THE ROYAL ENGINEERS JOURNAL

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Guidelines for Authors

The Editor is always glad to consider articles for publication in the *Journal*. Guidelines for prospective authors are:

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

Length. Normally approximately 4500 words (five A4 pages **single** line text plus illustrations). Blockbusters can sometimes be serialized.

Clearance. The author must clear his/her article with his/her commanding officer where applicable.

Copy. Ideally text should be double space typed and include the author's pen picture, photo and captions for artwork.

Computers. Articles saved as ASCII files on a 3.5in floppy disc, from any DOS computer, will be welcome.

Photographs should be black and white if possible. Coloured photographs rarely reproduce well unless they are excellent quality with sharp definition. Slides are not acceptable at present.

Line Drawings, should be drawn in proportion with the page size (145mm x 205mm).

Rewards can be generous. The Publications Committee has about £250 in prize money to allot for each issue plus valuable annual prizes. All authors receive £10 to help cover costs.

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

Contributions should reach the Editor by:

13 October for the December 1993 issue
Early February for the April 1994 issue
Early June for the August 1994 issue

Submissions before the deadline will be particularly welcome.

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Contents

4100

Chief Royal Engineer

GENERAL SIR JOHN STIBBON KCB OBE

GENERAL Sir John Stibbon was born in 1935 and was educated at Portsmouth Southern Grammar School and the Royal Military Academy, Sandhurst before being commissioned into the Corps of Royal Engineers in 1954.

He spent most of his early career at regimental soldiering, serving with field, armoured and amphibious Sappers. A short tour as a field troop commander in 35 Corps Engineer Regiment preceded his degree course in civil engineering at the Royal Military College of Science, and then further BAOR postings followed as Second in Command of 16 Field Squadron and Adjutant of 32 Armoured Engineer Regiment. He returned to UK in 1965 as GSO2 RE at the Royal Armoured Corps Centre, Bovington, before taking command of 2 Armoured Engineer Squadron in Hohne, followed by two and a half years as DAA & QMG of 12 Mechanized Brigade in Osnabrück.

A posting to the Staff College Camberley as GSO1 (Directing Staff) was followed by a very happy period commanding 28 Amphibious Engineer Regiment in Hameln before being promoted to colonel in 1977 and appointed as AMS MS(SB) in the Military Secretary's department. This was followed by promotion to brigadier and command of 20 Armoured Brigade in Detmold in 1979.

He attended the Royal College of Defence Studies in 1982 and took over as Commandant of the Royal Military College of Science in 1983 on promotion to major general. His final six and a half years was spent in the Ministry of Defence, first in 1985 as Assistant Chief of Defence Staff (Operational Requirements) and then in 1987 as Master General of the Ordnance, from which appointment he retired in December 1991.

General Stibbon was Colonel Commandant of the Royal Army Pay Corps (1985-92), The Royal Pioneer Corps (1986-91) and the Royal Engineers from 1987. He received an Honorary Doctorate of Science from the Cranfield Institute of Technology in 1989, is a Freeman of the City of London and an Honorary Vice President of the Football Association. He was appointed Chief Royal Engineer on 10 May 1993.

He and his wife, Jean, married in 1957 and they have two daughters, one of whom is married to an officer in the Corps.

His interests include athletics, association football, golf, water colour painting and palaeontology.

Gen Sir John Stibbon KCB OBE
Chief Royal Engineer (p116)

Engineer in Chief

MAJOR GENERAL G W FIELD CB OBE

MAJOR GENERAL Geoff Field takes over as Engineer in Chief in September 1993. Born in 1941, and educated at Daniel Stewart's College, Edinburgh, he was commissioned into the Corps in December 1961. After YO training and a "short" course at Shrivenham (where colours were earned for cross country but not much else) he served as a troop commander in 38 (Berlin) Field Squadron, 1 Training Regiment and 9 Independent Parachute Squadron. Whilst in 9 Squadron he was fortunate to have Mike Matthews (whose memoir sadly appears elsewhere in this edition) as his OC and this was to have an important influence on his future. After a tour as AI (Fieldworks) Chatham came a move to 59 Field Squadron Singapore as Second in Command. The Squadron supported 3rd Commando Brigade Royal Marines and was in the early stages of converting to the green beret role. After returning to Plymouth with the Brigade in early 1971, he later attended the Army Staff Course (Division II) at Shrivenham, followed by the Australian Army Staff course at Queenscliffe. All this fun in the sun was rewarded by the first of five tours in the MOD, on this occasion in MGO Secretariat. This "hot seat" in the Weapons Staff was traditionally filled by a Sapper – as was the MGO appointment.

He returned to command 59 Squadron in 1976 and immediately deployed to Northern Ireland. During this tour *Condor Troop* arrived in the Province on *Spearhead* with 45 Commando and so, briefly, the whole Squadron was together for the first time. He regards command of 59 as the most rewarding of all his tours at regimental duty. On promotion to lieut colonel in mid-1978 his next port of call was as a DS to Shrivenham where, in view of his earlier track record, he was amused (and amazed) to find himself teaching nuclear physics to Division I graduates! Common sense prevailed and he left in 1980 to command 36 Engineer Regiment. Serving in a regiment was a novel experience (having previously served only in independent squadrons) not helped by changing affiliations (from the UKMF to 5 Infantry Brigade) half way through the tour. As a result the Regiment deployed on *Operation Corporate* with the CO double-hatted as CRE in the two-star land forces HQ. He returned to the MOD on promotion in 1982 as the Assistant Director of Defence Policy, from which olympian

heights he descended on promotion to command 11 Engineer Group. From there he went to the RCDS where, after spending all of two days writing his thesis, he won a £25 book token for having it published in the Seaford House Papers!

By now a seasoned Whitehall warrior he returned to the Defence Staff as Director Defence Programmes, responsible for providing military advice on the overall size and shape of the armed forces and on the allocation of resources in the annual LTC exercise. A year later he was promoted to major general and assumed the appointment of Director General of Logistic Policy (Army). As de facto Chief of Staff to the Quartermaster General he has been at the centre of the "Q" world throughout the Gulf War, Bosnia, *Options for Change* and the Logistic Support Review.

After three and a half years he is delighted to return as the professional head of the Corps.

What are his aims as Engineer in Chief? Put simply:

> First, to ensure that we have the capability to meet any operational task which may be placed upon us; second, to continue the consolidation of the Corps after the turbulence of *Options* and to defend it against any further depredations; and third, to do what can be done to make soldiering professionally rewarding and fun.

Maj Gen G W Field CB OBE
Engineer in Chief (p117)

Annual Report to the Corps by the Engineer in Chief

Introduction

I ended last year's report to the Corps with emphasis on the challenge facing us all. The past year has seen the bulk of the implementation of the greatest change to the Army for a very long time; we have taken our share. However, I remain confident that the Corps' new structure, albeit smaller, is sound, balanced and flexible. With the mould of BAOR now broken the emphasis is very much on the traditional concept of military engineering across the total spectrum of our capabilities all of which remain firmly in place. The essential value of this is now becoming widely recognized as the concepts of power projection emerge doctrinally and in a pragmatic way on a day-to-day basis. Perhaps we should not be surprised how long it takes to relearn old military lessons.

As you read on you will detect that we have done no less than in previous years, and in terms of diversity we have done much more.

Operations and Deployments

Last year this section ended with the comment that the growth of UN-based operations would continue – unquestionably this has proved to be so. The most noteworthy example of this has been operations in the former Yugoslavia. I mentioned *Operation Hanwood* in last year's report. The contribution in Croatia was made by a troop of 3 Field Squadron which deployed in support of a field ambulance. As few of the other nations' deploying forces had any integral engineer support, the troop was in great demand more widely than Croatia. In Sarajevo it earned the Corps considerable praise both from the media and from the military as a whole. Kate Adie wrote to me saying, "His (the Troop Commander, Captain Damian McKeown's) efforts to restore and repair power and water supplies were tenacious, and his determination to ensure and encourage the cooperation of Bosnian repair teams, of all ethnic backgrounds, was an object lesson in UN ideals and practical assistance." The subsequent deployment of 35 Engineer Regiment to Bosnia on *Operation Grapple* built on this foundation and earned great praise at the highest levels. Several individuals have been honoured, in a special list published with the Queen's Birthday Honours, with one QGM, one Mentioned in Despatches, one OBE and four MBEs being awarded to members of the Corps. The priority of work has alternated between route development and maintenance and the provision of accommodation. The statistics speak for themselves; 610 accommodation and other units constructed; 6 camps established with power, water and all other facilities; 1000 kilometres of road constructed, upgraded and maintained through a difficult winter; 23 minor bridges (see article this *Journal – Jedan Most Previše – Bridge Inspections in Bosnia, Operation Grapple* by Captain J F Pelton) and one major bridge refurbished. Whilst it may not have been apparent in the media, for most of the first six months of the deployment there were more Sappers in Bosnia than Cheshires, and even some of the first humanitarian convoys were escorted by the Corps, as Warrior was too large for undeveloped roads. 1 Field Squadron, reinforced to a strength of 250, has now taken over from 35 Engineer Regiment (see article this *Journal – Engineer Support for Operation Grapple* by Colonel J S Field) and a wide range of contingency planning has taken place to allow for further deployments. Once again all elements of the Corps have drawn together to produce an outstanding response in broadly based military engineering terms.

Military Survey currently provides elements in the UN Protection Force Headquarters in Zagreb, in Headquarters Bosnia-Herzegovina Command in Kiseljak near Sarajevo, and in Headquarters Commander British Forces in Split. In both Kiseljak and Split, support consists of a major, heading a team drawn from Military Survey units. Each team provides mobile map supply and tactical printing (TACIPRINT) facilities together with terrain analysis and military survey advice. TACIPRINT facilities in particular are the envy of all other national contingents and its services are in great demand. A field survey team has been working in the British sector establishing a consistent network of trig points, using the Global Positioning System (GPS) in a precise surveying

mode and instructors from the School of Military Survey provided training in theatre in the use of vehicle mounted GPS equipment for navigation.

Elsewhere in the world the UN has called on the United Kingdom to participate in a variety of operations. Requests for assistance in Somalia and Mozambique were declined at the political level but not without contingency planning. However our contingent on *Operation Lecturer* in Cambodia has continued to expand its operations. At my request, a shift in ministerial policy has permitted the contingent not only to train local teams in the clearance of mines, but also to supervise clearance operations. Current plans are that the team will withdraw towards the end of this year.

The Prime Minister being briefed by CO 35 Engineer Regiment.

Our major contribution to the Emergency Tour Plot continues relentlessly. In the Falkland Islands there has been no major construction task of the size of the swimming pool mentioned last year but 11, 53 and 69 Squadrons have been very busy on a large range of tasks including a complete refurbishment of the accommodation on South Georgia.

In Northern Ireland 25 Engineer Regiment is now firmly established. Whilst it was my intention that roulement should cease, manpower pressures have dictated otherwise. The Regiment's second field squadron and search troop will continue to be provided on a roulement basis. Tasking for the Regiment continues at its normal high level. Recent major projects have included the rebuilding of border crossing points and the refurbishment of border observation posts. These are major military and military engineering tasks mounted largely by helicopter with all the attendant design, organizational and logistic complications.

In Belize the British defence commitment will end in the near future, and with it will go our 135-man roulement contribution to the garrison. The engineer squadron will be one of the last formed bodies to leave. A training team will be set up towards the end of next year.

Our commitment to overseas garrisons has continued as in previous years. In Gibraltar the Fortress STRE continues to provide tradesman support to the Rock, as well as valuable experience in power station operation although the power station's days are numbered. Further east 62 Cyprus Support Squadron continues operations in support of the garrison and the UN, and is now stripping out the reverse osmosis plants installed to supply additional drinking water to the Western SBA – recent rains have been plentiful. Further east still, in Hong Kong, the Queen's Gurkha Engineers have had another busy year, although mercifully to date there has been no requirement for them to deploy on what have become almost routine hurricane relief operations in the Pacific. The Corps' only commitment on that front was the deployment from Belize of a small party from 59 Independent Commando Squadron to the island of Eleuthera in the Bahamas following Hurricane *Andrew*. This small group achieved much in a short space of time, and earned the Corps yet more well-deserved praise.

The aftermath of *Operation Granby* lingers on. Whilst there are now no formed engineer units deployed in the region there have been many deployments of individuals. Most have been involved with support to the RAF policing the northern and southern air exclusion zones in Iraq, but we have also deployed individuals with the UN teams monitoring weapons of mass destruction within the country.

Whilst operational tasking on the mainland of the UK has, thankfully, been no more than routine, there has been a lot to do. 33 Engineer Regiment (EOD) in particular has continued with its round of support to the civil ministries, especially in the search field. There has also been a considerable amount of planning and reconnaissance effort put

Annual Report to the Corps (p119)

into updating plans for contingency operations throughout the country.

Waterleap 92

In the summer of last year 53 Field Squadron (Construction) carried out a number of construction tasks at the Canadian Forces Base Borden, Ontario on *Exercise Waterleap 92*, the thirtieth in this unbroken series of annual projects. Unusual features were piled bridge abutments, the diversion of a river into a new course after the bridge was completed, and the successful draining of a peat bog to allow road construction in the dry. The Military Works Force (MWF) was nearby, planning another set of tasks for next year's exercise.

The third *Exercise Oakapple* was conducted earlier this year by 20 Field Squadron in torrential rain in the Aberdare Mountains of Kenya, while a reconnaissance group from 11 Field Squadron was planning the fourth exercise for next year. Unlike *Exercise Waterleap*, which integrates the Corps' technical abilities, *Exercise Oakapple* is planned and executed by an unreinforced field squadron. This is more appropriate for Kenya, and the exercise is notable for its low project costs – met by a wildlife charity. This year the usual package of tasks such as tracks, timber bridges, and huts was supplemented by a large bungalow for VIP visitors with spectacular views from the veranda. Both exercises offer excellent training value.

The third part of the routine overseas projects mounted from UKLF consists of seven troop-level six-week exercises. The *Northern Quest* series has been expanded to two troops a year working on Norwegian training areas, the *Pinestick* series has been expanded to three troops a year working partially for British Forces Cyprus and the UN Force in Cyprus. A new series, *Crabapple*, has been added in Kenya, while *Exercise Fourteenth Shot*, in Gibraltar, undertook a mix of tasks for British Forces Gibraltar and the local tourist board.

UKLF units have also been involved in two other major overseas projects during the year. A small team from 39 Engineer Regiment and the MWF supervised the refurbishment of Uige Barracks in Angola, as part of the Foreign and Commonwealth Office's contribution to the (sadly short-lived) outbreak of peace in that country. Elements of a reinforced roulement Belize field squadron, found in turn by 9, 59 and 25 Squadrons, have constructed new ammunition storage facilities in Belize, replacing an ill-starred 1987 design.

Within the UK, the self-imposed target of four major projects on training areas was again missed due to the pressure of operations and reorganization. Nevertheless, two major projects were completed. 6 Field Support Squadron carved a route through the northern extension of the Garelochhead training area, opening it up for training, and 15 Field Support Squadron completely reconstructed the Holcombe Moor gallery range. Planning is now underway with renewed emphasis on these home-based projects, as we are seen as a cost-effective solution to updating many of the UK training areas.

In Germany, where there is always too little time for projects, 23 Engineer Regiment deployed both 73 and 39 Field Squadrons; the former to Vizusdudus in Romania to renovate a technical college and orphanage, and the latter to Greifswald in the former DDR to construct an adventure playground.

There have been few major exercises while units concentrated on reroling, but 28 Engineer Regiment deployed on their last amphibious regimental exercise in September last year. Scheduled overseas exercises have continued however, with 2 Field Support Squadron deploying on *Exercise Warpaint* and several Sapper troops supporting battle group exercises in Canada, Kenya and the USA. The annual Public Utilities Team exercise in January this year took place in Hong Kong and included refurbishment of the air conditioning system in the Headquarters building. Annual air support exercises in Germany, and TA STRE exercises in Germany, Belize, Gibraltar and Cyprus have continued unabated.

Reorganization

I took the opportunity in my last report to set out how the Corps would be organized following the *Options* process. In the succeeding 12 months we have made considerable progress towards reaching the new structure. In Germany much of the reroling process has been completed and engineer support to 1 (UK) Armoured Division has now been largely reorganized, with the few remaining changes to be completed next year.

In the UK many of the changes needed to meet the engineer support structure within 3 (UK) Division have been completed. This process will be taken a stage further when 22 Engineer Regiment forms its two armoured squadrons in August this year. 25 Engineer Regiment's move to Northern Ireland has gone well, but as I mentioned

in the section on operations, manpower problems have intervened and I have had to take the difficult decision to disband the second field squadron for the Regiment in order to balance the manpower account across the Corps. This means that 25 Engineer Regiment will continue to have one of its squadrons and its search troops found on a roulement basis for the foreseeable future. The title of 12 Squadron will be allocated to the Headquarter Squadron of the Regiment.

It has been a busy year for the TA. Three new regiments have been formed, 76 and 77 Regiments to support the Royal Air Force as part of 12 Engineer Brigade, and 78 Regiment as part of 30 Engineer Brigade. Much reroling has taken place within the other regiments. Sadly, we have lost one pre-*Options* formation and some units, in particular 29 Engineer Brigade and 74 Engineer Regiment, although the regimental spirit lives on in 74 Independent Field Squadron. 29 Engineer Brigade bowed out most graciously with a fine gathering at Edinburgh Castle.

My own Directorate has not escaped and is in the process of reorganizing and slimming down before moving to Minley next year. However I am pleased to be able to report that the importance of my own post at two stars has been recognized in the *Blelloch Review*, as has the post of Director General Military Survey.

Training

The past year has seen many changes started and a few completed. Phase 1 Common Military Syllabus (CMS) training of our regular soldiers has ceased at Gibraltar Barracks and 28 Training Squadron has moved to join the Army Training Regiment (ATR) at Bassingbourn. Squadron personnel have settled in well and have already completed the training of their first parties. In the autumn of last year the Executive Committee of the Army Board (ECAB) decided that the proposed training scheme for junior leaders was no longer affordable, and all regular recruits, other than apprentices, were to be recruited and trained as Single Entry (SE) regardless of age on enlistment or sex. It is planned to start the first SE recruits in training this September and they will be trained to Class 3 level in both combat engineering and in a trade, before joining their units.

For apprentices, the Army Apprentices College at Chepstow will close in 1994. However, the plan originally put to ECAB, to form the Army Technical College at Arborfield, has now foundered. Instead Arms Directors will be responsible for their own apprentice training. For us this will mean that apprentices will spend their first year in a new Apprentice Wing at Gibraltar Barracks where they will cover Phase 1 CMS skills as well as external leadership, education for trade training, sport and adventurous training. They will also reach Combat Engineer Class 3 level and have a brief introduction to their trade. Apprentices will then go to Chatham for the balance of their Class 2 trade training before joining their units.

Waterleap 92 – up the pole.

Much effort has been expended in the last 12 months on the reorganization of Arms training centres in order to meet financial savings. In the case of the Corps, there was considerable pressure to achieve this by locating all training currently done at Minley and Chatham onto a single site. However, it was soon apparent that this was just not cost-effective, and the retention of two major sites was accepted. Consultancies were then launched, by the Directorate of Manpower Audit (DMA) and a civilian firm of consulting engineers, to advise on the future manning and organization of the RSME and the capital costs associated with reshaping the school. Agreement to capital funding of £31M was given earlier this year and the new organization was approved in June. Detailed planning is well under

Annual Report to the Corps (p121)

way, however, it has already been established that Minley Manor will be reconfigured as an officers' mess and the offices currently located in the Manor will be moved to Gibraltar Barracks.

The principal outcome is that 11 Engineer Group has been closed down and the RSME is now responsible for all training carried out at Chatham, Minley and Chepstow. When Chepstow closes the RSME will consist of Brompton and Minley as colonel's commands, supported by 1 and 3 RSME Regiments respectively. These new regiments are the product of the amalgamation of 1 and 3 Training Regiments (3 RSME), and 12 RSME Regiment and the Depot Regiment (1 RSME – from late 1994). Other measures include the transfer of the majority of our driver training to the Army School of Mechanical Transport at Leconfield. Battlefield Engineering Wing is now forming at Minley, which will be the amalgamation of the Field Engineer Wing and Signal Wing. At Brompton, the formation of a Construction Wing will teach the skills currently taught in PRA, Civil and Mechanical Engineering Wings, and a Design Engineering Wing will cover management and technical training. The Counter Terrorist Search Wing, as an outstation of Brompton, will move to Lodge Hill into a new build in the space left by the move of 33 Engineer Regiment (EOD) to Wimbish. Tactics Wing will form the nucleus of a Command Wing at Brompton, which will sponsor the major command courses, including the Troop Commanders' Course (TCC), as well as providing agency training for many other courses at both Chatham and Minley. A study, led by a Sapper officer, will start this summer to plan the implementation of a Defence Diving School on a new site at Horsea Island, Portsmouth in 1995. Until then, REDE will be under the command of Colonel RSME (Minley). The links with the RE Wing at Bovington remain as before.

Finally a brief note on officer training. The first of the new one-year commissioning courses started at RMAS in September 92. Graduates and non-graduates are now trained together. There will be a change to the output pattern which will affect the TCC as will the need to combine the final all-arms exercises for the TCC with the Combined Arms Training Centre at Warminster. Both these changes are welcome.

Equipment Matters

The relationship between future concepts and equipment is particularly important and I have drawn the two elements into one branch within my Directorate. Close working ties are maintained with the Directorate of Land Warfare, in order to influence the development of future all-arms doctrine and ensure that engineer aspects of that doctrine are fully recognized. Already a considerable amount of work has been completed on engineer support to high intensity operations and on future bridging. Other work is in progress on support to force projection, a family of future mines and counter-mine warfare.

As I reported last year M3 is a very significant improvement on M2, but budgetary pressure on the German army, our partner in the development and production of the equipment, has caused some delay. Tenders for a production contract have now been invited. The BR90 general support bridge has been on trial in Germany with 7 Field Squadron this summer and has performed very well. BR90 is achieving the very short build times set in the requirement. It is transported and constructed from a superb fleet of rugged wheeled vehicles with exceptional cross-country performance. I have no doubt that BR90 will maintain the lead in military bridging that the UK has had for such a long time.

The Vickers Chieftain AVRE has been accepted for service and the first equipments were delivered to the RE Wing at Bovington in the spring. The capabilities of the Chieftain AVRE's special-to-role equipment have been built substantially on the revolutionary Willich AVRE. There are still significant mobility problems to be overcome; either a major automotive upgrade, or the introduction of Challenger are the solutions, but as yet they remain unfunded.

In mine warfare two contenders for our Vehicle Launched Scatterable Mine System will be evaluated this autumn. Mine-laying equipments from Alliant Techsystems (US) and GIAT (France), both mounted on the Alvis Stormer, will be compared in a comprehensive trial. A production contract will then be let. Both the international development programme for our new off-route mine and the contract with Royal Ordnance for a mid-life improvement to Giant Viper are progressing well.

The new Hydrema LWT, which entered service just in time for *Operation Granby* and which has proved an excellent machine, is now being joined by the Case 721 MWT, as a replacement for our old Terex MWTs, and by the Terex 3066 Frame Steer Dump Truck. The latter has the DROPS load-handling system and can set down its earth-moving

skip and load DROPS flat racks, giving a very useful and flexible capability. 75 are being procured for both Army and ADR roles.

New demolitions equipments are entering service and will combine to enhance our capability significantly. The range will comprise underbridge, overbridge and conical charges. They will allow us to tackle major reinforced concrete bridges more quickly with less manpower. The demolition remote firing device, which is also entering service now, will allow a number of demolitions to be fired by coded radio signals.

The new Terex 3066 Frame Steer Dump Truck.

Manning

THE Corps is well recruited with full manning at junior officer level and a healthy number of applicants for PET courses. Despite the record entry to Staff College in 1993 of 19 students, 1994 will top this with 22. At a time of contraction, following a period of full officer recruiting, a major concern has arisen over our inability to offer some of the high-grade Short Service Commission officers a Regular Commission.

We have had the first two phases of redundancy, losing 65 officers in Phase 1, of which only six were compulsory, and 98 in Phase 2, of which 37 were, sadly, compulsory. There is a final phase to come this year. All this, plus the inevitable gapping of posts and general turbulence has placed a great strain on commanders, individual officers and their families.

Soldier manning of the Corps is also in a healthy state with all units in the field army manned to, or above, establishment despite a small number of trade shortfalls. However, in 1994 the combined effects of restricted recruit intakes in 1992 and 1993 and Phases 2 and 3 redundancy will reduce manning to the new establishment levels. Soldier redundancies in Phases 1 and 2 totalled some 650, of which two thirds were in the combat rather than artisan trades. Fortunately all have been volunteers, a fact which has minimized the unpleasantness of redundancy for our soldiers and their families.

Military Secretary and Corps Affairs

LAST year saw the appointment of Major General A D Pigott CBE, as Chief of Staff of the Allied Rapid Reaction Corps (ARRC), whilst more recently Major General S C Grant, was appointed to lead the Command Structure Review Team. Major General P J Sheppard CBE, is to be Director General Logistic Policy, later this year, releasing Major General G W Field CB OBE, to take over from me as Engineer in Chief. Brigadier C L Elliott MBE, will become Director Military Operations in August this year.

General Sir George Cooper GCB MC DL, handed over as Chief Royal Engineer on 10 May 1993 to General Sir John Stibbon KCB OBE, having completed 50 years' service. The following officers have been appointed Colonels Commandant:

- Major General F G Sugden CB CBE – 2 July 1992.
- Brigadier R J N Kelly CBE – 2 July 1992, but transferred to the Royal Logistic Corps on 5 April 1993.
- Major General A N Carlier CB OBE – 7 January 1993.
- Major General J A J P Barr CB CBE – 5 April 1993.

Major General R L Peck CB, was appointed Representative Colonel Commandant for 1993.

We continue to be well represented and honoured in the Honours and Awards Lists. In the New Year, Northern Ireland, and Queen's Birthday Honours Lists this year we have received public recognition through the following awards; two CBs, three CBEs, four OBEs and fourteen MBEs.

Very sadly, Major General M Matthews CB DL, an active Colonel Commandant and Chairman of the Corps Finance Committee, died suddenly on 7 January 1993. The Chapel at Sandhurst was packed for his funeral. The early part of 1993 has seen the deaths of a number of other Sapper generals, including Lieutenant General Sir John Cowley GC KBE CB, Lieutenant General Sir Ian Jacob GBE CB DL, Major General W S Cole CB

Annual Report to the Corps (p123)

Second Lieutenant S Higgins receiving the Sword of Honour from HRH the Duchess of Kent.

CBE, Major General E M Hall CB MBE DL and Major General W G Fryer CB CBE. Sadly also, Brigadier P N M Moore DSO** MC, who won his DSOs at Alamein, in Yugoslavia and in Korea, died in July 1992.

A number of new Honorary Colonels have been appointed for our TA units, including General Sir John Wilsey KCB OBE for the Jersey Field Squadron(M), Air Vice Marshal G A Chesworth CB OBE DFC for 76 Engineer Regiment(V), Brigadier G A Hewish MBE for 131 Independent Commando Squadron (V), and Colonel J G Evans CBE TD for 78 Engineer Regiment(V).

Corps funds continue in a very healthy state, although income under the "day's pay scheme" has started to decline as the Corps reduces in strength. A surplus in 1992 enabled us to invest a further £¼M for Corps funds; which will help to provide a buffer against diminishing income, since our outgoings do not appear to be decreasing. Our investments continue to be well-managed and assets at the end of 1992 were:

Corps	£1,742,000
Institution	£327,000
REA	£3,479,000

Thus our total assets have increased from £4,870,000 in 1991 to £5,548,000 in 1992.

A study is in progress with the aim of reducing running costs for RHQs and museums across the Army by 30 per cent by 1995. The present collocation of RHQ RE and the RE Museum in the Ravelin Building allows us to run an efficient organization, and it is hoped that the study will not adversely affect the way we do business.

Officer recruiting is healthy; we have exceeded our recruiting targets in 1992 and 1993 and have a large number of good candidates in the pipeline for later years. We are beginning to achieve our targets of 80 per cent graduate recruitment, but have yet to reach our target of 60 per cent engineering graduates. Second Lieutenant S Higgins won the Sword of Honour at Sandhurst in December 1992, having served as a soldier in the Corps for six years.

A paper was written in 1992 with the aim of streamlining the many Corps committees. A number of lower-level committees were discontinued or amalgamated, and it is proposed that the Engineer in Chief's Regimental Committee and the Institution Council should meet on the same day for administrative benefit of the common membership. Some reduction in the membership of the Institution Council is also proposed.

Following the *Army Band Review*, the Corps' Band is to be reduced in size from 47 to 35 by 1995. Its status will change to that of a minor staff band. Our Band has been widely recognized in recent years as the best in the Army, and the announcement has caused dismay. In future there will be greater central control of Army bands from Kneller Hall. Despite these changes, we are determined to maintain the highest possible standards.

We have recently said farewell to our clerks, who transferred to the Adjutant General's Corps (AGC) on 1 July. A dinner was held in the Warrant Officers' and Sergeants' Mess at Chilwell on 2 April, to mark this transfer, and a number of other events have been held to commemorate the change of capbadge.

The Institution has been particularly busy with publications. The new short history of the Corps, *A Short History, The Royal Engineers* is now on sale through Corps Enterprises and will be issued free to regular recruits. It is a well written and attractive booklet, and I commend it to you all. Volume XI of the "History of the Corps of Royal Engineers", covering the years 1960 to 1980 will

Annual Report to the Corps (p124)

be published this summer, and we intend to start work immediately on compiling Volume XII.

Regular warrant officers have been invited to become Associate Members of the Institution; over 10 per cent have accepted to date. The offer is to be extended to TA warrant officers later this year.

A Joint Professional Meeting was held with the Institution of Civil Engineers at Great George Street on 22 March, at which a team from the Corps and the Register of Engineers for Disaster Relief (Red R), gave a presentation on *The Military Civil Engineer*. Our links with the Institution of Civil Engineers are very strong, and it is particularly important that they should remain so as construction engineering becomes an increasingly significant part of our role.

The development of the RE Museum has continued steadily and the refurbishment of the galleries is almost complete. A major project for ventilation of the courtyard and boiler room has been finished. Following the Falklands' 10th Anniversary Exhibition, a special exhibition to mark the departure from the Corps of RE PCS was opened by the Chief Royal Engineer on 24 March, and ran until the end of July. Plans are already in hand for a special exhibition to mark the 50th Anniversary of D-Day. This will open in May 1994 to coincide with a Joint Professional Meeting to be held at Brompton on the subject of Mulberry.

The next phase of development will be a permanent exhibition in the courtyard covering all the operations which have taken place since World War Two. Many of the operations will be within the living memories of those now serving in the Corps. The recession has been particularly hard on the parts of industry which have been most generous in the past in supporting the capital development of the Museum, and I have therefore launched an appeal throughout the Corps for £100,000 to cover the capital costs for this project. Money is already coming in.

Visitor numbers have continued to rise, reaching 18,000 in 1992. Opening hours were extended this year to include Saturdays. Colonel G W A Napier retired as Museum Director in May, having done an enormous amount, first as Institution Secretary and then as Director, to arrange the move to the Ravelin Building and to establish the Museum so effectively there. His successor is Colonel J E Nowers, who has been Corps Librarian for the past year.

The Corps Library was placed under the control of the Museum in 1992. A study has been conducted into the future of the Library. It concluded that the holdings should be focused more narrowly than hitherto on matters directly associated with the Corps, that surplus holdings should be sold with some of the proceeds going to rebinding, and that there should be closer integration of the Library and Museum.

Membership of the REA has been extended to include ladies to reflect the fact that female officers and soldiers are now serving in regular and TA units of the Corps. The *Shackell Report*, which made a number of recommendations to encourage younger membership, has been accepted and steps have been taken to implement the recommendations. Applications for benevolence continue to increase. The total expenditure in 1992, including individual grants, weekly allowances and grants to other Service charities was nearly £½M.

Major General W N J Withall CB, took over as Chairman of the REA from Major General H E M L Garrett CBE, on 1 April 1993. Brigadier C W Woodburn took over as Vice-Chairman of the REA, and Chairman of the Benevolence Committee, from Brigadier J D Walker OBE, in December 1992; the latter had filled this most important post for no less than 17 years.

Our links with retired members of the Corps have been strengthened by the affiliation of individual ex-Sapper In-pensioners at the Royal Hospital to units of the Corps; in most cases it has been possible to affiliate pensioners to units or locations in which they served. We have also restarted the scheme whereby specified units have been asked to visit the RE-sponsored Haig Homes in their vicinity.

Military Survey

This year has been marked by a number of important milestones in the delivery of geographic products and services to defence. The requirements, and the fundamental role in the planning and execution of operations, were demonstrated with great clarity through the support provided in the former Yugoslavia. Substantial progress has been made to realign post-Cold War priorities; to modernize facilities, to improve the management of the organization and to maintain training and planned production.

Although the end of the Cold War may have allowed cuts in some areas of defence, the Military Survey task has increased. The instability

now apparent in so many parts of the world leads to an expansion of the areas of potential defence activity and hence requirements for maps and air charts. The dependence of many new systems on geographic data in digital form, and an expectation of precision following the Gulf War has increased the task.

The major modernization of Military Survey's static production facilities (PETROS), due to come on stream from 1995, will improve efficiency and provide the prospect of meeting much of the increased demand at current running cost levels. The project remains on schedule and within budget.

In management terms it was an extremely busy year. A fundamental reorganization was implemented, post-*Options* establishments were approved and the military drawdown started, the new soldier trade structure was launched, total quality management initiatives continued, cash savings were achieved through aggressive contract action and a daunting programme of market testing was started. A management reorganization has been implemented, aimed at simplifying the structure and bringing command and financial responsibilities into line. To reflect Military Survey's defence-wide role, arrangements have also been made to move from the General Staff to a Central Staff Top Level Budget effective from April this year.

The regular soldier's trade structure has been refined to accommodate emerging technology and soldiers are beginning their conversion training. Similarly, Military Survey's TA squadron, 135 Independent Topographic Squadron(V) has begun retraining for its new map supply role.

Based on Gulf War experience officers have been appointed to the Directorate of Military Operations in MOD, to the Headquarters of the ARRC and to 1 and 3 (UK) Divisions; SNCOs are being posted to brigade headquarters. Work to build closer links with the other Services and with personel in the system development areas has continued.

Postal and Courier Services

This is of course the last time I shall have the opportunity of reporting on the activities of the Postal and Courier Services. Not surprisingly their year has been one of immense change and turbulence. Nevertheless they have been as busy as ever supporting operations and exercises worldwide for all three Services.

To mark the transfer of the "Posties" to the RLC, a farewell dinner was held in the REHQ Mess on 24 March, attended by some 80 regular and TA PCS officers. RE PCS presented the Corps with a silver replica centrepiece of the "Letter from Home" statue, and the Corps presented PCS with a portrait of Brigadier Drew, the founding father of the modern military postal service. A most successful parade was held at Mill Hill on 1 April, despite very trying weather conditions, and a PCS detachment participated in the inaugural parade for the RLC at Blackdown on 5 April.

