old Gravesend -Fort House. General Gordon spent six years in residence here. (Copy of print held in Royal Engineers Museum.)

Even more notably, the cathedral is not the only strictly ecclesiastical dedication to Gordon. As well as memorials, and windows, a "Gordon Memorial Chapel" was opened in 1914 in the Church of England Soldiers' Sailors' and Airmen's Institute in Aldershot. This seems to have no real link with the hero's life or activities. Along with a window showing Gordon at St Martin's Church, Kensal Rise, this is an open example of his name being used in precisely the same manner as a medieval saint's: applied with no relation to the life of the earthy person whatever.

Reverence is still paid to Gordon here and there. His cathedral has assumed greater importance as a Christian island in a strongly Islamic state; and on the 100th anniversary of the martyrdom a commemorative Evensong was held in Rochester Cathedral, a wreath being laid before the memorial window in the south transept by a former Secretary of the Wycliffe Chapel, Gravesend, where Gordon used to preach (RE Museum file M3/16.10). Flowers are also left at the monument in Gordon gardens in Gravesend. The more extreme manifestations of the cult are no more, but enough survives to make it clear how, for a time, Gordon became a sanctified anomaly, a medieval saint in Protestant Victorian England.

ABBREVIATIONS

"CHARE" and "GGC" refer to objects and archives which are part of the collection of the Royal Engineers Museum, Chatham.

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Extended Military Role for Engineers in Bosnia and Herzegovina

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He has spent 25 years as a civil engineer in the rail industry, culminating with three years as Commercial Director of one of the engineering units of British Rail. In 1997 he volunteered for an 8-month tour in the Former Republic of Yugosdavia as a NATO civil affairs officer, an experience which he rates as one of the highlights of his curver to date. He is now Senior Rail Consultant with Waterman Partnership in London.

Thus article is in two parts. The first part describes the impact that engineers are having in a civil affairs role in Bosnia and Herzegovina (BiH). The second part tells the story of the railways in BiH, in whose revitalisation civil affairs has played an important coordinating role.

REVITALISING THE ECONOMY

The UK's new Civil Affairs Group was formally established in April 1997 comprising about 50 officers, many with specialist professional backgrounds some of whom are engineers. Civil affairs is a growing industry in the military world as a result of the shift away from the threat of high intensity wars and a growing emphasis on peacekeeping and reconstruction following more localised conflicts.

The US Army has maintained a very sizeable civil affairs capability since the Second World War which is largely manned by reservists. In the last decade its units have been employed in several theatres including the Gulf, Panama, Haiti and the Balkans, Up until December 1997 the US was the only nation with a Civil Affairs (G5) capability in the Former Republic of Yugoslavia (FRY). In FRY, in simple terms, G5 operations on the ground centre round the Tactical Support Teams (TSTs) strategically located throughout the three Multi National Divisions (MNDs) – North, South-East and South-West, Additionally, there is the sizeable Combined Joint Civil-Military Task Force (CJ CMTF) based in Sarajevo under HO SFOR command.

Since the start of 1998 several other NATO countries have contributed personnel to G5 operations in the FRY, notably the UK. France, Germany, the Netherlands, Italy, Spain and Norway. Of these only the UK has a specific home-based civil affairs unit at the present time so that most of the European support is provided by officers and soldiers posted directly from mainstream home units. Within NATO, civil affairs is more commonly referred to as Civil-Military Cooperation (CIMIC).

In an immediate postwar scenario the emphasis is on programmes necessary to sustain human life. These, perhaps inevitably, tend to be driven by locally-identified priorities (centrally coordinated). At the completion of this stage the international military effort may be withdrawn. If it is to continue then, ideally, a national grand plan for economic

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reconstruction should be developed, The local programmes will still be very important, not least to maintain loyalty to the international peace efforts, although there may be a danger that a culture of dependency on international assistance will develop which will be counter-productive in the long term. The development of a national plan should be under the direction of nationally elected leaders although strongly guided by international military and non-military experts. It is likely that major projects emerging from these planswill at least be initiated by the inter-

Without a national grand plan, local efforts will ultimately be wasted because there will be no sustainable macro-economy on which the micro-economy can build. Benefits emerging from these major projects will include:

- · A recharged economy.
- · Reduced unemployment.
- · Incentives for returning refugees.
- Shift from political leadership to business leadership.
- · Perception that life is returning to normal.
- · Eventual withdrawal of Stabilisation Force.

As far as the military community is concerned in the FRY these national and local initiatives neatly fall to the CJ CMTF at HQ and the TSTs in the divisions respectively.

The core unit within the CJ CMTF is the CIMIC Functional Teams (CFTs). It has teams made up of professionally-qualified officers in the following fields: business, education, public health, agriculture, veterinary science, telecommunications and engineering. From the end of 1997 the efforts of these officers became primarily focussed on national-level projects, in line with Stabilisation Force's adjusted mission to play towards "end-state" rather than "end-date" By mid-1998 ministerial support teams (MSTs) had been formed within the CJ CMTF; these teams comprise officers working alongside ministers within the two entities of BiH and provide professional guidance to the entity administrations for national programmes.



Damage to Srpski Brod Oil Refinery.

The biggest team within the CFT is the engineering one and it has a large portfolio of major projects within the following general areas: industry, infrastructure and environment, Listed below are some examples from each category (as at July 1998):

Industry:

- · Revitalisation of Srpski Brod Oil Refinery.
- · Revitalisation of Doboj lime production facility.
- · Revitalisation of the commercial rail system.

Infrastructure:

- Structural and medical refurbishment of Banja Luka hospital.
- · Rehabilitation of buildings at Sarajevo University.

Environment:

- Rehabilitation of Sarajevo wastewater treatment plant.
- · Repairs to Srebrenica potable water supply.
- · Repairs to Jajce hydrological system.
- · Redevelopment of Sarajevo zoo.

The projects above were selected without the benefit of a national plan and a list of priorities, and therefore the following factors were used for an internal priority assessment:

- · Impact on the economy and the environment.
- · Feasibility of project.
- · Availability of funding.
- Local political environment and potential to effect change if desirable.
- Skills required to initiate the project and availability of these within the CFT.

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The projects require a range of engineering specialists but typically they will come from the following list:

· civil engineers: railways,

highways, hydraulies, sanitation,

- · environmental engineers,
- · chemical engineers.
- · petroleum engineers.
- · production engineers.
- · building engineers.
- · electrical engineers.

A CFT engineering officer is only likely to be successful if he/she has the following strengths:

- . Is a capable initiator.
- · Is self-motivated.
- Is capable at mixing and negotiating with senior people within the civilian political and business communities.
- Has a well-developed particular professional skill but retains the ability to operate at general level within his/her professional field.
- Is capable of making an initial business assessment on a potential project.

By and large CIMIC work focusses on the early stages of projects with the implicit objective of handing over to other agencies at the appropriate time through an exit strategy, this ensures that the nation does not become overdependent on military support. Hence, the focus on the ability to initiate and develop the early stages rather than project-manage the later stages of a development.



Demining at Sarajevo Wastewater Treatment Plant

For the requirements listed above it is likely that TA/Reservists (currently from the UK and the US) will have the most appropriate experience to take on these roles although the supply at present is tending to be dictated by international politics. Some civil affairs training is desirable but it need not be a requirement to belong to a civil affairs unit to fill one of these slots. Indeed, it is unlikely that the UK civil affairs group alone will have the resources and will need to call on assistance from Military Works Force (Volunteers), many of whose officers will have the necessary qualifications and experience for this work.

One of the more difficult decisions in the FRY has been defining the boundary lines between military and civilian projects. Since the establishment of the IFOR, military engineers have been repairing the infrastructure to at least the "minimum military requirement". Coincidentally, this has been highly successful in reestablishing "freedom of movement" in principle on the highways and on the railways.

As far as highways are concerned the works have provided temporary solutions for the reestablishment of commercial road-based traffic. However, many of the routes are main supply routes and heavy military loading is leading to the rapid deterioration of partially-war-damaged bridges and even non-war-damaged bridges. Road surfaces too are suffering. For the railways the repairs have been largely permanent although confined to tracks and bridges: capacity has been severely restricted because little provision has been made for reestablishing signalling systems. Yet, without signalling, both military and commercial traffics

> are affected unless it is accepted by all parties that military traffic has absolute priority (not acceptable from a CIMIC perspective).

> Another example of overlapping involvement is the reactivation of Sarajevo wastewater treatment plant; on the face of it this would seem to be a pure CIMIC project; yet, because the temporary Stabilisation Force military camps within the Sarajevo area push their waste into the city's sewerage systems, it therefore has a military component too.

> Consequently, CIMIC and military engineers are cooperating more closely, although it should be

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remembered that CIMIC officers operate within an overall CIMIC campaign plan.

It is important to be acutely aware of the political sensitivities connected with each project. In some cases this can work to the advantage of the overall mission. For example, the Srpski Brod Oil Refinery project was only progressed on the condition that the local mayor moved the town's politics away from hard-line Serb to a more central affiliation which generally supported the Dayton "General Framework Agreement for Peace". The Srebrenica potable water supply project was particularly sensitive. Few international aid agencies were prepared to put their name to assisting this now 100 percent Serb town because of its notorious history associated



Damage to Sarajeco 200 (now cleared and new scheme under development).

with the disappearance and probable murder of thousands of Bosnian Muslims. And yet without help many families will suffer who had little to do with the executions – they are Bosnian Serb refugees from Sarajevo. So should one use the most basic requirements for living as an instrument for political manoeuvring?

Much of heavy industry in BiH is still idle because of war-damage and the country's internal economic collapse. However, the problem is far more severe than just repairing damage. Under Tito and the communists, factories were built to provide employment and internal Yugoslav markets were forcibly distorted to ensure that the factories' outputs were utilised. Many of the factories were (and still are) very inefficient and effectively obsolete, only capable of manufacturing products which do not now meet the needs of domestic and international markets. And the high level of interdependence between major business units within the FRY makes ramping up isolated units onto a commercial basis very difficult.

Perhaps the biggest problem of all is how to retrain managers and workers towards a new culture and away from the inward-looking hierarchical system (the herd mentality) which has predominated for over 50 years. Privatisation laws are to be enacted soon. They may provide a framework for a new economy but, judging from the Russian experience, preaching alone will be insufficient. A massive intervention programme from Europe and the US to invest, manage and retrain, together with firm control of crime, may be the only solution provided that this level of outside assistance is acceptable to the Bosnian people.

By now it should be apparent that the Army's engineering output is edging into the civilian world. The obvious consequence of this is an increased requirement for engineers with substantial experience of working in the civilian environment. For those engineers who are able to volunteer, the work on offer in an organisation such as the CFT of the CI CMTF is enormously interesting and challenging and is much more than just an interlude in one's career. It can also form an invaluable part of a career portfolio which is likely to be well received by future employers.

A RAIL SYSTEM EMERGING FROM WAR

HISTORY

BOSNIA and Herzegovina is a hilly and sometimes mountainous country unsuited to fast land transport systems. The country had a fairly comprehensive system of single-track narrow gauge lines mostly built during the 40-year period of Austrian-Hungarian rule (1878 to 1918). During the period 1946 to 1978 the rail system was rationalised. As a result nearly all the lines were closed with some of the major routes being

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Diagrammatic map of principal rail lines in BiH and Croatia.

relaid as single-track standard gauge lines. This latter exercise involved complete reconstruction in the mountainous areas, the best example of this being the route between Sarajevo and Mostar (rebuilt in 1967 at 25kV AC) which involved construction of spirals reminiscent of those found in the Swiss Alps.

Despite their simuous nature the railways were extremely important to the economy of BiH and indeed Yugoslavia as a wholer, many heavy industries were completely dependent on them, notably the enormous steelworks at Zenica, the iron ore mines near Prijedor and the coal mines in



Destroyed culvert at Sevina Poljana on the Una Railway. New reconstructed by 77 Armoured Engineer Squadron.

the Tuzla area. The railways were also well used by passengers because of low car ownership.

The fragmentation of the national railways of Yugoslavia (JZ) followed closely behind the emergence of new independent states as declared by Slovenia (1991), Croatia (1991), Macedonia (1991) and BiH (1992). The new companies were SZ, HZ, MZ and ZBH respectively. JZ continued to operate over its reduced geography. There are two principal lines (mainly singletrack) within BiH which run roughly north-south

and cast-west and intersect at Doboj. The most casterly section (Tuzla-Zvornik) of the cast-west line was opened in January 1992 only to be closed as a result of the war four months later. There is also a line through Bihac in the northwest (known as the Una Railway) which runs southward straddling the Croatia/BiH border (crossing it seven times), and also a line from Tuzla northward into Croatia via Breko.

The story of the Balkans War (1991-1995) is a long and complex one but it is probably true to say that the troubles imploded into BiH. As a result the country polarised by ethnic groupings.

Railway infrastructure is always prone to severe damage in war because of its strategic importance and the ease with which it can be disrupted. BiH was no exception: numerous bridges were destroyed along with virtually all the signalling and overhead line systems (80 percent of the system was electrified); much of the rolling stock was also destroyed together with its maintenance facilities. What was left of the railway system was cannibalised by people looking for firewood or materials for home repairs. To complete the picture, routes were mined particularly along "lines of confrontation'.

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Despite all this some trains did continue to run during the war. The Bostian Muslims ran trains south of Sarajevo (sometimes under fire) carrying combat supplies.

DAYTON

The Dayton "General Framework Agreement for Peace" (signed in Paris on 14 December 1995) segregated the administration of BiH into two entities, the Federation (Bosnian Muslims and Bosnian Croats) and Republika Srpska (Bosnian Serbs), but still with a (nominal) national government. The former controls 51 percent of the country by area and the latter 49 percent. There is an invisible boundary separating the two parts known as the Inter-Entity Boundary Line.

The state-owned service companies emerged as separated entity companies and the railways were no exception (Federation – ZBH, based in Sarajevo; Republika Srpska – ZRS, based in Doboj), However, there was an added complication; the Bosnian Croats resented ZBH managing rail services throughout the Federation (believing it to be Bosnian Muslim dominated) and so promoted their own company, ZHB, based in Mostar and managing sections of route wherever there was Bosnian Croat political dominance.

In the immediate aftermath of the war there was almost no communication other than adversarial

between the three rail organizations. Each company struggled, with the limited operational resources it had, to run a few internal services, with ZRS having the most success because it had a workable rail geography and, being a new company, this improved morale. ZBH could do no more than run seven local passenger trains out of Sarajevo per day (reaching Konjic and Zenica) and a few internal freight trains. ZHB ran local passenger trains from South Mostar southward to Capljina linking in with services to Ploce. Most damaging to the national economy was the fact that no inter-entity trains of any type were operating, let alone interna-



Signalling and overhead line systems badly damaged on most routes.

The stand-off between the entity rail companies continued for two years with politics overriding any business sense. The situation was not helped by the residual belief by some at the top of ZBH that it should be running services throughout BiH, despite the Dayton Agreement. There was also no official recognition of the existence of ZHB.

The Office of the High Representative (OHR) is charged with supervision of the civilian implementation of the Dayton Peace Agreement and, in particular, Annex 9 so far as transport is concerned. Annex 9 requires the establishment of various national public corporations for BiH, and on 6 April 1998 in Sarajevo an agreement was



Rajlovac Railway Station (in suburbs of Sarajevo) largely destroyed.

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It is interesting to muse over organizational models which might have been adopted. The EU encourages separated rail infrastructure ownership and any number of rail operating companies. The Dayton Peace Agreement is looking for unification and ultimately discourages ethnically-based companies. OHR initially tried to satisfy both conflicting models by suggesting a unified infrastructure company. This was

Road/rail bridge over Sava River at Brod, Reinstatement of railway is vital to the future of Stpski Brod Oil Refinery.

signed by the entity prime ministers establishing the Bosnia and Herzegovina Railways Public Corporation (BHZJK). Some two months before, agreement had also been reached on cooperation over the operation of inter-entity traffic on the north-south and east-west routes and indeed the first commercial train to cross the IEBL ran on 26 February 1998 when 600 tonnes of coal was moved from Tuzla to Sarajevo.

Anyone who has conducted business in the Balkans will know that things do not move as fast as one would wish and that agreements are one thing but getting them to work is another. The hope is that from the establishment of BHZJK the two rail companies will work closely together and that inter-entity and international traffic will flourish. However, there were a string of legalities to be progressed before the corporation could operate let alone become effective. And there was the thorny question of ZHB which had no intention of just disappearing without some sort of official recognition. The best hope is that ZBH and ZHB can combine to form ZFBH (Federation Railway). An encouraging indication of future cooperation has been the recent introduction (on 28 July 1998) of an electric passenger service linking Sarajevo, Mostar and Capljina. BHZJK, ZFBH and ZRS each intend to apply for individual UIC membership (UIC is the universally-respected International Association of Railways).

never likely to find acceptance after such intense fighting over land and assets in the war. So the current solution is a compromise; however, its weakness lies in the hierarchy that is being created, and if the corporation fails to achieve its goals then the railways cannot be viable because the separate management of sections of routes will encourage the continuation of fragmented services.

INFRASTRUCTURE REHABILITATION

The seemingly hopeless task of restoring the rail infrastructure started in earnest as soon as the IFOR was in place (December 1995). Much of the repair work was carried out by the Italian Railway Regiment (IRR) which moved its Rapid Response Construction Train to BiH from its base in Bologna. The IRR has returned each summer since and repairs to the Una Railway, the last remaining non-operational war-damaged route in BiH, have just been completed. Some major bridge works were, however, funded by other agencies such as the bridge over the Sava River at Breko. This bridge and some other works on the route were paid for by the USAID (US Agency for International Development) at a cost of some \$5 million.

The military support, however, did not generally extend to signalling or overhead line works and there is now a concerted effort to catch up at least with the signalling so that some capacity can be restored to the system. For example, there

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is currently a programme to restore signalling between Zenica and Doboj which is being managed by SwedeRail and funded from the Swedish International Development Cooperation Agency. The logic here is that the original signalling equipment for this section of route came from the Swedish company, Ericsson.

No track maintenance was undertaken during the war and, except for sections of rehabilitation undertaken by the IRR during its visits, fittle heavy maintenance has since taken place. This is primarily because some of the track maintenance machines which were destroyed in the war have not yet been replaced. Consequently, maximum permitted line speeds (now generally at 50 kph) are lower than track geometry would dictate and have had the effect of further reducing track capacity.

MILITARY TRAINS

THE SFOR reached agreement in 1997 for the operation of military supply trains from BiH right through to Germany with all the railway companies involved. The agreements with ZBH and ZRS, which include inter-entity operation, were achieved relatively painlessly, probably because the SFOR was able to lead the discussions and leave politics and ethnic questions aside, something the rail companies have found difficult to do without a third party's involvement. Military supply trains now leave BiH for international destinations via one of two routes into

Croatia (Volinja or Breko). They, bring much-needed revenue to the entity rail companies (charges are based on a percentage of the DB (Deutsche Bahn (German railway)) tariff scales).

FUTURE

The economy of BiH badly needs the return of an efficient rail system. Much of heavy industry is completely dependent on rail, and indeed industrial traffic is starting to return particularly in the Tuzla area. The country's road system is poor and is further deteriorating as traffic increases. There is also great potential for international rail traffic (particularly freight) although this has been delayed pending yet another complex (political) agreement between Croatia and BiH and its entities. One hopeful development is that Volkswagen has recently signed an agreement to reactivate its car factory at Vogosca (a suburb of Sarajevo), an operation which will entail loaded rail movements into and out of BiH.

To a large extent, the recovery of the BiH rail system will depend on how fast the BiH economy can be restored. There is a long way to go, with economic output a fraction of what it was before the war. Like heavy industry, the culture within the railway companies is hierarchical and inward-looking with, for example, the concept of marketing virtually unknown. So, much needs to change in the internal structure and culture of these companies.

Despite the polarisation of ethnic groups there is still a strong demand for long-distance passenger travel as the operators of some recently restored inter-entity bus routes are discovering. The danger for the rail industry is that by the time that good passenger rail services are fully restored, a whole generation will have grown up who, without any experience of rail, is content to use bus, car or even air.

The 125th anniversary of railways in BiH was celebrated in 1997. The next 25 years will make or break the railways in this turbulent country.



 Landslide on main east-west railway near Zvornik (now cleared and cutting slopes stabilised).

Extended military role for Engineers p197

1.5

War was a Cross to Bear

CAPTAIN HUGH G S LOCK



Hugh Lock was born in Norwich and was educated at Greshams School in Holt. He joined the Territorial Army during April 1939 as a Royal Engineer, and served in the ranks to sergeant before being posted to 141 Officer Cadet Training Unit at Aldershot.

Having been commissioned in May 1942 he served abroad with 46 British Division – part of British Ist Army in Algeria and Tunisia, then with the US 5th Army in Italy. He was wounded three times and Mentioned in Despatches for gallant and distinguished service.

After convalescence in the UK he was promoted to captain and returned to duty, but the loss of his leg prevented him being offered a confirmed regular commission. He was discharged in the UK in 1946.

The following article is a shortened extract from the author's book "War was a Cross to Bear" a copy of which can be found in the Corps Library. The extract covers a period in 1943 when the author was serving as a lieutenant with 272 Field Company, and is reprinted here with his kind permission.

FROM DEFENCE TO ATTACK

OUR division was extended over a long front line from Medjez el Bab to Djebel Aboid, which had only three main roads running through the semimountainous terrain. We hoped that successful attacks or defence could be switched to and from as required, with troops from other divisions coming in to help. This was happening everywhere in Tunisia, not only with British 1st Army (46 Division, 78 and 6 Armoured) but also with the French and Americans, Our company, 272 Field Company, had left Béja and gone to Chemical Corner and then on to the Djebel Aboid area, My section, No 1, had a collecting point with the rest of the company, outside one of the villages in a small area of cork trees, near Sedjenane. This was particularly suitable as our vehicles were well camouflaged. The area was to be "home" for a few days.

I noticed that as soon as firing stopped, wherever you were, up popped an Arab. During the battle at Djebel Aboid, many came through our position from enemy lines and moved to the rear. Shells from enemy guns then started to fall more accurately near our position, so instructions were given to stop all Arabs and interrogate them, and if they failed to stop, to shoot them as enemy spies, Fortunately all obcycel our commands. One, detained for further questioning, looked more like a German than an Arab. German patrols often used Arab dress so it was not easy to know who was who.

Clearing the Arabs from the battleground proved impossible as they continued to live and tend their flocks in the valleys and hills between the enemy and ourselves. The Arabs would work willingly enough for us and on the whole could be trusted to carry out a bargain. Once finished however, they would, without computction, go and work for the enemy. It was their own profit they considered first, and there were many gruesome examples of their rapacity. They would dig up the dead in order to rob them of their boots, and on one occasion were known to have stripped a wounded officer of all his clothes so that he died of exposure. After a battle they descended like vultures on the dead, and in an overrun position were quicker than the enemy in pouncing on blankets, greatcoats and the debris of battle.

Already the countryside had changed; the valleys were green and spangled with bright flowers, white and yellow and orange. It was a surprise for

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Capt Hugh G S Lock War was a cross to bear p198 men new to war to note how life went on despite battles and armies. Arabs scraped their fields and Arab boys drove their sheep and goats, apparently indifferent to the sounds of battle all around. Up above a lark would be singing. The weather also changed; there were still torrential rainstorms, but the starry African nights had lost some of their bite although they were always in sharp contrast with the heat of the midday sun.

So there we were, on 7 March 1943, in an area which had been under 139 Brigade control. One of our jobs was to clear a small antitank minefield; it looked as if our brigade was going to attack again.

We were out in the open, miles from anywhere and anyone - or so we thought! The minefield straddled a small track that passed through a cactus grove leading to a ramshackle building. After about twenty minutes I heard a noise that sounded like a bridle and instantly recognised it as we used to hear a similar noise when the Goums (Moroccan mercenaries) were leading their mules - the handlers of course walked barefooted. Imagine my surprise to see four women with their little soil trowels over their shoulders, advancing along the track that we were clearing of mines. Behind them came an Arab sitting side-saddle on his mule. This was almost a biblical scene. Muslims were by religion allowed four wives who were used as workhorses. The Arab would dismount and sit and watch the women scraping the shingly soil to seed.

But it suddenly dawned on me that it was normal for the Arab on the mule to lead, and the wives to follow, a tradition which had been followed for thousands of years, so history tells us. However, in those days there were no minefields! This scene stuck in my mind. I nodded to the Arab, who sat down whilst his workforce took over the area we had cleared. We soon finished and left them to it.

On my arrival I was told to report to the OC straightaway. What now?

"Lock, where have you been?"

He knew where I had been.

"I took a sub-section to the minefield at the given map reference as you instructed Sir."

"What were your instructions to

Sgt Cleminson?"

