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Guidelines for Authors

The Editor is always pleased to consider articles for publication in the *Journal.*

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

Length. Approximately 4500 words plus illustrations.

Copy. Ideally one copy of the text should be submitted, together with a head and shoulders photograph of the author plus a short pen picture.

Clearance. Articles must be cleared by an author's CO where applicable.

Computers.

See boxed item on inside back cover.

Copyright. If an article has been published elsewhere before being submitted to the Institution, copyright clearance must be sought by the author; where necessary copyright clearance on photographs, maps or illustrations must also be obtained prior to submission.

Photographs should be of good quality with sharp definition, and don't forget to add appropriate captions. Please do not submit laser/photo copies of photographs for publication.

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Pseudonyms will not be revealed by the Editor under any circumstances.

Contributions should reach the Editor by:

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Submissions before the deadline are particularly welcome.

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Editorial

THE Engineer in Chief's *Annual Report to the Corps* was written at the end of May 1998, prior to the announcement in July of the strategic defence review (SDR). Brigadier McGill's optimism about increases in regular engineer manpower, and pessimism about cuts in the TA, were well founded. What is encouraging in his report is that both regular officer and soldier recruiting into the Corps is excellent. This bodes well for its expansion by nearly 15 per cent over the next few years, a clear recognition of the utility of the Sappers both now and in the future.

The Engineer in Chief also says in his report that whatever the outcome of the SDR, there is still much to be achieved in developing a military engineering capability to meet future needs right across the spectrum of defence. However this is to be achieved, there is little doubt that new technology will play a significant part. To quote from his report: " The Digitization of the Battlespace (Land) programme stands to have as significant an impact on British military capability as mechanization did in the 1930s."

If the word digitization does not conjure up any meaningful image in the minds of readers, then *Correspondence From Over the Pond* gives a mind-boggling insight into what digitization technology could herald. Some may think it is in the realms of science fiction, but then who would have believed a decade ago that IT systems would today be impacting upon so many facets of our everyday lives?

Convicts, Colonies and Royal Engineers provides a more familiar concept of the role of Sappers. It is also a reminder of the extraordinary contribution the Royal Engineers made to the development of countries in the British empire in the 19th century.

A more contemporary role of the Sappers is discussed in *Close Support Engineers: Towards a Coherent Doctrine,* which for serving officers at least keeps their feet firmly on familiar territory. The author uses some apt quotations to punctuate his exposition of close support engineer operations and the principles upon which its doctrine should be based.

Now that anti-personnel land-mines have been banned from the British Army's inventory, alternative ways of filling a capability gap are being addressed. The legacy of uncleared land-mines will remain, possibly for decades to come, and *No Breakthrough in Land-mine Clearance* is a stark reminder that there is no easy solution to this seemingly intractable problem.

With the forthcoming reductions in the overall size of the TA, it is timely to emphasize the requirement for specialist TA engineers to meet on-going commitments. *The Forgotten Reserves Non-Territorial Engineer Units 1877 to 1998* traces the history of what became known as sponsored units and individuals, whose central headquarters, 111 Engineer Regiment (V), was in its time little known in the wider Corps, to what are now STsRE(V) which bring together skilled tradesmen and specialists from civilian life to complete tasks that the regular Corps no longer has the resources to undertake.

One of these tasks, now the preserve of a STRE(V), is railway construction. *Railway Operations in Palestine 1947 to 1948 A Personal Memoir* is an exciting account of those troubled days at the birth of the state of Israel in which railways played such an important role in the final withdrawal of British forces.

Turning to other matters, at the AGM in July it was agreed to accept the recommendation arising from the Review of the Institution that warrant officers be eligible for full membership of the Institution. The Clerk to the Lords of the Privy Council is required to endorse the AGM's decision before it can be enacted, sometime later this year. The other major recommendation, to examine the management of the RE Museum to reflect more realistically the interests of the MOD, the Institution and the Corps as a whole, will be taken forward in a wider review of Corps affairs being initiated by the Chief Royal Engineer's Committee. ECAB has recently endorsed the recommendations of AG's Review of Army Museums paper, recognizing that security of tenure, staffing support and maintenance of the buildings should in principle be underwritten by the MOD. This is a great step forward, as indeed was the recent national award of "Designated" status to the RE Museum in recognition of the importance of its collection, one of only two military museums (the other was the tank museum at Bovington) to achieve it so far.

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Annual Report to the Corps by the Engineer in Chief

Introduction

1998 has so far proved every bit as demanding for the Corps as the previous years, although there has been an easing of Royal Engineers actually deployed on operations. Major issues range from the Strategic Defence Review (SDR), the Northern Ireland Peace Process, the Follow-on-Force from SFOR in Bosnia and the flood of legislation and initiatives in the GI area. SDR will drive the future size and shape of the Corps and I want to start my report with some comments on it.

SDR

The Royal Engineers numbered 280,000 after World War Two. Before the SDR is implemented we number just over 8800 regular all ranks (including our Gurkha squadron) and some 5500 TA; only five per cent of our size 50 years ago. Yet we still maintain (just) the same combat capabilities in our armoured, mechanized, amphibious, EOD, parachute, commando, plant, wheeled field and field support units to help the Army fight and move – and nearly all the trade and specialist skills which help the Army (and the other Services) to live. Nevertheless we have little depth and are at or below critical mass in certain areas; for example in our amphibious bridging.

Measures have been submitted in the SDR to address the balance of regular engineer effort though it is still too early to confirm exactly what enhancements will be funded – and the Government's Comprehensive Spending Review is still to come. I remain optimistic that we will have more engineer manpower to support the 6th Deployable Brigade and the Air Manoeuvre Brigade, increase our support to the RAF and relieve the continuous overstretch in our logistic (field support and field park) squadrons, EOD regiment and STsRE. Within an expeditionary era, the Royal Engineers have a key role before, during and after any conflict. But, whatever the outcome[1], the SDR is unlikely to provide the final solution. We have not yet tied our military engineering in with likely future allies, nor attempted to address any common weaknesses in conjunction with them; an illustration is the more robust wide river crossing capability of other armies which we might need to use in some future campaign. Neither have we fully addressed the opportunities offered by our manifold contributions towards defence diplomacy. Further changes are inevitable, not only with the delivery of a military engineering capability, but right across defence.

The anticipated pruning of our TA must not result in an irreversible loss of capability. Apart from the essential need to generate a future reserve in times of crisis or future wars, now considered less critical in the planning assumptions because of expected longer warning times, our TA currently supports the Corps by backfilling regular units with individual reserves on operations and exercises, by keeping the public informed about the Corps and by encouraging our healthy recruiting. Less obviously the Royal Engineers TA is a natural conduit to industry and certain specialized, but vital, construction capabilities which the regular Corps can no longer sustain, such as railways, docks, harbours and ports. We are remarkably fortunate to have unique links with some extremely influential "captains" in the construction industry, through the Engineer and Logistic Staff Corps as well as the expertise of the Military Works Force(V). This conduit must be nurtured and developed. The regular element of the Corps is too small to "go it alone" in any future serious conflict and we need the support of the TA and British industry, as well as our allies. Our natural synergy with the construction industry has to be exploited, as a catalyst, in order to bring in appropriate civilian expertise which can be harnessed, not just towards reinforcing a military engineering capability but also towards "Building the Peace" operations. This is much wider than simply a Sapper contribution; it encompasses the whole of civil affairs, including contracts, law, education and other aspects.

Operations

In the past 12 months, the average operational tour interval has increased from 11 to 17 months and it is hoped that this will increase further to our

[1] 1998 Report to the Corps written in May 1998 before final decision on SDR released.

desired target of 24 months. During this time, over one third of the Corps has trained for or deployed on operations.

Bosnia. The UKs contribution to peace-keeping in the Former Republic of Yugoslavia, following expiry of the SFOR mandate on 20 June 1998, is now Operation *Palatine* which has replaced Operation *Lodestar*. The engineer contribution to the ORBAT is a RHQ, a CS Sqn, a Fd Sqn, a Fd Sp Sqn(–), a STRE and three EOD detachments. Manning shortfalls have to some extent been alleviated by the backfilling of deployments using TA and reservists.

Snow and ice clearance in Bosnia.

Falkland Islands. Following approval of the change in establishment of the Falkland Islands Field Squadron, the minimum manning strength has been cut to 86 (including the Joint Services EOD and South Georgia detachments) and this was implemented by 69 Gurkha Fd Sqn in January 1998. The principal operational requirement is the provision of a troop for the repair of aircraft operating surfaces.

Northern Ireland. We continue to provide a roulement engineer squadron and search troop to 25 Engr Regt. The squadron is now collocated with 25 Engr Regt which has lost its pioneer troop, consequently more routine tasks have been passed to squadrons. 33 Fd Sqn no longer has a Royal Engineers search team capability. In November 1997, 5 Fd Sqn deployed to Belfast in the infantry role as a rifle company in 1 PWRR (the Belfast roulement battalion). With responsibility for Girdwood and Whiterock they returned in May 1998.

Cyprus. 36 Engr Regt continues to provide the 13-man RE detachment to UNFICYP.

The Middle East. 39 men from 34 Fd Sqn deployed on Operation *Bolton*, along with the RAF liaison officer from 12 (Air Sp) Engr Bde, to the Ali Al Salem airbase in Kuwait in January 1998 where they were joined by 22 men already on Operation *Jural* in Al Kharj. A roulement took place in April 1998 and 53 Fd Sqn (Air Sp) now has approximately 50 men working between the two bases. Initial tasks were associated with the bed-down of RAF aircraft and personnel with follow-on works including the construction of accommodation units, and the erection of aircraft sun shades.

Other Operations:

- Operation *Companion* – one PQE and one clerk of works deployed to Brunei on 11 May 1998 to identify methods of providing clean air to offices and accommodation following extensive fires in the rainforest.
- Operation *Bell* – is the name given to the possible military assistance which will be carried out during an evacuation of the northern tip of Montserrat. A field troop from the *Spearhead* squadron has remained on standby to support the *Spearhead* Battalion.

Exercises

Despite little reduction in operational commitments, the Corps has continued to take part in a wide range of all arms and Sapper special to arm exercises both at home and overseas. We once again supported ten TESEXs on Salisbury Plain, ranging from armoured battlegroups through airmobile to 9 Sqn's support to 2 PARA in January. Troops have been sent to support battalions in Kenya, Canada and the US as well as supporting the *Medicine Man* series of exercises in BATUS. In September 1997, 35 Engr Regt deployed to Poland in support of 20 Armd Bde on Exercise *Ulan Eagle*.

There were a host of squadron and troop level exercises and projects proving every bit as challenging to the planning and HQ staff involved in

their deployment as to the troops who carried out the interesting and exacting work demanded of them. 32 Engr Regt sent a squadron to Cyprus on Exercise *Pine Stick* while both 61 Fd Sp Sqn and 5 Fd Sqn deployed to Kenya. 53 Fd Sqn's winter training camp was in Belize on Exercise *Sail Fish* while 33 Engr Regt sent detachments to both Kenya and Belize to conduct battle area clearance. These are just a selection of the overseas exercises which I believe are vital in maintaining the interest of our soldiers while honing their artisan skills. Ultimately they contribute to our recruiting and retention successes.

Reserve Forces and the TA

In the last year the RE TA supported all three Services in a variety of ways. It continued to provide trained, voluntary, individual reinforcements to the regular army on operations, mainly in Bosnia. It has undertaken numerous training and military works tasks to both relieve regular commitments and promote a positive, public image for the benefit of the Corps and the Army. Thirdly, within the scope of its own training, it has maintained expertise in capabilities no longer found from the regular army, for example, railways and battlefield illumination.

A total of 123 officers and soldiers volunteered for operational tours as military engineers (including EOD), general duties, general staffs and civil affairs. Others have opted for short service, voluntary engagements with regular units and staffs elsewhere in the world. A further 71 have enlisted for full-time regular army careers, mainly within the Corps. In the last year, RE TA officers and soldiers have served in over 20 countries including places as diverse as Estonia and Mozambique. This active support has been appreciated by their hosts who have noted the volunteers' ability to fit in quickly and get on with the job. Additionally over 22,000 man days were expended on military works, and over 160 assistance tasks, to all three Services, were logged. Cooperation on this scale has served to underline the integrity of a "whole Corps" concept and brought invaluable experience back to the ranks of the RE TA.

HQ 29 Engr Bde has occupied its permanent accommodation in Buller Barracks, Aldershot and is developing its role and establishment as a focus for lines of communication engineer effort. It has refined its management of RE TA officer careers and employments, features of which have been applied throughout the TA. The HQ has continued to develop its new approach to RE TA training. Trials in two units are underway with full implementation planned for 1999.

The SDR looms large in the determination of the future roles, shape and size of the RE TA. An increased regular establishment and greater dependence on individual reservists regrettably means inevitable reductions in its strength. The future organization of the TA will be within the auspices of Commander in Chief LAND and studies are going on to that effect. We will aim to redesign a RE TA which at least maintains the essential link between the Corps and the UK construction industry, adequately sustained to mobilize its strength and quality as and when the need arises. I would like to pay tribute and express deep gratitude, on behalf of the Corps, to those elements and individuals in the RE TA we will have to lose under the SDR. They will be sorely missed. Individuals have maintained the best traditions of the British volunteer spirit, looking for self-expression and deriving a self-confidence and satisfaction from benefiting others. I sincerely hope that they will continue to make a contribution, either elsewhere in the Services or within the wider society.

Engineer Resources and the Implementation of the Logistic Support Review

Logistic engineering is an essential part of our contribution to sustainability and military capability. We have ignored it for too long, and relegated it to the background. But the lessons of history and current events in Bosnia remind us all of the importance to operations of engineer materiel and engineer services. The focus for most of this effort is D Engr Sp(A) and his staff in the Quartermaster General's organization at Andover.

On the materiel side, the directorate is forging ahead with the disaggregation of the non-core functions of Central Engineer Park Long Marston to LAND and other parts of HQ Quartermaster General. The policy function is retained and this, together with the many new Sapper posts created, ensures that we are fully part of the Army supply chain – the only show in town – and yet retain the control that we know we need for our materiel. This change to the way we do business is a real opportunity, but I must record here my gratitude for the major contribution to Sapper operations

over many years to our dedicated work force at Long Marston.

Major developments are in train for engineer services. The Engineer and Logistic Staff Corps, with its hugely useful network of expertise, is now firmly linked to the Directorate – please use it. An inspectorate of works is being established to carry out independently a proper technical audit of the construction work of the Corps both in the UK and overseas – on operations, projects and on routine works services. The utility of Sappers in the overseas estate organizations is rapidly being recognized (again?) with chartered engineers in key posts as the directorate enters, in effect, a partnership with the Defence Estates Organization in advising on arrangements in operational theatres. There is substantial related work to be done for all aspects of expeditionary warfare, from deployment to building the peace, and the Directorate is leading on this strategic effort. The Military Works Force continues to be as busy as ever, and its work continues to show clearly the qualifications, challenge and satisfaction gained by our specialist engineers.

Military Survey

Military Survey has taken part in over 90 operations and exercises during the year ranging from individuals carrying out global positioning system training to full scale deployments of squadron-sized groupings supporting brigade and divisional exercises. There is a continuing commitment to Operation *Lodestar/Palatine* in Bosnia where geo staff provide geographic advice and services including map supply, briefing graphics and terrain analysis to the HQs. Advanced graphics, fly throughs and full terrain analysis functions can be generated using container mounted tactical information computer systems. A team deployed to Kuwait on Operation *Bolton* in February 1998 to establish primary control, azimuth and a series of coordinated points on the base at Ali Al Salem, which allowed initiation of the precision guided weapons carried by RAF aircraft. In Northern Ireland, Military Survey has substantially increased its presence to meet the needs of creating, analysing and managing geographic data in the province.

Manning

General. Royal Engineers Manning and Career Management Division is now fully functional within the Army Personnel Centre in Glasgow. Work to develop the Army Human Resources Strategy continues, with Career 2000 – the plan for new career structures for the next millennium – underpinning other initiatives to obtain, retain and sustain people of quality for the Army.

Officer Issues. Officer recruiting is currently extremely healthy. The Corps achieved 100 per cent of its requirement in 1998. Current levels of interest at Sandhurst indicate that similar numbers should be achieved again in 1999.

A recent amendment by Director of Manning (Army) has provided a mechanism for a move towards a more progressive career structure. The vast majority of officers will now be granted a SSC on leaving Sandhurst. The standard progression from that point will be to convert to SRC and on to regular commission at a later stage. This development was borne out in the conversions awarded by the 1997 RE Arms Selection Board where a total of 16 SRCs but only three regular commissions were awarded; a significant increase in the total conversions awarded over previous years.

The number of senior officer posts continues to reduce; however, many influential E2 posts are still filled by Sapper majors and lieutenant colonels because our strength is slightly above our Manpower Planning Target (MPT). This enables us to fill a larger proportion of E2 posts than we would otherwise expect to.

There remain some 300 special list lieutenant colonels in the Army (21 in the Corps). In his February newsletter the Adjutant General said that the number on the special list would continue to grow because of the reduced promotions to colonel, a reduction in the number of suitable lieutenant colonel posts, and the voluntary nature of previous redundancy programmes. It is now likely that the special list will be absorbed into the overall manning plan of a larger army.

The second year of the RE Warrant Officers Assessment Board for SSC(LE) took place at Minley in February; 23 were selected. I was again very impressed with the quality of our warrant officers, but as ever there are not sufficient promotion places for them all. A gem which can be shared, is the name this event has attracted; the candidates call it "the quickening" and I can well appreciate the pressure under which they feel, being placed under the microscope. I nevertheless believe that it has great value and does give both the Arms Selection

BOWMAN.

Board, and the candidates for commission, more confidence that the selection process is fairer.

On 1 April 1998 the revised Army Late Entry Career Structure was implemented, embodying these essentials:

- Initial SSC(LE) commission for six years instead of five.
- Substantive promotion to captain on commission.
- An additional year (to six) for those already serving on the old five-year commission and substantive promotion effective 1 April 1998 for all acting captains.
- Conversion to SRC (LE) up to the age of 49.
- Retirement at 50 for SSC (LE) officers.
- Extension to 55 for SRC(LE) officers, according to the needs of the Corps.
- Conversion to regular commission for a smaller number of SRC majors, capable of competing realistically for lieutenant colonel.
- Selection for promotion to lieutenant colonel age 51 or 52, with appointment by the 53rd birthday for a maximum of a three-year tenure, thus increasing throughput in the rank.
- Transitional rights remain for all current regular commission (LE) officers.

Under the SDR, an increasing number of chartered engineers, garrison engineers and clerks of works may well be required. The base of clerks of works, although sufficient to man those posts currently established, is inadequate to support any significant growth in the requirement for garrison engineers and the Corps also needs to attract more aspirants for chartered engineer training.

Soldier Issues. Soldier recruiting and retention continue to hold up, and the Corps remains fully manned to within one per cent of the Manpower Planning Target for 1998 (MPT 98) of 7545 trained soldiers. However the manning margin, the component of MPT 98 which allows for non-effective service (including courses and non-availability for administrative reasons), is inadequate. This is being addressed by the MOD within the LTC 99 process. Meanwhile I continue to place a high priority on individual training and maintaining our throughput on courses in order to provide the level of trained soldiers needed by the Corps which inevitably leads to yet more overstretch in units.

In line with ECAB's directive to improve employment opportunities for women, all posts in the Corps became open to women recruits on 1 April 1998. At the same time, gender-free physical tests were introduced.

Shortfalls, particularly in ME (fitters air conditioning and refrigeration), ME (C^3 systems) and ME (driver), are being steadily whittled away, highlighted by more visible statistical information from the Army Personnel Centre. Understanding within the Corps of the overall manning situation, the relationship with Phase 1 and Phase 2 individual training, and the tautly drawn Statement of Training Requirement (SOTR), is also very much better. As a result, course loading is being achieved more smoothly. Continuing initiatives to improve internal recruiting for 9 Para Sqn and 59 Indep Cdo Sqn are bearing fruit, and the manning of both squadrons with soldiers who have passed the physically demanding courses is significantly better than it has been for several years.

ME (resources specialist) are being posted to match the disaggregation of RE resources, which is to be integrated within the army supply chain. The new manpower liability is being established, and further action is underway to improve both the manning position and prospects for the

career stream in line with a recent study by the RE Training and Development Team.

The Digitisation of the Battlespace (Land) programme stands to have as significant an impact on British military capability as mechanization did in the 1930s. The impact will be first felt with the introduction starting in 2001 of BOWMAN radio, the bearer system for digital information. Much work is going into the ME (C^3 systems) career stream to ensure that the Corps has the correct number of vocational signallers with the right skills and experience, ready to embrace digitization to the full. There will be enhanced career opportunities for those in the ME(C^3 systems) stream. Regimental C^3 systems officers will be required in each major unit. Ideally these would be mainstream officers, but the required number of captains is unlikely to be available and increased numbers of LE officers with appropriate experience will be required. Action is in hand to establish more WO1 ME (C^3 systems) posts to improve the base for commissioning opportunities.

Officer Recruiting. Competition within the recruitment market is increasingly fierce. The economy continues to improve with notifiable job vacancies rising and those enrolling in further education increasing. The demographic trough continues to impact upon overall numbers available and a worsening perception of the attractiveness of military service has reduced the number of enquiries from applicants. Officer recruiting is therefore an area of concern throughout the Army. The Corps, however, has managed to fill its output target of 57 officers from Sandhurst this year. Our high profile and popularity enable us to sponsor more candidates to Sandhurst than we require and allow others to take advantage of our surplus.

Between now and September 2002, the Engineer Recruiting Liaison Staff have 649 candidates targeted for entry to Sandhurst, of whom 214 have already passed the Regular Commissions Board. The Corps continues to sponsor a large number of high quality university cadets and bursars. To date we have 23 cadetship officers (25 per cent of the army intake) and 69 bursars.

Considerable emphasis is placed on recruiting events such as familiarization visits, the Minley lunch and Minley briefing for cadets, and presentations to schools and universities. Despite the heavy operational commitments of many units, their continued support and assistance in hosting attachments for potential Sapper officers has been first rate and a significant factor in our continued success.

Soldier Recruiting. Recruiting continues to be healthy with a four to five-month average waiting time before our soldiers can enter ATR Bassingbourn for their Phase 1 Common Military Syllabus (Recruit) training. However, this belies the fact that it is more difficult to attract high quality soldiers for our "clever" trades – we are fishing in an increasingly competitive market. This reflects trends in society; the sciences are less popular and standards of numeracy are not what we would wish. To counter this RHQ RE, which is now responsible for both soldier and officer recruiting policy, has a more focused marketing strategy. Together with the Recruiting Group of the Army Training and Recruiting Agency (ATRA), we have produced a range of new literature which will be available later in the year and we have produced an excellent video aimed at the potential Sapper. Additionally, I am pressing for educational assessment and development during Phase 1 training to overcome the numeracy problem. A summary of the recruiting figures is shown below:

	SCAMF* 97/98	Enlisted	Shortfall	Wastage
Single entry	980	951	29	10.0%
Apprentice tradesmen	138	136	2	10.6%

*Standing Committee for Army Manning Forecasts.

There is an imbalance of ME(A) trades with a shortage of ME (Ftr Gen) and ME (Elec) and surplus of ME (POM). A decrease in the quality of some AT[2] applicants and academic standards overall has been noted which will inevitably impact on Basic Employment Training. This is mainly due to the increase in further education, limiting the numbers we might previously have targeted, and the continuing effects of the demographic trough.

Initial figures for the current recruiting year (from 1 April 1998) show that there are significant numbers awaiting training. The challenge remains to maintain the quality of the individual and the balance across trades. Internal measures are in hand to improve our recruiting effort, for

[2]The RE Apprentice Wing moved from Minley to Arborfield in April 1998 with a May intake of 70 ATs. My wish to extend the course to one year is presently unfunded despite widespread support.

BR90 long span bridge.

example with the new RE films and the new Corps recruiting literature. This will be combined with better selection by the personnel selection officer while the Royal Engineers Employment Structure Review (REESR) will give an emphasis to a sensible and practical testing regime. The Corps has much to offer recruits and this is reflected in our strong position overall though again we are wary of complacency.

Individual Training

This year has seen much progress and consolidation. The recruiting function has been subsumed within the ATRA which now "owns" the process from the time a potential soldier or officer expresses an interest to join the Army through to the completion of Phase 2 training at RSME or officer training at Sandhurst. Additionally, the Statement of Training Requirement mechanism, which focuses attention on the ATRA's training outputs, has proved to be a better method for determining the funding for our individual training.

Wastage during Phase 1 training continues to be low and the trend is in the positive direction. In Phase 2 training, RSME has had an exceptionally busy year and enjoyed considerable success during a time of much change following the formation of ATRA. This included Investors in People accreditation by Kent Training and Enterprise Council. However the maintenance of our individual training base remains a concern. Despite some relief this year, resource accounting and budgeting together with the drive for efficiency means that the RSME will continue to be under pressure as will others. Additionally, the Strategic Private Sector Involvement programme has been delayed and now aims to award a contract in Spring 2000. This process will be allowed to run its course and will be crucial in determining whether we concentrate at a single site or otherwise.

REESR is now in full swing. All the new ME Class 2, transitional Class 1 and the majority of command courses have been introduced and redesigned following RE Training Development Team's job analysis. The full Class 1 ME courses will start in three to four years' time. I do not underestimate the efforts involved in this process and congratulate all those involved: those in the field army who contributed so positively to the analysis, the systems approach to training specialists in both the RE Training Development Team and RSME and the instructors on the shop floor. The analysis of our troop commanders' training, which was initiated last year, is also about to come to fruition. It will result in a better balanced 26-week course which will run three times a year to coincide with the Royal Military Academy Sandhurst's output, from January 1999. I am now confident that our soldier and officer training matches the operational requirement; a clear audit trail exists!

We have also made considerable progress toward the introduction of National Vocational Qualifications (NVQs). Our pilot "modern apprenticeship" courses for welder, bricklayer and concretor and carpenter and joiner have proved to be a success. We aim to introduce NVQs for the remaining Class 2 courses this year although some will continue to attract the more traditional vocational qualifications where there is no direct NVQ match. Level 3 (and above) NVQ awards for Class 1 training, and command training will follow. Eventually, the system will cascade down to units.

Finally, and despite what one sometimes reads in the open press, I sense no diminishing in the overall quality of soldier and officer we produce through the recruiting and individual training system.

Indeed, the opposite is true and I remain impressed and encouraged by what I see.

Equipment

The Corps' equipment programme remains well balanced following close scrutiny during the SDR although the final size and shape of the programme depends on the decisions concerning force structures. In general, the review confirmed the requirement for battlefield engineering equipment to support a much wider range of military tasks than hitherto. The main conclusions which will influence the larger equipment programmes are:

Volvo F12 self-loading dump truck.

- The profile of countermine equipment continues to rise and the mine neutralization detection and reconnaissance (MINDER) requirement, is increasingly urgent.
- The requirement for the future engineer tank remains robust although equipment numbers will be reviewed in the light of new force structures.
- TERRIER, the new and enhanced combat engineer tractor, will have utility throughout the spectrum of conflict and the requirement remains strong and urgent.
- Investment in mine systems remains necessary and there is a continuing need for MINX (mines in the new century), area defence weapon (a containerized "smart" top attack anti-armour weapon) and SHIELDER, the vehicle launched scatterable mine system.

The replacement of smaller equipment and plant continues on the basis of maintenance replacement. A new self-loading dump truck, the Volvo F12, and a new heavy crawler tractor, the Liebherr 742, are in production. Tenders will be invited in the next two months for a replacement range of excavators, the requirement for a replacement medium-wheeled tractor has recently been endorsed by Assistant Chief of Defence Staff Operational Requirements (Land Command) against an in-service date of Aug 2001 and that for a replacement light-wheeled tractor is being staffed. In the airfield damage repair area, armoured heavy-wheeled tractor and flush capping system equipments for the user trial will be delivered late in 1998.

The Corps continues to exploit the huge advances that are being realized from information systems. HQ EinC(A) has itself recently acquired CASH (Command & Information Systems Assistance for Headquarters) and two other key projects have advanced during the past year. The army digitization programme is gaining considerable attention and the RE battlefield information system application, BETA (battlefield engineer and terrain applications) itself heavily dependent on BOWMAN, will form a key element. The BETA technology demonstrator programme was completed in April 1998 to demonstrate the principle of digitizing selected military engineer activities. This will now be incorporated into the main digitization research rig at Fort Halstead for operational analysis. In Northern Ireland, the installation of the combined design and resources system will bring considerable benefits to the planning, design and resource allocation for projects.

Doctrine

The development of BA 2000/Future Army concepts has continued with papers examining the force capabilities likely to be required in a future army some 20 years from now. BA 2000 concepts have been used to guide early parts of the defence review and the detailed work undertaken last year proved to be vital in underpinning army force structure requirements. For the future, the Corps aspires to support each manoeuvre battlegroup with a close support squadron balanced to provide optimum support depending on the type of manoeuvre unit. Air manoeuvre units will also require close support by squadrons optimized to

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the role of each battlegroup. The full range of engineering capabilities will continue to be required at divisional level in general support units but the tempo of future operations and taut structures will dictate a fine balance as to where the main engineer effort is deployed.

World events have brought other doctrinal issues to the fore and in particular the focus on anti-personnel landmines (APL), following ratification of the UN Weaponry Convention Protocol II and the Ottawa Agreement. A moratorium on use and training with APL is in place and of course, a capability gap will result from the loss of APL from our inventory. Alternatives are being considered whilst other initiatives, such as the high profile Mines Information and Training Centre, come to the fore.

Image and Public Relations

Four new films have been made by and for the Corps and were released in April. I am grateful to the many units and individuals who put time and effort into making them the quality productions they are. We relied on goodwill and support from units on exercises and operations to allow sequences to be shot, sometimes repeatedly until they were just right for the director and his crew. This was the only way we could get the necessary access to units to cover the vast range of Sapper responsibilities that needed to be represented.

There are two main films. One covers the breadth of the Corps and is aimed at informing those in the Army who need to understand the Corps' capabilities and how we operate. The target audience was taken to be officers attending the Army Junior Division of the Staff College, although not exclusively. The other is specific to logistic engineering and again aims to convey, to those who need it, an understanding of how the Army trains and employs the professional engineers and artisan tradesmen of the Corps.