In line with the regulars, the PCS TA have also been incorporated into the RLC. The CVHQ RE (PCS) at Mill Hill has closed, and the responsibility for PCS TA administration and training has been transferred to HQ RLC TA at Grantham.

Sport

It has been another year of outstanding achievement by our sportsmen.

In December Sergeant Dixon, who had done so well at the Winter Olympics, confirming his place as Britain's best ever biathlete, received the national Sports Writers' Winter Sportsman of the Year Award and on top of that he was named as the Army's 1992 Winter Sportsman of the Year.

Captain H M Hutchison, has been in great form this year. He regained his moguls title at the British Freestyle Championships held at Davos, Switzerland. His preparation is now focused on the 1994 Winter Olympic Games at Lillehammer, Norway.

The Corps was strongly represented in the Army Boxing Team which beat London ABA. All four Sappers won their bouts, Sapper J Bhujel (QGE) is believed to be the first Gurkha to win an Army vest.

Our footballers featured very prominently again this year; 28 Engineer Regiment were the BAOR champions again and 3 RSME Regiment were the UK champions ensuring another all-Sapper Cup Final for the Army Challenge Cup. 28 Engineer Regiment were the winners for the fourth consecutive time, a new record. Just before they left the Corps, the Postal and Courier Depot bettered last year's second place by winning the Army Minor Units' competition in a thrilling 5 to 4 match against Base Ammunition Workshops Kineton, at the end of March.

42 Survey Engineer Group won the Army Major Unit Squash Championship and, during the last weekend in November last year, the Corps Squash Team gave an outstanding performance to win all their matches and regain the Army trophy.

The Corps has now won the Army Squash Championship three times during the past four years. The Army Badminton Championship was held at the AGC Training Centre, Worthy Down, in late February. The Corps was well represented with Corporal Gibb winning the Singles Plate competition with an all-Sapper final in the Unit Doubles Competition. Seven members of the Corps were selected for the Army Squad. Sapper Ingham won the Army Indoor Tennis Championships whilst still in training at Minley. He has consequently been selected for both the Army and Joint Services teams. The Army Apprentices College Chepstow won the Under 21 Army Hockey Tournament in October which complemented the Youth Cup they won earlier in the year. 42 Survey Engineer Group came runners-up in the Major Units Final.

Our canoeists have had an exceptional year. Six members of the Corps were in the Army team which won the national marathon title for the first time ever, beating the best civilian clubs in the country. They then went on to win the Inter-Services Sprint Championships, at Chester in September. The Corps team was outstanding in this year's Devizes to Westminster Race. The "A" Team was the fastest, narrowly missing the all-time record set in 1977, but easily breaking the previous Corps record. It was our fourteenth win, and a hat trick for the past three years. Corporals Beegan and Ross completed the course in the fastest time ever recorded by a Services crew, they came third overall in a time of just 16 hours and 9 minutes, only 11 minutes behind the winners, a truly magnificent achievement.

The Corps Rowing Club has also had an excellent year. Major N M Holland, rowing with a REME colleague, won a Gold Medal, against international competition in September, at Cologne, in the Veterans Coxless Pairs. The Corps provided six members of the Army 8 at the Joint Services Regatta, also our Coxed 4 representing the Army won, and Major J M Heron MBE, won the Veteran Sculls.

In sailing, the Corps won the 1992 Ilex Trophy Regatta against the Royal Naval Sailing Association Portsmouth at the end of September.

Postcript

I am sure you will agree that my report adds up to quite a story. And it is only the tip of the proverbial iceberg. I have had the chance to visit a good part of the Corps, regular and reserve, over the past year. I have been able to see far below the water line and all is generally well and sound. Of course redundancy has taken its toll of morale here and there but overall the management of our people is exceptional by any standards. PB7 and REMRO deliver a superb product well recognized and thoroughly respected. The Corps is in remarkably buoyant form considering the far-reaching changes now in train. My major concerns are threefold, firstly manpower, not only in the form of overtight establishments but also the total numbers needed to take on the increasing levels of commitment, secondly the age and condition of some of our equipment, mainly armoured, and thirdly the significant change of emphasis towards the reserve component. There is no lack of enthusiasm on the part of the reservists. My concern is at the political level. Never have we been so dependent on our reserves to flesh out our diminished regular order of battle should things go sour short of general mobilization. Work is in hand but substantial political will and employee cooperation will be necessary to make it work.

Probably the greatest reward an EinC can have is to receive unsolicited praise for the Corps' achievements. Let me say I am a rich man in this respect. Praise flows in regularly from the Prime Minister at one end of the spectrum, to a humble note of thanks at the other end for help given by the REA for an old comrade, with much in between, military and civilian, national and international. It is not just for tangible work either but for our contribution across the board, on the staff and where ideas, positive thinking and action contribute to progress. It is also most gratifying to note a sense of real purpose and objectivity throughout the Corps despite all the change. The concept of military engineering is so simple, so obvious, and yet it has real power to integrate all aspects of the Corps into a common effort for the future. The Corps knows it, believes in it and radiates it. We have the potential to contribute very significantly whatever the challenges of the future. There is no scenario which does not include a major military engineering component. That simple truth is understood more widely now than in recent times and is spreading quickly as old ideas and moulds are broken.

It has been a very great privilege and honour to have been EinC over this period of amendment and change. I have every confidence for the future.

Engineer Support for Operation Grapple

COLONEL J S FIELD OBE

Colonel Field has just finished commanding 35 Engineer Regiment, after nearly three years, handing over command while the regiment was serving with the UN in Bosnia. He is now serving in Zimbabwe with the British Military and Advisory Training Team. This article relates to the events during the first three months of 35's deployment to Bosnia, including the recce.
The cartoons reproduced throughout the article were drawn by Captain Chip Wood, who was TQM of 35 in Bosnia.

The Recce

It was 20 September 1992 and I had just received two hours' notice for a recce to Bosnia, this was not what I needed on a Sunday afternoon nor the best way to start an operation that was to prove to be something rather different.

The recce party was to comprise three brigadiers, two colonels and five lieut colonels (of which three were sappers); I wondered what such a high-powered team could really achieve in what was planned to be a three-day recce. This concern was confirmed when we got there; the shortage of time and the vast area to be covered meant that this "recce" could be no more than a feasibility study. Sadly, as it later transpired, there was to be no time for a confirmatory or detailed recce before the main force deployed. Consequently, there were many areas left unexplored on the recce which subsequently had to be covered by the advance or "pre-activation" party in the three weeks prior to deployment of the main body – certainly not a good way to start an operation but my job was to solve problems not create them.

The TV news reports hadn't helped our image of what to expect in Bosnia and we had a vision of ourselves crawling along mountain roads clearing mines and passing endless streams of refugees. Nothing could have been further from the truth and like all trouble spots, problems were localized.

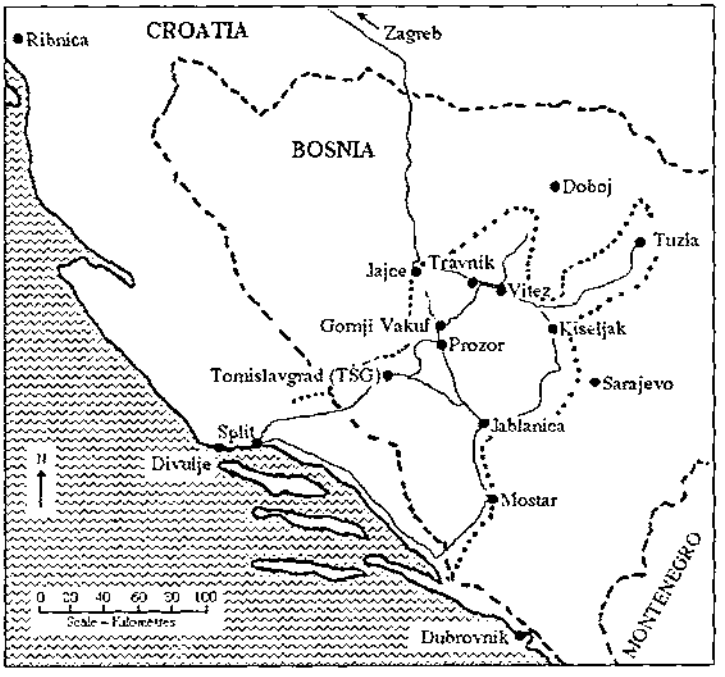
We had started the recce as planned from Zagreb and tried to enter the Tuzla area via Serbia from the east. After three days of frustration, hours spent at roadblocks and general obstruction from the Serbs, the recce was abandoned due to the Bosnian Serbs' refusal to let us cross the front line because, as they told us "...the UN were going to help the Muslims and they, the Bosnian Serbs, wanted the Muslims dead!" Subsequent events in Srebrenica and other locations have reinforced this dogma with tragic results.

We eventually went into Central Bosnia via Split in Croatia and started the process once more. We were in fact the first UN troops in the area since April, unarmed and very green as regards the ways of the local warlords. There was a certain reluctance by local authority officials to agree to anything unless we were able to pay for it immediately in foreign currency. Nevertheless we established a framework of bases and identified the major work to be done with what we assumed to be some degree of success. It subsequently transpired that our so-called deals and arrangements with local commanders and officials were almost worthless by the time we returned two weeks later. Promises turned to threats, agreed contract

Col J S Field OBE
Engineer support for Op Grapple (p128)

prices doubled, officials we had previously dealt with had mysteriously vanished and we had to start again from scratch in a lot of areas.

Although we achieved a lot in a short time on the recce there were some critical areas that had not been resolved; for example, a logistics base in Split, especially for the unloading of ships; a Force HQ location; agreed contracts for all the suitable base locations we had found; liaison with local contractors and road maintenance firms and the odd agreement from local authorities, commanders and warlords, as regards permission to operate freely in their area. The UN mandate did not give us any rights to ride roughshod over any existing authority; negotiation, diplomacy and compromise were to be the order of the day.



Map of area covered by article.

The recce did not pass without incident; elements of the party were shelled in both Prozor and Zenica, some of us were shot at in Vitez and Ribnica as well as being caught in crossfire in the Black Hills; we also ran into several roadblocks where mines were used instead of bollards to channel the traffic, an effective but alarming method of traffic control. In addition, I had been arrested twice along with other members of the recce party! This number of incidents on a short recce gave me the uneasy feeling that any large operation was not going to be trouble free. Much to my consternation, this feeling was to prove far too near the truth for comfort.

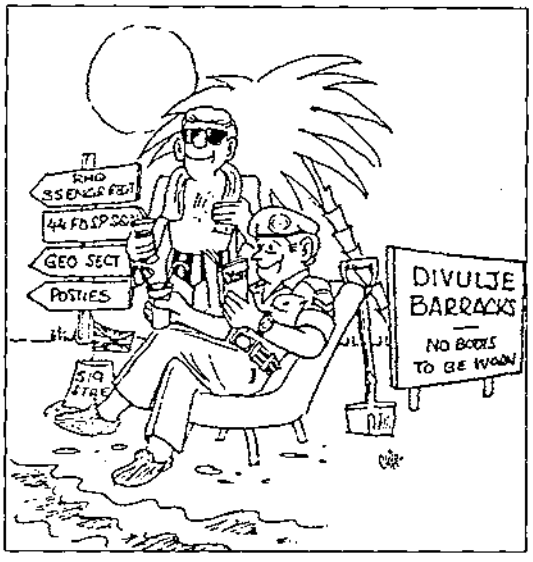
During the recce we learnt a few key facts about *Operation Grapple* which were to have a marked effect on future operations. These were:

- This operation was to be nationally funded, ie no UN funds or allowances were to be used to finance the British operation; although we were to wear the blue beret, fly the UN flag and abide by all the UN rules of engagement.
- We were to be part of a five-nation UN Force under command of a two-star UN HQ, the location and composition of which had yet to be decided.
- We were not a peacekeeping force but were to go purely as convoy escorts in support of United Nations High Commission for Refugees (UNHCR). This factor, which has not been widely understood by the general public, was to have a significant bearing on our modus operandi.

Identified Tasks

From the recce I evaluated the priority sapper tasks in support of *Operation Grapple* to fall into the following main areas:

- The construction of up to six main bases as well as three route maintenance camps along the main supply routes (MSR); using existing structures wherever possible as well as green field sites to house 1822 men and women, within a budget of £10 million, including protective works as necessary. The actual requirement by the end of October had risen to 2600 bedspaces and was rising daily!
- The improvement and maintenance of some 450kms of MSRs. There did not appear to be any local authority which would claim responsibility for road maintenance, gritting icy roads or clearing snow and even if they did, the equipment for doing these jobs had been used for digging defensive positions for months and was all but ruined.
- The construction of two bulk fuel installations (BFIs) for a total of 1.6 million litres of fuel.
- The repair or replacement of 12 bridges on the MSRs, including two main road bridges that had been partially demolished with explosives.
- Snow clearance, salting roads and gritting on most of the MSRs and other roads.



- Support to the UNHCR convoy escort operations to be conducted by the Cheshire Battalion Group from their base in Vitez.
- EOD and mine clearance throughout the area.
- Water supply and purification as well as general combat engineer support for the Force.

I got back to the Regiment after the recce on 6 October and, although I didn't know it at the time, I only had a week before I was to deploy to Bosnia again.

The Deployment

For the engineer support to *Operation Grapple* I estimated that I would need two field squadrons and a reinforced field support squadron as well as EOD specialists, a strong resources cell, a STRE and a lot of extra plant, and, most importantly, a tac RHQ to coordinate the engineer effort. All these elements eventually deployed as part of the 35 Engineer Regiment group, amounting to some 600 men and women, 189 A & B-vehicles, 57 C-vehicles, 115 assorted trailers and 19 specialist equipments. It was also necessary to hire various items of plant as required throughout the operation.

On 15 October the RSM and I were on one of the first flights to arrive in Split. We stepped off the plane into the waiting arms of the press and TV crews. Several interviews later we gained our freedom; this was to be the first of many encounters with the media.

As my Serbo-Croat was pretty non-existent, my negotiation skills were tested to the full to set the contracts for the renovation of the old Yugoslav National Army (JNA) barracks in Divulje, which was to be the main British HQ and transit base some 30km NW of Split. The barrack renovation was not a simple job as the buildings had been wrecked by the departing JNA whose troops had smashed all ablutions and plumbing fittings, ripped out all electrical boxes, sockets and light fittings, smashed doors and had broken many water pipes. The electrical system in the camp was overloaded and dangerous and the centralized heating system hadn't worked for two years. The JNA had also used the barracks as a defensive position when the war started, so there were abandoned trenches all over the camp as well as all the rubbish and wreckage of a retreating army.

A violent hailstorm, three days before we arrived in Split, had added the finishing touches to the devastation by smashing over 500 north-facing windows and riddling the asbestos roof coverings on all of the seven blocks we had been allocated. To add to the confusion, the cellars were flooded, buildings were knee deep in rubbish, old clothes, books and excreta, and there was also a high mine and unexploded ordnance threat in the barrack area. Not to mention creepy crawlies, snakes, scorpions and rats!

It was at the negotiation stage I realized that we were to use a very different set of rules to those we had been used to. It was necessary to set contracts for this work because I would have no sappers to deploy for at least three weeks and the work needed to be finished before the main body arrived. I squeezed the contractors so that they agreed to complete the work in 14 days for a total of DM220,000 (£75,000) but they wanted payment in deutschmarks (DMs) and in cash, not Croatian dinars, enough to give Civilian Secretariat nightmares. I felt this was a bargain as I had estimated that it would cost in the region of DM500,000 and then only if the materials were available. However, the incentive of foreign currency seemed to open all sorts of doors. When the work started it resembled a mini invasion as, to meet the initial deadlines, tradesmen crawled all over the buildings bearing scant regard for "health and safety" regulations.

The importance of worthwhile language training cannot be overstressed. Although a few people managed to do a "basic" course in Serbo-Croat this was, to say the least, insufficient for long meetings, setting contracts and negotiating

oneself out of tricky situations. As the few interpreters were in great demand, I found my German language skills invaluable on many occasions during the tour. If UN operations are to become more frequent, as seems likely, then the problem of language training needs to be addressed and not left to the sort of hit-or-miss policy that the British Army tends to employ. Had I not been able to converse personally with the right people I certainly could not have achieved so much in the circumstances.

On the occasions I had to use one of the interpreters I found it to be slow and frustrating and unless the interpreter managed to convey the exact tone or meaning I wanted then things were not achieved, or so-called agreements were liable to be misinterpreted.

By 18 October all but one of my "pre-activation" party had arrived and comprised such key people as the Adjutant, RSM, MPF, Intelligence Sergeant, OC 519 STRE, clerks of work (electrical, civil and mechanical), a surveyor and a draughtsman. I left WOI Green of 519 STRE to oversee the contractors in Divulje Barracks. Then I took the party north to Vitez, a trip which was, to say the least, a little eventful. We went north via Tomislavgrad (TSG) to see the proposed National Support Element (NSE), (or logistic battalion), and Sapper bases; for the latter we still hadn't obtained access permission or even found the owners! Even when we did it didn't seem to matter; this was to be a constant problem throughout the tour. For example, later when we started to construct the bunds for the BFI at TSG, we were confronted by the 21 cooperative owners of the piece of land all wanting payment and compensation. We had the approval of the mayor and the military commander and had already paid the rent but this had obviously gone straight into the war coffers and the farmers didn't get a penny.

The journey north to Vitez of 250kms took over 12 hours and we arrived at 9pm after being held up, at gunpoint, at roadblocks along the route. We arrived to find that problems were brewing between the Croats and the Muslims in and around the once-peaceful town of Vitez. After we had conducted the necessary recces in Vitez my plan was to return by a different route, via Kiseljak. However, in so-doing we got mixed up in fighting between the Croats and Muslims. The first 40kms of our return journey from the town took us over five hours and was punctuated by ambushes, the odd mortar and RPG 7 rounds, mines on the road, delays, roadblocks, threats, negotiations, angry mobs and the presence of the press looking for a scoop at every available moment – not to mention many more grey hairs and a faster heart rate.

Once clear of the trouble spots between Vitez and Gornji Vakuf, we took the Jablanica to TSG route as this had been my intention anyway if we had come via Kiseljak. The mountain road, stretching 10kms west from Jablanica, was badly damaged by erosion and higher up was awash and very muddy. The rain ran down the road in torrents some 6in deep, there was no drainage and the road surface disappeared before our eyes. Our vehicles had no difficulty, except that they leaked, the main problem was the 1000ft drop off the side of the road and visibility down to 20m. The biggest surprise we got on this road was to meet two fully-laden 40ft articulated trucks looming out of the rain on a particularly narrow and tricky section where most of the road width had been filled with a fresh landslide.

The remainder of our trip back to Split was virtually uneventful; everything is relative I suppose. The thought passed through my mind: this is only day five – we've run into mines, been ambushed, shot at, threatened and harassed by the press – what's the rest of the tour going to be like?

The main body arrived some two weeks later along with the first snow! By this time the Sapper advance party had made great progress as regards the camp recces, technical design, ordering stores from UK and from local firms as well as setting a few more contracts for essential engineer work, including a 400m road in order to get the Force vehicles out of the docks; a useful little job. This road was subsequently used by the UNs' Spanish, Dutch and French contingents.

As soon as possible I took my squadron commanders around their bases and sites and set them to work. The advance party from 42 Field Squadron went to Vitez where they immediately started to set up the tented camp for the Cheshire Battalion Group, as well as starting to prepare the construction site at the local school, which included having an 8m wide stone road built around the camp for Warrior. One of the terms of the contract I'd agreed with the mayor was that no stone was to be laid outside the school perimeter even though the Battalion Group was occupying an area three times the size of the

school grounds. However, I had not quite anticipated the need to lay stone a meter deep over the whole area of the school grounds, including the football pitch. Sadly this was necessary as many rogue vehicles had driven around the area and created a bog and this stone subsequently formed an excellent base for the many accommodation units we erected there.

On the return journey from Vitez to TSG, just south of Prozor, we were engulfed by a sudden snowstorm which was accompanied by driving winds. It took us six hours to travel 40kms over the mountains, sometimes walking in front of our vehicles to find the road. The snow was being blown around so much that vehicle tracks disappeared between each vehicle. That night my party recovered over 12 civilian vehicles and rescued a bus load of refugees. Having been in pleasant weather during the afternoon in Vitez, the temperature had suddenly dropped to -10°C. The unpredictable nature of the local weather was to cause us many more problems. I had previously chosen that afternoon and evening to deploy the plant detachments to the selected mountain sites of "Happy Eater" and the "Redoubt". I was pleasantly surprised that it was achieved in the most appalling conditions and by 0600hrs the next day, the teams were out on the road clearing the snow ready for the deployment of Warrior.

During the Cheshire Battalion Group's deployment north, one Warrior caused considerable concern when it did a 360 degree spin going down a slight slope, others skidded and slid their way along the route. It took them two days to cross the mountains. The weight and width of the vehicles, as well as some inexperienced drivers, caused the road to collapse in many places and parts were left impassable to wheeled vehicles for several hours much to the alarm of the locals to whom this road was a lifeline. The plant operators were also not amused as they had to repair the damage. These were not the only vehicles to experience problems, the wheeled plant without snow chains became difficult to use and the tracked plant sometimes performed as though on ice skates.

The plant operators worked miracles against the odds, the cheerfulness and expertise of the operators amazing all who saw them in action. We had some 57 items of plant and 13 tilt trailers, and keeping the fleet on the road was a major struggle in the conditions. Servicing, a vital factor in the circumstances, was difficult and the working environment was, to say the least, hostile. Improvised recovery was one of the main tasks performed by the plant and we found that the REME Foden recovery vehicles alone were insufficient to recover large civilian trucks, especially on the narrow, steep mountain roads in snow and ice.

One of my main complaints to the local Bosnian-Croat Army (HVO) commander was that HVO vehicles, using the roads at night to resupply the front lines, were overloaded and poorly equipped; they seldom had snow chains, nearly all had bald tyres and towropes were never in evidence. My protests made no difference as he just asked us to provide them! The other area of concern when recovering vehicles was that we often came across civilian vehicles with Red Cross markings, or other aid agency signs, including UNHCR, but with local drivers, which were carrying arms, ammunition and military equipment hidden under the so-called relief supplies. Sadly, we had to recover them too in order to keep the road open, I would have preferred to just push them over the edge.

The HVO commander said to me one day, "Now that you are here you share our destiny!" I was beginning to see what he meant.

My Road!

We had been carrying out route widening and improvement along the mountain road for about two weeks when a deputation from the local civilian authorities came to see me, demanding compensation for the trees we were cutting down and the stone we were using from borrow pits along the route. I was speechless, we were in effect improving the only north-south route and they were asking us to pay for the privilege: they were sent away with a "flea in their ears". I called a meeting with the mayors of TSG Jablanica and Prozor to resolve the problem. Each one was only interested in his own "parish" and didn't care about what happened in the next town. In the end I got very cross with them as they couldn't agree with each other on what they wanted done with the road; slapping 10 dinars (about one penny) on the table I said "if you can't agree what you want to do, I'll buy the road and then I can do what I like to it!" To my surprise they all agreed and from then on we had no major problems with the town authorities. It was from this point that I started getting a stream of visitors asking my engineer advice and wanting the "UN" to undertake major road-building schemes. Later on, one of our VIP visitors, Mr Paddy Ashdown MP, travelled along the

road and subsequently wrote an article for the *Independent*. In it he stated that he thought that I had been scandalously overcharged, "... To call it a dirt track would be an exaggeration." However, for us and a lot of locals it was a lifeline.

Resources

I FIRMLY believe that one of the key factors contributing to our success was a good resources system. I had a high-powered team led by Major Ian Kinnear, working in Split, as well as 44 Field Support Squadron's resources organization in TSG and in Vitez. All were involved in local purchase, manufacture of items not available on the local market, stores control and accounting. However, a lot of everyday items were only available in Split or from the UK; prices for timber, steel and small stores differed from town to town and from day to day, if they were available at all. Transactions were done in cash, and on one occasion my Resources Officer was offered a woman by a grateful timber merchant who had secured a contract to provide DM25,000-worth of timber for bridge repairs!

The locals must have thought that Christmas had come early. The precedent had been set by other UN troops and aid agencies to whom expense was no problem as the UN or a foreign government was paying. Prices rocketed and were not helped by inflation of the local economy; on arrival there were 230 Croatian dinars to the DM which in three months went up to 520!

After three months we had ordered or spent over £10M on engineer stores, contracts and accommodation units of which over £1.8M was spent on local purchase. The resources cell accounted for 19,000 line items and handled over 3000 tons of stores. We found a source of accommodation units in Croatia which were some £2000 cheaper than those in UK with delivery time twice as quick. Most of this saving was due to the cheapness of local labour, the desire for foreign currency and there being no shipping time or costs.

We encountered many problems but produced an equal number of solutions. However, we could not have achieved these without the excellent support from other agencies in theatre as well as units in the UK. The support received from UKLF was quite excellent but the accolade must go to Engineer Resources at Long Marston for their excellent response to our requests and their speed of reaction.

One of our stores availability problems occurred at the offloading end where, if we weren't watching, containers containing vital stores from

the UK disappeared into the RAOC system and were sometimes transported to unknown locations only to be discovered weeks later. The weather also did its share of damage to the stores; we lost containers off ships en route from UK and icy roads accounted for minor damage. An inconsiderate low tunnel completely rearranged the shape of one expensive accommodation unit!

Construction

THE excellent early plans so speedily drawn up by 519 STRE were altered at least six times as clients changed their requirements, causing a knock-on effect for ordering stores with the subsequent loss of lead time. This was inevitable considering the speed of deployment and the growth of the Force from 1800 to 2600, as well as the arrival in theatre of some more specialized units requiring customized office accommodation, but it was nevertheless frustrating. Our solutions to technical problems were governed by the availability and arrival of the stores, particularly the plumbing stores, switchgear and electrical small stores and these were inevitably on the critical path.

The cold weather caused everyone considerable grief. Condensation on the inside of ablution containers caused the metal doors to freeze shut at night; water pipes inside heated and insulated containers regularly froze, as did the overflow and waste pipes, this was not funny in the toilets especially, as we then had to use thunderboxes in temperatures of -15°C!

The local water pressure was erratic and caused leaks by overpressure. Pipes had to be buried at least a metre underground to avoid the frost; and

at the Vitez school site the rock was only 75cms underground. Wood chippings were found to be best to insulate the pipes in the trenches and also above ground.

Water storage was a nightmare but we had a local engineer convert stores containers into insulated water tanks at DM30,000 each. The local water was erratic in its purity as the purification systems were old and inefficient. Consequently there was no shortage of stomach bugs or, as we called it, the "Bosnian Foxtrot". These we could cope with but I was more concerned about the outbreak of typhoid in the refugee centre in TSG. Raw sewage seemed to flow directly into rivers as well as the sea and the scene was set for a major epidemic of some nasty plague, especially considering the movement of refugees.

While we built the camp at Vitez about 300 soldiers were living in tents; night temperatures inside the tents sometimes went down to -13°C despite the presence of two heaters in each tent. Temperatures at the mountain camps often went down to -20°C and there was a constant icy wind, known locally as the Bora; the chill factor recorded one day was -52°C!

The plant did not like the cold and it often took three hours to get equipment running in the morning; compressed-air machinery was the worst affected as the condensation in the pipes froze.

The locals' vehicles and buses were constantly trying to squeeze past breakdowns and road construction work, and this often resulted in our vehicles being nudged off the road, we lost two Volvo MWTs in this way. Snow chains were critical, and before we got them we lost three items of plant off the mountain road.

Frostbite and other cold-weather injuries were a real concern. We had ten confirmed cases in three months despite our best efforts. Luckily, many soldiers had bought their own Gortex clothing and Matterhorn boots before we left Germany. Most of the injuries occurred before the issue of cold-weather clothing which, unfortunately, arrived a month after the cold weather began. However, when it did arrive it was excellent.

Protection Work

The engineer base at TSG was shelled twice in one day just three days before I left the theatre; 134 rounds landed in the vicinity of both the NSE and the engineer base, two rounds were direct hits in our camp and there were also seven near misses. Shrapnel was scattered all over the camp, shredding many vehicles and destroying a lot of small stores. It was a miracle that nobody was injured. These incidents concentrated the mind on the protection problem. I was convinced, and still am, that we were not in the game of customized hardening. I opted for expedient protection and emergency bunkers using reinforced and sandbagged containers to provide collective protection against shrapnel and small arms fire. We were already constructing this type of defence at Vitez at the time of the shelling. A second option was considered in close consultation with my STRE, that of strengthening existing buildings and having a sacrificial top floor; this was adopted wherever possible. The use of dispersed "A" vehicles also provided good protection during bombardments but not all units were fortunate enough to have them.

The use of "Bastion Wall" proved to be a great saving in time and effort and also provided an excellent level of protection. Its early use resulted in a few teething problems as it does need a level surface and a consistent grade of filling material if more than a single height is used. Sand was almost unobtainable so we made do with crushed stone as a "fill" material, for concrete and mortar, and ash for icy roads. Blast film was put on all exposed windows, despite the cost of £700 a roll; improvised wooden and sandbag sangars also protected the sentries against the many shooting incidents from drunken HVO soldiers, cowboys and the odd stray rounds.

EOD

Although I only had a small EOD section they did some sterling work. Not only did they manage to travel to all quarters of Bosnia in pursuit of dangerous unexploded objects but they also became a key part of the engineer recce capability. They carried out mines awareness training for military units as well as civilian aid agencies and made a significant contribution to the overall UN effort.

Topo

The small geographic section, based at HQ BRITFOR in Split, regularly produced some excellent work including weekly route and tactical situation maps as well as the very important Force Christmas cards, designed by LCpl Hicks of 519 STRE, and sent to a few selected and important members of the Corps! The section's map products were used by all UN troops as well as the various aid agencies and

became essential reading for those wishing to proceed north into Bosnia.

The Posties

Although not under my command, the posties deserve a special mention. They always endeavoured to get the mail through by the fastest possible means and had some enormous problems to overcome. Sadly they are no longer part of the Corps but those who depended on that magic letter to boost morale will always remember them with a special fondness.

Command & Control

I retained all Sappers under command despite pressure to place 42 Field Squadron under command of CO 1 Cheshire. Communications in the early days were, to say the least, awful. It was easier to contact UK than speak to my squadron OCs in TSG and Vitez. It was also easier to drive to see someone rather than have detailed discussions on the phone or via high frequency (HF) radio – as a result I covered some 13,500kms in three months. I found the difficulty with communications one of the most annoying factors of the whole operation as it caused unnecessary misunderstandings and frustrations, especially when subunits were trying to get critical stores in a hurry. It took a while for the radio operators to become accustomed to the foibles of HF communication but after about two months they were able to operate on a 24-hour basis through most weather conditions.

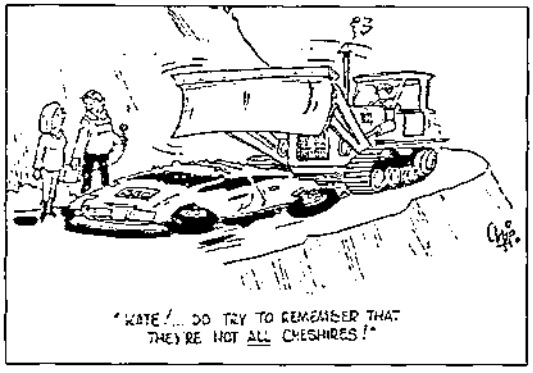
Stress

It was during the shelling of TSG that I observed my first serious case of shell shock, or battle stress. It is not until such an incident occurs that one fully realises the effect it can have on some people. To solve the problem of a soldier, or officer, just sitting in a corner and staring at the wall, incapable of reacting, needs careful handling if he is to be of further use. I had started to feel the effects myself, a combination of long distance travel over difficult terrain, long hours, being shot at, shelled, mortared, seeing tragedy at first-hand, being arrested and near-miss traffic accidents were taking their toll. In the absence of the opportunity for a break the best remedy I found was friendship and humour, and in potentially difficult situations I made sure I had the right sort of kindred spirits with me; and there are always plenty of all these to be found in an engineer unit. When I gave New Year's Day off to the squadrons based in TSG, some of the troops went to a local refugee centre in a driving blizzard to do jobs for those less fortunate than themselves. I decided then that the stress factor wasn't a serious problem for most of them, but it is something that commanders need to monitor.

Lessons Learnt

There were so many lessons learnt, or in most cases relearnt, that I can't cover them all in this article. However, I would like to emphasize some principles and factors that contributed to our success or, in some cases, hindered us:

- There is no doubt that we suffered from a minor identity crisis. The press persistently referred to everyone as being part of the Cheshires. It was difficult for them as we all wore the same capbadge on a blue beret and "Cheshires" takes up far less space in an article then "37 Field Squadron of 35 Engineer Regiment". But it wasn't for the lack of trying that our coverage in the national press was less than some other units in theatre. It would have been very nice to have a dedicated PR officer, however as our numbers were limited we made best use of the official PR organization. As an interesting statistic, there were more Sappers in theatre than Cheshires!
- Delegation to the lowest possible level paid exceptional dividends: I couldn't be everywhere at once, nor could the squadron commanders but our trust in the troop commanders, SNCOs and others in key positions ensured success. In fact, this delegation was essential as communications were so bad. I was particularly heartened by the ability of the junior commanders to exercise their own discretion and react to problems successfully without reference to anyone else.
- A strong resources team, with delegated financial powers and the ability for autonomous action gave the necessary essential stores back up to the squadrons.



- The support of an integral STRE gave me the flexibility to change or modify plans as well as deal speedily with new requirements. The necessity for detailed designs and the technical problems that needed solving made the STRE an invaluable part of the team.
- Except for the support squadron I deployed at the *Options* "whisky orbat"0000 and found that it was seriously wanting in the key areas of plant support, tradesmen and artisan toolkits. It was necessary to get a further 16 items of plant in order to carry out our task. As ever, the trades of electrician, fitters, combat signallers, surveyors and experienced resources specialists were all critical.
- Constant vehicle maintenance and good equipment husbandry ensured that the kit stayed on the road and jobs were completed on time. I found the level of expertise and competence of our tradesmen and operators to be quite excellent, obviously the training methods are sound.

Finally, the most valuable lessons I personally learnt.

Dealing with the press in all sorts of circumstances in such an operation is very much a function of command and regardless of how tedious or daunting it appears, it is now a fact of life. The training we did prior to deployment only prepared us for part of the ordeal; I do believe that soldiers cannot do enough of this training, especially if this sort of operation is to become the norm.

Stress on operations and under fire is a very real thing and the effects should not be underestimated. Everybody has a different tolerance level and we need to understand that the effects can be accumulative. After a series of incidents, resistance wears thin and performance is affected.

Over the past three years in BAOR the military emphasis shifted with the changing political situation and the demise of the Warsaw Pact. Therefore the emphasis of our training had to change and I concentrated on training the individual and developing basic skills. The element of surprise as well as realistic and exciting training ensured that squadrons were ready for the unexpected and were able to react accordingly. We threw away the "templates" that had been so much in evidence in BAOR for many years and concentrated on improvisation and relearning the fundamentals of both combat engineering and design. This type of training proved to be invaluable and paid exceptional dividends in the circumstances found in Bosnia.