"Sir, I gave no instructions. He was left in charge as senior NCO."

"Why did you not give Sgt Cleminson any instructions?"

"I considered it quite unnecessary Sir. Surely that's natural should anything have happened to me whilst out of the camp?" "Well nothing did happen to you did it?" "No, Sir."

"Well, something happened to Sgt Cleminson whilst you were away."

"Sir, if anything has happened to anyone in my section I feel a right to know of it."

"Of course you have. That's what this is all about. Sgt Cleminson has been injured (he lost an eye), Cpl Bridger has been killed and Sprs Fletcher, Griffin, Gillett, Oldham, Roper and Bilstein were also injured whilst you were away."

I was devastated to hear this, and the OC's very blunt way of putting over this terrible tragedy did not help, as he was more or less saying it was my responsibility.

What happened was that Cpl Bridger, one of the NCOs in charge of my three sub-sections, and some of his sub-section had gone in a 30cwt truck to demonstrate how an Italian Red Devil grenade worked. It went off, killing him and injuring the others.

The OC did not want to talk to me.

Death could come at any time in war, and quite unexpectedly I had lost and had injured more men in a few seconds than in the whole time we had been in action since mid-January. As a "rookie" officer, posted only four months previously to a seasoned unit, I could only hope to protect my men to the best of my ability. My loss had to be borne as well as possible.

The next day we buried Cpl Bridger.

It seemed that death was stalking you every second, every minute, everywhere. As a school lad I had attended chapel twice a day on Sundays and heard a lot about heaven and hell. Somehow I couldn't understand what I, as a volunteer in the Territorials, was doing killing or maybe being killed myself. Would it entitle me to go to heaven? I couldn't imagine hell being worse.

I cannot describe my feelings, not only at the tragic, sudden loss of one of my corporals, but at the attitude of the OC. He was trying to say that a corporal and a sub-section could have done the mine-clearing job, and that it was not really necessary for me to have gone. I totally disagreed with this. Usually an officer's duty lay with the majority of the men he commanded, but this was when in action. As the rest of my section were in camp with the remainder of the whole of 272 Field Company, I felt there was some danger even going out of camp a few miles to clear a minefield – certainly more dangerous than staying in camp. I also considered that it was the best way to gain the respect of

(1) I be any bed that (1) all the thing I have done I can't help the realized I - bady I and the det only real one. At the same god I that of out, She's a claim of her own. I und also thought more of me neally I have to be with her alme At forsion desire or craning Lat intertant of life I y with her night by made I be as us to wild be It love I that I am hide From the rest creating of a love that is losting and Oh God ! How I wil als were

my men. If there could be, or was, a dangerous situation, I wanted and considered it my duty to be there. I felt it was imperative that men should have faith, trust and respect for their leader, and that I should have compassion for my men; if not war would be a terrible burden to bear day in, day out. Life would have no purpose.

There had been terrible tension for some, and 1 later heard of a supper who had just got married and tried to get his arm broken to avoid embarkation by putting it across two stones and asking his mate to jump on it, but his arm did not break so he had to go. He didn't eat on the voyage and was very ill. This was hushed up, and I never knew about it until after the war. I think this highlights



the emotional torture which some of these youngsters suffered. This sapper was convinced he would never come back, and sadly he did not. He was killed in Italy, having survived the Tunisia campaign.

I had girlfriends, who didn't at that tender age? but no-one to think of seriously, to have and to hold in my heart. We all yearned for that special someone of one's own.

1 well remember one sunny morning, sitting on a small sloped bank near the Cork Forest. My mind and thoughts were of all these frustrations. Everything seemed completely senseless and pointless. Whatever was 1 doing here, involved in fighting a faceless enemy and losing my men in selfinflicted killing, some of them being only youngsters in their twenties with loved ones at home? What would they ever know, and

how could they understand the complete farce of war? It was at that time my own emotions poured out in a poem (see above left).

How can the youth of today understand our emotional feelings in that God-forsaken situation? I was living in a world of duty to country and duty to care about my men. They were my family, Hardly anything else mattered except life itself. You cursed the conditions; the mud, the slush, getting wet through, working in torrential rain, etc. Being in a slit trench full of water, in a thunderstorm, with guns firing over the hills in the next valley was a nightmare. One did not know whether a flash of lightning or a clap of thunder was masking a shell explosion. This was worse than a creeping artillery barrage, which is what happened when your position was spotted.

It was lovely to have these few days in the "Cork" Forest. We named it Cork Forest, as the bark from the trees was used for making wine bottle corks in peacetime. Sgt Horne was organizing daily role-call parades and getting all the drivers and sappers to clear up, washing clothes, carrying out necessary "arms" inspections (rifle) and all the usual bullshit. This helped to occupy the mind so as not to dwell on the past or ponder on the future. All blankets were shaken and deloused. As an officer I had a little camp bed which kept me off the ground (see left). It was a carvas roll, raised off the

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ground by three sprung legs; it had a triangular covering and a mosquito net.

A few days later we heard that Major Evans, 270 Field Company 139 Brigade had been killed at a bridging site where his men were working. He was a much-liked OC.

News came through that the 8th Army had reached Sfax in Tunisia, which meant that the Germans were being pushed into an area which became smaller and smaller, so they were desperately trying to break out through the hilly, mountainous passes, hence all the pressure on 46 Division area: Medjez El Bab, Béja, Djebel Aboid to the coast.

I had been chosen to go on a week's course at 1st Army School of Mines and Mine Warfare, held at Souk Ahras (Souk in Arabic means market

- small market town). I took with me a LPZ mine - a Jerry parachutist mine (the first the school had seen). On the Friday before the end of the course, a friend and I took some nurses from 84 General Hospital to a dance. I hadn't seen a white woman for over three months. I left Souk Ahras on Sunday 18 April, Palm Sunday. 272 Field Company had moved from the Cork Forest to El Aroussa.

My section was detailed to clear a minefield which was in an area I had been to the night before. Going with an infantry patrol at night in front of infantry positions to assess speed-flow of rivers, heights of river banks and widths of rivers, sometimes swimming across, was not one of my choice jobs. Anyway, the minefield was cleared.

We made camp in an olive grove. We were getting ready to attack – infantry of 128 Brigade on the right and infantry of 139 Brigade, the Durham Light Infantry, on the left. These battalions were to attack the enemy occupying the scrubby, mountainous hills, to start on April 21st at 0100hrs. One of my sub-sections was used to clear mines on the dirt track between the hills. It was as black as night could be and I had no idea as to the infantry's progress – just rifle-firing, shelling and mortaring on either side. We had to be careful not to get too far in advance of the infantry.



Map of area covered in article.

So there we were, completely "in the dark". We stopped for a minute as this was not a rush job. Hearing a sound we all went to ground, ready to shoot. Someone was approaching. It was a Royal Artillery officer. He said that he had orders to go forward, and did I "know anything?" I told him what we were doing and that the road track was probably mined. I let him go on forward into the night and a few minutes later he returned, staggering badly, probably hit by a sniper. In view of the this, I decided not to press on.

The infantry on either side were successful in capturing some of the straddling hills, so we were ordered to continue in daylight and started clearing the track where we had left off. About fifty yards further I smelt the unholy, putrid stench of decaying flesh. Indescribable rottenness. I approached near enough to ascertain it was a British soldier (using my field glasses). This incident had a very profound impact on me. The sun was shining, the heat beating down, and flies crawled over the stinking carcass. I was wearing a tag around my neck: name, rank and army number, religion: Christian. It would be the same for that poor bugger. What was a Christian doing lying there?

We proceeded, passing a building, obviously a farmhouse. The troops liked to make camp in buildings such as these, but they were an obvious

target for shelling. If they had been occupied by the Jerries, they were usually booby-trapped so that when you opened the door you would be blown to smithereens. Booby-trapping was sometimes more sophisticated. Instead of the door, which you would expect to examine, they conjured up more deadly devices. I heard of one unit getting in a farmhouse and bedding down for the night. Nothing happened until someone pulled the lavatory chain! My orders were to touch nothing!

We had just gone past this farmhouse when we ran (at least walked) into a withering burst of machine-gun fire. Down we dropped. I yelled "Scatter!" so that we couldn't be targeted "in group." Within seconds we were "stonked" – a concentrated salvo of mortar shells. Luckily some did not go off. I yelled: "Back to the farmhouse." Some transport had been following at a safe distance and had got to the farmhouse. A Stuka divebomber dropped a bomb near the farmhouse. I well remember seeing someone come out of the farmhouse. The bomb blasted him back in. I dived under a vehicle as the Stuka attacked. We were lucky to have only one slight casualty.

The next day we started just past the farmhouse. Obviously our infantry had eliminated the nest of resistance. I had been given a map reference to call a halt at a wadi. We approached cautiously, bearing in mind that Jerries might be hiding there. I thought that tossing a few grenades into the wadi might do the trick (we had not had a chance to use them before). Three of us spaced apart lobbed them in. There was no sign of movement, Looking in we saw two Germans lying neatly side-by-side outside a dugout. They had obviously not been killed holding hands, so why were they snuggled up? Booby-trapped! What religion could countenance such barbaric behaviour as booby-trapping your own dead? We continued along the wadi and turned into a form of "dug-out". There we found two Germans who had obviously been playing cards and had been killed by the blast.

My vehicles were now arriving and took cover in a nearby olive grove. We made camp and stayed there for a few days. It was April 26th. Our 128 Brigade attack had clearly been successful as there was no counter-attack. We had a few days off. We were completing roadworks and were away from the "nasties", at least the only nasty I saw was an Arab woman lying on her back with both lower arms blown off, and with her stomach spewed out. Her guts were caked and crusted with dried, dark-red blood. Again the smell of death. On May 1st we moved to Testour, then to Medjez El Bab by May 3rd. Apparently a big attack was being planned. The big push was to come through the Goubellat Plain. Some divisions were switched from 8th Army to give weight to 1st Army's attack on Tunis. 6 Armoured Division with 8 Armoured Division from 8th Army broke out onto the Plain of Goubellat as they were both motorised divisions – I and 4 Infantry Divisions were not in the actual kill, the capture of Tunis.

Naturally we were feeling very pleased with ourselves, but still every move had to be carefully considered. For example, the enemy will fight as long as he is willing or ordered, but the closer one gets the less he will show himself, hiding in scrub, behind low walls or in Arab huts. Then, after shooting at you, he will suddenly pop out with hands up. I was not keen to take any risk with my men who could, but would not, shoot a Jerry at point blank range. My policy on approaching a possible defended position or Arab hut was to shout out "Anyone there?" at the same time tossing a grenade in. A grenade takes four seconds to explode, so it should sort out the "men from the boys".

I witnessed Germans surrendering one morning; German soldiers in trucks and marching in orderly rank along the crowded roads to give themselves up to the first British soldier they saw – it was unbelievable. Why to us? I found out later that some of the Indian Division had emptied their Jerrycans of petrol and filled them with wine, which of course they were not used to. The Germans came to our line in preference and I don't blame them! It just happened that we were right at the spot where such a very large number surrendered. They came in with no weapons having burnt or blown-up everything beforehand. There were also some Italians, but they were very much a rag, tag and bobtail lot in comparison.

We were not prepared for anything like the number that surrendered, it was like handling a football crowd. Vast seas of men were divided into groups and handed over to our infantry who were now on the scene. There were insufficient rations so many units such as ours had to go short, which did not please the men. The normal organization of an army is amazing and necessary rations and equipment will usually turn up on time wherever a unit is sent, but how to deal with a mass surrender with up to 189,000 more mouths to feed? There must have been more surrendered troops than Allied soldiers in all the divisions in the 1st Army!
Our next job unsurprisingly was to make POW cages. We directed the Germans and Italians to build their own with barbed wire etc. Separate cages were built for Germans and Italians.

After battles there are many minefields to clear, and of course Royal Engineers were lumbered with this deadly dangerous and difficult task. The area around Medjez El Bab was heavily mined as Longstop Hill, just outside, was one of the most fought-over hill features of the war in Tunisia. When I arrived at the minefield it had just caught fire. Butterfly bombs had been scattered over the area. Sapper Dale was killed and Sergeant Horne slightly wounded. I also heard that the OC had been wounded and evacuated.

At the end of May, 46 Division moved back to the Algiers area several hundred miles away. After continuous contact with an enemy you will appreciate that a division needs a complete break to re-equip and bring units up to strength with replacements, especially the infantry.

We were pleased to be going away from what we thought would be an attack in some form on the "underbelly" of Europe. The invasion of Sicily took place on July 10th, involving 8th Army and the US 7th Army. We did not know that 1st Army had been disbanded in July 1943. 272 Field Company was resting at Blida near Algiers, "happy as sand boys", but not for long.

Suddenly orders came to move to a place called Djedjelli, where we carried out waterproofing of vehicles. The weather had become very warm so we had to take malaria tablets and have injections. I led the way while the needle was sharpest, with sixty men to follow!

By the end of August, 46 Division had moved again into Tunisia and was concentrated at Bizerta. The Americans and 8th Army had reached the Straits of Messina by August 17th.

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The night before the shipping armada was due to leave Bizerta, the Germans launched an extremely heavy bombing raid on the harbour. The commander of X Corps, Lieutenant General Sir Brian Horrocks, was struck down by a piece of shrapnel when he went outside to watch the "fireworks". Lieutenant General McCreery was appointed in his place. Our anti-aircraft guns were firing almost vertically, and the heavy shrapnel lumps came down like a hailstorm. I remember the occasion well as I sat with my head under an empty five-gallon petrol drum. My men took cover under their camouflaged vehicles in the embarkation area. We knew the Germans were aware of the concentration of shipping and that General Kesselring was ready for an invasion.

The next day all 272 Field Company embarked on American landing craft. Apprehension and tension were tempered with the knowledge that in spite of everything, victory was ours in North Africa. We considered ourselves invincible! The vast convoy left Bizerta, calling at Palermo in Sicily. What a relief to anchor there, as speaking for "every man Jack" of us, we still preferred dry land to being at sea.

We left Palermo Iate afternoon. The vast convoy appeared to be heading north to north-east. When we had landed at Palermo we naturally thought we were going to support 8th Army. With twilight approaching, aircraft had apparently dropped off aerial photos – of where, we did not know. Had we known it was the Bay of Salerno we would have been none the wiser. The Hampshires were with us. In fact, our landing craft was carrying 128 Brigade Headquarters. We were told that we, 46 Division, had become part of the US 5th Army and would be the first troops to land on *Uncle Red* beach at "H" (zero) hour 0330 near a town called Salerno (*see map below*).

The sea was calm, the night was still until the massive Operation Avalanche was launched.



German Corps of Engineers: New Tasks, New Challenges

COLONEL ROLAND VON REDEN, Chief of Branch III 6 "Combat Support" at the German Heeresamt



Colonel von Reden joined the Federal Armed Forces in 1965. He studied civil engineering at Munich University. Tours as troop commander and engineer LO were followed by appointments as CO of 2nd Sqn 11 Engr Bn in 1972 and of 320 Indep Armd Engr Sqn in 1974. In 1982 he was Deputy Commander and G3-officer of 110 Engr Bn 1 GE Corps and in 1985 was Training Officer at the GE Engr School. He was CO of 5 Engr Bn before attending general staff officer training at the GE Staff College in Hamburg. Two years spent as G3-officer in the German Army Office, Department X (Engineers and NBC-Defence) preceded nearly three years as the German Army LO at RSME Chatham.

November 1994 saw him as Chief of the Engineer Branch of the German Army Office in Cologne.

Promoted to full colonel in 1996, since 1997 he has been Chief of the Combat Support Development Branch of the German Army Office.

Colonel von Reden is married to Jutta, and has two daughters.

FOUR years have passed since I returned from the United Kingdom to the German Heeresamt in November 1994. Up to 1 October 1997, I was responsible for the further development of engineer support to combined arms combat operations and Operations Other Than War (OOTW). Besides developing concepts, I also had to guide, coordinate and monitor the development of the new engineer structure as part of the Army Structure "New Army for New Tasks", develop new directives for leadership and overall operational training as well as for the development of new materiel (as part of the pre-definition phase). As of 1 October 1997, I was put in charge of the further development of the entire domain of combat support (field artillery, engineers, air defence artillery, NBC defence).

I often, and gladly, recall my three-year tour as German Army Liaison Officer to the Royal School of Military Engineering and to the Corps of Royal Engineers. I am very grateful that I was given the opportunity to serve in this excellent Corps which is so rich in tradition. I am happy, too, that I was able to gain a lot of experience which gave me important and decisive ideas for the further development of the German Corps of Engineers. As an associate member of the Corps of Royal Engineers, a status I am very proud of, I still follow the Corps very closely, eg by reading the *Royal Engineers Journal*, always looking at features that could be eligible for adoption in support of the further development of the German Corps of Engineers. Thus, for example the "heavy engineer battalions" for "general engineer support" were integrated into the new German engineer structure thanks to my insights into the operations of 28 and 36 Engineer Regiments. In addition, many aspects of German engineer support during UN peace support operations are based on lessons learned by the Royal Engineers.

This article is meant to inform readers of the most recent developments in the German Corps of Engineers and thus give them the opportunity to learn about similarities and differences between the Royal Engineers and the German Corps of Engineers.

When forward defence was still a strategic necessity and represented the military answer to our security interests, the defence mission of the German Army required the Corps of Engineers to concentrate, as a first priority, on counter mobility operations, ic on the emplacement of all kinds of obstacles, and, as a second priority, on mobility operations. The German Corps of Engineers was organized, equipped and trained accordingly.

Meanwhile, changes to the European security environment created a completely new situation for the Alliance, for the *Bundeswehr* and for the German Army. Inevitably, the extended task spectrum of the armed forces directly impacts on all arms and services of the Army.

The *Bundeswehr* concept and the draft of the Army concept specify the following tasks for peacetime, crisis and war:

- · territorial and allied defence in Central Europe,
- crisis reaction and allied defence outside Central Europe,
- crisis management as part of the extended task spectrum,
- rescue and evacuation missions, and
- relief operations.

While many of these tasks are similar to previous ones, they also confront us with a lot of new challenges. And this is particularly true for the Corps of Engineers. This does not make the task of further development of the Corps any easier, but it offers the chance to review previous concepts and shape the Corps in line with its new tasks, a process which had to be initiated anyway against the backdrop of scarce resources.

To carry out further development, we have to answer the following questions:

- In which direction will the Corps of Engineers have to go?
- · Which additional tasks will they have to perform?
- How will they have to be organized, equipped and trained?

Prior to answering these questions, we have to mention the consequences resulting from the changed security environment and the extended task spectrum:

- The employment of smaller forces in larger areas and over greater distances requires higher mobility and the capability to monitor less threatened or less important areas.
- The greater the distance to Central Europe, the less likely is the possible use of local infrastructure in support of friendly forces. In these areas of operation it is therefore important to enhance friendly mobility and improve existing infrastructure by all means, ie we must become capable of constructing and repairing roads, tracks and bridges, among other things.
- Enemy weapons are an increasing threat due to improved reconnaissance capabilities, the availability of remotely delivered, sophisticated mines, and

terminally guided munitions. We thus have to enhance our efforts to improve protection, survivability, sustainability and mobility.

Considering these consequences and the lessons learned during its deployment to Somalia, the German Corps of Engineers identified shortfalls in construction training, in breaching operations – particularly minefield breaching –, in EOD as well as in their specialized equipment and materiel (such as construction machines) and in its organizational structure.

Of course, the main task of the armed forces is territorial and allied defence. However, with a view to the prospect of OOTW, the Army is surely well advised to concentrate first on those tasks which it is likely to perform in the foreseeable future and which may be subsumed under the generic term of crisis reaction capability.

THE TASKS OF THE CORPS OF ENGINEERS

For the Corps of Engineers, one of the major consequences of the extended task spectrum is the changed order of priority of its main tasks (see below). Now, mobility operations are on top of the priority list and counter mobility operations come second. The third main task, to enhance survivability and sustainability and improve living conditions, is taking on added importance.

The numerous and extensive tasks the Corps of Engineers has to perform as part of the extended task spectrum will be explained by means of a socalled scenario which is subdivided into different phases. Of course, some phases may occur simultaneously and others may not occur at all or they may not require engineer support.

Only as part of territorial and allied defence in Central Europe will the German Corps of



Engineers have to perform national tasks on a large scale such as to:

- · develop, keep available and provide engineer maps,
- support initial deployment and movements, to include:
- · water crossing operations,
- EOD,
- · operation of the NATO pipeline system and
- environmental protection tasks.

These tasks will not occur or only to a very small extent if friendly forces are deployed in support of allied defence operations outside Central Europe or in support of crisis management operations as part of the extended task spectrum.

As part of "creation of an in-theatre base" – to include, among other things, ports/airports of entry – for a deployment in support of the extended task spectrum, the engineers will mainly have to perform tasks such as those carried out in Somalia or in former Yugoslavia. These tasks comprise all kinds of infrastructure measures to:

- repair partly destroyed buildings for use by friendly forces,
- · construct/extend and repair logistic facilities,
- support the construction of airstrips,
- · repair overhead and buried power lines,
- sink wells and distribute water through pipeline systems,
- · construct field pipelines, also as part of a joint team,
- · construct, operate and repair roads and tracks, and
- perform environmental protection tasks.

In "preparation of the operating forces for the operation and deployment of these forces to the area of operations," the Corps of Engineers must support pre-deployment training, through building and replication of training facilities, the disembarkation of the operating forces through construction of temporary disembarkation ramps, or through the transport of heavy equipment from ship to shore by means of ferries.

When, in a subsequent phase, the operating forces are deployed from the in-theatre base to the area of operations, the engineers will mainly have to construct, repair and maintain roads, tracks, bridges and railway facilities, support water-crossing and breaching operations and perform EOD tasks.

During the operational phase in the area of operations, the engineers will continue to perform the above-mentioned tasks. In case the situation escalates to an armed conflict, the engineers must perform the same tasks as those described in support of territorial and allied defence. The extent of these tasks, however, will depend on the scope and intensity of the hostilities.

ENGINEER SUPPORT IN COMBINED ARMS COMBAT MOBILITY operations are the foremost priority. Mobility enables armoured combat troops to fight a highly mobile battle while it enables all forces to carry out diverse and wide-ranging movements – in time and space – and consistent with mission requirements. With their assets, engineers must support mobility operations in the entire mission spectrum, for example through:

- water-obstacle crossings with modern battlefield and support bridges,
- reconnoitring, breaching and clearing barriers,
- EOD measures, and
- improving terrain trafficability, eg by constructing roads and tracks.

Their support to mobility operations decisively contributes to achieving superior mobility and thus helps to seize or maintain the initiative.

The goal of counter mobility operations is to prevent or at least severely hamper enemy movement on and off the road network and across water obstacles. To do this, engineers mainly emplace barriers. In support of friendly offensive operations, barriers are primarily used to protect flanks. Area surveillance is mainly supported by barriers equipped with sensor technology. It is important that mines and minefields are adapted to the conditions of modern combat. The related requirements can only be met by responsive and remotely controlled minefields which are synchronized with fire and movement and only activated when tactically required.

The German Corps of Engineers has a requirement for mines which are remotely controlled and/or have a limited laid life. Minefields containing such mines enable friendly forces to act flexibly, ensure a high degree of friendly mobility and permit friendly forces to avoid one-on-one situations as long as possible and thus preserve assets for decisive thrusts in depth. Only modern mines are able to contribute in such a way to gaining or maintaining superior mobility.

Increasingly, artillery, too, will have to lay minefields, especially deep inside the enemy's territory.

Engineer denial and destruction measures will contribute to denying the enemy permanently or temporarily the use of important areas, facilities and installations. However, they are strictly subject to the host nation's permission. The engineers provide support to increase survivability and sustainability and improve living conditions by building field fortifications and special shelters. The capability to support special camouflage and deception measures also contributes to survivability. The disposal of all kinds of ordnance is another activity in this area. Here, engineers closely cooperate with the EOD forces of the maintenance corps which is responsible for EOD.

During the redeployment phase, the Corps of Engineers dismantles all kinds of facilities and installations and supports the logistic forces in the loading of major equipment.

Finally, during a potential nation-building phase, the Corps of Engineers may perform the following tasks:

- train local armed forces and, if required, the local population to identify and clear mines and minefields,
- provide orientation and, if required, assistance in the restoration of local infrastructures, and
- provide orientation and, if required, assistance in the restoration of utility lines and installations.

Of course, the training and equipment required to perform these tasks particularly enables the Corps of Engineers to support all kinds of relief operations. But engineer support may also be required during rescue and evacuation operations. For this purpose, we have specialized engineer assets in the *Kommando Spezialkräfte* (Special Forces Command).

All of the above diverse and numerous tasks, some of which are familiar, some new for the engineers of today's *Bundeswehr*, call for:

- new structures,
- · new additional equipment, and
- new training progressions and/or training courses.