We have also had two "shorties" produced; one caters specifically for recruiting, is 15 minutes long and omits detail on how the Corps is employed and the other is a "pop promo" which is a five-minute piece, set to music, that can be used to provide a high impact introduction to almost any presentation.

A new Corps prospectus, sponsored and paid for by the Director of Public Relations (Army) has also been recently released. This lavishly illustrated brochure has been issued on a limited distribution, is aimed at opinion formers and complements the series of similar publications that have appeared in the last 18 months.

Regimental Affairs

HM The Queen's Visit to the Corps. Her Majesty was unable to visit the Corps during the 250th Anniversary of Military Survey in 1997, a year in which she was kept very busy not least because it was also the year of her Golden Wedding Anniversary. It was therefore with great pleasure that the Corps was honoured with a visit from our Colonel in Chief on 26 June to the Royal School of Military Survey.

RE National Service Event. Chatham was host to a 50th anniversary reunion of ex-Royal Engineers national servicemen last October. After a nationwide publicity campaign, nearly 3000 veterans turned up on a sunny autumn day to receive a warm welcome from the present day Corps and a thank you from the Chief Royal Engineer for their past service.

RE Band Visit to Uzbekistan. The band has played in some unusual places but an invitation to take part in British Week in Tashkent in October, along the old silk route through Asia, took it where no other British band has been before. The British ambassador wrote afterwards that the band was hugely admired for its professionalism, musicianship, friendliness and, of course, splendid appearance. The Tashkent Pravda was equally effusive.

Review of the Institution. Arising from the review of the Institution of Royal Engineers is a firm recommendation to widen the membership to include warrant officers as full members and possibly SNCOs at a later date.

Sport

It has been another successful year of sporting achievements despite the pressure of busy operational and training commitments. Our successes include:

Soccer.
Army Major Units – 3 RSME Regt were Runners up.

Badminton.
Winners of the Inter Corps Championship.

Canoeing.
1st Service team and 2nd overall in Devizes to Westminster race.

Rowing.
Five RE in the Army Eight which won the Forces Pennant at the Head of the River Race .

Fencing.
Winners of the Inter Corps Championship.

Hockey.
42 Svy Engr Gp were Army Minor Unit Champions and RE Corps Champions.

Cricket.
- 33 Engr Regt (EOD) runners up in the Army Major Unit Championships.
- 42 Svy Engr Gp winners of the Minor Units Cup Final.

Sailing.
- Maj Ashcroft 1st in class and 4th overall in Scottish Peaks Race.
- LCpl Hamilton 2nd in Army Individual Match Racing Dinghy Championships
- 59 Indep Cdo Sqn 1st and 2nd in individual and team events of 3-mountains challenge (Cpl Burke individual first).
- Lt Col Mills and Maj Neil are skippers for legs of the Trans Globe Race starting in October 1998.

Rugby.
42 Svy Engr Gp winners Army Minor Units Shield.

Orienteering.
42 Svy Engr Gp Army Minor Units Champions, 4 Div League Champions.

TA.
Maj Webster and Capt Rosborough 1st TA and 5th overall in Montorio Military Patrol Competition, Verona.

Adventurous Training

Eighty-five adventurous training expeditions were supported by Corps funds during the past year. They included:

Unit	Location	Activity
35 Engr Regt	Denali National Pk, Alaska	Climb Mt McKinley
39 Engr Regt	Canadian Rockies	Ice Climbing/ Mountaineering
32 Engr Regt	Switzerland	High altitude ice climbing/skiing
36 Engr Regt	Kirgizstan/Tadjikistan	Ascent of Peak Lenin
35 Engr Regt	Nepal	Circumnavigate Annapurna Massif
31 Armd Sqn	Jamaica Blue Mountains	Cross country jungle treck
35 Engr Regt	Bermuda	Sub-squa
3 RSME Regt	UAE Al Liwa Desert	Camel trekking/sailing
2 individuals	Bolivia, Kota Mama Expedition	Support archaeologists
1 individual	China	Op Raleigh International Project

Military Secretary Appointments and Honours and Awards

Maj Gen K J Drewienkiewicz has been appointed Senior Army Member at the Royal College of Defence Studies. Brig A E Whitley CBE has been appointed EinC(A), Brig A S Craig OBE Commander Recruiting at HQ Adjutant General, Brig D R Bill Commander Engineer HQ LAND, Brig D R Burns OBE Commandant RSME, Brig J P Hoskinson OBE Chief Engineer Allied Command Europe Rapid Reaction Corps, Brig D R ff Innes Director Land Digitization and Brig I D T McGill CBE ADC Deputy Chief CJ3 Ops HQ SFOR.

The Corps was well represented in the Queen's Birthday Honours list in June 1998, with one CB (Maj Gen K J Drewienkiewicz), one CBE (Brig I D T McGill), one OBE and 15 MBE. Over the past 12 months, the total number of awards to serving members of the Corps is: 1 CB, 1 CBE, 2 OBE, 21 MBE, 1 QGM, and 5 QCVS (Queen's Commendation for Valuable Service).

Conclusion

I hand over as EinC(A) to Brig Albert Whitley, who is well known in the Corps and the wider Army; I am delighted that he is to be my successor. I leave the Corps heavily committed to tackling the rapid changes affecting the whole army, especially those arising from the SDR. We are certainly busy, often overextended, but our utility in both war fighting and nation building means that this should not be a surprise. Throughout my service I have never ceased to be impressed by the professionalism, tolerance and humour of our soldiers, of all ranks, and it has been the most tremendous privilege to have served as the Corps' professional head. Our units' performance on operations, training and on projects proves the Corps' effectiveness and extraordinary value to the Army, the other Services and the Nation.

We must continue to attract the right quality of recruits, invest properly in their training and conditions of service and challenge them on operations, in order to retain enough good officers and soldiers to sustain a military engineering capability in its widest sense right across defence. The nation may not be able to afford a large Army, or a large Corps; we must therefore continue to nurture talent and innovation to make up for what we lack in size and resources.

Close Support Engineers: Towards a Coherent Doctrine

MAJOR J A H WELCH BA

Major Welch was commissioned in 1983 and spent his early career with medium recce and then failing a flying course. He transferred to the Corps in 1986 and after the YO course undertook tours as a troop commander in 31 Armoured Engineer Squadron, 2IC 4 Field Squadron and Training Major with the Territorial Army. After completing the Division 3 at Staff College he was posted to a staff job and then back to command 31 Armoured Engineer Squadron. During his time in command he deployed with the squadron to British Army Training Unit Suffield, both in 1996 and 1997, Bosnia and Poland. He is currently shackled to a desk as the SO2 G2/G3 Engineer in HQ 3 (UK) Division.

"Military doctrine is a formal expression of military knowledge and thought that the Army accepts as being relevant at a given time, which covers the nature of our current and future conflicts, the preparation of the Army for such conflicts and the methods of engaging in them to achieve success".[1]

Introduction

In his article "The Close Support Engineer Squadron and BATUS Training: A Squadron Commander's Perspective"[2], Chris Sloane identified a number of pertinent concerns. Not least is the perception that there is a lack of a coherent doctrine for close support engineer operations. The other issues he raised: training, organization and combat service support, should all "fall out of" the way that our core business of war fighting is conducted. Accepting, and some may not, that doctrine is an "... expression of military knowledge and thought that the Army accepts as being relevant at a given time ..." which is essentially the embodiment of "best practice", then establishing a close support doctrine should really be a process of identifying what is the best way of providing close engineer support and committing it to paper. Few would contest the Gulf War lesson that engineer support to a brigade is best achieved by a close support engineer regiment. Indeed I would argue that exercises like *Ulan Eagle 97* continue to back strongly such a view and consequently the building of a close support doctrine might start from that premise: combined arms brigades require a close support engineer regiment. That is the easy part. The problem is stepping down the chain of command to sub-unit level. Currently our doctrine is enshrined in Tactical Doctrine (TD) Note 33 "The Command and Control of Engineers within the Division". Although the TD Note is a fine theoretical script, it has rarely been practised on training or operations. I hope to demonstrate that the reason it hasn't been adhered to, is that at sub-unit level it is not workable and that the short term solutions mentioned by Chris Sloane have had to be independently created by each close support squadron as a matter of necessity. What is more I will also demonstrate that TD Note 33 is in need of revision at regimental level as well, simply because many of the methods of operation explained therein are no longer considered to be "best practice".

[1] Staff Officers Hand Book Part 8, Serial 68.
[2] *RE Journal* Volume 111 No 3 December 1997.

Aim

The aim of this article is to examine lessons from recent combined arms training exercises and close

Major J A H Welch
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support engineering on operations in order to draw conclusions which may provide the basis of a coherent doctrine.

Establishing Credentials

If doctrine is the embodiment of best practice then the fundamental criteria for proposing a coherent doctrine must be recent experience of close support operations or training for war fighting. I have been extremely fortunate in commanding an armoured engineer squadron over the last two years, which for the vast majority of the time has been configured as a close support squadron in support of one or two battlegroups. Indeed the experience was varied to include different configurations of close support squadron, on different exercises and under command of a variety of units. Without labouring a point, but to demonstrate the utility of drawing lessons from a broad spectrum of experience, I will explain these circumstances. 31 Armd Engr Sqn was configured as the "lead" squadron for Exercise *Medicine Man 1/96* supporting 2 RTR battlegroup (BG). As such the squadron provided the SHQ, BGE, armoured engineer troop, support troop and echelon (minus), and took under command a field troop from 37 Fd Sqn. In a similar fashion the squadron provided an armoured engineer troop for 37 Fd Sqn on Exercise *Medicine Man 2/96*. Following these exercises the squadron then reformed to a close support squadron in its own right by re-roling an armoured troop to a mechanized field troop for an operational tour in Bosnia. There the squadron was based on an armoured troop, a field troop, a support troop, SHQ and echelon: a similar configuration to BATUS. After Bosnia the squadron stayed in its configuration both for Exercise *Medicine Man 4/97* supporting 1 D&D BG and then deployed as part of 35 Engr Regt Gp on Exercise *Ulan Eagle 97*, the 20 Armd Bde FTX in Poland. For this exercise the squadron supported both 1 D&D BG and 1 RTR BG simultaneously. During these exercises the squadron was subject to constant external evaluation and achieved the highest of training standards. It is against this background that the following "draft" doctrine is proposed.

The Core Issues

Current doctrine makes two major assumptions.[3] Firstly that a close support squadron can adequately support more than one BG at the same time. Secondly that the engineer regiment may operate by the "... Deployment of pure armoured and mechanized field squadrons to undertake specific tasks under brigade command ...", as an alternative to forming close support squadrons. I hope to demonstrate that both assumptions are seriously flawed.

Can a Squadron Support More Than One BG?

Engineer support to BATUS has improved considerably over the last two years, and during 1997 engineer squadrons were considered to be amongst the most tactically aware sub-units on the Prairie. This in itself suggests that the command and control structure is *de facto* sufficiently robust and flexible to meet the challenges at BG level. At the same time the sabre and support troops are sufficiently well trained and balanced to support the range of challenging engineering demands faced by a BG across the spectrum of activity. I will consider many of these issues under the functions in combat. The benefits of dedicated support to a BG cannot be overstated. Chris Sloane alluded to the fact that there is little common combined arms doctrine and to some extent he is right. For example 2 RTR BG (2,2) used a very specific, non standard, brevity code[4] and discarded altogether the use of battle code. Having trained with the BG in Germany and Canada, battle code became second nature to us. However when another squadron had to support them later in the year, not having trained with them before, it naturally took some time for their "non standard" procedures to be understood. The difficulties of any supporting arms who had not trained with the BG being task organized to them during operations are self evident. The fact that 2 RTR was a square BG meant that their Standard Operating Procedures (SOP) were considerably different from, for example, 1 D&D BG (1,2). In a similar vein when supporting 1 D&D BG on Exercise *Medicine Man 4/97* they adopted a quite different command and control structure, preferring the creation of three tactical headquarters groupings mirroring each other and a smaller operations forward (main equivalent). Despite this lack of doctrinal purity at BG level, the fact that the squadron had trained with the respective BGs before deploying onto the Prairie allowed us to

[3] TD Note 33 Paragraphs 6 to 9.

[4] Brevity code (BREVCO) was used by 2 RTR BG for BBGT, all pre-BATUS training and during Exercise *Medicine Man 1/96*.

operate effectively. What I am quite clear about is that it would have been considerably more difficult if we had been regrouped at short notice to support either of those BGs. I believe that this point was demonstrated quite clearly during Exercise *Ulan Eagle 96* and is explained further in the *Journal* article of April 1997 "Royal Engineers or Armoured Corps Engineers".

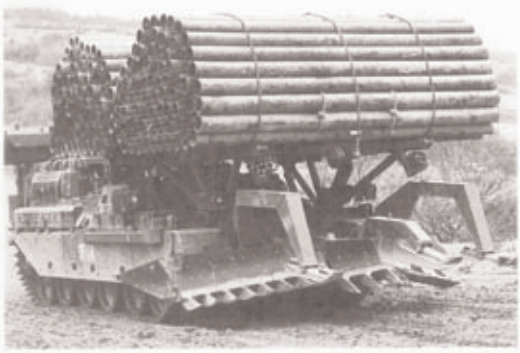
In Poland on Exercise *Ulan Eagle 97* the situation changed and the squadron found itself supporting two BGs. Fortunately we had trained in BATUS with 1 D&D BG just a fortnight before that deployment and were therefore totally familiar with their *modus operandi*. My recce sergeants and BGE were particularly well integrated into the close recce troop and BGHQ respectively and trusted, which made life easier. I received a second BGE from 21 Engr Regt (who had been a troop commander in the squadron during our tour in Bosnia), two recce sections from 44 HQ Sqn (more about that later), an additional AVRE and a field troop from 37 Fd Sqn. As 1 RTR had undertaken Exercise *Medicine Man 2/97* with 77 Armd Engr Sqn they were used to having a complete squadron in close support. After considerable thought, discussion and war-gaming of options our adopted procedure was to form two close support troops each based on two AVLB, two AVRE, one CET and one or two mechanized sections. The remainder of the squadron switched between BGs as the main effort changed. This is easier written than executed with all the problems associated with a passage through BG lines. 1 (UK) Armd Div Engineer Operating Procedures (EOP) provide a planning guide of six hours for a troop to regroup and 12 hours for a squadron. These timings seem generous but were never "truly" achieved. Once RVs were identified, replenishments conducted, moves deconflicted, initial briefs organized and communications information received it was more likely 12 hours for a troop and 24 for a squadron. That this fact did not have a detrimental effect on the task in hand was due to an early assumption understood by all my commanders: if the available time from warning order to execution was less than 12 hours, plan on achieving the task with integral troops. To demonstrate this further it was a necessary risk to deploy frequently "task critical" assets like additional CS bridges, GSB or plant without proper and detailed briefings. We made "a" system work to support two BGs over a short time-frame of 14 days, with the minimum of lines of communication and over terrain which by its nature restricts manoeuvre above BG level. I am convinced that even with these factors working in our favour if the regiment had tried to adopt TD Note 33 we would not have been as successful, as it would have been less flexible, imposed delay and resulted in BGs, and in some instances the brigade, losing momentum. What is more if the squadron had been expected to support two BGs on sustained operations, over longer and more realistic lines of communication its capability would have been severely degraded. I will explore further the role and command status of BGEs, recce sergeants and echelons under respective functions in combat.

The main deduction from the first of what I have labelled the "core issues" is that a close support squadron can only effectively support one BG and this must be the starting point for any attempt to formulate close support doctrine.

Can a Close Support Regiment Operate in Accordance with TD Note 33? There are three main areas of TD Note 33 which require further analysis: Engineer task organization, the command of BGEs at regimental level and the utilization of recce troop. I will deal with each in turn.

TD Note 33 identifies two methods of fighting a close support regiment based on an armoured and a mechanized field squadron. The first is to create two close support squadrons comprising a "mix" of armoured and mechanized troops. The second is to identify specific tasks for each and retain command and control at the highest level (in this instance regimental). The success of the first method is relatively easy to demonstrate where a "smaller" close support squadron can be allocated to a single BG with any additional assets formed into troop level subunits for the BGs not on the main effort. The principle however does not change: a BG must have its dedicated engineer support, be it a squadron (minus) or troop (plus). The example of BATUS during 1996/97 proves this. The second method of fighting a regiment is frankly less well defined and involves all the issues described in the difficulties of conducting regrouping and the passage of lines across BG boundaries. The time it takes to regroup, the difficulties involved in adhering to different BG SOPs and a lack of time to establish credibility in training simply destines such an approach to failure. Regrouping critical assets in this manner loses momentum, destabilises balance and can severely restrict the tempo of BG operations. Tempo is the

critical factor here and is defined as "the rhythm or rate of activity on operations, relative to the enemy"[5]. It should not be confused with simply the "speed" of moving around the battlefield and involves timely decision-making, the rapid execution of tasks and the ability to transition from one activity to another in a swift and balanced manner. Consequently **I believe that the option offered in TD Note 33 of not forming close support squadrons should be discarded as in practice it is unworkable.**



Mobility support: critical for an armoured or armoured infantry battlegroup.

The next issue in TD Note 33 requiring investigation is the *modus operandi* for the command and control of BGEs. Current doctrine states that they are commanded directly from the engineer RHQ which is collocated within the Brigade Main HQ. The BGEs therefore report directly to the engineer CO who tasks them independently. Any system which "muddles" the engineer chain of command and confuses BGs is prone to ambiguity. The BGE is an outstanding concept and works very effectively when all parties understand their role in the "command team"[6]. I will discuss this fully under the COMMAND function in combat, but in simplistic terms the OC ***Commands***, the squadron second-in-command ***Controls*** and the BGE ***advises and plans***. Anything other than that will not work. Likewise if a troop finds itself alone with a BG it is the troop commander who ***Commands***. Many readers may be aghast at such a simplistic explanation, but unless each individual in this "command team" fully understands his role then complications will inevitably result and the situation which is frequently quoted where a squadron commander was heard on a BG net to enter into a discussion with a BGE as to who commanded assets allocated to that BG may develop. Ambiguity of this nature must not be tolerated as it very quickly loses credibility in a combined arms environment. Now having established the important role of the BGE it is imperative that the command chain is not "muddled" by doctrine. During Exercise *Ulan Eagle 97* the engineer CO did not try to command the BGEs directly. As a squadron commander supporting two BGs, the BGEs reported directly to me thereby enabling the Squadron to respond quickly to any changing circumstances within the respective BGs. **So the deduction I draw from the application of current doctrine in regard to the command and control of BGEs is that it is impractical and needs rewriting.**

The final issue regarding TD Note 33 is the use of the regimental recce troop. It is now some nine years since I first wrote the paper published in the August 1989 *Journal* recommending the formation of engineer recce troops, and I am pleased to say that overall the improvement in the practical performance of individual recce sergeants has been substantial. However I am less easy with their command and control at regimental level. When a squadron deploys to BATUS it is (yet again) a simple issue. The two recce sergeants are placed OPCON the BG, be they from the regimental recce troop or from the squadron itself, and report in engineer terms directly to the squadron. Consequently the squadron can then respond quickly to that information. When

[5] Army Doctrine Publication volume 1, Operations, pages 2-9, paragraph 0223.

[6] I acknowledge the success of the BGEs in Bosnia during Operation *Resolute 1* and *2* where they worked in accordance with TD Note 33. I would submit that the more static and deliberate nature of Peace Support Operation allowed this to happen and the squadrons were not placed under tactical command to any BGs.

A No 10 close support bridge used to overbridge a dodgy wooden structure in Poland. Note the 1m gap: a serious problem for CVR(T), Land Rovers and B vehicles.

deployed regimentally, and in accordance with TD Note 33, they are ***meant*** to report to RHQ. This would I believe result in a delay in responding to information. Another concern arises when relying on a regimental recce troop to provide the support to a BG recce troop. The default setting for Exercise *Ulan Eagle 97* was agreed at two recce sections, one for each BG. Yet regimental pressures quite understandably resulted in the squadron never receiving this level of support and indeed it was not until five days after the regrouping date that we saw them at all! This is entirely understandable, yet the impact at squadron level was that I needed to provide recce sergeants for the BGs' recce troops. I was able to allocate one each on a permanent basis and had to form extra ad hoc recce sergeants from within my own subunit. The main point here is that the credibility of the recce sergeant who had undertaken a BATUS exercise with the BG he then supported, was exceptional and worth any number of regrouped recce sergeants from the regimental recce troop. That said, all recce sergeants in a close support regiment should be able to take their place in a BG close recce troop thereby creating flexibility and allowing them to "leapfrog"[7]. **Consequently the deductions I draw from this are that the recce sergeants who are initially placed OPCON the BG close recce troop must come from within the squadron, or be permanently placed under command of the squadron. Hence I again recommend a complete revision of the doctrine explained in TD Note 33.**

[7] The ability to send forward a replacement recce sergeant to join the BG close recce troop.

Having considered the "core issue" of the TD Note, I will now turn to drawing further deductions from the respective functions in combat.

Functions in Combat

COMMAND

"The Army's philosophy of command ... has three enduring tenets: *timely decision-making, the importance of understanding a superior commander's intention, and, by applying this to one's own actions, a clear responsibility to fulfil that intention*".[8]

I have explained the roles of the OC, BGE and squadron second-in-command above and I believe that these functions should underpin any close support doctrine. Yet command on the battlefield is about more than simply understanding one's role. It is about *fingerspitzengefühl*[9]. As a commander one needs to be in the right place at the right time to influence rapidly changing events and to issue any necessary orders or direction required to affect circumstances. It is about making things happen. I have over the last two years preached laboriously about anticipation, for without that ability a commander just cannot influence events in sufficient time to achieve the desired impact. Yet it is also about understanding and applying mission command, and in particularly it is about developing trust and faith in subordinates. To try to *micro manage* on a rapidly changing battlefield will lead to failure. This is aptly demonstrated during the TES phase in BATUS where tactical awareness is critical. The battle picture very quickly becomes distorted as commanders are destroyed and information is confused. I've heard it said that command is making order from chaos and I subscribe wholeheartedly to that philosophy. All this cannot be achieved by the engineer commander religiously

[8] Army Doctrine Publication Volume 2, COMMAND, Paragraph 0210.

[9] Fingertip feeling. The ability to read the tactical situation.

deploying as an integral part of the BG Commander's Tac HQ. Although there are occasions when he needs to be there, specifically during the advance, it needs to be on a "when required" basis and not as a matter of routine. After all the OC is quite easily reachable on the BG Command Net. It is difficult to explain this very personal function in the precise terms that doctrine would require. But I do believe it is based largely on experience, achievement and credibility. Experience of combined arms operations and training is absolutely essential; be that in an armoured, mechanized or airborne capacity. With a considerable amount of assessment and evaluation currently taking place after all training, achievement may be measured. Certainly within the engineers, the collective training standard achieved both before and after BATUS exercises is a good starting point. Credibility stems from both experience and achievement, for without them it would become difficult for a commander to play his part in a combined arms grouping. This applies at every level of command and underpins the requirement to give junior commanders the maximum opportunity to train in a combined arms setting. I heard, with an element of horror, recently that there should be a handbook produced for newly appointed OCs to read as a guide to "how" they should command their squadrons in the field. I am firmly of the opinion that commanders do not learn their trade by reading a book! The understanding and application of doctrine is one thing, reading a book on how to command a squadron is quite another. In these days of objective assessment and perpetual evaluation there can be no excuses for not appointing the right people to the right jobs. So in COMMAND terms our doctrine must incorporate:

- Clear guidance on the chain of command.
- The understanding and application of MISSION COMMAND at all levels.
- A full understanding of the roles of the command team and their respective functions (OC, second-in-command, BGE).
- Experience and an ability to develop instinct and anticipation.
- Ability to command from a position of influence.
- Ability to act boldly and not shy away from firm decisions.
- Timely decision making.
- Ability to develop a "relationship" of trust with sub-ordinate commanders, allowing them to "learn" from mistakes and exploiting every opportunity to develop in combined arms groupings.

INTELLIGENCE AND INFORMATION

"Without an efficient intelligence organization a commander is largely blind and deaf".
Field Marshal Alexander.[10]

"You can never do too much reconnaissance".
General Patton.[11]

Decision making must be backed by reliable, timely and accurate information. The acquisition of that information is multifarious from satellite imagery to local knowledge, but it must be trusted and it must be confirmed. At BG level that means quite simply putting men on the ground to interpret their surroundings in a relevant military context. In engineer terms that means our recce sergeants. My experience differs somewhat from Chris Sloane's on this issue as the engineer recce sergeants that I have had the privilege to serve with over the last two years have to a man been quite outstanding in their application of war fighting practices and their ability to integrate into a BG recce troop. I make no bones about the fact that some have made mistakes, but they have learned from them and not repeated those errors. Furthermore I acknowledge that some BG recce troops are easier to integrate into and more open to engineers than others. However I believe that the contribution of the recce sergeants to the overall success of the engineers in BATUS during 1997 was significant. It is therefore thought provoking that one of the main lessons of TES is that the life expectancy of any recce element is very short. The deduction therefore is that the acquisition of the information I mentioned above is not solely the responsibility of the recce sergeant. It is the responsibility of commanders at all levels to be constantly aware of the tactical picture and to replace any lost recce resources immediately. I would illustrate this point with an example that during TES Mission 2 on Exercise *Medicine Man 4/97*, both recce sergeants and one troop commander were destroyed, another troop commander became embroiled in a scatterable minefield and my field troop recce sergeant was at the rear of the BG sorting out a route clearance problem. It then fell to the OC to recce a suitable crossing point and lead in an AVLB!

The identification of "engineer relevant" information and its application in the intelligence preparation of the battlefield process is an ongoing

[10]Field Marshal Earl Alexander, Memoirs, 1962.
[11]General George S Patton, *War As I Knew It*, 1947.

Real mobility problems: Poland.

issue. I suppose it can be compared to a living organism, it is always developing, being enhanced and changing the implications of the terrain on a BG. It is the BGE, with his permanent link into BGHQ, who is responsible for compiling engineer intelligence and applying it to the planning process. He needs to discuss openly with the squadron commander any specific information requirements, and to ensure that he always responds to the passage of information on all nets. Likewise he must ensure that frequent reverse situation reports are passed out on the relevant nets to ensure an "all informed" nature of critical information.

The deductions I draw from INTELLIGENCE AND INFORMATION are therefore:

- The critical importance of well trained, integrated and reliable recce sergeants. Only then can tactical opportunities be exploited by recce-pull.
- Our recce sergeants are well trained and competent. It is how well that they integrate into the BG recce troop which determines their success.
- The information and intelligence function is a "living" process constantly changing the tactical situation.
- The need for situational awareness and an ability to communicate (for the passage of information) is critical to success.
- The BGE must be responsible for the consolidation of all engineer intelligence and information for the BG.
- The BGE is generally best placed to influence the IPB (intelligence preparation of the battlefield) process and in the absence of the squadron commander is the BG Commanders principal engineer adviser.
- The BGE should be permanently located in BG Main HQ.
- All commanders are responsible for information and intelligence and must be tactically aware to ensure the appropriate intervention.

MANOEUVRE

"The tendency to penny-packet resources is wasteful and should be resisted".[12]

Manoeuvre is a particularly emotive issue for the Corps owing to the ageing condition of armoured engineer equipment. It has a bearing certainly and I could expound endlessly on why we should have an AVRE with a main armament rather than a fascine-carrying roof rack, but that as they say is quite another story. The main area of concern for us is really obstacle crossing. Current doctrine at BG level is found in TD Note 29 Drill 4. It is my experience that this is generally well followed by BGs, with the minor exception of marking the crossing site. Although this particular issue always raises its head during discussions of doctrine, I believe that it is best left to squadron SOPs. For example the task of marking the route from the BG RV to the crossing site is doctrinally one for the BG recce troop, but does it really matter if that function is carried out by, say, two armoured infantry platoons? I believe it doesn't as what really matters is that the route is clearly marked and all vehicles in the battlegroup know that they have to pass to the right hand side of them. Likewise the numbering of crossings. I have seen a complete range of these from traffic light colours to reverse alphabets. I preferred the use of Alpha, Bravo and Charlie in order of priority. But again that is a matter for squadron SOPs, or even regimental SOPs, not one of doctrine.

Returning to the organizations, Chris Sloane offers the "principle of 4". I consider that an unnecessary luxury. I strongly believe that to produce one crossing site for a BG requires three assets. Assuming for the moment that a crossing may be anything from a bridge over a wet gap to a breach through a minefield. Let us first be clear that a crossing site should be more than one asset in a fairly close vicinity. Once one route is successfully constructed over an obstacle it must be immediately enhanced by developing more. A

[12] TD Note 33 Paragraph 2b.

planned crossing site for a BG should incorporate at least two cleared routes over an obstacle. To achieve that requires three assets. Two for the operation and one in reserve. This grouping should not be penny packeted, for to do so is to spread critical assets too thinly and to risk failure. I accept that I have been forced into forming close support troops (as for Exercise *Ulan Eagle 97*), but I fundamentally disagree with this concept as a default setting as it "penny packets" critical assets and therefore invites disaster. At squadron level, however, the ability to form "ad hoc" groupings is not lost and is frequently necessary for, say, forming a route opening detachment on an unopposed move along a linear feature. I therefore wholeheartedly concur with Chris Sloane that the synergistic effect of a close support squadron is maximized by fighting it with a separate armoured engineer troop and a mechanized field engineer troop as they compliment each other.

It would be wrong not to mention manoeuvre in a BG context, which is the ability to get into a position of advantage in respect to the enemy from which force can be applied or threatened.[13] I have witnessed BGs commanders who confuse the ability to manoeuvre with speed and consequently focus solely on the ability of Challenger and Warrior to move quickly over large distances, frequently resulting in an imbalance of forces, not supported by indirect fire and poorly placed to exploit areas of enemy weakness. This focusing of attention away from the combined potency of a BG and concentrating on singular elements inevitably leads to dislocation and undesirable TES results! They are the BG commanders who fail to appreciate the requirement for engineer support, no matter how hard one works at it.