Summary

In the first three months of *Operation Grapple* the Regiment cut down over 600 trees, built 15kms of new road, widened 66kms of single track road, moved over 35,000 tons of stone, dug five quarries, erected countless accommodation units, built "luxury" accommodation for 2600 men and women, erected over 15kms of security fence, and made 800 bunk beds. All these tasks contributed to the main aim of escorting humanitarian aid. The experience gained by all ranks was excellent and no amount of CPX, FTX or other exercises in peacetime could have simulated the events we encountered. I wouldn't have wished to exchange those experiences, despite the dangers and difficulties I encountered.

The work achieved by all the Sappers in Bosnia was remarkable. Sappers were much admired by all other agencies in theatre but without the combined effort and help of all units there, as well as the back up from UK, we could not have achieved so much. From a dubious start we made the original plan work far better than I expected and the Sapper contribution to the UN effort in those early days was outstanding.

I claim little personal credit for any success we had in Bosnia; the boys who worked the miracles were the troop commanders, SNCOs, JNCOs and soldiers; these men are what the Corps is all about. In this role of honour we must not forget the invaluable part played in the Sapper regiment by the REME, RAOC, ACC, RAMC and AGC(SPS). I was privileged to command them all and just glad to be part of it, knowing that we were doing something for those less fortunate than ourselves.

A Day in the Life of a Sapper

HOLDFAST

THE events recorded in the following stories are true and reflect a very small proportion of the incidents that actually took place in the early months of the Royal Engineers' deployment to Bosnia as part of the UK's contribution to the UN Force.

SERGEANT STEVE SHARPE
INTELLIGENCE SARGEANT

So I was to go to Bosnia. I had just been promoted and moved to the job of intelligence sergeant; suddenly I was responsible for giving background briefings at the CO's "O" Groups and to the Regiment on the situation in the former Yugoslavia as well as daily updates. I was pretty daunted by the prospect but when you have no choice it is much easier to come to terms with a situation. Needless to say I made a few cockups in the early days but that is all part of the learning process.

After doing all the necessary research I decided that Yugoslavia had been a motley mix of six republics, five peoples, four languages, three religions, two alphabets and one political party. It was also a hotbed of discontent and had been for over 400 years. What a muddle!

Today, nothing appears to have changed; neighbour seems to fight against neighbour, village fights village, friend fights friend; family feuds are rife, senseless killing and wanton destruction of property are commonplace. Theft, bribery, smuggling and the misappropriation of aid are a way of life, and sadly this view was confirmed once I got to the area. Allies one day were enemies the next. It didn't seem to make much sense but it was into this cauldron that we dared venture as part of the British contribution to the UN Force in Bosnia, not as peacekeepers but purely as escorts for aid convoys in support of the UNHCR.

The CO decided to take me on the advance party so that I could, as he said "... do route and bridge recces, clear any mines I come across, collate engineer information from all the agencies already there, and make the tea!" I wasn't sure that I was ready for this little expedition even though I had been to the Gulf. The situation was confused and working for the UN was to be a new experience.

For me the tour started on 16 October 1992 at what can only be described as "running pace" as we had so much to achieve before the main body arrived. I would have said that it started with a bang but that was too near the truth for comfort; several bangs in fact! The experience of being part of the operation was fascinating not just from a professional point of view but also from being in a fairly privileged position as part of the CO's party. I had previously thought that all orders came from on high as if by magic but that is not so. I was now "on high" and able to see how the plans were formulated and I was actually contributing to them; I never knew that there were so many factors to be taken into account. Factors which didn't even enter my head as a section commander, but which now seemed critical for the success of the operation. It was a real education and one from which I've gained great benefit. The situation turned out to be as confusing as I had imagined but we had a clear aim as engineers and a good team to work with, two very important assets in the circumstances.

I never for one minute imagined that I would be writing sitreps (situation reports) or attending high-powered meetings with local military commanders or government officials but these events were all part of a normal day; if there was such a thing as a "normal" day in Bosnia. So many different things happened to me in my time there, from being shot at, shelled and mortared at the one extreme, to receiving boundless hospitality from a Muslim family in an isolated village in the mountains on the other. I will remember it all as part of my military education and I was glad to be part of it and in some small way contribute to the well-being of those less fortunate than myself.

RSM GRAHAM FERGUSON BEM
WARRANT OFFICER CLASS I

THE fun started when I got a call from the CO on Sunday afternoon 20 September. He had been summoned to London at two hours notice to go on a recce to Bosnia. Until that time I was not in the frame to go but I now saw a glimmer of hope that I too would be able accompany whoever might be going from the Regiment. I had been following the exploits of the UK recce party in the national press so I knew that the CO's trip had been eventful. When he called from Zagreb to give the Regiment a warning order to prepare to deploy I knew that

he wouldn't leave me behind. It was several days before he finally got back to Hameln and then he only had a few days in which to prepare for the deployment of the engineer advance party.

Yes, I was to go but as we had been limited to the number of people we could take on the first flight I became the CO's driver! I thought this was to be an easy way to get there but I was very much mistaken.

We left Hameln at 0530hrs on 15 October 1992 for a pleasant drive to RAF Gütersloh. On arrived I was suddenly expected to prepare my vehicle for the flight! What did I know about that? Not a lot! The CO was sitting in the front of the landrover desperately trying to draft warrant officers' confidential reports before he left. Surprisingly we only had six hours before the flight so I managed to pass the "inspection" by an RCT LCpl and the CO and I were allowed to go for breakfast.

The flight was a bit of a surprise, we had been so limited to numbers that I expected to be sitting on the CO's knee but there were only four passengers! What had been the problem I wondered? When we landed at Split Airport we were immediately thrust in front of the BBC TV cameras. Jeremy Bowens was there to put us at ease and ask difficult questions, (he was really after the commander but had missed him so we would do) it was not quite what I expected but it was to be the first of many encounters with the press.

Not long after the rest of the advance party arrived we all went "up-country" to carry out some detailed recces. Our destination was Vitez some 250kms from Split but the journey took 12 hours. We had been told that this town was peaceful and so far from the front line that the fighting would never reach it. So it was somewhat of a surprise to hear the evening being punctuated by sporadic small arms fire around the town and over the school where we were camped. The CO said that this was a common occurrence as he had had some experience of this from the recce and he assumed that the shooting was just drunken soldiers, therefore I wasn't too concerned. The following day we saw that there were six serious roadblocks in the main street, antitank mines on the road and fighting and shelling at both exits of the town, this was all very inconvenient and certainly wasn't the work of high-spirited soldiers!

The CO had intended to return to Split via Kiseljak and Jablanica as we had other sites to visit and various contractors to see; therefore the party endeavoured to leave Vitez at 1100hrs. The local UNHCR office considered that the situation was getting too dangerous and asked us to take out three UK civilians who had been doing a job for the Overseas Development Agency (ODA). So here we were, five landrovers (LRs) and 15 people, 12 armed with SA 80 and 20 rounds apiece, about to depart into an unknown situation. Jeremy Bowens and the BBC TV crew, who were hovering in the area, got to know of our plans and thought that a story was in the offing so followed us in their armoured LR.

As a small precaution we donned flak jackets and helmets as we were heading into an area where there had been some incidents and from where we could see plumes of smoke rising; a very wise decision I thought! We left the town to the east at a steady speed so as not to alarm the drunken soldiers with AK 47s on the checkpoints and quickly saw evidence of fighting, shelling and some burnt out houses.

We were about 2kms out of town when we came under small arms fire, it seemed to come very close and the noise was frightening enough. As the bullets weren't making contact the CO decided to continue, a little faster this time; my heart rate as well as the vehicles! For quite a few years I had been a member of the national biathlon squad and had spent many hours and countless different methods to get my heart rate up – being fired at does it in seconds!

It wasn't until an RPG 7 round went between the front two LRs, and exploded 5m from the convoy, that I thought the situation was getting tricky, a mortar round landing at the rear of the convoy confirmed my suspicions. I uttered a few unprintable words because the RPG 7 round went past the back door of the CO's Rover and I was in the back! There isn't a lot of protection from three army sleeping bags which was all I had around me. The driver was told to step on the gas, he needed no further instructions. After 500m when we took a bend by a Muslim graveyard some 3kms from Vitez, we ran into a barricade of TMA 3 and TMA 4 antitank mines scattered across the road. There is nothing like mines on the road to concentrate the mind on stopping, and I nearly ended up in the front!

I dismounted with the CO to take a closer look and the remainder of the other crews went to ground, except for the three ODA civilians who we had forgotten about and who were trying to get into the landrover battery compartments. As we were still being fired at and had no equipment to

deal with mines under these circumstances, the CO decided that it was time to turn around; another wise decision. I've never seen five vehicles execute three point turns quite so fast.

Meanwhile, the BBC crew had holed up in their armoured LR and were getting good footage of us in this tricky situation. This was later shown on the 10 o'clock news and bits were repeated some three weeks later to cover another incident.

We returned to Vitez without knowing whether it was the Croats or the Muslims who had been firing at us but we knew it certainly wasn't the Serbs. By this time the situation in the town had deteriorated even further with Muslim snipers shooting down the length of the main street from the Mosque's minaret with fire being returned from police and militia standing in the middle of the road; the odd mortar and artillery shell also landed in the town, adding to the confusion. I was beginning to wish that I had an extra flak jacket.

When we reached the Town Hall we joined CO 1 Cheshire as well as COMBRITFOR. It was then that I discovered the Brigadier's passion for chocolate Rolos, he stole my whole packet! We all retreated back to the school and en route picked up the Sky TV crew who had received two rounds through one of their vehicles.

We also had to dodge the sniper fire and negotiate our way around various barricades between the Muslim and Croatian groups, it was at one such barricade that I got my first glimpse of a Mujahideen fighter who was crawling across the road putting tilt fuzes onto four TMRP 6 antitank mines that were nailed to a plank.

After a lunch of several sedatives we decided to try the other way out of town via Novi Travnik, it was now 1500hrs. The Sky TV crew had had enough and decided to come with us for protection and we still had our three ODA men, despite their earlier excitement. Just as we approached Novi Travnik, 4kms west of Vitez, we passed a section of irregulars scurrying along a ditch at the side of the road clutching grenades, explosives and an old fashioned plunger-style exploder, they were also bristling with weapons. The town was deserted, a few buildings were smoking and others bore evidence of fighting. Not a good start I thought.

The route south was via a series of villages that we already knew were alternately Muslim and Croatian. As we approached each village along the way we came across an armed roadblock comprising a large truck or several trees and many militia. Each time we stopped we had to negotiate our way around the obstacle; packets of cigarettes and handshakes backed up by a show of strength seemed to be a successful formula. Nevertheless it was still a very uncertain situation and we were very aware that our position, even as UN troops, was tenuous.

The militia at each roadblock told us that the group in the next village was heavily armed and would certainly kill us; stories of recent atrocities normally accompanied this news. Therefore, every bend in the road had a special significance, especially as I was in the lead vehicle; what was in store for us around the next corner?

We passed five villages over a distance of 40kms in this way with the addition of twice as many grey hairs! As we progressed along the route the Sky TV crew became bolder and every time the CO, the Adjutant or myself went along the convoy to give instructions for the next stage, we found ourselves looking into a TV camera and having our words of wisdom recorded. Along the way we passed over 300 civilian vehicles stranded in jams with drivers wishing to get to Vitez – some had been there since we had passed that way three days earlier. The drivers were not amused by the situation and let us know that they thought that we, the UN, should solve the problem. When we got to Gornji Vakuf we were mobbed by about 500 stranded civilians who wanted us to escort them to Vitez. We had no interpreter with us so the CO spoke to a few of them in German, who in turn translated for the rest, this seemed to do the trick.

However, the worst ambush was yet to come. We stopped in a garage some 10kms southwest of Gornji Vakuf to fill up, and were joined by the world's press, or so it seemed. I thought that they were a group of aid workers until the notebooks were produced; they suddenly surrounded the CO and bombarded him with questions along with many cries of "can we quote you?" It was dark and had started to rain, we were tired, a little shell-shocked, hungry and thirsty; so to be confronted by lots of eager reporters intent on getting a good story was the last thing we needed. We were still at least six hours from Split and the weather was turning nasty with a thunderstorm brewing. Parts of the interview made the front page in several papers the next day, some quotes were accurate but others seemed to have been deliberately taken out of context to make a good story. Another lesson learnt about dealing with the press.

We travelled back to Split through the worst thunderstorm I've seen. We arrived back at

0045hrs and it dawned on me that I had only been in the country for five days – I wondered what the remainder of the tour had in store for me. As events unfolded over the coming weeks I wasn't disappointed.

Corporal Mark Lobley
CO's Driver

I had been the CO's driver for a year and he had decided that as I was to be promoted I should do a different job. That was until we were officially tasked to go to Bosnia. The CO wanted, as he said, "the devil he knew ..." The RSM stole my vehicle to get to Bosnia early in case the CO changed his mind, but he soon got tired of being a driver so I got my vehicle back. It was during the little ambush in Vitez shortly after we arrived that I realized that this was not going to be an ordinary tour. One evening after this event while we were in Split I got talking, at the request of the military PR boys, to a female reporter from *The Times* about that incident, my time in the Falklands in 1986 and other things one talks about to impress a female reporter. I was horrified to discover that she had misquoted me, twisted the facts and had generally been selective in the use of what I told her and the *Sunday Times* carried a long article about my "war" in Bosnia! The CO was not very amused.

We certainly had quite a few narrow escapes but at the time I didn't worry too much about the problem as I wasn't making the decisions. I could see the tension in the CO when we had been in a tricky situation but at the time of the various incidents he was more concerned about others to worry about himself. We did a lot of travelling and covered over 13,000kms in under three months, we therefore had a greater chance of being in the wrong place at the wrong time. I kept a record of the incidents and it quite surprised me; we were shot at seven times, mortared twice, had a PRG 7 fired at us, and were on the receiving end of an artillery bombardment. We also nearly went over a cliff on an icy road one night; I think that I was more scared then than during any of the other incidents, maybe it was because I was driving and it was me making the decisions? I was beginning to understand how the CO and others in positions of responsibility must feel when the situation gets tricky.

Lance Corporal Wright
RSM's Driver

The RSM needed a new driver so I volunteered as I hadn't been out of the base very much. The first time I was to drive the RSM he was going off with the CO to investigate the bridges on the Mostar road. This didn't mean very much to me at the time but it certainly does now, I didn't even know where Mostar was! I suppose that I should have suspected something when the RSM said to me "... have you got your helmet and flak jacket ... you haven't been out with the CO before have you?"

The CO's driver just laughed.

All went well throughout the day until we were stopped at a Croatian Army (HVO) checkpoint at the entrance to a tunnel some 10kms north of Mostar, it was dusk and our radio communications were at their limit but the CO's radio phone seemed to be getting through OK when we were not surrounded by steep hills. When we asked what the problem was we were informed that Mostar was being shelled again and no-one was allowed down the road until it stopped. I was getting a little nervous as the "soldier" on the checkpoint seemed to be drunk, and waved his loaded weapon around quite casually. We waited 30mins and by then it was dark and we had little option but to go on or stay there as the HVO had closed the road going north as they were nervous of the Muslim forces holding the bridge at the next checkpoint to the north. We were suddenly told to proceed and when asked, the drunken guard said that the shelling had stopped. We entered the long tunnel and when we had gone about 300m the guards at the HVO checkpoint started firing at us along the tunnel. Luckily there was only about 100m to a bend in the road and we were then out of the direct line of fire. However, the RSM was swearing well and muttering about it being a tunnel and the danger of ricocheting rounds, I put my foot down until we were clear of the tunnel.

When we emerged into the pitch blackness we stopped and assessed the situation. The CO decided to continue but without lights; the famous "Mostar Road" was beginning to mean something to me. We travelled at about 40kph along the road narrowly missing several trucks coming the opposite way, also without lights. I hadn't appreciated how dark it could get and how little I could see. We followed the convoy light of the CO's vehicle until we suddenly saw several large flashes to our right, accompanied by loud bangs. We stopped behind some buildings to assess the situation once more. It would appear that a group firing mortars on our right was engaging an unseen target to our left; we

were between them both. A good time to leave I thought; the CO must have read my mind as we left in double quick time. We passed several mysterious groups of people on the road, all the houses seemed to have been "cleansed" and were therefore deserted. It was not a nice place to be at that time of night.

As we were passing the old town of Mostar we could see fires burning in many places and sirens echoing in the night; obviously the aftermath of the shelling. Just as we got past the town there were some flashes from our left this time but as we were out in the open we just went faster rather than stop. It was a further 10kms before we put our lights on and some time before we stopped for a break.

My next trip up this road was with Jim Davidson, when he came to visit, and I thought I'd

be able to impress everyone with my war stories. As that trip was almost uneventful I don't think anyone believed me.

College of Military Engineering, Pune, India

To mark the 50th anniversary of the College of Military Engineering at Kirkee, and our long association with it, an exchange of gifts took place on 17th March 1993 between the Institution and the Commandant of the College. Colonel R C Gabriel kindly conveyed and presented the following gifts from us: A print of the Indian Sappers and Miners by Johnny Jonas, an engraved brass plate showing the outline of the Ravelin Building, and Volumes I and II of "The Military Engineer in India" by Lt Col E W C Sandes.

The wrapping has been undone and the picture is admired by Lieut General K C Taneja PVSM.

In return we were kindly presented with the following books, suitably annotated, and which are now held in the Corps Library: "Trishna", "History of the Corps of Engineers Indian Army 1947-7", and "In Pursuit of Adventure, Nanda Devi 1980".

College of Military Engineering Pune India (p141)

Jedan Most Previše

Bridge Inspections in Bosnia – Operation Grapple

CAPTAIN J F PELTON BSc(Eng) CEng MICE

Captain John Pelton was commissioned into the Corps in 1982 having graduated with a civil engineering degree from Imperial College. He spent his first tour with 48 Field Squadron (Construction) learning about airfield damage repair and construction before moving to the Junior Leaders' Regiment, first as a troop commander and subsequently as the Training Adjutant. The Professional Engineer Training Course followed, during which he was fortunate enough to spend 18 months in Australia designing and constructing motorway structures. On returning to Europe he was posted to Nienburg as 2IC 4 Field Squadron and during the tour deployed on Operation Granby. *He has recently returned to the construction world as 2IC 519 Specialist Team Royal Engineers (Works) and has just returned from* Operation Grapple.

(Jedan Most Previše – Serbo-Croat meaning "a bridge too far".)

Operation Grapple began in October 1992 with the deployment of a British Force (BRITFOR) to the former Yugoslavia. The Cheshire Regiment provided the armoured infantry element of the force, whilst 35 Engineer Regiment provided engineer support. The force based itself in the towns of Vitez and Gornji Vakuf, in the north, and Tomislavgrad and the port of Split, in the south. The mission was to provide escorts for convoys delivering humanitarian aid to victims of the war in northern Bosnia. The dispersion of BRITFOR over such a large area, combined with inhospitable terrain and difficult weather conditions, meant that supply routes would be critical to the success of the operation and indeed perhaps to the survival of parts of the force.

Due to fighting, most of the all-weather routes between the Adriatic Coast and northern Bosnia had been cut and only two practical options remained. The first, Route Triangle, crossing the mountains from Tomislavgrad to Prozor, was developed into a Main Supply Route (MSR) and subsequently maintained through some appalling weather conditions by elements of 44 Field Support Squadron and 37 Field Squadron. However, during January and February 1993, the route was affected by fighting in Prozor and Gornji Vakuf. Furthermore, the Mercedes low-loaders, which were being used for recovering the Cheshire Regiment's Warriors, were unable to negotiate the many tight bends and the second route therefore considered was along the all-weather Mostar Road. This involved travelling down the coast from Split to Metkovic and then north up the Neretva River Valley through Mostar to Jablanica and from there to Vitez via Gornji Vakuf or Kiseljak. Unfortunately, two of the bridges on the section between Mostar and Jablanica had been damaged and although both had been repaired with improvised bridges by the Bosnians prior to the deployment of BRITFOR, there was concern about the strength of the repairs. As both bridges were constructed from prestressed concrete their inspection and assessment for use by BRITFOR became the responsibility of 519 Specialist Team RE (Works). This article aims to describe the work carried out by the team on the two bridges.

The Aleksin Hanu Bridge

The Aleksin Hanu Bridge carries the Mostar to Jablanica Road across the River Neretva. In the

Jedan Most Previse (p142)

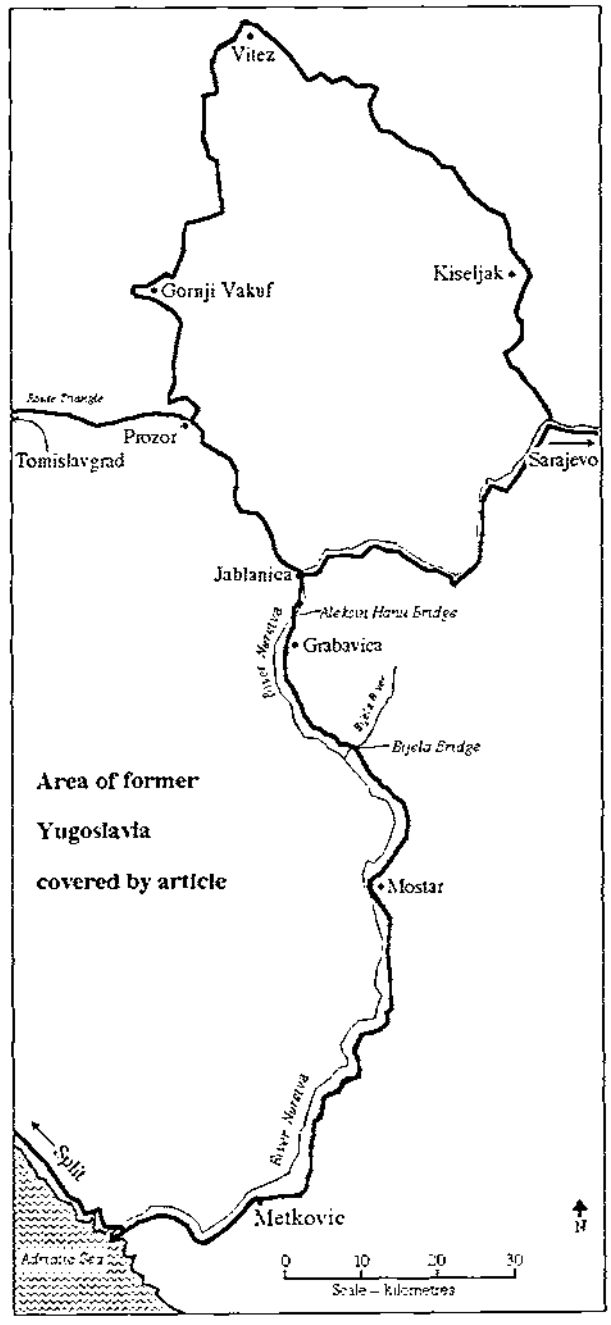
area of the bridge the river forms a lake behind a dam constructed at Grabavica, some 3km downstream. Built in 1968/69 the bridge consists of a continuous 3-span prestressed concrete box girder, supported on reinforced concrete piers with a deck wide enough for two lanes of traffic. A 13m long section of the bridge had been destroyed leaving only one web of the box connecting the two ends of the bridge. The damage was probably caused by a bulk explosive charge being detonated on top of the bridge, followed by the prestressing tendons on the south side being cut using oxy-acetylene equipment.

An improvised bridge, consisting of two 700mm deep "I" beams, with a 160mm deep reinforced concrete slab spanning the bottom flanges, had been erected over the remaining section of the web on the eastern side. It was supported on the existing bridge deck immediately adjacent to the damaged area.

The bridge investigation aimed to satisfy two requirements. First, to assess the capacity of the concrete bridge to carry the design load (prompted by comments from a number of people who had reported experiencing alarming deflections and vibrations whilst standing near the area of damage when the bridge was being trafficked). Second to assess the shortest span of Extra Wide Bailey Bridge (EWBB) that would be required to replace the improvised bridge which only had a carriageway width of 2.9m – too narrow for the Mercedes low-loaders.

The bridge was surveyed, critical dimensions measured and the cross-section details exposed by the blast inspected carefully.

A major difficulty was encountered in assessing the prestress in the tendons and the number of tendons involved. As-built drawings were not available, although a reference provided by the University of Split, gave the prestress at construction as 20 tonnes per tendon. The damaged area in the centre of the bridge provided some clues as to the spacing of tendons but was too far from the critical section, over the pier, to provide anything certain. Finally it was decided to conduct an analysis of the structure, make any necessary assumptions, and then attempt to validate the analysis in as many ways as possible. To do this it was assumed that the central span had been completely cut by the blast and, therefore, that the bridge was acting as two cantilevers. Sections of both reinforcement and stressing strand were tested in the University of Split laboratories, whilst the concrete was assumed to have a characteristic strength of 45N/mm^2, a typical value



EWBB on the Aleksin Hanu Bridge constructed by 37 Field Squadron.

for such a structure. The design load used was a loaded Mercedes low-loader crossing a 60 tonne EWBB. A limit state analysis was conducted to British Standard 5400.

The results indicated that the bridge could be expected to have sufficient moment and shear capacity at the pier to carry the design load. To achieve this required about 80 stressing tendons which, given the size of the cross section, seemed reasonable.

Confidence in the results of the analysis was established in three ways.

- The deflection of the concrete bridge was measured under traffic loads.
- The profile of the bridge was surveyed.
- A detailed visual inspection of the bridge was carried out, which included the inside of the box section.

The deflection measurement was carried out using a survey level sited on the west abutment. The largest deflection measured was 9mm for trucks of up to 42 tonnes which was considered to be acceptable given the span and the recent history of the bridge. The results were, however, only a rough guide as it was found that the type of vehicle, tyre pressure and the driver's estimate of his load, all combined to produce an unreliable relationship between the estimated vehicle load and the observed deflection.

A survey of the bridge centre-line profile was conducted to establish whether the bridge had suffered any permanent distortion which might indicate a progressive failure. On extrapolating the profile across the damaged section it was found that an unbroken curve could be drawn which peaked at the centre of the span, indicating that the bridge was largely unaffected by the damage.

The results of the visual examination confirmed that the damage to the bridge was confined to the area surrounding the hole, extending no more than 10m either side of the centre of the damage.

The bridge was assessed as having sufficient capacity to carry the required loads and a recommendation was therefore made to erect an 8-bay (24.4m) EWBB to span the damaged area. The EWBB was constructed by 37 Field Squadron and a subsequent visit by the team showed that the deflection and vibration had reduced considerably.

The Bijela Bridge

In contrast, the Bijela Bridge was a much simpler structure. This 5-span concrete road bridge crosses the River Bijela, a tributary of the River Neretva, on the Mostar to Jablanica Road. It was built in 1969 as part of the civil engineering works associated with the construction of the dams on the River Neretva. The structure is essentially a composite bridge consisting of three simply supported precast prestressed concrete girders per span supporting a reinforced concrete deck.

The southern span of the bridge had been partly demolished and a scaffolding improvised bridge had been erected by the Bosnians over the damaged span *(see diagram above right)*.

Jedan Most Previse (p144)

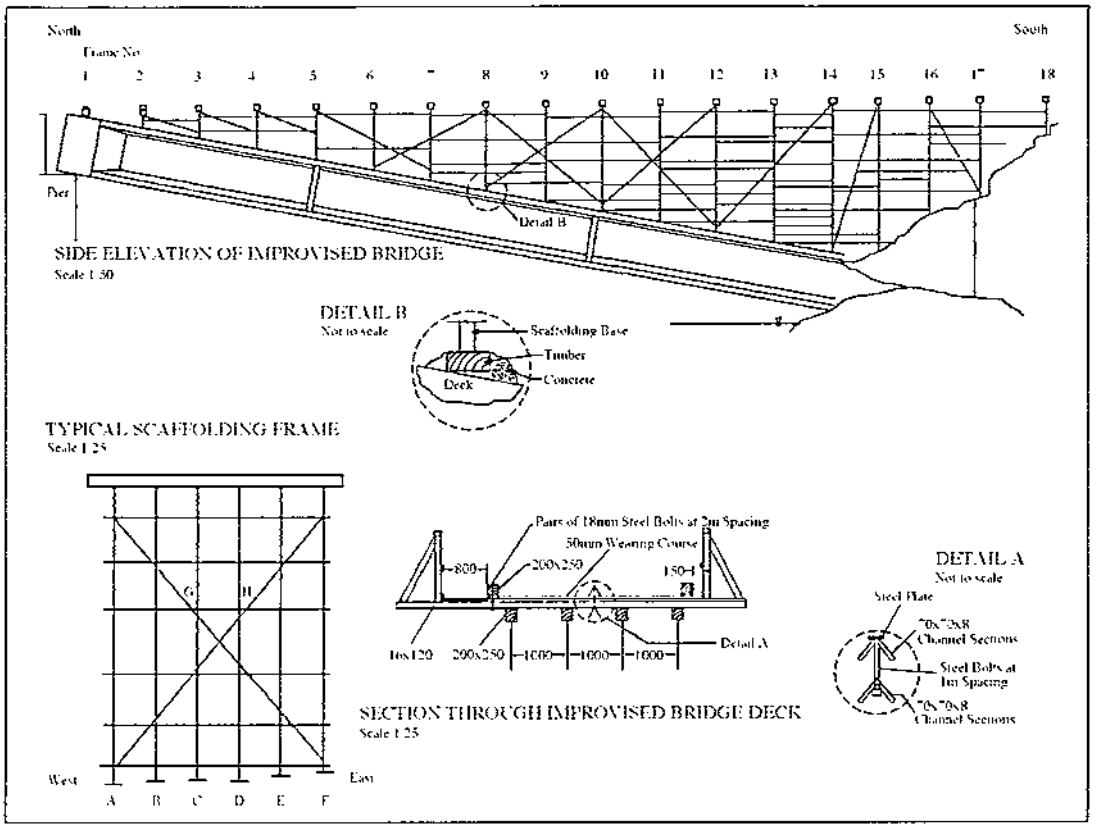


Diagram showing improvised scaffolding details for the Bijela Bridge.

The investigation aimed to assess the capacity of:

- the existing spans to carry intended traffic loads (ie a Mercedes low-loader carrying a Warrior),
- the fallen span to support those loads from the improvised bridge or, if not, possibly from an equipment bridge,
- the scaffolding improvised bridge to support the traffic loads.

The bridge was surveyed and the critical dimensions measured to permit a structural analysis to be carried out, although great difficulty was found in gaining access to some parts of the underside of the bridge.

As with the Aleksin Hanu Bridge, the stressing tendons were partly exposed by the blast. The original structure was, however, simpler and the load capacity of the beams could therefore be established with some confidence and a back analysis completed, again to British Standard 5400. The bridge was found to have the necessary capacity. Validation of the analysis was carried out using a load deflection test in a similar way to the Aleksin Hanu Bridge inspection. The test was carried out using a DROPs truck carrying a full water tank, allowing the bridge to be repeatedly loaded using a standard vehicle; the weight of the vehicle was adjusted by partly emptying the tank. The results of load tests on the concrete span, however, were not helpful as the test vehicle was not heavy enough to cause sufficient deflection to be reliably and accurately measured using the available survey equipment.

The scaffolding span presented a different problem. The deflection test was repeated but this time horizontal lateral deflection was measured. Vertical deflection was not measured as the play between the deck components was too great to allow useful results to be obtained. From the results of these tests it was found that the scaffolding bridge deflected to the west at the southern end and to the east at the northern end. On inspecting the scaffolding it was found

The damaged southern span and the scaffolding improvised bridge.

that due to the arrangement of the collapsed concrete deck the western stanchions were longer than the eastern stanchions and therefore tended to deflect a greater distance – hence the bridge tended to sway towards the western side. In addition, the bracing members in the scaffolding frames in this portion of the bridge did not extend from the top to the bottom ledgers. At the northern end the scaffolding frames were not cross-braced and were able to deflect in the unbraced direction.

The frames which appeared to be causing the deflections were modelled as plane frames using the Oasys General Structural Analysis software. They were first modelled in their existing state under the design loads. The results of this analysis indicated that the scaffolding bridge would carry the design loads. A few different configurations of the scaffolding were tried in order to find the arrangement which produced the greatest reduction in lateral deflection, and this was found to occur when each frame was fully cross-braced and the bracing was connected to the top and bottom ledgers. The likely reduction was of the order of at least half the current deflection.

The team had the opportunity, soon after their initial visit, to observe the bridge under full design load, as a Mercedes low-loader carrying a Warrior had been directed to the Mostar route. As predicted the bridge was able to carry the load and showed no visible sign of distress. However, it was noted that when another vehicle in the same convoy crossed the bridge at speed, the deflections were much greater and that poorly fitting deck planks were causing impact loading of the substructure underneath when trafficked by heavy vehicles at faster speeds.

It was concluded that the scaffolding bracing should be rearranged and that the deck timber should be repaired and regularly maintained. The bridge should also be provided with a substantial chicane on its approaches to slow vehicles down before they crossed the bridge.

The final aspect of the inspection was to recommend the most suitable EWBB configuration to be used if it proved necessary to replace the scaffolding bridge. From the results of the analysis of the concrete bridge the fallen beams were assessed as being able to carry the grillage loads from a loaded EWBB. An inspection of the abutment revealed that the two beams beneath the scaffolding bridge had been encased in concrete at the abutment to provide a support for the scaffolding. The third beam had been left untouched and could well have settled further if it had been loaded. It was therefore concluded that the end of this beam should also be encased in concrete before considering construction of an EWBB. As far as the EWBB itself was concerned, bridging the full span would have required either a 2-span bridge, or a triple triple construction. However, if the northern grillage was placed on the fallen span's deck, and prevented from sliding, the EWBB span could be reduced to allow a double triple construction.

Jedan Most Previse (p146)

Conclusion

A number of useful lessons were learnt from the two bridge inspections. The use of design software in the field allowed some parts of the structures to be modelled in a way which could not have been achieved by hand. Had the team had more experience with the available software then even more use could have been made of this facility. Without the as-built drawings prestressed concrete will always present problems to anyone required to assess a structure, be it intact or damaged. The use of non-destructive load and deflection testing of the bridge below its ultimate capacity can provide some useful information about its performance, however a controlled load such as a water tanker must be used if the results are to have any meaning. If such a system is to be used for shorter span bridges then either much larger loads, or more sensitive survey equipment will be required. Further research into such methods may be worthwhile, particularly if it is possible to establish a correlation approach to the assessment of prestressed bridges.

The two bridge inspections provided a considerable challenge as, in addition to testing the team's knowledge of the design and construction of such structures and methods of investigating the structures' performance, the work had to be completed against a deadline and without the back up of a fully equipped design office. The main conclusions drawn from the inspections are that:

- the Corps should improve its technique, and practise its capability to inspect concrete bridges,
- a specialist team has the capability to assess non-standard structures although there is scope for this capability to be improved,
- even in an operational theatre the perception that a bridge is shaking too much, even though it may not be loaded to its ultimate capacity, can be sufficient to prompt an investigation, together with resulting repairs and rebuilding work if necessary.