A NEW STRUCTURE FOR THE CORPS OF ENGINEERS

UPON adoption of its new structure, for which Establishments have been agreed, the Corps of Engineers will have, as in the past, units which are primarily capable of providing direct combat support. These units chiefly include the armoured engineer and airborne engineer squadrons of the mechanized or light infantry, mountain infantry or airborne brigades.

In addition, the two armoured engineer squadrons of the Reaction Forces will be trained to provide general engineer support, for example to conduct construction or repair measures or build support bridges. Apart from the manoeuvre brigade level, there will only be engineer units at military district command/division level. These assets will be concentrated in the engineer brigade (see below).

With its two engineer battalions (one of which is cadreised in peacetime), the engineer brigade directly supports combined arms combat by assigning parts of the battalions to reinforce the armoured engineers in the manocuvre battalions and brigades. In the future, these engineer battalions will be increasingly called upon to perform tasks in support of friendly mobility and survivability.

A new component in the engineer brigade is the heavy engineer battalion (which emerged from the reorganization of the previous active engineer bridge battalion). It will primarily provide general engineer support but certain assets – in particular those equipped with assault bridging equipment – will also provide direct engineer support to the combat troops. Besides its headquarters and service squadron the heavy engineer battalion has two technical engineer squadrons (engineer construction equipment), one of which is cadreised in peacetime, as well as two floating bridge



Big and small engineer brigades.



squadrons. With its varied engineer construction equipment, battlefield bridging equipment (the new amphibious and/or the previous ribbon bridge) and support bridging equipment (the medium girder bridge and the new folding dry support bridge) it is also particularly well suited for performing the emerging tasks across the spectrum of operations.

Besides its headquarters and service squadron and its technical engineer squadron, the engineer bridge battalion (non-active in peacetime) of the engineer brigade has two floating bridge squadrons with hollow-deck bridges. When troops are withdrawn from the line, the latter replaces the fast and floatable battlefield bridging equipment which must always be employed "up front." Thanks to their organization and equipment, the engineer bridge battalions are particularly well suited for damage repair and water crossings in Germany, eg in case permanent bridges are destroyed, etc. Besides their previous task – ie operation and maintenance of the NATO pipeline system in Germany – the two specialized (pipeline) squadrons of the engineer brigade will now also perform tasks as part of the extended task spectrum, ie:

- construction and/or maintenance of all kinds of field pipeline systems
- distribution of water via pipeline systems, and
- waste water disposal as part of base camp operations.

Based on their engineer construction equipment, the specialized squadrons are also able to support construction measures.

While it is part of the engineer brigade, the NBC defence battalion does not belong to the Corps of Engineers. In the past, this arrangement proved to be very useful since the Corps of Engineers must cooperate closely with the NBC Defence Corps in some areas such as water extraction and treatment or repairs after large-scale devastation.

After adoption of its new structure, the peacetime organization of the Corps of Engineers will comprise:

- 19 active and 4 cadreised armoured engineer squadrons,
- 2 airborne engineer squadrons,
- · I light engineer troop AMF,
- I special engineer troop of the Special Forces Command,
- 7 engineer brigades with a total of 7 active and 7 non-active engineer battalions, 7 heavy engineer battalions and 7 non-active engineer bridge battalions as well as
- 7 active and 7 non-active independent specialized (pipeline) engineer squadrons.

Moreover, the Corps of Engineers training facilities will comprise:

- the Klietz Engineer Special Training Area,
- · the engineer dry and wet training areas,
- the Engineer Base for "Camouflage and Deception" in Storkow, and

 the Engineer School and Army School of Constructional Engineering.

At the military region commands, special sections called "Engineers, Infrastructure and Environmental Protection" as well as Special Engineer Teams (*Wallmeister*) have been established to support certain engineer tasks at national and international level such as:

- · development of engineer maps,
- · development of records for expedient water supply,
- giving advice on questions of damage repair, water crossings (suitable sites) and barrier preparations at home.

Moreover, there are senior engineer officers, engineer officers and NCOs to advise on engineer matters at the different levels of command (see opposite left).

Under the new structure, the established peacetime strength of the Corps of Engineers will be 15,000 soldiers, ie 7.5 percent of the overall strength of the Army. In case of war, this number will increase to almost 35,000 soldiers after mobilization and comprise 6.9 percent of the Army's wartime strength.

ENGINEER REACTION FORCES

IF compared to the overall strength of the Corps of Engineers and above all to the extensive and diverse tasks to be performed by engineers, especially in support of crisis management in the extended task spectrum, the engineer portion of the Reaction Forces is relatively small. It is just barely 2050 men.

At division level (see right), the Corps of Engineers has a battalion equivalent of engisquadron (270) and one AMF engineer troop which is subordinate to Armoured Engineer Squadron 370 in administrative matters.

New Equipment for the Corps of Engineers

To be able to perform its new and to better perform its previous tasks, the Corps of Engineers has a requirement for the SPIA combat direction system (SPIA stands for *Standardisierte Planungs und Informationsausstattung* "Pioniere", ie, Standardised Engineer Planning and Information System).

To enhance friendly mobility, the following equipment is currently at one stage or another of the development and procurement cycle:

- Fast Floating Bridge Amphibious Equipment M3 (MLC 70).
- Folding Dry Support Bridge (MLC 70).
- Armoured Vehicle Launched Bridge 2 (MLC 70).
- Minefield Reconnaissance Equipment.
- Mine-Clearing Ladder 80.
- Mobile Mine Detection And Clearing Equipment.
- Handheld Mine Detection Equipment (nonmetallic mines).
- Equipment for EOD/Mine Documentation Database.
- Light Fragment Protection Clothing.
- · Engineer Clearing and Earth Removal Charge.

In support of counter mobility operations the following major projects have been initiated:

- Mine and Minefield Remote Control Equipment.
- SKORPION Mine-Launching System Upgrade.
- · Mechanical Minelaying System 85 Upgrade to include:
 - · step 2/3 Laid Antitank Mine 3,
- off-route Antitank Mine 2 and
- · a remote activation device.

The 20kg Cutting Charge and the Off-Route Antitank Mine are currently under procurement.

neer reaction forces which is made up of assets from two engineer battalions, one heavy engineer battalion and one specialized (pipeline) engineer squadron so as to be able to cover the broadest possible task spectrum.

At manoeuvre brigade level, the Reaction Forces portion of the Corps of Engineers is comprised of two armoured engineer squadrons (120 and 550), one airborne engineer



To improve survivability and living conditions, the following projects have been initiated to procure:

- diverse commercially available engineer construction equipment,
- a multi-purpose earth mover, air transportable, with ancillary equipment,
- a well boring rig,
- well construction material,
- · a water transport equipment set,
- a mobile pressure chamber for rescue operations after accidents to engineer divers, and
- · individual accommodation modules for the base camp.

CHANGES TO LEADERSHIP AND OVERALL OPERATIONAL TRAINING

WITH the new tasks in mind, the leadership training courses of the Corps of Engineers were reviewed and partly extended to include training segments addressing the new tasks.

New training programmes were integrated into the overall operational training directives and, as a decisive step to improve the capability to carry out all kinds of construction measures, the Structural Repair Centre of the Engineer School and Army School of Constructional Engineering was set up in Münchsmünster. Here, leaders will be trained in special construction courses. Starting this year, follow-on training of engineer leaders and troop training will take place at this centre as part of the so-called "directed training."

In addition, more and more engineer officers will study constructional engineering at university. A large number of senior NCOs, (ie not only infrastructure and demolition engineer sergeants as in the past but possibly also all company HQ squad leaders, engineer troop leaders and construction equipment troop leaders) will undergo the two-year clerk of works training course at the Army School of Constructional Engineering which is part of the Engineer School.

The Corps of Engineers will face up to the new challenges. The particular conditions of the OOTW environment make it an arm of the future, an arm which can "fight and build" and which "is one of the trailblazers of progress in the Army."

50th Anniversary Articles

The Editor of the Journal would be pleased to receive for consideration, articles from anyone who took part in projects during the aftermath of WW2, or have something interesting to relate of happenings during the year of 1949, with a view to their publication on or near to the 50th anniversary of the event. Accounts of later events are also welcome as they can be kept for publication in the appropriate issue.

The Kota Mama Expedition 1998

CAPTAIN T J L MARRINER



Commissioned December 1994. RE Troop Commanders Course 114. Posted to 20 Field Squadron as a troop commander April 1996; went with squadron on Operation Resolute in April 1996, and Operation Descant in September 1997. Took part in Kota Mama Expedition – March to April 1998, Posted to the Counter Terrorist Search Wing April 1998, as Assistant Instructor, Police Branch.

Keen skier, sailor and surfer. Has represented the Corps and 36 Engineer Regiment at rugby, Will lead a team from 1 RSME on the High Peaks Mountain Marathon in the Peak District in March 1999.

FOLLOWING a busy six months, my troop were anxiously looking forward to returning home with the prospect of a relaxing four-week period of leave and a short break from military life. I, however, had sacrificed the opportunity to relax on a sunny tropical beach because at some time during my tour I had agreed to spend my holiday paddling reed boats down a river in Bolivia, South America, in search of lost civilizations and to assist with other pursuits in the same area. I flew to La Paz, Bolivia's capital, which is situated at an altitude of 10,000ft, and had to acclimatize prior to joining the rest of the team higher up, on the altiplano.

The rest of the team had arrived a week earlier and on 15 March 1998 had set sail with a fleet of three traditionally constructed reed boats which were launched from Lake Titikaka, the world's highest navigable lake, to tackle the 250-mile long Rio Desaguadero heading south to Lake Poopo, on the Bolivian altiplano, in oxygen-thin air 13,500ft above sea level. The multinational team was lead by veteran explorer and former Sapper Colonel John Blashford-Snell, who had first visited the region in the mid-80s and had returned to commence planning what is to be a three-phase expedition running until 2001. He was responsible for advertising the expedition to the Corps via the Engineer in Chief.

The aim of the expedition is twofold. First, to prove that there could have been trade links between South America and Africa, following discoveries of tobacco and cocaine in Egyptian mummies which could only have originated in South America; hence the use of the reed boats, the traditional means of inter-continental transport. Another link between the two continents is to be found in the language of the region which experts say sounds peculiarly like Arabic and could have originated in north Africa. The second aim is to support local Bolivian archaeologists in discovering investigating more of the 30,000 unexplored sites in this region, known as the wilderness of archaeology. Another phase will take a crew from the southeastern corner of Bolivia down larger rivers to Buenos Aires in more substantial reed boats, and then across from Argentina to Cape Town in a vessel similar to that used by Thor Heyerdahl in his epic "Kontiki" Expedition.

The voyage down the river during this, the first phase, was lead by the flagship *Kota Mania* (Mother of the River) the largest of the three balsas. Progress was severely hampered by the effects of El Niño; water levels considerably lower than anticipated meant that the boats had to be pushed and carried in places, but the team soon learnt how to read the river and find the deep channels to avoid being grounded. The going was

Capt T J L Marriner The Kota Mama Expedition 1998 p211



Map of area covered in article.

extremely tough in places as the boat crew waded waist deep in almost freezing waters and there were tense moments when storms swept in over the Andes from Peru and strong winds forced the vessels onto sandbanks mid-channel.

The British/Bolivian boat team numbered nine, and was commanded by Captain (retd) Jim Masters (formerly 9 Parachute Squadron), another very experienced explorer who had been part of many adventures organized by Colonel Blashford-Snell. Captain Masters ensured that the boat crew was resupplied regularly and was on the end of a radio if the need arose for land support. The team on the



The balsas attracted the attention of curious locals. Progress was slowed by low water levels.

water was enthusiastically lead by Lieutenant Luke Cox, who set the pace for the boats and looked after the welfare of the crew. The language barrier with the Bolivians was overcome to a certain extent, though conversations usually stretched no further than terminology relating to sailing, or how they liked their evening meal cooked. Local support was provided by Maximo Catari, his son and nephew, who had gathered the reeds and constructed the boats, and members of the Bolivian Navy (due to the fact that Bolivia is landlocked they had some spare time on their hands).

The first major discovery of the expedition was two statues found buried beneath a field near Uruhito. The find came about during a chance conversation between expedition member Richard Snailman and a local woman who complained that she kept striking a large rock whilst ploughing her field. Exploration of the site uncovered a temple (constructed of large hand-crafted stones) which had been the religious centre of a small Tiwanaku (pre-Inca) city dating back 27 centuries. The engineering feats of the Tiwanaku are remarkable even by modern standards and experts remain mystified as to how they managed to move stones weighing over 130 tons each and fit them together so perfectly that a playing card cannot even be inserted between them.

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Sailing south, the boats encountered more shallows as the river narrowed. The team continued to pole, push and portage their craft until they reached Calacoto, a small isolated village, accessible only by dusty tracks and, of course the river. On arrival Yolima, our interpreter from Columbia, spoke to the head of the village who agreed to provide accommodation for the team for a few days whilst we carried out archaeological exploratory work in the surrounding mountains. We were given a recently completed school building in which to stay and this provided some comfort. We negotiated with the villagers to provide food in the evening which they did, constructing a makeshift restaurant in the yard of a local



The mesetas sat high above the surrounding terrain – accessible only by a steep climb to the top – a mighty task for unprepared attackers.

garage, amongst tyres and rusting vehicle parts. Like any good eating establishment the quality of food varied, though the cooks were extremely resourceful with their limited facilities and available food; I would not recommend their chicken recipe however.

Using Calacoto as a base the crew split into teams and trekked to various areas cited by our Bolivian archaeologist, Oswaldo Rivera. The teams were led by the military personnel including a Royal Signals. officer, Captain Lee Smart, responsible for communications, and Lance Corporal Jason Joyce of the Royal Logistic Corps. Many of the excursions were productive with finds of small artifacts and pottery, though in the mountains west of Calacoto a series of fascinating discoveries was made: three cities were uncovered of a people known as Pakajes or Eaglemen, who had died out around the year 1175AD and had lived on heavily fortified mesetas. These high plateaus were surrounded by formidable defences. After scaling sheer rock faces and 18m-high walls each member of the team had to scramble through tiny entrances surrounding the high ground. The defences would prove difficult to breach even to a modern infantry battalion. Within the walls were dozens of stone tombs which appeared to be for burial, though it was unclear why they needed to be so well defended. Many contained mummified bodies that were well preserved, covered in sacks made of woven grass, Most of the skulls were elongated because the Eaglemen used to bind their heads in a similar

fashion to the Tiwanaku. Also there were more skeletons of women than men, indicating that when a warrior died he was buried with all his wives and mistresses. The team found many remains of children and it may have been that they were also sacrificed.

Initially we felt that these fortified *mesetas* sheltered cities of the dead but further investigation discovered dwelling sites that contained stone corn grinders and primitive tools made of rock.

One of the walled cities housed a tunnel that lead to the edge of the hillside and this basic piece of engineering could have been used as a lookout post or possibly an escape route. Beneath the cliffs of another were square tombs decorated with painted designs. The patterns showed step pyramids similar to those found in Mexico and early Egypt. Beneath these, further tunnels ran back into the mountain, but could not be accessed due to displaced debris. The lost cities had to be charted and this gave the Sappers in the team a chance to use field engineering skills.

As the rest of the team headed south along the river to Lake Poopo, I went to Oruro to join a film crew which was looking at the possibility that the fabled city of Atlantis may have existed on the Bolivian altiplano. Legend has it that the city, whose walls were plated in gold and silver, sank into the sea in a single day of earthquakes, floods and torrential rain and this theory was being explored by Jim Allen, a former aerial photographic interpreter with the RAF. Following a

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Several tombs on the high plateaus contained human remains – including some well-preserved munnified bodies.

study of photos of the area he felt that the city may have been situated in the Corque region of the altiplano and was particularly interested in a large "canal" that could have formed part of the vast water system that surrounded Atlantis. Having carried out a study on the geology of the area prior to joining the expedition 1 reluctantly reported the canal was, in my opinion, a natural fault, possibly forming part of the famous Corque syncline, and was not a feat of human engineering. Nevertheless, they continued to explore the Atlantis theory in other areas of the region.

My next task involved working south of the Salar de Uyuni, large salt plains situated in the southwestern corner of Bolivia. The first leg of the journey was by train from Oruro to the small town of Uyuni, where I was due to be met by the director of the Eduardo Abaroa National Park. I had to querie for a ticket for four hours as the daily service was expected to be busy because the road to Uyuni was closed. The closure had been caused by striking locals blowing the route with dynamite, a popular move to restrict mobility and to cause maximum disruption during periods of social unrest. On meeting the director I embarked on an eight-hour journey south in the back of a robust Landeruiser across the Salar to two lakes, Lagunas Colorado and Verde – these expanses of water were the purpose of my visit.

At the request of the Bolivian government the expedition had been asked to study the effects of El Niño on the lakes. Due to the unusual weather the water levels had dropped significantly and had failed to replenish. I stayed a week to study how the reduced water levels would affect the locality. Not being an expert in this field I had to carry out research and discovered, for instance, that rates of evaporation could be calculated by measuring the temperature of the water at different depths - this I did with the help of two enthusiastic park guards and some fairly basic improvized equipment. The time spent in the magnificent surrounds of the lake was tremendous and a good chance to practice my Spanish as the locals were unable to speak much English. Food was plentiful and the staple diet was a llama that lay on the shelf in the kitchen, and locally produced vegetables. On completion of the work I forwarded the information collected to the government representative in La Paz for a proper analysis.

In my absence the crew successfully navigated the river to just short of Lake Poopo, where they were stopped due to lack of water. They then packed up and headed back to La Paz, while I caught a bus to Santa Cruz with another member of the expedition to carry out a recee for the second phase.

We were scheduled to meet Tito, a Bolivian guide, in Santa Cruz in the early hours of the morning. However, due to a landslide we were held up in the depths of the rain forest for a number of hours, eventually arriving five hours late to meet a bleary-eyed Tito who, having driven through the night to meet us had spent the morning approaching all foreign-looking couples to see if they were us. After purchasing picks, shovels, rope and jerry cans (despite our guide failing to see their necessity) we departed on a long journey which turned out to be quite eventful. Our destination was the small town of Puerte Suarez, situated near the Bolivian border with Brazil and Paraguay, and we had a choice of two routes to get there. The first was the direct route, which we had been advised to avoid due to the rough road. The second was considerably longer though with better roads, some of which were even tarmacked. We chose the second option and set off, hoping to make up lost time. The road took us deep into the jungle and we drove through remote villages that appeared to contain considerable wealth - Tito

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informed us that the money had been made through cocaine that grew in abundance in the area despite efforts from the government to curtail the trade. After fourteen hours we arrived in the early hours at San José, the mid-point of the trip. At 0200hrs there was little activity in the town and we opted to camp on a verandah outside a local residence. Due to our fatigue we were not bothered by the mosquitoes, but a few hours later were woken up by two pigs trying to nudge their way into our sleeping bags and an unconcerned lady sweeping her doorstep.

We resumed our journey hoping to reach Puerte Suarez by nightfall, though the road deteriorated rapidly and we wasted valuable time digging the Landeruiser out of swamps. In the late afternoon the road came to an abrupt end where we were due to cross a river. A rail bridge was nearby but had been temporarily closed by a flatbed truck which was parked across the track as part of the national strike effort; the soldiers guarding it would not allow us to drive across. An option was to take a ferry constructed from planks of wood and oil drums and to pay 200 Bolivianos (SUS25) to the crew. We tried this unstable craft, but a few feet out it began to sink, so we returned to shore. We found out later that a school bus using the raft a few days before had ended up on its roof in the middle of the river. Two American Humvees1 arrived on the opposite bank. They were commanded by a lively American seconded from the Miami Drugs Enforcement Agency, who was on his way to carry out an operation in the jungle. They were given clearance to cross as we prepared to spend a night in this mosquitoridden area. The next day we were allowed to cross the bridge and arrived in Puerte Suárez a day late with one day to complete the recce. Fortunately, we met an Argentinian ex-naval diver who was working for a salvage company. He knew the rivers, that we planned to navigate, extremely well and, despite being a prisoner of war during the Falklands Campaign, he was very helpful and provided us with information even offering a site upon which to construct and launch the reed boats. He also drove us into Brazil to look at stretches of the river.

The return journey to Santa Cruz was affected by a considerable amount of rain that had fallen





Despite the innovative design, I did not suspect that the ferrymen were recently trained combat engineers?

during the last few days and on one occasion we had to tie a barrel to the front of the truck and float it across a swamp whose waters had risen to chest height. Fortunately we had the help of other drivers that were also stuck. For the journey to San José we teamed up with two young Bolivians who were driving a car that had been stolen in Paraguay and smuggled across the border, but they were stopped at a checkpoint on leaving the town and we did not see them again.

We arrived weary in La Paz two days later with enough time to complete the recee report before returning to England.

The expedition was a great experience for the whole group, composed of people from a variety of nationalities and backgrounds. Despite differences in language and cultures, the individuals formed an extremely effective team and successfully completed the mission, making some interesting archaeological discoveries along the way. Everyone involved had skills to offer and relished the challenges with which they were faced.

The second phase of the expedition (scheduled for next year) aims to continue the research into international trade links and to carry out further community tasks within South America. The phase will be organized by the Scientific Exploration Society, which will be looking for adventurous individuals who speak Spanish or have sailing experience. Further expertise will be sought from within the Corps to tackle a variety of tasks.

Details on the expedition can be found on the Internet: http://kota-mama.awe.co.uk.

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Developments in Mine Detection

LIEUTENANT COLONEL J R WYATT MBE MIMGT MIEXPE



John Wyatt followed a traditional RE career: Sandhurst, troop commander, squadron 21C, OC and MOD staff. He became the first adjutant of 33 Engineer Regiment EOD on its formation in 1973 and because of this was asked to form 58 EOD Squadron in 1988 to fulfil a specialist role in the Falklands, UK High Risk Search and Operation Crabstick (pipenines under airfields). During this time, the Brighton bomb exploded necessitating development of high risk search techniques and procedures for which 58 Squadron took the lead. It was a natural progression for John Wyatt to become Senior Instructor Mines and Search Wing.

On leaving the Regular Army in 1988, he continued to work for the MOD advising overseas governments on EOD and minewarfare. Its unique experience, at that time, of these two disciplines made him the ideal person to analyse and plan the initial response in the aftermath of the Gulf War. He has been intimately involved in the development of these two areas ever since and is now Technical Director of the SDS Group Limited.

The following article was first published in INTERSEC, dated 6 June 1998. A shortened version is reprinted here with permission.

WHICH EQUIPMENT FOR WHICH ENVIRONMENT?

THERE are many organizations, some government and some non-government, that would like a definitive report on which mine detection equipment is most effective in a given situation. Although many trials have been carried out they have frequently been hastily prepared by people not normally involved in equipment trials and the results are therefore not comprehensive enough to be meaningful. Some trials have purposefully been biased one way or another because the organizer has a hidden agenda such as being blatantly in league with one of the manufacturers. A good example of this would be where a country is donating funds for humanitarian mine clearance and leans on the organization to choose a detector manufactured from that country.

A further significant problem is the environment in which the equipment is to be used. Some detectors suit one environment while others do not.

It would be presumptuous to claim that this article will realistically compare equipment, but it will look at the technology available, and consider user requirements.

ACCEPTABLE RISK VERSUS UNACCEPTABLE RISK

TRADITIONALLY, mine detection has been the prerogative of military engineers who in war have to clear minefields, or lanes in minefields, to enable their own forces to advance. Or, in the aftermath of war, battlefield area clearance will be undertaken by the military, for instance as done in the Falklands and the Gulf. Clearance might be accomplished with explosives, mechanically, eg with a flail, or by hand. These operations can cause casualties and although through the use of good equipment, procedures and training, casualties are kept to a minimum it is nonetheless accepted that, in war especially, those wearing a uniform would tolerate the risk.

However, a more recent requirement is for humanitarian demining which is carried out by civilians, under the guidance of contracted experts, and which has a zero acceptable casualty level!

SUPPORTIVE DEVELOPMENT

MOST of the mine detection developments reflect the "no risk" element for civilians, but that is not to say that developments for military and civilian

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are not mutually supportive. What transpires in one discipline may well have implications for the other, although it is apparent at present that this technological gap is widening rather than coming together. In the UK, some effort is being made to keep the two at least aware of what each is doing, even if not actually working hand-in-hand (the UK has not embraced the military/commercial integration that some countries have).

A FIVE-POINT PLAN

The Secretary of State has produced a five-point plan that includes:

- A lieutenant colonel staff officer for humanitarian mine action.
- UN attachments for military personnel, eg in New York and Bosnia
- Setting up a Mine Information and Training Centre based with the military engineers.
- A technical research centre (for military research only at present).
- · An inter-government departmental working group.