And so to the deductions on MANOEUVRE:

- TD Note 29 Drill 4 is a sound foundation for conducting obstacle crossing operations. It should be second nature to all engineer commanders. Procedures may differ slightly and that should be a matter for BG and squadron SOPs.
- Close support squadrons should be fought with a default setting as armoured and mechanized field troops, task organizing where necessary in response to developing situations.
- Armoured engineer assets need to be well forward during the advance.
- The "principle of 3" should be applied to guarantee getting a BG over an obstacle.
- One crossing site means at least two crossing points. If two cannot be opened simultaneously, once one crossing is opened another must be developed as soon as possible.

PROTECTION

For Sappers the function in combat PROTECTION focuses attention on the areas of counter mobility and survivability. Indeed it encompasses the complete range of sappering tasks that a BG requires during defensive, delaying and transitional phases of war. The process of "shaping the terrain" to our advantage requires close support engineers to be able to lay tactical and phoney minefields, to plan scatterable minefield options, to dig anti-tank ditches, to deny routes, to dig-in defensive positions and BGHQs, and to aid deception. For these reasons robust mechanized field troops and support troops are essential, it is a question of getting the balance right. Again I favour the "principle of 3". A field troop of three sections gives a squadron the flexibility to regroup if required without substantially affecting its output. One of my squadron SOPs was created to detail the procedure for laying a 1km minefield with only two sections; and it worked although it was always preferable to have the field troop complete. The support troop needs to be split between armoured vehicles in close support and plant: by this I mean CETs and others. Three CETs is an effective mixture but four is certainly the ideal, allowing two digging groups to be formed. One MWT is sufficient and I am ambivalent as to whether it could be traded for a CET, but only one LWT is not. I would argue for at least three LWTs in order to provide the level of essential protective digging support to a BG regardless of its composition. These "soft skinned" digging assets I tended to group with the squadron echelon rather than the support troop. When combined with an armoured troop, such an organization gives a close support squadron great versatility. Again I would contend that the synergistic effect of this grouping negates the need to reinforce engineers for specific operations at BG level.

The BG Deception[14] Plan is critical and rarely receives the level of thought which it requires. During certain phases of war the close support squadron is particularly well placed to add to the deception plan by developing ideas such as:

[13] ADP Volume 1, Operations, Page 2-12, Para 0229.

[14] Deception being defined as "those measures designed to mislead the enemy by manipulation, distortion or falsification of evidence to induce him to react in a manner prejudicial to his interests".

creating false obstacles, constructing "dummy" positions, simulating a false signature and building replicas. Although already firmly established in doctrine, some would argue that a lack of resources makes deception at BG level difficult to achieve and consequently it is frequently overlooked or given scant regard. I would argue that it is more of a "mind set" to ensure that it is considered in all circumstances and therefore needs to be expressed in close support engineer doctrine.

Finally under PROTECTION is the somewhat difficult question of local protection to critical engineer assets. In a (2,2) BG it is not too much of a problem as I have been able to persuade BG Commanders to release an armoured troop to protect their movement to task sites. However it becomes more tricky in regard to a (1,2) BG and one is often faced with the "umbrella" argument: that is, that engineer assets fall under the collective protection of the combined BG firepower. In reality, and in my experience of TES, that really means do the best you can to protect them yourself. Applying further logic to that means that unless one is prepared to throw a fascine at the enemy, the only means of protection available is to deploy a field section armed with LAW to protect AVLBs and AVREs. This is "vaguely" achievable within the close support squadron grouping that I have been suggesting. However it would be far more secure to have an AVRE with a main armament, both for the ability to protect itself during minefield breaching operations and to offer some local protection to other critical engineer assets. But as I said earlier, that is another story![15]

So, deductions from the PROTECTION function:

- The "principle of 3" holds good. A close support squadron needs a mechanized field troop of three sections.
- Squadron SOPs must contain information on how to undertake troop tasks using two field sections (minefields, reserve demolitions, GSBs and approaches et al).
- A robust support troop is also required and should be based on at least three CETs and one MWT; or four CETs.
- Substantial "light" digging assets are required to support a BG. As a minimum three LWTs are required which should be grouped with the squadron echelon.
- A close support squadron can contribute a considerable amount to a BG deception plan and this should be incorporated into doctrine.
- In BGs other than (2,2) consideration needs to be given as to "how" to locally protect critical engineer assets.
- The final point here is to emphasize that an engineer close support squadron is woefully short of anti-armour local protection. It needs to be clearly expressed in doctrine that critical engineer assets require protection, particularly from the engineer RV to the crossing site. It is assumed that the over watch subunit will position themselves to cover the engineer activity on site! Consequently, I will by necessity miss out the Firepower function and jump straight to Combat Service Support (CSS).

COMBAT SERVICE SUPPORT

"Without supplies no Army is brave."
King Fredrick of Prussia.[16]

I rather like the above quote as it links logistics with combat power. So much more appealing than the lecturer I once heard state "Logistics IS Combat Power". CSS incorporates logistic support, equipment support (ES), medical and provost. Apart from stating that squadrons need an ambulance on their establishments, I will not consider further medical or provost.

In engineer terms logistic support frequently means that a lack of resources in the right place at the right time results in failure: no bridge, no obstacle and an inability to contribute to the effectiveness of a BG. For this reason I cannot over emphasize the need to get the squadron echelon right, both for providing the daily combat supplies and for ensuring that specific resources are delivered to tasks sites when they are required. I believe there are two requirements here: getting the organization correct and the ability of the echelon commander to anticipate.

Currently there is not a standard echelon organization: armoured engineer squadrons have a different establishment to mechanized field squadrons and both are different to the somewhat bizarre ORBAT for BATUS, based on performing both first and second line support. What is clear is that to try to define a doctrine here one must first investigate the function a close support

[15] It is interesting to note that in the Land Command Observations from Training 1997 a reoccurring theme is the protection of BG assets: "Perhaps the weakest area of training is in providing protection for the armour and other elements of the battlegroup" (Paragraph 2, Pages 3C-11). I would extrapolate this to include the lack of resources to protect critical engineer assets.

[16] King Fredrick of Prussia, Instructions for his Generals, II (1747).

squadron echelon should undertake. I really categorize this into three activities: combat supplies, armoured engineer ancillaries (and I use this term so as not to confuse it with the next) and engineer resources. These activities need to be drawn together by a robust command and control system. The echelon commander, who must have attended his quartermaster's course, leads the organization and must have both a "soft tactical headquarters" (FFR LR) and an established command vehicle (FFR LR) in support. Then the three activities may be sub-divided with the SQMS commanding the combat supplies section, the TQMS commanding the armoured engineer ancillaries section and the MT SNCO commanding the engineer resources section. This was essentially the organization my Squadron used in Poland and it just about coped with the need to support two BGs. The next issue is the need for "logistic" anticipation. By their very nature echelon troops are very good at being reactive and responding to demands. Unfortunately on the fast moving, high tempo battlefield they need to be proactive, to be constantly aware of the battle picture and to be planning to meet the next eventuality. Combined with the good passage of information, echelon commanders need to anticipate and this can only be achieved by applying military judgement to developing circumstances.

The final point under CSS is ES and again my experience differs substantially from that of Chris Sloane. My squadron was fortunate to be served by a quite outstanding fitter section, who integrated extremely well and conducted themselves in a thoroughly professional manner at all times. Their achievement was openly recognized in the BATUS report where the availability of our "ageing" fleet was quoted as OUTSTANDING with all seven Chieftains (including the REME armoured repair and recovery vehicle) and three CETs being available for the majority of the time. I raise this only because it demonstrates, in a similar fashion to the echelon, the need to get the organization of the fitter section right. Firstly it needs an AQMS who is experienced on Chieftain, increasingly difficult these days I know. Likewise it needs personnel experienced in armoured operations who can command the REME command vehicle, command the AFV 434 and offer guidance to their crews. A REME corporal soon loses credibility if he needs to seek the advice of the AVLB or AVRE crew about Chieftains! I believe that many of the concerns that Chris Sloane raised were as a result of a mechanized field squadron's fitter section's ORBAT and experience.

Combination bridging – definitely an act of war.

The deductions I draw from CSS are therefore:

- The echelon needs to be trained to be proactive and to anticipate at all times.
- The echelon needs to be established to undertake the three activities of the provision of: combat supplies, armoured engineer ancillaries and engineer resources.
- The combat supplies section should be commanded by the SQMS.
- The armoured engineer ancillaries section should be commanded by the TQMS.
- The engineer resources section should be commanded by the MT SNCO, while at the same time overseeing all B vehicle MT matters. Furthermore the squadron establishment should be amended to include at least one resources JN CO.
- The echelon needs an established main command vehicle and a "soft tac" to enable the commander to get on the ground to sort out problems.
- The echelon commander needs to be quartermaster trained.
- The fitter sections of all close support squadrons should be standardized and should:
  - be commanded by an AQMS;
  - have junior commanders who are trained on Chieftain (or whatever chassis the future engineer tank is based on).
  - And finally their performance should be assessed by the availability of the Squadron's critical assets.

Conclusion

"In no other professions are the penalties for employing untrained personnel so appalling or irrevocable as in the military."

General MacArthur.[17]

This is a lengthy exposition and I applaud your perseverance for enduring it. But at a time when there is considerable discussion about close support doctrine it is important that recent experience is analysed so that the correct lessons are incorporated into our current doctrine. It is after all merely a "formal expression of military knowledge and thought that the Army accepts as being relevant at a given time." I have attempted just that: to analyse and record my experience of close support operations in the last two years. Together with the core issues I have used the functions in combat to expound a series of principles which I hope will be of use to those tasked with producing close support doctrine. These principles should not, of course, be confused with the procedures used to achieve various engineer tasks: the latter should rightly be confined to squadron or even standardized regimental SOPs. As such I would recommend a complete revision of TD Note 33 to include operations at BG level in considerably more detail than at present. Furthermore I would recommend a standardized set of both regimental and squadron close support engineer SOPs.

[17]General Douglas MacArthur, Annual Report to the Chiefs of Staff Army, 1933.

Journal Awards

The Publication Committee announces the following awards for articles of special merit published in the April 1998 *Journal*.

Training for the Last War 1936 to 1939
by General Sir William Jackson GBE KCB MC* – **£100**

"... And Another Thing" (CDM, SDR, Bean Counters – and Crossing the Rapido)
by Lieutenant Colonel A J Willis – **£75**

The Role of Air Transport in the Burma Campaign (1941 to 1945)
by Captain K D Nelson ED – **£75**

The Mulberry Harbours – My Final Assessment
by Brigadier A E M Walter CBE – **£75**

A Snippet of History 1924 to 1946
by Major P H James – **£75**

Annual Awards

The Publication Committee announces the following awards for articles of special merit published during 1997.

Montgomerie Prize
The Close Support Squadron and BATUS Training
by Major C R J Sloane – **£90 or a set of Corps History**

Arthur ffolliott Garrett Prize
Repair of Slovonski Brod Fixed Bridge
by Lieutenant Colonel A P Burnside – **£120**

Best article of the year
Is the Grass Really Greener Over There?
by Major T R Urch – **£120**

Best junior officer article of the year
Royal Engineers or Armoured Corps Engineers?
by Captain M D Owen – **£60**

Best warrant officer article
Quarrying Operations in Bosnia Herzegovina
by Warrant Officer Class I P Jackson – **£30**

Correspondence From Over The Pond

COLONEL P LILLEYMAN MBE BSc(ENG)

Colonel Phil Lilleyman joined the Corps in 1973. He commanded a mechanized field troop in 12 Field Squadron, was 2IC 34 Field Squadron, Operations Training Major 32 Armoured Engineer Regiment, OC 20 Field Squadron and CO 71 Engineer Regiment (V). He was Mentioned in Despatches and appointed MBE. Staff appointments have included: DS at the Armour School, DS at Junior Division Staff College, SO1 at Engineer 4, Chief Instructor Command Wing RSME and Team Leader Army Recruiting Agency Team. He is currently British Liaison Officer at the US Army Engineer Centre, Fort Leonard Wood, Missouri.

CONSIDER what command would be like without the burden of uncertainty. Or what orders would be like if subordinates were already aware of the detail. How easy would it be to manoeuvre without obstacles, logistics or the chance of surprises to inconvenience our plans? Some junior officers in the US Army today will experience an operational environment like this before they face retirement. Certainly, the revolution in military affairs pursued by our US allies, sees military operations entering a new and exciting era in the next 25 to 30 years. It sees commanders able to look at the battlefield with a certain knowledge of what everyone is doing, including the enemy. It sees the ability to engage and destroy anything, of any quantity, at will, without the need to expose forces to risk. It sees armoured vehicles manoeuvring at speeds worthy of Le Mans less than 50 years ago. Does this warrant serious military debate or is it simply a distracting arcade game that will be unaffordable when Congress must find the money? I don't know, but in my role as the Institution's Corresponding Member in America I thought you should be made aware of what is happening over here and share some thoughts on what it might mean to our Army and Corps if we choose to chase the same dream.

DIGITIZATION AND SITUATIONAL AWARENESS

FIRST, perhaps we should attempt to define two of three concepts that support the revolution in military affairs. These are "digitization" and "situational awareness". The third, "air-mechanization", can be left until later.

My definitions might be imperfect but understanding the gist of what these terms mean is fundamental to seeing the step-change in capability that the future may hold. Digitization is the procedure of bringing computer-processing power to military activity. By its very nature, it enables information to travel quicker and be more widely available than before. It also allows intricate procedures to be completed automatically, or with the minimum of human guidance. Although I am conscious that the UK is not as familiar as the US with the Internet, I think it is useful to make an analogy with that system. Certainly, its opportunities have been swallowed whole here and it would not be an exaggeration to say that the US will soon run on it. To find out anything from the weather in Brisbane to the exchange rates in Bogota the US goes to the Internet. Americans shop around and buy anything from books to binoculars, cars to caravans. Useful software and other digital information can be "downloaded" to home machines, it is possible to

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locate and chat to like-minded people and, for those with strong stomachs, we had the first live transmission of a human birth on the Internet a few days ago. It is both an unlimited library of information and an interactive marketplace. It's all happening and we can join it or not as we choose and this is the style of information flow that digitization will bring to the battlefield. Information will not be dumped on the watchkeepers desk. It will be there to be accessed as and when required. When the CO asks what the combat effectiveness of his neighbouring battlegroup is, a few cursor strokes will reveal all in graphic detail.

Just as digital data and software can be downloaded from the Internet, so tactical data can be fed into battle systems automatically. Warheads can be targeted and weapon effects decided with the click of a mouse button many miles from the weapon or its delivery system. This technology is here now. For example, in the new Apache D attack helicopter, bought by the UK, the mission, including enemy locations, route restrictions, target priorities, etc can be formulated separately and downloaded into its computers prior to a mission. Only one aircraft needs to be primed in this way. That then informs any other aircraft on the same mission and the aircraft brief their crews en route to the task area. Equally, the pinpoint accuracy of cruise missiles, at extended range, is becoming much more widely available as the data necessary to prime individual missiles can be formulated so much more quickly and inserted into individual warheads in an automated manner. In this way, an armoured formation in the open could be destroyed at once with multiple missiles individually targeted. Indeed this future tactic has become known as the "precision ambush" and is a feature of the future concepts. With such surgical economy and precision the use of logistically inefficient area weapons, such as mortars and artillery, becomes limited.

In addition to information on the friendly forces, the commander will have nearly as much knowledge of the enemy within his area of interest. Not only will sensors deliver this directly but there will be an historical record as enemy forces will be tracked constantly once deployment looks likely. Topographic data will be assembled and this trilogy of knowledge of "blue", "red" and terrain, delivers the next concept of our three, that of "situational awareness". Situational awareness will present the commander with a real time view of what has become known as the "common tactical picture". This is a bit like a bird table but the information will be based on fact not supposition. Equally, the commander need not be satisfied with a two dimensional graphic. Simulations will allow him to "fly through" as if in a helicopter, seeing all the features as he goes. Those commanders equipped with situational awareness, delivered by digitization, can plan with certainty, act decisively, and with economy. Those subordinates with access to the common tactical picture need little in the way of orders to pursue the commanders intent, even in the most fluid of tactical situations.

So my experience from America has taught me not to think of digitization in terms of smarter battlefield communications. To do so misses the point. Digitization makes available a huge swath of knowledge to be accessed by selected users. It allows previously involved processes to be completed quickly and above all, it grants situational awareness to the commander and his subordinates. The commander is in a position to perceive his opportunities and threats, formulate his intent and to act quickly in changing circumstances. Subordinates can see the same common tactical picture and thus understand the dynamics of their part in it all and can act with the minimum of coordinating staff work. This is the mental agility that will make so much difference and its not too far away.

The Army of the 21st Century (Army XXI)

The Americans are wholeheartedly committed to building a digitized Army called Army XXI that will enjoy the benefits of digitization and situational awareness and be able to exert what has been described as, "information dominance" over its enemies. The first division will be fielded in 2002 and a corps in 2005. After that they are looking to import smarter technology to deliver enhanced precision lethality and greater integration of battle systems with the digitized information available. The most significant area will be in the individual targeting of missiles to deliver massed precision effects, as described previously. In addition, as a result of increased precision and of new power sources, logistics will begin to get leaner. This will be the next army, Army XXI (+) in 2015.

Looking beyond 2015, US studies indicate that potential competitors will be transforming their armies into information-age forces of similar capability around 2025. Situational awareness favours the defence, particularly when both sides have similar capabilities. To avoid an attritional contest, US forces intend to develop greater speed and agility of manoeuvre in order to bring massed precision effects to bear quickly from dispersed troops. Contending forces will not have the ability to counter-manoeuvre, despite situational awareness, and will be placed firmly on the back foot. This is the seed in the revolution in military affairs that, it is believed, will grow into the Army After Next (AAN) in 2025. As Army XXI brings knowledge to the battlefield, so the AAN will bring speed, and the combination of knowledge and speed is the maxim used to characterize the revolution that will be the AAN.

Air-Mechanization and the Army After Next

My third attempted concept definition is of "air-mechanization". Whereas air power can deliver force quickly and at long range, it cannot, without enemy compliance, achieve an end-state. Ground forces are hobbled by terrain, speed and range but they can achieve lasting objectives on the ground. Therefore, to combine the two capabilities allows rapid manoeuvre and a force able to dominate the ground environment and achieve lasting results. Current thinking here is for a family of light, highly lethal, agile fighting vehicles physically clipped underneath advanced airframes with rotating rotor pods that take the ground combat power to the battle area. Several variants of vehicle/airframe coupling exist as thumbnail sketches but the constant principle is that this combination allows short period ground strike operations from a secure base well outside the theatre of operations. Indeed, many see the requirement as being able to conduct pulsed strike operations anywhere in the world from bases inside the USA.

The force would be fuelled and armed with efficient systems that free it from the baggage of logistics. The lethality of the force's own weaponry would be backed by missiles on call from loitering unmanned aerial vehicles (UAVs). Force protection too would probably come from UAVs as well as individual vehicle defensive-aids-suits. Operations, for the most part, would be dispersed with small groups of vehicles tasked with simultaneous actions to destroy or disrupt the enemy's ability and will to fight

There will be no ground based air defence. There may be no field artillery and, sadly, there will be no Sappers in support of this AAN. Any collective support for ground manoeuvre swims against the requirement for semi-autonomous dispersed troops operating at high tempo. There will be no cantonments for in-theatre troops, no logistic routes to be kept open and no minefields to lay. Although it is recognized that counter-mobility applied to the enemy can fix his manoeuvre, counter-mobility munitions will, most likely, be delivered by air or remotely. The AAN battle force, as it is known, will be unconcerned with infrastructure outside its three dimensional bubble of operations. A partial parallel can be drawn with today's special forces. The battle force will have specific short-term missions to achieve crippling action deep in enemy controlled territory. Similarly, they will be independent and self-contained.

The parallel with special forces can be taken further as it is becoming increasingly recognized in America that the AAN cannot be a whole army but must be the strike force of a more conventional army. Some would go further to describe it as an adjunct to conventional force structures. It is fully realized that Army XXI type forces are by far the more usable in the range of pre-conflict, post-conflict and peace support operations common today and likely tomorrow. Clear-cut confrontations between industrial nations will be few. Indeed, the US sees a more likely threat from non-governmental organizations with access to weapons of mass destruction. In such situations the massed precision of AAN battle forces will be no good. Equally, it would not have solved Bosnia, less so Northern Ireland. Its benefits soon evaporate in urban terrain or close country and in this media age, there are few circumstances where massed precision strikes can be launched and then the consequences abandoned.

So the AAN cannot be viewed alone. It may offer a step change in key areas of military activity but it does not in itself offer an answer to conflict. However, the implications of "knowledge and speed", of digitization and air mechanization, are profound and to pursue these objectives will change operational thinking in a fundamental manner, possibly comparable in its impact to the use of blitzkrieg.

Thoughts on Digitization

It must be said that nothing so far described is beyond the bounds of physics and technology. It is simply a matter of time before the enabling materiel becomes economically available here in America. Computing power continues to grow, fuel cells developed for space exploration are becoming more efficient and cheaper. Sensors, and, more importantly, the processing of sensor output, is becoming so sophisticated that little above ground can escape detection, particularly if it moves. This is coming and the Americans realize they must catch it. However, amongst the many changes it will bring, may I share four thoughts that may impact on our future army.

Integrating digitized and non-digitized forces. There is a huge commitment to digitization here. They see no alternative. However, a recognized difficulty is working digitized troops alongside non-digitized troops and this will apply to their own reservists as well as foreign troops in a coalition. Non-digitized troops will not have access to the common tactical picture, they will not appear as blue forces on anyone's screen, communications will be rudimentary in comparison and their assets will not be fused into the central database. It would be like a troop joining a battlegroup with incompatible radios and no SOPs. Therefore, those that don't get smart will be relegated to tasks outside the digitized force's area and this has clear implications for future coalition warfare and for our own place alongside the US as a first division player.

Allowing for technological expansion. The US is conscious that microelectronics and computer processing power is predicted to grow at their current rate for the next 30 years. Therefore, to embrace digitization with hard-wired green boxes would be foolish in the extreme and would witness other nations, coming later on the scene, buying much improved capabilities for much less money. The US procurement strategy involves civilian contractors in the whole life of the system, ensuring that the hardware is modular and the software is based on commercial principles, not military specials. In this way, the whole system can grow with technology. This is a common approach within the US. For example, the National Training Center at Fort Irwin has contractors to give its central computers a technology transplant about every nine months. The ability of a system to continue to grow is considered more important than perfection on the date of launch. Perhaps this lesson comes from the US Maneuver Control System, a military special that continues to under-perform cheap commercial software while having cost the US taxpayer billions of dollars over the last 15 years.

The importance of the enemy picture. The importance of the enemy picture in situational awareness, and its inseparability from the whole concept of digitization, cannot be stressed enough. Without an enemy picture the main area of interest, the main focus for action, is absent. There is no true situational awareness and digitization is simply improving battle communications and administration in the field. Therefore, there has been almost equal energy invested in information gathering systems, their sensors and the platforms to carry them. The US does not think of digitization and situational awareness in terms of passing information about the battlefield. It is a means of taking the lid off the battlefield so commanders and staff at many levels can look inside at the common tactical picture and dominate future events.

Its influence on command. The US sees the possibilities of relying more heavily on a mission command approach during immediate operations. All relevant levels can access the common tactical picture and know the commander's intent. This should allow the staff focus and estimate processes to be pushed further into the future or onto a higher plane than hitherto. Whatever happens, the commander must resist the tempting opportunity to micro-manage. Certainly, command procedures and attitudes will need to be rethought. Commander TRADOC (Training and Doctrine Command), General Hertzog, identified the impact of digitization on command as one of the most difficult areas to assess and anticipate. He also recognized that the middle command strata that will pioneer these new processes is already serving as junior officers. There will be a significant training liability for the US Army and for our own as digitization comes along.

The Progress of the Army After Next

The UK is already committed to digitization and many are working hard to ensure our version of the process is compatible with the US, and available in a reasonably similar time-frame. But as the clock runs forward there is no certainty that our future army will run parallel with the AAN process. However, as our doctrine commits us to coalition warfare, probably more often than not with the US, we will not avoid the implications of the AAN whatever we do.

In America the AAN concept is gathering momentum. The Chief of Staff of the Army is keen to put his name on it and has commissioned annual war-games and an annual report on its progress. Other services give guarded welcome to its opportunities and the politically powerful National Defence Panel in an independent study came up with answers along similar lines to the AAN. It is the way the US see themselves

defending their national interests and retaining the world edge as other digitized armies, with hostile intent, begin to appear around 2025. It's good-to-go! Nevertheless, some military planners regret the debate becoming so public so soon and fear politico-military pressures may launch a version of the AAN before technology sorts out the mobility, logistics and precision technology. This would not enjoy the unfettered agility proposed for AAN battle forces and would probably fail.

AAN Implications

In high intensity operations against a future major aggressor, there seems little doubt that the Americans plan to use AAN battle forces in the offence (except where terrain is not conducive). Whether these forces are completely autonomous in all of the core functions (find, fix and strike) is not certain. Satellite imagery and topographic interpretation are unlikely to be wholly under their command and in the 2025 time-frame it is not certain what style of air support may or may not be available. What is important is that these forces, devoid of engineers and artillery, will assume the aggressive assault role, albeit achieving the effect in novel ways.

It is true that AAN forces cannot achieve everything in all circumstances. Legacy forces, as Army XXI forces operating at the time of the AAN are called, will be required for operations short of high intensity. They may also operate in support of battle forces, clearing up bypassed pockets of resistance or in taking a lead in difficult terrain but the requirement for them to exercise shock action and assault is not so clear in American eyes. Legacy forces deployed with battle forces are seen as being very much in general support. If the UK is equipped as Army XXI forces and in coalition with the US, when will our assault capabilities be required, or will we assume a general support role like the US legacy forces? If that be the case, what impact will there be on our force mix and the engineer component that now gives close support to manoeuvre in high intensity operations? Thankfully, these questions are several years away, but it is not difficult to imagine a migration of engineer involvement from the "sharp end" to the general support area.

The US Corps of Engineers sees its influence at the sharp end of the AAN in question. It is rightly emphasizing the urban terrain difficulties, topographic support and counter-mobility as areas that need an engineer contribution. But that need not involve a deployed contribution. There will always be a huge volume of general support engineering and force sustainment work to be done in areas outside the influence of the AAN, so the US Corps is under no threat, but things will certainly be different.

Convicts, Colonies and Royal Engineers

LIEUTENANT COLONEL A TAYLOR

Lieutenant Colonel Taylor left the Corps in 1979 and has since worked in international industry, with an ecumenical institute in Jerusalem and lately with the United Nations Association and associated bodies in the southwest of the United Kingdom. He is still the founding trustee of the Lord Caradon Lectures Trust and a Soldiers, Sailors and Air Force Association secretary for the Kingsbridge Division in Devon.

SOME time recently spent in Western Australia (WA), particularly in the ports of Fremantle and Perth, gave me an interesting insight into some elements of British Colonial policy during the period 1850 to 1870 and the detailed involvement of many of the officers and men of the Corps of Royal Engineers in the founding days of Australia. 170 years ago Captain C H Fremantle RN claimed the western coast of New Holland(!) as British territory and built the Fremantle Round House, the first gaol (really only a small lock-up) and now the oldest building in WA. It was completed in 1831 at a cost of £1840. The colony was not founded as a penal colony but as the first free settlement in Australia. The city has been preserved, miraculously and to a greater extent than I have seen almost anywhere else, as a 19th Century British colonial port and the principal port of the State of WA.

For 20 years the fledgling colony had only just survived, without development of any of the infrastructure needed to exploit the country's resources and with total absence of any form of labour for works, agriculture, water supply, roads or harbours. The colonists decided to appeal to the Governor for labour, and his approach to Britain found a sympathetic, though thoroughly self-interested, ear in the government of the day, whose jails were overflowing with prisoners and which was about to be faced with the probable abandonment of transporation to Victoria, New South Wales and South Australia.

Our tale starts in late May 1850 with the arrival of Captain E Y W Henderson RE on the *Scindia*, an Indiaman of 650 tons. With him came 75 fit, well disciplined convicts[1], 70 pensioners, some free immigrants and Henderson's small staff. The journey took 80 days; so fast a passage that they arrived before the dispatches notifying appointments and policy changes, and were totally unexpected and unprepared for. Henderson was appointed by Lord Grey, Secretary of State for the Colonies, as Comptroller of Convicts in WA, to undertake public works on the colony and oversee a new policy modelled on current experiments in Pentonville and Portland prisons, where convicts, after a period in close confinement, were employed on public works in an attempt to rehabilitate them, though also of course justified as a substantial cost-saving measure[2].

[1] Later batches were not so well found. In 1853 arrived a rabble of sickly, turbulent Irish convicts [sic].
[2] Henderson carried detailed instructions from Lieutenant Colonel Joshua Jebb RE, Surveyor of Prisons in England, who later became Major General Sir Joshua Jebb KCB, chairman of directors of convict prisons.

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The works themselves were usually designed, controlled and supervised by Royal Engineers; military and civil works having been taught at the Royal Military Academy, Woolwich, since 1741 (and that saved a bob or two, I bet!)

With no provision ashore for his charges, Henderson was forced to improvize. He leased a woolshed on the harbour from the harbour master (only partly roofed, with an earth floor and a few ancillary lean-tos) and restructured, refurbished, and extended it, walling it in with local limestone. The work was carried out by the convicts at a convict rate of 1s 4d a cubic yard against a civil price of 4s 6d. Like the larger and more secure prison which replaced it, the "woolshed" had stores, an infirmary, a cookhouse, laundry and production and training workshops. The essentials were finished just in time, for on 26 October 1850 the *Hasherry* arrived with another 100 convicts, followed by 360 in December. The buildings survived until 1985 when they were demolished to extend the Esplanade Hotel for the Americas Cup. One of the prison stores is now the Western Australian Maritime Museum.

Henderson then had to plan for future convict shipments. A site for a permanent establishment was selected, with accommodation for wardens and their families in rows of two-roomed houses and some larger units for chaplains, a surgeon, a a superintendent, clerks of works and office staffs. Twelve warders' cottages and six larger units still exist in what is now Henderson Street in Fremantle. The RE office in Fremantle also advised, planned and supervized civil projects for roads, bridges, harbours, sewerage, drainage and water supply and established convict outstations to supervize projects, accommodate work gangs and hire out convict labour to settlers, though the construction of the permanent prison was naturally given a high priority.