As an epitaph, the Yugoslavian engineers who built the original structures and the other projects in the Neretva Valley deserve full credit for some impressive engineering works which have been tested well beyond their designer's expectations – and survived.

The Brennan Torpedo: Part II
Mechanism after 1887

MICHAEL KITSON MCSD NDD FSG

The Torpedo in 1887

By 1887 the simple model which Louis Brennan had patented in 1876 had been transformed into a 24ft long steel torpedo, similar to the one displayed today in the Royal Engineers Museum, a design which remained unaltered until 1897. However, although between 1876 and 1887 the internal and external features of the torpedo had been completely changed, the principle of the method by which the torpedo was driven through the water remained exactly as before.

Wire which had been wound onto two drums and loaded into the torpedo before a run, was, on launching, pulled off the drums by a steam winding engine ashore. The two drums in the torpedo were keyed to the propeller shafts, and thus the drums and propellers were rotated by the wire being hauled in at great speed by the winding engine. An action which produced an interesting contradiction, because the faster the wire was pulled in by the winding engine the faster the torpedo was driven away from it.

Some of the major changes which had been made, were designed to increase the torpedo's stability; an alteration to the way in which the wires from the drums were led out of the Brennan being one. By passing them through the centre of the propeller shafts the possibility of the wires being snagged was minimized, and sideways drag was less likely to create a rolling motion, which would have been the case when they were led back above the propellers and the rear rudder.

Another noticeable stabilizing feature was the substantial horizontal fixed fins at the stern. Fins of this sort were a feature of the Whitehead torpedo until 1874, when the introduction of counter-revolving screws were found to make them unnecessary. However, the Brennan of 1878 used them and they remained on all subsequent models.

Vertical (depth) steering was now controlled by a pair of horizontal fins placed well forward on either side of the torpedo's nose, whilst lateral (directional) steering was obtained by four rudders, a pair above and below the nose and a second pair aft. The aft rudders were placed in front of the twin propellers, a change introduced in 1878 and prior to the decision to exit the wire from the centre of the propeller boss.(1)

Steering and Depth Mechanisms

The most substantial changes were those made to the steering and depth mechanism. Even during the year between 1880 and the trials of 1881, Brennan had made improvements, and during the following five years an entirely different depth mechanism had been constructed. While the negotiations for the torpedo's purchase were taking place, Major M T Sale RE, the senior officer in charge of its development, had summed the changes up for the Treasury as follows:

"Whatever the value of the secret may have been in 1881 that value has been very greatly increased by the improvements added since that date. Steering arrangements could, no doubt, be devised by any clever mechanist acquainted with the torpedo in principle, but it would be most difficult, if not impossible to meet the many small practical difficulties which are met with in working out this principle, without prolonged trial and experiment.

The value of the depth mechanism is, in my opinion very great, it is a wholly novel and strikingly ingenious apparatus for meeting conditions far more complex than are met by the corresponding apparatus in the Whitehead torpedo. I do not think that this mechanism, or anything equal to it in efficiency is likely to be hit upon (except by prolonged study) by any person, however able a mechanist he be. Moreover, its action is so very peculiar that it would require a prolonged inspection, whilst at work, by a skilful mechanical engineer to comprehend its action, and would be quite beyond the comprehension of a working artisan."(2)

The Extant Torpedo

Although no full and reliable description, or drawing, has been found to establish how this new depth mechanism worked, a considerable amount of sound information about how the rest of the torpedo's mechanism functioned can be pieced together from three reliable sources. These are:

- Proof copy of a confidential War Office document "the Memoranda for Station Torpedo Officer, (1903)".
- A small notebook (Army Book 136) kept by an officer under instruction at the Brennan School, probably in 1904,(3) which was recently discovered in the Corps Library.
- From the torpedo in the possession of the Royal Engineers Museum.(4)

When, in 1985, this torpedo was moved from the old Corps Museum to its present location, it was necessary to separate it into three component sections and the author was able to arrange for photographs to be taken of the inside of the compartments this partial dismantling revealed.

The date this torpedo was built has not been established with certainty. However, various parts are marked BTF and numbered 18, confirming that it was built at the Brennan Torpedo Factory, which began production in January 1888,(5) and therefore that this torpedo was the eighteenth built. Five, or six, were reported to have been completed by March 1890 when a further 30, or 40, were under construction. Fifty had been completed by June 1891. We know with certainty that after the torpedo was redesigned to take a heavier gauge of wire in 1897 the new Mark II torpedoes were numbered from 101 to 200. It is therefore likely to have been completed in 1890, or 1891.(6)

Although the information provided from these three sources is far from complete, it adds considerably to our knowledge of the torpedo. Thus, although the depth mechanism itself was not opened, or dismantled and photographed in 1985, it is possible to both recognize and locate it from the officer's notebook.

It is also possible to gain an understanding of the nature of the engineering used, and why, for instance, the value of its secret was considered "... to lie not only in the steering and depth mechanism, but also in the numerous clever devices which have been invented to meet the many difficulties which arose when working out the details."(7)

The eight compartmental sections of the torpedo, listed fore to aft, are: charge chamber, pistol chamber, depth chamber, fore drum chamber, aft drum chamber, reciprocating chamber, ballast chamber, and the aft chamber. There are access ports on the left (port) side facing forwards; circular ones to the pistol, reciprocating and aft chambers; a small square port to the depth chamber, and one large square port to both drum chambers.

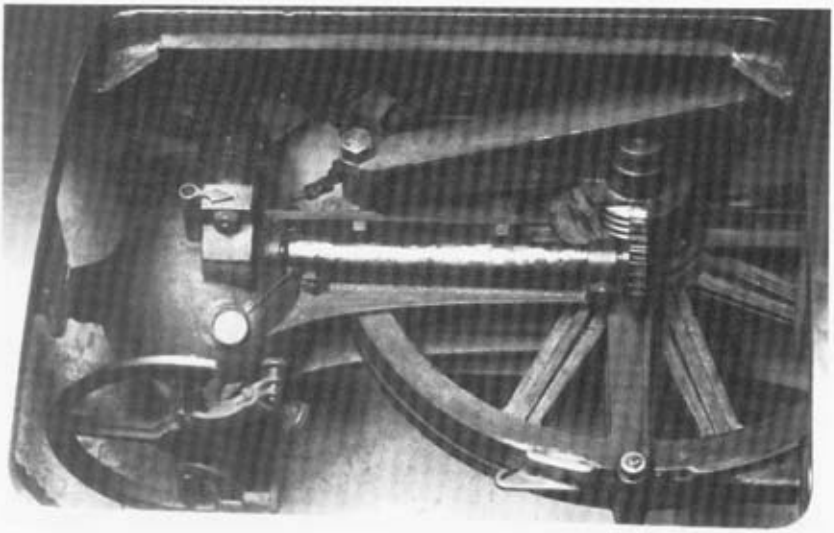
There are two propeller shafts, one inside the other, the inner shaft driving the rear propeller and the outer shaft the forward one. The drums are keyed to the shafts which slot into them and thus empty drums can be removed from the torpedo for winding on more wire, by drawing out the shafts to the rear and lifting the drums through the square port.

In 1887 about three times as much wire was required to be wound onto each drum as the distance the torpedo was intended to travel, and so, for a range of 2000yds 12,000yds of wire were needed, and the maximum range of 2700yds required 16,200yds of wire.(8)

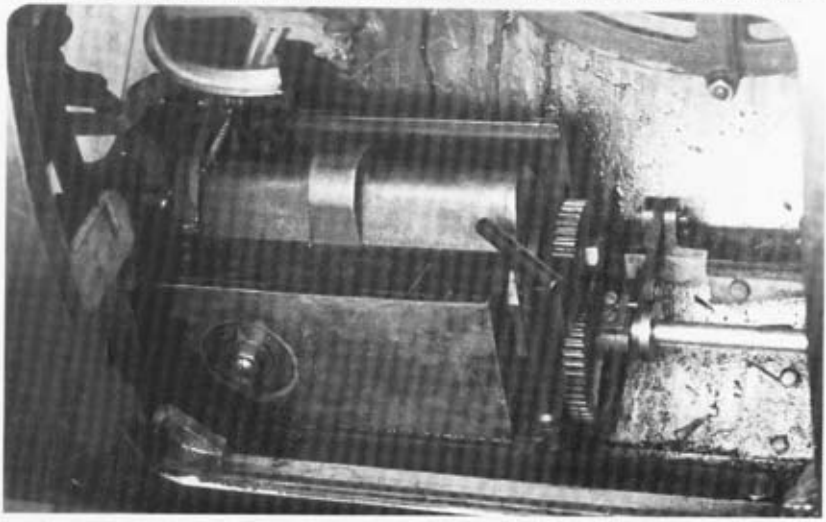
The work done by the moving wire can be understood if we follow its route from the drums as it was drawn from the torpedo by the winding engine ashore. Wire was led from each of the full drums over a reciprocating pulley, located above the drum and angled so as to give the best lead to the wire as it was drawn from the outer side of each drum. The pulley is ingeniously geared to travel backwards and forwards above the drum, so as to remain exactly above the point at which each layer is unwound. From the reciprocating pulleys the wire was then led forwards and over another large wheel, or pulley, in the depth chamber, with its axle lying transverse to the torpedo's axis. One function this pulley performed was to feed both wires into the forward end of the propeller shaft.

Steering Mechanism Drive

This pulley, in the depth chamber, appears to have been driven by both wires, and its second function was to transmit work, via a worm geared shaft, to the steering mechanism. It seems that the shaft therefore transmitted drive obtained from both wires to the steering mechanism, and it cannot be ascertained from



The photographs above and below reveal the depth chamber, with hatch removed, taken from different angles; above shows the large wheel, or pulley which feeds the wires to the centre of the propeller shaft. From this a drive shaft transmits work to the steering mechanism at the left where a half circle pulley can be seen. Chain to work the vertical rudders passed round this pulley and another similar to it at the top of the steering mechanism.
The depth mechanism is beneath the steering mechanism and can be seen below. Also the shaft which transmits drive from the reciprocating gear train to the depth mechanism can be seen at the bottom right. *(Photographs courtesy Royal Engineers Museum.)*

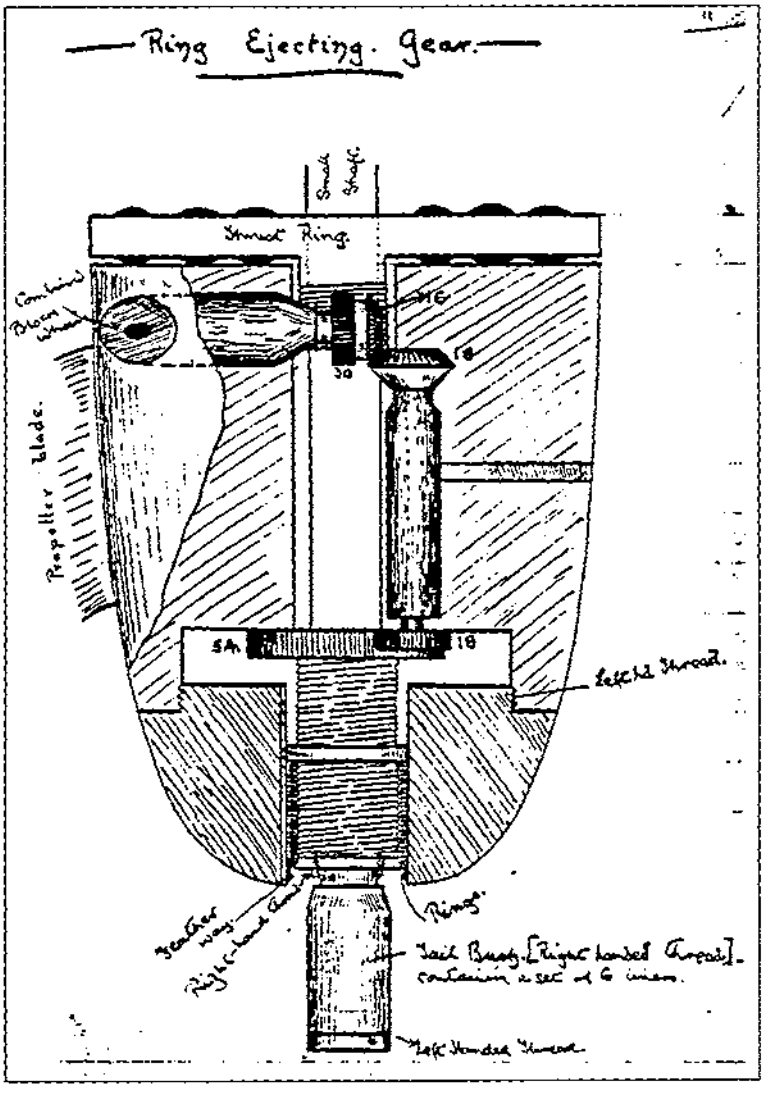


The Brennan Torpedo Part II (p150)

the photographs how a difference of speed was provided to steer the torpedo. But this would have been necessary if a differential, such as that described in the 1877 patent, was obtained. At the top and bottom of the steering mechanism box, half-circle pulleys worked the fore and aft rudders via chains and rods.

Ring Ejecting Device

The wire then travelled through the inner propeller shaft, to exit from the torpedo in the centre of the rear propeller boss. Housed in the rear propeller mounting was a mechanism which ejected a series of rings to keep the wires together as they ran back behind the torpedo to the winding engine. A ball-bearing thrust ring, set loose on the inner shaft, but set between, and running against the mountings of both propellers, remained stationary as they turned because the propellers were counter-revolving. The rear propeller mounting therefore turned against the stationary thrust ring and worked via gearing to drive a sleeve which ejected the rings. This was managed so as to eject one ring for each 90 revolutions of the propeller, or every 60yds of the torpedo's travel.

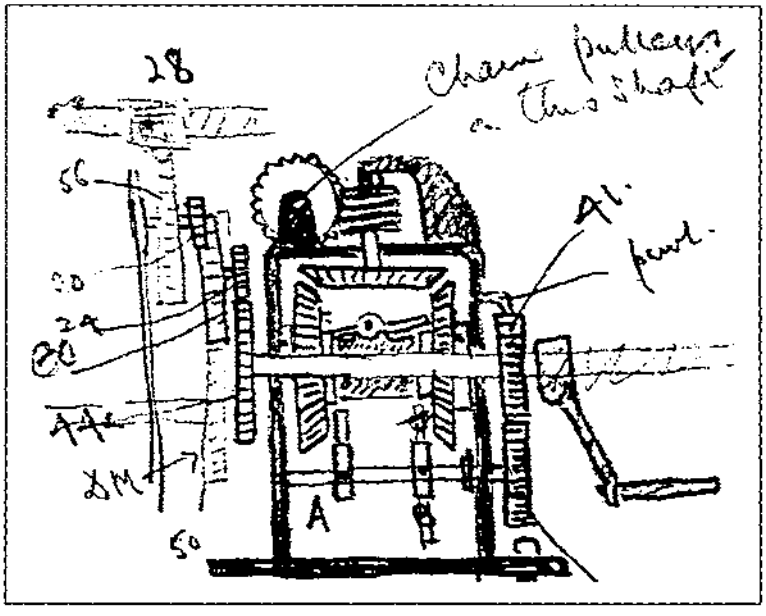


Drawing of ring ejecting gear from A B Ogle's notebook, "Army Book 136: Confidential Brennan". *(Courtesy Royal Engineers Museum.)*

Reciprocating Pulleys

The reciprocating pulleys are located above the drums, the one for the forward drum on the port side, and that for the rear drum on the starboard side. An arrangement which indicates that the drums were counter-revolving, and as they were keyed to the shafts drove the counter-revolving propellers without gearing being necessary, the forward drum working the rear screw via the inner shaft and the rear drum working the forward screw via the outer shaft. As the drums and shafts were counter revolving it follows that the "collar and slot" method of obtaining a differential for steering, as described in the 1877 patent, had been dispensed with.

The backwards and forwards movement of the reciprocating pulleys was obtained by transmitting drive from the main, or outer shaft, via a gear train in the reciprocating chamber. This train carried the drive to a tripper which caused a "jack in the box" gear



Sketch of reciprocating gear train from A B Ogle's notebook, the shaft transmitting drive forwards to the depth mechanism is labelled DM. *Army Book 136: Confidential Brennan. (Courtesy Royal Engineers Museum.)*

to reverse the motion. This in turn used chains to drive the two reciprocating pulleys (one for each drum) backwards and forwards on slides. The gear ratio is such that they were driven across the length of the drum as the wire was led off it, and it reversed their direction after 220 drum revolutions, which was the number of turns in one layer of wire.

Hydrostatic Valve

The hydrostatic valve housed in the brass nose of the torpedo, was placed under pressure by water entering through the circular holes in the nose. The "notebook" mentions the problem of the spindle of the hydrostatic diaphragm sticking, and also that the diaphragm worked against a spring, which extended 2in under 63lb of (water) pressure. It is possible, but not certain, that the movement of the spindle was transmitted to connect at the lower forward side of the depth mechanism box via a rod which has been removed from the torpedo.

Depth Mechanism Drive

The gear train in the reciprocating chamber was also employed to transmit drive from the main shaft forwards to the depth mechanism(9) by a shaft which passes below the drums. As yet, little concerning the depth mechanism can be established other than this.

It is clear that although at present it cannot be established with certainty how the depth and steering mechanisms worked, they can be identified in the extant torpedo. Furthermore, the steering mechanism of the torpedo is entirely different from that described in the 1877 patent and in the numerous published articles which have appeared since then.

The Mast

To steer the torpedo to its target the directing officer followed the course of the 8ft mast which projected above the surface. We know that for running at night the mast was fitted with an electric light run from a battery carried in the torpedo. This light was arranged to be switched on at the same time as a brake, applied to the wire drums, was taken off. This was done by using the sudden tensioning of the chain to the reciprocating gear as soon as wire began to be hauled off the drums. The purpose of the brake was to prevent the wire on the drums from unwinding, or slackening, prior to launching, for instance when the torpedo was being moved sideways onto the launching ways.(10)

When the torpedo was in store the mast folded back along the length of the torpedo and when raised was held in position by a single stay. Less is known for certain about the marker at the top of the mast in 1887; early accounts of trials refer to a flag at the top of the mast, others to a disk, and another to a spring-loaded butterfly, which closed on impact with the water.(11)

Another method used to enable the operator to follow, and therefore direct, the course of the torpedo, and which is described in early accounts, was to place phosphide of calcium (or Holmes' composition), in a small compartment immediately behind the mast which, when in contact with water emits "... flame and smoke in

the track of the torpedo."(12) As standing orders required this to be used on all practice runs, whether by day, or night, it is likely that its prime purpose was to mark the position of the torpedo for retrieval if it sank from sight below the surface, perhaps, for instance, at the end of a trial run.(13)

Charge Firing Pistol

The device used to fire the charge was housed in the Pistol Chamber, but as it has been removed from the torpedo held by the RE Museum. The only information we have of its design (c1903) is an incomplete drawing in "Army Book 136". It comprised a large spring-loaded pin, which under the shock of impact was released to strike a (77 grain) detonator and a (20oz) priming charge of dry guncotton. This detonated the charge of 230lb of wet guncotton, a charge increased to 364lb in the Mark II Brennans.(14)

Two safety devices were fitted, a bolt, to be withdrawn after the pistol was set, and possibly, a dial-plate lock, which was geared to revolve to an unlocked position after sufficient drum turns had elapsed for the torpedo to pass the shock of launching and clear the torpedo station. A device similar to this was proposed in the 1886 patent by Hiram S Maxim for a wire-driven dirigible torpedo.(15)

Recording Devices

Elaborate care was taken to monitor and record the performance of each torpedo during its run, and it was recommended that all torpedoes would be run in rotation at least twice a year(16). The need to keep careful records may have derived in part from the continuing development of the torpedo stations and their fitments, but also because the particular characteristics of every torpedo's individual performance were recorded. Certainly the amount of information collected was unusual for its time, and it also appears to have been carefully analysed and put to practical use to improve the weapon's accuracy.(17)

At the winding engine, recorder-barrels turned to produce continuous graph scales of the stress on the wire, of the number of drum turns wound in and of all steering put on. From a careful examination of the curves of the stress diagram, malfunctions could be traced to their source, such as the ring ejector failing, or the spindle of the hydrostatic valve sticking.(18) The stress diagrams could, it was claimed, elucidate "... almost every abnormal occurrence which arises in practice, and in many cases it is only through diagrams that the causes can be traced."(19)

A similar recorder was housed in the charge chamber of the torpedo during practice, to produce continuous graphs of steering and depth-keeping throughout the run.

Gyrostatic Performance

When discussing the depth and steering mechanism, three fundamental questions need to be addressed:

- Did the rapidly rotating drums of wire in the torpedo produce a gyrostatic force which was sufficient to have an effect on the torpedo's performance?
- And leading from this, if they did, then to what extent was that force either put to use, or controlled?
- And thirdly, whether, or not, there is sufficient evidence to suggest the depth mechanism employed a gyroscope?

Amongst the whole literature on the torpedo only one author, although a significant one, Brigadier General W Baker Brown RE, mentions a gyroscope. At the time of Brennan's death in 1932, some 26 years after the torpedo had been withdrawn from service, Baker Brown wrote that although details of the depth and steering mechanisms were secret and remained secret, "... it may be stated that they depended on the application of a gyroscope."(20) As the author of the History of Submarine Mining in the British Army, and of the volume of the History of the Corps of Royal Engineers which describes this period, Baker Brown's article must be considered authoritative. His first-hand knowledge of the activities of the Corps was exceptionally comprehensive and therefore, although it is possible that he did not know the "secret" in detail, there is every reason to suppose that he was correctly informed about the gyroscope.

Another cogent argument for the supposition that gyroscopic principles were understood and may have been employed, is that Brennan applied them to the major inventions he subsequently undertook. For instance, to the stabilization of the monorail he developed for the British War Office and the Indian Government, to the gyrostatic controls of his helicopter, and to his gyro-car.(21)

The Howell Torpedo and "Directional" Stability

Although the first practical application of a gyroscope to torpedoes is usually ascribed to Ludwig Obry in 1895, and its first adoption for azimuth control of the Whitehead torpedo by the US Navy took place the following year, in fact, not only was the principle already well understood but 25 years previously it had been applied to the Howell torpedo.

If we leave the problem of maintaining a steady depth to one side and first consider the use of the gyroscope to obtain directional stability, we know that the stabilizing effect of rifling, on shells and bullets was, of course, well known, and described as a "directive" force: one which kept the projectile pointing in the same direction during its flight.

It was this "directive" force which led Captain John E Howell, United Stated Navy (USN), to use the gyrostatic effect of a large flywheel to supply both motive energy and "directional stability" for the torpedo he invented in 1870.(22) The Howell torpedo was ultimately adopted by the USN in 1889 and the contract for its manufacture awarded to the Hotchkiss Ordnance Company. As the Howell was protected by patent it was never officially regarded as secret. Thus, the torpedo's mechanism was not only thoroughly described in successive patents, but was widely publicised by the manufacturer as well. The Howell was fired from a ship and although it could not be directed to its target, later models were able to self-correct deviations from their course to a remarkable extent.

Hotchkiss described the model of 1887 as being driven by the momentum of a heavy 110lb flywheel, with its axis placed laterally across the torpedo and geared to drive two propellers placed side by side. The flywheel was set running to about 10,000rpm by a steam-driven Barker's mill and thus the range was limited by the method of propulsion. In 1887 Hotchkiss claimed the range of an 8ft torpedo as only 300yds at 21 knots, but at that date this was not substantially less than the range of the Whitehead of 437yds at 29 knots. Also the range given for the Howell is deceptive, because the momentum of the flywheel kept the torpedo running, albeit at a decreasing speed, for a maximum of 1000yds. The same report ascribes the inherent directional force produced by the gyrostatic effect of the flywheel as the reason for the torpedo's remarkable "directional" stability, and in this account no details are given of the gyrostatic mechanism for correcting lateral deviation from the course, which was probably first publicly demonstrated at Villefranche in 1890.(23)

As we have seen, the Brennan differed substantially from the Howell. The drums of the Brennan were not solid throughout, were considerably lighter, rotated at a slower speed and moreover, were contra-rotating, but the large amount of wire required for a run added significantly to their weight. In the case of the Howell the primary purpose of the flywheel was to provide energy to turn the propellers and drive the torpedo to its target; thus weight and speed of rotation were vital requirements. The flywheel of the Howell in 1884 weighed 112lb and on launching rotated at 10,000rpm, the weight of the flywheel being increased to 128lb in 1890. In 1887 each drum in the Brennan fully wound with wire for a run of 2700yds weighed about 180lb and rotated at about 1290rpm.

The fundamental principle of the gyroscope, as most children discover from quite small toys, is that if a revolving flywheel is acted on by any force not parallel to the axis of the flywheel there will be a resultant motion about an axis perpendicular to the plane of these two. Put more precisely the tendency of such an influence is to bring the axis of the flywheel into the axis of the disturbing couple. For instance, if the Howell torpedo, in which the axis of the flywheel lay across the hull, changed direction to the right, the gyroscopic effect would cause the torpedo to heel over to the left. Howell utilized this by introducing a pendulum to swing transversely as the torpedo rolled, and the position of the pendulum provided a switch to cause power to be applied to the vertical rudder to give the correcting helm – in this case left rudder. This in turn applied a corrective couple to the flywheel with the result that the original direction was resumed and the heel-over corrected.(24)

When contra-rotating flywheels are placed exactly equidistantly fore and aft of the centre of flotation, as was the case with the drums in the Brennan, the gyroscopic effect still occurs, but as long as the gyros rotate at the same speed, the gyroscopic effect of one flywheel cancels that of the other. In short, by adopting

contra-rotating drums, the Brennan became much more easily controlled.(25)

We know that the Brennan used rotative power to transfer sufficient force to apply helm. It was transmitted from the rotating outer shaft via a gear train in the reciprocating chamber to the depth mechanism, and therefore the means by which rotative power was used to turn the fins of the Howell is of interest. The position of the transversely swinging pendulum allowed a rocking arm to engage, or disengage from, a cam wheel rotated by a worm drive on the propeller shaft. The rocking arm could therefore be disengaged, or tilted one way or the other towards the cam wheel. The arm which was tilted towards the cam wheel was struck by the cam rib each time the wheel revolved and threw the tiller over for an instant, and caused a rapid series of flicks to be made by the fins.(26)

Maintaining Depth

Obviously a hydrostatic valve working by itself can exert only a pressure equal to the pressure of water at the depth of the torpedo, and suffers from two major defects. The pressure exerted is insufficient to turn the fins of a torpedo travelling at 20 or 30 knots. Nor can the valve, working against a spring, react quickly enough to prevent an "over-and-under" effect, caused by successive, corrective inclinations of the fins, as the pressure pad registers too low, or too high – the porpoise-like behaviour so much commented on during the trials of the Brennan in 1879.

To solve these problems in 1868 Whitehead used a heavy pendulum weight which worked in conjunction with the depth mechanism. The in, or out, position of the hydrostatic valve signalled the depth, and the weight swung forwards and aft with the inclination, or tilt, of the torpedo, whilst the linkage between the two enabled the position of the pendulum to act as a damper. As the Whitehead was driven by a 3-cylinder engine, powered by compressed air, the next step, taken in 1876, was to add an air-operated servo-motor to the depth mechanism. The depth mechanism now opened, or closed a valve to provide sufficient effort to turn the horizontal fins; thus with a half ounce pull, or push, from the slide rod of the "balance" mechanism the motor could exert 180*lb lift*.(27)

The depth mechanism of the Howell in 1887 was similar to that of the Whitehead and a second pendulum, swinging fore and aft, was used in conjunction with the hydrostatic valve to operate the horizontal fins.(28) As the axis of the flywheel was placed horizontally and at right angles to the axis of the torpedo, the inclination of the horizontal fins and the resultant inclination of the torpedo, as it changed its depth, would not produce a gyrostatic couple, because such an inclination occurred about the axis of the flywheel. But, of course, this would *not* be the case if the torpedo did not remain vertical, for instance if it heeled over on diving.

Eventually the steadily improving speed and range of the Whitehead, as well as the adoption by Whitehead of Obry's gyroscope, and the difficulty of further developing the motive power of the Howell to match the increased range of the new Whiteheads, was to lead the USN to switch from the Howell to the Whitehead.

Evidence from Accounts of Trials

Amongst the literature on the Brennan there are a number of references to the torpedo's behaviour, which suggest, but cannot be taken as proof, that a powerful gyroscopic "directive" force was evident. Often eyewitness accounts of the torpedo's performance when it was on trial inadvertently throw light on the function of the "secret" mechanism; as always, malfunctions are given special attention. In such accounts, we read of sudden dives, or sudden uncontrolled right-angle turns. In the case of the earlier models when the drums rotated in the same direction (perhaps only until 1878) this could easily have been caused by a gyrostatic force over-riding the steering or depth-keeping mechanism. But after that date such an effect would only have occurred if one drum stopped operating, or ran more slowly than the other.

The *Memoranda for Station Torpedo Officers (1903)*, which is one of the few War Office documents to come to light, in recommending methods for steering seems to imply that a gyrostatic effect had to be considered: "The steering should, if possible, be put on gradually, two or three at a time, and then at a short interval, and so on. This is particularly important in the case of a torpedo which is seen to vary its depth badly on steering. In this case care should also be taken not to reverse the steering suddenly, as this is particularly liable to make a torpedo, *which is already diving on being steered in one direction, come to the surface when the steering is reversed.* (author's italics)"(29)

In 1885 naval officers of the "Vernon" torpedo school, who witnessed a trial, were interested by the almost instantaneous turning reaction of the torpedo in response to the engine ashore being braked, despite the long run out and loop of wire trailing behind the torpedo "... for", as they reported, "it would naturally be expected that after turning first one way and then the other for considerable distances, the slack wire would have to be taken up before pulling strain could be imparted to the torpedo, but this in practice seems not be the case, as the torpedo turns almost immediately the operator moves his wheel."(30)

Also the torpedo could be turned in a remarkable tight circle, as was shown in the defence exercises off Sheerness in September 1891 when the "improved" model "...was turned almost in its own length when about a 1000yds from the shore."(31)

Certainly the torpedo turned quickly, and the placement of rudders in the nose as well as aft would have made for smart tight turns: each rudder pivoting about its centre, the fore rudders pivoting clockwise (to effect a turn to the right) at the same time as the rear rudders pivoted anti-clockwise. If the turns were indeed "instantaneous" it is possible the rudders were supplemented by, and were used to correct, a gyrostatic effect.

A more surprising demonstration of directional control took place at the celebrated and dramatic trial made from Fort Albert (Isle of Wight) in June 1889 to a select audience of parliamentarians and senior naval and military officers. Essentially the demonstration was to show that the purchase, and the large price to be paid, were justified. "The target was an old wooden ship which was towed past the fort at a range of 1200yds, and at a speed of 10 to 12 knots. Brennan was himself in charge of the torpedo which to the astonishment of the spectators passed astern of the target! Brennan then turned the torpedo nearly at right angles, caught up the target boat and struck it on the side furthest from the operator! The explosion was successful and the target hulk entirely destroyed."(32)

Bearing in mind that the control of the torpedo was effected by the agency of two wires, under stress as they were pulled from the torpedo drums to the winding engine, the apparent "directional" stability demonstrated at the Fort Albert trial when the torpedo was turned through more than a quarter circle might suggest that a gyrostatic force was active. However, it is arguable that a combination of momentum and the effect of a large curved bight of wire could have achieved such a result.

Torpedo Station Launching Ways

But perhaps the most interesting evidence is provided by the launching ways at Brennan torpedo stations. Before launching, the torpedo was held on a trolley at the head of the ways (two rails of a tramway) at an angle of ten degrees to the horizontal. The wires were coupled to the winding engine drums, the winding engine drums set running and then stops, which restrained the torpedo were withdrawn. This allowed the torpedo, by the agency of gravity alone, to run down the rails into the water. The ways were designed with very great care so that in their vertical section the rails made a smooth arc, so that the torpedo was running as level as possible at the time it entered the water, irrespective of the distance the torpedo station was located above the water, and irrespective of the height of the tide. Both of which varied from station to station.

Brennan is reported to have claimed that "... on launching the torpedo never undershot its set depth, but anticipated its depth-line and took it up in a single curved path".(33) The need to accommodate the action of gyroscopic "directional" forces may perhaps explain the care taken to release the torpedo into the water as level as possible.

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Modified Perspectives

Europe, Arms Control and the Royal Engineers

CAPTAIN A P GLADEN BSc(H)

(Capt Gladen is seen above with the tools of the trade of Arms Control Inspectors: the dictaphone and clipboard.)

Captain Andrew Gladen was commissioned into the Corps from Sandhurst in 1985 after obtaining a degree in Politics and International Studies at Southampton University. In March 1991, after tours with 12 Field Squadron and the Junior Leaders Regiment, he was the first Sapper officer posted to the newly formed Joint Arms Control Implementation Group (JACIG), responsible for implementing the United Kingdom's obligations to various arms control treaties.

His tour at JACIG encompassed the roles of both Arms Control Inspector and SO3 Operations for Inspections of British Forces in Europe.

Introduction

Notwithstanding the concentration of the world's most modern forces in the Gulf under *Operation Granby/Desert Storm*, the challenges posed by *Options* and the breakup of the Former Soviet Union (FSU), the last three years have borne witness to some remarkable events.

It is now possible to land a British military aircraft on an airfield of the FSU with only 36 hours' warning and then receive a detailed brief on the location and orbat of a specified motorized rifle regiment within 9 hours following nomination. It is just as likely that a former Warsaw Pact general can be briefed on the manpower of a British brigade at that brigade's headquarters.

In the last two years in Europe we have seen an enormous leap forward in the openness of relationships with, and the management of, various armed forces including some which for many years have been hostile. Arms control, like it or not, is here to stay and the Corps is inextricably linked to its implementation.

Background to Arms Control

There is nothing new in arms control despite being wrongly labelled in some quarters as "disarmament". Since man discovered that pouring boiling oil over ramparts was effective but unpleasant on the receiving end, attempts have been made to limit weapon types.

The control of weapon types from both ends of the offensive spectrum has been attempted by the superpowers – from micro organisms to silo-based intercontinental ballistic missiles (ICBMs). In 1925, the Geneva Protocol outlawed the use of chemical and biological weapons but did not preclude production or storage. In the late 1980s the USA and the FSU undertook to abide by the flawed Strategic Arms Limitation Talks (SALT) Agreement. These examples demonstrate the range of attempts by governments to impose arms control.

The Problem with Arms Control

The problem with arms control is one of trust; there remains that sneaking suspicion that the

Capt A P Gladen
Modified Perspectives (p158)

other side is cheating. The most sophisticated national technical systems (satellite overflights) cannot detect what is buried or under covered storage.

Intrusive Verification

The requirement for, and problems associated with, breaking the secrecy cycle to achieve meaningful arms control inspections cannot be overstated.