Developments for the military requirement are concentrating on three areas: the remote detection of minefields, vehicle mounted systems and hand-held equipment. The technical research centre mentioned above is funded by the government to look at systems for the future. The emphasis is on technology, not the MANPRINT implications (the interface between man and equipment in terms of application, training, maintenance and repair) and, of course, cost does not come into it at present.

Developments in vehicle-mounted detection systems may be useful for humanitarian demining, although the expense may prove too much for commercial companies. Use of ultra wide band radar, thermal imagery and ground penetrating radar (GPR) are being considered.

Hand-held equipment technology for the military requirement is concentrating on combining detection systems to produce a more accurate detection picture. This will not only assist in neutralization methods because the target is recognized, but will also remove the mass of false alarms. The three systems being looked at are traditional metal detection, GPR which will identify size, shape and depth of the mine and nuclear quadrapole resonance which will recognize explosive content. One difficulty will be to integrate these systems and improve the data fusion, whilst at the same time trying to package



White's AF1088, showing control pack and halo probe.

them into a hand-held system. Back-packs or umbilicals connected to an electronics pack, as shown above, may be acceptable to the military, but is not suitable for a local farmer!

The above programme, and others like it, will continue for several years yet, but humanitarian demining needs something **now** and therefore developments in this area have been more immediate.

REQUIREMENTS FOR HUMANITARIAN DEMINING

SPECIAL requirements are needed for humanitarian demining because the work has to be carried out by locals who have no technical skills and little training. The mines they clear are generally not laid in any pattern. In any one area the mines may not all be the same type. being those which were available at the time or which could be improvized. Many areas have adverse working conditions where support is difficult to provide for a variety of reasons, eg lines of communication, transport, quality of person involved, technical facilities etc. Finally, humanitarian demining has to be paid for and there is a finite budget. All of this means that successful equipment must almost be service and maintenance free, of robust design and simple to repair, yet effective in a wide variety of soil conditions.

MINE PRODUCTION CHANGE

THE production of large metal mines did not change very much until the early 70s when moulded plastic was introduced for the outer casing because it was simpler and cheaper. It was

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The Eben 420PB in service with the British Army.

then discovered that by keeping metal content to a minimum, these mines were much more difficult to detect and hence more effective, particularly in the case of AP (antipersonnel) mines. Nowadays the only metal content many of these AP mines have is a very small spring or striker. Modern detection technologies have to cope with this.

WHICH DETECTORS

Is June 1994, during the international workshop organized by FAO¹ in cooperation with the UN Under-Secretary General for Humanitarian Affairs at Stockbohn, the Working Group came to a conclusion regarding the correlation of effectiveness of technologies in various working conditions. The two technologies which were applicable to the largest number of environments: eddy current detectors and magnetometers, are still the ones used for most operations and deserve a closer look.

EDDY CURRENT DETECTION

The eddy current detection principle is best applied to detect close-to-the-surface mines or

Swedish Research Centre



Top: Oscillator amplitude of a continuous wave detector. Below: Oscillator amplitude damped as target is detected.

munitions, whereas searching for deep air-delivered ordnance (bombs) is best done using differential magnetic anomaly detectors, as these bombs would be beyond the limits of the average eddy current detector. It is the former which is relevant to this article.

Eddy current detectors apply an active working principle by emission of electromagnetic waves. Most common are continuous wave detectors within a frequency range of approximately 2kHz to 500MHz, or pulse induction detectors using a sequence of electromagnetic pulses. These signals are sent out by one or several coils in the detector head. Continuous wave detectors feed a continuous wave to their search coil inside the search head. An electromagnetic field is generated around the search head and induces eddy currents into any conductive material within range.

Eddy current induced into objects within the reach of the detector will respond with a seconlary field which is opposed to the primary field. This results in an increased energy consumption in



and secondary field surrounding it.

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the detector electronics, and a damping of the oscillator amplitude and frequency. These parameters can be used for evaluation and to indicate the presence of a conductive object by an alarm.

PULSE INDUCTION DETECTORS

PULSE induction uses a sequence of single pulses, instead of a continuous wave, to generate an electromagnetic field around the detector's search head. These pulses induce eddy currents into conductive targets. Immediately after the pulse transmission, the transmitter is temporarily switched off. The short oscillation after the pulse is due to counter induction in the coil. The secondary electromagnetic field which surrounds the conductive target is now received by the search coil and fed into a receiver for evaluation and to generate an audio alarm.

At the end of the transmission phase the coil tends to maintain the emitted field by a counter induction which depends, in intensity and length, on the pulse energy. Short pulses of low energy allow an early evaluation of the generated target "responses."

The environment in which the mine is situated will also affect the ability of the equipment and technology to detect it.

Elements with low conductivity, such as salt water or slightly mineralized soil, give a weak secondary field which decays rapidly.

If the receiver start is delayed by approximately 15µsec, such unwanted signals can be excluded from indication as they have already decayed to zero before the detector starts to receive any response signal.

Looking at the time axis, (see bottom right) the transmitter pulse starts at 1 and ends at 2. The response signal from interfering salt water decays at 3. To avoid false alarms the receiver circuit in the detector starts at 3, when the interfering signal has already decayed totally.

A comparison of the two technologies shows that:

Continuous wave detectors are superior in their range of detection of minimum metal mines and are very good at detecting high grade steel, springs and foils, but are sensitive to salt water and mineralized soils. The pulse induction detector is able to suppress these false alarms and has a safer and more stable search mode, but requires more technical input to detect conductivity with short signal responses.

WHAT MANUFACTURERS PROVIDE

MOST quality detectors at present on the market are using pulse induction. However Adams



Top: Primary pulses fed to search head. Below: Transmitter pulse and response signal from metal object.

Electronics, which has a strong history of handheld metal detectors, are considering using their linear detection (sine or continuous wave) technology in their AX 777 programme for mine detectors. This will enable them to produce relatively cheap equipment, able to use very low current which considerably increases battery life. The programme is still in its infancy and performance in mineralized soils unproven. Vallon's ML1614 C has concentrated on this problem as difficult soil conditions have been encountered in many mined areas.

Guartel's MD8, which also uses pulse induction, has been very successful in many countries with this problem. Its power output, however, shortens battery life. Solar power may be one way ahead and this has been used by Ebinger. Adams is also assessing solar power.



Top: Response signals of different decay angles and length. Below: Delayed receiver start at 3, suppressing false alarms (salt water).



Above left: Guartel's MD8 and right: being used with the head reversed for search in the prone position.

Ebinger produces both continuous wave and pulse induction equipment, the client selecting the one which is most suitable. The Ebex 420PB, in service with the British Army, (see page 218) uses pulse induction, and developments in this area are for the detector to discriminate between mines, mine-like targets and natural interference. The equipment mainly carries out an on-line response signal scan and evaluation to discriminate between wanted and unwanted signals. Additionally, a multi-spectral analysis of the response signals beyond the usual very low frequency supports the definition of plastic mines against interference. Such analysis gives the advantage of not reducing the detector's range, compared to a detector running in a pure compensation mode.

SIMPLICITY IS A MUST

MOST of the manufacturers have now sorted out problems concerning moisture, atmosphere, weight and robustness so there are unlikely to be many developments in these areas. However for humanitarian demining, the MANPRINT implications assume a greater importance. With low levels of training and education, extended lines of communication and minimum supervision, simplicity and reliability are essential. Much equipment has now done away with separate control boxes and annoying cables (MD8 and Ebex 420), thus reducing snagging, connector repairs and difficulty of movement for the operator, especially while in the prone position, although White and Foerster² (Minex 2FD 4.400) (see opposite) may counter the "annoying cables" argument with the fact that control consoles give more options, particularly in terms of safety measures, eg light emitting diodes showing malfunctions.

The wide variety of terrain in which detectors are used often means that equipment is operated in both the prone and standing position. To be able to shorten the equipment is therefore a distinct advantage; both the Minex and Ebex 420 do this, while the MD8 reverses the search head while maintaining balance, (see above).

But it is in the logistical and maintenance area where most developments have been made. The requirement for easy first line field maintenance has become paramount. Time is of the essence, when equipment is in continuous use. To have to send it back to a major city for repair, or have it recalibrated every time a component is changed, is costly in both time and money. Manufacturers are now quoting MTBF (mean time between failure) figures based on actual operations (not laboratory or training conditions) and many are incorporating simple component exchange without the need for special tools or calibration.

²Whites Electronics and Foerster.

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2.49



Ebinger 420PM in shortened form being used in Cambodia.

FUTURE DEVELOPMENT

FUTURE equipment development must be sympathetic to these very real practical implications because user confidence is almost as important as the technical capability of the detector. Development should benefit from the combination of new detection technology such as interference rejection and scanning of response signatures.

Interference rejection will improve a higher resolution of weak response signals, particularly from minimum metal AP mines. This may lead to a larger detection range, as requested at the 1997 Tokyo Conference (200mm for AP mines). The increased performance and the drop in prices of complex microprocessors will help to integrate new characteristics into metal detectors. Response signals can be scanned to discriminate between different sorts of metal or alloys, the depth of the targets and their approximate size.



Foerster's Minex 2FD 4.400.

Additionally, the radio frequency component from the pulse signal can be used for further questioning of targets, such as the change of underground conductivity (plastic + explosives inside minimum metal mines).

Many interested parties will monitor the developments in both the military and civilian disciplines of mine detection. The influx of money into the humanitarian side will ensure that competition among the manufacturers is keen, which can only be good for the user.

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Jordan – 50th Anniversary Reflections



MAJOR ALAN O'HAGAN

Major O'Hagan enlisted in 1944 and was commissioned from 140 OCTU, Newark in 1945. His service spanned the years 1944 to 1964 and included tours in 9 Airborne and 26 Assault Squadrons (as they were then titled). He served widely in the Middle and Far East including Egypt, Palestine, Jordan, Korea and Malava and, on retirement, was appointed as the first ROII Corps Recruiting in HQ EinC during 1964 to 1968. During this appointment he travelled extensively in Aden, the South Arabian Federation and East Africa, filming and subsequently producing the official Army and Corps recruiting and training film "Engineering For Peace." During his service, among other sports and activities, Major O'Hagan learned to fly with the RE Flying Club.

In 1970 he joined the TA and served for over 16 years as the permanent County Staff Officer to Kent Army Calet Force. The author's first overseas tour was in the Middle East from 1946 to 1949 and this article recounts the story of his first regular commission appointment in 1948.

This story was first printed in Jordaniana, the magazine of the Anglo Jordanian Society, in Spring 1998, and an edited version is reprinted here by kind permission of the Editor.

My troop sergeant and I had just emerged, reluctantly as always, from the sea's warm waters. We threaded our way between the bronzed bodies of our Sappers, each of them towelling down before making their way back to the troop lines for breakfast. It was the usual scene which followed the 0600hrs daily swimming parade. As the sun emerged, like clockwork, from behind the dramatic line of hills to the east and climbed quickly into an azure sky, it already brought a warm glow to the skin. It would not be long before those newly arrived from cooler climes could comply with the admonition of their more experienced desert veterans to 'Get your knees brown!'

But this was a morning with a difference, for just as we reached the edge of the harbour wall and looked down to pick up our towels, there, brinshing against the wall itself, swam two sharks. One probably 20 feet in length, the other a little over half that size, cruised slowly and majestically past the very point at which we regularly dived into that deep and inviting water. Their appearance concentrated the mind and prompted the posting of a lookout for all future swimming.

Yet this was not the most important direction in which our minds and our lookouts were then focused. For we were in Aqaba, Jordan's only and vital port, and the time was January 1949.

The presence, once again, of the British Army in Jordan stemmed from the consequences of the decision taken by the UN in November 1947. This sanctioned the division of Palestine to provide land not only for the Palestinians but also for the new state of Israel. By May 1948, the British withdrawal from the mandated territory of Palestine had been completed and the Anglo-Jordanian Treaty signed. This made provision for assistance from Britain to Jordan in the future should the Palestine-Jordan frontier be violated.

Palestine's partition was immediately followed by all-out war involving Arab-Allied forces ranged against the Israeli Army. By the end of 1948 much land had changed hands and Israel's annexation of southern Palestine posed a direct threat to Aqaba. Its acquisition would not only provide Israel with a Red Sea port but, critically, would deny Jordan her only sea link to the outside world, and, arguably, threaten her very existence. Thus, in late 1948, following several Israeli violations of the border, the Anglo-Jordanian Treaty was invoked. "O" Force was assembled in Egypt and, at battalion group

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Maj Alan O'Hagan Jordan - 50th Anniversary reflections p222.



The author on the Jordan-Palestine border 1949.

strength, was dispatched to Aqaba to secure the port, arriving on 8 January 1949.

"O" Force took its title from the initial letter of the surname of Lieutenant Colonel R H L Oulton, commanding 1st Battalion The Royal Lincolnshire Regiment, and Force Commander, changes of unit until final withdrawal in 1957. Alongside 1 Bn R Lincolns, the Force included anti-tank and anti-aircraft detachments of the Royal Artillery, 1 Troop 17 Field Squadron, which I commanded, and the other usual supporting arms. The GE was Captain Bill Fawcett, who shouldered his responsibilities most capably. By March 1949 the Force had expanded to become 8th Infantry Brigade commanded by Brigadier S A (Sam) Cooke, comprising additionally, 45 Commando RM, A Squadron 4th Royal Tank Regiment, and the balance of 17 Field Squadron, 11MS Magpie, Peacock and Troubridge were assigned on rotation to provide close support inshore, the RAF flew regular supply sorties by Dakota aircraft from Egypt, and bulk stores came by sea.

"O" Force was thus, essentially, a tri-service force whose defences, presence, preparation and determination proved sufficient deterrent to ensure Aqaba's security until the Israeli threat subsided. Additionally, it provided critical relief



Observation post at Aqaba on Jonlan-Israel border 1949.

to the Arab Legion commanded by General John Glubb, (also a Sapper) which was thus able to concentrate on the defence of central and northern Jordan.

The role of Sappers in war is to enable the Army to fight, move, and live. All this was well illustrated in "O" Force. We developed forward defences by building command bunkers and observation posts. We dug in tanks. We improved and maintained roads, tracks and our desert airstrip and, later, made life more comfortable for the Force by creating more permanent camp structures and supplying electricity and water. Maintenance of the desert airstriplocated vulnerably just inside the Palestine-Jordan border and whose southern approach began at the shoreline itself where today's Coral Beach Hotel stands - was vital. It was achieved by dawn-to-dusk lightweight mechanical rolling and watering, the water pumped by pipeline along its length directly from the sea. Young sappers were regularly placed in charge of projects such as this and of construction tasks employing local Jordanians. This provided our men with wonderful experience in developing leadership, man management and organizational skills, allied to their artisan capability.

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RAF Dakota desert airstrip Aqaba, 1949.

"O" Force provides many memories to savour: we learnt how dangerous a rifle can be when left - unlawfully loaded - in a tent which catches fire. From a safe distance we counted as each round of ammunition exploded until we knew the magazine was empty. Tasked with finding a secure fighter aircraft base should we need close and rapid air support, I found myself gazing at the incredible expanse of the desert of Qa'al Jafr hard baked, as flat as a billiard table, and stretching for seven miles in all directions. Forty-seven years later Richard Noble would select the same location for his final supersonic land-speed record trials which culminated successfully in America in 1997. Again, at 1200hrs on a day in mid-summer, our squadron - soldiers first and Sappers second - was tasked to take over, for a time, the front-line positions of 45 Commando: We might well have been taking over a gigantic oven as the thermometer registered 130°Ft

The day also came when, amidst real echoes of history, we followed in Lawrence's footsteps as we explored the spectacular desert and the sandstone hills of Wadi Rum. Later, entering Petra, it seemed in those pre-tourist days as if we were the first to set foot in the rose-red city since the Nabeteans had left.

As we pray for peace throughout the Middle East we salute the key role played by HM King Hussein and by Jordan to this end.

When I revisited Aqaba in 1992, 1993 and again this year to see the modern metropolis where once our

canvas city and front line had stood, I quietly reflected on the role played by "O" Force in the context of that region's subsequent history. And I could not help but wonder how different things might have been had we failed to arrive in time.

I had voluntarily extended my Middle East tour to fulfil my role in "O" Force, and as 1 prepared to return home in September 1949 1 knew that my love of Jordan, my appreciation of the kindness and hospitality of her people, and my wonder at the breathtaking beauty of this desert land would remain with me always.

At this 50th anniversary of the year in which "O" Force was formed, let us hope that the day is not too distant when we shall finally see, on that tiny stretch of coastline where the frontiers of Jordan and her three neighbours meet, the reality of the Red Sea Riviera. Then, the only invaders will be travellers, and the only lookout needed will be to spot the two sharks brushing gently against the harbour wall

DIGITAL CAMERAS

Please note that photographs taken with a digital camera, although very suitable for reproduction on a coloured laserprinter at home or in the office, are got suitable for reproduction by a commercial printer for publications such as the *Journal of Sapper* magazine. The reason for this is that for laserprinting 72dpi is suitable but for commercial reproduction, images need to end up at 400dpi, starting with scans of 800 to 1200dpi. 1 can hear you thinking: "well, I can just increase the 72dpi to 400 and all will be fine?" But no, this is definitely not so.

To cut a long story short, if you intend to use digital photographs to illustrate an article you must set the camera at a minimum of 800 dpi, L200 would be better. Photographs taken at this number of dpi will produce VERY large files. You will need a cable to transfer the information from the camera to a PC. Then you will need a removable hard-disc to store them on to send here. If you have Photoshop, you can change the image from colour to greyscale as this will reduce the size of file considerably. If the file can be changed to greyscale, you can try sending it as an attachment to an Email but it will take some time on a normal line and is best sent overnight. If you cannot produce a digital image at the correct dpi <u>please</u> just send the photographs – yes, photographs, not **lasercopies**: another long story.

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Extempore Engineering

COLONEL SIR ALAN HARRIS CBE BSC(ENG) DSC FENG FCGI FICE FISTRUCTE

The following is an extract of an item which was first published in the New Civil Engineer in February 1983. It is reprinted here with the kind permission of the editor.

I MADE good progress on the old BSA 500 across the wintry plain, a touch of spring in the air. Down side lanes soldiers swarmed around tanks, guns and trucks. Liberators at dropping height followed by Dakotas towing gliders hid the sky for a moment.

In a dry ditch by a lay-by was a padre of the old religion. Confession, absolution, the wafer on the tongue; off again in the nose-to-tail traffic towards the battle for the river.

We in Port Construction were the heavies of the Royal Engineers, manned mostly by major contractors. Our job was a timber-piled bridge across the Rhine at Xanten.

And what had I had to confess? Why, cowardice, sloth, bawdiness, arrogance (intellectual, of course); gluttony and drunkenness when possible. Same as you, save for envy; I envied no one.

Nothing would stop us now. Berlin? No trouble, Moscow? If you wish.

We came to wooded hills and the remains of grisly battles. They fought their last defeats with the same skill and dash as their first victories. Heavy machine guns were firing over our heads at extreme range; at the river bank, we were in front of the 25 pounders – very noisy. The assault bridge was going over; air command had obscured accepted wisdom and the field behind the rafting sites was full of bridging vehicles – but the enemy had new planes which we could not catch. A rocket engined "squirt" appeared from a cloud to disappear forthwith in a flurry of tracer, and soon an artillery bombardment knocked the stuffing out of the field alongside. Had our gunners been dozing, the pilot might have got his map reference right.

The company arrived and bivouacked in an orchard, near Xanten where I heard a sapper reading from his girl's letter the old ballad "My love has gone to the cruel wars in High Germany." All within earshot listened.

Our bridge was special broad deck Bailey in 18m spans at high level to clear navigation; length 1260m with 370m over normal waterway. The river piers were of timber piles driven from swinging leaders hung off a cantilevered thing called the "monster". It avoided piling afloat, but was that the problem? The Americans upstream had brought up segmental rafts with piling gear; working simultaneously at numerous piers on which they placed 1m deep RSJs they beat us by weeks. Anyhow, to pitch the piles in that current, we needed power afloat and had chatted up a naval officer in Ostend about the joys of a trip on the Rhine; we transported across the country an indispensable LCI with skipper and crew in sailor suits. Moreover, timbering the bents was not easy with six piles each oscillating several feet.

Fitting some doofer (do for now) to the head of the pile rig, I saw the bridge emerging from the seeming chaos of the bank and thrusting out over the swirling water – frail, adequate, rectilinear, ours. I exulted in being an engineer.

It took us some 40 days; Caesar built a piled bridge upstream of Cologne in nine days; the fastest assault bridge (folding boat) had taken ten hours. Our bridge lasted a season. When a big Rhine barge hit it broadside on and pushed it over, it didn't matter any more.

Peace; abruptly, there was a future so I studied Pippard and Baker (devilish clever these civvies) – my degree was ten years old and I had not seen a slide rule for six. In the evenings we would discuss prospects and end by asking Doc Smith, our benign, tacitum MO from Glasgow "What do you do in civvy street, Doc?" – nor would he fail to delight us with a roar of rage.

War is crime, and punishment for crime. His crime? Yours? Mine? Work it out for yourself – but here's a curiosity.

While in Paris in 1947, I was sent on a prestressing mission to the US with Count de Lubersac the banker, well connected over there, and Etève, long a colleague of Freyssinet. Both had fought in the resistance, been caught, tortured; dwelt in Buchenwald, Etève! An ace fighter pilot in World War One, living the wildest of lives, passing his days in fury and cursing, beloved of all who knew him, a prince among engincers.

New York was a long day with Raymond Concrete, a boozy dinner with Etève, work together in the hotel till the small hours; Fridays we did the night clubs. "I often wonder" said Etève later "why you and I get on so well together, Harris; I think it is because we are both of us soldiers." No one has told me anything which pleased me more. Chaps anyhow.

Some Thoughts on Wider Peace-keeping and the Key Role that Military Engineering Plays

SECOND LIEUTENANT MARK WORKMAN BSc PuD



Second Lieutenant Mark Workman was commissioned into the Corps in December 1997. Prior to joining the Corps he attended Southampton University obtaining a BSc and PhD in Oceanography. Since passing out of Sandhurst he has attended 120 Royal Engineers Troop Commanders' Course and is at present serving as a troop commander.

INTRODUCTION:

THE end of the Cold War marked a major watershed in UN peace-keeping. It not only led to an increase in the number of operations' (see map opposite) but also to a shift in emphasis from interstate missions to intrastate ones (4). The consequence of the latter has been the development of a new dimension to UN peace-keeping. Traditionally peace-keeping¹¹ involved dealing with governments in conflict¹¹¹, however, in the case of intrastate conflicts there is often no government to deal with, hence aspects such as the supervision of elections, dealing with non-government organizations, and the provision of humanitarian aid become vital. The execution of these objectives are termed "wider peace-keeping¹⁴ tasks." It is worth emphasizing that wider peace-keeping doctrine is in its infancy and is still evolving to the extent that it has not been accepted by all in its present format (6). Furthermore, the term "wider peace-keeping" is essentially unique to British military literature and appears not (yet) to have been adopted in our civilian literature⁸ nor in that of other nations.

Here one wishes to consider the pivotal role of military engineering in achieving "success" in wider peace-keeping. The ambiguities in defining success in these operations are then discussed as well as political flaws in the UN that inhibit the effective implementation of wider peace-keeping. Finally, an examination of the importance of military engineering at an operational level and political brokering at a geopolitical level in future wider

 Out of the 34 peace-keeping operations established to date. 15 were established in the first 40 years of the UN (1948 to 1988), while 19 have been established since 1989 (1).

 Defined as "operations carried out with the consent of the belligerent parties in support of efforts to achieve or maintain peace in order to promote security and sustain life in areas of potential or actual conflict."(11).

iii. With the exception of the Congo 1960 to 1964 and the Lebanon 1978. For details see (10).

iv Defined as "the wider aspects of Peace-keeping operations carried out with the consent of the belligerent parties but in an environment that may be highly volatile." (11).

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v. For example, it is referred to as "post conflict peace building" by Bertram (1995), "Peace building" by Brethenton (1995), probably due to the terminology used in Boutros-Boutros-Ghall's report "Agenda for Peace" (1992), Indeed Goulding (1993) actually considers two aspects of peace-keeping: "Implementation of a Comprehensive Settlement" and "Delivery of Humanitanian Relief" as separate – both of which are integral aspects of wider peace-keeping (11).



Map showing UN peace-keeping operations around the world (as of January 1995).

peace-keeping operations is also made. These factors are reviewed in relation to wider peace-keeping aspects of the Bosnian and Rwandan missions, not necessarily because these provide the best examples but because they are the best documented (8, 16).