20 Field Company arrived in 1851 to provide technical skills and direction for projects[3]. The CO was Lieutenant Henry Wray[4], to be based in Fremantle, with Second Lieutenants E F Du Cane[5], Crossman and Le Mesurier as company officers. Crossman had the ports of Albany,

Second Lieutenant E Y W Henderson, commissioning photo.

Bunbury and the roads to them in his charge. Du Cane covered works at York and east from Guildford. Wray supervized the construction of the Fremantle/Perth jetties that opened the Swan River for commercial use. Records for Le Mesurier during this period seem to have been mislaid. All these officers were appointed magistrates and visiting magistrates of the convict stations.

The priority work, then, was to locate and build a secure, well-provided, permanent prison, though there can be no doubt the settlers screamed for immediate maximum convict deployment on their priority projects. Construction of the prison, designed for 1000 prisoners, was started in limestone quarried on the spot and exploited the structural properties of abundant jarrah timber. New ideas in ventilation and plumbing were incorporated. Another innovation was the provision of a substantial workshops to produce components for public buildings – metal fittings, furniture and doors, and to attempt to transfer skills to some prisoners. The scheme also included the area's first wells and pumping station and security gate complex. The bulk of the work was completed

[3] Similar RE companies arrived in Tasmania in 1836, New South Wales in 1838, South Australia 1839.

[4] Later Lieutenant General H Wray, CMG.

[5] Later Major General Sir Edmund Du Cane KCB. He was particularly commended for work on the 1851 exhibition, as were the Royal Engineers generally. Henry Labouchere, President of the Board of Trade, commented: *"Whenever the Government was in difficulty in finding an officer of high capacity for civil administration, the right man was sure to be obtained among the officers of the Royal Engineers."*

Colonel H Wray, Chatham 1868.

Captain E F Du Cane.

ready for occupation in 1855 at a cost of £27,270 13s 1d. The complex was abandoned as a penal institution 100 years later.

In 1856 design for another important project, an asylum for prisoner and convict lunatics (an increasing problem) was started but was subject to much argument, change and stringent budget restrictions. Captain Wray, acting Comptroller General in Henderson's absence in England from 1856 to 58[6], had his original plan for the asylum rejected in 1857. In Britain Henderson redesigned and renegotiated the asylum plans with the home government as a massive limestone structure, often referred to somewhat pejoratively as convict colonial Gothic. The eventual building, of prison quarried limestone footings and walls, jarrah floors and roof timbers and she-oak shingles[7], was finished in 1865 and occupied by 28-male and 17-female lunatics. Today the building is the Fremantle Art Centre and Museum and has also served as a women's prison, an orphanage and many other purposes. It is still a very impressive sight.

But changes were on the way, in policies and in practices. In 1861 20 Company was withdrawn to England. The RE office in Fremantle continued to develop civil projects, particularly those using convict labour. In 1868 the *Hougemont*, the last convict ship to WA, anchored in Fremantle harbour. 32 ships had delivered 9500 convicts and roughly the same number of free immigrants. The colony had expanded from around 4900 in 1850, (only 200 in Fremantle) struggling desperately to wrest a minimal living from the land, with few made roads or bridges, no iron or brick industry or lime-burning, milling or soap-making. By 1863 when Henderson, now a lieutenant colonel, returned to England, in addition to the prison, asylum and other public buildings (Perth Barracks, Town Hall, Government House etc), the Royal Engineers, using convict labour, had finished 570 miles of road, much drained, culverted and paved, had built 7000yds of stone

Fremantle Museum and Arts Centre.

[6] Henderson's wife, Mary, died in Fremantle in late 1855, aged 29. He returned to England with his son, remarrying a clergyman's daughter from Kent and returning to WA in February 1858.

[7] Primary WA timbers used:

Jarrah [*eucalyptus marginata*]. Straight trunk, up to 40m high. Also called Swan River mahogany. Widespread and used for building and furniture.

She-oak [*allocasuarina fraxeriana*] Small to medium tree up to 15m high. Somewhat like English oak. Used for roof shingles (splits into sheets) and furniture.

Freemantle Prison.

causeway, 239 bridges with 7 miles of approach work, wells and water supply systems, 2 jetties, a sea wall, a 15-mile tramway and innumerable smaller works. They had established 15 works and hiring depots, large ones at Mount Eliza, Port Ongary, Tooday, York, Bunbury, Guildford and Albany.[8] WA was opening up at last and the population was now around 20,000. Eventually the supervision of public works was civilianized.

What happened to Henderson? A brass plaque in his honour, recording his devotion to the emerging colony and the cause of penal reform, remains in the Perth pavement in St George's Terrace. So does the road bearing his name in the heart of Fremantle. On returning to England he sold his commission and was appointed Director of Convict Prisons, following fellow Royal Engineer Jebb, then Surveyor General of Prisons and Inspector General of Military Prisons. In 1869 he became Commissioner of the Metropolitan Police, instituting the Criminal Investigation Department system and police orphanages. Knighted in 1878, he died in London in 1896. Apart from Hazluk's biography of Du Cane, little has been written about these soldiers and their role in and contribution to reform of the penal system. What has been written, though, mainly by Australian writers, is invariably laudatory[9].

Were the Hendersons, Du Canes and Wrays so much larger than life? Perhaps not, but they were well-trained generalists with sound engineering backgrounds. They did carry large responsibilities in far-flung places; were required to exercise sound judgement without the nanny-like supervision modern servicemen often have to endure. And all this without refrigeration, fly screens, air conditioning or antibiotics.

But things inevitably change, often for the better. So I suppose that since we have in practice become almost indistinguishable from the infantry, we cannot grumble if they become inspectors general of prisons?

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[8] A typical working party was 20 to 40 men in charge of a warden, assisted by convict constables, living in tents or huts depending on the length of stay. Convicts earned 1d per day, held in a savings account in trust for them, pending release.

[9] "The most important feature of their [RE officers' & men's] contribution to prison administration was an insistence on the rule of law being paramount. This was one manifestation of a high degree of integrity which is evident in their work and was probably the most important single reason why the convict experience in WA was so much less brutal & squalid than in the eastern states, ... being praised by superiors & underlings ... since the main feature of prison administration for over 500 years, was ... a rotten, confused, capricious and devastatingly cruel structure. The RE officers who set up centralized prison systems in England and WA combated all this by creating ... a cohesive intelligible, carefully supervized and supportive structure." [Imprisonment in WA. Uof WA Press. 1978 pp22-3.]

The Forgotten Reserves
Non-Territorial Engineer Units 1877 to 1998

DR GRAHAM E WATSON

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SINCE 1908 the majority of the British Army's reserve units have belonged to the Territorial Force (TF) and its successors: the Territorial Army (1920-), the Territorial Army Volunteer Reserve (1967-) and the Territorial Army (1982-). The Corps of Royal Engineers has included a large number of territorial companies, squadrons and regiments in its order of battle since 1908. The distinguished service of many of these units has been recorded, and rightly so, but the predominance of the territorials has tended to obscure the important contributions of other reserve units of the Corps. This article will outline the role, organization and service of those sapper units which, at one time or another, were reserves but not territorials.

Prior to the formation of the TF, reserve sapper units were to be found in two different and separate organizations: the volunteers and the militia. The former had sprung up in the 1860s in response to political and public fears of invasion at a time when the adventures of the French emperor, Napoleon III, and the diplomatic manoeuvres of the Prussian Chancellor, Bismarck, were creating widespread concern.

The volunteers provided enthusiastic clubs of riflemen, some of whom became gunners or sappers. All were dedicated to the home defence role. In this, they tended to supplant a much older reserve force – the militia. The poor image of the militia contributed to its decline from a compulsory home defence force to a draft-filling role for the regular army by the late 19th Century. The major exception to this rule resulted from the government's realization in the 1870s that the regular army needed formed units of specialists who could be mobilized for overseas service, as well as home defence. The result was the conversion of two county militia battalions of infantry to engineers. The regiments were those of Anglesey and Monmouthshire. The intention was to fill out the engineer component of any overseas expeditionary force with specialist engineers not normally needed in peacetime. Both regiments fulfilled their intended role during the second Boer War when field companies were dispatched to South Africa on a roulement basis. They operated on railway duties between 1900 to 1902.

The draft-finding role of the militia was confirmed in 1908 when that organization was replaced by the Special Reserve (SR). The new reserve was regarded as an integral part of the

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regular army. Most of the new reserve existed only on paper – it consisted of lists of reservists held at regimental depots pending mobilization. Such lists were described as the third SR battalion of each infantry regiment. Upon the outbreak of war such battalions acted as reinforcement depots for operational battalions: they never existed as field units. This role was to continue until 1953.

Six independent formed units were created in the SR in 1908. Four regiments were formed in Ireland where the TF did not exist: the South Irish Horse, the North Irish Horse, the Cork Artillery and the Antrim Artillery. The two existing regiments of militia engineers – Royal Anglesey Royal Engineers and Royal Monmouthshire Royal Engineers (RMonRE) – were converted to the SR. Again the intention was to provide the regular army with additional specialist sappers when deployed overseas. The TF sappers were confined to either field engineer companies of infantry divisions or coast defence duties.

The contrast with the territorial sapper units and the SR units could be seen in their respective terms of service. The SR units were liable for overseas service – a duty not requested of the territorials until 1914. Both engineer regiments remained outside the administrative framework of the TF. They came under regular army command for training and administration. Like the TF units, both regiments came together for annual camp. The training requirements were more onerous. Officers had to undergo 12 months of continual training: five months with the regiment, six months at Chatham and one month with a regular engineer company. Camp for other ranks lasted for 37 days rather than the 15 days normally required of the territorials.

Within this framework, both regiments organized themselves into siege companies and railway companies. During the First World War, the regimental depots at Beaumaris and Monmouth acted as training and reinforcement centres for the companies sent overseas. Neither regiment went overseas as a complete unit. Instead, each sent a number of companies to France and elsewhere. The five companies from Anglesey were complemented by eight from Monmouthshire. One company of each regiment served at Gallipoli and then in Egypt. Both became part of 74th (Yeomanry) Division when it was formed in Egypt in 1917: they went to France with the division in 1918. With one exception all the other companies served on the Western Front. No 8 Army Troops Company, from Monmouth, served in Italy in 1918. The SR status of these companies was seen in the retention of their regimental designations throughout the conflict. In contrast, all TF engineer companies lost their territorial designations when included in an army-wide numbering scheme for all engineer units in 1917.

In 1919 both regiments were reduced to cadres. The SR was declared defunct in 1919 and the cadres were described as militia. The regiment in Anglesey did not survive this change: it remained on the Army List until 1939 but without officers and men. It was not included in the new reserve created in 1924.

The TA was reformed in 1920 along pre-war lines with emphasis on the recreation of infantry divisions which now included three field companies and one field park company under command. Most of the pre-war fortress engineers were revived for coastal and anti-aircraft defence. In spite of the new obligation to serve overseas, the needs of the regular army for specialist reinforcements remained. This resulted in the formation of the Supplementary Reserve in 1924. This reserve was to remain in being until 1953. Supplementary Reserve units were largely to be found within the Corps of Royal Engineers or in the newly founded Royal Corps of Signals. They were administered within the regular army's command structure.

From 1925, Supplementary Reserve engineer units were organized into six army troops companies, two electrical and mechanical companies, one workshop and park company, seven railway companies and one docks company. All companies, except the army troops companies, used the particular civilian occupational skills of their members for military purposes. Such units required little more than refresher training each year. The army troops companies which were composed of six officers and 242 men, each required annual camps to prepare them for the wartime role of construction work for GHQ British Expeditionary Force. Each company was allocated a number in the 100 series (their TA counterparts were numbered in the 200 series). Two of the army troops companies were raised in Monmouthshire and were grouped together under the name of the former militia engineer regiment.

The Supplementary Reserve units were:

100 Army Troops Company, RMonRE(SR)	Monmouth
101 Army Troops Company, RMonRE(SR)	Monmouth
102 Army Troops Company	Bethnal Green
103 Army Troops Company	Rutherglen
104 Army Troops Company	Manchester
105 Electrical & Mechanical Company	Liverpool
106 Army Troops Company	Doncaster
107 Army Troops Company	Middlesborough
108 Electrical & Mechanical Company	Chelmsford
109 Workshop & Park Company	Glasgow
150 (LNER)[1] Railway Construction Company	York
151 (GWR)[2] Railway Construction Company	Paddington
152 (GWR) Railway Construction Company	Paddington
153 (LNER) Railway Operating Company	Gateshead
154 (GWR) Railway Operating Company	Newport
155 (LMS)[3] Railway Workshop Company	Derby
156 (SR)[4] Railway Stores Company	Lambeth
157 (LNER) Docks Company	York

All SR companies were mobilized in 1939. Most of the non-railway companies were sent to France either as GHQ or Corps troops. As with most engineer units which served in a support role, there is little information on their active service. The RMonRE companies, as GHQ troops, were responsible for the construction and maintenance of both forward and rear headquarters for Lord Gort. 102, 105 and 107 Companies came under the command of I Corps. 108 Corps Field Park Company was a component of II Corps while 104 and 106 Companies served on the lines of communication. 105 Company served as part of I Corps Troops Engineers for the rest of the war. By 1943, 102 and 107 Companies were to be found in Italy as components of 1210 GHQ Troops Engineers. In that same year 100 and 101 Companies became part of VIII Corps Troops and, as such, were engaged in construction work in 21st Army Group's successful campaign from Normandy to the Baltic. Many of the TA's fortress engineer companies joined their SR counterparts in this useful if little known construction activity. An indication of the scale of the engineer support role in 1944 can be seen in the number of units allocated to 21st Army Group: they grew out of the pre-war Supplementary Reserve. They included nine GHQ troops engineers, three army troops engineers, four corps troops engineers – each of four companies – plus a large number of construction, railway, port and inland waterway groups on the lines of communication. The Canadian army provided additional engineer assets.

Such was this contribution that although most of the SR companies were not reformed in 1947, their numbers were used by the new TA engineer regiments. Some of these regiments were construction regiments which formed around the old fortress engineer units at locations used by SR companies before the war. The only pre-war companies to be revived were 100 and 101 at Monmouth and the railway companies.

The Supplementary Reserve was reformed in 1947 with the same objective – the provision of specialist engineer support – but even more specialized than before 1939. The war had widened recognition of the need for specialist sappers and this resulted in the creation of six army, five independent field and twelve construction engineer regiments in the TA. One army engineer regiment was established in the Supplementary Reserve – RMonRE(SR) – and that regiment was transferred to the TA in 1953 as part of a wider reorganization of the reserves. Before the war the Royal Signals was the only other corps with SR units. As a result of the conflict the SR principle was extended to RASC, RAOC and REME. This was a recognition of the multitude of talents which a modern army needed to have trained and ready for deployment in a general war.

The initial engineer establishment in the Supplementary Reserve was:

RMonRE(SR) (100, 101, 111 Squadrons)
18 Railway Group (151, 152, 154, 158 Squadrons)
19 Railway Group (150, 153, 157, 159 Squadrons)
80 Railway Workshop Regiment (155 Squadron)
81 Port Regiment (165, 166, 167, 172 Squadrons)
82 Port Regiment (168, 169, 170, 171, 173 Squadrons)
83 Inland Water Transport Regiment (156, 174, 175, 176 Squadrons)

Between 1950 and 1957 a substantial number of extra regiments and squadrons joined the SR or its successor, the Army Emergency Reserve (AER) (which continued to provide "units or individuals of a specialist or logistic nature in support of the Regular Army"). The newcomers either came through transfer from the TA or were entirely new units. Some of the the former TA regiments were given new, more specialized roles. The following TA regiments were transferred in 1950: 116 Army Engineer Regiment and 130 Construction Regiment. They were followed by 111 Plant Regiment, 112 Engineer

[1]London and North Eastern Railway.
[2]Great Western Railway
[3]London Midland Scottish Railway
[4]Southern Railway

Stores Regiment, 126 Advanced Engineer Stores Regiment and 128 Engineer Workshop Regiment in 1951. In the following year, 120 Construction Regiment joined the SR. In addition a number of individual TA squadrons were transferred and re-roled as bomb disposal squadrons.

During the same period a number of new engineer regiments were formed exclusively for service in the SR or AER. They included 136 Construction Regiment, 137 Bomb Disposal Regiment, 138 Plant Park Regiment, 139 Advanced Stores Engineer Regiment, 142 Bomb Disposal Regiment, 144 Bomb Disposal Regiment, 201 Army Engineer Regiment and 251 Construction Regiment. In 1956 624 Crane Squadron was formed out of a disbanded artillery regiment which had originated in the Lancashire Artillery Volunteers.

The links between the two forms of reserve were enhanced in 1957 by the formation of four port task forces, each of which included both TA and AER elements. Nos 1 and 3 Port Task Forces were largely made up of AER units with the addition of 105 Engineer Regiment on Tyneside to the former and 107 Engineer Regiment on Merseyside to the latter. Nos 2 and 4 Port Task Forces were TA orientated with the addition of the newly formed 276 Port Regiment to the former and 80 Port Regiment to the latter. In 1961 all were replaced by 80 Port Regiment TA on Clydeside. HQ of 4 Port Task Force became HQ 29 Engineer Group in Edinburgh – the forerunner of the current brigade of that number.

The nation's ability to sustain a very large reserve army after 1947 was based upon the requirement of all national servicemen to spend three and a half years with a reserve unit after two years in the regular army. The abolition of conscription lead to a very substantial reduction in the reserves in 1961. The total size of the AER was cut back to 8700 former regulars. Most AER engineer regiments were merged into 111 Corps Engineer Regiment. It was complemented by 590 Specialist Team (Bomb Disposal), and 276 Port Regiment. The latter was lost to the Corps in 1965 upon transfer of all transportation units to the newly formed Royal Corps of Transport.

In December 1965 the government announced a massive reduction in the size of the reserves which would take place on 1 April 1967. All reserves were unified into a single Army Volunteer Reserve. Emphasis was placed upon those units and individuals whose skills would fill gaps in the war requirements of the regular army. Effectively the *raison d'etre* of the militia and its successors was extended to the whole reserve force. The TA would cease to be a formed and balanced army in its own right. There would be several categories of units and individuals within the new reserve. Engineer units were divided between independent regiments and squadrons – the successors of the traditional TA, and sponsored units and individuals – effectively successors of the AER. All those in the latter category would be administered from a central headquarters which was termed 111 Engineer Regiment (V). The regiment was divided into 120 Field Squadron, 130 Field Squadron and 198 Field Park Squadron. As such it remained the most important sponsored element of the Corps until overtaken by *Options for Change*.

The Corps also formed nine STsRE – 501 (Bulk Petroleum), 502 (Well Drilling), 503 (Bulk Petroleum), 504 (Power Station), 505 (Engineer Procurement), 506 (Public Utilities), 525 (Construction), 526 (Construction) and 590 (EOD) which brought together from civilian life skilled tradesmen and specialists who were organized into teams which dealt with matters normally not required by the regular army in peacetime. The principle was extended to the air support role in the 1980s when several more STsRE were formed. 590 STRE (EOD) was expanded to become 101 Engineer Regiment (EOD) in 1988. STsRE remain in the orbat as components of the Military Works Force and in the air support role with the recently reformed 12 Engineer Brigade. Additionally, in the 1980s, several combat artisan troops and combat plant troops were formed, none of which survived *Options for Change*.

In 1995 the functions of 111 Engineer Regiment were transferred to CVHQ RE with 198 Field Park Squadron as the only remaining unit of this type of reserve. In 1997 CVHQ RE became 29 (Corps Support) Engineer Brigade and as such administratively responsible for the STsRE of the Military Works Force. The allocation of the number 29 revived a command connection with the reserves which had existed between 1961 and 1995. The brigade's command of RMonRE(M) and 71 Engineer Regiment not only indicates the current lack of distinction between territorial and other reserves but brings the story full circle back to its beginning with the conversion of the former regiment of Royal Engineers in 1877.

Two Up and Bags of Smoke

LIEUTENANT COLONEL A D MACKLIN MA(H)

Lieutenant Colonel Macklin is clearly one of the Corp's slow learners as he has to do most things twice. After two visits to Sandhurst (before and after Cambridge) he was a troop commander twice. His first troop was in 50 Field Squadron supporting the RAF; his second was the Allied Command Europe Mobile Force (Land) troop in the "good old days" when it was independent. He attended the RAF staff course where he did so badly he had to return to Greenwich later to complete the Joint Services Defence Course. His staff job in Main Building was so poor he was sent back to "show again" in the same office for his SO1 tour. For his squadron command tour he was let loose on two squadrons, 51 Airmobile and 11 Mechanised, taking the latter on Operation Grapple 3. *His current tour as CO 39 Engineer Regiment represents second time around in many ways: had he taken over on time it would have been a second visit to Bosnia, it is his second tour in support of the RAF, second time in Cambridge and second post as a lieutenant colonel. Perhaps they will give him a second regiment to command for his next tour!*

WHERE do you find an orchard without trees, a pool without water and vehicles without wheels? The answer is the Brigade and Battlegroup Trainer (North) (BBGT(N)) in Catterick.

The aim of this article is not to extol the general virtues of the BBGT (one would hope that few readers are unaware of the facility and that many have taken part as either a battle group engineer (BGE) or as a troop commander) but to highlight the experiences of 39 Engineer Regiment and the opportunities revealed.

As the only regular air support regiment in the Corps, 39 Engineer Regiment has no all arms higher formation with which to train and, in the air support role, no requirement to do so. However, the trickle posting system means that today's troop commander in Waterbeach may be tomorrow's BGE in a brigade close support regiment, and the next time a squadron second in command is at regimental duty may be as a squadron commander in support of a battlegroup. There is therefore an implied task to train individuals, and officers in particular, beyond their current role, not least as a part of their intellectual and professional development. Given our claim to be "soldiers first" and that there are few better ways to understand the organization you are supporting than by playing its role, the opportunity offered by a cancellation to go to BBGT(N) as an infantry battlegroup was not to be missed.

The concept was to deploy as a 1, 0, 2 battlegroup using the Regiment's field squadrons as dismounted companies in a two-level exercise (both RHQ and SHQ being exercised) with "imported" combat and combat support arms assistance to educate the Regiment's participants. Internal and external commitments meant that it was left to the "old boy net" to secure an armoured squadron leader, a full set of battery commander and forward observation officer parties and infantry expertise in the intelligence and support weapons domains. The final cosmopolitan deployment included personnel from MOD, HQ 49 (East) Brigade, 14 Field Regiment Royal Artillery, 33 Engineer Regiment (Explosive Ordnance Disposal), 76 Engineer Regiment (Volunteers), 1 and 7 Battalions the Royal Anglian Regiment.

But the key to the success of the exercise was the attitude of the BBGT(N) staff. The exercise was intended to be a learning process of all arms capabilities and procedures: not that 39 Engineer Regiment should be "tested" as an infantry battlegroup. It was here that the BBGT(N) staff, used to battlegroups feeling that this was a trade test of their professional competence and therefore inclined to be resistant to guidance and criticism,

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came to the fore. With a balance between allowing freedom of action and providing guidance to ensure that all levels of command optimized benefit from the experience, the staff gave the impression of joining the players in thoroughly enjoying themselves.

It is not the intent of this article to eulogize on battle procedure, doctrine or tactical deployments in North Yorkshire. However, it is worth highlighting some of the broader lessons learned that may be of use to others. At the outset, I should own that I have never been on *Medicine Man* or *Ulan Eagle* exercises although I claim all arms experience with the AMF(L) and 24 Airmobile Brigade including numerous BBGTs. The BBGT experience also helped put into context some of the frustrations for RE troops on TESEX (tactical effects simulation exercise.)

One of the greatest benefits of the BBGT exercise was the insight it gave Sappers: officers and SNCOs in particular, of the perspective, pressures and philosophy of the all arms commanders that they can expect to support as BGEs or field troops. This should assist with the practical delivery of mission command and its requirement to be inside the mind of the commander one and two levels up. Of prime importance is the time imperative for Sapper work: at a time when the battlegroup is going through its battle procedure, if the obstacle plan is to be optimized then Sappers need to be starting work almost before anyone else is moving. The "time jumps" at BBGT tend to underplay this: as a procedural trainer, the exercise programme covers the planning and orders process but then skips to the battle thereby overlooking the critical period as far as most Sapper activity is concerned. It takes a strong willed BGE to tell a CO who is on his "trade test" that the minefield is not complete at the start of his deliberate defence operation. It will be interesting to see how the single supply chain changes this as the BG DCOS (Battlegroup Deputy Chief of Staff) is asked to ensure that 100 pallets of barmines are at the front of the combat service support packet or even delivered to the mine dump ahead of the main convoy. We should not forget that, even in a doctrinal period of manoeuvre warfare, the vast majority of battalions remain other than Warrior mounted.

The second major benefit was the experience of seeing all arms interaction with far more transparency than is possible on a field training exercise or from a BGE's post in BGHQ. The annual publication of Land Command's "Observations from Training" gives officers across the Army visibility of where our weaknesses in implementing doctrine and procedures lie. But without the opportunity to see for oneself, paper lessons can have limited impact: to read, practice and then be debriefed by directing staff offers an excellent route to progress.

In an era of drives for efficiency, a major bonus was the relatively small effort required for the benefit obtained. By using an "off the shelf" BBGT scenario, the biggest non-exercise challenge was finding other arms players; other G1[1], G3[2] Planning and G4[3] preparatory workloads were minimal. Such was the training value of the experience, that a "BBGT-type" control room has been established in Waterbeach for the benefit of all those using the training area. Without computer support, the conduct of the battle cannot be so faithfully represented but LOCON (lower control) booths, with communications, allows for the exercise of battle procedure and the undertaking of Sapper tasks that the time jumps at BBGT avoid.

In summary, the BBGT offers an excellent training medium for Sapper units to use to understand the issues of current doctrine and procedures from a non-Sapper perspective and to maintain currency as "soldiers first".

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[1]Personnel matters.
[2]Operations and training.
[3]Material/materiel.

Railway Operations in Palestine 1947 to 1948
A Personal Memoir

MAJOR C F ROSE CBE(CIVIL) MBE CENG FICE MCIT

Charles (Freddie) Rose went out to Palestine as a subaltern in mid-1947, following three years as a trainee civil engineer with the Southern Railway Company and an introduction to military railway construction and operation at Longmoor. Palestine was to determine the future course of his career, details of which were given in the April 1997 Journal.

BACKGROUND

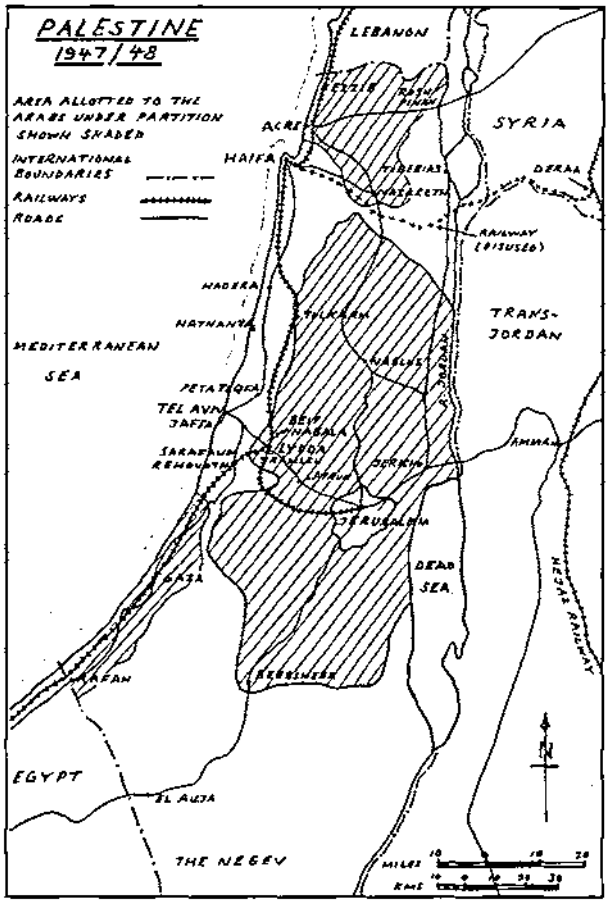
PALESTINE, with its predominantly Arab population, had been under Turkish rule for centuries until the Turks were driven out by Allenby in 1918. The way of life of the people had remained virtually unchanged since biblical times. Transport was by camel, horse or mule until, in 1901, the Turks began the construction of the Hejaz Railway, designed partly to carry pilgrims from the Near East to Medina and partly for strategic reasons. A branch, following the Yarmuk valley, linked Deraa (now in Syria) with Haifa. During the 1914-18 war a railway was built from Egypt across the Sinai desert to support Allenby's advance and this was extended northward to Haifa, with a branch to Jerusalem, as the war progressed. The 1939-45 war saw the railway extended northward again, as the Haifa-Beirut-Tripoli Railway.

In 1923, in deference to President Woodrow Wilson's novel ideas on "self-determination", Britain assumed a League of Nations Mandate to govern Palestine, together with Iraq and Transjordan, until self-determination could be effected. Any hope that this might be achieved peacefully had been pre-empted by the so-called Balfour Declaration, a letter written by Arthur Balfour, as Foreign Secretary, to Lord Rothschild on 2 November 1917 and which was incorporated into the terms of the mandate. The letter contained a fatal contradiction, in that it stated "His Majesty's Government view with favour the establishment in Palestine of a national home for the Jewish people, and will use their best endeavours to facilitate the achievement of this object, it being clearly understood that nothing shall be done which may prejudice the civil and religious rights of existing non-Jewish communities in Palestine ... ".These words virtually guaranteed that the following 80 years would see an unresolved conflict in the Holy Land.

During the 1930s events in Europe led to increased pressure for Jewish immigration into Palestine and this in turn led to a serious Arab revolt in 1936, which rumbled on until 1939. Although suppression of the revolt fell to Britain, as the mandatory power, the Jewish population began to organize its own defence. An armed force, the *Haganah*, although never officially recognized, became in effect the embryonic Jewish National Army. It spawned other more radical and militant offshoots such as the *Irgun Zwei Leumi* and the Stern Gang.

Maj C F Rose CBE (Civil) MBE
Railway Ops in Palestine p128.