The most important element of modern arms control, "intrusive on site verification" is now being attempted by consenting nations and there is no substitute for a clipboard, camera, dictaphone and boots combat high, to enable a team to verify that the equipments being inspected are actually those being declared by the "other side". Satellite surveillance is now secondary to the footwork of the Arms Control Inspector.

Open to evaluation: former Warsaw Pact combat engineers, minelaying.

An expectation of what might be possible in the future came with the Stockholm Document, which facilitated National Inspection Teams in gaining a "flavour" and overall impression of the war fighting capability of a signatory nation. A most important by-product has been the improving of trust and building of confidence.

President Gorbachov, having inherited the embarrassment and international condemnation that followed the surprise and speedy invasion of Afghanistan, bowed to international pressure and accepted the concept of national evaluation visits. A year later, the Intermediate Range Nuclear Forces (INF) Treaty was signed to remove categories of American ground-launched cruise missiles (GLCM) and comparable Soviet weapon systems from Europe. The systems themselves are compact, mobile and difficult to monitor. One of the main breakthroughs to come from the INF Treaty was the advent of the inspector who, with formal yet limited warning from his/her government, could arrive in a country and demand an inspection of military activity to confirm treaty obligations with no right of refusal; findings being passed, via the chain of command, to his/her national government. The intrusive verification phobia had finally been broken – much more would follow.

The Conventional Forces Europe (CFE) Treaty

Although weapons of mass destruction were the initial targets of arms control, the objectives consequently set have been hard to achieve due to problems of perceived national security, making verification difficult.

Ignored up to this point, in the various treaties, were conventional forces located in Europe. Most of these had participated in medieval, civil, nationalist, independence and two world wars and were prepared for a third. With the passage of time, technology had made the possible scale of destruction ever greater.

The success of the INF Treaty however and the American Department of Defense's modernization of their conventional equipment holdings in Europe, coupled with pressures on the Soviet economy and a more flexible outlook from President Gorbachov, facilitated the agreement to limit conventional forces and weapons under the CFE Treaty. Into the original melting pot were placed the conventional land and air forces of 22 European nations.

Modified Perspectives (p159)

Nothing changes, BTR-60 PB crew watching bridging.

Although specified as "defensive", the size of the Soviet forces indicated defence by large scale pre-emptive offensive action which is inherently destabilizing. The original success of the CFE Treaty was in its conception and agreement despite tremendous resistance from the Soviet armed forces and the effect such a reduction would have on the Russian military industrial economy.

Scope of the CFE Treaty

The treaty was signed on 19 November 1990 and ratified on 17 July 1992. The area of application of the treaty stretches from the Eastern Atlantic coast of the USA, through northern, central and southern Europe, across eastern Europe and the FSU to the Ural mountains. Naval forces (less land-based naval aircraft) are excluded from the treaty. It has three main features:

- An exchange of data on conventional armaments and equipments by state parties.
- A regime of intrusive verification of the data as provided by state parties.
- A reduction regime to reduce (destroy) conventional equipments below agreed levels.

The treaty limits those equipments employed for mobile offensive action or those that form part of the all-arms war fighting concept. It is these equipments that have been in the forefront of invasions in recent history. The following categories of conventional equipments subject to the treaty are:

- Main battle tanks.
- Armoured combat vehicles, including armoured personnel carriers and armoured infantry fighting vehicles.
- Artillery (over 100mm and including multiple launched rocket systems).
- Combat aircraft.
- Attack helicopters.

It is now the treaty obligation of each and every signatory state to provide the following information every six months or annually:

- The types of each equipment under each category.
- The locations in which they are held.
- Details of the first and second higher command subordinations.
- The manpower associated with the locations at which the equipments are held.

Joint Arms Control Implementation Group (JACIG)

A word or two about JACIG. Within the UK and British Forces Germany (BFG), the public face of JACIG has been seen in its activity with those units subjected to arms control inspections under the CFE Treaty, or in confidence and security building measure evaluations under the Vienna Document, which is an extension of the regime of openness and part of the Stockholm Document.

JACIG was formed in 1990 to assume the primary role in the implementation of the UK's arms control agreements, currently dominated by the CFE Treaty but taking into account the Vienna Document. The primary role is the inspection of former Warsaw Pact forces to verify what has been declared and to monitor the subsequent reduction of the equipment

Modified Perspectives (p160)

Classic treaty limited equipment, T-72.

categories in excess of national ceilings. JACIG is based at RAF Scampton, Lincoln.

The author was fortunate to take part in an American inspection of units based in the Ukraine in 1992. After extensive preparations at Rhein Main Air Base, Frankfurt, and the required 36 hours' warning, through the State Department to the Ministry of Foreign Affairs, the inspection team was flown to Kiev International Airport by C141 Transport Aircraft.

The aim of the inspection was to verify the declared treaty-limited equipments at Chortkov airbase (SU 24 "Fencer" and SU "25 Frogfoot") and the 89th Motor Rifle Regiment at Chernomoskoya on the Black Sea coast just east of Odessa (T64 MBT, 2S1 SP Artillery, BTR 70 APCs and associated equipments). The latter unit was part of the vast 82nd Motor Rifle Division mostly located on one site! Numbers of equipments were predictably large and the task tiring over three days but successful with no notable discrepancies.

Living conditions for the Ukrainian Army are extremely basic – water and power cuts are the norm and any sensible inspection team takes its own water. Furniture is very fragile to the touch, vehicle suspension non-existent, armour plentiful but lacking crews and spares.

The CFE Treaty is most important to the Ukrainians in their quest for good foreign relations but another item on their long list of problems.

Arms Control Within the Corps

The Royal Engineers, since the Crimea days of "follow the Sapper", have been an integral part of a balanced fighting force and have thus been equipped accordingly to provide mobility and protection. It is because of this that the Corps is well documented in the CFE Treaty data exchange. The following categories of armoured vehicles deployed within the Corps are included in the treaty and the holding units must declare them as such:

Centurion AVRE (105 and 165mm)
AFV432
CVR(T) Spartan
AVLB both Chieftain and Centurion
AFV 436
Saracen ADR

Extracted purely as an example from the UK Data Exchange as at 17 July 1992, 32 Armoured Engineer Regiment was listed with the following details available to all parties:

Formation or unit record number	–	AO303A
First higher echelon	–	1(BR) Corps
Second higher echelon	–	BAR
Number of personnel	–	728
Record number and location of declared site	–	UK 0430 Dennis Barracks Münster (Ortze)
Object of verification	–	32 Armd Engr Regt

Equipments limited by the treaty:

24 x Centurion
11 x AFV432
31 x Spartan
2 x AFV 436
23 x Chieftain AVLB

It should be noted that the details provided form the basis of the information exchange that is "audited" when the unit concerned is subject to an inspection by a treaty signatory/inspecting state party. The following are examples of the type of information that should not be provided nor disclosed accidentally:

War Roles.
Deployment plans.
Weapon capabilities.
Reinforcement plans.

For those who react in horror at such a disclosure of military information it should be remembered that the UK publishes its arms control information at the unclassified level. Information of proportionately greater significance is published annually in the statement of defence estimates, defence White Papers and open source defence journals. Even if equipments or parts thereof within an inspection site are of a sensitive nature, then it is still possible to protect UK interests within the scope of the treaty by declaring a sensitive point within a site and formally denying access to the inspectors.

UK Arms Control Sitrep as at December 1992

The UK has been more active in conducting outgoing inspections than escorting those into the UK and BFG. Over Easter 1992, 38 Engineer Regiment was subject to a Russian Vienna Document evaluation as part of the wider visit to 24 Airmobile Brigade at Catterick.

The Future of Arms Control

Arms control has removed intermediate range nuclear weapons from Europe. The CFE Treaty is of unlimited duration and looks set to facilitate more intrusive examinations of international forces. For instance, arms sales are now recorded on a UN register, an "open skies" overflight inspection regime is imminent and the list of nations signing up to a future chemical weapons agreement is growing.

Whatever future changes to arms control are made, the Corps of Royal Engineers will continue to be involved.

April 1993 Journal Awards

The Publications Committee announces the following awards for articles of special merit published in the April 1993 *Journal:*

Seventy Men. A Troop of Sappers with the Eighth Army in Early 1943 –by Nitebar ... **£75**
Training an Army to Navigate – Experiences from the Gulf War – by Major J F Prain ... **£50**
Europe's New Green Army – by Second Lieutenant V F H Orrell-Jones ... **£50**
Operation Lecturer, UK Participation in UN Operations in Cambodia –
by Lieut Colonel M W M Warren ... **£50**
Construction for Change – by Colonel M G le G Bridges OBE ... **£25**
The First Arakan Campaign and the Brief Life of DAIFORCE – by Colonel D C S David MC ...**£25**

Special Award – **£50** to Major D Vernon for his work in extracting the article "Australian Adventure" from the full text by Major S Love DSO* MC Croix de Guerre avec Palme.

Junior Officer Award – April 1993

This new award, announced last year, (to be given specifically for an article written by a junior officer not above the rank of lieutenant at the time the article is received by the Institution), could have been presented to Second Lieutenant Orrell-Jones. The Publications Committee, however, considered that the article merited the greater award of £50, which automatically places it on the list of articles to be considered for the following annual awards: the Montgomerie Prize (£75 or a set of volumes of Corps History), and the Best Junior Officer (£50).

This is an encouraging start and committee members hope that more junior officers of both sexes will be encouraged to take up the challenge.

Farewell to the RE Postal and Courier Services

On Wednesday, 24 March 1993, a Corps Guest Night was held in the RE Headquarter Mess, to mark the transfer of officers of the RE Postal and Courier Services, to the new Royal Logistic Corps on 5 April 1993.

At the conclusion of dinner, the Chief Royal Engineer, General Sir George Cooper GCB MC DL, presented a portrait of Brigadier J N Drew CBE, the "father" of the modern Postal and Courier Services, to the Director Defence Postal and Courier Services, Brigadier M A Browne CBE, as a gift for the Mess at Mill Hill.

In return, Brigadier Browne presented to the RE Headquarter Mess, a 1/9th scale silver replica of the "Letter from Home" bronze statue by Jagger, at Paddington Station.

Farewell to the RE Postal & Courier Services (p163)

German Engineers
History, Structure and Tasks

LIEUT COLONEL ROLAND VON REDEN

Lieut Colonel von Reden was born on 2 September 1945 in Pattensen near Hannover in Germany.

He joined the Federal Armed Forces as an officer cadet in 1965 and, after training and commissioning, became an engineer troop commander in the engineer battalion of the 2nd German Infantry Division. 1968 saw him studying civil engineering at the Technical University in Munich, which was followed by tours as Troop Commander in the Independent Armoured Engineer Squadron 310 and Engineer Liaison Officer to the German Armoured Infantry Brigade 31.

In 1972 he became Commander 2nd Squadron 11 Engineer Battalion followed by Commander 320 Independent Armoured Engineer Squadron during which time, in 1980, he was promoted to major.

From 1982 he was Deputy Commander and G3-Officer of 110 Engineer Battalion in I German Corps and then became Training Officer responsible for engineer troop commanders' courses at the German Engineer School in 1985.

On promotion to lieut colonel in 1986 he was appointed Commanding Officer 5 Engineer Battalion 5 German Armoured Division.

General Staff training at the Staff College in Hamburg came next in 1989, followed by a tour as G3-Officer in the Army Office, Department X (Engineers and Nuclear, Biological and Chemical Defence).

His present appointment as German Army Liaison Officer at the Royal School of Military Engineering commenced in 1992.

Lieut Colonel von Reden and his wife, Jutta, have two daughters.

Introduction

As the German Army Liaison Officer at the RSME, I must own up to having a wonderful time with the British Army and especially with the Corps of Royal Engineers. I have been overwhelmed by the friendliness, politeness and comradeship shown me by everyone – officers, NCOs and soldiers. I have also been very impressed by the history of the Corps, the loyalty of all its members and its capability to support all the other arms of the British Army to an extremely high standard.

During this year, I have learned a great deal and feel it is a great pity that the British and German military engineers do not have a better knowledge and understanding of each other. I was therefore delighted when invited by the Institution Secretary to write an article for the *Journal* about German Engineers, (or should I use the German word *Pioniere*), who have been your partners in NATO for more than 35 years, and who will, in the future, play a very important part in the multinational forces. It gives me the opportunity to provide a little information about their history, tasks and, from January 1995, their new structure.

To understand the German Engineers, now and in the future, it is necessary to understand something about their remarkable history – in some parts very similar to that of the British Royal Engineers.

History

In the German Army the name for engineer or sapper is *Pionier*. This word may have come from the French, *Le pion* meaning pedestrian or a soldier who is marching on foot, or from the Italian word *piccone*, which means pick. A *picconiere* is a soldier or a worker who works with the pick. A British source explains that

Lt Col Roland Von Reden
German Engineers (p164)

pioneer comes from the word "peon", an old word for servant or farm hand. In North America pioneers were people who dug entrenchments "paving the way" for the settlers who were to follow; this definition explains the German engineers' job, to "pave the way" for other troops. We have a saying in the German Army: "The engineers are always in front."

Amongst our engineers were famous architects and master builders as well as famous inventors. Many other arms originated from the Corps, for example the Nuclear Biological Chemical Corps, the Signallers and the Air Force.

There have been engineers in Germany for about 270 years, but their tasks are more ancient. In antiquity the *pontoniers*, the sappers and miners, had to do all the construction and support tasks required by other arms. Their primary tasks were to build floating bridges or piers, fortifications, roads, and they also had to support the combat troops during assaults on villages and fortifications. In order to execute these tasks in the Middle Ages, they had to gather together craftsmen, peasants and shipbuilders who were then commanded by engineers or artisan officers or "war architects".

Up to this day most German engineer officers will have studied civil engineering at the Forces University, every engineer NCO has to be a craftsman, and the majority of the soldiers in the German Corps of Engineers are qualified craftsmen, artisans and engineers before joining the army, making further training on these subjects unnecessary.

German engineers have been involved in such tasks as, in 1990 in Iran, building camps after an earthquake and in 1991, again in Iran, a refugee camp. After natural disasters they are called to rebuild houses, roads and repair power lines.

In the late 17th century some of the various German states formed special engineer units and this was the origin of a new arm – *Pioniere*. This word was used for the first time in 1810 by the famous Prussian, General Scharnhorst, when he suggested to his king that the existing *mineur* and *pontonier* squadrons should be combined into a *Pioniercorps*.

During the First World War the tasks of German engineers changed. More and more, combat support became the primary task whereas construction tasks became less important. Because of constraints in the peace treaty of Versailles after the First World War, it was necessary for the German Army to train an "all round engineer" who was able to build bridges as well as to lay minefields and work with explosives, build and breach other obstacles, and build routes.

During the Second World War the importance of the engineers grew more than ever before. They had to perform more tasks and more specialized tasks. Various special engineer units had to be formed and deployed. A French source, reflecting the first month of the Second World War said: "where the Germans have their main effort they are always deploying their engineers." Nothing could be done without the support of the engineers. That is why I am very proud of the history of my Corps, a Corps which has almost the same function as the British Royal Engineers.

Main Tasks of German Engineers at Present and in the Future

The aim of engineer support is to help combat troops to prevent enemy mobility and at the same time support the mobility of friendly forces and increase their survivability.

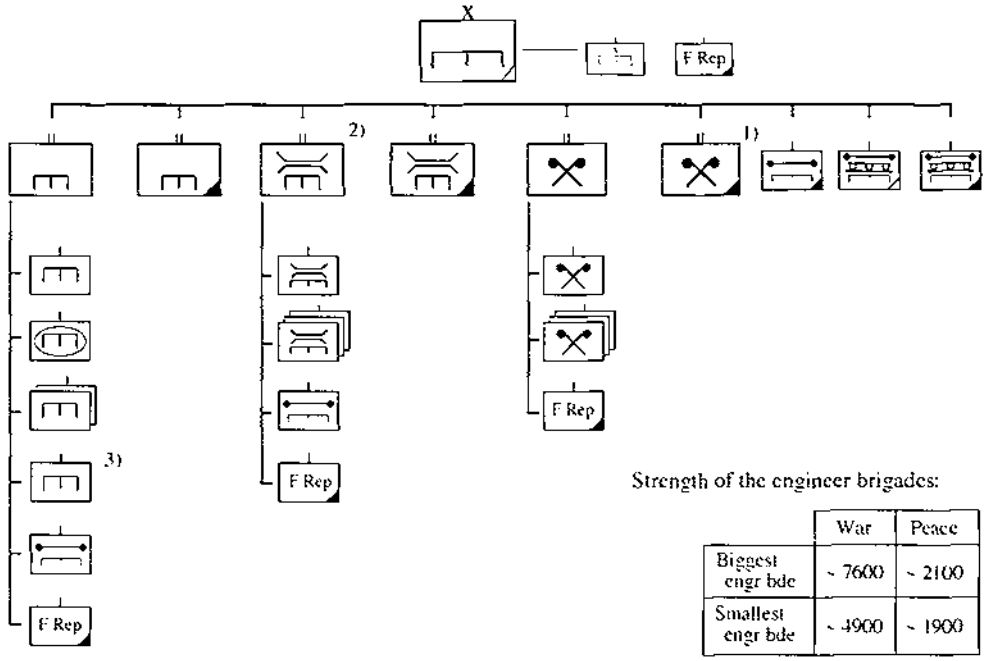
In addition to this the territorial tasks of German engineers are to ensure support to other troops all over the country: eg river crossing operations in the rear, damage repair, other territorial engineer tasks such as obstacle preparation, breaching of obstacles, sustaining the NATO-pipeline system in Germany, *Wallmeister* tasks, (eg to take care of preplanned obstacles, or to give engineer advice in their local area to German or Allied engineers. (HNS – Host Nation Support)), EOD tasks and giving engineer advice to the staff of the military region and district commands.

In future the German engineers will have to be prepared to support much more in humanitarian aid and disaster relief operations.

Modern warfare requires engineers who are able to stop the enemy advance with modern methods but at the same time allow friendly forces high mobility. For this reason the German engineers obtained the mine launcher *Skorpion*, a modern minelayer with scatterable, antitank and antipersonnel mines. They are about to develop a barrier system similar to MINX (Mines in the next century).

In order to support increased mobility over long distances the German engineers have, or will have, modern bridge equipment in the near future (eg: M3 amphibious bridge, foldable bridge, improved

GERMAN ENGINEER BRIGADE (ARMY STRUCTURE 5)
(From January 1995)



Strength of the engineer brigades:

	War	Peace
Biggest engr bde	~ 7600	~ 2100
Smallest engr bde	~ 4900	~ 1900

F Rep = Field replacement squadron.
◢ = Full cadre-strength unit.
◿ = Different strength in peace and wartime.
1) This cadre-strength battalion only exists in Engineer Brigades 30 and 50 (one each), and in Engineer Brigade 40 (two).
2) = Depending on the likely deployment areas of the engineer brigades, their bridging battalions will have different bridge equipment and therefore a different number of squadrons.
3) = NCO training squadron: only one in one engineer brigade of each GE corps.

AVLB *Biber)* as well as a mine detecting system and the mine clearance tank *Keiler.*

The increased threat caused by modern weapon systems, and more troops, mainly in the rear, in assembly or harbour areas, create a need for more protection. Therefore the German engineers are equipped with modern plant either armoured or unarmoured (eg: the Armoured Vehicle German Engineers *Dachs*).

(Editor's note: An article about the *Biber, Keiler, Skorpion* and *Dachs* equipment appeared in the December 1989 *Journal*, and an article covering the M3 was published in the April 1992 *Journal*)

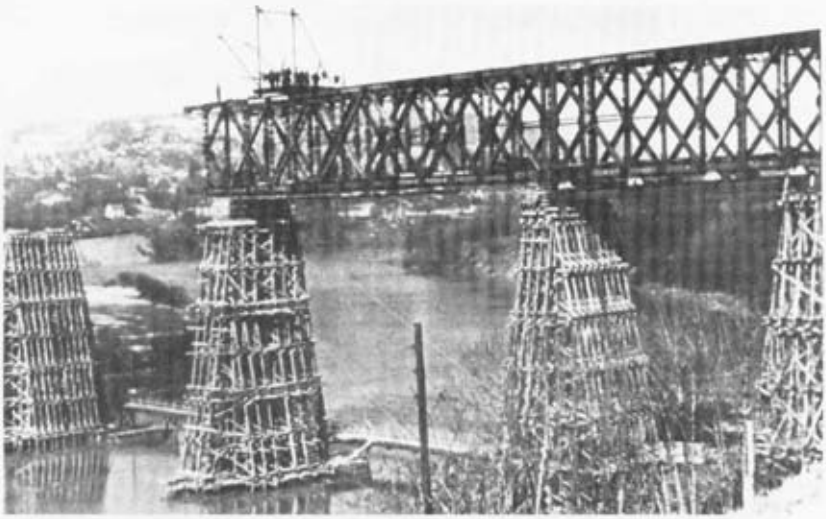
New Structure of the German Engineers

In order to execute the various tasks mentioned above, a new engineer structure was thought out in 1990/91, to be implemented by 1994.

Let me first explain what the new army structure, (Army Structure 5), entails:

- To merge the Army Field Forces and the Territorial Army in peacetime in such a way as to permit, in case of war, strong major formations to be brought up to full wartime strength while retaining the capability to accomplish territorial tasks (eg: Wartime Host Nation Support).
- To organize a large number of units as equipment holding units in peacetime. Warning times will be sufficient to allow for manpower replenishment and training in case of war.
- To keep a small number of units (seven brigades) at 100 per cent personnel strength ready in peacetime. These forces shall be readily available for NATO commitments and crisis management.

Thus, the command echelons of the army will be maintained – but there will no longer be engineer forces at all levels: the corps commands



Reconstruction of a railway bridge across the Trondheim Fjord by German railway engineers in 1944.

will have an engineer cell, but there will be no engineer units in the corps troops.

The divisions/military commands will have one engineer brigade each.

As before, mechanized brigades will have one independent armoured engineer squadron.

A new feature will be the engineer brigade of the division.

It will comprise:

- 2 engineer battalions.
- 2 floating bridge battalions.
- 1 or 2 NBC defence battalions.

} One of each will be an equipment holding battalion.

In addition the engineer brigade has "technical", ie engineer plant/machinery squadrons and "special squadrons" for tasks related to pipeline operation. All battalions have – and that's new too – their own personnel replacement units.

The engineer battalions will thus give the division six (instead of the previous three) engineer squadrons, one of which will be armoured. This is more than we have at present – but in the previous organization, corps engineer units were deployed well forward anyway and had to strengthen the engineers at division and brigade level.

The bridge battalions of the brigades differ in the type of equipment they hold. Here, the territorial mission of the so-called "Army of the united Germany" becomes evident: part of our bridging equipment is restricted to aiding friendly forces cross specific bodies of water (eg: the Kiel Canal or River Rhine) by internationally-binding agreements. Therefore, this equipment is assigned to the brigades stationed in these areas and will not be available anywhere else.

In war, elements of the engineer brigades may well be expected to accompany the combat troops of the division in large-area operations, while others will remain in their deployment area to accomplish territorial tasks. This also applies to the cadre-strength NBC defence battalions with WHNS missions.

SUMMARY

A COMPARISON between the British and German Engineers shows us that both Corps' have a different structure but both have a remarkable history, which in some areas is alike, and both perform similar tasks. These are some of the main reasons why I feel very happy to serve as the German Army Liaison Officer with the Royal Engineers.

German Engineers (p167)

Northern Ireland – The Border Campaign. An Example of Counter Mobility Operations in Internal Security Operations

ANON

Introduction

As a junior captain on JDSC, I had listened to the lecturers, in the Faraday Hall at Sandhurst, expound the theories of Thompson's principles for the defeat of counterinsurgency in Malaya. In the warmth of the classroom these principles made good sense and seemed easy to apply. These principles are:

- Government must have clear political aims.
- Government must be legitimate and its agents must work within the law.
- Priority must be to defeat political subversion.
- Government agencies must work from secure base areas.
- Subversives must be denied safe havens.

To my surprise, two months later I was standing in the mists of Fermanagh trying to apply one of Thompson's eminently sound principles in Northern Ireland (NI).

My thoughts on arriving at the sharp end were markedly different from those that I had had in the classroom. Initially I found it very difficult to see the benefit of denying the terrorist cross-Border access, removing from him his ability to move into and out of his safe haven at will (one of Thompson's principles). All I could see with my limited experience was the Security Forces (SF), restricting the access of local communities across the Border, splitting some small parish communities in two and denying the people one of their basic liberties – the freedom of movement.

Two years on, after several major incidents and many conversations with people from both communities in Border areas, I realised that the controlled Border policy was a very effective one and that events were validating the control that the Government placed on the Border in NI. I also realised that what I had seen as a loss of liberty for a limited number of people was providing security to a greater section of the community. It gave them the freedom to live their lives "safer" from the threat of terrorism.

Border Control

The Northern Ireland Office (NIO) operates a controlled Border Policy from Middletown to Londonderry. This control takes the form of a series of road closures, tied in with Patrol Bases with a roadside control facility, or police stations that are capable of monitoring roads that cross the Border. The theory being that it is difficult, if not impossible, to cross the Border from the Republic of Ireland (ROI) into NI without passing a SF location which is capable of monitoring vehicular traffic.

Along the 290kms of Border from Middletown to Londonderry there are 15 approved routes along which people can cross the Border. Additionally there are many smaller roads which are not covered by obstacles or subjected to some form of control, leaving farmers local to the Border access to their land from either the Province or the ROI. These roads tend repeatedly to cross the Border, though they do not link roads in the ROI to any roads in the Province that would bypass Border Control Points (BCPs).

Political Reasoning for Border Control

The political reasons behind this Border control are assurance, deterrence and attrition.

Assurance is the first reason for Border control, in that the road closures act as a display of Government resolve to local communities, which are regularly threatened by terrorist activities in Border areas. On many occasions when a BCP has been left open for a period of several days, Protestants will complain that they are vulnerable to attack from terrorist gangs, which may use the open BCP to move into the Province from the Republic to mount attacks.

Deterrence is very important in that the road closures make it harder for the terrorists to cross the Border, either routinely or en route to mount an attack. The terrorists can plan their attacks in the ROI with little fear of capture, making the ROI a

safe haven from which they can mount their attacks and then retreat into on completion of their mission. The tight control imposed upon the Border, forces them to find available unmonitored routes or to construct their own routes into and out of the Province. This requires detailed route recces and complicates their planning.

Attrition of terrorist attacks mounted against targets in NI is the final reason for the existence of the controlled Border policy. Attack by terror gangs may, and have, become dumbfounded in the muddy lanes that the criminal fraternity construct across the Border.

Political Authority for Border Control

Border Control was imposed very early on in the resurgence of the Troubles in the early seventies, to try and prevent terrorists crossing the Border in formed bodies of armed men. This was seen to be effective and the military continued to pursue this policy with little political control until the mid-1970s when the NIO imposed strict limits on the way that Border Control was exercised. This new legislation denied the military the use of explosives to close Border roads.

To ensure the legitimacy of road closures (another of Thompson's principles) in Border areas, a new section was introduced to the Emergency Powers Act (EPA). Each closure had to be personally authorized by the Secretary of State for Northern Ireland (SOSNI) which involved issuing a new closure order for each road closure. The staff work required to obtain permission to effect a closure took three to four weeks to process, which meant that there would always be holes in the Border through which the terrorists could slip unchecked.

The current legal authority for road closures is Section 25 of the EPA 1991. This section of the Act not only allows the military to close roads, but makes it an offence for someone to reopen the closure if the order is still standing. The new legislation has taken some of the burden of finding proof for convictions off the SF, and placed it upon the suspect to prove that, having been found within 200m of a BCP with a piece of construction plant, he had a legitimate reason for being there. The act was developed to support the Border Campaign and it is no longer necessary to justify the reclosure of a road to the NIO every time it is illegally reopened. The use of explosives still remains a controversial issue and the SOSNI must authorize each use of explosives for road closure purposes.

Military Reasons for Border Control

The military aim in Border areas is to combine roadside control with patrolling in the remaining border areas, in order to inhibit and interdict the movement of terrorists and their munitions across the Border.

Limiting terrorist access across the Border reduces the support that the Army has to provide to the Royal Ulster Constabulary (RUC) for their routine policing of Fermanagh. In consequence this enables the military to concentrate their efforts on defeating the terrorists from a position of strength.

In places the Border is clearly recognized as being open to anybody to cross (either on foot or using a 4-wheel drive vehicle) who does not wish to cross it through a controlled route. The creation of an impassable barrier along the Border would require an obstacle akin to the Iron Curtain with the manpower bill to support it. This would not only be unacceptable in the current European political climate but also unacceptable to the Treasury.

Successes of the Controlled Border Policy

The Controlled Border Policy has proved to be effective in the attrition of three terrorist attacks in the past eighteen months.

The first terrorist failure in this period attributable to the Border Campaign was in September 1991 when terrorists tried to deliver an 8000lb bomb to Annaghmartin Permanent Vehicle Check Point (PVCP) (PVCPs are now known as Patrol Bases (PB) most of which retain a roadside control function). The terrorists had planned to deliver the device in the back of a farmer's silage trailer. They attempted to smuggle the device across the Border, through several fields, into NI avoiding normal cross-Border channels. The aim being to deliver the device to the NI side of the PVCP, trying to blend in with the normal pattern of life for the area, so that the attack could come from a less expected direction.

To move the device across the Border the terrorists had hijacked a tractor and trailer, and loaded the 8000lb bomb into the trailer. The chosen route required a lot of preparatory work before it was suitable for the tractor and trailer. The gang moved the bomb to a holding area 200m from the Border in the Republic, meanwhile assistants cut down hedges and a fence and improved a ford. The device was

An example of roadside control.

moved along this rather tortuous route across the Border, until it was 100m short of a farmer's hard-core track in NI, when the weight of explosives in the trailer caused a french drain to collapse, trapping the trailer. Several attempts were made by the terrorists to recover the trailer using another hijacked tractor fitted with a winch, all to no avail. At this point the terrorists abandoned their attack a kilometre short of their objective.

The incident was significant from a Sapper's point of view, as it was the first recorded incident where terrorists had undertaken basic route preparation as part of an operation.

The second incident in January 1992 happened in the Clogher Valley area. A patrol had established a vehicle checkpoint 400m from the Border when they came under fire from high ground between themselves and the Border. The soldiers returned fire and several minutes later, whilst they were regrouping, a large explosion was heard behind the high ground. In the subsequent follow up it was revealed that a terrorist gang had been trying to move another explosive device across the Border, mounted on an agricultural tractor, once again through a series of fields linked by gaps in hedges. The PIRA gang had panicked when they saw the military unit on their intended route, and knowing the device could not be diverted around the patrol, the attack was abandoned and the bomb detonated.

Once again the terrorists had undertaken very detailed recces to find this rather obscure route, as well as a fair amount of route preparation to make it suitable for a tractor.

The third incident that validates the controlled Border policy occurred on 5 February 1992, when an off duty part-time member of the Ulster Defence Regiment was called, in his civilian capacity, to capture and put down a rogue dog on a farm near the Border. He was suspicious of the call and as he went out to the job he called in at his house and collected his Personal Protection Weapon. On his arrival at the farm a hooded man ran from a barn shouting, "This is the IRA and you are dead." The dog-catcher drew his pistol and fired in the direction of the terrorist, killing him. The rest of the PIRA gang stepped out of cover and shot at the dog-catcher hitting him several times in the legs. The wounded victim climbed back into his van, reloaded his weapon and continued to engage the enemy. The terrorists panicked and fled the scene in a hijacked car. On approaching the Border they found that they could not drive straight across into the Republic so they abandoned their vehicle and ran across the Border and hid in a ditch just inside the Republic. A Garda patrol in the area observed this suspicious activity and went to investigate. They found the terrorists hiding in a ditch clutching their weapons trembling with fear, whereupon they were arrested and charged.

The significance of the closure of the BCP in this incident was that the terrorists were forced to act suspiciously. This lead to their capture and subsequent prosecution. The Garda's response to this strange behaviour is a typical display of the levels of cooperation that have developed between the RUC and the Garda in Border areas over the years of the Troubles.

These three incidents are specific pointers to the success of the Border Campaign in Fermanagh. The new legislation which has allowed the Border to be controlled far more effectively has also lead to a drop in the number of terrorist incidents in Central Fermanagh, as terrorist access to their targets has been impaired.

The imposing of the Controlled Border Policy has its drawbacks however as the reclosure of an illegally

Northern Ireland - The border campaign (p170)

reopened BCP is predictable. The terrorists have been quick to exploit this and an illegal reopening of a BCP can be used as a "come on" in order to attack the SF, either as the SF try to arrest people for the illegal reopening of BCPs, or as they reclose the BCP.

The number of attacks against BCP closure operations has risen markedly over the past two years, as terrorists have found it harder to mount attacks against "soft" targets inside Fermanagh due to the effectiveness of the Border campaign.

An example of a road closure.

Excavators Under Fire

The terrorists' use of shoots against soldiers guarding obstacles or closure operations have become more common. PIRA have, with little success, attempted to mortar excavators working on a closure.

Sappers closing a BCP must be fully briefed, and have a comprehensive set of "actions on" prepared, as an attack on the operation will be concise and will allow little time for ad hoc reactions to be implemented.

Most of the military plant in the Province has been civilianized, to ease its movement around the Province on the back of covert low-loaders. Unfortunately, excavators in civilian colours make very good targets and to ensure the safety of operators on BCP closure operations the plant park painted several of their valuable civilianized excavators green (again). Operators had to relearn the skills required for digging in the dark – a very dangerous operation when working on unstable soil very close to the edge of large craters. The practice of stopping the machines working in the dark cannot be afforded as the longer an operation was deployed on the ground, the longer the terrorists had to mount an attack against it.

Options for Closure

Royal Engineers have a variety of types of closure to use on BCPs. The sort of operation mounted depends on a variety of factors such as threat, political emphasis and facilitating the local community ie allowing them access to their property.

The standard closure is effected using plant and a concrete obstacle. This type of closure is complex to plan and coordinate due to the multitude of different threats to be considered and the size of the operation. The infantry will secure and clear the area and routes into the BCP, allowing Sappers to transport their plant in and execute the task. Concrete for the obstacle must be transported onto site at some stage which again requires secure routes and protection. The movement of stores and equipment down the narrow roads in Fermanagh requires precise navigation as crossing into the Republic with a low-loader full of British Army stores can cause a "minor" political furore!

The requirement for protection is compounded by members of local Community Associations, who are against road closures. They have resorted to stealing the concrete out of the obstacles before it has had time to cure and have used it to construct bridge seats for their own bridges across the obstacles. To prevent this the Infantry are literally required to watch the concrete dry.

An alternative method of closure is to use explosives. The control of the use of explosives is retained by the SOSNI. Gaining political clearance of this type of operation requires the original recce report to be submitted up the chain of command to the NIO, for SOSNI perusal. This requires detailed and accurate reports from young officers who may only have just finished the YO course. Speed of processing the applications is vital and a lot of pressure is applied to the recce officer from Brigade. Speed was not always easy to achieve as the staff in the NIO would

Northern Ireland - The border campaign (p171)

question reports in the most minute detail, they once returned a report covered with red ink corrections (civil servants!!). Political clearance, if it be given, can take five days to three weeks. The element of doubt as to how long it would take for the clearance to be granted on some of the more controversial BCPs led to some routes being closed by Infantry Pioneers with shovels as a stopgap.