WIDER PEACE-KEEPING - AIMS

THE integral aim of wider peace-keeping is the reestablishment of a nation from a state of anarchy such that it is able to govern itself in a state of stability. This is done with the consent of the belligerent parties and as impartially as possible. To this end a number of operational tasks exists within wider peace-keeping doctrine (11) which sets out to achieve this aim.vi These are summarized in Table 1 (over the page), from which can be seen that the principal military engineering requirements are associated with the provision of military assistance, ie, support of civil affairs programmes such as the supply of maintenance of civil infrastructure facilities, eg, the provision of shelters, waste disposal facilities and electrical power, and the procurement, storage and distribution of water.

Additional contributions are the location, removal and disposal of mines and unexploded ordnance (5). Engineer roles in the delivery of humanitarian relief supplies (15) include the re-opening or construction of supply routes. These direct tasks augment the aim of wider peace-keeping due to the fact that the scale of the tasks is often such that local help is required and local supplies of construction materials need to be procured. This helps to reestablish an economic base to the country (15) and broadens the skill base of the indigenous population (analogous to the schemes used in development areas in the UK and around Europe (eg, The Welsh Development Agency)).

Though military engineering's primary role lies in the above-mentioned areas, the application of traditional engineer roles to assist those involved with conflict prevention, demobilization and guarantee and denial of movement tasks is also substantial. These military personnel require accommodation, essential services, working bases and accurate mapping in operational areas (13). The contribution that military engineering makes toward the operational tasks involved in wider

vi Though a significant proportion of "Army Field Manual" Volume 5 is dedicated to other facets of wider peace-keeping, these other aspects largely arise due to the need to implement the tasks shown in Table 1, for example, the maintaining of impartiality and consent when carrying out these tasks. These are not considered here but are referred to later.

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Operational Task	Description of Task		
Conflict prevention.	Activity that seeks to anticipate and forestall conflict. It embraces early warning, surveillance, stabilizing measures and pre- ventative deployment. The latter often requiring large scale deployment backed up by a substantial reinforcement and sup- port capability.		
Demobilization operations.	The controlled withdrawal, demohilization and rehabilitation of belligerents. Something that in this context would be can out with the prior agreement of the parties concerned.		
Military assistance.	All forms of mandated military assistance rendered by a wider peace-keeping force to a foreign civil authority a refers to such as supervising a transfer of power, reforming security forces and developing or supporting civil inf structure facilities. The maintenance of law and order is foundational to such activity.		
Humanitarian tehof.	Operations seek to meet the needs of residence, refugees, or displaced persons. They may be conducted independently by the military or in support of aid agencies. They are likely to involve such things such as the protection of supply deliveries and relief workers, and the establishment, support and protection of safe havens. Such operations may also include administrative, coordination and logistical activities to support humanitarian relief efforts.		
Guarantee and denial of movement.	antee and dof movement. Those operations that are mandated to guarantee or deny movement by air, land or sea in particular areas over routes. The denial of movement usually focuses on the establishment of no-fly zones. Assets involved (often and aircraft) deem that such tasks are controlled at strategic or operational level.		

Table 1. Wider peace-keeping operational tasks (after Army Field Manual, Volume 5 (1995))

peace-keeping is summarized in Table 2, opposite. Examples and references from Bosnia and Rwanda are also shown.

From the above it can be seen that at operational level military engineering should, in theory, be vital to the effective implementation of wider peace-keeping programmes. Without it forces required to establish peace are unable to carry out their tasks effectively and, more significantly, the very essence of wider peace-keeping, the re-establishment of civil and economic normality via infrastructure taskings and minefield clearance, are unable to be carried out. In this context therefore it would seem that military engineering is indeed the key to wider peace-keeping.

SUCCESS OR FAILURE

It has become evident, however, that despite the implementation of military engineering in the majority of wider peace-keeping operations, these missions have met with mixed success. To consider the reason for this, one needs to know how these operations are assessed in terms of "success" and "failure". Despite the definition in "Army Field Manual" Volume 5 (1995) of success being "the rate at which the sum total of the desired activities progress toward the achievement of the UN mandate", in practice this proves somewhat unsatisfactory. Wider peace-keeping mandates are not always clear and various governments expect different things from UN decisions. Therefore assessment of such operations is somewhat ambiguous - not only in terms of success and

failure, but also in the time-frame used to determine the durability of the results. For example, in the case of Bosnia was the mission successful because it saved lives and managed to contain conflict in Europe or rather a failure because the UN did not stand up to aggression, genocide and the forced movement of pcople?(8). In the case of Rwanda, though some form of rehabilitation was re-introduced, (12) this only occurred after the execution of 500,000 and the displacement of 4.7 million people (6) – despite the fact that the UN had a presence from the very outset of the troubles (16).

INFLUENCING FACTORS

OTHER more influential factors are likely to affect wider peace-keeping operations. These factors are attributed, by many commentators, to lie at a political level, particularly those associated with the politics of the UN. The two most quoted political problem areas in wider peacekeeping operations, which may have contributed to their failings, are political and structural inadequacies of the UN, and doctrinal flaws in wider peace-keeping.

The UN, by its very nature, is a highly complex political machine (18, 7, 14). With respect to intrastate peace-keeping missions the situation is augmented by the fact such missions intervene in matters that are of "domestic jurisdiction", thereby raising the politics of sovereignty (9). Firstly, informed decision-making and the formation of the appropriate mandates is considered

SOME THOUGHTS ON WIDER PEACE-KEEPING

Operational Tasks	Engineer Roles	Examples	References
Conflict prevention and demobilization operations.	Construction of accommodation.	Accommodation for French, British and Dutch troops on Mount Igman and throughout the rest of Bosnia.	Lilleyman, Apr 96
	Provision of security facilities.	Support of the establishment of BRITCON bases (Rwanda). Upgrade of protection levels (Bosnia).	James, Aug 95 Urch, Aug 95
	Maintenance of camps.	Maintaining UNPROFOR camps in Op Grapple 5 (Bosnia).	Urch, Aug 95
Military assistance.	Minefield clearance.	Monitoring of minefield clearance/marking (Bosnia).	Urch, Aug 95 Buttery, Dec 94 James, Aug 95
	Powerline repairs, hospital refurbishment water and sewage reconnection and route repairs.	Support key to Op Grapple 5 infrastructure projects (Bosnia). Assist the restoration of essential services and facilities throughout the country (Rwanda).	Urch, Aug 95 James, Aug 95
	Well drilling for water.	Well drilling in Bosnia. Produce potable water for BRITCON refugees (Rwanda).	Wye, Aug 94 James, Aug 95
Humanitarian relief.	Construction and maintenance of aid routes.	Route Triangle and Diamond (Bosnia). Maintain and repair work on MSR and other routes in Rwanda.	Urch, Aug 95 James, Aug 95
Guarantee and denial of movement.	Airfield support operations.	39 Engineer Regiment.	

Table 2. Operational tasks in wider peace-keeping and engineer roles in Rwanda and Bosnia.

poor.vii For example, in Croatia the UN came between the breakaway Serbs and nationalist Croats, each with unfinished political agendas (8). Though UNPROFOR's mandate allowed weapons impoundment, most of the former Yugoslav soldiers' equipment was only withdrawn. This resulted in pushing the conflict around, the UN troops acting, in effect, as guardians of the territorial situation that the Zagreb government rejected as a permanent solution. Therefore whatever initial stability the UN force brought to Croatia at its time of deployment, it allowed the Croatians time to rebuild its military power as a prelude to further war and civilian suffering. In the case of Rwanda, the initial contingent of UN peace-keepers (a Belgian and Bangladeshi force) actually withdrew prior to the climax of the violence due to the lack of a sensible mandate, brought about largely by a poorly informed security council. Furthermore, in the case of the Croatian situation, the timing of the UN intervention was questionable; many argue (8) that the UN forces should not have been

deployed into such a volatile environment as the situation was hardly conducive to peace. The inadequacies of UN mandate formulation, then, makes the matching of political goals and military end-states extremely difficult. Military commanders find that political objectives fail to reflect the situation on the ground and as a result mission creep develops which then hinders the effectiveness of such operations.

LACK OF POLITICAL WILL

ADDITIONAL flaws include the problems of political will. It is likely that the reason for UNI-MAR II (United Nations Assistance Mission) for Rwanda being slow to respond to the genocide in that country was due to the lack of willingness of nations to respond. At the time (1994) the Somalian operation was floundering (16) and nations (especially the United States) were reluctant to participate in another commitment in a conflict-ridden, failing state. Further reasons for lack of political will is the open-ended nature of wider peace-keeping operations which makes

vii Which at an operational level has the effect of the production of poor rules of engagement and poor command and control set-ups for the multinational forces involved.(1)

them potentially costly^{viii} and politically unattractive. This prevents governments from willingly committing troops immediately thus further hindering the potential for an effective solution by allowing the situation to deteriorate.^{ix}

POOR DOCTRINE

PROBLEMS with wider peace-keeping doctrine have also impeded the effectiveness of these missions. The most salient problems with the doctrine are maintaining impartiality and the need for consent throughout operations (6). Connaught (6) more than adequately highlights the situation, using Rwanda as an example.

The maintenance of impartiality is difficult as every action by the UN will affect the local balance of power. Humanitarian intervention, for example, favours whichever faction is nearest to defeat and is sure to anger those factions which lose political or military leverage. Also, mandates that rely on the consent of all parties are difficult to reconcile with those that require a peace operation to become partisan to one side or the other (8). In Bosnia this was exemplified by the safearea mission. Though the UN was able to protect the safe areas, it never seriously punished any major infringement of these areas for fear of Bosnia-Serb retaliation to humanitarian missions throughout the whole of Bosnia. Alternatively, had the UN been more willing to deal with these attacks they could have assessed the conflict and supported the least objectionable party in order to end the stalemate in a shorter time.

SUMMARY

THE UN is, at its most basic, a political animal that imposes its will on nations by exercising its (collective) economic, diplomatic and military power. As a consequence the success of any of its operations, including those of wider peace-keeping, is

as much a function of political decisiveness and brokering as it is of military assertion. The unfortunate situation that military commanders face is that they are often introduced to a problem as a last resort when most political avenues have been exhausted. As can be seen in the case of Bosnia and Rwanda, such timing rarely provides the ideal basis for military effectiveness. The UN intervened in Bosnia at a time when there was no peace to keep and with no effective mandate. In the case of Rwanda, due to the lack of political will the UN reacted half-heartedly and too late. This situation is augmented by a poorly informed UN which results in inadequate mandates and the consequential difficulty in matching political goals and military end-states.

However, once the military wider peace-keeping operation has been established, and given appropriate mandates, the key role of military engineering is unquestioned. It underpins the very essence of wider peace-keeping, ie, the re-instatement of a nation's infrastructure so as to nurture its economic base and thus allow democratic self-reliance to emerge, as well as providing the traditional engineering roles as set out in Table 1. This is despite evidence that the doctrine of implementing wider peace-keeping tasks requires refinement (2, 6); problems of maintaining impartiality and consent are not always possible to resolve. Military engineering is key to wider peace-keeping but only at an operational level. The inability of the UN to adapt to the new geopolitical circumstances brought about by the end of the Cold War, however, has had an over-riding effect on the success of such operations despite the efficiency with which military operations are carried out. This situation is augmented by the lack of an effective, coherent, doctrine that should be adhered to by all members of multi-national peace-keeping forces. The role of decision-makers today should be to

viii UN peace-keeping is extremely costly, as can be seen by the number of operations depicted on the map. The UN routinely requests that member states pay their contributions for peace-keeping operations "on time and in full", but in practice only a few states submit their contributions within the requested 30 days. Recently, only approximately 50 per cent of requested bills were paid within 90 days for peace-keeping requirements.(14) This has the knock-on effect of creating a gap between mandates and means as well as lowering the morale of peace-keepers, especially those of developing nations who tend to wait for the UN reimbursement before paying their troops.

ix Though such problems were anticipated by Boutros Boutros-Ghali in his report "An Agenda for Peace" (1992) he suggested that these could be avoided by the UN possessing a self-contained rapid reaction force of 30,000 troops, streamlining the UN structure and financial restructuring. However, due to a lack of political will, none of these have been achieved.

enable the political structure and financing of the UN to reflect the new role in which it finds itself, thereby overcoming the problems outlined above. Otherwise the UN and peace-keeping will face an uncertain future. It seems a strange paradox that at the time when peace-keeping appears to be so important to world order its effective application has reached crisis point. In an increasingly violent world, the next few years will dictate the need and shape of peace-keeping operations.

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It's Hard Being An Officer Cadet

SECOND LIEUTENANT S BOLTON AND SECOND LIEUTENANT R J MACDONALD

As "the remainder" marched off Old College Parade Square on Friday 13 December, the thoughts of ten members of 15 Platoon were far from the all too familiar grounds of Sandhurst. Floating through the minds of these errant officer cadets were images of red-hued canyon walls, roaring rapids and ever present prickly pears, for these were the fortunate men who had passed the rigorous selection procedure allowing them to participate in Exercise *Wylie Cadet* – the search for Roadrunner,

Removing our uniforms with a speed reminiscent of Wonder Woman's super heroine costume changes, we emptied our rooms, picked up our bergens and left. After a night of indulgence, celebrating the end of term and the beginning of our trek, we arrived at Gatwick airport in good time to catch our flight to Los Angeles International. Select members of our party, due to their fine, officer-like dress sense, were upgraded to first class for the second leg of the journey – a point all too often recounted to those of us unfortunate enough to suffer the peanuts and Diet Pepsi of economy class!

Arriving in Los Angeles we picked up our vehicle for the trip to the Grand Canyon. Unlike anything we had previously experienced, it was a metallic green, 15-seater Dodge van, complete with tinted windows and air conditioning, and just large enough for the ten of us plus kit. The drive took two days, and we arrived in the Grand Canyon Park late Sunday evening. After a healthy meal, we settled down for a good night's sleep in preparation for the task ahead. Next morning we loaded the wagon and drove to the top of Tanner's Trail – the start point for the expedition.

We were then approached by a strange character wearing cowboy boots and packing a pistol, but our fears proved unfounded when he identified himself as a Wilderness Ranger. Concerned with the route submitted during the planning phase of the expedition, he had contrived to meet us in order to assist in the selection of a new one. Wrestling between choosing something sensible or killing ourselves on a challenging suicide mission, we eventually took on board his expertise and knowledge of the area and selected a more realistic and shorter route.

Our descent began into what must be one of the largest holes on the face of this planet. Snow and ice lay on the ground as we slowly zigzagged down the trail, taking in the unbelievable vastness of the Grand Canyon and pondering the wisdom of walking down something we would obviously have to walk up! As we descended, the temperature rose and it was not long before we had discarded our fleeces and were sweating freely in our t-shirts; a small price to pay, however, as the views were truly fantastic. "Grand" seems to be an understatement when applied to the Canyon. At the end of the day we had gone one mile straight down to the bottom and, with aching toes from the constant downward pressure, set up camp a short distance from the Colorado river. Unknown to us this was to be our major source of water as many of the springs marked on the map proved to be dry. Fortunately we had brought our issue puri-tabs, and for many this was the first experience of their taste! For those who had the courage, the Colorado also proved a most refreshing, if chilly, way of rinsing off the day's dust. The days are short at that time of year, the sun disappearing beyond the Canyon rim earlier than expected. There were no complaints however; it enabled us to catch up on some of the sleep missed during the preceding term's training and rest our aching bodies as the walking, although not covering phenomenal distances, was extremely hard work. The trails were demanding, with up and down being far more prevalent than straight and level. There were some stunning views and at times the group got quite snap happy.

Horseshoe Mesa was our destination for day four, and on arrival we looked for a small cave system recommended by the friendly ranger. After some searching we found the entrance and five of us dropped our bergens, checked our torches and made our way into the stygian gloom. The Cave of Domes was a veritable warren and, with a great sense of adventure, we set off to find the "ammo box", apparently located at the end of the system and containing a notebook for those who found it to leave a message. After an hour of exploring, and pretending to be Indiana Jones, we had still not found the box and when we realized that we had started to go around in circles we made our way out. Imagine our surprise when we found the ammo box located in a shadowy nook just inside the entrance - our crawling had been for nothing ("or had it?" he said, fingering a nugget of purest gold.)

Our final day saw us undertaking the arduous slog up. Is it not amazing how one's opinion of something can change when gravity is playing the role of enemy? Many hours, and many litres of sweat, later we finally emerged to be greeted by a gaggle of Americans with amazed expressions on their faces: "You've been down there for five days? Camping? And you carried all that kit?" Of course, we underplayed the situation: "Oh, it wasn't that bad. No, we do this sort of thing all the time in the British Army – really, it was nothing."

Of course, that is not strictly true. Before this exercise I had not spent five days away from civilization, without seeing a single human other than those few in my group, with the only sound the roaring Colorado river, the only concern whether my beans would be hot that night. I had not carried five days worth of food on my back, or camped out under the American sky with nine other like-minded individuals. Similarly, I had not raced into an icy river to cool my burning feet, or crawled around in a hot, dusty cave system, or scaled an 80ft rock face with a bergen on my back, wondering why the trail could not have gone elsewhere. To be honest, I have never had such a good time, and can say with a great deal of confidence that my thoughts are echoed by every other member of the expedition.

Unfortunately, all good things come to an end and, once we had partaken of an icy beer and attended to matters of an administrative nature, we started the R&R phase of our trip. Las Vegas was tame, skiing in the Sierra Nevada mountain range was cold, seeing the sights of San Francisco was boring, and strolling along the beaches of Santa Monica and Venice in 75-degree heat was absolute torture – it's hard being an officer cadet, but, somebody has to do it!

MEMOIRS

MAJOR GENERAL J H S BOWRING CB OBE MC

Born 13 February 1913, died 14 February 1998 aged 85.



Joins Humphrey Stephen Bowring was born in India just before the First World War. His father, a major in the 22nd Punjabis, went off early in 1915 to Mesopotamia with the Indian Expeditionary Force, and later that year was killed in action when John was only two years old.

John Bowring went to school at Downside and then to the Shop, where he represented the Academy at golf, won the military history prize, learned to ride and passed out second in the order of merit. Commissioned into the Royal Engineers in 1933, at Chatham, during his YO course, ocean racing was added to his accomplishments. Trinity College Cambridge came next, where he learnt to fly, obtained his "A" Licence and gained a second in the Tripos.

In 1936 he went to Palestine with 6 Field Park Squadron, during the Arab revolt, and then returned to India in 1937 to join the Royal Bombay Sappers and Miners in Kirkee. During the next two years all the things that life in India had to offer were enjoyed, not all of them politically correct by today's standards, but that was 60 years ago. He played polo, hunted with the Poona and Kirkee hounds and with the Quetta Hunt, enjoyed small game shooting, fished for mahseer, shot two bison and bagged a tiger in the Gharwal jungles at the foot of the Himalayas, IHLG, who was his companion on the last exploit, testifies that John Bowring was indeed "that mythical person one would choose to go tiger-shooting with: cool, original and funny. He proved his worth on the last day by shooting a charging tiger through the forehead at point-blank range'

He served with 17 Field Company, Royal Bombay Sappers and Miners, in Quetta and Waziristan, and in 1940 went to the Sudan as second-in-command of 20 Field Company. becoming OC the following year, just before the battle of Keren. John Bowring's company supported the leading brigade in the follow-up operations to Asmara and on to the fortress at Amba Alagi. The advance was opposed by harassing fire from artillery. Returning from a mine reconnaissance on the night of 1 May 1941 he was hit in the leg and ankle. Soon afterwards the route through to Amba Alagi was opened. John Bowring was awarded the MC for this action. He was evacuated to South Africa because his wounds were so bad; his leg never really recovered, leaving him with a limp and in constant pain. Returning to Suez in May 1942, a posting back to GHQ India soon followed. He attended Staff College at Quetta in 1944 before going to the Arakan to be on the staff of Chief Engineer 15 Indian Corps. During this tour he was promoted lieutenant colonel, and finished his time with the Indian Army in 1946 as Commandant (Colonel) of 4 Engineer Group in Sialkot, reverting to the rank of major on return to the UK at the age of 34.

In 1947 he went to Greece with the British Military Mission in the face of the Communist rebellion, first as GSO2 SD and then as AAG, once again being promoted to lieutenant colonel. He bought a small yacht, *Katia*, sailed all round the islands and raced with the Royal Piracus Sailing Club, while organizing and then manning

Maj Gen J H S Bowring CB OBE MC (p 234)

the reconstituted Greek Army (see *Journal* article "A Greek Experience" December 1997.)

After tours as GSO1 in the Cabinet Office and the Joint Services Staff College, he was appointed Chief Instructor Tactics at the SME Chatham, being promoted brevet lieutenant colonel in 1953. After qualifying as a REYC skipper, John took part in a dozen or so ocean races including three Fastnets as skipper. He requalified as a pilot and this stood him in good stead in his next job as CRE Bedford, responsible for works services in East Anglia, where an cx-RAF mothballed Tiger Moth of the RE Flying Club was used to get him around his parish.

On 25 July 1955, Lieutenant Colonel John Bowring became CO of 50 Field Engineer Regiment consisting of 67 and 68 Gurkha Field Squadrons with 11 Independent Field Squadron RE and 410 Plant Troop RE under command. At that time the Gurkha officers and men were seconded to the Royal Engineers but remained on the strength of their parent Gurkha infantry regiments. On 29 September 1955 the Gurkha Engineers were born and became an integral part of the Brigade of Gurkhas. The regiment became 50 Gurkha Field Engineer Regiment. The announcement was made with little warning and John Bowring had no time to prepare his officers and men for its impact. He handled the situation with great charm, sensitivity and ability, so much so that fresh enthusiasm entered and affected every facet of regimental life. He described the signing of the amendment as the most fundamental event of 1955: "Now our Gurkhas are enlisted, and OGOs commissioned, into the Gurkha Engineers, it makes us more of a part of the family of the Brigade, it gives us the chance of establishing our own individual, regimental traditions, customs and spirit. The ball is at our feet."

John Bowring was the prime architect of the Gurkha Engineers. By 1956 most people were convinced that the Gurkha sapper was well capable of acquiring all the standards and skills to carry out the work of a field sapper given time and the necessary education. John Bowring's solution was to lay down optimistic and strict individual standards for promotion that required combat engineer, trade and education qualifications, starting at lance corporal and going through to Gurkha officer. Many of the old and bold thought these to be unobtainable. It put the pressure on British officers and Gurkhas alike but the men responded with enthusiasm and application. By the time he became colonel of the regiment, in 1967, the standards were being achieved and surpassed. His wisdom, prudence, foresight and insistence on the achievement of these standards, made possible the raising of 70 Gurkha Field Park Squadron and then the third field squadron, 69 Gurkha Field Squadron, during the next four years.

The establishment of regimental traditions, eustoms and spirit was executed against the background of continuing operations against the communist terrorists with all three squadrons and the plant troop deployed throughout Malaya. His steady hand and imaginative direction led the regiment through an explosive period of development. He loved his regiment and his men and they responded. For his efforts he was appointed OBE.

After a tour in the MOD as Colonel GS MI he returned to the Far East in 1961 as Chief Engineer FARELF, for a tour which included the development of the North Bornco Training Area, the beginning of the great airfield project in Thailand and the start of Confrontation with Indonesia. As Chief Engineer he watched over the growth of the Gurkha Engineers into a minicorps and its deployment into Borneo. He then became BGS (Mobility) responsible for vehicles, armour and engineer equipment including the Combat Engineer Tractor.

For his last three years in the Army he was a popular and successful Engineer in Chief: "He was the best man I had the good fortune to work for and the two years I spent as his staff officer were the happiest and most worthwhile of my Army life. It was always fun and we all had complete confidence in him."

In 1967 he became Colonel of the Gurkha Engineers and in that capacity resumed the guardianship of its quality, its customs and its traditions. He was Colonel during the troubled period of redundancy and retrenchment during 1968-71.

In retirement he was non-executive director for Consolidated Goldfields and Amey Roadstone, helped his wife Iona run her Arab bloodstock business, and in 1984 became High Sheriff of Wiltshire.

Two comments tell of the impact of his life. "He was a marvellous friend – warm, kind, wise. I think of all the many people I have known in my life I have never admired anyone more than John. His absolute integrity, his innate kindness, his sense of fun and quiet sense of humour were legendary." "The Corps owes him much, John was a gentleman in every sense of the word – loyal and compassionate to the less fortunate, and full of encouragement to the young." He is survived by Iona (née Murray), whom he married while he was Commanding Officer 50 Gurkha Field Engineer Regiment, and their four children, Charles, Caroline, Michael and Camilla. DHB WGHB JJS IIILG HEMLG CHC

LIEUTENANT COLONEL E L L EARP OBE ERD TD

Born 4 April 1909, died 20 July 1998, aged 89.