The 1939-45 war saw a lull in the tension between Jew and Arab, Palestine becoming a commonwealth base for rest, training and stores, but by 1945 realization of the extent of the Holocaust led to great pressure for the immediate creation of a Jewish state. Britain, unable to reconcile this pressure with implacable Arab opposition to the idea, referred the problem to the newly-created United Nations. Whilst the UN deliberated, the Arabs, trusting Britain and the UN to safeguard their interests, remained quiet but Jewish guerrilla and terrorist activity began to be directed against the British garrison. In October 1945 a simultaneous attack at 240 places on the railway system demonstrated Jewish organization and on 22 July 1946 a bomb destroyed the King David Hotel in Jerusalem which housed the British High Commissioner and military offices. A further bomb attack, in October, destroyed much of Haifa East railway station. With rapidly growing tension between the Jewish and Arab communities, it was not surprising that, in September 1947, a UN Special Committee recommended partition. This was accepted by the UN in November. It gave the Jews less than they wanted and was rejected outright by the Arabs. Britain announced it would end the mandate on 15 May 1948 and would complete its evacuation by 1 August.



Palestine 1947/48.

The First Seven Months – Central Palestine

It was against this background that I arrived in Palestine, on 15 July 1947, to become a troop commander in 603 Railway Construction Squadron. The squadron was based in the large, rail-served engineer base stores depot at Beit Nabala, near Lydda. The depot, which occupied some 500 acres, lay close to the eventual dividing line between Jews and Arabs after partition. Most of the squadron was deployed maintaining track and structures in the many other rail-served depots throughout Palestine. My first task was to construct new sidings and facilities for the planned move of 199 Railway Workshops from Lydda into Beit Nabala. Man-management was tested a few days after my arrival when news came that two British security sergeants had been murdered by Jewish terrorists, their bodies left hanging from a tree and booby-trapped. Our soldiers were all for making their way to the nearest Jewish settlement and exacting revenge: restraining them was not easy.

Beit Nabala contained stores, workshops and plant worth several million pounds. The extensive perimeter was guarded by Mauritian troops and guard dogs and doing the rounds at night as orderly officer could be exciting. The guards were somewhat trigger happy and the dogs had already accounted for several Arabs attempting to steal stores. Excitement was also on offer when, during 8/9 August, the squadron assisted the Palestine police in a major night operation to capture illegal arms hidden in Ramleh. The next day, a Jewish force attacked the Transjordan Frontier Force (TJFF) camp alongside our perimeter and we watched the spectacular battle.

Palestine Railway's locomotive on new track laid by 603 Squadron near Beit Nabala

Life was not all action. During August parties from the squadron visited Jerusalem and also Latrun monastery, between Lydda and Jerusalem. The monks made us very welcome and we later organized a number of "retreats" there for our men. We also bathed in the sea at Jaffa, until someone mined the beach and blew up an army 3-tonner. Within the base there was plenty of football and a large camp cinema.

Following the UN decision in November, Arab labour throughout Palestine went on strike and the TJFF refused to serve any longer, decamping into the hills with their weapons. The other Arab force stationed alongside our perimeter, a unit of the Arab Legion, remained loyal. But in the country as a whole, Arab opinion turned against us, with good reason, it being the second time that we had let them down – the first being at the end of the 1914-18 war when we reneged on the promises made to Feisal during the Arab Revolt. Bricks were thrown at our vehicles in Lydda and Nablus.

With the announced ending of the mandate, the squadron's role changed. The emphasis now was on recovering as much track and railway equipment as possible whilst continuing to maintain track and structures needed to clear the rail-served depots. Rail was to play a major role in getting military stores and equipment out of the country, either overland to Egypt or to Haifa for shipment. My ever-cheerful sappers toiled at taking up all the new track they had laid after my arrival.

On 14 December, I was conducting a visiting officer round the camp when heavy firing broke out and we dived under our jeep, which was hit by several machine-gun rounds. A Jewish convoy bound for a kibbutz had provoked an attack by the Arab Legion, possibly a premeditated ambush, and their fire came into the squadron lines. Twelve Jews were killed, all young men, and when things had quietened down we recovered the bodies to a makeshift mortuary in the camp. Amid all this tragedy it was moving, ten days later, to attend midnight mass in Bethlehem, an expedition we had been advised not to make but which we accomplished without incident, returning to camp at dawn on Christmas day.

Train blown up by Jewish terrorists near Rehovoth on 29 February 1948, in which some 35 British soldiers were killed.

My attitude at this stage to the Jews and Arabs was somewhat ambivalent, as it was with most of us. Before coming out I had read *The Seven Pillars of Wisdom* and Ronald Storr's *Orientations* and my sympathies were firmly with the Arabs. But a few months in Palestine had shown me the way in which the Jews, by hard work and ingenuity, had transformed the areas they occupied, citrus groves replacing desert and neat settlements the dusty Arab villages. But there was no doubt that the Jews had been more active in

their hostility towards us and this in the end swung our sympathies towards the Arab cause. Of course, in our official dealings with the two sides we tried as best we could to be impartial.

During January 1948, Arab crews refused to work trains on parts of the railway system and sappers from 193 Railway Operating Squadron took over. At once, trains they were operating came under attack and two were wrecked by mines, luckily without serious injury to the crews. Much more serious were two further attacks by Jewish terrorists, the first near Rehovoth on 29 February and the second between Lydda and Haifa on 31 March. The first train attacked was carrying British troops, about 35 of whom were killed and over 40 injured. The second resulted in 100 civilian casualties, including 40 dead. After these atrocities, 193 Squadron was obliged to take over the entire operation of the Lydda-Haifa line, followed soon after by the line from Lydda to Jerusalem. 603 Squadron was kept very busy repairing and maintaining these lines. This could be lonely and potentially dangerous work. The tasks might be anywhere on more than a hundred miles of main line and most required no more than a section. With the constant possibility of attack, the sometimes quite junior NCOs in charge were responsible for the defence of their party as well as the work. The traditional "look out man" was watching for more than approaching trains. As time went on, the track deteriorated despite our efforts, and derailments, especially in the depots, became common. Since some of the track was dual standard and 105cm gauge, rerailing heavy locomotives and wagons within a web of damaged rails, especially at points and crossings, and with fairly basic rerailing equipment, could be difficult. Some of the locomotives were indeed heavy since we were using ex-London, Midland, Scottish Class 8F 2-8-0s and comparable Palestine Railways main line locomotives, and wagons were usually loaded to capacity or beyond.

Destroyed bridge near Acre on the Haifa-Beirut-Tripoli line.

The Last Four Months – Northern Palestine

In late February 1948, 603 Squadron left Beit Nabala and moved to Haifa. The move coincided with two unfortunate incidents – our detachment in one of the more remote depots, at Al Jiya, was attacked, several sappers being wounded; and one of our sergeants, returning late to camp attempted, foolishly, to climb back through the perimeter fence and was shot dead by a young sapper from the squadron who was patrolling the fence. Two days after we arrived in Haifa, sharing a camp with a movement control unit, the *Haganah* started a vigorous bombing campaign aimed at forcing out the Arab population – an early example of "ethnic cleansing". Our camp was situated between the Jewish and Arab areas of the town and when heavy fighting broke out between the two sides, in early March, we were forced to keep low as the battle raged above our heads. Movement, especially at night, became hazardous.

At this stage, major efforts were being made to clear stores, military equipment and munitions from depots around the country for export through Haifa or for dumping at sea. 193 Squadron, trying to move as much of this material as possible by rail, was under constant attack. All trains needed armed escort. A sapper signalman in a signal box near Haifa was murdered and his rifle stolen; an ammunition train on the Lydda-Haifa line was attacked by a Jewish force, three of the Gunner escort being killed and the sapper engine driver seriously injured; and another train was wrecked and attacked just north of Lydda, here again three of the escorting soldiers being killed and the sapper fireman fatally wounded. The attack on the ammunition train ended in a dramatic rescue operation. When news of the attack reached the Railway Control in Haifa, an officer from

"Holding up the express."
Derailed Class 8F locomotive near Haifa. May 1948.

193 Squadron, accompanied by the local Palestine Railways manager and two co-opted infantrymen hurried south in a locomotive. As they approached the stricken train they exploded a mine but managed to open up with two bren guns, driving off the terrorists who were still transferring ammunition to waiting lorries.

By 25 April the worsening situation led to all train operations outside the Haifa enclave being stopped. One of the last depots to be worked, at Tel Lewinsky, was mined during one night and as I arrived to pay the detachment my vehicle exploded a mine, one of the front wheels being blown off. The corporal in charge said "We thought there was one on that track, Sir, but we weren't sure". I can't remember what I replied but it was probably not too polite. In spite of all these attacks, 193 Squadron had succeeded in moving some 270,000 tons of stores by rail, exceeding the target of 250,000 tons.

Late April saw the start of a major offensive by Jewish forces, aimed at clearing Arabs from areas that would fall to the Jews under partition. Action against the British reduced in consequence, aided by the fact that most British troops were now within the Haifa enclave. At this stage also, the Palestine police started to withdraw and law and order collapsed in the face of what was now open civil war. The time also came for 603 Squadron to leave the country, moving by road to Egypt where it would be disbanded. Before it left, the OC, Major Toby Goodwin, handed over to the 2IC and moved to 193 Squadron, where he was to take over command. I went with him. 193 Squadron's HQ was located at Ezzib, on the Palestine-Lebanese border. It occupied a depot holding mainly railway stores and was on the Haifa-Beirut-Tripoli railway. By the time we arrived, major bridges to north and south of the depot had been blown up and stores were being moved to Haifa by road. We watched as a number of locomotives made the journey on low-loaders; they were still in steam and went through villages on the way with whistles blowing and amid cascades of sparks as overhead wires were brought down.

The Ezzib depot was proving attractive to the local Arabs who were making regular raids through the perimeter fence to pilfer stores, especially railway sleepers. We went to visit the nearby village headman and told him that, as he knew, we would soon be going but that whilst we remained we had a duty to safeguard the camp and its contents. We said that if the raids continued we would shoot to kill any intruders. He accepted this philosophically. The raids continued and we opened fire, killing several Arabs on or within the perimeter. After this there was a lull but when the stealing resumed we laid an ambush and fired a PIAT at close range at a truck being used to load the stolen goods. The truck burned fiercely for the rest of the night.

The outgoing OC had established relations with one Mezin Bey, the leader of the Arab forces in the area and, before he left, he took Major Goodwin and myself to meet him. It was "cloak and dagger" stuff as we were blindfolded and driven into the hills, to be offered a lavish meal in a tent guarded by well-armed tribesmen. The Bey seemed well disposed towards us and totally unconcerned at the action we had taken against the raiders of our camp. To balance this liaison with the Arabs, part of the squadron turned out one night to help a group of illegal Jewish immigrants whose small boat had become stranded on

rocks just off the coast not far south of our camp. They had set off from a ship coming from Europe and were in a wretched condition, men, women and children. We set up a searchlight and helped them ashore, giving them mugs of hot tea before they disappeared into the night. I am sure that what we did was against all the rules, but we put it down to "humanitarian aid".

On 1 May the squadron abandoned Ezzib and moved in convoy to Haifa. The villagers, some of whose relatives we had killed, lined the road to wave us "goodbye" before rushing into the depot to see what we had left! In Haifa we occupied a vehicle repair depot (VRD), abandoned by the departing Palestine police with its vehicles, stores and workshops. Like our previous stay in Haifa, the VRD was on the boundary between the Jewish and Arab sectors and again we found ourselves under nightly exchanges of fire. As the weather was getting warm we slept on the flat roof, under mosquito nets, and often fell asleep with tracer passing overhead. The mosquito nets were needed not so much against mosquitoes as against the flies that had become a plague.

Two weeks after we arrived in Haifa, the mandate came to an end. There was a ceremonial parade to mark the departure of the High Commissioner, and on the same day, 15 May, the first Israeli-Arab war started: Egyptian forces crossed the Sinai desert, the Arab Legion crossed the Jordan and occupied what is now the West Bank, and Syrian and Lebanese forces advanced from the north. Jewish forces moved north from Haifa to occupy Acre. Meanwhile, within the Haifa enclave preparations were under way for our final evacuation. Since April, following the defection of most of the civilian work force, the port had been operated by 1261 Port Operating Squadron and 193 Squadron was now called on to assist with the loading of ships, our men working 12-hour shifts as well as continuing to operate trains within the enclave. During this time, thousands of Arab refugees poured into the port area from whence they were shipped, in Z-craft operated by 1207 Inland Water Transport Operating Squadron, to areas north still in Arab occupation. The sight of these sad people, clutching their few belongings, reminded us of the Jewish immigrants we had helped earlier and underlined the tragic nature of the events taking place around us.

June was a strange month, as within the enclave we were largely left alone whilst we followed the news of Israeli-Arab battles not far away. The final stores were loaded and troops evacuated and on 28 June we left our cramped accommodation in the VRD and embarked on the troopship *Orduna* in Haifa harbour. On 30 June we posed for photographs beside the last locomotive on the quayside, still in steam, and watched troops from 1st Guards Brigade beat retreat along the Haifa waterfront. At 1240 the GOC paid a formal call on the British Consul before the Union Jack was lowered, a 15-gun salute was fired and 30 years of British rule came to an end. As we sailed out of the harbour, the RAF flew overhead and we saw ahead, like ourselves heading for Egypt, an impressive flotilla of Z-craft carrying the last stores and vehicles.

A few days later I joined 10 Railway Squadron at Adabiya, south of Suez. Palestine had shown me the improbability that I should return to a routine job on the railways at home and my application for a regular commission was being processed.

Palestine, in the three years before the ending of the mandate, had posed many problems for the British garrison, not least for the transportation sappers involved. It had cost the lives of 233 British soldiers, including 22 Royal Engineers. It is a sobering thought that these sacrifices might have been avoided if politicians in the aftermath of the 1914-18 war had acted differently. But all that is in the past. My abiding memory today is of a country steeped in history and at times very beautiful, of the sorrows heaped on the people, Jews and Arabs, and of the way in which our sappers, mostly very young, had coped cheerfully and with professionalism with everything that was demanded of them. It had certainly been an eventful, and rewarding, year.

No Breakthrough in Land-mine Clearance – But Encouraging Messages From Practice and Technology

COLONEL STEWART GRAINGER BA FIMgt AMRAeS

Stewart Grainger trained as a civil engineer and enjoyed a full career in the Royal Engineers. Field tours in airborne and main stream engineer units and army aviation, culminated as the Commander RE of 1st Armoured Division. As a staff officer he was the Senior Military Advisor to the Director of the Royal Aircraft Establishment and the Chief Scientist of the Army.

Stewart Grainger joined British Aerospace Royal Ordnance in 1989 since when he has managed land mine projects and directed demining contracts in Kuwait and Mozambique. In 1995 he was active in the NATO Industrial Advisory Group Study Group 49 conducting a pre-feasibility study into the remote control of mines and minefields and again in 1995/6 with Study Group 51 into the close-in detection and neutralization/destruction of mines and munitions. He is currently based at the Defence Evaluation and Research Agency Site at Fort Halstead involved in the alignment of his company's and MOD research programmes.

He is the Chairman of the UK Defence Manufacturers Association Special Interest Group on Mine Clearance.

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"Thousands of deminers risk their lives every day to try to clear the world of the 110,000,000 land-mines that already lie uncleared."

Secretary General of the UN, 1996

THERE is a major land-mine clearance problem in the world today and good work addressing the technical problems involved with the removal of mines after conflict is being done in the US, the UK, Germany and France. This article gives a personal view, from a commercial perspective, of the current situation and indicates priorities for future research.

SAFETY

SERIOUS accidents and deaths involving civilians, and military and professional mine clearers graphically demonstrate the dangers of land mines. Experience has shown that accidents, and their associated publicity, can weaken political resolve to proceed with demining operations and discourage commercial interest. Mine casualties in the British Army's Royal Engineers had a major impact on Margaret Thatcher's government which decided to fence and not clear minefields following the Falkland Islands conflict. For commercial companies, accidents and the resulting increases in insurance premiums can erode profit and undermine competitiveness.

The hazards and potential for accidents has made safety during demining operations the key factor for military, commercial and non-government organizations.

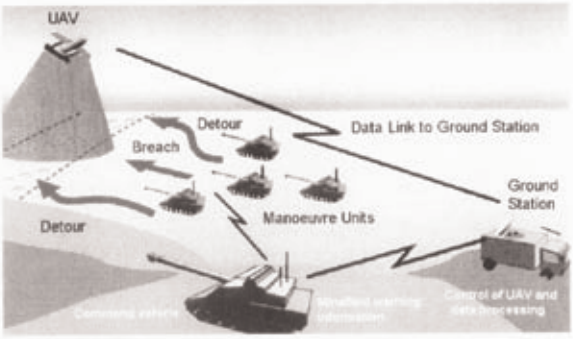
DETECTION

IN a perfect world a target of 100 per cent for the detection of mines should be the aim, however, technically this is not possible at present.

The UN stipulates a 99.6 per cent clearance standard which makes quality assurance and proof of compliance very difficult. After much debate with some astute commercial protagonists,

Col Stewart Grainger
No breakthrough in land-mine clearance p134

UN contracts now specify a quality regime that requires the reclearance of areas where a percentage of mines has been discovered during the quality assurance process. This is a realistic approach. The message for scientists is that technological improvements are required to improve the performance of detection systems.



DERA technology demonstrator programme – REMIDS concept.

Clearance Methods

Hand clearance using mine detectors and prodders, is currently the only method that approaches the UN's clearance standard. This is well-known and was evidenced in the European Union funded invitations to tender for the recent minefield clearance contract in Northeast Zimbabwe: only hand clearance was acceptable.

A wide range of machines is available, such as ploughs, flails, rollers and explosive hoses, and these can be fast but they require capital investment; they also only reduce, not remove, the number of mines present. Their utility is usually for military minefield breaching.

Proven and commercially available mine detectors are based on metal detection technology. However, the small metal content of some mines makes them very difficult to detect; a technical problem yet to be resolved.

The Threat

On the right is a table showing a summary of current threats: anti-tank, anti-vehicle or anti-personnel; some will have anti-handling devices. In a minefield an additional hazard can be the presence of UXO; all in all a very dangerous and complex environment.

Mine Clearance Challenge

Bearing in mind that the conventional method of mine clearance is by hand which is recognized as being slow, expensive and dangerous, it is important to examine the basic elements of the problem to seek a way forward.

Where to start?

In Kuwait in 1991 in the aftermath of the Gulf War there were live, spent and unexploded munitions everywhere. The initial problem was: when and where to get the bayonet and detector out and go to work? The inclination was to start everyday by clearing from your bed to your boots and then to proceed very carefully. This procedure may be necessary in battle, but after a war there are usually indicators and equipment to help speed up movement. There may be animal and human tracks and even vehicle tracks to follow with reasonable safety. There are also mine resistant vehicles for safe transportation. With a mine threat, the problem for the population, the military and the contractor is to find out where they are laid and avoid wasting effort looking in areas where there are none.

The US has had government-funded programmes for the past 15 years researching stand-off airborne sensors, and system-level trials are in

Placement	Type of Mine/ Delivery	Activation Methods	Attack Methods
Above Ground	Area Off route Directional Jumping	Seismic Acoustic Infra red Radar Trip wire Command	Blast Fragments Explosive jet
Surface	Scatterable Hand laid Machine laid	Pressure Trip wire Magnetic Influence Command	Blast Fragments Explosive jet Explosive plate
Below Ground	Hand Planted Machine planted	Pressure Influence Command	Blast Explosive jet Explosive plate

No breakthrough in land-mine clearance p135

MEDDS minefield surveillance vehicle – CASPIR.

progress. For many years Germany has had programmes researching the visual and infrared spectrum. In the UK the MOD has funded the Defence Evaluation and Research Agency (DERA) for the Remote Minefield Detection System (REMIDS) Technology Demonstrator which started in 1995 and runs until 2001 *(see concept illustration on previous page.)*

Research suggests that remote surveillance has promise but technologies that may have potential for military minefield surveillance may not be effective for humanitarian demining. The difference is that, during combat mines will have been recently laid and more readily detected. When mines, and the ground disturbed in the laying process, have had time to settle, they are much more difficult to detect with remote sensors. Also the military will be primarily seeking anti-vehicle and anti-tank mines which are larger in size, contain more explosives and are accordingly more easily detected.

The South African Mine, Explosives and Drug Detection System (MEDDS) has proved to be effective in locating areas where military actions have taken place and where mines may exist.

Air samples are taken and dogs are used to indicate where explosives are present. Conventional methods are then used to locate, identify and dispose of any mines and munitions found. The advantage is that the slow hand detection and clearance methods are only employed where explosives have been used. MEDDS was employed in Mozambique in 1994; 2000kms of roads and tracks were surveyed and cleared in under six months and all the work passed the UN independent quality assurance inspections.

MEDDS is limited by the weather and will indicate all the debris of war such as spent ammunition cases and weapon fragments that have been in contact with high explosives and propellants: hundreds of thousands of items! However, MEDDS has proved to be a breakthrough for rapid surveillance, ideal for use in former combat areas where road and rail communications can be opened up quickly, and minefields identified and left for deliberate clearance later. It is difficult to compare mine clearance techniques in absolute terms but when considering an earlier road clearance contract in Mozambique that had similar manpower resources, MEDDS showed a 15-fold improvement in the time taken to clear unmetalled overgrown roads.

Combat debris.

Locating the mine

Once mined areas are defined, the task is to physically locate each device so that it can be cleared. There are many conventional metal detectors on the market today, each with its strengths and weaknesses. The key to selecting the correct type of detector for a specific task is to ensure that it matches the following: the

- depth of detection required;
- sensitivity to detect expected hazards;
- capability of the operators to be employed;
- available power supply (batteries/battery chargers);
- metal content of the soil in the area to be cleared;
- extent of the operation – robustness of the equipment and,
- available servicing and repair chain.

In practice the selection of mine detectors can only be done by operators on the ground in the areas to be cleared.

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Above ground devices and trip wires are very difficult to detect safely and more so in areas overgrown with vegetation. Ground Penetrating and Millimetre Wave Radar show promise, but no proven system using these technologies is available today to the commercial practitioner.

The clear message from research is that no single technology can offer both high detection performance and the required level of efficiency. By associating several types of sensors and using data fusion techniques to cross-cue sensor data, both detection performance and efficiency can be improved but such progress is forecast to depend on advances in data fusion that are some five years in the future.

Once Detected Must It Be Neutralized?

Once a suspect device has been located and uncovered, the problem is to decide whether it is a hazard. Today, only man can make this decision. His training and experience will identify the device and decide whether to ignore it, render it safe or destroy it. For the future, by careful directed research, identification in multi-sensor systems should be feasible during the data fusion process. Images can be matched with known mines in similar ways to the target matching processes of guided missiles. For the military the challenge is speed with a requirement that data fusion and target identification processes match the wish to clear a route at 50km per hour. For humanitarian mine clearance safety and quality predominate and hence when time is not critical practical systems may become available earlier.

The process of deciding whether a located object that is not recognized is a hazard, is a further area for research. Current research is following the line that: if a device contains explosives and/or explosives vapour it is a hazard, and so technologies are being developed to detect the explosives contained in mines. In this respect promise is evident with Nuclear Quadrupole Resonance and Fast Neutron Activation technologies. A summary of detection sensor technologies can be seen on the right.

Disposal

Mine and munitions disposal has not been an area of high investment in recent years. Microwave ovens to bake mines, corrosive chemicals to neutralise detonation trains, electromagnetic signature duplicators to trigger

MEDDS dogs can indicate presence of explosive's vapour.

mines and large weights to over-pressure and disrupt mines have emerged, but none have proved to be effective to the required humanitarian standards.

There is a military drive to acquire a vehicle mounted system for the rapid clearance of routes in peace keeping and peace enforcement operations. If, and when, such a system is produced, there will be a follow-up need for self contained, remotely placed, vehicle mounted destruction or neutralisation tools.

Recent developments in the disposal of mines in the UK have come from the DERA with a device called FireAnt. This is a high temperature pyrotechnic torch that can be used against exposed mines to cut through the mine case and burn the detonator and explosives. High order

Sensor Technologies
Present day/near term (maturing technology):
Video Video (360°) – rotating camera Forward-looking infrared Electromagnetic induction – metal detector Ground penetrating radar Ion mobility spectrometer Active infrared sensor (360°) Active millimetre wave radar
Future (research)
Polarimetric/hyperspectral camera Nuclear quadrupole resonance Passive millimetre wave radar Fast neutron activation

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DERA FireAnt in position ready for ignition.

detonations are possible but in trials have proved to be rare. This product could become a commercial success if it can be sold at an economical price. The cost of detonating a single mine with explosives can be as little as £2.50 per mine, depending on the source of the explosives. For FireAnt to be competitive, its developers must approach this unit price. The advantage of FireAnt is in its ease to store, transport and handle. It is not classified as an explosive store.

The message from mine disposal studies is, just as for detection, no one technology is capable of defeating all possible threats. A selection of tools is required. In the table, right, can be seen a summary of neutralization/destruction technologies.

Conclusions

Public and political awareness of the dangers and problems of removing land-mines has undoubtedly focused research and attracted resources in western nations. Research is currently focused on detection but that research has yet to make real impact in the field. Therefore, at present, the traditional methods of using hand held detectors and prodders are still the only practical and reliable way to achieve the UN Clearance Standard of 99.6 per cent.

Mine & Munition Neutralization/ Destruction Technology

Current & Future Technologies	Technologies with Development Potential	Technologies for Future Research
Flails		
Rollers		
Ploughs		
Laser Beam		
Ballistic Disk		
Rake Plough		
Radiation Cone		
High Explosives		
Shaped Charges		
Vibrating Rollers		
Full Width Plough		
Fuel Air Explosives		
Track Width Plough		
Signature Duplicator		
Electromagnetic Pulse		
High Power Microwave	Heating	
Scatterable Mine Plough	Laser Beam	
Explosive Formed Projectiles	Direct Fire Weapon	
Dismantling by Remote Control	Mechanical Aggression	Charged Particle Beam
Chemical Neutralization	Handling	
Gagging and Jamming	Burning	
Charged Particle Beam		
Direct Fire Weapon		
Explosive Removal		
Smoke Obscurant		
High Pressure Jet		
Heating/Burning		
Cutting Charges		
Electric Arc		
Freezing		
De-armer		
Decoys		
Foams		
Tiller		

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Miles Behind The Lines

J W POUNDER

The following is a shortened extract from a book (unpublished) which has been written by the author. It is a story about the lives of men who took part in the D-Day landings in 1944. The book goes on to relate the continuing story of the men who finally took part in the push over the Rhine.

ONE day in early summer 1944, Jack, Bolton and "Brummie" were ordered to Southampton to take delivery of a "Rhino Ferry". The ferry was high and dry when they got to it, due to the low tide, so they took the opportunity to walk around the park for a while. Jack found his favourite dancing partner there and told her to watch the papers for major events about to happen, advising her to keep her mouth tightly shut until then! When the ferry was afloat, the engines were started and they sailed out onto a sparkling sea enjoying a leisurely trip back to the Isle of Wight where the the ferry was tied alongside a Landing Ship Tank.

On the evening of 4 June all men (who had been confined to camp) were ordered to collect their equipment and board various transport craft by the dockside. Jack and his ferry crew were placed aboard the Landing Ship Tank which was to tow their ferry over to France.

Terry, the corporal, had shown them a marked map showing the exact spot where their cargoes would be discharged onto the beach, and left them to find a corner of the deck to settle in for the night. Depositing their kit they made their way to the canteen where a sumptuous meal was provided, American fare, which they enjoyed enormously. Fully believing that they would be in France by early morning they were too excited to sleep and, as rain started to pour down, they constructed a tent, using two winches to anchor their groundsheets.

By dawn the sea had grown rough and the rain heavier. Several smaller landing craft sailed by in the wrong direction, as if returning from landing troops, and many of the men waved and cheered believing that landings had already been made. It was not known that the departure had been delayed for another 24 hours.

Late that night, 5 June, all ships began to move slowly into the darkness. Several miles out the sea heaved in huge heavy swells causing great discomfort aboard smaller craft.

Most men were in a quiet, tense state wondering what the morning would bring. Adrenaline flowed as they contemplated the vastness of the operation ahead. Would it fulfil their youthful dreams of adventure and brave deeds? Would they be brave? Would they be full of fear? Only dawn would reveal the calibre of the inner man. Whatever, they were on their way.

The clouds, scudding quickly across the sky, cleared a little during the crossing allowing the moon to shine down on the thousands of ships which could be seen in every direction, each one towing a barrage balloon like a silver banner in the sky. Nobody felt alone. It was as if the whole of the western world was there and many a man felt his heart surging with pride because, after all the setbacks and defeats of the war, the enemy was about to get the biggest beating in all history! Throughout history the British had faced fearsome odds and won the day. With an armada as large as this and including Canadians and Americans, they could not fail!

Jack was watching the fluorescent whirls of the sea sweeping the hull of the ship as it moved steadily forward. Twin-hulled planes flew over, heading for the French coast; probably support fighters for the planes carrying the first men to be dropped into enemy territory.

The fleet slowed down and came to a stop mid-channel allowing craft in the rear to catch up and the gunners to prepare and man their weapons. Jack noticed a black American gunner sitting at an anti-aircraft gun, ready for action. The man wore a peculiarly wide helmet as if to protect his shoulders from enemy fire.

Thinking about the next day Jack decided to see the skipper and ask whether he (Jack) could try the ferry engines to make sure they would start when required in the morning. "Sorry" said the skipper, "We could be ordered forward at any moment which would not give me time to pull the ferry alongside, so you will have to wait and hope for

A photograph of the author, Spr William Pounder, aged 20, taken 1944.

the best." Jack felt that the engines were going to give trouble because of the rain and sea water.

The ships slowly moved on and mugs of cocoa were issued so Jack and his crew settled down to a game of cards to pass the time until dawn which was not far off.

In the first light peaceful green hills appeared just beyond the horizon. The first glimpse of France. The fleet was creeping forward almost silently. Then the beaches could clearly be seen and landing craft sped forward to discharge the first load of infantry, with tanks following close behind. Jack could see four villages which he knew from the map seen earlier to be Courselles, Ver-sur-Mer, Asnelles and Arromanches.