The explosive closure is a simple operation to mount. A cordon would be inserted, the area cleared, explosives flown to the target, fired and the operation completed in as little as four hours. A larger closure, using as many as 12 Rapid Cratering Kits (RCKs) may take six hours.

On the conclusion of every operation the NIO sends damage assessors to the site to check that all closures have been executed within the prescribed parameters. Any infringement of these guidelines causes political upheaval, usually with fairly major Community Relations implications. In the event of the Sappers causing unnecessary damage during a closure, the unit involved will find that they are returned to the location to repair it. To prevent this embarrassing situation occurring, the recce report must be accurate and the operation must be conducted as per this report.

All operations mounted in Border areas are shadowed by the Garda or Irish Army on the other side of the Border. This requires a lot of planning by the RUC who are the only people authorized to communicate across the Border. It also means that all military patrols operating in Border areas must be accompanied by an RUC officer so that they can communicate across the Border. Cross-Border cooperation between the RUC and the Garda is very strong but a poorly planned operation can damage this politically delicate relationship, again making BCP closure operation an emotive subject between the two police forces.

The Opposition – The Community Associations

BCPs which have been closed by the SF are regularly reopened or bypassed by the local population wanting to use the crossing. These people have no connections with terrorist organizations although terrorists are happy to exploit the reopenings. The Community Associations, (the name they like to refer to themselves by) have a large plant fleet on call, with a comprehensive support organization capable of maintaining and moving their equipment. They occasionally call "Days of Action" when they will try to reopen as many as six BCPs in a day. "Days of Action" are rare but there is still a requirement for the SF to reclose four BCPs on average each month.

The RUC are forefront in trying to prevent members of Community Associations from reopening BCPs illegally, as it is a law and order problem. The task is a very difficult one as it is only an offence to reopen a BCP in NI; once the offenders step across the Border into the Republic they are safe from arrest. This can reduce the Community Association's planned illegal reopening of a BCP to a slanging match across the Border, with the RUC on one side and the Community Association on the other. To their credit, the RUC have successfully arrested and prosecuted four people in the past six months.

Conclusions

The Border Campaign in Fermanagh, County Tyrone and County Londonderry is a demonstration of the benefits of engaging in countermobility operations in Internal Security Operations or Low Intensity Conflicts.

Control of cross-Border routes effectively strangles terrorist supply lines, in turn deterring and inhibiting them from mounting attacks inside "soft" areas.

Tight political control is the secret to success in this type of campaign. The rules governing the implementation of the Border policy at times appear frustrating to soldiers on the ground, but they ensure the legitimacy of the SF's actions and ensure that neither side of the Community is discriminated against.

The damaging nature of Sapper countermobility operations on the national infrastructure means that politicians must always show a lot of interest in these operations.

There will always be opposition to Government plans. The opposition to the Border campaign is well organized and extremely overt.

The supporters of the Controlled Border Policy all strongly believe in the policy, and I believe events over the past eighteen months have confirmed their beliefs.

Sapper Geology: Part 2

Geologist Pools in the Reserve Army

COLONEL E P F ROSE TD MA DPHIL MIWEM CGEOL FGS
AND COLONEL N F HUGHES TD ERD MA ScD FGS

BRITISH military geologists have supported the Corps of Royal Engineers since 1915, but until 1948 only in wartime. For the next 40 years – a period spanned by the overlapping service of the two authors – reserve army Pools of sapper officers provided six to eight geologists annually for military tasks. Pool geologists contributed considerable academic expertise to the Corps, and in the first 20 years also some very varied operational experience.

INTRODUCTION

PART one of this brief series of articles (Rose & Hughes, 1993) showed how the military applications of geology and of geologists were first put to effective use in the British army in World War One, and considerably expanded in World War Two. However, in both conflicts military geologists had to be recruited directly from civilian occupations after hostilities had begun. Neither war began with military geologists already in post, and a military geological staff was developed only as war progressed (Rose & Rosenbaum, 1993a,b). Next time, it was planned, things would be different. This part of the series documents the formation of a Pool of Geologists in the TA in 1948, and the military and geological careers of its founding members; also geologist service since reconstitution of the Pool as a unit of the Army Emergency Reserve (AER) in 1953 until its later amalgamation with the Engineer Works Pool of Officers to form the Engineer Specialist Pool of the Territorial and Army Volunteer Reserve (TAVR) in 1967 – predecessor of the RE Specialist Advisory Team of the present Territorial Army (RESAT).

THE TA POOL OF GEOLOGISTS: FOUNDATION

IN the summer of 1949, largely on the initiative of W B R King, a group of eight geologists, with very varied but in total considerable previous military experience, attended an introductory training course for RE officers of the TA at Ripon. Bill King had distinguished himself as the first military geologist of World War One and the senior British military geologist at the beginning of World War Two (Rose & Hughes, 1993), laying the foundation for the military geological successes of F W Shotton later in the war which were still much in mind in 1948. By this time King was not only well established in the prestigious academic post of Woodwardian Professor of Geology in the University of Cambridge, but also still influential as a geological adviser to the War Office (although sadly the details of this latter role can no longer be traced in the archives of the Chief Scientific Adviser to the present-day Ministry of Defence). King's view that a pool of military geologists should be formed within the TA at last prevailed and, on his nomination, from 1948 suitable officers were recruited to the Unattached List RE(TA). Seven were soon to feature in the *Army List* with the new post-nominal letters "GP" (Geological duties, TA).

These were the very first geologists to be appointed to serve as such in the TA branch of the Corps. Their earliest members included some increasingly distinguished members of the geological profession, notably N L Falcon, D R A Ponsford, T G Miller and A W Woodland, and one of this paper's authors (N F Hughes), together with H Rutledge and O C Farquhar, who served more briefly. Falcon, Miller and Woodland were all soon to rate entries in "Who's Who", from which biographical details can readily be gleaned.

Norman Falcon, now aged 89, was educated at Exeter School and as a Senior Exhibitioner at Trinity College Cambridge. He gained a "double first" in the Natural Sciences Tripos, in part one in 1925 and part two in 1927. From 1927 to 1940 he worked for the Anglo Persian Oil Company, largely in extensive pioneer geological exploration in Iran, where his major achievement was to effect the primary survey of the oilfields whose development became so important in later years. Then with war raging, he joined the army. Appointed to a Regular

Army Emergency Commission as a second lieutenant in the Intelligence Corps on 14 August 1940, the *Army List* records that he was appointed war substantive captain/temporary major on 31 March 1943, and war substantive major/temporary lieut colonel on 31 August 1944. His wartime role was primarily in air photographic interpretation (Rose & Hughes, 1993), and at the close of hostilities he was awarded the Bronze Star (USA). He then rejoined the Anglo Iranian Oil Company at its head office in London, until appointed chief geologist of British Petroleum in 1955. It was whilst working in London for Anglo Iranian that Falcon was recruited to serve as the senior member of the TA Geologists' Pool. His qualifications were impeccable: an excellent Cambridge degree; many years of proven experience as a field geologist; many years of relevant commissioned military experience; ready availability in London; and considerable potential. (Falcon was to be elected to the council of the Geological Society of London for 1954-58, and again 1967-71, serve as its Foreign Secretary 1967-70, and be awarded the Society's Murchison Medal in 1963; in 1960 he achieved the supreme British scientific accolade, election as a Fellow of the Royal Society). He was to serve as a major in the Corps until 1955, when his new civilian appointment as chief geologist of British Petroleum brought a burden of responsibility incompatible with continued service in the reserve army.

David Ponsford, now aged 78, matriculated in 1932 at Gowerton School and proceeded to the University College of Swansea, where he gained BSc and MSc degrees under the guidance of Professors (Sir) A E Trueman and T Neville George. In 1937 he joined the Royal Dutch Shell oil group and went to the East Indies to supervise exploratory drilling programmes in the then British Borneo. After the outbreak of war, work ceased and he returned to the UK in 1940. He enlisted in the Royal Engineers in 1941, and was the only senior member of the TA Geologists' Pool who had previous service as a military geologist to his credit. He had risen to the rank of temporary major in this role (Rose & Hughes, 1993), and was eventually granted substantive rank as a major RE(TA) on 1 June 1949. At this time he was already well established as a geologist working for the British Geological Survey, quickly becoming a principal geologist in its Atomic Energy Division, and later a district geologist in charge of the Yorkshire and East Midlands District. He remained in the TA pool until its reconstitution in the Army Emergency Reserve in 1953.

Photo 1. Lieut Colonel T G Miller (as a subaltern, 1943). Excluding T W Edgeworth David, who served in the Australian forces as a General List lieut colonel (illustrated by Rose & Rosenbaum, 1993a), all five British military geologists ever to have achieved lieut colonel rank by service in the Royal Engineers are illustrated either in part one or part two of this series of articles.

Terence Miller, now aged 75, (*Photo 1*) was educated at the Perse School, Cambridge (as a Foundation Scholar) and at Jesus College Cambridge (as a Scholar). At Cambridge he gained 1st class honours in Natural Sciences Tripos part one and was Wiltshire Prizeman in June 1939. Then war broke out, and he joined the artillery. Granted a Regular Army Emergency Commission as a second lieutenant on 15 July 1940, subsequently promoted war substantive lieutenant on 15 December 1941, and temporary captain on 6 July 1943, Miller was to serve with the Glider Pilot Regiment of the Army Air Corps for most of the war, ending in 1946 as a major commanding H Squadron.

Postwar he returned to Cambridge in 1946, taking a first in Natural Sciences Tripos part two in 1948 and becoming a Harkness Scholar, an honour which Bill King had enjoyed some 25 years previously. Concurrently, he was appointed a university demonstrator in geology under King as Woodwardian Professor. It is not surprising, therefore, that he was recruited as a TA sapper geologist at this time: he had the appropriately distinguished Cambridge academic pedigree; fine record of military service earned in the war years; and necessary potential. Miller was appointed as a captain TA(RE) with seniority 24 April 1946, promoted acting major (and subsequently major) with seniority 6 May 1950, and finally lieut colonel (in the AER) from 2 July 1964. Meanwhile his academic career blossomed. Appointed a research fellow of Jesus College Cambridge 1949-54, in 1953 he was appointed lecturer in geology at the University of Keele, being promoted senior lecturer in 1963. In 1965 he moved to the University of Reading, as Professor of Geography, before in 1967 moving again, on appointment as Principal of the University College of Rhodesia, a move which brought his service as a reserve army geologist to a close. Events which ultimately transformed Rhodesia into Zimbabwe brought him back to the UK after only two years, to a Visiting Professorship at Reading, but his age and also his appointment 1971-80 as Director of the Polytechnic of North London at a time of notable student unrest precluded any further TA association. He had, however, earned a TD, awarded in 1960.

Austin Woodland (1914-1990) was educated at Mountain Ash County School in Mid-Glamorgan and then at the University College of Wales, Aberystwyth, where he graduated with a BSc in geology and went on to obtain a PhD degree. In 1937 he was appointed a temporary assistant lecturer at Manchester University, but quickly moved to Queen's University, Belfast, as a demonstrator in geology for the years 1937-9. In 1939 he left the university on appointment as a geologist with the Geological Survey of Great Britain, beginning a distinguished career in which he was promoted to district geologist in 1957, to assistant director in 1962, to deputy director in 1971, and finally to the very top, as Director, for the three years 1976-9 (during the time in which the Survey was temporarily renamed the Institute of Geological Sciences) – being honoured with appointment as CBE in 1975. It was as a rising star and as a highly experienced hydrogeologist (finally with 23 Survey water supply publications to his credit) that he was recruited as a military geologist, being directly commissioned as a captain RE(TA) with seniority from 1 June 1949, and promoted major on 30 January 1953. However, he left the reserve army in 1957 on promotion within the Survey. Woodland contributed expertise to the Gibraltar garrison, gratefully acknowledged in British Geological Survey archives, but like all the really useful military geological tasks, its precise nature remains clouded in secrecy.

Some biographical details of Norman Hughes, now aged 75, have already been given in the pen picture prefixed to the first of these two articles (Rose & Hughes, 1993). Educated at King's College School, Wimbledon, and at Queens' College Cambridge, his undergraduate career was interrupted by the Second World War, so he graduated in Natural Sciences by taking part one of the Tripos examinations in 1939, part two in 1947, gaining a "double first" and the Harkness Scholarship like his Geologists' Pool colleagues Falcon and Miller. Granted a Regular Army Emergency Commission in the Royal Artillery as a second lieutenant from 15 December 1939, and war substantive lieutenant from 15 June 1941, he was certified as "fully qualified to instruct in [artillery] regimental survey". By late 1945 he was an instructor in biology at the Army Formation College at Perugia in Italy. With this background, and war service as both acting and temporary captain to this credit, he was duly promoted into the sappers as a captain RE(TA) on 3 February 1949, and promoted major on 6 May 1950. From 1953 he was appointed a university lecturer at Cambridge by Bill King, becoming a Fellow of Queens' College in 1962, and a Life Fellow on retirement. His contribution to geological research in the fields of palynology, palaeobotany, and stratigraphy was recognized by award of a ScD degree in 1977.

Harold Rutledge (1920-1954) was educated at Stockton Secondary School and the University of Durham (AH, 1954). He graduated with 1st class honours in geology in 1942, having distinguished himself in university athletics and games – and as sergeant major of the Officers' Training Corps. From 1943 to 1946 he served with the Royal Bombay Sappers and Miners, notably in the Burma campaign. Appointed to a

Regular Army Emergency Commission as a second lieutenant RE on 24 April 1944, he was promoted war substantive lieutenant on 24 October 1944, and ended the war as a captain. After demobilization, he briefly joined the Atomic Energy Division of the British Geological Survey before appointment in 1947 as an assistant lecturer in geology at the University of Nottingham. In 1948 he was appointed a lecturer at the University of Edinburgh, where he gained a PhD degree, and joined the Geologists' Pool. A captain RE(TA) from 3 February 1949, he served until appointed a senior lecturer in the University of Sydney, moving to Australia in 1952 but dying soon afterwards, in a tragic air crash at Singapore.

Oswald Farquhar, now aged 72, after war service in the Royal Navy graduated from Oxford (Lincoln College) with 1st class honours in Natural Science: Geology in 1948. He was then appointed an assistant lecturer in geology at the University of Aberdeen, where he gained a PhD degree in 1951, and joined the Geologists' Pool. Commissioned as a lieutenant RE(TA) with seniority from 30 July 1945, he was promoted captain on 18 April 1951. He served until leaving the UK about 1953, first for an appointment at the University of Kansas, later moving to the University of Massachusetts, where he is currently an Emeritus Professor in the Department of Geology and Geography.

In recruiting to the TA Geologists' Pool, it is therefore clear that Bill King sought men of proven academic ability, likely to achieve positions of increasing responsibility in their civilian geological careers, normally with previous experience as commissioned officers. To obtain them, it seems that he scanned a field reflecting his own background as a Cambridge graduate and professor, formerly employed by the British Geological Survey and conscious that the Survey had nominated both himself and others for wartime service as military geologists. Miller, Hughes, Rutledge and Farquhar were all university staff; Falcon, Miller, and Hughes had timely Cambridge associations; Ponsford and Woodland were recruited through the Survey. Woodland's commission directly in the rank of captain, apparently without previous military service, on the basis of his civilian technical expertise, set an interesting precedent long abandoned in the specialist TA as developments in the modern army increased the need for military skills to enhance effectiveness and survivability on the potential battlefield. The most long-lasting appointments proved to be those recruited from academic staff because of their continuing availability (Miller, Hughes, who not only served longest but attained the highest reserve army ranks achieved by members of this group).

Falcon (in the petroleum industry) and both Ponsford and Woodland (in the Survey) had to leave the TA on promotion in their civilian careers, Rutledge and Farquhar on leaving the UK. All but the last two achieved at least the rank of major in the Corps – although only one of the field officers had previous sapper service. Equal or greater success was obtained from a start in the Intelligence Corps or even the gunners!

In the uneasy period between the end of World War Two and numerous emergencies yet to come it was easier to form a Geologists' Pool than it was to instruct or to exercise it. After the Pool's initiation course in sapper affairs at Ripon, annual training was held for the next three or four years in Germany with BAOR. A particular study was made of "going" conditions in the area around Osnabrück and Hameln, and of lessons to be learnt from the then relatively recent failures experienced during operations in 1944-5; the difference from soil conditions in the UK was the existence of thick deposits of loess, and the redistribution of much loessic material in other surface sediments. Local mapping and auguring were enthusiastically undertaken. The resident sapper units helpfully provided transport and messing facilities but were not at that time closely associated with the Pool's investigation. Most of the Pool members had been professionally involved with entirely different geological problems, and this soil-formation work proved generally valuable training, as intended.

Some of the work was guided by A H V (Harold) Smith, who had graduated in 1944 and was serving as a War Office scientist in the Army Operational Research Group, then based at Herford in Germany. In June 1952 he left BAOR for employment by the National Coal Board, and was then (from 6 October) briefly appointed to a commission on the AER General List, and posted to the Pool of Technical Staff and Technical Intelligence Staff Officers as a TSO III, before joining the Geologists' Pool as a captain RE on 28 February 1953. He "trained" that year in Austria with Woodland and

Farquhar, but transferred to RARO in March 1955. With a University of London PhD degree to his credit, he gained distinction in civilian life as a palynologist and coal petrologist.

The AER Pool of Geologists: Transformation

In 1953 the pool of geologists was transferred from the TA to the recently-formed AER. According to the *Army List*, geologists appointed to the AER pool in 1953 included Majors N L Falcon, T G Miller, N F Hughes, and A W Woodland (all continuing from the former TA pool, as described above), together with Captains A H V Smith, A F Fox and F Moseley.

Anthony Fox (1920-1983) was born in London, and educated at Emanuel School Wandsworth, from where he obtained a Shell scholarship to study Petroleum Technology at the Royal School of Mines, part of Imperial College, London. However, an obituary (MFR, 1984) records that his entry into Imperial College coincided with the outbreak of the Second World War, and that he entered the Royal Sussex Regiment in August 1940. He was subsequently commissioned into the Royal Tank Regiment (second lieutenant 8 March 1941) and became responsible for organizing the tests of a number of tank special devices as well as the design of tanks themselves and of armoured cars. His last year of military service was at the War Office, dealing with the postwar reorganization of the Royal Military College of Science. In 1946 he returned to the Royal School of Mines where, in addition to continuing his course on Petroleum Technology, he became a renowned oarsman. He graduated ARSM and BSc with 2nd class honours in 1948 and joined Trinidad Leaseholds Ltd as a production engineer. Such was his rowing prowess that had it not been for his departure abroad he might well have become an Olympic oarsman. He stayed in Trinidad only a year before joining the Kuwait Oil Company Ltd as a geologist, working in both London and Kuwait until appointment in 1955 as head of the Company's geology and geophysical section in London. In 1964 he transferred to British Petroleum (one of Kuwait Oil's two parent companies) and was sent to Libya to serve as research geologist in Benghazi, but he returned just over a year later to take over as regional geologist for the Middle East at BP's head office in London, having responsibility for the administration of all BP's geologists worldwide. In 1967 he was appointed operations manager for the UK, and became one of the pioneers of the North Sea petroleum industry. He was appointed MBE in 1972, the year in which he took early retirement from BP to become first exploration manager, later managing director, of the small independent British oil company Tricentrol. Perhaps surprisingly in so busy a life, Tony Fox contributed some 16 years of service to the reserve army as a military geologist. Commissioned captain RE(AER) on 3 July 1953, he was promoted major RE(AER) on 18 July 1958, and continued to serve until 1969.

Frank Moseley, now aged 71, served with the RAF as a pilot during World War Two (1940-46). Subsequently he graduated as a geologist from the University of Sheffield, with a BSc (1st class honours) in 1949 and a PhD in 1952. There he was influenced by the two most senior military geologists of World War Two: Fred Shotton was Professor of Geology at Sheffield during his undergraduate studies, Bill King an examiner for his PhD thesis. Moseley moved on completing studies to a lectureship at the University of Keele, at which time he was recruited by Shotton into the Geologists' Pool, and briefly to Cambridge as a university demonstrator in geology, initially under Bill King as head of department. Later he became a lecturer in geology, then a senior lecturer, and finally a reader, at the University of Birmingham. He was commissioned into the Corps as a second lieutenant RE(AER) on 4 July 1953, and promoted captain the same day; promotion to major came later, on 18 July 1958 (together with Tony Fox). In 1966 he was awarded the Montgomerie Prize of the Institution of Royal Engineers. He continued to serve as a military geologist major until 1971, although with formation of the Territorial and Army Volunteer Reserve (TAVR) in 1967, his commission appears in the Postal and Courier section of the *Army List* from 1968 onwards. During this period he acquired a DSc degree, a rare distinction for a serving sapper officer – but since as befitted a military geologist all his degrees were in geology, none of them entitled him to the qualification pay enjoyed by BSc engineers in the Corps about that time.

The transfer of the Geologists' Pool to the AER in 1953 did not immediately alter the

pattern of training activities. In 1953 the whole Pool attended a course at the Army Photographic Interpretation Unit near Oxford to encourage prediction of "going" from air photographs and geological knowledge **without access to site**, and in 1955 Hughes was attached to the US Army Engineers in Heidelberg for similar purposes. Although Pool members were keen for individual attachment to Regular units encountering geological problems overseas, it was clearly difficult to timetable this with summer training availability during the university vacation for those who were academic staff. Pool attention to "going appreciation without access to site" was extended to arid regions in sessions held at Woolwich in 1960 and 1961. A study in 1956 by Miller and Hughes of permafrost conditions in the Mackenzie Delta region of Arctic Canada to relate vehicle design to trafficability proved to be a one-off opportunity; the extreme difficulties of even living and working throughout the year in such areas as the Soviet Arctic could not be a high military priority at that time. The whole Pool further extended its expertise by attending an applied geophysics course in 1958 at Professor Fred Shotton's department in Birmingham University – for the operational value of geophysics in water supply had been firmly established during World War Two by 42nd Geological Section of the South African Engineer Corps.

Other geologists and soil scientists were, after National Service, appointed to the Pool of Technical Staff and Technical Intelligence Staff Officers. These included D B Smith, a geologist with the British Geological Survey who had graduated with 1st class honours from Birmingham in 1950 under Fred Shotton and who later achieved international distinction through his research work on the Permian rocks of Britain and West Texas, recognized by the award of a DSc degree in 1974, and election as President of the Yorkshire Geological Society for 1985-6. Denys Smith had been commissioned as a Regular Army National Service officer, as a second lieutenant RE from 6 October 1951. He was appointed lieutenant RE(AER) on 29 May 1953, acting captain on 24 August 1953, and finally captain with seniority from 9 April 1956, continuing to serve until 1964. He recalls that members of the Geologists' and the Staff pools "trained" jointly for about four years, on a range of projects,

Photo 2. Lieut Colonel P I Manning (at work, as a geologist major).
(Photo courtesy of Mrs Janet Manning).

including terrain assessment as the basis for a Cross Country Movements (CCM) map series. Reserve army geologists at this time thus made a potentially significant contribution to the regular army's defensive planning and training for a major war scenario.

The AER Pool of Geologists: Reorganization

The Geologists' Pool survived the major reorganization of the AER which took place on 1 May 1961, eight years after its transfer. It then became one of the RE units placed in AER Category IIA, and contained four officers of field rank: Majors T G Miller, N F Hughes, A F Fox, and F Moseley (all described above), plus Captains P I Manning, R M S Perrin, and R G West (of whom Manning and Perrin had joined the Pool much earlier, in 1955-6).

Peter Manning (1928-1983) (*Photo 2*) had graduated with 2nd class honours in Geology from University College London in 1948, and then joined the Geological Survey (Morrell, 1984). He became a principal geologist at the

Geological Survey of Northern Ireland, before secondment in 1971 to a less hazardous country – Ethiopia! He returned to the UK in 1973 and became head of the Survey's Industrial Minerals Assessment Unit, based at Keyworth in Nottinghamshire. Appointed captain RE(AER) on 30 August 1955, he was promoted acting major (and subsequently confirmed in substantive rank) with effect from 3 July 1964. Promotion to lieut colonel came in 1971, but he left UK and the active list of the TA too quickly for this rank to feature either in the *Army List* or the *RE List* of officers.

Robert Perrin, now aged 72, had served in the Royal Artillery in World War Two, being granted a Regular Army Emergency Commission as a second lieutenant from 21 July 1942, and war substantive lieutenant from 1 October 1942, serving as an air observation post pilot in Italy and finally as a captain. He graduated with a BSc in chemistry from the University of Wales in 1948, and moved to King's College Cambridge where he gained MA and PhD degrees in 1950 and 1956 respectively. There he became a soil scientist, as a lecturer in pedology in the Department of Agriculture, later Applied Biology, developing professional interests in the clay mineralogy of sediments, in the drifts and derived soils of eastern England, and in the application to soil studies of air photographic interpretation. He was appointed captain RE(AER) on 1 May 1956, and promoted acting major on 1 April 1965, but left the Pool soon afterwards, after some ten years in the reserve army. Appropriately, he was later to become Master of the Armourers and Brasiers Company of the City of London.

Richard West, now aged 67, was educated at the King's School, Canterbury, and subsequently at Cambridge where he trained in geology under Bill King. He became a Fellow of Clare College in 1954; a university demonstrator in botany in 1957; lecturer in botany in 1960; Director of the Sub-Department of Quaternary Research from 1966; Reader in Quaternary Research in 1967; Professor of Palaeoecology 1975-7; and Professor of Botany from 1977 to 1991. Elected a Fellow of the Royal Society in 1968, he received many geological honours and awards, notably the Bigsby and the Lyell medals of the Geological Society of London (in 1969 and 1988 respectively) for his research studies in Pleistocene "Ice Age" geology. Appointed captain RE(AER) on 21 August 1961, he was to serve as a military geologist until 1967, when promotion within the university brought responsibilities too time-consuming to permit continued membership of the reserve army.

In joining the Geologists' Pool in 1961, West in effect replaced K A Joysey, now aged 65, who had been appointed captain RE(AER) on 1 May 1957, but left nearly four years later. Kenneth Joysey, a staff member (demonstrator) at the Royal Military College of Science, Shrivenham, 1954-5, had graduated with 2nd class honours in Geology from University College London, where he subsequently (in 1952) obtained a PhD degree for research on fossil echinoderms. He moved to Cambridge in 1955 on appointment as assistant curator at the University Museum of Zoology, became Curator of Vertebrates also, and was in 1970 promoted to his current post of Director.

As formerly in the TA Pool, all of these geologists were therefore potential "high-fliers" in their profession when recruited to the AER Geologists' Pool. Most are known to have had previous service as commissioned officers, dating from the war years or later from National Service. New members of the Pool were seemingly recruited by Fred Shotton (Moseley), through their Cambridge associations (Perrin, Joysey, West), via the Geological Survey (Manning), or from the petroleum industry (Fox). Fox, Moseley and Manning were each to contribute over 16 years of service as military geologists, providing valuable long-term continuity of expertise.

The AER reorganization opened with a Pool training session at Long Marston in 1962, at which links with MEXE – the Military Engineering and Experimental Establishment – were strengthened. Thereafter individual visits abroad markedly increased. In 1963 Hughes, Perrin and West studied tropical conditions in Malaya, and in 1964 Moseley and Perrin experienced East Africa (Kenya, Uganda and Tanganyika). In 1965 West went to the Muskeg area of northern Ontario in Canada to study "going" conditions. In 1966 Hughes joined the end of *Operation Crown* at Loeng Nok Tha in north-eastern Thailand just west of the Mekong River, to advise on potential sources of good laterite and other rock required for airfield and road construction. A great deal of effort also went at this time into development of terrain

evaluation systems, air photographic interpretation, and production of "going" maps, by providing support to MEXE at Christchurch. And always there were projects related to ground water. Most were peacetime tasks, such as the need to provide adequate supplies of potable water for troops exercising in Libya (described in the *Journal* by Moseley, 1963; Moseley & Cruse, 1969, with additional reference to earlier unpublished reports by Tony Fox dating from 1965 and 1966). Others were conducted under operational conditions, notably in Aden (described in the *Journal* by Moseley, 1966; 1967). Terence Miller also served under operational conditions, during the Indonesian "small war": attached first to an Australian sapper squadron and later to a Gurkha battalion. There he was associated with "knives swung in anger" if not actually "shots fired in anger"! Frank Moseley came close to the latter, on the Dhala Road in Aden. So the operational value of military geologists, proved during world war, was maintained in "local" war.

In 1967 the reserve army was reorganized once more, with the formation of the TAVR. The Geologists' Pool of the AER was merged with the former AER Works Pool of Officers to form the Engineer Specialist Pool, which was to survive until 1988 – but that is another story (Rose & Hughes, in prep).

Conclusion

Readers of this account may by now have realized that it is in effect a tribute to the vision and initiative of one man: W B R King (*Photo 3*). In World War One, King was the very first military geologist to be appointed in the British army and was consequently our longest serving military geologist of that war. As far as British military geology is concerned, he founded the subject. Indeed, his (1919) account of geological work on the Western Front was translated into Russian, together with a similar paper from an American point of view (Brooks, 1920), to form a military geological textbook for our potential ally, the Soviet Union (Brooks & King, 1923). In World War Two, he was again the very first British military geologist to be appointed, and it was due to his personal initiative prewar that a potential assistant and successor (his former student F W Shotton) was ready and waiting in the Regular AER at the outbreak of war. The D-Day success had an element of geological expertise from both these men behind it. Postwar, it was King's geological advice to the Ministry of Defence (as it now is) that led to foundation of a pool of geologically and militarily experienced officers in the reserve army, and King's drive and enthusiasm that recruited men of the calibre necessary to guarantee its continuing success. Even after his death in 1963, his influence continued through the leadership exercised by the men he had himself first recommended for appointment, and through use of the Corps' textbook: *Military Engineering Volume XV Application of Geology* (anon, 1949). Although in keeping with other War Office publications this was an anonymous work, its leading author and editor was known to be Bill King. It was to influence use of geology in the Corps and the British armed forces as a whole for nearly 30 years, until superseded in 1978 by the new, still current version of *Military Engineering Volume XV* (anon, 1978) – in turn part authored by men Bill King had taught or helped to recruit.

Photo 3. William Bernard Robinson King, as a sapper officer, photographed at Cambridge during World War Two. *(Courtesy of his daughter, Professor C A M King).*

Readers of the "History of the Corps of Royal Engineers" will find only brief mention of Bill King's services; readers of the *Journal* will not find a lengthy obituary. His lifelong commitment to military geology has gone largely unrecorded and unrecognized, despite his military courage (evidenced by award of a MC), his scientific ability (evidenced by election as FRS), and his academic achievements (evidenced by appointment successively as professor of geology in the universities of both London and Cambridge). His memorial is the continuing and active existence of geologists within the TA much as he planned some 45 years ago. And one standard set by Bill King from the year 1915 has been maintained almost unbroken to the present day: sapper geology has consistently been led (and largely supported) by officers with first class honours degrees – a noteworthy contribution to high standards of technical excellence in the Corps.

ACKNOWLEDGMENTS

WE are grateful for information relating to their military geological service to Lieut Colonel T G Miller, Majors N L Falcon, D R A Ponsford and F Moseley, and Captains D B Smith, K A Joysey, R G West and A H V Smith; and for additional data to Graham McKenna, Chief Librarian and Archivist of the British Geological Survey, and Wendy Cawthorne, Assistant Librarian of the Geological Society of London. Commission and promotion details cited above are derived from the *Army List*, consulted at the Public Record Office.

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[Part 3, the last in this series, will be published in the December issue of the *Journal*, and will document the service of geologists in the Engineer Specialist Pool, from its foundation in 1967 until reconstitution as the RE Specialist Advisory Team (V) in 1988.]

A Division For All Seasons

CAPTAIN K P STRATFORD-WRIGHT BSc

Captain Kevin Stratford-Wright was commissioned into the Corps in 1986. After completing 90 YO Course he was posted as a troop commander to 30 Field Squadron in Iserlohn followed by a troop commander's tour at the Army Apprentices College Chepstow. In May 1990 he was Second in Command 12 Field Squadron in Osnabrück. He assumed his current appointment as SO3 Engineer Operations at Headquarters 3 (UK) Division in July 1992.

Introduction by CRE

Captain Stratford-Wright has drawn on material from across the Division to produce an article which marks the first anniversary of 3 (UK) Division. The mood in the Divisional HQ is refreshingly upbeat and optimistic despite the traumas of *Options for Change* and the formidable challenge of preparing the Division for its intended roles. There is some way to go before all its constituent parts are operationally ready but a great deal of work has already been done in working up an understanding of the Division's war fighting capability. This is the story so far.

History

The 3rd Division was formed by Wellington in 1809 and played a leading part in the Peninsular War. In 1815 it faced Napoleon at Waterloo, served in the Crimea and, at the turn of the century, in the South African campaigns. The 3rd Division fought with distinction as an infantry division in both world wars, earning, in 1916, the nickname of the "Iron Division". Major General Bernard Montgomery was the GOC through the dark days of May 1940 and the Dunkirk evacuation. On 6 June 1944 the 3rd Division led the assault against the "Atlantic Wall" on Sword beach; a Sherman tank sits today outside the HQ building as a reminder. The Division was to finish the North-West Europe campaign in Bremen. In postwar years the Division formed the UK's strategic reserve, dispatching troops to operations in all parts of the world. From 1978 until last year the Division had been stationed in BAOR. The old HQ South West District closed and gave up its building in Bulford to "The United Kingdom Division" on 1 April 1992. This new division was then retitled 3 (UK) Division on 1 September 1992. The HQ has full command (less the responsibility for administration, which remains with district headquarters) of a significant part of the UK Field Army. It may also take command in war of one artillery regiment, two engineer regiments and other elements of the Territorial Army. The HQ became fully operational on 31 May 1993 when 3 Division Signal Regiment completed its move to Bulford from Germany. The first GOC 3 (UK) Division is Major General Hew Pike DSO MBE, late of the Parachute Regiment.

Threat

With the demise of the Warsaw Pact, 3 (UK) Division no longer faces one specific threat, the current world instability presenting wide-ranging possibilities, therefore it must be capability-based rather than geared to meet one particular enemy over one particular piece of ground.

Capt Stratford Wright
A Division for all seasons, (p182)

Character

The need to face an as yet unidentified enemy in an unspecified place means that 3 (UK) Division must, in the GOC's words, be a "Division for All Seasons." For all the importance and current relevance of low-intensity skills, the Division must prepare for high-intensity conventional war as well as the range of operations that lie short of general conventional war. It can expect to participate in joint, or combined operations, probably conducted with allies, quite possibly under a United Nations mandate. These may be executed either within the command structure of the ACE Rapid Reaction Corps (ARRC), to which both 1st and 3rd Divisions are assigned, or within a National Joint Headquarters (JHQ)/Joint Force Headquarters (JFHQ) command structure. In the latter case this would almost certainly be as part of a coalition.