LANCELOT Earp was able to combine a distinguished civil engineering career with service in the reserve forces. During the war he worked with transportation on the construction and repair of ports and harbours. He was a keen and valued member of the TA and later the Army Emergency Reserve. Educated at Alcester Grammar School where he became head boy, he spent most of his childhood at Arrow, Warwickshire, His father was Land Agent at Ragley Hall. After graduating from Birminghan University with a civil engineering degree in 1930, his subsequent career was spent entirely with Edmund Nuttall Ltd. He worked on the first Mersey Tunnel, Clearwen Dam in mid-Wales for the Birmingham Water Supply, the first Dartford Tunnel and the Tyne Tunnel, finally retiring in 1965.

Lance joined the TA in 1935 and saw early war service in France leading to evacuation from Marseille, Here he lost a suitcase overboard which, amazingly, was returned to him several years later.

Like many other professional civil engineers he worked on the construction of Cairnryan Military Port in Scotland (see Journal article "The Sappers' Biggest Construction Job?" April 1992) and then in Sicily and Italy where he became CRE No 3 Port Construction and Repair group. Ports under British control in this theatre suffered extremely heavy damage. This produced an immense number of problems requiring skill and initiative of the highest order to solve them in the tight timetable necessitated by military operations. He was mentioned in dispatches and in 1945 was appointed OBE before his release from active military service the same year. He continued his involvement with the reserve forces and was awarded the TD in 1948 and the ERD in 1961.

Lance retired to Kent where his wife Jean predeceased him in 1971, In 1973 he became one of the first residents of Coral Bay, Paphos in Cyprus, where he lived till his own death. He is survived by his daughter Helen.

HH MBA

Lt Col E L L Earp OBE ERD TD (p 236)

BRIGADIER C E H SPARROW OBE MC

Born 31 January 1908, died 14 October 1997, aged 89.



CHISHOLM Edward Hugh Sparrow (Tim) was the elder son of Isaac Sarsden Sparrow of New Barn, Ferry Hinksey, Oxford. He won an exhibition to Winchester before proceeding to the RMA and was commissioned on 2 February 1928. He then went up to Queens College, Cambridge to read the Mechanical Sciences Tripos under Professor Inglis. Whilst there Tim met Claire Deschamps who was reading History and they were married in 1932. Claire was a friend of the Professor's daughter and one day, when visiting the Inglis' house with Claire. Tim remarked that he thought he had done just enough work to achieve, if he was lucky, a 3rd Class Honours Degree. Little did he know that the great man was in his study within earshot, and a voice boomed out "He will be lucky if he even gets a Third!"

In 1931 he went to Blackdown, joining 1 Anti Aircraft Searchlight Battalion, and spent the next nine years in searchlight units. In November 1934 he was posted to 16 AA Searchlight Company (renamed 16 Fortress Company in 1935) in Malta, before joining the staff of the School of Anti Aircraft Defence in Biggin Hill as an Assistant Instructor in September 1938.

Next, in March 1940, came Staff College for the six months war course, followed by two years as a temporary major on the staff of GHQ Troops Chemical Warfare and 5th Chemical Warfare Group, He then commanded 244 Field Company in 43 (Welsh) Division from February to November 1943 before going to the School of Infantry as GSO2 RE until February 1944. Appointed CRE of 45th Division at this point, in August 1944, determined to see action, he asked to revert to the rank of Major in order to command a field company in action and was given 19 Field Company in I Corps Troops in France. staying with them until February 1945. For the next two months he commanded 275 Field Company in the 51st Highland Division during Operation Veritable. It was for his gallant leadership during this time that he was awarded the Military Cross. At the end of March he moved to take command of 257 Field Company in XXX Corps Troops for the bridging operations of the Rhine crossing. After the war, in December 1945, he was appointed Chief Adviser (RE) of the British Military Mission in Egypt. From there he went on to be GSO1 (SD) in March 1948 at the Headquarters of the British Military Mission in Greece for which job he was appointed OBE.

He returned to England in April 1951 and was employed in various works appointments: in February 1954 with the Logistics Division of SHAPE as a staff officer (colonel) for two years followed by two years as Colonel (E) at HQ BAOR and Northern Army Group. He was then promoted to brigadier to take up his last appointment: Chief Engineer, Middle East Land Forces in Cyprus. Whilst there he was actively involved in negotiations to determine the boundary between the Greek and Turkish sectors, and in setting up the Sovereign Base Areas.

On retirement in 1960 he joined the staff of the Wildfowl Trust, at Slimbridge, as its first Controller and Chief Executive. He was thus able to combine one of his hobbies, ornithology, with his work. During thirteen years at Slimbridge he played a major part in planning the Wildfowl Trust expansion throughout the United Kingdom.

Brig C E H Sparrow OBE MC (p 237)

On his retirement in 1973 he became chairman of the Gloucestershire Wildlife Trust for four years and then a vice president.

Sparrow's countryside interests covered a wide span of natural history with a considerable depth of knowledge much of which was reflected in his garden at Frampton on Severn which he opened every year up to his death. His erudite and active mind was never still whether he was playing bridge, chess, solving mathematical problems or completing *The Times* crossword while most of us were still struggling with the first clue. With all these talents he never ceased to be courteous, kind and hospitable. It was typical of his energy that he lived life to the full up to the day he died having travelled to his Bridge Club in Cheltenham and driven himself home.

His wife Claire died in August this year and he is survived by his younger son. His elder son died tragically while climbing in Greenland some years ago.

SEMG

CAPTAIN R C HARRIS MICE

Born 1923, died 5 February 1998, aged 75.

BOB Harris, senior engineer of the Canadian company Buckland and Taylor Ltd and a much respected wartime Sapper, was a well-known figure in British Columbia who had made a hobby of the history of his former Corps in his adopted country.

Robert C Harris was commissioned into the Corps in the first half of the Second World War and joined 24 Field Company at Hammamet in Tunisia. He returned home with the company in December 1943 as Senior Subaltern and a meticulous keeper of the War Diary. The company landed in Normandy in July 1944 and Harris earned a reputation as a fearless reconnaissance officer and Bailey bridging exponent. In one incident in Holland, in October 1944, the information he brought back was critical to the successful bridging operation which played a major part in the liberation of Venraij by 11 Armoured Division. In the course of this action under intense small arms fire, he was blown up and injured but stayed forward in a sodden ditch for eight hours coolly sending back his information. Perhaps his finest achievement, however was the design of the semipermanent 800-foot long Class 40 "Club Bridge" over the River Weser at Nienburg, which was later increased to Class 100. Unlike many military bridges, this withstood the winter floods of 1947.

Demobilized in the rank of captain, Harris then obtained a degree in civil engineering at London University and emigrated to Canada to pursue a distinguished career. This started in Ontario and eventually took him to Vancouver where he joined the Dominion Bridge Company, eventually becoming its chief engineer. He moved to Buckland and Taylor in 1975. In the course of his career he was involved in the design and/or erection of over 100 bridges and 130 steel construction buildings. But he also succeeded in combining his professional activities with his fascination with history and particularly the early work of the Royal Engineers in British Columbia.

Bob Harris was an engaging character with a dry sense of humour. Though a teetotaller he was happy to record in the War Diary convivial mess evenings to celebrate birthdays, one "with table napkins and champagne" and another when the menu offered veal, stuffed roast pork and chicken accompanied by Chambertin '25, Chateau d'Yquem '28 and Moët '37.

An obituary published in Canada after his death recorded his involvement in a wide range of activities and that "Organizations to which he belonged benefited greatly from his extensive knowledge, exceptional memory, meticulous planning and unstinting support."

He is survived by his wife, Rita, whom he married in 1948, two daughters and a grandchild.
LIEUTENANT COLONEL J L W DANIELLS

Born 31 March 1918, died 19 July 1998, aged 80,



Joins Lionel Wyatt Daniells came from a family of soldiers and sailors. Brought up in Cornwall, his love of sailing grew from an early age and became a passion which was to remain with him for the rest of his life. He owned several boats and was active in the sailing clubs of Singapore, Hong Kong, REYC and later Helford in Cornwall. His father, Master of the St Elwyn and convoy commander North Atlantic, was lost at sea, torpedoed in 1940 off the Irish Coast. His brother was lost while serving with the RAF, when his aircraft was shot down off Cevlon.

John joined the Army in 1938. His first posting overseas was to Malaya where he was involved in the defence of Singapore after the Japanese invasion. His escape from Singapore, after the fall of the city, the full story of which is on tape in the Imperial War Museum, was indicative of his bravery and initiative. A perilous journey by sea brought him to Sumatra and eventually Ceylon. Posted to India, he was commissioned into the Madras Sappers and Miners, returned to Chatham in 1944 in the rank of lieutenant, promoted to major a year later and returned to India where he was involved in preparations for the re-invasion of Malaya. Despite the dropping of the atomic bomb the invasion went ahead and John set about preparing Port Swettenham for the unloading of ships and aircraft. He was mentioned in despatches for this work. Later he served in Malacca returning to Singapore in 1946 where he was joined by his wife Marjorie, after a separation of 18 months.

John returned to England in 1947, posted to No 7 Supplementary Course in Ripon. A hectic 18 months followed during which he skippered the windfall yacht Overlord in the first postwar North Sea race. (All wives still with us will remember those frantic days painting the boat to get her ready in time.) In December 1948 he was posted to Egypt to undertake the preparation of a vast stores depot at Fayid to receive material from Palestine. After a spell on the Chief Engineer's Staff he was posted to Malta to command a sapper squadron and in 1952 returned to the UK for a tour as DDFW in the War Office. 1955 saw him leaving for Hong Kong, again on the Chief Engineer's staff, and three years later returning to No 4 Training Regiment as secondin-command. A promotion to lieutenant colonel in 1960 was accompanied by a posting as CRE Malta and Libya - a very demanding post in those days.

On leaving Malta in 1963 he took early retirement and after a time joined a firm of consulting engineers working in the United Arab Emirates. In 1967 he was to oversee the building of a road from Abu Dhabi to Buraimi Oasis and one from Sharjah to Dhaid.

Forming his own consultancy in 1971 and returning to Dubai, he and his partners were commissioned by Sheikh Rashid to build his new Majlis and Ministry of Defence. After nearly ten years of satisfying work John returned to Cornwall and retired again, becoming very active in local affairs and chairman of several associations. He was also active in the affairs of his local church, St Anthony-in-Mencage, where his funeral took place.

With his death the district and local community suffered a great loss, John is survived by his wife Marjorie, whom he married in 1945.

EN MD

Lt Col J L W Daniells (p 239)

MAJOR G K BOOTH

Born 29 January 1932, died 27 March 1998, aged 66.



GRAHAM Kenelm Booth, born in Worcester, was educated at the Royal Worcester Grammar School and commissioned into the Royal Engineers from Sandhurst in 1952. It was somewhat ironic that his first regimental posting should be back to Malvern to 1 Training Regiment from where he could see his former home. He attended the Royal Military College of Science and gained a London University external engineering degree.

From 1957 Graham served in BAOR, first at Hameln with 26 Engineer Regiment, then with 7 Field Squadron at Osnabrück in support of a mechanized infantry brigade.

In 1960 he returned home to attend No 8 Long Engineering Course which included attachments to dam construction and rock tunnelling projects in Scotland and then bridge design with Freeman, Fox and Partners in London. He was subsequently elected a MICE in 1963, and was one of the few members of the Corps to be elected a MIStructE. He was also a Member of the Institute of Management and of the International Association of Bridge and Structural Engineering. His long course was followed by a two-year tour in the MOD working on the staff of Director Engineer Services in Engineer 5. He then returned to the RSME at Chatham as a senior instructor in the Roads and Airfields Wing.

In 1967 Graham began his long association with the Establishment at Christchurch when he was posted to MEXE (as it then was) as a project officer in the Bridging Wing. As was the case with most serving and retired Sapper officers at MEXE, his military and engineering experience combined to make him a valued member of staff.

Graham's military service ended in 1970 when he retired for health reasons. He then spent a year as a civil service engineer involved with motorway bridge design in the Taunton region, but at the instigation of his former group leader at Christchurch returned to the Establishment in 1971. After a spell as test officer in charge of structural testing and field trials he transferred to bridge design work. Promotion followed when he was appointed to head a design group.

During his time at Christchurch Graham was involved in many projects, including the Airportable Bridge, the Medium Girder Bridge and Bridging for the 80s. For many years he was the UK member of the British, American and German Military Bridge Design and Analysis Group which produced the excellent "Design and Test Code for Military Bridging." Eventually, in 1986, he became head of RARDE (Christchurch), responsible to RARDE (Chertsey) for the development of the wide range of engineer equipment within the Christchurch programme.

Graham was a keen sailor and was for a number of years secretary of the Army Sailing Association. He was also a long standing and active member of the REYC, even after retirement from the Army. He organized the Yarmouth meet on several occasions.

At the end of 1989 Graham suffered a brain haemorrhage and had to retire prematurely. However, with great strength of character he overcame the effects of his illness and continued to enjoy sailing, which was his great joy. He also took up long distance walking, taking part in the 30-mile or so Dorset Walk along the south coast. Unfortunately further illness in 1995 left him confined to a wheelchair; a misfortune which he bore with great dignity and courage.

Graham was an infectious enthusiast in his work, play and indeed in all that he undertook.

Maj G K Booth (p 240)

He enjoyed and contributed much to the sociable life he led. He was an excellent companion. He had a great zest for life, which was so sadly and untimely cut short. He is survived by his wife, Renate, whom he married in 1959, and by a son and daughter and three grandchildren.

BTBB JHJ RCP

Memoirs in Brief

Roy Henry, who died recently, aged 71, was, from 1979 to 1984, Commissioner of the Royal Hong Kong Police, the highest post to which a colonial police officer could aspire. During his time with the force he restored both the image and morale of Hong Kong's policemen, which had been at a very low ebb.

Roy was commissioned into the Corps and saw active service in Palestine before leaving the Army in 1948 to take up an appointment with the Malayan Police where he earned several decorations and was marked out for early promotion. He was Commissioner of Police in Sarawak and Fiji before moving to Hong Kong in 1973. He was awarded the Queen's Police and Colonial Police Medals, and was appointed LVO and CBE. Sarawak made him a Dato (its equivalent of knighthood).

Thomas (Tom) Colyer Venning MBE, died recently at the age of 83. He joined the Corps in 1939 at the outbreak of war, achieving the rank of Captain. His military career included helping to establish the Mulberry Harbour, and he advanced into Europe as far as the Rhine but was blown up by an antitank mine which precluded him from further active service.

Returning to civilian life, Mr Venning rejoined the council, later became divisional county surveyor to West Riding County Council, and was appointed MBE in recognition of his services to the road industry.

Correspondence

THE FORGOTTEN RESERVES NON-TERRITORIAL ENGINEER UNITS 1877 TO 1998

From: Captain J P Mapstone ERD

Sir, – In "The Forgotten Reserves", Dr Watson forgot that in the post 1961 AER, there was 40 CRE (Works), which included 106, 107, 108, and 109 Works Sections, in the latter of which I was E&MO. Sincerely – J Mapstone.

THE LATE BRIGADIER J G CARR

From: Major D D A Linaker

Sir, - In 1950 I was a cadet in Dettingen Company, Sandhurst, when Major, as he then was, Carr commanded it. He was an excellent company commander although as cadets I do not think we fully appreciated just how privileged we had been to have him until we endured his successor, who although no doubt a good officer just did not stand comparison. Brigadier Jimmy was very kind to me at a time when my family fortunes were at a very low ebb. Without his support I would have had to return to the ranks to finish off my National Service commitment or even the regular five-year engagement on which most cadets were enlisted at that time. I like to think I repaid his trust by passing out in the first 20, which brought me the then considerable prize of £60 and the regiment of my choice, the Royal Tank Regiment. The prize gave me adequate funds for all those expenses one incurs on commissioning.

To one Sapper I owe the fact that I was commissioned and to another I owe my life. This occurred in 1964 when I was commanding "C" Squadron 4RTR in the Radfan. On one of my frequent drives through the Rubwa Pass the track surface on a corner of the steep ascent gave way so that whilst my scout car's wheels were turning forwards, it was sliding backwards. Trooper Durno, my driver, and I seemed doomed as we moved slowly but surely to a sheer drop of over 100m. Suddenly the vehicle came to rest with one wheel overhanging the cliff. A Sapper captain came up and said, "Oh! Thank heavens I had that rock put there, I was sure it might be useful." Alas I did not find out his name but he was with the field squadron that I think had been flown in from Britain or Kenya

to support the operations, possibly the 12th. This squadron made all our lives much more tolerable as in true Sapper style they not only lifted mines but improved the base camp facilities to make life relatively comfortable.

Do hope that I have not bored you with my reminiscences but it is probably my best chance of expressing my deep gratitude to your Corps for all it does for the rest of the Army. Yours sincerely – David Linaker.

ROY HENRY

From: Major R E Ward

Sir, – The obituary in the *Daily Telegraph* on 21 July 1998 states that Roy Henry served in the Royal Engineers in Palestine. [See Memoir in Brief, this *Journal.*]

I should like to add that, after being granted an Emergency Commission, Roy served as a second lieutenant under my command in 23rd Field Company, later 23rd Field Squadron, in Palestine in 1947 and 1948 when we were supporting 1st Guards Brigade in Internal Security Duties and on camp works.

He was a very steady and reliable officer, likable and popular with all ranks and he had a dry sense of humour. We judged him to be one of our most outstanding young officers and believed he would go far. He always said he would join the Colonial Police when he left the Army. I am naturally sorry to hear that he has died so soon but pleased to read how well he did in the Police, as I had never heard about him again until I read his obituary last week. Yours sincerely – Roland Ward.

RAILWAY OPERATIONS IN PALESTINE 1947 TO 1948 A PERSONAL MEMOIR

From: Captain J F Mapstone ERD

Sir, – "Railway Operations in Palestine 1947 to 1948", brought back many unpleasant memories, especially that of my narrow escape on the blown up train.

I arrived at Haifa Transit Camp on 27 February, from convalescent leave in Cyprus, and was told that I would have to wait until the 29th for a train to Rafah as that on the 28th was fully booked. I was in a hurry, as 1295 Stores and Workshops unit was waiting at Rafah for me to take command, preparatory for a move to Kenya. Movement Control would not alter bookings, but told me that if I found an officer not in a hurry who would change with me, then they would accept the change. I found an Infantry officer willing to change and so missed the deadly explosion.

I was told later that a dead donkey on the line, stuffed with explosive, had been detonated under the first class carriage, ie under the officers. Major Rose's article is the first information I have seen of the number killed. I have often wondered whether the officer who swapped seats with me was killed or wounded. Does Major Rose know how many of the 35 killed were officers?

I served three months at AI Jiya, possibly the most remote and unpleasant Sapper posting in Palestine, where I had two further close shaves with death, as we were attacked twice on Christmas Day when I was the only officer on duty in the depot.

I am puzzled as to why the shot sergeant (p131) climbed through the wire, as there were many gaps local Arab shepherds used to drive their flocks through the camp, until I shot one - a sheep, not a shepherd - and put mutton stew on the menu. Sincerely, - J Mapstone.

CLOSE SUPPORT ENGINEERS CONTINUED

From: Major R S Hourahane BEng

Sir, – Privileged as I am to have read an advance copy of Matthew Whitchurch's article "Close Support Engineers Continued", which is published in this issue, and having recently attended the Combined Arms Tactics Course, I feel that a view from the floor might be appropriate. I will concentrate solely on the predominate issue of whether a squadron can support more than one battlegroup (BG). I will consider only support to armoured or armoured infantry BGs.

This letter is written with the view that tempo is a key ingredient for success on the manoeuvrist battlefield; mission command being the means to maximize tempo. Implicit in this philosophy is the ability to react more quickly than the enemy with the aim of creating surprise which is the most effective way to achieve dislocation. Success comes to those who can identify enemy weakness, often unexpected, and then apply the required concentration of force at a precise moment more quickly than the enemy can react.

The current battlefield scenario is a less dense non-linear environment where formation frontages are considerably larger than in the past, a result of longer weapon ranges and the increased capability of individual weapon systems. In order to maximize the potential of widely dispersed weapon platforms and bring them to bear on the enemy at a precise point of influence, timely manoeuvre and support, in the form of battlefield engineering, is essential.

If tempo is a key to success then manoeuvre support must be immediate. This can only be guaranteed by manoeuvre support assets dedicated to manoeuvre units (BGs). If you subscribe to the idea that a brigade does not manoeuvre as a whole but manouevres its BGs to apply force at the required time and place, then it follows that it is those BGs that require integrated manoeuvre support. To take this away is like removing the tyres from your car; it could still move on the wheel rims but not quickly. Given sufficient time, speed could be restored by refitting the tyres, as mobility could in the case of the BG by regrouping engineers. In the case of the car you mightabe late for work, in the case of the BG you might have missed your opportunity or, worse, be defeated.

As an example, look at a square armoured brigade in the advance: in this case two BGs up, one in depth and one in reserve. The left forward BG contacts and then fixes the enemy while the right forward BG manouevres to strike the enemy flank. In doing this the reconnaissance from the striking BG identifies a potential enemy weakness further forward. With both forward BGs committed, the depth BG is called forward to exploit the opportunity. Dedicated manocuvre support within the depth BG would guarantee its rapid manoeuvre permitting exploitation of the opportunity. If, as is often the case, the engineers had been concentrated with the forward BGs then regrouping could well be required in order to allow the depth BG to move forward. The time required to do this would result in a loss of tempo and possibly a lost opportunity.

My argument so far has founded the idea that manoeuvre BGs require dedicated manoeuvre support assets; naturally this not only applies to offence as we are now manoeuvrist in defence. What size should this manoeuvre support grouping take? It is probably safe to state that the most versatile engineer unit contains a mix of armoured and field engineers with a command structure and supporting assets. Applying the rule of three (plan on three to achieve one as Matthew Whitchurch explained) the smallest grouping of armoured engineers should be three AVRE and three AVLB, in other words a troop. When field engineers and support are added we have a squadron. Hence the smallest grouping of engineers required for a BG is an engineer squadron comprising an armoured troop, a field troop and a support troop.

I am not advocating that we should never deviate from this default setting. For deliberate operations a certain amount of regrouping/reinforcement might be essential but it must be understood that to remove engineers from a manoeuvre unit is done at the penalty of a loss of flexibility and the ability to exploit an unexpected situation quickly thereby denying the opportunist his moment.

If an engineer squadron supports more than one BG then there is a price to be paid in the potential loss of tempo inflicted when regrouping is required to enable the exploitation of often unexpected opportunities. Working on the principle that you should expect the unexpected, individual manoeuvre units must be able to react quickly and decisively which means that they must have their own integral manoeuvre support assets. I therefore support the view that an engineer squadron should not support more than one BG. Yours – R S Hourahane.

From: Major J A H Welch MA

Sir, -I was fortunate in being able to read an advance copy of Matthew Whitchurch's article "Close Support Engineers Continued". His contribution is extremely valuable and, as he mentions, he has some experience of these issues. Indeed he was Training Major in 32 Armoured Engineer Regiment when I was a young and impressionable troop commander. Hence there is so much that we agree on that I had to think long and hard as to whether a response was necessary or not. But I think there is, albeit in relation to one issue: that of whether a close support squadron should support more than one battlegroup (BG).

First, we must be clear on what we are trying to define. It is nothing more than the most appropriate organization to provide close engineer support to a manoeuvre BG, and in this context I mean an armoured or armoured infantry BG. It needs to be robust, it needs to be flexible and above all it needs to be so configured as to provide the maximum amount of capability for the minimum number of vehicles and personnel. It is this combined synergistic effect that makes a close support squadron so adaptable as to remove the constant requirement to regroup. So what does Matthew base his hypothesis on? Well, the following three factors:

- That Sappers help combat arms to "... live, move and fight."
- That $\overline{\ }$... RE have to go where the work is." And finally that:
- · we will have to regroup.

I agree with them all. The role of Sappers is not in dispute and of course we go where the work is; is that not the very reason why we are such a diverse and varied Corps? And, yes, we will also have to regroup. In a deliberately planned operation, when there is sufficient time to regroup into an assembly area, it will take place and will include reinforcements, of both men and materiel, brought about by battle casualties. But to undertake this regrouping as a routine task on a highly mobile less dense battlefield using equipment which is two generations behind the equipment of the very people we are supporting, is just a little optimistic. It must be rehearsed, and regularly, but let's not make it the basis for our doctrine as it simply is not best practice: Exercise Ulan Eagle 1996 proved this point and led to the quite serious suggestion published in the April 1997 Journal that armoured engineers should be absorbed into the Royal Armoured Corps! Although I do not subscribe to his recommendations, Captain Marc Owen made an equally valuable contribution to this debate in his article "Royal Engineers or Armoured Corps Engineers" based on his experiences on Exercise Ulan Eagle 1996. Incidentally an exercise for which Matthew played a large part in preparing 35 Engineer Regiment for by his organization of Exercise Monty's Delight.