As the landing craft were speeding over the waves toward the beaches the men wondered what welcome would be waiting. Spasmodic firing could be heard but it seemed that most of the Germans were still in their beds. The infantry sped towards the villages which were quickly cleared of the enemy. A grenade put the gun site out of action on the promenade of Asnelles but unfortunately an infantry officer fell during that action and he was to lay there for the rest of the day, his revolver laid across his chest. A written account stating the gun site had stayed in action until 8pm just wasn't true. By 8pm our troops were seven miles inland.

Jack saw very few casualties on the beach. The infantry could be seen running up the hill with tanks close behind them. They suddenly dropped out of sight and a tank moved forward towards a small farmhouse being used as an enemy gun position. Two rounds fired point-blank sorted the problem and the infantry were soon over the brow of the hill and out of sight. The Medical Corps took the wounded to shelters to attend to their injuries.

The REME and RE were now busy on shore removing obstacles and laying wire mesh mats to enable vehicles to drive over the sand. Supporting troops and machines began arriving in great numbers.

It was now time for Jack and his crew to play their part and they prepared to descend the nets to board the ferry which had been brought alongside. At that moment a sound like mountains cracking open blasted the air as all the guns of the mighty fleet opened fire in one great savage roar of challenge. The shock and the blast flew over Jack's head as he climbed down.

Jack's earlier fears were confirmed: the engines would not start. The batteries showed no sign of life and Jack felt terribly embarrassed as he turned to face all the men watching him from the rails and shouted for a heavy-duty battery; once aboard it got the engines working in seconds.

The ferry then manoeuvred towards the bow of the ship, which had opened its massive bow doors, and made secure. A ramp was lowered and boarding began. Supply lorries, machines and guns of all descriptions plus crews and supporting men were loaded until almost every inch of the deck was covered. The weight took the ferry deck down to sea level; it must have been a remarkable sight to see so much war material apparently floating unaided over the surface of the sea.

With an officer on the roof of a wagon at the bow end and Jack on top of a wagon at the rear, the ferry made its way toward the beach. Hand signals were used to give directions for steering.

The next load took longer as most of the materials had to be brought down to the hold from the deck using deck floors similar to those that car ferries use today. The final item, a massive bulldozer, was placed into position between the ferry engines and the vessel set off once again. By the time the deck was cleared this time the ferry was grounded

as the tide had receded. The bulldozer was not required immediately so it was left as was a large wooden box which had been rescued from the sea. When opened the box was found to contain thousands of cartons of cigarettes which were shared out and stuffed into kit bags. Some slightly damp packets were placed on the engines to dry out.

Jack decided to while away the time between tides exploring the area. Walking only where vehicles and feet had left tracks he inspected the curious gate-shaped items known to the Germans as Belgian Gates. Thousands of angle iron lengths welded together in the form of stars littered the beach. And there were lengths of tree trunks with shells fastened on the seaward ends to pierce and explode under the bows of landing craft: obviously successful as several landing craft had been holed and were now stranded. Jack noticed a tank which had bogged down so far into the sand that it had been abandoned. Suddenly the roar of aircraft was heard and two German fighter craft approached flying low to prevent anti-aircraft gunners firing in case they hit our troops. The planes did not fire at anyone, they were in fact filming the landings. The films are on show at the *Musee du Paix* in Caen.

By now the main body of Royal Engineers selected to work on dock installations and other sea and river related activities were landing. A ferry was used as a landing jetty to make it easier for the Pioneer Corps to unload barges.

A good number of tramp steamers, having discharged their cargoes, were anchored offshore and were used later to form a breakwater, code-named *Gooseberry*.

A fleet of dredgers and lighters plus floating cranes had been assembled from all parts of the British Isles and even from Canada. Manned by Royal Engineers they would do sterling work from Normandy to Holland.

George Galtress, a railway man from Doncaster in charge of a Thames barge, was working directly to the beach where men from the Pioneer Corps unloaded their cargo. Another man unique to the Royal Engineers, was a man well into his seventies! When Jack asked how, at his age, he had got into the army, the man replied: "I am a Thames barge man and this is my own barge so I would not let the War Office have it without me to look after it." He was probably the oldest man in the invasion force. Charlie Carter was operating his ferry to *Pluto*, code-name for the beach in the Canadian sector. (Two of Jack's cousins from Saskatchewan were already ashore on *Pluto*.) Charlie had a load so heavy that the deck was near to six inches under water!

Jack wandered along the sea front and tried to talk to some of the French villagers using a standard phase book issued to the troops, but as the book contained only questions it was impossible to understand the answers.

On top of the hill separating Asnelles from Arromanches Jack discovered a small monument commemorating the fact that Admiral Nelson had bombarded Arromanches, and also stating that the brave French sailors had repelled the attack. Two cannon balls of different calibre were embedded in the monument, obviously souvenirs of the attack. He joked later that he had found Nelson's balls in Normandy!

It should be mentioned here to those who have never heard of Asnelles that most references to that area use the name "Le Hamel", a district of Asnelles and at the time not even shown on maps. The beach and the roads running alongside and beyond are part of the village and were an important asset to the forward movement of men and machines but due to this mistake the village did not share the fame accorded to the other villages.

With plenty of time before high tide Jack continued his exploration. The beaches began to look like Blackpool at the height of the summer season. The sun was warm and hundreds of thousands of men were busy about their various tasks; more ships could be seen arriving. A site just beyond Courselles was being levelled to create a landing strip for aircraft. An anti-tank ditch was quickly filled in. Anti-aircraft guns were erected on the shore near the beach and field hospitals were established. The beachmaster with his loud hailer and his dog were comfortably placed surrounded by sandbags at the exit from the beach at Ver-sur-Mer. A flail tank was at work in the fields beyond the beach.

A fat German lay dead on the garden path leading to a house. A few cattle were dead in the fields with their legs sticking grotesquely skyward. A bomber came flying toward the sea with one engine on fire, heading home.

Jack watched a group of Engineers prodding the earth near the roadside. "Odd" thought Jack, "what happened to the mine detectors that are supposed to be used for that job?"

"Bugger off you silly sod!" bawled a corporal in charge of the group, "If one of these goes off you will be blown to pieces with the rest of us." Jack made a hasty retreat.

The roads were now full of vehicles looking for the way forward. A lonely red-cap stood like a policeman on point duty directing the flow inland through the narrow streets of the village to the open spaces beyond. The infantry were seeking snipers in the small wood beyond Ver-sur-Mer. Vehicle camps were being established and houses within villages were selected for use as command offices.

Still the guns were blasting away at points further inland but Jack didn't seem to hear them any more. There was so much going on to keep his mind off the noise.

The sun went down and a bright moon shone in a hazy sky. The tide was almost high enough to refloat the ferry so Jack made his way back. As the moorings were released a voice shouted through the artificial fog now being created by the ships, "Ahoy there, will you take these bastards off my hands and place them aboard one of the ships?" An officer and some men came into view herding a couple of hundred German prisoners. After loading them they set off into the murkiness: three men in the dark with 200 Germans and only one man to watch them as the other two manned the engines! For all the many thousands of ships anchored in the area not one could be sighted through the murky fog. Eventually a ship, a Lighter, appeared out of the gloom and they pulled alongside. As the Germans scrambled over the deck, an angry roar came from the skipper, "Get those sods of my ship now or I'll throw them into the sea!" One of Jack's crew went aboard and, firing a shot in the air, motioned them to return to the ferry which they did in double quick time.

Once more into the murk. A flurry of shells came flying over splashing around the ferry and sending great spouts of water up, spraying everybody. The Germans panicked and were moving aft to seek shelter near the bulldozer. Bolton fired his rifle over their heads fearing the consequences of three sappers alone against 200 prisoners. They could quite easily have taken control and sailed the ferry toward enemy-held beaches. However a sharp order in German was heard and the prisoners flattened themselves on the deck.

Sailing on, it seemed impossible that it was so difficult to find a ship among the several thousand known to be at anchor but suddenly the welcome sight of an American landing ship appeared out of the gloom. Jack hailed the ship, requesting that they accept the Germans, and was ordered to tie up alongside. A German officer spoke to Jack in perfect English stating that he had a seriously wounded man who should be taken aboard first. Scrambling nets had been lowered so Jack shouted for a stretcher and medics to attend the man. Soon the prisoners were safely stowed below where they were quickly divested of any item useful as souvenirs by the American crew.

Jack and his men were now extremely tired. It seemed to them that as if in a dream they had been watching an exciting war film in which they saw themselves playing leading roles and had not slept because they did not want to miss any of the action. They went aboard the American ship to seek a hot drink and then retire for the night. Jack went to the operating theatre to enquire about the condition of the wounded man and was told that he had died. They showed Jack the enormous hole in the man's side, large enough to insert a fist, and stated that due to the under garments and items that the man had on they believed him to be British so he would be handed over to the British force for burial.

Jack found a doorway to shelter in on deck and immediately fell asleep to be awakened by the warm sun late next morning. As he slept, he was not aware that seven miles along the coast at Courseulles his CO, Major Ingram, and a group of 32 men were approaching the shore in a landing craft.

The Bosnian Experience

LIEUTENANT CHARLIE BATTEY

The author was commissioned into the Corps in August 1995, and immediately sent on an attachment to 28 Engineer Regiment. After completing the troop commanders course he was posted to 38 Engineer Regiment, in 1996, serving with them in Kenya and Bosnia before returning to the UK as a troop commander at ATR Bassingbourn.

THE RAF Tristar dropped out of the clouds and immediately the cabin was filled with bright Croatian sunlight shining through the tiny windows. Banking sharply to the left, the plane began its approach to Split airport and the soldiers within started donning their warmest clothes, as they had been warned how cold it could be in mid-September in this part of the world. Alighting from the Tristar into the glorious sunshine, they felt its dry heat against their faces and discovered one of the many freak changes in weather that would confront them over the next six months.

During the long coach journey new members to this part of the world began to discover the real Bosnian experience. A climbing road led into the rocky mountains that lie on the border between Bosnia and Croatia, and then to the rolling hills, with scattered trees and bushes, around Tomislavgrad. The temperature dropped slowly as we climbed higher and moved further north. Next came the flat plains of Kupres, where a burnt-out T55 tank was pointed out to me. Not only had the topography of the land changed, but I then noticed the change in the nature of the country; the bombed-out buildings, the hundreds of car wrecks strewn along the side of the road and the miles of open country which hid millions of deadly mines.

Moving slowly toward our destination, the landscape changed once more as we passed through the eerie surrounds of the Kupres Tunnel. This time a steep downhill run through mountains thickly covered with trees, just turning from lush green to golden brown at the first touch of autumn. (A stream ran alongside the road babbling with crystal clear water that would soon turn to ice.)

Local Bosnian drivers managed to keep you wide awake and your heart pumping by their wild overtaking, and this helped the time pass quickly. On many occasions the coach rounded a tight corner to find a local at the wheel of a humble VW Golf, driving on the wrong side of the road as it tried to overtake a slow moving lorry struggling up the mountain.

We neared our final destination and home, Gornji Vakuf had seen its share of war over the last few years. To the left and right of the road, where houses had once stood, lay piles of debris that bore witness to the destruction that had gone on. In places people were moving about and businesses had sprung up in an attempt to return to normal. More cars lay wrecked at the side of the road here, but cars were not the only thing left lying; there were plenty of dead animals, some of which had died from exhaustion or malnutrition, but most had been killed by the local drivers as

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Gornji Vakuf High Street, 1997.
Illustration by Lieutenant Henry Morshead.

they attempted their costly overtaking. We approached the centre of the town and the small, easily missed, left turn which crossed the river and led down the hill to the Precision Factory.

The handover from 29 Field Squadron passed without event. However I could not help but will them to leave as soon as possible because this was my first operational tour and I was itching to get stuck in! There were plenty of tasks on the cards but few that we could really get our teeth into; what we really wanted was a bridge. My prayers were answered, but not quite in the way I had in mind. I had wanted to build a bridge but what we got was to strip one out. The strip-out of the old McPhee Bailey at Donji Vakuf went smoothly and was finished ahead of time; it was brilliant to work as a complete troop again, all striving for the same goal, something which had not happened for a very long time.

The camp at Gornji Vakuf lies in a valley between two very steep mountains, the valley between covered with patchwork fields of rural farmland. Early in the morning when the strong sun had not had a chance to burn away the low layer of mist trapped between the ridges, you caught the not too sweet and very unpleasant smell of burning cabbage leaves. It was not long before the sergeant major came up with the idea of running up one of these beautiful hills and surprisingly no one disagreed with him! So on a Wednesday afternoon, while the sun was still high in the sky, a handful of seniors and an officer began the climb. The track weaved on, not too steep yet but still a long way to go. Lungs grew tight and legs became heavy. All conversation stopped as the track wound its way up, getting steeper and steeper with every step. By now my lower legs had become numb and my thighs were screaming to stop, but my head would not let me be beaten by a man old enough to be my father. I kept alongside the sergeant major staying just in front to let him know I was close. I hardly noticed another burned-out shell of a car, the model now unrecognizable, that would serve as a way-point on future ascents of the hill. Close to the top the views were unbelievable in the late evening sun. And I remember that this was the first time I realized what a truly beautiful country I was in. Slowly we rounded the final corner before the hundred metre uphill straight. By now the field had got pretty strung out and only the sergeant major and I were left at the front.

Needless to say he beat me, but then he always does! The hill became part of our weekly routine, getting up early on a Sunday morning to thrash ourselves and take in those breathtaking views on the way down (because you have too little breath on the way up to notice.)

The tour was now into October and the weather had changed again, the evenings were much shorter even after the clocks had gone back. The squadron settled into a routine and were just waiting for the snow to arrive. We knew it must be coming as the locals had cut down hundreds of trees and now had them stacked against the walls of their houses for firewood. The snow must arrive soon, and one afternoon, a few flakes fell but never really settled. Instead the weather changed to rain and lots of it. It rained for a couple of days at a time and then stopped for a day or so as if it was taking a breather before it rained again. When the rain came out so did the tubes of silicon sealant to try and repair the holes in the roofs of the CORIMECs ours leaked even though we had another on top.

Tasks had moved on too, and we had even managed to complete a few, but nothing as big as we had expected. The troop kept itself busy mainly with physical exercise, all the soldiers wanting to turn themselves into Greek gods for their lasses when they returned on R&R. A log race was organized for a Saturday morning and I found myself talking to the local timber merchant trying to borrow a pair of logs without paying for them! When the race actually took place the locals watched with great amusement the mad SFOR which had so much expensive machinery but still preferred to carry timber around by hand.

On occasion, Staff and I would visit the local trading establishment in order to purchase materials and equipment for different tasks. At first we would take an interpreter as few of the locals spoke English and even fewer of us spoke Serbo-Croat. However as time went by we got more confident and started to make visits on our own, finding it most amusing to ask someone who has not got a clue, for a cubic metre of concrete and an 18mm drill bit to be delivered to Lipa Camp on Wednesday. Staff seemed to have got the lingo sorted much sooner than I: a mixture of drawings, strange body language and saying English words with a foreign accent always managed to get the point across.

November arrived and with it another change in the weather. The rain left and the temperature fell. High up on Routes *Square* and *Triangle* the mountain streams had frozen solid, only the widest and roughest parts of the once babbling brooks remained free of ice. The locals too had changed; they had always been well wrapped up against the elements but now they wore so many clothes they all resembled the Michelin Man. We took note and rolled the sleeves down on our combat 95 shirts. It seemed strange that in the UK's milder temperatures we would have been snug in thick wool jumpers and windproof smocks, but here we battled below zero temperatures with only a thin cotton shirt to defend us.

The countryside remained beautiful but in a different way. The land had turned bleak; you could see and feel the struggle of this nation. The simple task of cutting firewood became a bitterly painful effort, but one that needed to be done in order to survive. If we were touched by the early morning frost we knew that another generator would cut in to keep the ambient temperature around 20 degrees.

Life in the streets slowed down; the rebuilding of bombed out houses all but stopped. Only a few hardy locals, whose family had occupied the same house for generations, worked on to put their homes back to the way they once were.

However, the winter that we had been warned about still had not arrived by the end of November. We had prepared for being snowed in and had put on our snow chains countless times to be ready for the snow that was sure to arrive soon. The weather became bleaker and the temperature continued to drop but still no snow. Perhaps it would not come at all this year! Somehow we knew we would not be so lucky.

BRIGADIER E C W MYERS CBE DSO

Born 12 October 1906, died 6 December 1997, aged 91.

"Two minutes later there was a tremendous explosion and I saw the end of at least one 70ft steel span leap into the air and oh what joy! drop into the gorge below." This extract from Brigadier Eddie Myers' article in the December 1992 *Journal* tells of the climax of the operation to cut the Gorgopotamos bridge in Greece 50 years earlier, the task for which he had been sent by SOE Cairo, with the aim of cutting the crucial German route to Piraeus for resupply of the Afrika Corps. Under the plan, he and his party were to have been taken off by submarine following the operation but, after a hazardous journey to the rendezvous, they were notified that they were to remain in Greece and Myers was to set up a British Military Mission. In this role he masterminded a second highly successful demolition on the same railway line in January 1943. It is a reflection of his modesty that it was the story of that operation against the Asopos viaduct, in which he did not participate himself, that he chose to record first, in the September 1981 *Journal*. These two episodes, however valiant, are only a small part of the tale which is fully told in Myers' own book "Greek Encounter" (Hart-Davis 1955 and Alan Sutton 1985). Most remarkable was the manner in which he managed to achieve cooperation in these operations between the two guerrilla factions, communist and republican, which were really more interested in fighting each other in pursuit of eventual power in post-war Greece, than in attacking the Germans. Myers realized before it was generally appreciated, the trouble that would be unleashed if those planning the return to Greece of the exiled King George II failed to take account of the feelings of the republican faction in the country. Despite the personal reports he was able to make to Churchill, Eden and King George VI, his views failed to change the official line and the civil war he predicted duly broke out with tragic consequences.

Edmund Charles Wolf Myers, whose father was the first Professor of Psychology at Cambridge and had been a consultant to the BEF in the First World War, was educated at Haileybury and Caius College, Cambridge. He went to the Shop in 1926 and joined the Corps having persuaded the cadet one above him that he would be far better off as top Signaller of his term than bottom Sapper. "Neither" he said "ever had any regrets". In his early career he served with 11 Field Company, 1st Field Squadron and 42 Field Company in Aldershot, Egypt and then Palestine where he was mentioned in despatches. In 1940 he took command of 2 (Cheshire) Field Squadron (TA), detached from Palestine to support 7 Armoured Division which at that time was without any Sappers, and made such an impact during Wavell's dramatic early campaigns in the Western Desert that defeated the Italians in Cyrenaica that he was still spoken of with admiration in the Cheshire TA in the 1950s by those who had served under him. For part of the time he acted as CRE.

After handing over command of 2 Field Squadron, he attended the Middle East Staff College and the mission to Greece then followed. In 1944 he was appointed CRE 1st Airborne Division for the Arnhem operation, taking over from Lieutenant Colonel Mark Henniker who, as

Brig E C W Myers CBE DSO (p146)

fate would have it, as CRE 43 (Wessex) Division, became responsible for the plan to evacuate the survivors once it had been decided to abandon the Arnhem bridgehead. Myers had been in the party which had been sent by stealth to XXX Corps to, as he put it "explain our dire situation and hurry them on", returning to the bridgehead during the gallant but failed attempt by 4 Dorsets to reinforce the garrison. This was among the many frank remarks which Myers made in his account of Arnhem published in the September 1982 *Journal*, one of the best short but controversial accounts of the problems of command and survival in the desperate circumstances which the division experienced. The end of the war in Europe found him with 1st Airborne Division in Norway where his task included the clearance of mines along the coastline. He was awarded a DSO in 1943 and appointed CBE in 1944.

From 1945 to 1949 Myers was employed in Intelligence, first in the Far East in the Supreme Headquarters under Mountbatten and, immediately afterwards, back in London at the Joint Intelligence Bureau. In 1949 he took command of 32 Assault Engineer Regiment at Perham Down where, among other things, he kept a fatherly eye on his old wartime squadron now redesignated 622 Assault, part of 113 Assault Engineer Regiment TA. Then in 1951 he was appointed the first full Colonel CRE of the Commonwealth Division in Korea where, as the war developed into aggressive defence, the sapper contribution became ever more significant.

Korea was strictly speaking Myers' final operational campaign but his tour as the last Chief Engineer Middle East at Moascar, after a brief interlude teaching at the RAF Staff College at Bracknell, was full of operational problems and excitements as the British withdrawal from Egypt was being planned in an increasingly hostile atmosphere. From Egypt he returned to the UK as Deputy Director Personnel Administration in the War Office, his last appointment before retirement from the army in 1958.

He began his second career as Chief Engineer with the Cleveland Bridge and Engineering Company, moving on to Davy Power-Gas as Construction Manager in 1965 and remaining with them until 1968.

Throughout his career Eddie Myers was renowned and respected for his personal leadership qualities. He had an adventurous spirit and was a keen horseman, a five times winner of the RE Point-to-Point. He founded the RE Flying Club and was its first secretary.

In 1943 Eddie Myers married Louisa Sweet-Escott who died in 1995. They are survived by their daughter, Thalia.

MAJOR GENERAL R L CLUTTERBUCK CB OBE

Born 22 November 1917, died 6 January 1998, aged 80.

It is not given to many to achieve success in two quite separate careers, but Richard Clutterbuck was such a one: first as a soldier, becoming Engineer-in-Chief; and subsequently as lecturer, author and acknowledged expert on terrorist techniques, a role in which he continued to be active up to the time of his death at the age of 80.

Richard Lewis Clutterbuck came from a military family and was educated at Radley and the RMA Woolwich. He was commissioned into the Royal Engineers in 1937, and like all Sapper officers of that time spent two years at Cambridge where he gained his degree in Mechanical Sciences.

On the outbreak of war he was posted to 514 Field Survey Company with which he went to France and Belgium, and from where, in his own words, "he left without ceremony through Dunkirk in 1940". His subsequent war service took him to Ethiopia, the Western Desert and Italy, in the process becoming a temporary major at the age of 23.

1946 and 1947 found him commanding 55 Field Squadron in Trieste and later Palestine.

After attending the Staff College he spent two years as a GSO 2 in the War Office before going in 1950 to command 4 Field Squadron in Germany. He then had three years as a DS at Camberley which was followed by being appointed GSO 1 Plans to the Director of Operations in Malaya. For his services there he was appointed OBE; but equally important, his experiences in that theatre started his interest in the whole subject of countering insurgency.

From 1959 to 1961 he commanded 38 Engineer Regiment, first on Christmas Island, supporting the British nuclear trials, and afterwards in Ripon as part of the UK Strategic Reserve. On relinquishing command there was a gap between postings, which the EinC took advantage of by asking him to take on the challenging task of doubling Corps recruiting. This he did with such enthusiasm and energy that recruiting not merely doubled, but trebled within the year; and the temporary post known as "ERLO" was as a result made permanent. Richard spent the best part of the next three years in America as an instructor at the US Army Staff College at Fort Leavenworth. This was at a time when the Vietnam war was at its height, and he established himself as a highly rated lecturer and author on the subject of dealing with insurgency, at the same time preaching the value of the military engineer as a weapon in the Cold War. For an article he wrote on this topic (later republished in the *Journal* in 1964), the Society of American Military Engineers awarded him the Toulmin Medal.

Home again, he did a year as Colonel AG7 before spending a year as a student at the then Imperial Defence College. 1966 took him to Singapore as Chief Engineer FARELF, in which capacity, amongst other things, he put into practice what he had been teaching by persuading the MOD to allow Sappers to build a road which would link up otherwise isolated villages in North East Thailand. As he said later in reference to this: "Suddenly they had a bus service, and there's a Latin American guerilla saying that when the bus comes along it's time for the guerillas to move out". It was in Singapore that he took the first step towards his second career by commencing to read for a PhD in politics at Singapore University. On being posted home in 1968 as EinC, he succeeded in continuing his academic studies by enrolling at London University. When sometime later an interviewer suggested to him that it was rather nice to think of a major general popping round in his official

Maj Gen R L Clutterbuck CB OBE p148

staff car to see his tutor, he had to say that, sadly, that was not the case; he went by tube. One of his achievements as EinC was to persuade the powers that be in the MOD to recognize the tremendous value of military engineers in the Cold War, in that they combined the military capability of looking after themselves with the ability, if need be, to take defensive or offensive action, with the technical expertise to do worthwhile construction works, such as building roads or bridges, providing accommodation, supplying water and so forth, thus helping to boost the local economy to undermine the causes of subversion.

His last Army appointment was as senior Army Instructor at the Royal College of Defence Studies, and it was during this time that he was awarded his PhD by London University. On retirement in 1972 he was made CB and appointed Colonel Commandant of the Corps.

For many individuals retirement might have been a time to ease up; but not for Richard Clutterbuck. He now embarked on what for him was a stimulating and absorbing second career, by taking up the post of Senior Lecturer in the Political Faculty of Exeter University, and later becoming Reader in Political Conflict until 1983, when he retired. Philip Purser has described his arrival there: "Though the revolutionary fervour of the late 60s had played itself out, students remained suspicious of military men... But once he was installed, not surprisingly, his students found him refreshing and judged his lectures unmissable. They found him enthusiastic and eccentric, with spectacles colour-coded according to strength and a wallet so often repaired that the original leather had disappeared". Typically, he was at pains to take a keen and friendly interest in the out-of-hours activities of his students, particularly those from overseas, often inviting them to his house or taking them on excursions in the Devon countryside, with the result that many of them kept in touch with him long after the end of their courses (which incidentally were always over subscribed).

After his retirement from Exeter University in 1983 he was granted an honorary research fellowship, and was able to continue his consultancies and his overseas research visits, which involved work with some 15 multinational corporations and five governments. One of these in 1990 took place in Moscow, where discussions were being held between the Superpowers and Western Europe on the subject of the fight against drug-trafficking and terrorism. In addition to this work he gave about an average of 100 lectures a year, mostly to the police and other government organizations, but also to courses of US graduates and undergraduates studying in the UK. He also broadcast frequently, and was often to be heard on the *Today* programme commenting on the latest terrorist outrage.

He had earlier, in 1977, joined the Board of Control Risks, and as a non-executive director saw this company make a twenty-fold growth in its work of advising a wide range of clients on the subject of improving security. Two years previously he had become a member of the BBC's General Advisory Council, where his work included the review of highly controversial programmes.

In between all this he found time to write, an activity which he had long been keen to pursue. His first book, published in 1957 under a pseudonym, had been a novel, "Across the River", based on his wartime experiences in Italy. It sold 50,000 copies. But his more serious writing began in 1966 when he wrote "The Long, Long War", a comprehensive study of the Malayan Campaign. For this, he drew upon his own experience when serving on the staff of the Director of Operations, as well as subsequent research. In all, from 1973 onwards he wrote another 19 books, the last of which he completed shortly before his death and which is due to be published posthumously.

That his work, whether as lecturer, broadcaster or author, carried weight is evidenced by – amongst other things – the fact that he received death threats of a nature which had to be taken seriously. Needless to say, these in no way deterred him from carrying on.

Not a games player, his outdoor occupations were chiefly canoeing and walking. In his earlier days he had rowed in both the Radley and Pembroke College eights. No obituary would be complete without reference to his achievement when, in 1961 as CO of 38 Engineer Regiment, he set up and took part in a regimental team which canoed across the Channel. It gave him great satisfaction to be subsequently instrumental in founding the RE Canoe Club.

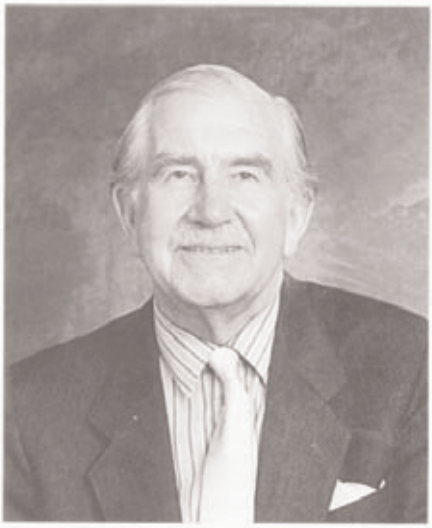
To the casual observer Richard Clutterbuck might have appeared egoistic and ambitious, but this was far from being the case. For one with such ability his was essentially a modest and unassuming nature. He was a kindly, warmhearted person who, despite his professional

activity, was very much a family man, and he was devoted to and supported by his wife Angela, whom he married in 1948, and his three sons. Though he expressed his views with vigour, he was in no way self-opinionated; on the contrary, he was a good listener and very ready to accept ideas different to his own. He hated pomposity and anything which smacked of pretentiousness. His sense of humour and the ability to laugh at himself, coupled with a flair for acting and mimicry, contributed greatly to his success as a lecturer. He had a mind which needed to be constantly exercised, and in this respect it might not be unkind to say that he had only two gears: neutral and full-speed ahead; whatever the job in hand, be it work or pleasure, it would be undertaken with enormous enthusiasm and energy. But perhaps his most outstanding talent was a truly remarkable flair for establishing a rapport with the young, in spite of his being three or four times their age. This undoubtedly accounted for his success as a university lecturer.

It is probably true to say that of Richard Clutterbuck's two successful careers it was the last that brought him the most satisfaction and which displayed his talents to best advantage; and it could well be that more will remember him as Doctor than as General.

MAJOR F J PIPE

Born 1921, died 10 April 1998, aged 77.



MAJOR John Pipe was the Honorary Secretary of the Royal Bombay Sappers and Miners Officers' Association until his death. Born in Cardiff in 1921, he was educated at Cardiff High School and was studying for his BCom examinations when in July 1939, with war imminent, he enlisted in 247 Field Park Company RE (TA). This unit was part of 38 Welsh Division (TA) and although mobilized with the rest of the Territorial Army just before war was declared, it did not go to France with the BEF and was eventually dispersed to reinforce other units. Nevertheless many of the original members of the company, including John Pipe, met regularly for reunions after the war. Such loyalty was typical of him, and it was very fitting that at the funeral his coffin was wrapped in the RE flag and escorted by the RE Association Standard.