Mission

The GOC has defined 3 (UK) Division's mission as:

> "To prepare for war, and for operations short of war, fighting or conducting joint, combined operations in response to either NATO/ARRC or national/coalition contingencies."

Organization

3 (UK) Division normally has three brigades under command: 5 Airborne Brigade and 1 and 19 Mechanized Brigades. Each brigade will, on completion of reorganization, comprise four battlegroups. 5 Airborne Brigade will consist of two parachute and two air-portable battalions. The mechanized brigades will consist of an armoured regiment, equipped with Challenger from 1995, an armoured infantry battalion with Warrior, (from October 1994 in 1 Mechanized Brigade and from March 1995 in 19 Mechanized Brigade), and two Saxon equipped battalions. The Division also has the Household Cavalry Regiment as its medium reconnaissance regiment, 9 Regiment Army Air Corps, and the Divisional Artillery Group(DAG) consisting of field artillery including light gun, AS 90 and MLRS, and the Rapier and Javelin air defence systems. The Divisional Engineer Group comprises three regular regiments, two volunteer regiments and a slice of specialist engineer support. The Divisional Support Group provides for the combat service support needs of the Division.

Capability

The Division can field a mix of light through mechanized to armoured assets, all with the appropriate combat support and combat service support elements. But it would be wrong to take the simplistic view that there are "light" forces for low-intensity conflict contingencies and "heavy" forces for high-intensity conflict. The Division's components, each with its own specific strengths and limitations, will be grouped and operate according to the threat, the terrain and the political or operational objectives. That said, the Division can generate a rapidly deployable force, such as 5 Airborne Brigade, and then subsequently reinforce by one or both of the heavier mechanized brigades. The Division's core capabilities may be summarized as follows:

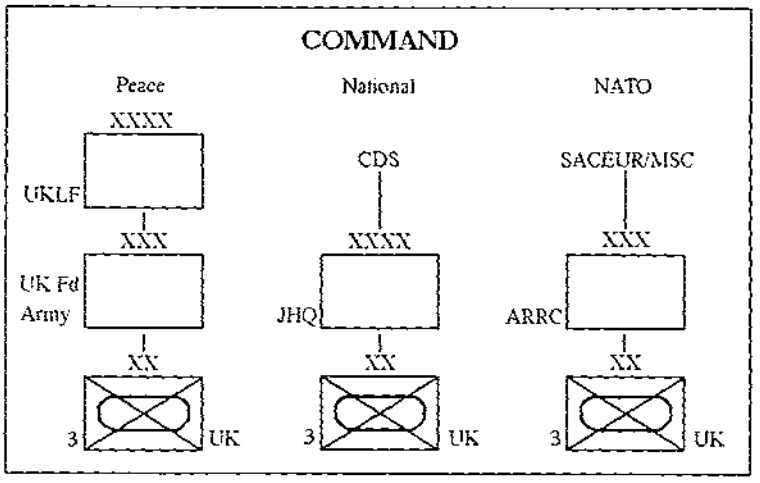
- Deployability.
- Versatility.
- Mobility.
- Lethality.
- Sustainability.

Operational Groupings

The Division will, for certain contingencies, deploy without some of its organic elements but, on the other hand, it may take operational command of other non-organic components such as 3 Commando Brigade or 24 Airmobile Brigade for certain operations. The Division is also developing links with the Italian Ariete Brigade which may, on certain ARRC operations, be placed under operational command of the Division. This ability to task-organize to mission should be achieved without breaking up the cohesion of formations. No doubt it will be necessary to make adjustments; some elements will need to be brought into formations while others may be unavailable or not required. Such adjustments can be achieved successfully within an organization that has trained together.

Command and Control

On a day-to-day basis CinC UKLF exercises operational command of the Division with operational control delegated to the Commander UK Field Army. For an ARRC contingency the Division would expect to operate under operational command of Commander ARRC. National contingency operational command arrangements are potentially more complex. It is likely that a JHQ at either High Wycombe, Northwood, or possibly



Command arrangements for 3 (UK) Division.

Wilton, will be nominated with the appropriate commander, together with an in-theatre joint force commander. The choice of the latter will of course depend on the size and nature of the operation and the composition of the forces involved. For a single brigade operation with emphasis on the land component we would expect GOC 3 (UK) Division to be nominated. His staff would be drawn from Joint Force Operations Staff (JFOS) and his own HQ. If the force should grow then the GOC, and that element of his staff deployed to the JFHQ, may well have to take to the field with the Divisional HQ in order to fight the Division. This transition would no doubt have associated difficulties but it is Commander UK Field Army's view that this is preferable to holding the GOC and the HQ in reserve.

Training

In order to cater for all possibilities there exists a dual track training programme. This aims to ensure the Division is prepared for both ARRC/NATO and national/coalition contingencies.

Each of these tracks will involve an annual command post exercise (CPX), with a field training exercise (FTX) every fourth year.

Within the Division there will be an annual CPX which, from April 1994, will be linked to the Higher Formation Trainer (HFT) to be based at the Combined Arms Training Centre (CATC) Warminster. The long-term forecast includes a divisional command field exercise (CFX) to be run every four years.

At brigade level, each brigade HQ will conduct a CPX and attend the Brigade and Battle Group Trainer (BBGT) annually. 5 Airborne Brigade will conduct its full airborne exercise (ABEX) prog-ramme every year which will include a brigade FTX. 19 Mechanized Brigade will carry out a FTX in 1994/95; 1 Mechanized Brigade will do so in 1995/96. Their FTXs will thereafter alternate annually in accordance with the UKLF *Stable Training Platform* guidelines.

Units will be required to complete the collective training objectives as outlined in the *Compendium of Unit Collective Training Tasks*. Units will, from 1994, train using the new Tactical Engagement Simulation (TES) exercises which are to be run by the CATC. From 1995 the Division will be allocated its share of the British Army Training Unit Suffield (BATUS) *Medicine Man* exercises.

Divisional Engineer Group

All engineers within the Division are under operational command of the CRE, currently Colonel Bob Pridham OBE. While engineer command is to be exercised at the highest practical level to ensure optimum use is made of scarce engineer resources, engineers will be task-organized according to the mission and routinely, brigades will be given operational control of an appropriate slice. To this effect each of the brigades will have affiliated engineers under operational control to provide for their close support engineering needs. The CRE will retain a slice to provide for the general engineering support of the Division as a whole.

22 Engineer Regiment, comprising 3 Armoured Engineer Squadron, 5 Field Squadron (mechanized) and 6 HQ Squadron, will have an affiliation with 1 Mechanized Brigade. Like its brigade the Regiment is located in Tidworth.

38 Engineer Regiment, comprising 8 Armoured Engineer Squadron, 11 Field Squadron (mechanized) and 32 HQ Squadron, will have an affiliation with 19 Mechanized Brigade. The Regiment remains in Ripon close

to its brigade, which is in Catterick, but note that in peace 8 Armoured Engineer Squadron is accommodated in Tidworth so that it can easily make use of the Salisbury Plain Training Area (SPTA).

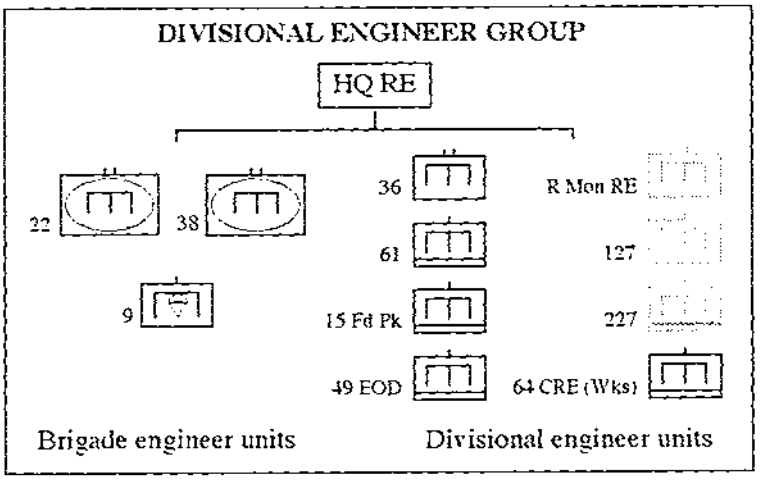
9 Parachute Squadron RE will retain its close ties with 5 Airborne Brigade, with which it shares a barracks in Aldershot. The Squadron remains part of 36 Engineer Regiment.

36 Engineer Regiment remains in Maidstone. It comprises 20 Field Squadron (wheeled), 69 Queens Gurkha Engineer Squadron (wheeled) and 50 HQ Squadron. Together they provide the Division's general support engineering capability while 61 Field Support Squadron (from Maidstone) and 15 Field Park Squadron (from Ripon) provide the engineer logistic and support functions.

While they are not part of the Divisional Engineer Group in peace, on operations the Division might expect elements of 33 Engineer Regiment (EOD), most likely 49 Field Squadron (EOD) and specialist teams from the Military Works Force, most likely 64 CRE (Works) to come under command.

The Royal Monmouthshire RE(M), 127 Field Squadron (V) and 227 Amphibious Engineer Squadron (V) from 78 Engineer Regiment (V) are also earmarked to join the Divisional Engineer Group should the TA be mobilized.

51 Airmobile Field Squadron is to remain part of the Divisional Engineer Group in peace, although on operations and for training it is under operational command of 24 Airmobile Brigade.



Summary

3 (UK) Division differs from its immediate predecessor in Germany as indeed it must. The situation today is very different from that prevailing during the period 1945 to the late 1980s. While the threat on the Central Front has all but disappeared, in its place looms a variety of unlikely, politically complex, and militarily dangerous situations. In these uncertain times 3 (UK) Division must develop the necessary versatility and flexibility to deal with the unexpected without resort to a pre-prepared plan. With the likelihood of reduced formation field training opportunities and the continuing Emergency Tour Plot commitments, this presents a considerable challenge in the coming years as the Division establishes its proper place in our new cabability-based army.

"Valecti Garde (Corporis) Domini Regis"

(Yeomen of the Guard (of our body) of our Lord the King)

CAPTAIN J E BORER

The author started his career as a Junior Leader at Dover in 1961. His original trade was Draughtsman (Electrical and Mechanical), but his secondary employment of Combat Signaller overtook this and after his tour as Signals Corporal with 11 Independent Field Squadron in Post Crown Force in Thailand, he never returned to the drawing board. He served as Signals/Flight Sergeant in 653 Aviation Squadron, Technical RQMS at the Army Apprentice College, Chepstow, and was the first Quartermaster Sergeant Instructor (Signals) of the reconstituted 32 Armoured Engineer Regiment in 1980. He then became Sergeant Major Instructor of Signal Wing, Royal School of Military Engineering and remained there as an Assistant Instructor after commissioning. He retired at Easter 1991 to become SO3 of the Wing as an RO3. He was appointed to the Queen's Body Guard in January 1992.

On several occasions since notices of my appointment as a "Yeoman in Ordinary of the Queen's Body Guard of the Yeomen of the Guard" appeared in both the *Supplement to the Royal Engineers Journal* and *Sapper* magazine, the reaction to my appearances in Brompton or Chattenden messes, or even answering the telephone in my capacity as SO3 of Signal Wing, has been, "I thought you were in the Tower!"

There are of course two bodies of Yeomen and the confusion between them can be laid firmly at the feet of Gilbert and Sullivan, who set their work "The Yeomen of the Guard" in the Tower of London. The guardians of that august and revered institution are properly termed "Yeomen Waiters or Warders of Her Majesty's Tower of London". They are also in fact, "Yeomen Extraordinary", but take no part in the duties performed by the Body Guard, apart from guarding the saluting base at Buckingham Palace when they parade for their Sovereign's Inspection. The confusion is not helped by the full dress uniform of the two bodies being basically the same. The one slight difference is that the Yeomen of the Guard wear a cross belt with a brass swivel, dating from the days when they needed to support the weight of the arquebus with which some of them were armed.

I also generally get asked three questions, the first two being: "How did you get in?" and, "Can I join?". If you are interested in further service to Her Majesty, then you can do no better than to visit your orderly room and consult Queen's Regulations. There you will find details of four organizations which are open to ex-NCOs, WOs and officers from the rank of sergeant upwards, whose existence is based on loyalty, integrity and Service to Queen and Country. They are:

- The Military Knights of Windsor.
- Her Majesty's Body Guard of the Honourable Corps of Gentlemen-at-Arms.
- The Queen's Body Guard of the Yeomen of the Guard.
- The Yeomen Waiters or Warders of HM Tower of London.

The third question is normally "What do you actually do?"

The *Journal's* guidelines to authors states that articles should have, even if rather tenuously, some military engineering connection. 'Search' is a good current Sapper occupation so here goes!

Imagine the scene – a threat has been made against a public figure who is due to make an appearance. It is not very specific, but intelligence has determined the probable location and also the fact that a hidden

Capt John Borer
Valecti Garde (Corporis) Domini Regis (p186)

cache of explosives will be employed. The authorities spring into action – a search is conducted, and the 'bomb' is discovered. What is more, one of the perpetrators is caught in the act!

The above scenario really illustrates that things do not change much over the years. The story could have come from any newspaper of recent days. In fact, it describes the events of the 4 November 1605 – the captured man being one Guy Fawkes.

It is not clear if the Yeomen of the Guard made that first search. It is however known that the officer who conducted it, Sir Thomas Knevet, caused Fawkes to be handed into the keeping of the Yeomen. They conducted him into the personal presence of King James I for interrogation, and then escorted him to imprisonment in the Tower. Since that date, apart from 1943 when the Home Guard temporarily took over, the Yeomen of the Guard have searched the cellars of the Houses of Parliament before the Sovereign arrives for a State Opening.

After the General Election last year, I was honoured to be part of the Search Party and, later on, helped to line the Royal Gallery of the House of Lords when the Queen passed through on her way from the Robing Room to the Chamber to make her speech from the Throne.

The lining of the Royal Gallery is actually quite interesting in that when the Queen arrives at the Victoria Tower and enters the buildings, she only proceeds down routes lined by her own Household troops. The Household Cavalry line the Royal Staircase from the entrance to the Robing Room and the Yeomen of the Guard line the Royal Gallery from the Robing Room to the Prince's Chamber. The Prince's Chamber and the entrance to the Lord's Chamber are guarded by the Gentlemen-at-Arms. The Lords themselves are presumably loyal enough to look after her during the speech!

The other occasions during the year when the Guard parades for duty are:

- The Epiphany Service at the Chapel Royal, St James's Palace.
- Investitures.
- The Maundy Service at the designated Cathedral.
- State Visits.
- State Banquets.
- Diplomatic Receptions.
- The Garter Service at Windsor Castle.
- Buckingham Palace Garden Parties.
- Visits by Her Majesty to the Royal Opera House.
- Coronations, Royal Weddings and Royal Funerals as they arise.

Many of these duties also involve the Gentlemen-at-Arms.

At the time of writing, apart from the State Opening of Parliament, I have attended an Investiture, two Garden Parties, a Diplomatic Reception, the Royal Maundy Service, a State Visit and a State Banquet. I shall eventually attend all those on the above list, but it could take some time since individual Yeomen are only called for duty 6-8 times per year.

Most of the duties involve 'keeping the ground' for Her Majesty. In practice, this means standing still for long periods lining galleries and dais, guarding doorways etc. There is scope for some movement because being armed with partizans (NOT pikes!), we use the old "stand at ease" position – arms in front cradling the shaft, and it is fairly easy to keep the circulation going.

Even on a long duty I have never been bored. The range of national costumes at the Diplomatic Reception for example have to be seen to be believed. If you have ever accompanied someone to an investiture, you will know that at the moment of being honoured, spectators cannot see the recipients' faces. The Yeomen can, and the range of expressions and emotions in those faces as they meet their Sovereign would require an article by itself to describe.

The Maundy Service at Wells was particularly interesting. If you have visited the Cathedral there, you will know it made a wonderful setting for the ancient service. There are continuous records of the Distribution having been made on Maundy Thursday from the reign of King Edward I. The service used to consist of the washing of feet as well as the distribution of alms, but the former was discontinued in 1730. Members of the Royal Almonry procession are still however "girded about with linen towels" in remembrance of the act. They also still carry nosegays of sweet smelling herbs, as do the Queen and the Duke of Edinburgh. The recipients of the Maundy used to be the same sex as the reigning Sovereign, but for the past 150 years, they have numbered as many men and women as the Sovereign has years of age. In this case, 67 ladies and 67 gentlemen, all pensioners who have rendered christian service to the church and country were honoured. They each received two soft leather purses; a red one containing £5.50 in current coin as a gift from the Sovereign for "clothing and provisions", and a white one containing 67p in the specially minted Maundy

Money. As well as we Yeomen, the Children and Gentlemen of Her Majesty's Chapel Royal, St James's Palace, also attended the service and we all received an unexpected souvenir in the form of an attendance fee – 10p in Maundy coins (4p, 3p, 2p and 1p). These coins are actually legal tender although I for one would not part with mine. Offers are made however and I understand the going rate for one set of the four coins in their presentation box is about £80. A reception, for all members of the Royal Household who had travelled to Wells, was held at the Red Lion Hotel the evening before the service and we were able to meet some of our "fellow employees" such as the Lord High Almoner of England! The Dean of Wells was the principal guest.

The State Visit of President Soares of Portugal was in two parts. After he and his wife had been met by the Queen at Victoria Station, they rode back to Buckingham Palace where the Household Cavalry, the Gentlemen at Arms and the Yeomen of the guard lined the entrance and galleries whilst the Royal Family and their guests went into a lunch reception. Later that evening, after the numerous rehearsals which are the main reasons why British state occasions run like clockwork, the Yeomen were again on duty for the entry to the State Banquet. During the Banquet, we lined the Dining Room, my post covering the Prime Minister, the Foreign Secretary, Princess Michael of Kent, the Archbishop of York, the Duchess of Gloucester and Commander Timothy Laurence. At the end of the main course, "Changing of the Guard" took place and we went off to the staff restaurant for roast beef and yorkshire pudding. We were back at the Banquet in time for the last course, the Queen's speech, the President's reply and to hear the pipers of the Scots Guards.

One of the most impressive aspects of the occasion, especially for old soldiers who have attended and perhaps helped to run innumerable Corps and Regimental functions, was the control of the staff. It was done with traffic lights installed at strategic points. No one moved on red, but it was all go on green!

At Garden Parties, the colourful summer dresses of the ladies provide a cheerful contrast to the grey of the Palace buildings and the more formal attire of the gentlemen. These are very happy occasions once the awe of the guests in finding themselves in the Queen's garden has worn off. For the Yeomen and the Gentlemen-at-Arms, these are also slightly less formal duties, although they do have their serious side. The highest and the lowest in the land come for "a chat to a Beefeater" (a soubriquet which is frowned on by the way). The most common question is asked in a whisper – "Where are the toilets?" (In case you have an invitation and are wondering, they are in large tents down by the lake!)

How the Yeomen from both bodies came to be nicknamed "Beefeaters" is not really known. There are various stories, but the one most likely to be true can be found in "The Travels of Cosmo through England, 1669". This is an account of the travels of Count Cosmo d'Medici, son and heir of the Grand Duke of Tuscany. He said, "I saw the Yeomen of the Guard, who are beefeaters; that is eaters of beef, of which a considerable portion is allowed daily by the Court." At that time, the Guard was a full-time body. The official ration for the 30 Yeomen on duty daily was 24lb of beef, 18lb of mutton and 16lb of veal. They also received 37 gallons! of beer between them. In practice, the mutton or veal was not always available, so any shortfall in the total allowance of 58lb of meat was made up in beef. Nowadays, there is no allowance as such, but meals are provided at Buckingham Palace or Windsor Castle when necessary.

The establishment of the Guard is six officers, two Messenger Sergeant-Majors (one of whom is the only full-time member as Keeper of the Wardrobe), four Divisional Sergeant-Majors and 60 Yeomen formed into four Divisions. Each Division's two senior Yeomen are designated "Yeoman Bed Goer" and "Yeoman Bed Hanger" from the days when they actually used to make up the King's bed before he got into it. They also had to maintain both the bed itself and its hangings. The maximum age at which one will be accepted is 55 and retirement (or being placed on the exempt from duties list) is compulsory at 70. There is no lower limit for acceptance, but the constraints of previous rank (no one under sergeant), and possession of a Long Service and Good Conduct Medal are rigourously applied. This latter condition immediately rules out Regular Commissioned officers, but means that Late Entry officers can apply. I believe that there are four other Late Entry officers apart from myself currently serving. Regular Commissioned officers can apply to join the Gentlemen-at-Arms.

The six officer posts of the Guard are in theory open to applicants, but I believe that in practice, they are 'head-hunted'. They use old titles going back into history. The CAPTAIN is a political appointment and changes with the Government. The post is currently held by the Earl of Strathmore and Kinghorne. The LIEUTENANT is Colonel Alan Pemberton CVO MBE, late Coldstream Guards. The CLERK OF THE CHEQUE (Adjutant) is Colonel Greville Tufnell, late Grenadier Guards. The ENSIGN is Colonel Shaun Longsdon, late 17/21 Lancers and there are two EXONS, Major Charles Marriott, late The Rifle Brigade, and Major Charles Enderby, late 9/12 Lancers. The term Exon comes from the French *Exonere* which means exempt and was applied to officers doing duty away from their regiment.

Each Yeoman receives a taxable Honorarium of £100 per annum. Travel and subsistence allowances are paid and meals are provided at Buckingham Palace after each duty. The only expense individuals have to bear is for shoes. They are of the 'Monk' design with silver buckles and a strap to hold the rosettes which cover the uppers.

You can see then that it is not a paying profession. Application in the first place must be motivated by a desire to serve. There are searching interviews and before being sworn in, each applicant is personally approved by Her Majesty.

Apart from the Military Knights, the Gentlemen-at-Arms, the Yeomen of the Guard and the Tower Warders, there are two other bodies open to ex-servicemen who desire to continue service. The Royal Body Guard of Scotland (sometimes known as The Royal Company of Archers) is based at the Palace of Holyrood House, Edinburgh. The Queen's Watermen look after the Queen on the River Thames. They also have a traditional role in that when the crown jewels left the Tower, they were always transported by river for security. Even now, Watermen accompany the crown when it is moved, even on land, until it is handed over to the Robing Room attendants for the Queen to don.

I realise that the majority of readers of this *Journal* are excluded from membership of the Yeomen of the Guard since it is principally composed of those who have served in the ranks. That same majority however may be eligible to apply for the Gentlemen-at-Arms. Its full title is "Her Majesty's Body Guard of the Honourable Corps of Gentlemen-at-Arms" and is termed the "nearest guard" to the Sovereign. It was formed by King Henry VIII in 1509 from "cadets of noble families"; its original style being "The King's Pensioners and Speares". In 1539, this was changed to "Gentlemen Pensioners". In the Civil War, they fought for King Charles I, and only 25 were left to welcome King Charles II on his return to England. Later on, with the sale of commissions becoming prevalent, nearly all were really civilians. King William IV designed their present uniform, changed the name again to its present style, and also ordered that the Corps be composed of selected, retired military officers. Nowadays it is composed of five officers and 40 Gentlemen, all of whom are distinguished retired officers of the Army or Royal Marines. The officers are the CAPTAIN, the LIEUTENANT, the STANDARD BEARER, the CLERK OF THE CHEQUE and the HARBINGER. The full dress of the Corps is topped by a cavalry style helmet with a plume of swan's feathers. The collar badge is a silver portcullis, the old badge of the Beauforts, used by King Henry VIII. Whilst on duty, each Gentleman carries a battle-axe.

The Yeomen of the Guard is the oldest military corps in the world, having given continuous service since being formed by King Henry VII after the Battle of Bosworth Field in 1485. Sir Julian Paget and Colonel Sir Reginald Hennell have both written histories of the Guard; a copy of Sir Julian's book is in the Corps Library at Brompton.

I hope this article has whetted your appetite for reading more about "The Queen's Men" or even, when you retire, applying to join the body relevant to your previous rank and type of commission.

Addu Atoll 1943

LIEUTENANT COLONEL M D MACLAGAN MA

After commission into the Corps and a short tour with 59 Field Company, the author departed for India in 1932, where he remained with the Madras Sappers until 1940.

He expected to go to Norway in company with other officers with frontier experience but the German invasion of Belgium occurred whilst en route to England and he ended up in the Midlands, then Chatham, then back to India via the Cape in August 1941.

A posting to Secunderabad to form an Engineer Training Centre was followed by a six-month tour as CRE Addu Atoll, reversion to major at No 1 Engineer Centre, Lahore and a tour in the EinC's Branch, Delhi.

In 1945 he was appointed 2IC of a pioneer battalion at Asavali, part of a force prepared to invade Malaya. When Japan capitulated however, a course at Tactical School was undertaken prior to becoming 2IC No 4 Depot which had 20 battalions on establishment. These he gradually disbanded before going home on leave in May 1947.

When, in August, India and Pakistan separated, a posting to the Bomb Disposal Department of the War Office arrived. Early in 1948 this department was transformed into Bomb Disposal Unit UK under the author's command. From 1950 he was CRE Famara and Suez, CRE Moascar, CRE East and West Riding and lastly CRE Hannover.

Upon leaving the army, 19 years were spent teaching mathematics at Millfield School, before final retirement.

On 25 January 1943, I found myself at Bombay, appointed OC Ship, the *El Medina*, bound for an unknown destination. At some stage I became aware that I was going as CRE Addu Atoll, which was just north of the Equator, some 650 miles southwest of Colombo. I heard that Addu Atoll was so unhealthy that no-one stayed there for more than six months. Apparently, the Marine Unit which went there first, had 70 per cent casualties from sickness. We berthed at Colombo on Sunday 31 January. I spent some time ashore, and met the Chief Engineer, Brigadier Greenwood, who was responsible for engineer requirements at Addu Atoll.

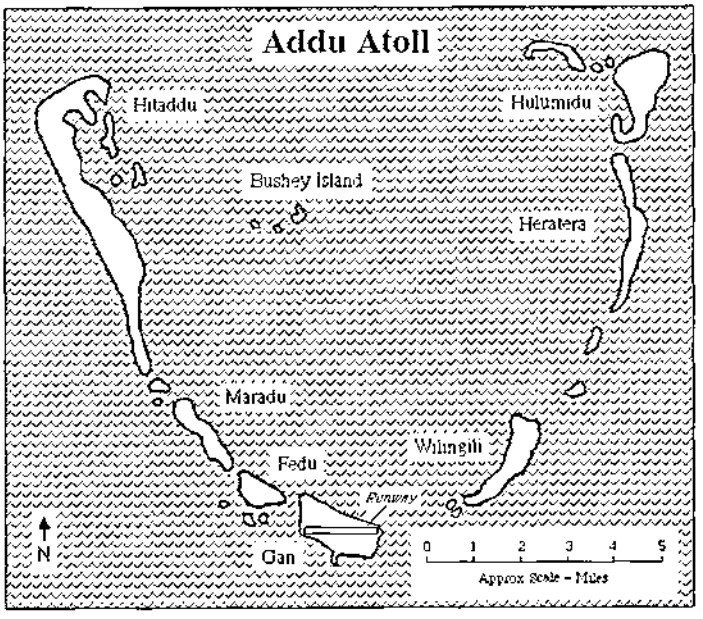
We arrived on 3 February, and disembarked the next day. The atoll was a deep water lagoon of considerable size formed by a series of similar islands.

Between the islands of Gan and Wilingili, a deep water channel permitted ships to enter the lagoon. The perimeters of the islands were uniformly about 4ft above high water level, the interiors being slightly lower. For an average distance of perhaps ½ mile out from the perimeter of each island, the depth of water was between 3ft and 6ft depending on the tide, then came the reef, on the far side of which was a near vertical drop to the ocean bed.

For about 100yd in from the perimeters of the islands there was just a skin of top soil or coral sand, sufficient to support coconut trees. Further inland there was a foot or so of very spongy black cotton soil on top of coral. This produced a dense jungle of scrub, and some shallow rooted breadfruit trees.

The local inhabitants were of Arabic origin, and formed part of the kingdom of the Maldive Islands, the capital of which was Male, some 350 miles to the north. In normal times the inhabitants of Addu Atoll sailed to Colombo to trade. On their return journey they were supposed to come via Male and pay tax on the goods acquired; I gathered however that adverse winds frequently forced them to return directly. We were permitted to employ local labour, provided they were not paid in money. I think we paid them with rice but cannot recall the amount. They were employed mostly for scrub clearance and casual labour.

Lt Col M D MacLagan
Addu Atoll 1943 (p190)



Malaria and scrub typhus were the diseases which caused trouble at first.

Scrub typhus, which was also encountered during the campaign in Assam, was something new to the medical profession and a team of doctors came to investigate. The locals seemed immune to the disease and by employing them to clear fresh areas and then using troops to finish off removing coconut trees, roots etc, sickness was much reduced.

A considerable number of mosquitoes bred in very shallow ponds, but it was not difficult to fill these in with coral sand and so malaria was largely eliminated.

Before going on to describe the organization and the work carried out, it is interesting to recall that a few days after our arrival, the *Queen Mary* and three other large liners came into the lagoon for refuelling, escorted by a number of warships. On board the liners were units of the Australian Army, being transported from North Africa back to their own country.

Army and naval personnel mainly lived on Gan and an RAF organization was located on Hitaddu. Accommodation, initially in tents, was gradually converted to timber hutting and a few permanent buildings were constructed using concrete bricks made on the spot, using coral sand and cement. All new work, other than army requirements, was detailed by the Admiralty; standards etc were given by two Superintendent Civil Engineers (SCE); and the CRE's role was mainly that of a contractor. Nearly all materials had to be brought in from Colombo, including water.

The question of water caused a minor clash of opinion between the SCEs and myself. Naturally everyone realised how undesirable it was to have to bring water from Colombo. The SCEs had a pit dug in what they considered a suitable area, and gathered a number of us for a water tasting. The SCEs considered their samples to be palatable but I said that I couldn't recall tasting anything worse in my life. Fortunately, I found a solution. In an unoccupied area, I had four wells dug, each about 12ft square and about 9ft deep sited about 50yds apart, interconnected with 4in piping a foot or so below normal water level. An electrically driven pump, with diesel standby, lifted the water into a 10,000gal Braithwaite sectional steel tank, placed on top of a 2in tubular trestle tower 30ft above ground. From there water gravitated to the various camps etc. The SCE at once wanted to test the capacity of the wells but I thought this would be unwise, as there was ample water for normal requirements, and over production might result in the wells becoming brackish.

The Fortress Commander was a Royal Marine officer, Colonel Oliver Jones; Commander Briscoe was NOIC and Lieut Colonel W H Bond, from whom I took over, was CRE, probably the first appointed.

The main task Bond had in hand was the construction of an airstrip on Gan, extending the full length of the island from sea to sea. Being less than 1600yds long, it was a minimum for operational Liberators.

Originally three runways were proposed, but only two were completed; a subsidiary runway intersected the main runway at 30°.

Progress at first had been slow, much of the work being done by hand, including cutting a 200yd gap through scrub.

The coral with which the runways were constructed, was collected from suitable positions between the shore and the reef, but as the depth of water varied between 6in and 3ft, material could only be transported between tides. Subsequently, coral was removed by excavators

or angle-dozers, collected in heaps and then carried to the runway in dumpers or lorries. As a result of working in sea water however, mechanical delays caused numerous hold-ups.

Units involved in the airstrip construction consisted of one company each of Royal Marine engineers, Indian engineers, Indian auxiliary pioneers, and one platoon of Indian mechanical engineers. An infantry battalion, allocated to the island for defence purposes, provided two companies for runway construction. The runways were 50yds wide, and laid with a slight camber, the finished level being 9-12in above natural ground level. Black cotton soil was removed where encountered along the length of the runway, and a minimum thickness of 12in of lump coral was placed as a hardcore foundation. A 6in layer of 2in coral was placed on top of this and rolled continuously prior to a final 6in layer being laid of ½-1in "pea" coral which was well watered, and given the necessary camber, before a final rolling with all available machines.

As the runway was above natural ground level, haunching was laid on both sides, graded to ground level at about 1 in 90. The full length of the runway was completed, I think, by June, but was hardly used operationally during my last two months there.

Another important task undertaken was the construction of some jetties. On the lagoon side of the islands, the beach sloped very gradually for two or three hundred yards or more, before sloping steeply into deep water. This made landing of stores from ships difficult. The most suitable material to build these jetties with was found to be 3in tubular scaffolding with 3in timber decking. The use of timber underwater was avoided because it was attacked by teredo worms and rendered useless in two or three months.

During my time there, two causeways were constructed between adjacent islands. One was about 350yds long, the other 600yds. The depth of water in the channels varied from 4-10ft. The causeways were built mainly for defence purposes, and were capable of taking a 6-wheeled trailer, carrying a 3.7 gun, with an axle load of 13 tons.

Most offices and stores were built out of timber but more solid construction was required for other buildings such as offices for the NOIC, cold storage chambers, generator stations, the fighter direction office, W/T (wireless/telegraph) transmitter station and local telephone exchange. These were built with bricks made with one part cement to five of coral sand. The mixture was shovelled into moulds and punned, taken from their moulds next day and left for two weeks before use.

The Garrison had been provided with a few tennis racquets and balls, but the view was that it was not worthwhile making a court because the balls would soon be worn out and it was unlikely that replacements could be obtained. It so happened however, that the large number of bricks being made needed a concrete area provided for storage during drying and this turned out to be large enough to serve as a tennis court. By a coincidence the commander of the unit making the bricks was a county player, from Westmoreland (I think), and a court was soon in use – it was very satisfactory. After daily use for an hour or so the balls were very little worn after a week, but my tour finished soon after so I do not know what happened later.

I do not know to what extent Addu Atoll was used during the rest of the war but I believe that by 1945 the RAF was in charge, and the runways were in use. Subsequently civilian planes flying to Australia also refuelled at Addu Atoll. In 1965 the Maldives became independent and in 1968 a republic.

On Sunday 1 August, Major Steed arrived as my relief and much of the next fortnight was spent visiting the various islands with him.

Having the last day, prior to leaving, to myself and having often admired the brilliant fish in the lagoon but never having looked at the ocean side, I decided to wade out in the thigh-deep water to the reef. When near the reef, I noticed what looked like two rings of stone, one on top of the other green and black in colour. With recollections of deadly sea snakes in mind, I lacked any spirit of research and waded back to shore without delay.

After attending the Fortress Commander's anniversary dinner, I boarded the *SS Wingsang* at midnight, leaving for Colombo the next day. Arriving on 19 August, I went to an officers camp near the Galle Face Hotel. I took a train to Bangalore where I hoped to see my brother but, finding that he had just been transferred elsewhere, I spent a week renewing old acquaintances with Madras Sappers, spent another week at my previous station, Secunderabad, and eventually reached No 1 Engineer Depot at Lahore on 8 September.