On the question of best practice, Matthew cites that RE squadrons supported more than one BG before 1990 and they may have to do so again. My response to this is that we didn't necessarily get it right in the 1980s, and hence when 7 Armoured Brigade initially deployed to the Gulf they went with an engineer regiment and not just their brigaded squadron (accepted practice at the time). Indeed the very reason why close support was introduced as a concept during the mid 1980s was because we could not get the right level of engineer support to the right place in a timely fashion. We were working on precisely the doctrine which Matthew believes should still be used.

My final point is that this debate must take place in the context of current military doctrine. The requirements of close support engineers are drawn out by the way combat arms plan to conduct war fighting now and in the future. British military doctrine is now very firmly based on manoeuvre warfare; it is the standard against which everything we do should be measured. A short study of the ten tenets of manoeuvre warfare would be beneficial:

- Focus on the enemy not on the ground.
- Act more quickly than the enemy can react (get inside his decision cycle and generate tempo).
- Use mission command and always designate a point of main effort.
- · Avoid enemy strengths and attack his weaknesses.
- · Exploit tactical opportunities (recce-pull).
- · Use reserves to reinforce success not failure.
- · Be unpredictable, treat all situations as unique.
- · Support movement by fire and manoeuvre.
- Command from the front/from where you can best assist the main effort.
- · Act boldly and decisively.

All these lead to destroying the enemy's cohesion rather than defeating him in detail. They assume the ability to manoeuvre freely and at a high tempo in order to outwit an opponent. Hence we must have close support engineer organizations which are robust, flexible and adaptable without the need constantly to regroup; a process which is time consuming, creates friction and leads to a lack of momentum. Matthew's historical evidence is compelling, but I am mindful of Rommel's initial successes in the Western Desert, of the Israeli's manoeuvre in 1973 to create the conditions for a ceasefire and, naturally, the deep manoeuvre operations in the Gulf. We must learn from history. But it must be a process which is achieved by identifying the lessons and applying them to different circumstances of modern warfare. We must not fight the next war by preparing for the last.

My submission is therefore simple. I believe that close support doctrine should be based on a close support squadron supporting only one BG. This is, in my opinion, current best practice and I have not been persuaded otherwise. It gives BGs the best opportunity to manoeuvre in the high-tempo operations that are currently identified. Like Matthew I appeal to others to join in this debate, especially those with recent experience of close support operations. That said, I am very grateful to Matthew for responding to my article for now I know that at least one person read it! Yours – J A H Welch.

WELLINGTON AT WATERLOO

From: Colonel G W A Napier MA

Sir, – You may be interested in the following extract from a letter received recently from Hr Peter Hofschröer, author of "The Waterloo Campaign", reviewed in the August *Journal*:

"My publisher has just sent me a copy of the REJ containing your most interesting review of my recent publication, so I thought I would take the opportunity of writing to thank you for your kind efforts and to raise a couple of points with you. ...

"... to your point 'Wellington's motivation was to frustrate Prussia's expansionist ambitions although it seems highly unlikely that he would deliberately risk an allied defeat to this end.' I would agree with that. However, I think we should differentiate between Wellington's political strategy, which was to limit Prussian expansionism, and the military situation in which he found himself on the evening of 15 June 1815. By 6pm on 15 June, Wellington must have realised that he had lost a vital day. He needed to regain that time and complete the concentration of his forces. He had just heard from Blücher that all of the Prussian army would be concentrated in the Sombreffe position the next day. Thus, Wellington acted in the firm belief that [he] would be able to hold his own on 16 June, but knew that without his support, Blücher could not beat Napoleon. Wellington was not deliberately risking an allied defeat. Over the coming hours, Wellington continued to exaggerate the extent of his concentration to Blücher. Only at the meeting at Brye on the afternoon of 16 June did Wellington first hear that Bülow's Corps was not going to arrive that day, and that the Prussians were in danger of being defeated. By then, it was too late for him to go back on his promises. My view is that the deception of Blücher was expediency and went wrong because of faulty Prussian staff work. It was not part of a 'great conspiracy' in pursuit of British foreign policy."

Yours sincerely - Gerald Napier.

Reviews

LIVING WITH DANGER Captain (Retd) H W Beckingham

Published by Countyvise, 1 & 3 Grove Road, Rock Ferry, Birkenhead, Wirral, Merseyside, L42 3XS – Price £7 ISBN 1 901231 03 8

VERY few books have been written about wartime Bomb Disposal. Very few records were kept and even fewer photographs were taken.

This book has a sub-title: *The memoirs of a Bomb Disposal Officer*, and is thus one person's view of his war. It describes the trauma suffered by young bomb disposal officers, some of whom still suffer the consequences.

Harry Beckingham joined the TA, as a sapper, just 75 days before war was declared on 3 September 1939. In May 1940 he was posted to one of the first Bomb Disposal Parties RE (with a full complement of one lance corporal, one sapper and one driver) and relates the kind of war experienced by them in those early days. Although 25 companies were authorized in June 1940, it was two to three months before the organization was fully established and operational. They were soon working flat out, dealing with 20 German HE bombs in June, 100 in July, 300 in August and over 2000 in September.

The book describes what it was like during the Blitz, when all were working flat out dealing with the ever-increasing number of unexploded bombs appearing daily on the list of "Bombs to be dealt with!" Also covered is the work the author carried out in the Channel Islands; very much a "one off". No other subaltern was given such an enormous task, that of being responsible for the clearance of some 70,000 mines and other explosive ordnance. It is described in much detail with reference to maps and photos and is a very good read. As a result of his endeavours Harry is always a most welcome visitor to the Channel Islands and his work will always be remembered.

From a historical point of view, it is sad that many of the mines he rendered safe were dumped into an unused quarry on the island and are now the responsibility of 33 Engineer Regiment (EOD) to clear – some 50 years later! EEW

KEEP YOUR HEAD DOWN Bernie Bruen

Published by The Book Guild Ltd, 25 High Street, Lewes, Sussex, BN7 2LU – Price £15 ISBN 1 85776 262 2

IN this book Bernie Bruen has described in great detail what it was like to serve in and command a small close-knit team responsible for the disposal of unexploded ordnance on land, on ships and under the water, during and after the Falklands conflict. (He commanded the Fleet Clearance Diving Team No 3.) Details of the work undertaken by the Fleet Clearance Diving Teams in the Falklands are well-known and documented within explosive ordnance disposal (EOD) circles. However, this book, written in a personal and distinctive manner, gives an excellent impression of the tensions, pressures and very real dangers faced by one such team, in a way which is clearly understandable to military and civilian readers with no knowledge of the subject. The story is interspersed with his and others' poems which describe the feelings of the time and add greatly to the story.

The book, based on logbooks and notes written at the time by Lt Bruen, describes the pressures on professional clearance divers and also the voluntary work undertaken by the team; for example their work assisting the medical teams when casualties were at their peak. He also describes the ways in which he and the team were able to unwind.

Known throughout the RN Clearance Diver Branch for his musical ability on the fiddle, an instrument he took with him everywhere, in the Falklands he played it for every occasion, for relaxation in the team's makeshift shore accommodation or aboard ship, and during burial services for casualties.

Throughout the book his unique leadership skills are plainly visible but in common with most small EOD units, discipline is based upon respect and mutual dependence upon each other's skills, rather than the rank worn on the uniform. The team clearly shared everything: risks, accommodation, discomfort and above all an appreciation of each other's professional ability. To many the obvious use of Christian and nicknames between ranks may seem alien but to anyone who has served in such circumstances it is both acceptable and understandable. As Vice Admiral Sir Donald Gibson wrote in the Foreword to the book: "It's not surprising that senior officers, of more conventional mould, sometimes took fright when they saw you lot coming." Nevertheless Lieutenant N (Bernie) Bruen RN ended his naval career as a full Commander MBE DSO.

I recommend this book to anyone who wants to know what it was really like from the naval point of view.

ASH

MONTY'S HIGHLANDERS PATRICK DELAFORCE

Published by Tom Donovan Publishing Ltd, 2 Newport Street, Brighton, BN2 3HL – Price £18.95 ISBN: 1-871085-40-3

PATRICK Delaforce's history of the 51st Highland Division in the Second World War is in the clipped, chronological style of a war diary. However, the cumulative effect is a graphic account of the unrelenting, repetitive grind, which is the lot of the infantryman in war.

To follow the First World War reputation of the "Ladies from Hell" was an unenviable task for the reconstituted Highland Division which went to France in January 1940. Delaforce describes how the vibrant, proud Division more than met this challenge in the battle for France. He also describes the despair when it was sacrificed, in the debacle which resulted in the decimation and capture of most of the Division at St Valéry. The re-formation of the Division and the vigour with which it set about putting this disaster behind it says a good deal for the depth of Scottish National pride. Delaforce conveys this period with a host of personal anecdotes and details of the personalities and units involved. This is a style he uses throughout the book and which brings the account to life. It also provides a useful basis for those who seek to trace details of "who was where and when" throughout the subsequent travels of the Division in the Second World War.

With St Valéry to avenge and two years of training under their belts the men of the Highland Division were eager to "blood" themselves in battle. Their chance came at the battle of

El Alamein and the reputation they forged for themselves there was to place others in awe of them for the rest of the war. Though the Division fought well in North Africa and in Sicily, it is questionable whether it ever again reached the heights of determination and corporate battlefield dash seen at El Alamein. In Normandy it was a disappointment. Delaforce's account gives due praise for the spirit, valour and successes of the Division but it does not gloss over the effect which unremitting effort and relentless casualties, so often among the best men leading from the front, have upon a formation. That the Division regained its élan for the advance across Germany to end the war speaks volumes for the sheer stoicism and courage of the individuals who proudly wore the "Highland Decorators" insignía.

This is a book which those who served in the wartime Division will enjoy because they, or many of those they knew, are mentioned in it. It is also a book for those who seek to understand the real effect of war upon individuals involved in the "sharp end". The story it tells will fill Scotsmen with pride and no "HD" fan's bookshelf will be complete without it.

CMD

PASSCHENDAELE IN PERSPECTIVE: THE THIRD BATTLE OF YPRES Edited by Peter H Liddle

Published by Pen and Sword Books, 47 Church Street, Barnsley, S70 2AS – Price £25 ISBN 0 85052 588 8

PASSCHENDAELE! Even after some 80 years it is one of the most evocative names in the roll call of British battles. From July to November 1917 the British and Commonwealth Armies fought one of the bloodiest battles of the First World War in appalling weather conditions. During a 3½-month period Passchendaele became synonymous with death in a sea of mud.

Yet this book is much more than just an account of the battle. The key element is the phrase "In Perspective". It examines the wider political, strategic and technical perspectives and as such gives an insight into all aspects of the critical war years. The result is a book which inadvertently gives a fascinating view of the whole war rather than a detailed history of a specific battle. Its wider dimensions make it an ideal introduction for new students of the First World War. Its detailed accounts of specific elements make it ideal for the more experienced and specialist amateur historian; a rare achievement in one book. This effect is uchieved as the book is a collection of 30 independent essays and not a homogenous history of the campaign. The breadth of topics is impressive. They include "High Politics", "The Tactical Problem and Infantry in the Salient", and "The Weather in 1917". The wide variety this book displays is best summed up by the titles of two chapters – "Passchendaele – the Maritime Dimension" and "The Planned Amphibious Assault"! Not quite what your reviewer expected in a history of Passchendaele!

The detail in each of the essays is such that there is something in this book for all students of the First World War. The joy is that the Sappers come out of it so well. References to their exploits abound, be it in front line occupations such as mining or in the huge effort of logistic support. Some 76,000 men were employed in building, maintaining and operating the railway systems supporting the front! The development of field survey merits a chapter on its own. The need for accurate cartography and survey for field artillery is comprehensively detailed. Its success allowed for the provision of genuinely accurate and effective artillery fire. The result was that targets were effectively neutralized and, more importantly, German counter attacks, a constant feature of all engagements, smashed on their start lines. The horrendous effect such bombardments played in the Germans' defeat was accurately described in General von Kuhl's account of the battle, a translation of which appeared in a recent edition of the British Army Review.

Two key elements emerge from this book. The first is the devastating effect of the weather. The rainfall in August 1917 was over five times the amount for the same period in 1915 and 1916. Despite the best efforts of the Royal Engineers' Meteorological Section in attempting to forecast dry periods, many crucial attacks literally bogged down. The second is the way in which tactics evolved continuously throughout the war years. The bitter lessons of failure learned at such high cost to life in 1915 and 1916 were studied and changes implemented. By 1917, the technique of "bite and hold" based on effective combined arms operations was proving successful. The German perception in 1917 was that the British tactics were unstoppable - praise indeed!

In summary, an unusual but extremely informative book. It details the tactical and technical advances, which were constantly being made in an attempt to overcome the natural advantages that technology had given to defence. It goes a long way to dispei the old adage of lions led by donkeys while reflecting on and detailing the horrors of a truly frightening campaign. Perspective allows the campaign to be examined strategically. Passchendaele, so often scen as a failure, was a success. The mud, rain and horrors of Third Ypres did not break the British Army, but did mark the beginning of the end for the German Army.

A first class book that will be of great interest to all those interested in the First World War. Strongly recommended.

RW

WITH THE RANK AND PAY OF A SAPPER - 216 (NUNEATON) ARMY TROOPS COMPANY RE in the Great War James Sambrook

Published by Paddy Griffiths Associates, 22 Callendar Close, Nuneaton, CV11 6LU – Price £20 ISBN 09521488-3-8

This is an absolute gem of a book and a really good read throughout its 250 pages of photographs, text and notes. Written by an English professor at Southampton University with no background in military history, it could be a bit creaky around the edges. However, under the stewardship of Paddy Griffiths (well known to HQ EinC staff of DZ's vintage, for his superb battlefield tour of the "Last 100 Days of the Great War") it is no such thing.

James Sambrook sets out to tell the history of 216 (Army Troops) Company RE through the reminiscences of his father and surviving memorabilia of other members of the company, and his book is a fascinating record of life within a small, close knit, unit such as a RE squadron when at war.

216 Fortress Company was authorized under a Kitchener scheme in 1915, one of 48 such companies to be raised by town councils. Recruited under a similar idea to the Pals battalions (whose huge casualties in the Battle of the Somme tore such a devastating hole in the social structure of the UK, the repercussions of which were felt far

beyond the end of the Great War) its recruits came almost exclusively from the Nuneaton area which gave the unit a family feel and a unique way of doing business. Recruiting was sponsored by the Mayor of Nuneaton and he was allowed to nominate an OC, one Mr (later Captain) Cook who was the Borough Surveyor and who had some very basic military experience; he had been a sergeant in the Territorial Force as well as the Commandant of both the Church Lads' Brigade and the Nuneaton Citizens Training Corps! One cannot but feel that there was a deal of compulsion to join, particularly for recruits in key trades but the amateur ethos of the whole procedure beggars belief.

The book deals with 216 Company's war chronologically. The early chapters are about recruiting and training. Arthur, James Sambrook's father, at 17 years and 6 weeks, was number 45 on the company roll and, rather than receive his King's Shilling, was given a Woodbine. Training consisted of PT, drill, infantry skills and some combat engineering but, being local men and given the scarcity of barrack accommodation, all recruits lived at home until the unit moved to Buxton, a RE training centre, where the company was introduced to Army food, a salutary contrast to the home comforts of Nuneaton.

Via Le Havre in early 1916 the company moved slowly to war by train and on foot into the Loos area where they first experienced shellfire – "I was not frightened for the first time, more curious!" – and suffered their first KIAs (killed in action) a week after. Field fortifications and heavy bridging were their lot next, in the Lens area which was, in early 1916, relatively unspoiled in Great War terms.

In late 1916 they moved to 2nd Army in the Ypres area where they were employed almost continually on development of a water supply system to serve the Salient. After 3rd Ypres, the company moved south again in the New Year 1918, to Peronne, where work involved the construction of defence lines and infrastructure. A new task was heavy bridging which General Gough, commanding 5th Army, wanted in place to withdraw heavy equipment across in the event of a German attack. Caught up in the van of the attack with 18 Corps, they demolished bridges that they had previously built and fought as infantry as part of Carey's Force, a scratch grouping of engineer units including some US railway engineers, and with the Canadians at Hangard Wood. Surprisingly, given the shock of the German attacks, morale did not break and from April 1918 the company started to repair the bridges which they had demolished during the retreat. Moved to Amiens just after the "Black Day of the German Army" battle they then bridged almost continually until the end of the war.

This is not a particularly glamourous yarn but it gives an accurate feel for how run of the mill non-infantry units spent their war and there is much in the book which must attract the Sapper and Great War historian alike. It wasn't an easy war for 216 Company but it wasn't as bad as it might have been. The company retained its morale, cohesiveness and essential character and many friends who had enlisted together came home together. One of these was Arthur Sambrook who lived until the late 1970s. Its well worth a read.

MDC

RAJ

THE MAKING AND UNMAKING OF BRITISH INDIA LAWRENCE JAMES

Published by Little, Brown and Company, Brittenham House, Lancaster Place, London, WC2E 7EN – Price £25 ISBN 0 316640 727

THIS massive work is a scholarly and well presented study of the period 1740 to 1947 which is likely to become the standard textbook for future students. It contains a number of comparatively minor errors of fact and spelling which give rise to some doubts as to its general accuracy and some more serious ones, which need to be pointed out.

The minor errors include Jumma for Jumna (now of course known as Yamuna) and mention of Humayun as a place rather than the tomb of the Emperor Humayun. The Indian Distinguished Service Medal was instituted in the 1840s not in 1907. Regimental Headquarters RE proudly display to this day the names of 14 men, all Hindu brahmans from Awadh, who were awarded the IDSM for their bravery at the Siege of Delhi in 1857. The Durand Line marking the frontier between India and Afghanistan in 1893 was laid out unilaterally by Sir Henry Mortimer Durand at the request of the Amir, rather than by his brother Colonel Algernon.

More serious is the use of the term Bengalis for soldiers of the pre-Mutiny Bengal Army. In fact since Bengalis do not make good soldiers, they were recruited from the Kingdom of Awadh – high caste Shiah Muslims for the cavalry and high caste Hindu brahmans for the infantry and sappers. This had a big impact on the origin and progress of the Mutiny. It was the ill-judged protest of the 85 Muslims of the 3rd Cavalry at the unsympathetic behaviour of their Colonel, which led to the premature outbreak at Meerut on 10 May 1857, which actually saved India for the British. If it had taken place as planned three weeks later, every British soldier in India would have been in church with his rifle locked in the armoury.

The Amritsar affair had a serious impact on Indo-British relations. There was undoubtedly unrest in the Punjab at the time when Brigadier Dyer, an embittered man who had been passed over for promotion, was sent to Amritsar to sort things out. He was determined to make an impression and took personal charge of a platoon of Indian soldiers whom he led to the Jallianwala Bagh. The correct procedure for dealing with an unruly gathering of civilians, which he must have rehearsed many times, was first to blow a warning bugle, then to fire one single round at an obvious ring-leader, then if that did not work, to order three men to fire three rounds each. In this case that would probably have done the trick, since many among the crowd were women and children pilgrims, waiting to visit the nearby Golden Temple. He ordered his men to open fire without any restriction, and the result of firing 1650 rounds into the crowd was some 2500 casualties.

Wavell's plan called Operation *Flood-tide* in February 1947, called for an orderly withdrawal of British authority starting from the south of India over a period of three years. It would probably have produced a happier result than Partition, but Attlee's government, having come to power with a promise of the early return of all British soldiers, was unable to accept Wavell's requirement of two divisions of British troops to keep order during the transitional period.

Lady Mountbatten's sympathy for the unfortunate villagers displaced by Partition may or may not have been genuine, but your reviewer remembers showing her round a pathetic refugee camp at Amritsar in August 1947, when she smilingly patted the heads of starving children, but said to me behind her hand, "God! Don't they stink!"

Auchinleck did his best as Commander-in-Chief but was wrong to accept Major Shahid Hamid as his only ADC. Shahid was a charming man but came from the Shiahs of Awadh, making him clearly biased. It would have been wiser for the Auk to have had a Sikh or Hindu officer as a second ADC.

To sum up, there is no doubt that this record of 200 years of rule, shows that the British pulled India out of the Middle Ages and gave her splendid canals, roads, railways, harbours, airports and hospitals. India and Pakistan also gained schools, colleges and universities, a sound legal system and a magnificent army. They have therefore been left with a solid framework on which they have used their intelligence and capacity for hard work, to build two commercially viable nations.

However it would appear that the British exit from India was too hurried. Neither of the two countries was ready to take on the democratic government of large numbers of diverse populations of different origins and religions. History will decide the outcome in due course.

The Indian Native States were shabbily treated. Most of the Rulers had looked after their people to the best of their ability. They had been loyal to Britain, and trusted that Lord Mountbatten, as a relation of the King Emperor would look after their interests. Now their people find they have to pay higher taxes to a less benevolent government. WGAL

Based on an original review for the RUSI Journal, published in October 1998, courtesy RUSI.

SOLDIERS OF THE RAJ Alan J Guy and Peter B Boyden

Published by National Army Museum Publications, Royal Hospital Road, Chelsea, London, SW3 4HT – Price £29.95 ISBN 0 901721 35 2

This extremely handsome book was issued by the National Army Museum in connection with their Special Indian Army Exhibition in 1997 on the occasion of the 50th Anniversary of the Independence of India.

The text includes fourteen authoritative and well-illustrated chapters written by experts on the composition, organization, weapons and uniforms of the Indian Army since 1600. Of particular interest are the chapters on Race, Caste, Mutiny and Discipline, with a reassessment of the impact of the Great Mutiny of 1857, referred to by some Indian writers as the First War of Independence, on the performance of the Indian Army in two world wars and on the way in which the traditions of the old Indian Army have been inherited by the new armies of India, Pakistan and Bangladesh.

This book will be of particular interest to sappers as it includes not only the accounts and photographs of the work of the Bengal, Bombay and Madras Sappers and Miners in various operations, but also describes the invaluable contributions made by RE officers in the fields of survey, canals, roads and railways.

The best part of the book is the Exhibition Catalogue, which contains more than 100 pages, mostly in full colour, showing the uniforms, medals, weapons, paintings, photographs and other memorabilia which are held in the National Army Museum.

This book will be of absorbing interest to all those who have lived or served in India and will encourage them to see for themselves what the National Army Museum has to offer.

WGAL

Based on an original review for the *Pennant* published in November 1998. Courtesy the Officers' Pensions Society,

KITCHENER The Road to Omdurman John Pollock

Published by Constable and Company Ltd, 3 The Lanchesters, 162 Fulham Palace Road, London,W6 9ER – Price £20 ISBN 0 09 479140 6

A SENIOR officer at Chatham some years ago, when discussing the difference between Gunners and Sappers, was heard to say that the former had lots of old metal with holes in, while Sappers had national heroes. Unfair, but we do seem to go in for household names, be they Napier, Burgoyne, Gordon or even, perhaps, Blashford-Snell! But certainly Kitchener is one of the best known and this new biography, to coincide with the 100th anniversary of the Battle of Omdurman, is timely.

The sub-title is somewhat misleading as John Pollock's excellent book takes us up to the end

of the South African War, with a further volume to follow. It gives a very good insight into Kitchener's somewhat complex character beginning with his rather lonely childhood in Ireland and Switzerland, his mother dying when he was only 14. His eyesight was poor and, with a severe squint, he was no good at ball games or shooting - at one time he had three gun dogs. "Bang", "Miss", and "Damn"! Goodness only knows why he was portrayed in that famous poster with the title "Your Country Needs You" as with his squint people never knew who he was talking to, so perhaps it was the man next door who was really needed? His austere countenance was enhanced when he was badly wounded in the face at the Battle of Suakin, on the Red Sea coast of Sudan, at the age of 37.

Kitchener was commissioned into the Corps in 1871 and three years later was in Palestine, and thus began his long association with the Middle East. No ordinary soldier, he studied Hebrew. was proficient in Arabic and had a keen interest in history and archaeology. He was responsible for the first comprehensive survey of both Palestine and Cyprus and is arguably the most famous surveyor the Corps has ever produced. His subsequent military career was unusual even for a Sapper: a British vice-consul in Turkey, Second-in-Command of the Cavalry in the new Egyptian Army, Governor-General of the Eastern Sudan, Commander of the Egyptian Police Force and then, in 1892 Sirdar of the Egyptian Army and the avenger of Gordon at the Battle of Omdurman. Soon after this he was off to South Africa as Chief of Staff to Lord Roberts, taking over as Commander-in-Chief in 1900.