Commissioned into the Royal Engineers in 1940, after a short time at 3 Training Battalion RE at Ripon, he was drafted to India early in 1941 joining the Royal Bombay Sappers and Miners at their headquarters in Kirkee near Poona. Initially posted to 17 (Royal Bombay) Indian Field Company in Malaya, following the Japanese invasion of Malaya in December 1941, he joined another Royal Bombay unit, 23 Indian Field Company, which had suffered many officer casualties and was with them as they fought their way down the Malayan peninsula to Singapore. Once surrender seemed inevitable, officers were ordered to escape if they could, and in company with officers from divisional HQRE John reached Sumatra and eventually, in an Australian destroyer, Bombay (see article on page 62, *RE Journal* April 1997.)

Returning to Kirkee, he became Second-in-Command of the newly formed 97 Field Company, accompanying them to Iraq in October 1942 but leaving in March 1943 to become Adjutant to the CRE of 458 Corps Troops Engineers. He again returned to Kirkee to a staff officer appointment in the HQ, where he was also OIC horses and hunted jackal twice a week. Later he became the Chief Instructor (Fieldworks).

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After leaving India he spent a year in Germany before returning home in 1946, and after release from the Army worked in the family firm for a short time before joining Sanlinea, in which he rose to become Managing Director. He left them in 1960 and started his own firm of export packers, initially in Newport and then expanding to Poole.

In 1951 he married his wife, Marjorie, and in the 1960s they both did much to revitalise the church in the parish of Penarth-with-Lavernock. He inaugurated stewardship and follow-up campaigns and recruited teams to canvas on behalf of the Christian cause. He also became a Samaritan in the early days of the movement, becoming the Director of the Cardiff and East Glamorgan branch in the late 1970s.

A kind and compassionate man, he was charming in manner yet totally sincere, devoted to his family and many friends who will remember him with both respect and affection. He was rightly described in the address at his funeral as "not only a gentle man; he was a truly Christian gentleman".

He is survived by Marjorie and their two sons; he was predeceased by his daughter.

COLONEL I T C WILSON MBE MC

Born 2 July 1924, died 17 January 1998, aged 73.

On 6 June 1944 Ian Wilson landed in Normandy shortly before H-hour with 73 Field Squadron, as a "teenage platoon commander" to use his own phrase. In support of 231 Brigade of 50 Northumbrian Division, his platoon's task was to clear a path through the beach obstacles. Anyone who saw the BBC's 50th Anniversary television programme will remember the typically self-effacing way in which he described his platoon's task and replied to questions from the interviewer. In his equally modest article in the June 1984 issue of the *Journal*, he wrote "Our initial clearance lanes were ragged, unmarked and by no means perfect, but the Invasion went ahead anyway... It was a long day; we started rather short on sleep, wet with little chance of drying out, food was almost non-existent and danger tends to be tiring." *The Times* of 20 June 1944 had described the obstacle clearance teams as "... true successors of those dauntless Sappers who blew in the Cashmere Gate at Delhi". For his gallantry on that momentous day, Ian Wilson was awarded the Military Cross.

Ian Thomas Candelent Wilson was born in India, the son of a Royal Engineer officer whose family came from Perthshire. After education at the Imperial Services College, Windsor, he enlisted in the Army in 1942 and was commissioned into the Corps in 1943. He was wounded in Normandy in 1944, but not badly, and was able to take part in the whole of the North-West Europe campaign, finishing on the Baltic coast. His squadron was engaged in bridge building and built the bridges over the large rivers: the Seine, Maas, Rhine and Elbe, as well as many lesser ones. This period also included a short "Inter-BSc" degree course and a fair amount of rugby football, a sport to which he made a considerable contribution in later years as well. As a hooker he has been described as a "terrier in the loose" and in one cup final match appeared from the lineout periodically like "an armoured hedgehog" and hurled himself at the opposing fly-half (a Welsh

Col I T C Wilson MBE MC p151

international). The result was a Sapper victory.

At the end of the war in Europe he went to Palestine initially to 248 Field Company, of which he acted for a time as Officer Commanding, and later as Second-in-Command 23 Field Company during the last stages of the troubled British Mandate. "Although very keen and efficient he was quiet, modest and likeable helping to make a very happy unit" (REW). He then returned to the UK to join 3rd Airborne Squadron in 1947 at the beginning of his long association with Airborne forces. His degree course at RMCS followed this tour and later he became Adjutant of 131 Airborne Regiment TA, then qualifying for the Staff College which he went to in 1953.

After a tour of duty in 1956 as GSO2 RE with HQ 6 Armoured Division in Germany, he returned to the Middle East, to Cyprus, towards the end of the EOKA emergency and during a tour of regimental duty on counter-terrorist operations was Mentioned in Despatches. He then became secretary of the Cyprus Working Party, set up prior to Cyprus becoming independent in 1960, whose purpose was to negotiate the defence requirements for the Cyprus Treaty of Establishment and the future shape of the Sovereign Base Areas. For this work Wilson was appointed MBE.

He returned home to command 9 Independent Parachute Squadron from 1960 to 1962, a period he regarded as the highlight of his military career.

Next came two years in the United States as British Airborne Liaison Officer at Fort Bragg. During this time he was involved in the original tests for the Chinook helicopter and was also engaged in Halo (High Altitude Low Opening) parachuting with American Airborne and Special Forces. He made some useful references to this in a letter published in the December 1989 *Journal*.

Ian Wilson's period of regimental command was with 33 EOD Regiment which he took over in 1967 and he threw himself with his usual enthusiasm into learning the arcane tricks of the dangerous trade of bomb disposal. It was a matter of some disappointment to him that during this tour no major wartime UXB was discovered upon which he could test his new-found skills.

His last Army appointment was as Defence Attaché in Bangkok, after which he retired from the Army in 1979 and settled at Kings Somborne in Hampshire. Many who knew him well were not surprised when he then became a schoolmaster teaching maths and science at the local preparatory school, since this seemed to suit his talents so well, and so it proved.

He also embarked on a major modification of his house, and gave generously of his time and effort to a variety of Service associations and local village organizations. He was an active member of the British Legion, the RE Association, and the Airborne Engineers Association of which he was Vice President. In the village he was Churchwarden and Treasurer of the Parochial Church Council, for five years Chairman of the Village Hall Management Committee, and involved with Neighbour Care and Neighbourhood Watch. He also continued to give much of his time to Corps affairs maintaining close contacts all his life. He contributed many articles and reviews to the *Journal* including his winning entry for the Cooper's Hill Memorial prize in 1961 and an important article in August 1994 telling of "Bing" Force's little known operation in Normandy. He was one of the editors of Volume X of Corps History and a major contributor to that and to Volume XI. And with all this he still found time in his 60s to try his hand at windsurfing and hang-gliding, and he made his last parachute jump to celebrate his 70th birthday. He then took up fly-fishing!

RMM concluded his address at Ian Wilson's funeral thus: "Ian was the least stuffy and pompous of men. He had of course great courage and determination as his record shows, but he was by nature a gentle and modest man, and a very kind one. His was a generous spirit, and he looked for and found the best in everyone. He was in a very real sense 'a good man', and we shall all remember and miss his ready smile".

He is survived by his wife Sally, three children and three grandchildren.

RMM REW IHGW

BRIGADIER H A T JARRETT-KERR CBE

Born 6 July 1911, died 28 November 1997, aged 86.

THE name of Brigadier Alfred Jarrett-Kerr should always be linked with the Bailey Bridge, in the design of which he was intimately involved as a young captain when he acted as Sir Donald Bailey's military "shadow". This was but one episode in a distinguished career in which his expertise was responsible for shaping the course of development of engineer equipment during the Second World War and the post-war years.

His father served in the Leinster Regiment, but Alfred was born at Simla in India, and was later sent back to England to be educated. Like many distinguished Sapper officers who were commissioned between the wars he attended Cheltenham College. It was here that both the intellectual and spiritual dimensions of his character, which were to be so manifest in his life and service, blossomed from bud into full bloom. His contemporaries were not surprised that he was awarded a number of academic accolades – the Silver medal for mathematics two years in succession at Cheltenham, a high place in the order of merit at the Shop, 1st Class Honours in the Mechanical Science Tripos (with distinction in two subjects) while at Emmanuel College, Cambridge, and the Fowke Medal while on the YO course at the SME.

It was inevitable that after experience in 26 Field Company at Aldershot, the Corps should make early use of Jarrett-Kerr's exceptional technical acumen and ability, and thus began his long association with the then Experimental Bridging Establishment which he graced for so long, as an Experimental Officer from 1936 to 1939. This tour coincided with attempts by some realistic spirits to re-equip the Army as the Second World War approached. He found himself testing, inter alia, box-girder and Callender-Hamilton Unit Construction bridges as well as Folding Boat Equipments (FBE) and the new Mark 5 Pontoon Equipment. Simultaneously he made his first acquaintance with a civil servant whose talents were emerging and burgeoning – Donald Bailey.

After a short tour as an Adjutant and an SO3 RE with the North West Expeditionary Force in Norway, Jarrett-Kerr was summoned back to Christchurch. The arrival of the Churchill tank had demanded a more versatile family of bridging. Jarrett-Kerr succeeded in adjusting the design of the FBE to withstand additional loads on the pontoons and in particular on the landing bay. By now the Inglis Bridge was found to be unstable in some of its members, and the idea of a panel bridge had formed in the fertile brain of Donald Bailey. Jarrett-Kerr was assigned to Bailey to lead the team doing the detailed design. After the construction of the prototype and its testing, Jarrett-Kerr was responsible for the extended liaison with the manufacturers of both the original Bailey and Bailey Pontoon Bridges in order to achieve simplification for mass production. Those of us who are more acquainted with the successors of Bailey Bridge should never underestimate its impact in its generation. Some leading American military authorities judged the Bailey Bridge to have reduced the length of the Second World War by several months. Civil authorities in the United Kingdom and abroad continue to use Bailey and its derivatives for permanent and temporary use.

In 1943 the Engineer-in-Chief, Lieutenant General Sir Charles King, placed Jarrett-Kerr on his staff to influence the policy on development of all Engineer Equipment. This gave him his

first experience of working in Whitehall's corridors of power. The experience was cut short, for in the early months of 1945 the challenge of crossing the Rhine was in sharp focus, and Sapper involvement of paramount importance. Jarrett-Kerr was appointed OC 235 Field Park Company, which was responsible for providing stores and workshop support for road maintenance and approaches to the river for the Reichswald and Rhine crossing operations by 21 Army Group. It was not surprising that the CRE 50 Division, Lieutenant Colonel R W Ewbank, who was responsible for building what was believed to be the longest bridge built in war, should ask for Jarrett-Kerr to be seconded to him as technical adviser. There was understandable concern that the security of the operation would be compromised as the Divisional Commander had had to override Sapper advice, and insisted on the build taking place on a site where the home bankseat could only be established after substantial demolitions had been undertaken. Years later it was affecting to hear Major General Sir Robert Ewbank, then Commandant at Shrivenham, relate how he and Jarrett-Kerr, who both shared a clear Biblical Christian faith, had knelt down together on the west bank of the Rhine to commit this momentous operation in prayer. The two-way bridge was 5000 feet long, casualties were light and the robust cheerfulness of the Tees-Tyne Sappers was evident throughout the operation. Both officers retained a life-long sense of gratitude for prayer answered so faithfully.

After commanding 10 Field Squadron in the Lubeck area in the immediate post-war months, and instructing at the Staff College at Quetta, Jarrett-Kerr returned to Christchurch to work under Sir Donald Bailey as the arrival of the Centurion Tank had led to the need to widen and strengthen the Bailey Bridge. He was therefore to play a prominent part in the emergence of the Extra Widened Bailey Bridge prior to no less than nine continuous years in different ranks in the Directorate of Royal Engineers Equipment. During that time every policy decision on the research and development of engineer equipment in bridging, hutting and mine warfare was affected by the wise influence of Alfred Jarrett-Kerr, who was appointed OBE in 1954. In 1962 he returned to Christchurch for the fourth time as Deputy to Sir Donald Bailey, at the now Military Engineering and Experimental Establishment. Their final partnership lasted two years before Bailey was appointed Dean at Shrivenham, and Jarrett-Kerr was promoted to Brigadier and appointed Director. This promotion was regarded as entirely appropriate by all who knew him, and who were delighted that this last tour and his military career were crowned with the award of the CBE.

Alfred Jarrett-Kerr had a deep sense of service. This was evident not only throughout his military service, but also in his subsequent work as Research Director in West's Group's Industries from 1965-1976 and as Chairman of West's Piling and Construction Company 1967-1970, and in many areas of voluntary work. He was a churchwarden and lay reader in his church at Windlesham and later at Ringwood. He was President of the Mission to Military Garrisons, and Chairman of the Soldiers' and Airmen's Scripture Readers Association and Miss Daniell's Soldiers Homes from 1967-1981. In this latter responsibility his shrewd judgement enabled the rustication of the Association's Headquarters and adjusted use of the Soldiers' Home in Aldershot to be undertaken with fluency, and to place both in positions of financial stability which has been evident to the present day.

In 1937 he married Meme Middleton-West who was a most supportive influence on him throughout their marriage. Together they enjoyed a stable and happy family life, and their commitment to each other and their four children was evident to all who came into their home. A humble man who never paraded himself, Brigadier Alfred Jarrett-Kerr was impressively consistent in his achievements professionally, domestically and spiritually. He was worthy in every sense of the epithet of being a Christian officer and gentleman. Like William Wilberforce, the Slave Trade Abolitionist, he has "left behind him the abiding eloquence of a Christian life".

WICD

LIEUTENANT COLONEL D C MERRY

Born 10 April 1910, died 22 June 1997, aged 87.

DOUGLAS Cooper Merry was commissioned into the Royal Engineers in January 1930 and went first to Chatham and thence to St John's College, Cambridge, graduating in 1932 with a First Class Honours degree in the Mechanical Sciences Tripos. Being then posted to the Railway Training Centre at Longmoor, Douglas spent most of his subsequent army service in the transportation branch of the Corps.

Educated at Berkhampsted School, Douglas Merry was the third son of Arthur and Alice Merry of Wing, Buckinghamshire. With his elder brothers joining the family firm of estate agents, Douglas determined upon a military career and, after early training, his first overseas posting was in 1936 to a detachment of 8 (Railway) Company, part of the Emergency Force in Palestine. In 1938 he was posted to regimental duty with the Fortress Company in Singapore but was withdrawn to the UK in 1940 to attend the Staff College.

Douglas's wartime service was spent on tours of duty firstly in the War Office, then in command of 8 (Railway) Company engaged in construction work in the UK and, from 1943 onwards, on Lord Mountbatten's South East Asia Command staff as Assistant Director of Transportation. In the immediate aftermath of the war in the Far East, he was technical adviser for the reconstruction of the east coast railway linking Malaya to Thailand, in which the construction of a rail ferry near to the destroyed Rama VI bridge was a notable achievement.

Douglas returned to the UK in 1946 and, following further periods of service in the War Office and at Longmoor as Instructor in Railway Construction, undertook his last overseas posting to the Suez Canal Zone in 1950 to assist in planning the withdrawal of UK forces. Here he acquired the soubriquet of "Kipper" Merry due to his partiality for a particular breakfast. After a final period in command of 16 Railway Training Regiment at Longmoor he retired from the army in 1958.

Douglas's academic qualifications provided him with a second career in teaching where he used his aptitude for encouraging achievement in others to great effect. He spent the next 12 years lecturing in electrical engineering first at Farnborough Technical College and then at Ryerson Technical College in Toronto.

Outside his army and teaching careers, Douglas Merry's main interest lay in rifle shooting. He was a fine marksman regularly competing in the army championships and at Bisley where, in 1958, he was runner-up in the Queen's Prize. He was selected for many national teams, shooting both at Bisley and in overseas tours to Canada, but he was particularly in demand as a "coach" having a shrewd eye for judging the wind. He supported many activities in Goring-on-Thames where he lived and was a chorister in the parish church for 35 years.

Una, whom he married in 1934, predeceased him in 1990 and he is survived by his two daughters, Jeanne and Susan, and by his grandchildren, Andrew and Zoë.

JPC DGC

Lt Col D C Merry p155

LIEUT COLONEL W G CARTER MBE

Born 4 July 1912, died 13 February 1998, aged 85.

BILL Carter, a civil engineer, served with the Corps throughout World War Two as a Royal Bombay Sapper and Miner. Joining as a second lieutenant he rose to lieutenant colonel before demobilization in 1946.

William George Carter was born in India but educated at Taunton School and Bristol University where he graduated in 1933 with a 1st Class Honours Degree in Civil Engineering. He also achieved university colours in both rugger and cricket. Joining a Glasgow structural steel company he was sent in 1936, as a resident engineer, to Calcutta where his rugger playing ability was also useful as a member of the provincial team in the All India Cup annual tournament.

A year or so before the war he joined the Calcutta Scottish, an auxiliary force of volunteers, originally formed in 1914. On the declaration of war against Germany, Bill immediately volunteered for active service and was sent to 1st Indian All Arms OCTU, Bangalore. From there he was commissioned into the Corps and posted for service with the Royal Bombay Sappers and Miners. After a few months of indoctrination and training with Indian Sappers in Kirkee he was posted in July 1940 to Egypt, newly under threat from Italian Libya. He joined 18 (RB) Field Company, with the 4th Indian Division, in the Western Desert in time to take part in the early stages of Lieutenant General O'Connor's December 1940 campaign in which the the Italians were driven out of Cyrenaica early in the new year. However, 4th Indian Division did not take part in the advance as it was transferred to join 5th Indian Division and the Sudan Defence Force in the Eritrean Campaign. 18 (RB) Field Company was the only sapper unit to serve continuously at the forefront of the critical battle for the Keren Gorge which lasted nearly two months. The Company together with four other Indian field companies played a major part in the final successful assault which in effect decided the fate of the Italian Army in Eritrea. Bill and his Mahratta Section (60 sappers) were mainly responsible for clearing an extensively blocked 700-yard railway tunnel, through which the infantry launched their initial assault in the final battle for the Gorge. Immediately after the battle 4th Indian Division was returned to the Western Desert to help stem the advance of Rommel's first counter-offensive in the Spring of 1941. Bill left 18 Company to be a field engineer for the divisional CRE (Lieutenant Colonel H P Cavendish DSO OBE) where he helped develop much of the mine warfare tactics and techniques which became a major factor in the desert war.

In the Autumn of 1942 Bill was returned to Kirkee to be the adjutant of one of the training battalions which had been formed to cope with the massive influx of recruits. Promoted to temporary major in the early Summer of 1943 he was appointed to command 403 (RB) Field Park Company with 15 Corps Troops Engineers in East Bengal and Burma Arakan. During his 12 months in command the Company was much employed in bridging and rafting over the many Arakan waterways and in meeting the needs of 15 Corps HQ, particularly its lighting. His second in command at that time writes that he was an exemplary company commander; a firm disciplinarian but always supportive and understanding. His appreciation of the Indian soldier and his command of Urdu earned him the instant respect and loyalty of his men. In recognition of his and his company's work he was appointed MBE. In May 1944 he was posted back to Kirkee, where Colonel Cavendish was then Commandant, to be the Chief Instructor of the Engineer Officer Training School. He was greatly respected, liked and appreciated by his cadets most of whom came to him fresh from the UK. One writes that they owed to him "a great deal for any success they had both in the Army and subsequent civilian careers". He was promoted lieutenant colonel in a staff appointment at the end of the war prior to demobilization.

Returned to civilian life Bill became a partner with W S Atkins, the well known civil engineering consultants, and later became the company's managing director. On retirement in 1972 he continued as a consultant for Bath University and helped with several charitable organizations including being treasurer of Yeovil Day Centre for 23 years and a trustee of an old people's home. He had a strong Christian faith and served the Methodist Church in southern Somerset in several capacities as well as being a senior steward for nine years. He had a delightful sense of humour and was always very good company. He will be much missed by the South Petherton and area community. A war time friend, whose friendship continued past war, writes that his "enduring memory of Bill is of a truly sincere

man whose constant and undeviating intention was to 'get it right'. He never ever compromised that intention and would not let any of his subordinates do so. A truly good man."

Bill married Hazel in 1943 in Bombay. His marriage was enormously important to him. Hazel, their two sons and six grandchildren survive him.

WCSH CAP DAB-W

LIEUTENANT COLONEL W B J ARMSTRONG MC

Born 11 March 1912, died 12 April 1998, aged 86.

LIEUTENANT Colonel Barry Armstrong, who died aged 86, won an MC in the battle for Meiktila, Burma, in 1945.

Armstrong removed the charges on a bridge which the Japanese had arranged to blow up in order to safeguard their retreat and to inflict casualties on their British pursuers. While engaged in this hazardous task he came under heavy sniper fire.

Barry Armstrong was born in Penang, where his father was a barrister, and was educated at Uppingham and Trinity College, Dublin, from which he graduated in engineering.

At Trinity he showed outstanding prowess in golf and reached the semi-final of the Irish Open Amateur Championships in 1934. In 1938 he set a course record of 69 at Bramshott, Hampshire, a course commandeered by the Army during the Second World War and never restored.

Commissioned into the Royal Engineers in 1935, Armstrong was posted to India in 1939. Serving with the Madras Sappers and Miners he attended the Staff College, Haifa.

In 1944, commanding 36th Field Squadron (Madras), Armstrong arrived in Burma, and by 1945 was in the advance on Rangoon, operating with the spearhead provided by 255th Tank Brigade. At Meiktila, the brigade, having cut Japanese communications, found itself outnumbered but pressed on, forcing the enemy to retreat.

The campaign provided ample opportunities for Sappers to demonstrate their skill in improvization. On reaching a wide river Armstrong was informed that they could not wait for a Bailey bridge and that he must contrive a way across.

He weighed up the situation and in spite of enemy interference built a hump-backed bridge, held together with lashings and nails. Narrowly avoiding collapse, it enabled 500 vehicles to cross and saved a full day when time was vital.

While waiting to take part in the final advance on Rangoon, Armstrong, examining a map, noticed a golf course marked a few miles north of the town. With Lieutenant David Orr (later to be chairman of Unilever Inchcape and the British Council) he set off in a jeep, found the course with a few holes still playable, bartered two blankets for some clubs and a few balls, and thus liberated the Rangoon Golf club.

After the war Armstrong was seconded to the Irish Army, which gave him the task of conducting a survey of the Republic's coastline. At Bundoran, in Donegal, he encouraged the local club's assistant professional, whose abilities struck him as well above the ordinary. The man's name was Christy O'Connor.

Armstrong's own golfing career continued to prosper, and he came close to winning the Irish and the Open Championships, in the course of which he twice beat the great Joe Carr. His final military posting took him to Germany, where he won both the British Forces and BAOR championships.

After retiring in 1956 Armstrong became a journalist, writing on golf. He was secretary of the Golf Foundation, which introduced thousands of boys and girls to the game. In addition he served on the committees of several golf societies.

He represented Hampshire many times, and played for the old Uppinghamians in the Halford-Hewitt Cup. With his wife, who played off three, he took part regularly in the Worplesdon Mixed Foursomes.

"He had immense charm", a friend observed, "a dry wit and a delightful sense of humour. Of the highest integrity and conduct, he inspired friendship wherever he went, whether on the battlefield or the golf course."

In 1937 he married Margaret McKay; they had a son.

MAJOR ALLAN ALBERY MC*

Born 28 January 1917 died 1998, aged 81.

MAJOR Allan Albery, was awarded an MC in France in 1940 and a bar to it in 1944 at Akyab, Burma, where he lost a leg; this did not stop him skiing, playing tennis and hill-walking by using artificial legs adapted for different purposes.

Allan Crofton Rolleston Albery, the youngest son of the theatre owner Sir Bronson Albery, was educated at Stowe and Cambridge. His mother had been so horrified by the carnage of the First World War that she would not allow him to be in the Officers' Training Corps (OTC) at Stowe. But at Cambridge, with war against Germany in prospect, he ignored her wishes and joined the University OTC.

Having graduated in engineering he became a junior technical assistant in the London Passenger Transport Board in 1938, but the next year volunteered for the Army.

He was commissioned into the Royal Engineers and posted to 236 Field Company in March 1940. The unit moved to the Maginot Line in April, where it laid anti-tank mines. When the Germans attacked on 10 May, 236 Company, which was part of 51st Highland Division, moved rapidly to confront them. Albery was awarded an MC for going ahead of the British Forces to destroy a bridge under enemy fire. He was dive-bombed by Stukas on the way back, "a terrifying experience on the first occasion". In addition to his MC he was also mentioned in despatches three times.

He then took part in the dispiriting retreat of 51st Division, which was given conflicting orders by the French Higher Command and was then trapped at St Valéry. The Highlanders put up stiff resistance but with no hope of evacuation the 51st became prisoners.

Albery was out laying minefields when the Division surrendered and, upon learning what had happened, made his way to Le Havre and was evacuated from Cherbourg.

Back in England he was posted to Inverary to train for Combined Operations. His next assignment was the landing in Madagascar in spring 1942; the island was held by the Vichy French who looked likely to invite in the Japanese. Albery landed near Diego Suarez under chaotic conditions. The commander of his landing craft lost his way, and their route inland was extremely hazardous. Fortunately the Vichy French surrendered after token resistance. The worst enemy was malaria which killed 30 and incapacitated nearly 600 out of the landing force of 6000.

In July Albery (who had had a mild bout of malaria) was posted to India to set up a "Beach School" at a new Combined Operations training centre at Bombay. Here he observed the insanitary conditions in which Bombay Duck was produced and vowed never to eat it again.

In the winter of 1942 there was a great fire in the dock, kept secret from the rest of the world. One ship blew up and devastation was widespread. Sabotage was suspected.

On leave, Albery went up to the Himalayas to ski, but was surprised to find that his Kashmiri porters would not accompany him onto glaciers which they believed were inhabited by demons. He went alone, praying he would not fall into a crevasse.

In September 1944 he was posted back to Europe to study the Normandy landings and report on how the lessons learnt there might be of value in the Far East during Combined Operations landings. However, little was of use, as the coastlines were so different.

He returned to the East to join 15th Indian Corps at Akyab and helped plan the landing near

Kabaw, in January 1945. During the landing he went forward to see if he could find any source of fresh water but in doing so was blown up by a mortar bomb, which cut through his thigh bone and his leg had to be amputated.

The citation for the Bar to his MC recorded that he "rendered services which had a vital bearing on the subsequent stages of the operations. Finding that the beach was impracticable he went forward alone and recce'd a new one in an area unoccupied by our own troops. By nightfall he had not only succeeded in cutting a road from the beach but had also organized a water point. All this was done in full view of the enemy and under heavy shell fire."

When Albery returned to England he found a seven-month wait to have a fitting for an artificial leg at Roehampton, so decided to make his own. It worked, and although he also had the official leg for routine purposes, he used his own peg leg to play tennis.

In 1947 he joined Sir Alexander Gibb and partners, consulting engineers, and at his own request was put in the hydroelectric department. He worked on the Errochty project, and in 1954 on the Hume power station on the Murray River in Australia. He then became chief engineer on four large projects in New Zealand and in 1958 was appointed chief engineer for the firm for their projects in Canada. He also worked on projects in Jamaica, Sierra Leone and Indonesia.

His first wife Amelia (Milly) died in 1968; they had three sons, the eldest of whom died this year. In 1990 he married Irene Watson.

Memoirs in Brief

Brief memoirs are published below of distinguished men whose deaths have been notified recently in the press and who served in the Royal Engineers.

Lord Donaldson of Kingsbridge, died recently aged 90. He was Labour Arts Minister between 1976 and 1979 but joined the SDP in 1981. Throughout his life he sought to improve the lot of those less privileged than himself. He was a jazz saxophonist and clarinettist and recorded "Stomp Your Feet" in 1927. At the outbreak of WW2 he joined the Royal Engineers. Appointed OBE in 1943, he was demobbed in 1945 as a lieutenant colonel.

Lord Mellish, the former Labour MP, died recently aged 85. He was an old-fashioned working-class MP for 37 years, and became Labour Chief Whip from 1969 to 1976. He resigned from the party in 1982 in disgust at the encroachments of the Marxist new Left. In 1940 he enlisted in the Dockworkers Battalion of the Royal Engineers, rapidly rising to the rank of captain. Much of his service was in South-East Asia Command.

Correspondence

From: Lt G Webb BSc(Eng) PEng

Sir, – While at the Royal Bombay Sapper & Miner Training Battalion in Dighi, Pune (Poona) I took a short leave to go trekking in Sikkim in December 1943.

It began with a ride on the famous narrow gauge railway from Siliguri to Darjeeling, where the train has to go backwards and forwards in order to climb the hillside.

Having hired a cook/porter in Darjeeling, we set out down the valley of the Tista towards Gangtok in Sikkim. Along the way we had spectacular views of Kangchenjunga 28,168ft a mountain far more beautiful than the squat pyramid of Everest.

Continuing along the Tista from Gangtok we came to a decisive fork, the left-hand Lachen Valley leading to Chomo Yummo 22,403ft, on the border with Tibet, the right-hand Lachung Valley leading to Chomo Lhari 23,997ft, inside Tibet itself.

I thought it wiser to take the Lachen Valley, and leaving my cook/porter behind, climbed to a height of about 19,000ft before turning back as daylight was fading.

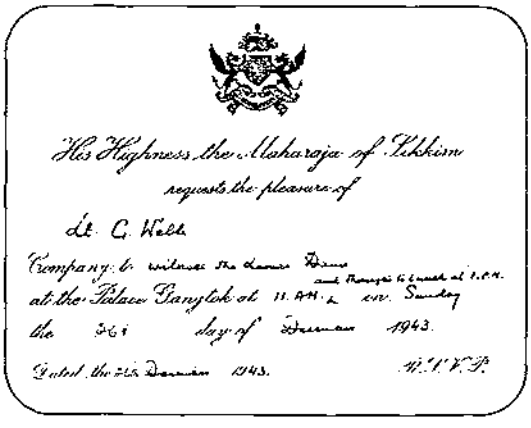
Back in Gangtok it was Christmas and I was invited to the Political Officer's residence to tea on Christmas Day. The PO looked remarkably like the actor C Aubrey Smith ("Lives of a Bengal Lancer"). The PO had radio contact with India, via a small transmitting station, the function being to keep a watch on the borders of India.

On Boxing Day I was invited to the Maharaja of Sikkim's palace to witness the Lama's Dance, and to luncheon. The dance was a series of endless gyrations to the sound of conches – one began to think it would never end!