John Pollock has had unprecedented access to the Kitchener Papers and the Royal Archives, as well as to the extensive background information held by the Corps, and this has enabled him to bring out all the many facets of Kitchener's character and add some much needed balance to what has been said in previous biographies. Painfully shy, disliking personal publicity, "K" was often misunderstood, but those who knew him well realized that under his somewhat brusque manner lay a very caring person with a deep Christian faith. As his portrait in the Chatham Mess brings out, he was a striking figure and one of his Confidential Reports describes him as very capable, clear-headed and ambitious but not popular and somewhat lacking in tact and manner. He was also described as a fine gallant soldier and

"very successful in dealing with orientals", a politically incorrect phrase one would not be allowed to get away with today! In those days before radio communications, Kitchener was always eager to see things for himself and, without being foolhardy, he always took the same risks as his men and liked to move close to the contact squadron of cavalry. However, he was a poor delegator, and administration was not really his forte. His superiors found him difficult to deal with at times as he could be obstinate and was inclined to keep information to himself. Nevertheless, he earned their respect, though they must have been suspicious of his friendship with Lord Salisbury and his direct access to the Oueen with whom he kept up a long correspondence. All this is well brought out by the author.

It is fashionable these days for biographers, wishing to write something "different" to denigrate their subjects who, until then, had been revered figures. Kitchener has been the victim of these so-called historians, usually people with a journalistic background and a penchant for appearing in so-called "television documentaries". Kitchener has been portrayed as a brutal sadist who publically humiliated and flogged his Dervish captive and slaughtered the wounded. None of this was true, as John Pollock's research shows. "K" was also the centre of a storm in South Africa when he concentrated Boer families living in isolation into hurriedly built camps. These concentration camps, though they had none of the sinister connotations of later Nazi concentration camps, have been unfairly compared to them in recent years. In fact the motives were humanitarian, Kitchener wishing to bring in families from their precarious existence in the veldt, but the Boer women, used to living in isolated farms, had no conception of communal living and hygiene was virtually non-existent, with epidemics and a rising death rate following. The author does not try to make excuses for him and Kitchener must bear some responsibility for the delay in bringing out experienced administrators, but he was as horrified as anyone at the conditions. Sadly, he will be remembered in South Africa for the camps rather than for the enlightened peace conditions he persuaded the British government to settle for.

There have often been whispers that Kitchener was homosexual and John Pollock devotes a whole appendix to "Kitchener and Sex", surely a sad reflection on our modern society which seems suspicious of any unmarried person, male or female. In Kitchener's day, and indeed right up to the late 1950s and the widespread introduction of air travel, it was quite usual for soldiers and colonial administrators to spend long periods of their lives abroad, with few opportunities for marriage. There was nothing unusual in being single, but Kitchener, a shy and rather private individual, did contemplate marriage on more than one occasion though, in the particular case of Hermione Baker, to whom he was devoted, she died of typhoid at a very young age.

This volume ends with Kitchener's triumphal return to England from South Africa, inundated with honours and decorations. The one that delighted him most was probably the award of the newly founded Order of Merit, the King bestowing it on him personally, saying that he was the first to be invested. Kitchener was held in great respect and how right it is that we should pay homage to him a hundred years after his greatest victory. And what a fitting tribute it would be if Kitchener on his charger could gallop from Chatham and find his final resting place on the vacant plinth outside the National Gallery in Trafalgar Square! GLC

BELOVED IMPERIALIST H B GOODALL

Published by The Pentland Press, 1 Hutton Close, South Church, Bishop Auckland, DL14 6XG – Price £15.00 ISBN 1 85821 557 9

FOR a Royal Engineer to have become a colonial governor was a rare event, but Sir Gordon Guggisberg became Governor of the Gold Coast (now Ghana) from 1919 to 1927 and gained the respect and affection of the Africans he governed.

Dr Goodall, the author, is a tropical diseases pathologist and has taught in hospitals at Accra and Kumasi. He became intrigued to know why the government of Ghana, ten years after independence, had erected a statue to a colonial governor outside Korle Bu Hospital in Accra. On investigation, he became fascinated by the extraordinary career of this remarkable man, and consequently wrote this short and very readable biography of Sir Gordon Guggisberg KCMG DSO.

The author relates how the young Gordon came to be commissioned into the Royal Engineers in 1889, and seconded to the Colonial Office in 1902. It was during the twelve years he then spent in the topographical and cadastral survey of the Gold Coast and Nigeria that he became so impressed with the calibre of his African staff that he determined that the full potential of their people should be realized.

Guggisberg returned to England for the First World War and had a brilliant record, starting as OC 94 Field Company and becoming brigadiergeneral commanding 170th Infantry Brigade.

After the war, he determined to return to the Gold Coast and, assisted by his wife Decima (who also had a distinguished war record) and several influential friends, he persuaded the Secretary of State for the Colonies, Viscount Milner, to appoint him Governor of the Gold Coast in succession to Sir Hugh Clifford. The Colonial Office was not particularly pleased with his appointment and was even more upset to receive, even before he left England, a detailed and ambitious plan for improving the infrastructure of this colony. It involved the building of a harbour and the improvement of the railway system to facilitate trade, and included far-reaching plans for the health and education of the people.

Dr Goodall clearly sets out how Sir Gordon Guggisberg, with unswerving determination, achieved all his aims during the eight years of his governorship. Takoradi harbour was built, and the railway from Takoradi to Kumasi and Accra to Kumasi constructed or re-laid; during both of these tasks his knowledge as an engineer enabled him personally to supervise the work. Korle Bu hospital was built, the first major hospital in West Africa, and Sir Gordon's insistence on the importance of educating the native people within their own country led to the founding of Achimota College.

The two maps of the Gold Coast are mere sketches; a well drawn map of the country in Guggisberg's day would have been better. The reasons for the mutual dislike between Sir Gordon and his predecessor, Sir Hugh Clifford, remain a mystery (though Dr Goodall indicates that he may explore this at a later date) and one would like to have learnt more about the formidable Decima, Lady Guggisberg, to whom Sir Gordon appears to have owed a great deal. These are minor criticisms of a well-written book full of interest, which leaves one with a desire to know more about this man and the country to which he devoted such a large part of his life. PEGC

A HISTORY OF THE PENINSULAR WAR. VOLUME VIII The Biographical Dictionary of British Officers Killed and Wounded, 1808-1814 John A Hall

Published by Greenhill Books, Lionel Leventhal Ltd, 1 Russell Gardens, London, NW11 9NN – Price £35 ISBN 1-85367-315-3

GREENHILL Books has republished the seven volumes of Sir Charles Oman's "History of the Peninsular War" and they have taken the rather unusual step of adding this useful eighth volume, which has been compiled by Dr Hall.

As the author comments in his Introduction, a gentleman named Lionel Challis spent almost 40 years compiling biographical details for all the 10,000 or so British officers who served in the Peninsular War. Unfortunately this prodigious task was never published and much of the information has now been lost. This new, 640page volume, is limited in its use since it has been reduced to 3000 entries by only including details of those who were killed or wounded (it also excludes those who died from natural causes or due to accidents), but even this number was an enormous task and it took the author seven years to research and compile. While the information on infantry and cavalry officers appears to be reasonably comprehensive, apart from the better known individuals such as Fletcher and Burgoyne, the information on Royal Engineers is rather sparse. It is probable that the author has never heard of the RE Library or Conolly's "Brief Memoirs of RE Officers", so he did not contact the library to obtain the comprehensive information that is available.

It would be unfair to criticize in detail this extensive volume, but RE readers may wish to know that a total of 109 Royal Engineers served in the Peninsular War, which excludes Sub Lieutenants of the Royal Military Artificers and Engineer officers of the King's German Legion. Of these 109, 24 were killed, one died due to natural causes and a further 25 were wounded. The Dictionary does not include Lieutenant H Davy, who was killed on 10 January 1809 when blowing up a bridge on the retreat to Corunna, or Lieutenant S Trench who died on 10 June 1811 from wounds he received when demolishing the ruins of the fortress at Almeida in May that year. The author presumably classified these two as accidental deaths. Captain P Patton is included as wounded at the siege of Badajoz in June 1811; in fact he was hit by a musket ball when making a reconnaissance on the night of 8/9 June, evacuated from Badajoz to Lisbon in a spring wagon and died from his wound on 17 June so he should have been shown as killed. Of those wounded, Captain J F Birch and Lieutenants P Barry, G Gipps and S C Melhuish do not have an entry; Birch was shot through the thigh at the battle of Valmesada on 7 November 1808 when serving with the Spanish army of Blake as a Military Agent [adviser], Barry was severely wounded by a grape-shot in the groin on 31 August 1813 when leading a party to the breach at the storm and capture of San Sebastian, Gipps received a slight bayonet wound in his left arm when leading the right colump to the assault on Fort Picurina on 25 March 1812 at the siege of Badajoz and Melhuish was wounded on the afternoon of I April when employed in the trenches at the same siege.

JTH

SALIENT POINTS 1 & 2 CAMEOS OF THE WESTERN FRONT – YPRES SECTOR 1914-18 TONY SPAGNOLY AND TED SMITH ISBN (1) 0-85052-319-2 ISBN (2) 0-85052-610-8

LADYSMITH Colenso/Spion Kop, Boer War Lewis Childs ISBN 0-85052-6116

Published by Pen & Sword Books Ltd, 47 Church Street, Barnsley, South Yorkshire, 570 2AS Price, all: £9.95 each

THREE more handy (A5 size) and well-presented books in the "Battleground" series. Salient Points 1 is a reprint but contains a whole chapter on tunnelling in the Wytschaete area. This and Salient Points 2 are laid out in chapters, each a complete story in itself about an individual, a place or an incident.

Ladysmith is more specifically a battlefield guide and very useful it would be to anyone planning their own venture into the area, perhaps for the forthcoming centenary. Despite the book's title, the battle on Wagon Hill which arguably saved Ladysmith and in which Robert Digby Jones won a posthumous VC, is not mentioned.

GWAN

STORMING ST NAZAIRE By James G Dorrian

Published by Pen & Sword Books, 47 Church Street, Barnsley, S70 2AS – Price £19.95 ISBN 0 85052 419 9

In the 1939-45 war there were many episodes where examples of personal bravery and devotion to duty could be found. The raid on St Nazaire differed from these in that it was one of the relatively small number of military actions which gave the impression of taking place, as it were, in a vacuum, rather than as a part of a larger campaign. Partly for this reason St Nazaire stands out in the history of the war. The concept of the raid was, to say the least, bold, verging on the foolhardy. Those participating met the challenge.

As told by James Dorrian the story does not concern itself over much with strategy but dwells rather on the incredible bravery and self-sacrifice of the participants. Nevertheless the background to Operation Charlot is well documented and the situation in 1942 is vividly described. The writer of this review was slightly put off by a few clichés in the first chapter - "lash out from behind the shelter of Churchill's bombastic oratory", "the glittering prizes of Brest, Lorient, St Nazaire." But these are soon left behind as the author gets into his stride. James Dorrian has the knack of presenting splendid pen pictures of the participants. For example we learn that the naval force commander, Commander Ryder, found out to his amusement that he was appointed "due more to the fact that he was the only commander available than to any special qualities it was thought he might bring to the job." That will ring a bell for many of us. Dorrian also has a very sure touch later as he tells, in this meticulously researched tale, of the events of the landing itself.

For the Sapper this book has particular interest as we read of the participation of the then Captains Bill Pritchard and Bob Montgomery, Corporal Bob Wright of 12 Commando and, of course, Sergeant Tom Durrant. In the preparatory training we read too of the work of "Major Jim Gavin and his fellow sapper Captain Gabriel." With hindsight it is strange to read how Operation *Chariot* was hindered by lack of support in certain areas. The author writes "Bomber Command – [had] little time to spare for sideshows such as Commando raids; in the event a mere sixty two planes were allocated to the raid even though its stated purpose was to materially effect the balance of sea power in the North Atlantic." The Admiralty too was often halfhearted in its support. It was not so with those who took part. As the author notes, "Amidst the transparent enthusiasm of the under used Commandos to get to grips with the enemy at last, an objective assessment of the risks ... seems to have occupied only second place."

This is a splendid adventure story. Compellingly narrated. The bravery and devotion to duty of those who took part is breathtaking. The fact that 85 medals, including no less than five VCs, were awarded to "Charioteers" speaks for itself.

FRB

FORTS OR FOLLIES? – A HISTORY OF PLYMOUTH'S PALMERSTON FORTS FREDDY WOODWARD

Published by Halsgrove, Halsgrove House, Lower Moor Way, Tiverton, EX16 6SS – Price £19.95 ISBN 1 874448 12 4

This welcome volume follows the author's "Citadel a History of the Royal Citadel, Plymouth" (1987) and "The Historic Defences of Plymouth" (1996) which he wrote with Andrew Pye. Both were important contributions to our knowledge of the history of the defences of Plymouth, as is this latest volume. Freddy Woodward brings us the perspective of a historian and a soldier, having been commissioned into the Royal Artillery in 1941, later becoming Instructor in Gunnery in Coast Artillery at Plymouth.

This book examines and discusses the extensive ring of defences built from the 1860s to protect the naval base and dockyard of Plymouth against sea and land attack. The author places his study in context by tracing the origins of the defences from the 14th century and discussing the wider evolution of artillery and methods of fortification and the extent of their application to Plymouth. He cites the rapid advances in the development of artillery from the 1840s and the emergence of steam warships as technological threats. These ultimately combined with a fear of invasion from France, to bring about the great Royal Commission programme of defence construction implemented from the 1860s, of which Plymouth was a part. The author has covered the roles of Lord Palmerston who, as Prime Minister from 1859 to 1865, was the major political advocate for strengthening the nation's defences and of Colonel (later Major General) Jervois, RE, who greatly influenced the design of the forts at Plymouth and elsewhere.

The author has provided an ingenious test for the effectiveness of the Plymouth fortress by including a fictional French attack on its defences.

The concluding chapter could have argued the question "Forts or Follies?" more sharply. On the whole, the author considers that to write-off the forts as having been no more than follies would be unfair. He points out that the construction of the forts at Plymouth - as elsewhere under the Royal Commission scheme - reflected a genuine perception of the threat of invasion from France, based on what was considered to be reasonable evidence of French aspirations. behaviour and attitudes at the time. The need for defences on land "keeping goal behind the Royal Navy" was real enough, no matter how little or how much confidence was placed on the ability of the fleet to defend against invasion. The debate was about how much and which types of fortification. We may agree with the author that, given the circumstances of the time, the construction of the fortress was justified. We may also accept his argument of deterrence: a potential invader would more readily consider attacking and capturing an undefended naval base than a fortified one, despite any imperfections possessed by its defences. The theory of deterrence continued, albeit with different weapons, into the Cold War age.

This fascinating thought-provoking and very well produced book is recommended.

Journal Awards

The Budget, Investments, Membership, Scholarship, Memorial and Publications Committee announces the following awards for articles of special merit published in the August 1998 Journal.

CLOSE SUPPORT ENGINEERS: TOWARDS A COHERENT DOCTRINE by Major J A H Welch BA – £100

> CORRESPONDENCE FROM OVER THE POND by Colonel P Lilleyman MBE BSc(Eng) – £75

CONVICTS, COLONIES AND ROYAL ENGINEERS by Lieutenant Colonel A Taylor – £75

RAILWAY OPERATIONS IN PALESTINE 1947 TO 1948. A PERSONAL MEMOIR by Major C F Rose CBE(Civil) MBE CEng FICE MCIT – £75

The Forgotten Reserves. Non-Territorial Engineer Units 1877 to 1998 by Dr Graham E Watson – \pounds 50

THE BOSNIAN EXPERIENCE by Lieutenant Charlie Battey – £50

Explanation of Abbreviations and Foreign

Words Used in This Journal

1 Bn R Li	ncoln Ist Battafion the Royal
	Lincolnshire Regiment
21C	
ΑΑ	anti-aircraft
AC	alternating current
ADC	
Admin	administration
AER	Army Emergency Reserve
AFV	armoured fighting vehicle
AMF	air mobile force
AVLB	armoured vehicle-launched bridge
AVRE	armoured vehicle RE
Armd	armoured
BAOR	British Army of the Rhine
BATUS .	British Army Training Unit Suffield
BEF	British Expeditionary Force
Bn	battalion
BRITCON	J British contingent
Bundeswe	hr Armed Forces of the
	Federal Republic of Germany
Cdo	
CET	combat engineering tractor
CO	Commanding Officer
CRE	Commander RE
CSM	Company Sergeant Major
DComd .	Deputy Commander
D D C III I	
DDFW .	Deputy Director Fortifications and Works
DDFW Div	Deputy Director Fortifications and Works division
DDFW . Div DZ	Deputy Director Fortifications and Works division
DDFW . Div DZ	Deputy Director Fortifications and Works division common abbreviation used for: Major General K J Drewienkiewicz
DDFW Div DZ E&MO	Deputy Director Fortifications and Works division common abbreviation used for: Major General K J Drewienkiewicz celectrical and mechanical officer
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DDFW Div Div DZ DZ E&MO. (E) eg EinC Engr EOD ERD EV G3 G4 GSO Hecresamt HMT	Deputy Director Fortifications and Works
DDFW Div Div DZ DZ E&MO (E) eg EinC Engr EOD HRD FARELF. G3 G4 GSO Hecresami HMT HQ	Deputy Director Fortifications and Works
DDFW Div Div DZ DZ E&MO. (E) eg EinC. Engr EOD HRD FARELF. G3 G4 GSO Hecresami HMT HQ ie	Deputy Director Fortifications and Works
DDFW Div Div DZ DZ E&MO. (E) eg EinC. Engr EOD HRD FARELF. G3 G4 GSO Hecresami HMT HQ ie IFOR.	Deputy Director Fortifications and Works division division
DDFW Div Div DZ DZ E&MO. (E) eg EinC. Engr EOD HRD FARELF. G3 G4. GBO Hecresam HMT HQ ie IFOR. Indep.	Deputy Director Fortifications and Works division division

1.11.7	Junior non-commissionea orricer
N116	kilohertz
kV	kilovolt
LO	liaison officer
MEXE	Military Engineering
	Experimental Establishment
MHz	
MLC	military load class
MOD	
MSR	main supply routes
Mt	
MWF	Military Works Force
NATO	North Atlantic Treaty Organisation
NBC	nuclear, hiological, chemical warfare
OC	Officer Commanding
On	operation
OPCON	operation control
POW	prisoper of war
PT	nhysical training
RΔ	Royal Artillary
RAC	Poyal Armoural Corps
RAG	Povel Air Fores
RARDE	Powel Armemont December and
KARDE	Development Establishment
DE	Beveropment Establishment
Dant	agimant
DEME David	Electrical and Mashaniant Engineers
NEMES, NOYAI	Electrical and Mechanical Engineers
DEVC	Doubl Ungingare Vasht Club
DM	Davis Moyai Engineers Fachi Club
RAL	Royal Marines
	Lassen 5 5 february A and Lassen
KMA	
RN	
RN RO	Royal Military Academy Royal Navy
RMA RN RO RSM	Royal Military Academy Royal Navy retired officer Regimental Sergeant Major
RMA RN RO RSM RSME I	Royal Military Academy Royal Navy retired officer Regimental Sergeant Major Royal School of Military Engineering
RMA RN RO RSM RSME RTR	Royal Military Academy Royal Navy retired officer Regimental Sergeant Major Royal School of Military Engineering Royal Tank Regiment
RMA RN RO RSM RSME RTR RUSI	Royal Military Academy Royal Navy retired officer Regimental Sergeant Major Royal School of Military Engineering Royal Tank Regiment Royal United Services Institute
RMA RN RO RSM RSME RTR RUSI	Royal Military Academy Royal Navy retired officer Regimental Sergeant Major Royal School of Military Engineering Royal Tank Regiment Royal United Services Institute for Defence Studies
RMA RN RO RSM RSME RTR RUSI SD SD	Royal Military Academy Royal Navy retired officer Regimental Sergeant Major Royal School of Military Engineering Royal Tank Regiment Royal United Services Institute for Defence Studies
RMA RN. RO RSM RSME RTR RUSI SD SFOR	Royal Military Academy Royal Navy retired officer Regimental Sergeant Major Royal School of Military Engineering Royal Tank Regiment Royal United Services Institute for Defence Studies Stabilisation Force
RMA RN. RSM. RSME RSME RTR RUSI SD. SFOR SHAPE.	Royal Military Academy Royal Navy retired officer Regimental Sergeant Major Royal School of Military Engineering Royal Tank Regiment Royal United Services Institute for Defence Studies Stabilisation Force Supreme Headquarters,
RMA RN. RSM. RSME RSME RTR RUSI SD. SFOR SHAPE.	Royal Military Academy Royal Navy retired officer Regimental Sergeant Major Royal School of Military Engineering Royal Tank Regiment Royal United Services Institute for Defence Studies Stabilisation Force Supreme Headquarters, Allied Powers, Europe
RMA RN. RSM. RSME RSME RTR RUSI SD. SFOR SHAPE SME.	Royal Military Academy Royal Navy Royal Navy Royal Navy Royal School of Military Engineering Royal School of Military Engineering Royal Tank Regiment Royal United Services Institute for Defence Studies Stabilisation Force Supreme Headquarters, Allied Powers, Europe School of Military Engineering
RMA RN. RSM. RSME RSME RTR RUSI SD. SFOR SHAPE SME SME	Royal Military Academy Royal Navy Royal Navy Royal Navy Regimental Sergeant Major Royal School of Military Engineering Royal Tank Regiment Royal United Services Institute for Defence Studies Stabilisation Force Supreme Headquarters, Allied Powers, Europe School of Military Engineering School of Military Engineering
RMA RN. RSM. RSME RSME RTR RUSI SD. SFOR SHAPE SME SME SNCO Sqn	Royal Military Academy Royal Navy Royal Navy retired officer Regimental Sergeant Major Royal School of Military Engineering Royal Tank Regiment Royal United Services Institute for Defence Studies Stabilisation Force Supreme Headquarters, Allied Powers, Europe School of Military Engineering senior non commissioned officer squadron
RMA RN RN. RSM. RSME RTR RUSI SD. SFOR SFOR SHAPE SME SME SNCO Sqn TA	Royal Military Academy Royal Navy Royal Navy Royal Navy Regimental Sergeant Major Royal School of Military Engineering Royal Tank Regiment Royal United Services Institute for Defence Studies Stabilisation Force Supreme Headquarters, Allied Powers, Europe School of Military Engineering senior non commissioned officer squadron Territorial Army
RMA RN. RN. RSM. RSME RTR RUSI SD. SFOR SFOR SHAPE SME SME SNCO Sqn TA TA CON	Royal Military Academy Royal Navy retired officer Regimental Sergeant Major Royal School of Military Engineering Royal School of Military Engineering Royal United Services Institute for Defence Studies Stabilisation Force Supreme Headquarters, Allied Powers, Europe School of Military Engineering senior non commissioned officer squadron Territorial Army tactical command
RMA RN. RN. RSM RSME RSME I RTR RUSI SD. SFOR SHAPE SME SME SNCO Sqn TA TACON UK.	Royal Military Academy Royal Navy Royal Navy Regimental Sergeant Major Royal School of Military Engineering Royal Tank Regiment Royal United Services Institute for Defence Studies Stabilisation Force Supreme Headquarters, Allied Powers, Europe School of Military Engineering senior non commissioned officer squadron Territorial Army tactical command United Kingdom
RMA RN RN RSM. RSME RTR RUSI SD SFOR SHAPE SME SME SME SNCO Sqn TA TACON UK UK	Royal Military Academy Royal Navy Royal Navy Regimental Sergeant Major Royal School of Military Engineering Royal Tank Regiment Royal United Services Institute for Defence Studies Stabilisation Force Supreme Headquarters, Allied Powers, Europe School of Military Engineering senior non commissioned officer squadron Territorial Army tactical command United Kingdom
RMA RN. RN. RSM. RSME RTR RUSI SD. SFOR SHAPE. SME SME SME SMCO Sqn TA TACON UK UN UN NPROFOR.	Royal Military Academy Royal Navy Royal Navy retired officer Regimental Sergeant Major Royal School of Military Engineering Royal United Services Institute for Defence Studies Stabilisation Force Supreme Headquarters, Allied Powers, Europe School of Military Engineering senior non commissioned officer squadron Territorial Army tactical command United Kingdom United Nations UN Protection Force
RMA RN. RN. RO RSM. RSME RTR RUSI SD. SFOR SHAPE SME SME SNCO Sqn TA TACON UK UN UN UN UN SNCOR US SHAPE US SHAPE US US US US US US US US US US	Royal Military Academy Royal Navy Royal Navy Regimental Sergeant Major Royal School of Military Engineering Royal School of Military Engineering Royal United Services Institute for Defence Studies Stabilisation Force Supreme Headquarters, Allied Powers, Europe School of Military Engineering senior non commissioned officer squadron Territorial Army tactical command United Kingdom United Nations UN Protection Force