Tibetan tea was served for the lunch – a weak tea, laced with rancid butter and very salty. Quite an experience.

On one's morning walk one would encounter the Maharaja's daughter, the Princess, dashing along on her pony, round the narrow, precipitous paths, seeming quite fearless.

The awesome beauty of the Himalayas is unforgettable! Yours – Geoff Webb



His Highness the Maharaja of Sikkim
requests the pleasure of
Lt. C. Webb
Company to witness the Lamas' Dance and Banquet to Guests at 11 A.M. & 8 P.M.
at the Palace Gangtok on Sunday
the 26th day of December 1943.
Dated the 24th December 1943. A.D.C.

KOREAN WAR REMEMBRANCE PARADE: THE DWRS AND "THE HOOK"

From: Dr J D Lewins MA, PhD, DSc, SM, PhD(MIT), PPINucE

Sir, – You may like to have this note of a recent reunion in which Sappers played a part.

Representative Sappers recently attended the Duke of Wellington's Memorial Day, honouring their dead of the Korean War and celebrating, in particular, their battle honour, "The Hook". Four Sappers who had supported the first battalion exactly 45 years ago were invited to join the Duke's Regimental Association in Halifax and afterwards at lunch on Saturday 30 May 1998.

The day started with a reception in the City Hall, Halifax. The Deputy Mayor and the Regimental Colonel, Brigadier the Duke of Wellington, welcomed us over an essential cup of tea and refreshments, before the march to the parish church. The parade was commanded by the CO of the current first battalion, stationed at Hounslow, and led off by the regimental band and the Colours, the Duke and Deputy Major taking the salute. A contingent of wheel-chaired veterans was followed by officers and other ranks and the rear brought up by the regular battalion. Town's people applauded the veterans warmly.

The service of remembrance was impressive, not least for the address by Father Stacpoole, better known to the veterans as John Stacpoole MC, who commanded the Assault Pioneers. After the follow-up before the Cenotaph, with the usual rites of Last Post, the party was bussed to the Stakis Hotel in Bradford for a late and long lunch. There were further speeches from the Duke of Wellington and Major General Charles Huxtable.

Those who had supported the Duke's on the Hook and elsewhere in Korea were warmly welcomed and remembered, not least the CO of the Close Support Artillery Regiment who played such a key role in the battle. The four Sappers present represented all three troops of 55 Field Squadron together with the Plant Troop which built the tank-scrape used by 4 RTR and consisted of: Stanley Ireland (commanding Plant Troop and later Lieutenant Colonel Ireland in Survey); Corporal (then) Jenkins MM of 2 Troop who was awarded his medal for a solo daylight raid across no man's land; Jeffery Lewins (subsequently OC 2 Armoured Engineer Squadron) who was temporarily commanding 3 Troop working on the left-hand defences of the Hook; and Tommy Thomson of 1 Troop on the right-flank (subsequently SSM School of Survey).

It was a touching day. Veterans know that age will take an even greater toll were we to gather again, but the memories of that period will not wither in our hearts. Yours sincerely – Jeffery Lewins, Maj (retd).

Reviews

THE DOMINO THAT STOOD
THE MALAYAN EMERGENCY 1948-60
DONALD MACKAY

Published by Brassey's (UK) Ltd, 33 John Street, London WC1N 2AT – Price £25
ISBN 1 85753 118 3

THE Malayan Emergency, as it was euphemistically known, lasted officially from 1948 to 1960. Though the memory has now receded from public consciousness, events in Malaya loomed large in the life of the Services during the 1950s. But it was not only a Service concern; because of the involvement of many national service men and women the whole country, and in particular the families and friends of those serving, was closely concerned with the outcome.

The author of this shortish book (153pp) was well placed to observe the progress of the emergency over several years. He was a National Service subaltern in the Highland Light Infantry and then from 1953 to 1956 worked as a rubber planter. In good parochial Sapper fashion the writer of this review delved into the index to see how RE involvement in the emergency was covered. However this book is not concerned with detailed military operations, but rather with the origins of the war, the strategy used by two or more British governments to deal with the problem and the evolving military, police and civil organization which finally contained the insurgency. So "RE" does not appear in the index but several famous Sappers do feature including Major General R L Clutterbuck, Major General J M L Gavin, Brigadier M Calvert and briefly General Sir Brian Robertson (as he was in 1951) whom Oliver Lyttleton (at the Colonial Office) wished to appoint as High Commissioner and Director of Operations. General Robertson, who was GOC-in-C MELF, turned down the appointment which went to General Templer.

In retrospect, it is fascinating to note in the book that "On paper at least then, the Army [in Malaya] was moving towards the establishment that by the end of 1950 would be deemed enough: 17 infantry battalions, six squadrons of armoured cars and one field regiment Royal Artillery ...". Despite this ORBAT, Major General Richard Clutterbuck in his book "The Long, Long War – The Emergency in Malaya" 1948-1960, p55, Cassell London 1966, says "By the spring of 1950, though we had survived two dangerous years, we were undoubtedly losing the war". It is a sombre thought to speculate what would have happened in the Far East if the war had been lost. It seems eminently fair, therefore, to count the eventual successful conclusion of the emergency and the handover of power to be a source of considerable satisfaction to Britain, its Services and colonial administrators.

This book is clearly and cogently written and is very easy to read despite the complexities of its subject. Though a close participant, the author can now stand back and look dispassionately at events, though readers may not always agree with his comments on some of the major players. He also writes with a clear and compassionate insight about those who counted most, the

Malay and Chinese people. Donald Mackay has written a most interesting book and one well worth reading.

FRB

THE WATERLOO CAMPAIGN
WELLINGTON, HIS GERMAN ALLIES AND THE BATTLES OF LIGNY AND QUATRE BRAS
PETER HOFSCHROER

Published by Greenhill Books, Park House, 1 Russell Gardens, London, NW11 9NN – Price £25
ISBN 1-85367-304-8

WATERLOO and Wellington are under the microscope yet again. This latest book by a German historian who has had access to archives not previously available, maintains that when Napoleon's army advanced into the Low Countries in June 1815 Wellington deliberately misled his Prussian allies into believing that he would be coming to their support at Ligny, so letting them suffer defeat and terrible losses at that battle. He is further accused of falsifying the record to conceal the errors he is alleged to have made in the build-up to Waterloo. This book covers only Ligny and Quatre Bras. A sequel is due covering Waterloo itself.

The research that has gone into this book is impressive. The argument is based primarily on the timing of messages to both Wellington and Blücher, sent by the Prussian Corps Commander, Zieten, whose force was the first that Napoleon's advance encountered; and the actions which Wellington then took to deploy his own forces. Hofschröer maintains that these were inconsistent with the promises of support which Wellington gave Blücher should the enemy contact in front of Ligny prove to be the main direction of the attack. The accusation is not new. German historians have long maintained that British accounts of Waterloo emphasize "Wellington's victory" and diminish the Prussian contribution to Napoleon's defeat which, but for the Duke's failure to deal with the situation on purely military considerations, could have resulted in a Prussian-led triumph at Ligny.

Hofschörer claims to have "scored a first" in examining all primary evidence before coming to a conclusion. This statement comes only three pages after admitting that every historian has an axe to grind and the main text of the book does little to support his claim to freedom from prejudice. A further objectionable claim is that the only recent account of the Waterloo campaign "worthy of interest" is Lord Chalfont's *Waterloo – Battle of Three Armies*, published more than 15 years ago. Two recent reviews in this *Journal* alone offer alternatives: David Hamilton-Williams' *Waterloo, New Perspectives* and Andrew Uffindell and Michael Corum's *On the Fields of Glory* also, incidentally, published by Greenhill. While on sources it is worth mentioning, however, that among Hofschörer's approved works is the Sapper, Colonel Charles Chesney's *Waterloo Lectures*, first published in 1868 and now available again from Greenhill.

Anyone interested in the Waterloo campaign and the social and political upheaval as Europe emerged from the 22 years of chaotic struggle of the Revolutionary Wars should, however, read this book. Its main theme is bound to cause much argument among scholars and it is the sort of argument which non-scholars can also happily get their teeth into. Apart from that, the stories of the battles of Ligny and Quatre Bras are so vividly told and presented so clearly with lavish provision of maps, that it is fun to read and, no doubt, would be an excellent handbook for anyone wishing to follow the battles on the ground today.

As to the main theme, those without the time, expertise or inclination to question the detail of the argument may wish to draw back from it and consider the wider picture that faced Wellington. This included the political realities of the post-war Europe; Hofschörer maintains that 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. It also included Wellington's responsibility for his "infamous", inexperienced polyglot army, his anxiety for the security of his right flank, the need to cover Antwerp and the knowledge in the back of his mind that a highly suitable position existed at Mont St Jean which would take account of most of these concerns. Add fog of war and the mental physical pressures on a man who set off on a six-hour ride to the most crucial battle even of his life at 5.00am after two hours of sleep and one has to wonder whether a cold analytical mining of the archives nearly 200 years later can ever be appropriate to such overwhelming events.

GWAN

MAIDA: A FORGOTTEN VICTORY

JOHN STEWART

The Pentland Press, 1 Hutton Close, South Church, Bishop Auckland – Price £11.50
ISBN 1-85821-476-9

FORTUNATELY the stretch of the Edgware Road between the Regent's Canal and Kilburn was christened Maida Vale otherwise the battle of Maida might have vanished from the public consciousness. This delightful book, by telling the story of one of the most obscure but significant battles of the Napoleonic wars, shows what a mistake that would have been. The battle was obscure because it took place in a small corner of southern Italy quite separately from any other British land action. It was significant – well, best to read the book to discover why but, in outline, a British force of 5100 under Major General Sir John Stuart, defeated 6440 Frenchmen under General (later Marshal) Ebenezer Reynier, at the height of the reputation of Napoleon's armies (1806, a few months after Austerlitz). Many on the British side were to achieve fame in the Peninsular under Wellington (Cole, Kempt, Oswald, Ross, Colborne). Sappers were there too including Boothby and Pasley, though the latter is not mentioned by name. The tactics used on both sides foreshadowed the Peninsular battles. Stuarts failure to follow up the victory has been criticized as a lost opportunity. All these questions and more are covered neatly in the book, which is a most readable cameo of the whole episode.

GWAN

ANTI PERSONNEL LANDMINES

RECOGNISING AND DISARMING

EDDIE BANKS

Published by Brassey's (UK) Ltd, 33 John Street, London, WC1N 2AT – Price £75
ISBN 185753-228-7

ANTI personnel (APL) mines are a very simple and cost-effective munition. Many millions have been laid worldwide, mainly in Africa and Asia. Their use has been largely indiscriminate and the toll they take of often impoverished non-combatants is significant.

The UK has been directly and indirectly involved in mine clearance for many years, the most recent initiative being the establishment of a SO1 Humanitarian Mine Action on the Director of Military Operations' staff and the UK Mine Information and Training Centre in the Battlefield Engineering Wing at Minley.

This hardback, large format book has just under 300 pages. The text is clear, using a triple column layout, and is supplemented by both black and white photographs and diagrams. The latter are clear if on occasions somewhat lacking in style and detail.

The book's aim is to give to those involved in APL clearance the most up to date information on the correct identification of mines in order to help prevent casualties. In addition it describes function and gives detail on detection, neutralization, disarming and breaching. The first 40 pages provide useful background information on the history and development of mines and minewarfare, mine breaching and clearance, quality assurance, render safe procedures and obsolete mines.

The meat of the book is some 200 pages of APL data laid out in sequence, alphabetically by country of origin. It catalogues some 250 APL followed by an annex of six pages covering fuzes, their method of operation and neutralization, and finally a mines index. The book is pragmatic, comprehensive and a very useful reference on APL. The chances of having to deal with APL which it does not cover are very slim. The author is very experienced in dealing with mines and has produced a first class book.

AH

SOMME – COURCELETTE

PAUL REED

YPRES – HILL 60

NIGEL CAVE

Leo Cooper, Pen & Sword Books, 47 Church Street, Barnsley, S70 2AS – Price £9.95 each, ISBN 0 85052 592 6 and 0 85052 559 4

TWO more books in the very successful "Battleground Europe" series for armchair and actual battlefield visitors. *Ypres – Hill 60* is of particular interest to Sappers covering the fighting in 1915 and also the mining and fighting underground, culminating in the great attack on the Messines Ridge in 1917. Much new material on the subject has been included from an unpublished manuscript written by the Assistant

Inspector of Mines at GHQ, Major H R Dixon, MC, and contributed to the author by Colonel Phillip Robinson. Without such a guide and background material, a visit to the area can be very confusing. Strongly recommended.

GWAN

THE BIRTH OF MILITARY AVIATION: BRITAIN 1903-1914

HUGH DRIVER

Published by the Royal Historical Society, the Boydell Press, PO Box 9, Woodbridge, Suffolk IP12 3DF – Price £40
ISBN 0 86193 234X

THIS book is a very detailed study running to almost 350 pages. It is as much concerned with the development of technology and the aviation industry itself as with early British military experience. As such perhaps only the latter half of the volume is of direct interest to Corps historians.

A very useful appendix contains biographies of the key personalities, many of whom were Royal Engineers and there are fulsome acknowledgements of help received from the Corps museum and library amongst many sources.

The publishers offer a 25 per cent discount to readers of the Royal Engineers *Journal* quoting reference 97118: Boydell & Brewer Ltd, PO Box 9, Woodbridge, Suffolk IP12 3DF.

JEN

GREAT BATTLES OF WORLD WAR II

DAVID MILLER

Published by Greenhill Books, Park House, 1 Russell Gardens, London, NW11 9NN – Price £15.99
ISBN 1-85367-299-8

THIS large format book gives summarised accounts of 26 "battles" of the Second World War. Some are single incidents (eg, "Pearl Harbor") and some protracted campaigns (eg, "The U-Boat Battle in the Atlantic"). The selection of the particular events, described in the subtitle as "major operations that affected the course of the war", from the whole panoply of the war might be questioned. For example, Burma is not mentioned but the airborne capture of Crete is. Nevertheless, the condensing of each into its essentials is a brilliant feat by this experienced author; the immaculate, simple clear maps and the garnishing of photographs (many of them unfamiliar) are a pleasure to see. A coffee-table publication for the popular market, perhaps, but one which could be a very handy and reliable reference book for the general reader.

GWAN

GUILLEMONT: SOMME - BATTLE-GROUND EUROPE

MICHAEL STEDMAN
ISBN 0 85052 591 8

POZIERES: SOMME - BATTLEGROUND EUROPE

GRAHAM KEECH
ISBN 0 85052 589 6

Leo Cooper (Pen & Sword Books), 47 Church Street, Barnsley, S70 2AS – Price £9.95 (each)

THESE are two more first-class books for the battlefield visitor whether by armchair or actually on the ground. Both are in the laminated soft-back, pocket-size format now familiar in the Battleground Europe series. Both suggest a number of walks in their areas and give very detailed directions with maps and photographs as a guide. The introductory accounts of the phases of the battles are clear and well illustrated albeit for anyone who either knows the broader picture or is prepared to look it up. There is excellent emphasis on individual stories often through quotations from diaries and letters; Guillemont includes a German and British account of the same incident intriguingly presented side-by-side. Strongly recommended.

GWAN

A MEMOIR OF 9 PARACHUTE SQUADRON ROYAL ENGINEERS IN THE FALKLANDS CAMPAIGN, 1982

C M DAVIES

Published by C M Davies, Red House, Abbey Road, Swineshead, Nr Boston, PE20 3EN – Price £13 incl p&p

THIS is a very personal account of 9 Squadron's experiences in the Falklands War, seen through the eyes of their commander. It is an edited version of the memoir written by Chris Davies just after the war, with some of his more trenchant comments

modified, fortunately not too much as it still reads with the direct freshness of a contemporary account. The Squadron was essentially in support of 5 Infantry Brigade but had had to detach 2 Troop to support 2 Para who had been allocated to 3 Commando Brigade and when they themselves received the call, the deficiency was made up by a troop from 20 Field Squadron ("4 Troop"). The book includes all these subunits, covering their activities from the moment it became apparent they would be involved, their preparations, training, deployment and their exemplary contribution to the various battles in the campaign. But much more than that, we share their OC's own thoughts and feelings as he made his decisions as the events unfurled, and his reactions to the triumphs and tragedies experienced by a unit trained for but, until that point, not yet blooded by war. These include his own actions in the dreadful aftermath of the attack on the *LSL Sir Galahad*, the support of the infantry as they worked their way forward through the minefields in the approaches to the Argentine positions and the attack on Mount Tumbledown.

Chris Davies' style is from the heart and unsparing in emotion where appropriate, but the professionalism of his soldiers and the reliance on them of the units whom they supported, particularly when faced with mines, comes through clearly. Fifteen years later the book could still make an excellent case history from which junior officers and NCOs could study the essentials of preparation for such a short sharp campaign and the principles of leadership and morale required to see it to a successful conclusion.

The book has been privately produced in good quality soft-back A4 format and copies are still available from the author.

GWAN

THE JENA CAMPAIGN

COLONEL F N MAUD

Published by Greenhill Books, Lionel Leventhal Ltd, 1 Russell Gardens, London NW11 9NN – Price £19.50 – ISBN 1 85367 310 2

THIS is a reprint of the classic work originally published in 1909, written by the Sapper military historian Colonel F C Maude. It is part of Greenhill's "Napoleonic Library", a rapidly increasing collection of works new and old which throw significant light on the campaigns of the revolutionary wars. In this reprint the format of the text is slightly larger and clearer than the original and the smaller maps are bound into the book rather than appearing in a separate pocket. Maude's comments on warfare in general, written just before the First World War are still apt and the account of the campaign lucid and detailed.

GWAN

THE SAPPER VCs

GERALD NAPIER

Published by The Stationery Office, PO Box 276, London SW8 5DT – Price £35 ISBN 0 11 772835 7

SUB-TITLED "The Story of Valour in the Royal Engineers and its Associated Corps", this is a beautifully produced book. The contents are good too! In fact Gerald Napier is to be congratulated on filling a gap in our Corps history which has been crying out to be filled for years; for far too long we have hidden our light under a bushel. As the author recounts in his Preface, the only subject a Guards officer could think of talking about to his Sapper guest was drains (which may not say much for the Brigade of Guards!), but many can remember the days when the Corps was responsible for Works Services, and the Garrison Engineer invariably had a poor office for fear of being accused of favouring himself, to the detriment of the units he was there to serve. It is time to put the record straight and Gerald Napier has done so in no uncertain manner. Not only are we responsible for the engineer support of the whole army, we are very much one of the "teeth arms", and as the Chief Royal Engineer says in his Foreword, the catchphrase "first in, last out" may be an over simplification, but the stories told in this book go a long way to explaining its origin.

The VC was inaugurated in February 1856 and made retrospective to 1854 to include the Crimean War. Since then over 50 Sapper VCs have been awarded, with all parts of the Corps represented: from sappers in the infantry role to tunnellers and the embryo Royal Flying Corps, from Sapper to Brigadier General. All have been richly deserved. Many of the exploits, such as Lieutenant Chard's at Rorke's Drift, are well known but there are many others recorded here which are no less worthy. This is Gerald Napier's first book and it has been meticulously researched with an impressive bibliography. Let us hope it will not be his last.

The main attraction of this book, though, is not so much the citations, exhilarating as they are, but the background against which they have been earned. There are brilliant potted histories of various wars and expeditions, many of them little known, setting the scene for stirring exploits. For instance, not many people had ever heard of Bhutan, let alone been able to point to it on a map, until Prince Charles visited the kingdom last year, yet two sapper VCs were won there in 1865. Similarly, another VC was won in the Ashanti War of 1873 and Captain Aylmer won his in the state of Hunza, where the empires of Britain, Russia and China met, in 1891. The subsequent careers of the recipients add to the fascination, though one cannot help wondering why LCpl Jarvis, who won his VC at Mons in 1914, was discharged "a somewhat embittered man" only two years later. The full list does include some who won their awards whilst serving with other arms but the author has worked on the principle of "once a sapper, always a sapper" and who could gainsay him for the inclusion of Captain James McCudden VC, DSO and Bar, MC and Bar, MM of the RFC, but who came from a sapper family and started his service as a bugler? His medals are in our museum.

No book is ever perfect, but it is difficult to find fault with this one and it may seem carping to criticize. The otherwise excellent maps, however, would have been improved by some very minor additions to enable the reader to follow the narrative more closely. For example, where are Sukkar and Sibi, or the Kurram Valley mentioned in the chapter on Afghanistan, and the addition of a scale on the map of Ladysmith would have helped, but these are very minor comments in the context of the book as a whole.

When one has finished this very readable and well illustrated book, one is left full of admiration for those gallant sappers who have gone before us and who have done so much to enhance the reputation of the Corps. But as Gerald Napier points out in his thought-provoking epilogue, victory in battle is the outcome of endeavour by all, the rewarded and unrewarded alike.

Finally, do not be put off buying this book by the published price of £35. The Institution has obtained copies for sale to the Corps through the Corps Enterprises Shop for only £20 plus p&p and it deserves pride of place on every Sapper's bookcase.

GLC

FLASH SPOTTERS AND SOUND RANGERS

How They Lived, Worked and Fought in the Great War

Originally compiled by John R Innes in 1935

Published by Redwood Books Ltd, Trowbridge, Wiltshire – Price £16
ISBN 0 95311565 0 8

Facsimile limited edition privately published in 1997 by Colonel Mike Nolan on the occasion of the 250th anniversary of the foundation of Military Survey. Available from Mike Nolan at Tall Trees, Broad Layings, Woolton Hill, Newbury, RG20 9TS – Price £16 plus £1.25 p&p.

It is only in recent years that historians have started to lift the veil on the tactical, logistical and technical realities of the Great War, for so long dominated by the infantry experience, and the myths generated by many commentators. In the development of the all-arms battle systems that in 1918 finally broke the main German Army, the role of the British artillery was crucial. Although it never matched the Germans' numerically or in range, by late 1917 it developed a qualitative superiority. To quote the official history "The British Artillery throughout had the upper hand of the German batteries whose fire, if not quickly subdued, was gradually lessened directly they disclosed their positions by fire". In the summer of 1918 Ludendorff complained that the British artillery had destroyed 13 per cent per month of the German artillery opposing it.

Vital to achieving this ultimately decisive superiority was the mapping enabling fire predictions, provision of survey data for precise positioning and laying of the guns without betraying their presence by prior registration, and swift location of enemy gun positions. John Innes charts how this was achieved with the emphasis on detection of enemy guns through flash spotting and sound ranging.

Various extempore methods were tried initially and – in the customary manner – the early organization, like Topsy, just "grow'd". The first Artillery Survey Section (with the unfortunate acronym ASS) was formed by Third Army in October 1915. Although staffed initially by Gunners, it was quickly passed to the Sappers and they changed its name! This reorganization coincided with the rapid expansion of the

1st Ranging and Survey Section which was engaged on the topographic surveys that produced the familiar 1:10,000 trench maps in a remarkably short space of time. Meantime scientific method was being rapidly injected. The War Office secured the services of a Lawrence (later Professor Sir) Bragg who, with a team of other scientists (including a number of Sapper officers), and initially drawing on French initiatives, continued to develop the two complementary systems to a degree of perfection. Bragg is one of the several contributors to the book.

By 1918 each of the five armies had a survey battalion of around 800 to 1000 men, each of which incorporated a number of observation sections and sound ranging sections. The technical and organizational developments are well covered although as a modest criticism the book would have benefited from more explanatory charts and diagrams. However John Innes' main purpose was to narrate something of the experience of these independent bodies of men. As Army troops near the forward edge of the battlefield, they lived as small almost autonomous groups, mostly under NCOs, linked to their officers and thence the guns by tenuous telephone lines. Each section developed its own inimitable domestic style, but the one thing they all appeared to have in common, despite a variety of capbadges, was a strong sense of responsibility.

The latter chapters of the book deal with the experiences of some when impelled into the fighting to stem the German advances of the spring of 1918. What is particularly interesting in this is the absence of any panic; rather a dour determination to win.

Predicted fire and suppression of enemy artillery came fully of age at Cambrai. With the tanks to crush the wire and provide close fire support to the infantry the main task of the medium and heavy artillery was to protect the tanks themselves from enemy artillery. Secrecy and surprise were paramount so prior registration was rigorously prohibited. Almost all enemy batteries had been pinpointed, all British guns calibrated, meteorological data constantly monitored and survey officers visited every battery to check on bearing pickets and ensure methods were understood. With observation denied by extensive smoke screens precision was vital. The guns spoke en masse as the infantry and tanks left cover, and almost immediately crushed the German artillery defensive fire.

By the final 100 days, starting with the battle of Amiens, the spotting and survey sections had become adept at moving position and placing new survey points enabling the heavy and medium artillery to be swiftly and secretly switched. No sooner was dust settling on the one attack than a fresh punch came in at a new location. It was this that provided the vital element of tactical surprise and local gun superiority that restored movement and drove back the German armies. The description by one historian of the development of survey, spotting and gun calibrations as the "Manhattan Project of the Great War" may be gilding the lily but certainly the contribution to victory by this branch of the Sappers, and associated scientists, deserves better recognition. In republishing John Innes' book Colonel Mike Nolan has made a valuable contribution to restoring some of the balance to understanding the Great War.

GPGR

Abbreviations and Foreign Words Used in This Journal

2IC ..... second in command
A ..... Army
AFV ..... armoured fighting vehicle
AG ..... Adjutant General
AMF(L) ..... Allied Command Europe mobile force (land)
AQMS ..... artificer quartermaster sergeant
Armd ..... armoured
AT ..... apprentice tradesman/men
ATR ..... army training regiment
AVLB ..... armoured vehicle-launched bridge
AVRE ..... armoured vehicle RE
BATUS ..... British Army Training Unit Suffield
BCom ..... bachelor of commerce
BBC ..... British Broadcasting Corporation
Bde ..... brigade
BEF ..... British Expeditionary Force
BGE ..... battle group engineer
BSA 500 ..... army issue motorbike
C^3 ..... command, control and communication
Cdo ..... commando
CET ..... Combat Engineering Tractor
CinC ..... Commander in Chief
cm ..... centimetre
CO ..... commanding officer
CORIMEC ..... trade name for flat pack fd office accom
CRE ..... Commander Royal Engineers
CS ..... close support
CVR(T) ..... combat vehicle, reconnaissance (tracked)
d ..... denarius (penny)
D&D ..... Devonshire and Dorset Regiment
D Engr Sp (A) ..... Director Engineer Support (Army)
Div ..... Division
DS ..... directing staff
ECAB ..... Executive Committee of the Army Board
eg ..... exempli gratia: for example
EinC ..... Engineer in Chief
Elec ..... electric
Engr ..... engineer
EOD ..... Explosives Ordnance Disposal
ERLO ..... Engineer Recruiting Liaison Officer
et al ..... and others/elsewhere
FARELF ..... Far Eastern Land Forces
Fd ..... field
FFR ..... *fitted for radio*
Ftr ..... fitter
FTX ..... field training exercise
G1 ..... personnel matters
G2 ..... intelligence/security
G3 ..... operations and training
G4 ..... material
Gen ..... general
GHQ ..... General HQ
GOC-in-C ..... General Officer Commanding in Chief
Gp ..... group
GSB ..... general support bridge
GSO ..... general staff officer
HQ ..... headquarters
I/C ..... in charge
Indep ..... independent
JNCO ..... junior non-commissioned officer
LAND ..... Land Command
LAW ..... light antitank weapon
LE ..... late entry
LR ..... Landrover
LSI ..... landing ship infantry
LTC ..... long term costing
LWT ..... light wheeled tractor
ME ..... military engineer
MELF ..... Middle Eastern Land Forces
MO ..... medical officer
MOD ..... Ministry of Defence
MT ..... motor transport
MWT ..... medium wheeled tractor
NATO ..... North Atlantic Treaty Organisation
OC ..... officer commanding
OCTU ..... Officer Cadet Training Unit
OIC ..... officer in charge
OPCON ..... operational control
ORBAT ..... order of battle
PARA ..... The Parachute Regiment
PIAT ..... projectile infantry anti tank (e1942)
POM ..... plant operator mechanic
PWRR ..... Princes of Wales's Royal Regiment
QMG ..... Quartermaster General
RAF ..... Royal Air Force
RAOC ..... Royal Army Ordnance Corps
R&R ..... rest and recuperation
RASC ..... Royal Army Service Corps
RE ..... Royal Engineers
Reg C ..... regular commission
Regt ..... *regiment*
REME ..... Royal Electrical and Mechanical Engineers
RHQ ..... Regimental Headquarters
RN ..... Royal Navy
RSJ ..... rolled steel joist
RSME ..... Royal School of Military Engineering
RTR ..... Royal Tank Regiment
RV ..... rendezvous
s ..... shilling/s
SFOR ..... Stabilization Force
SHQ ..... squadron headquarters
SME ..... School of Military Engineering
SNCO ..... senior non-commissioned officers
SO ..... staff officer
SOE ..... special operations executive
SOP ..... standard operating procedure
SOTR ..... statement of training requirement
SQMS ..... squadron quartermaster sergeant
Sqn ..... squadron
SRC ..... special regular commission
SSC ..... short service commission
STsRE ..... Specialist Teams Royal Engineers
TA ..... Territorial Army
Tac ..... tactical
TACISYS ..... tactical information system
TACOM ..... tactical command
TESEX/s ..... tactical engagement simulation exercise/s
TQMS ..... technical quartermaster sergeant
UK ..... United Kingdom
UN ..... United Nations
UNFICYP ..... United Nations Force in Cyprus
US ..... United States
UXB ..... unexploded bomb
VW ..... Volkswagen
YO ..... young officer

Articles on computer disk

Please remember the following when preparing articles on your computers: type straight text, single line only, no formatting other than a single manual carriage return at the end of a paragraph. Please! NO capitals-only titles, use upper and lower case.

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Photographs (please! not slides). A few photographs have been sent on disk but we have been unable to use any of them. To produce an image suitable for publication, a photograph needs to be scanned at 800 to 1000 dpi/ppi minimum in greyscale. This produces a file far too large to put on a floppy disk (usually 10 to 20Mb according to photo size) but allows the photograph to be manipulated and improved here without loss of detail. Really it is best to send the actual photographs (not forgetting to add captions of course). If requested, photographs can be returned to sender after publication.

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