Early Days

MLC

MANY readers of the *Journal* may be familiar with the group of temples dedicated to Rameses II at Abu Simbel on the Upper Nile. The "Encyclopaedia Britannica" (1911 edition) describes the principal temple as "probably the greatest and most imposing of all rock hewn monuments". The temple frontage of about 140ft width and 100ft height is scarped out of the sandstone hillside. Above the scarped area the hill rises to about 320ft before it levels out. The area is formed of sandstone, most of which is solid, but there are many veins of loose rock. Backed against the lower facade are the four immense colossi of the King, seated in pairs on either side of the entrance to the temple which is hewn out of the interior of the hill. Each colossus is no less than 65ft in height. The Encyclopaedia adds a footnote to the effect that the front has been cleared several times of fallen rock, "most recently in 1892".

In the recent 1960s the Egyptian government, with the help of the Russians, decided to dam the Nile in this area in order to make better use of its power and irrigation potential. The plan included moving the whole temple frontage, as described above, including the colossi and their associated carvings, up the hillside so that they were safely above the new flood level. However it is what happened in 1892 with which we are concerned here.

In December 1892 a Public Works Department (PWD) official warned Cairo that a "whole ledge of rock overhanging the left hand Abu Simbel statue has advanced forwards... I consider the temple in imminent danger... work will cost about £1000". Since the PWD appeared to have neither the money nor the men to undertake the rescue work, application was made for a "detachment of RE". Authority was given for an officer, two NCOs and ten men from 24 Company to undertake the task. The key man seems to have been Corporal Spary, a "hard headed smith and a capital man for the work". The party was billeted in one of Thomas Cook's Post Boats. In all it was estimated that at least 1400 tons of loose rock had to be removed and many tons of solid sandstone had to be made fast. Blocks, tackles, steel wire ropes (up to 4in!), hold fasts, plugs and feathers, jumping bars, screw jacks and Spanish windlasses all came into their own. No doubt the Chatham field works training of the men was well tested! The railway and steamboat authorities had forbidden the carriage of explosives, but cannibalizing of 9 pounder cartridges from *HM El Teb*, a stern-wheeled gunboat, which was also at the RE disposal, sufficed to break up such rock as could not be dealt with by means other than explosive.

The work was started at the end of January 1893 and was finished by early April 1893. The PWD engineer who inspected the finished work, expressed himself as thoroughly satisfied and astonished at the way the Sappers had set about the task. There had been no accidents, no illnesses, despite the high temperatures, and the cost was well under budget. "Despite a trifling difficulty with the Station Master at Assiout", the detachment marched smartly into Kasr-el-Nil barracks in Cairo on Good Friday morning 1893. It seems that for a bunch of soldier-tradesmen they thought they had done pretty well!

Because of continued complaints in the Press and elsewhere about the Ordnance Survey, the Department of Agriculture appointed a Committee in May 1892 to report on the matter. The Committee were asked to give answers to the following three questions:

- What steps should be taken to expedite the completion of the one-inch map?
- What permanent arrangements should be made for the continuous revision and speedy publication of the maps (from the one-inch map to the 1/500 for towns, etc)?
- Whether the maps as at present issued satisfy the reasonable requirements of the public?

The Committee was also asked to answer a Parliamentary question as to whether "the President of the Board of Agriculture was aware of the dissatisfaction amongst geologists, Welsh scholars and others with the inaccuracy of, and incompleteness of place names on the Ordnance maps?" The Committee reported in December 1892.

In April 1893 the *Journal* devoted many pages to the Report and its conclusions, adding, it seems, much comment of its own: "The Ordnance

Survey, with limited means at its disposal, has turned out a series of maps that have no equal for accuracy or finish in any country in the world". The Press is not spared and much scorn is directed at the calibre of those who were responsible for the continued complaints in the Press, that the Ordnance Survey was "not doing with a limited staff what, if they had the services of all the trained surveyors in the kingdom, might perhaps have just been a possibility!"

"The Ordnance Survey may be congratulated on the result of this inquiry", the *Journal* report concludes, "which amounts to a vindication of a much abused Department... The satisfaction of those critics, who look for absolute perfection, may well be left to the millennium, when maps will not only correct themselves but make themselves. Or, better still, when criticism be tempered by judgement!"

The Committee Report itself may not have been couched in such forthright terms but there is no doubt that it was extremely complimentary! Well done the Ordnance Survey. It is a pity that it is no longer a Sapper preserve!

The Corps in those days was continually appealing for money for various worthy causes, and 1893 seems to have been a particularly demanding year. Usually the reason was to provide a portrait of some very eminent general for presentation to the HQ Mess, although the 1893 causes were more varied. The latter included an appeal on behalf of Rochester Cathedral. This had first been circulated to all RE officers individually, past and present, before reaching the pages of the *Journal*, but apparently with a very disappointing result. The May 1893 *Journal* reported that only 24 replies, amounting to some £50 had been received as a result of the individual appeal and surely the Corps could do better than that. The *Journal* notice itself also seems to have had little appeal, for the only subsequent figure, printed in the July 1893 issue, gave the new total as having risen only to £66. Other worthy causes were for a portrait of the Duke of Cambridge, CinC and Colonel of the Corps – total £608; Mr Crout who, after serving 21 years in the Corps, worked in the Brompton mess as a civilian for another 26 years before formally retiring – £189; General Sir Lothian Nicholson, Director Fortifications and Works and Lieutenant Governor of Jersey for a portrait – total not published in 1893; wedding present for the Duke of York (later George V) and Princess Mary of Teck. This was to be a very large solid silver-top tea table plus a pair of round tea tables to correspond, with a complete service comprising tea kettle, tea and coffee pots, sugar basins and jugs. This time an officer seems to have been required to contribute an arbitrarily determined sum of "one day's pay". The total collected was not divulged – anyway as far as 1893 was concerned. Other occasions were General Sir Frederick Chapman, Inspector General of Fortifications and Works and Commander in Chief of Bermuda for a portrait – total not published in 1893; furniture for the new officers' mess in Aldershot – £350 from the officers stationed in Aldershot and £308 from the Corps as a whole. As can be seen, the demands were appreciable. It is to be hoped that the complete lack of interest in Rochester Cathedral passed without too much embarrassing comment!

"It would probably interest many readers of the *Journal* to have the appropriate date on which the Corps riband and colours were first introduced", so ran the introductory paragraph of a letter to the *Journal* in May 1893. Whether present day readers will "probably" be interested is another matter! It seems that the cricket blazer was introduced about 1864, when the then cricket captain, one Lieutenant Andrews, "invented the cricket coat". "It would", the author of the letter continues, "be interesting to have the date on which the Brigade of Guards adopted the blue and scarlet stripes. The distinction between our stripes and the Guards' Colours appeared to be that ours are of unequal width". Subsequent correspondence underlines the lack of sealed patterns, so that an officer could be reasonably sure of what he was ordering, which had not been the case up till then.

Oddly enough in this correspondence there is mention of most of those activities likely to be interested in having "colours" such as "polo, cricket, football and boating", but no reference of the seemingly all important tie. The need for a standard "riband" is however discussed but what exactly was meant by that term is not clear!

In last year's *Early Days* contribution (for 1892) the subject of obituaries received some comment. For instance, that junior ranks might get a posthumous mention so long as the cause of death was sufficiently violent. Sadly, 1893 had reason to feature two subalterns, Lieutenant P J Bourne and J C J Fallon, both of whom were drowned off Malta on 18 June 1893. Three officers, the above

two and Lieutenant Pike, went out for a sail in a small "Mudian" boat. At about 9.45pm on the evening of 18 June the wind dropped and the trio found themselves drifting helplessly off the mouth of the harbour and about half a mile from land. They had oars but only one rowlock and that unserviceable. The night was dark and they had no lights. At about 10pm the lights of P&O *SS Sutley* were sighted as she cleared the entrance to the harbour. Suffice it to say that, despite their best efforts to call attention to themselves, they were run down. The steamer's boats were on the scene in about 15 minutes, but during that time the two officers had disappeared and only Pike remained to be picked up. These were not the only drownings to be recorded in 1893. A wherry manned by sappers was run down by a barge off Upnor Hard. The Sappers were attempting to collect cutters, moored off shore for the return journey to the Chatham bank after their party's day's work. Nine of the boat's crew saved themselves, but sadly three were drowned.

On Monday, 28 August 1893, HRH the Duke of Cambridge, the CinC, was the Inspecting Officer at the annual inspection of troops in Chatham. At 10.50am about 1800 were present on the Lines for the inspection and march past, after which followed a brief visit to the Dockyard and lunch in the Brompton mess at 1.45pm. At the latter, all the local naval and military dignitaries were present. This was all clearly a big occasion only somewhat marred by the cryptic comment that the proposed inspection was only known about on Saturday, 26 August, and that the lunch in the mess was only first known on Sunday, 27 August, the day before. In his thank you speech at lunch, the CinC stressed that during the 37 years in which he had been head of the Army, he had always been most satisfied with the Corps, of which he had the honour to be the Colonel in Chief... There must have been other and less complimentary thoughts in the minds of many of those present. The very short notice must have caused some apprehension to say the least! As everyone knows, a good soldier is never taken by surprise. The report in the *Journal* merely states "The short notice prevented a more formal reception".

In a series of articles on "The warlike characteristics of the French and the German – a comparison" (published from the German by Captain F C Ormsby Johnson, RMLI) the author remarks that the "*vis viva* of the French soldiers, *qui marchent toujours en avant*, is not sufficient to support them in the hour of defeat, in the patient waiting of defence, in the uncertainties of desperate dilemmas". It is difficult to say whether to be inspected by the most senior officer in the British Army, at practically no notice at all, and even then spanning only a weekend, ranks as a "desperate dilemma", but the Chatham Sappers seem to have come through with flying colours!

It was noted in *Early Days* last year that in 1892 the finances of the RE Widows' Fund were in some difficulty, particularly with an estate near Marham in Norfolk, when it was disclosed at the AGM that £12,000 had been lent on the security of the estate, and this in 1871. The rents were in arrears and the property could only be sold for about £9000. However it was alleged that "it is a very good property and there is a good chance of a large proportion of our money being recovered in the long run". Let's hope the "good chance of a large proportion of our money" was an accurate forecast, as it seems that, even by today's standards, quite a lot of money was involved. All very familiar!

The Rideau Canal, an Engineering Feat

MAJOR P E CROOK

Major Crook joined the Army in August 1974 and was commissioned into the Corps on 28 June 1975. His first tour was as a troop commander with 4 Field Squadron during which time he went to Australia on an exchange in 1977. Having spent two years at 3 Training Regiment, he moved to 26 Engineer Regiment and then, in 1982, was appointed 2IC 60 Field Support Squadron, serving with them on two deployments to the Falklands. This was followed by a tour at the Royal School of Military Engineering as an instructor with the Field Engineer Wing. His first staff job was as SO3 Engineer, 19 Infantry Brigade, before assuming command of 15 Field Support Squadron in January 1988. In February 1991 he was appointed Deputy Chief of Staff 11 Engineer Group (subsequently changed to RSME (Minley)), and from September 1993 he will be off to join the Battle Group Trainer (South).

Major Crook is married with two boys and a black labrador.

Introduction

On 21 September 1826 Lieutenant Colonel John By, Royal Engineers, arrived at the little settlement of Hull on the north shore of the Ottawa river. His mission was to construct a canal system along the line of the rivers Rideau and Cataraqui, linking the Ottawa river to the Great Lakes of North America. This was to prove to be no ordinary project.

The war of 1812 showed that the St Lawrence River supply route to Upper Canada was extremely vulnerable to American attack and the Rideau system was to become the key to the future defence of Canada. The Duke of Wellington, then the Master General of the Ordnance, gave orders for the construction of fortifications in Upper and Lower Canada interconnected by a network of canals.

The Rideau Canal was constructed between 1826 and 1832. It consisted of 47 masonry locks which stretched across 123 miles of wilderness and involved a workforce of some 5000 men. The finished works included engineering achievements unequalled anywhere in the world and cost the Treasury more than any other military project in the British Empire at that time. The Canal provided the necessary deterrent to invasion and played a major part in the development of Lower Canada.

The Challenge

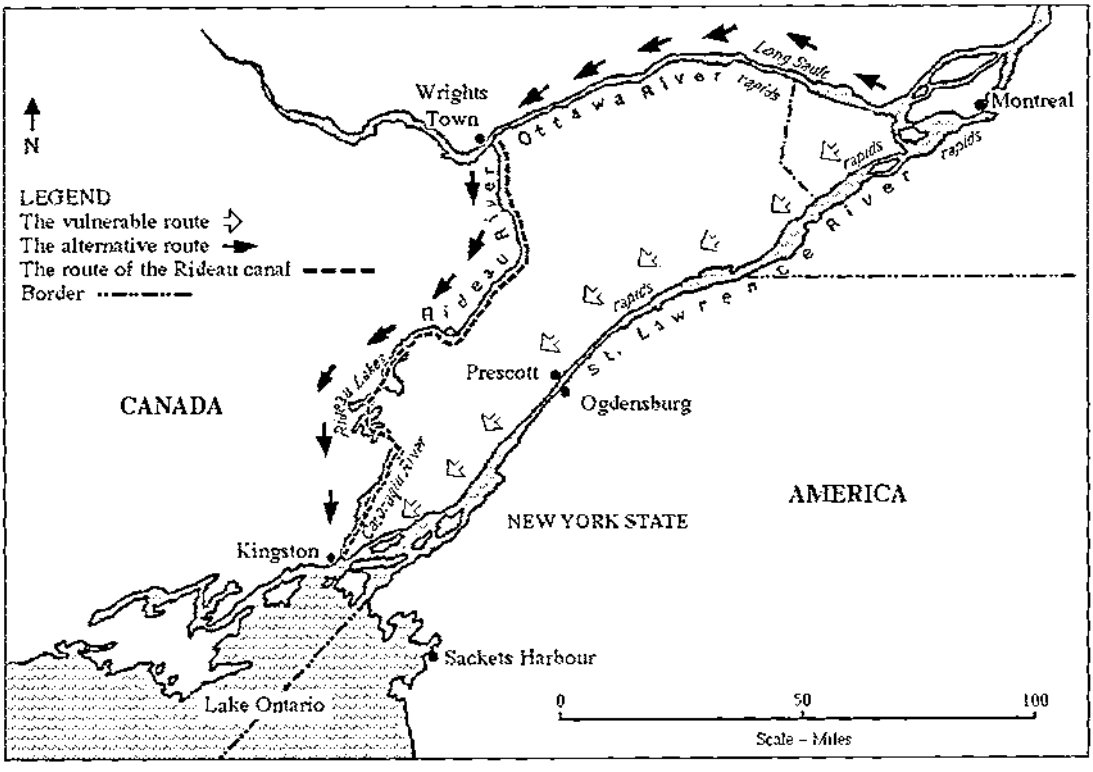
The aim was to build a canal system which would enable the rapid deployment of troops to reinforce strategic locations such as Kingston. The boats had to take hundreds of men from Montreal to Lake Ontario within days rather than weeks.

The 123 mile alignment of the proposed canal cut across wild forested country with thick undergrowth and swamps. The summers were hot and humid whilst the winters saw temperatures fall to minus 30°C.

The Rideau River did not form a natural navigation as its course was interrupted by rapids, shallows and an elevation of some 281ft 2in from the Ottawa River to its summit nearly 80 miles inland. The steepest rise was at Ottawa where a rise of 79ft had to be overcome.

The challenge facing Colonel John By and his engineers can be illustrated by the difficulties his survey team faced when they were dispatched in November 1826. The snow was deep and temperatures were well below zero. Screws on the theodolite continually froze and the surveyors, unfamiliar with snow shoes, often fell through the ice becoming soaked and frostbitten. At night the men slept together for mutual warmth; they awoke the next day to find their hair frozen to the ground.

Maj P Crook
The Rideau Canal, an engineering feat (p196)



Rideau and Cataraqui Rivers.

Construction

Colonel By, with the assistance of his Clerk of Works a Mr John MacTaggart, and a small staff of Royal Engineer officers, set about arranging contracts for the various lock stations.

Although Colonel By had many problems with contractors during the construction of the canal almost the entire work was completed by the employment of local labour working to By's plan and designs.

Locks are basically hydraulic machines which lift and lower boats by the use of water and gravity. Each lock consists of a watertight chamber with gates at either end and sluice valves to control the flow of water in and out of the chamber. On the Rideau, each lockage took about 12 minutes with the longest set of locks at Ottawa, taking about one hour to complete. The typical Rideau lock was constructed of masonry blocks quarried locally with timber gates operated by crab winches and chain.

The basic plan adopted for the Rideau locks was for lock chambers 33ft wide by 134ft long, sill to sill, to leave a 110ft clearance when the lower gates were swung open. These dimensions allowed current boats to pass through and Colonel By also anticipated, in his designs, the emergence of steam-powered craft. The masonry walls were to be 8ft thick at the base and 5ft at the coping, with a slope on the inner face of the lock chamber. The rear of each wall was strengthened by $4ft^2$ counterfort piers on about 20ft centres. Each wall was thickened adjacent to the lower gates to enable it to withstand the force of the water thrusting the gates back against the hollow quoin pier in which each gate was pivoted.

The lock walls were also thickened at the upper gates where tunnel sluices were to pass in and down through the walls to fill the lock, and manholes were provided to give access to these tunnels. The sluices for emptying the lock were placed in the lower gates. Walls were to be constructed of rubble stone masonry with a dressed stone (ashlar) facing of blocks up to 20in wide and from 3½-5½ft long by 18-24in high. The stones were laid alternately header and stretcher with the

headers tying in with the rubble masonry backing. Where the locks were constructed of clay or earth, a row of sheet piling was emplaced across the lock behind the breastwork and below the lock floor to prevent water from penetrating under the floor. If there was no natural bed-rock to floor the lock then masonry blocks were sometimes placed.

The pointed masonry sill against which the upper gates closed was built on the breast-wall, and the sill for the lower gates was built on the lock-pit floor. As a cost-saving measure, By adopted the common practice of building the lower sill and gates recess floor of wood. Wooden sills were also placed at the base of the stop-log grooves in the upper and lower wing walls so the lock could be dammed and pumped dry for repairs. Clay puddle was also used to prevent ground water seeping in and a 2ft thick wall was built up against the lock walls prior to backfilling the lock-pit.

Initially, By planned to lay all of the lock stonework in common mortar and only point, or trowel, the joints with hydraulic cement. Common mortar could be made from the limestone at the lock-sites, but hydraulic cement had to be imported from England until a substitute was found locally. Large quantities of hydraulic cement were grouted into the stonework to form solid units of masonry.

In addition to the 47 lock sites, nine stone arch dams were constructed, the largest being built at Jones Falls. At its crest the dam is 61ft high and 350ft long with a base of 27½ft in thickness. The great stone arch dam at Jones Falls represents a magnificent achievement by Colonel By and his engineers. Not only was the dam the first of its type in North America and Britain but it was by far the highest in North America at that time. In addition to work on the canal a number of defensive block houses were built as well as barracks and lock keeper stations.

Finance

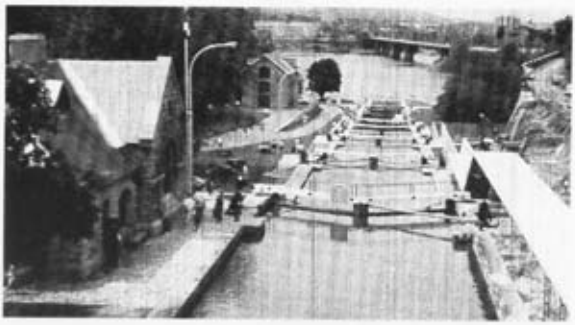
Like today the project had to work to a budget and it was this aspect which plagued Colonel John By to his grave. The initial reconnaissance by Samuel Clowes put the estimated cost of the canal at £169,000 and it was upon this figure the Treasury based future expenditure. Colonel By's estimate was for a canal system costing £474,844. A long battle between By and his political masters ensued over the costings of the project. The final cost came to £822,804 and, despite a number of committees vindicating By's plan, the Treasury had the final word which affected By's reputation in that he received no public recognition for his efforts. However, it is worth comparing the Rideau with other projects such as the Welland Canal which took ten years to complete at a cost overrun of 55 per cent. The Caledonian Ship Canal, constructed by Thomas Telford no less, took 19 years and overspent by 88 per cent. The Rideau took six years to build and, even based on Clowes initial estimate, overran by only 43 per cent – effective economics when the Rideau Canal system was considered the largest military engineering project outside of Britain at that time.

The Men

Colonel John By was born in England on 10 August 1779 and entered The Shop at Woolwich before being commissioned into the Royal Engineers. He gained a reputation as an officer of great judgement and ability after being involved in a number of construction tasks and his service in Canada from 1802-11, working on canals and fortifications, probably stood him in good stead for the Rideau project. Under the Duke of Wellington's command, he took part in the siege of Badajos in 1811, after which he returned to England to take charge of the Royal Gunpowder Mills. Whilst serving in London, his responsibilities included organizing the fireworks display for the "Peace of Paris" celebrations – little has changed since then! In 1821, with reductions in the size of the Army, By was retired on half pay at the age of 42; obviously held in high esteem by the Ordnance Board, however, as they promoted him to Lieutenant Colonel in 1824 while still in retirement. In March 1826 he was appointed to superintend the Rideau Canal project.

Colonel John By died at his home in Sussex on 1 February 1838 aged 56. Not only did John By build the Rideau Canal but he also founded the City of Ottawa and, although he was eventually exonerated over the matter of the financing of the project, he received no official recognition for his works. Perhaps we, as a Corps, should now give this great military engineer the recognition he justifiably deserves.

Colonel By was ably assisted by officers of the Royal Engineers and two companies of Sappers and Miners, the 7th and 15th. Little is known of By's officers except that they too were held in high regard as military engineers. The two companies were called upon to undertake many and varied tasks, including guarding the Commissariat stores from the large Irish labour force employed on the canal works. By used the sappers to deal with the more difficult tasks such as when the contractor admitted defeat after the Hogs Back dam had broken in the spring floods. The 15th Company was moved from Ottawa at great haste to rebuild the dam. The 7th Company had to work on one inland lock site which civilian labourers refused to work on because of a high risk of swamp fever or malaria. On the completion of the project the two companies were disbanded and individuals either settled in Canada or returned to England. Those who did settle were given 100 acres of land and many men found employment working on the canal.



The eight locks at Ottawa looking north to the Ottawa River.

Recently, after a visit to Canada, 12 members of 15 Field Support Squadron were made Honorary Lock-Masters, an unusual privilege but an indication of how strong the Corps ties are with Canada, and with the Rideau area in particular.

The contractors' work varied in quality and several of the contracts had therefore to be changed, with consequent legal tangles. All but four of the original contractors eventually went bankrupt or had to have their contracts terminated. The labour force came from some 4000 Irish immigrants escaping from poor economic conditions in their own homeland. Life and work on the canal was hard with an average working day of some 14hrs; and the work was physically demanding as there were few labour-saving devices. The winters were harsh and the summers hot and humid with the risk of disease being high. The work itself was dangerous, particularly during excavation and quarrying, and many men were killed or injured. Skilled tradesmen such as masons, carpenters and blacksmiths were, surprisingly, not in short supply and much of their original work still stands good today, which says a lot for their craftsmanship.

The Rideau Today

The Rideau Canal was never "used in anger" although it was used on a number of occasions to move troops when tension arose. However, it has played a major role in the economic development of Lower Canada. Today the Rideau Canal system and its locks are still maintained in their original state by the Canadian Parks Commission and the traffic is more likely to be pleasure craft than men-of-war.

Modern day engineers, who are contracted to carry out maintenance on the canal, are often amazed by the standard of workmanship and the engineering techniques which were used to build the Rideau.

The Royal Engineers' role is certainly not forgotten as, at each lock station, there are plaques stating how the Corps was instrumental in the development of this region. In addition there are some beautifully maintained museums at Smith Falls and Ottawa, in which the Corps features strongly. Colonel John By's statue stands proudly overlooking the Ottawa locks and is a constant reminder to the citizens of Canada of the role of the Corps of Royal Engineers in Canadian early history.

The Rideau Canal is certainly one of the military engineering wonders of the world and remains a modern delight for tourist and locals to enjoy.

The Rideau Canal an engineering feat (p199)

Butterflies Over Grimsby/Cleethorpes – June 1943

LIEUT COLONEL E E WAKELING ERD

The author was commissioned from the Officer Cadet Training Wing of 11 Chemical Warfare Training Battalion Royal Engineers (CWTBRE) in June 1940. Posted to 12 CWTBRE then 2 Chemical Warfare Group in January 1941, he volunteered for bomb disposal (BD) and arrived at No 3 BD Company in April 1941. After a spell as Chief Instructor Northern Command Bomb Reconnaissance School in 1942, he went back to No 3 BD Company and on to No 14 BD Company in 1943. This unit moved to Shoreham in February 1945 to pioneer the technique of high pressure water jetting for beach minefield clearance. Postings to 12, 20 and 2 BD Companies followed as units were disbanded after the war. 1947 found him as SO3 in the Directorate of Bomb Disposal. Transferred to Strategic Reserve (then Army Emergency Reserve) he became Adjutant 142 BD Regiment in 1952, followed by Officer Commanding 547 BD Squadron (1955 – within the Regiment), Second in Command (1961), Commanding Officer (1964) until its disbandment in March 1967.

On the night of 13/14 June 1943, there was a heavy raid on Grimsby and Cleethorpes. Two enemy aircraft were shot down in the sea.

What made the occasion unusual was that for the first time a much higher proportion of antipersonnel bombs was dropped in number compared to high explosive (HE) and incendiary bombs, and both towns were brought almost to a standstill. The whole area was designated one vast category "A" bomb – highest priority, where the death of a BD officer was an acceptable risk!

Immediate clearance was ordered. Three George Medals and, I believe, two BEMs were awarded for actions during this clearance operation.

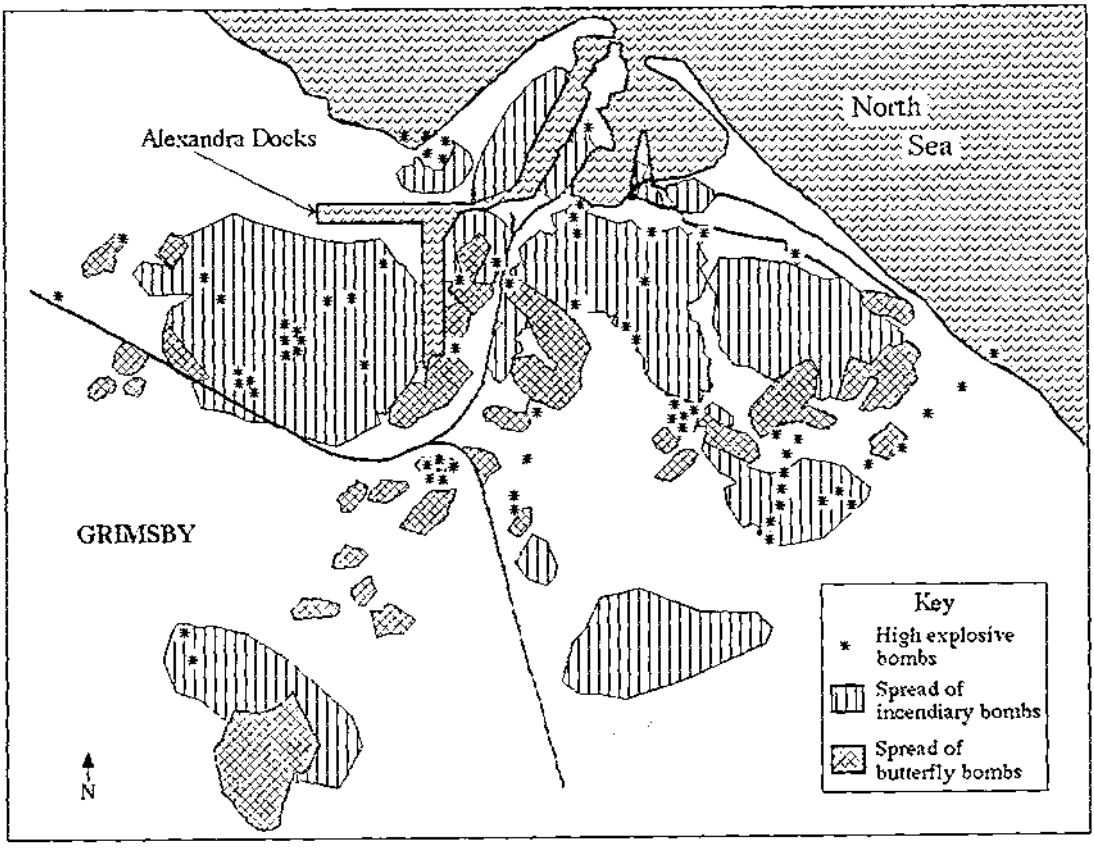
The official report of the raid states that the number of enemy planes which took part was 23. The weight of bombs dropped was about 18 tonnes, containing 4.8 tonnes of HE, 10 tonnes of incendiaries of all sizes and 3.5 tonnes of antipersonnel bombs.

In my calculations, 3.5 tonnes of antipersonnel bombs, each weighing 2kg equates to 1750 bombs. However, according to the Company War Diary, in the eight days that the whole company operated in the towns, 1350 bombs were dealt with. By the end of August, when I was posted to 14 BD Company, I had cleared a further 823 and after I left another 205 were disposed of – a total of 2378, estimated to be 60 per cent of the total dropped. If that estimate was correct, then 4000 could have been dropped, which is 8 tonnes.

These antipersonnel, or "butterfly bombs" – so called because of their design – were officially known as SD2s: SD being the German abbreviation of the name for a thick walled bomb and 2 because it weighed 2kg[1]. The bomb itself was cylindrical in shape, about 3½in diameter and about 4in long. On the aircraft they were carried in bomb-shaped containers which, when released, dropped a predetermined distance before an "air burst" fuze fired, splitting the container and allowing the contents to drop. There were 23 bombs to a container and one aircraft could carry several hundred of these bombs in 10 or 12 containers depending on the type of bomber being used.

The bombs had an outer thin metal cover consisting of two equally sized pieces covering the cylindrical part, hinged so that when opened they formed a drogue – a sort of parachute. The circular ends, opened at an angle and were designed to make the drogue rotate in descent. When the drogue opened it slid up a 6in steel wire and fitted onto a square shank, the other end of the wire being attached to a spindle set in the bomb fuze. As the

[1]Some additional notes by Major Arthur Hogben QGM, follow this article, together with a clear diagram of the 2kg bomb.



Grimsby, showing distribution of bombs dropped.

bomb fell the drogue spun round (the weight of the bomb preventing it from spinning at the same speed), and the spindle was unscrewed from the fuze thus arming the bomb.

A high proportion of these bombs did not explode on landing and the reason for this was that they were fitted with fuzes designed not to go off until disturbed; most casualties were caused after the raid by people handling or otherwise disturbing them. Sometimes additional casualties resulted from sympathetic detonation of bombs lying within a 50/60 yard radius of one when it exploded. Fifty per cent of casualties occurred within half a hour of the "all clear" sounding.

By a strange quirk of fate at that time, all the sections of 3 BD Company were together for the first time. They were at Tollerton Hall, just outside Nottingham, for a training camp. Normally the ten sections were dispersed within the counties of Nottingham, Derby, Lincoln, Leicester, Rutland and parts of Northampton and Cambridge, usually based just outside a major town or city.

On the night of the raid, at about 0300hrs, the company duty officer took a call from the Civil Defence Regional Headquarters, advising the unit of the situation. The duty officer then woke the OC, Major W G Parker, and briefed him. The OC decided to dispatch his three most experienced officers to Grimsby immediately to deal with the bombs, most of which were reported to be lying on the surface. The officers concerned were woken, along with their drivers, as was the company quartermaster sergeant (CQMS). The OC explained the situation to them all, as far as he knew it, and they left within the hour.

As they drove into the town it was just dawn, the pale light getting brighter by the minute. This was fortunate for them because had they arrived earlier in the dark, they may well have been killed as had some police officers, civil defence wardens and others, who had been in the streets at the time of, or just after, the raid. The bombs were scattered everywhere and had been kicked, ridden over by bicycles and driven over by cars, resulting in many deaths and injuries.

Butterfly bomb.

Arriving at Grimsby the officers saw many bombs lying around on the ground, and hanging from fences, gates and telephone lines. Reaching the central police station, they found chaos. No police force had ever experienced this type of raid. They were doing their best but the town itself had come to a halt.

Lieutenant C H Green GM, being the senior of the three officers, assessed the situation and made some recommendations to the superintendent in charge. Chaos eventually became sanity and a war room was set up. Lieutenant Green realized that the three of them would not be able to cope with the problem. Residents were frightened to leave their homes, it was even dangerous to go upstairs. Bombs were found in attics; some had penetrated the ceiling to be left dangling held only by their drogues; some were on bedroom floors; some even in the bath! They were lying in gardens and hanging from gutters and it was assumed, rightly, that any one of them could go off at any moment.

Green 'phoned Major Parker who, on being told of the gravity of the situation, decided to send every available officer and sergeant in the Company to Grimsby.

After I arrived, with my section, I went to the central police station and war room. There were two maps on the wall, one a large scale street plan of the town covered with coloured pins. The second was an Ordnance Survey map of the town and its surrounding area. Here there were fewer pins but more were expected as soon as bomb searches had been organized in the rural areas. The existing pins represented those bombs which had already been reported. The duty officer explained how bomb reports were organized. The police took all the calls reporting the whereabouts of each bomb, and filled out a record card detailing its exact location; a policewoman then marked the map and kept a log of each report which was given a serial number.

As each officer came in for more "work", he was given the cards for a number of bombs, usually in the same street or within a close area. One of the policewomen noted in the log which officer had taken the reports and when the officer returned the log was ticked off and the colour of the pin changed to indicate a "cleared" bomb.

The most important piece of information to come out of the work so far was about the fuzing of the bombs. There were two new fuzes, a 67, which proved to be a delayed action fuze designed to explode any time up to 30 minutes after the bomb had landed, although this wasn't always happening – it was later discovered that the fuzes sometimes stopped just a few seconds before they were due to go off and that this was probably caused by a little "burr" on the teeth of the clockwork mechanism. The other was a 70B fuze, designed as a booby trap to detonate the bomb at the slightest movement.

Whenever the bombs with 70B fuzes were found on the ground in the town, it was a quick and easy job to build a circle of sandbags around them and then explode them by remote control with a length of string – pulled from a safe distance. In the open they could, of course, be dealt with quicker as no sandbags were required.

The 67s were a different problem in that there was no guarantee that the bomb would go off immediately it was moved and there was no safe way of knowing if it was ticking. In such cases explosives were used to blow them up. This became expensive on sandbags as the explosion blew most of them apart. Of course the sand could be used again but it needed men to collect it to fill more sandbags. One of the subalterns had the brilliant idea of using bales of straw which absorbed

Butterflies over Grimsby Cleethorpes (p202)

the explosion better and could be reused, with the added advantage that a protective wall could be built much more quickly. Speed was of the essence to make the town safe again.

Those bombs which fell into houses presented greater problems. My first bomb was lying on a bedroom floor with a 70 fuze. Sapper Maggs, my driver/batman, brought in the sandbags and carried them up to the landing where I took over, tiptoeing into the room and placing them gently around the bomb. It was a lovely room, pink and very feminine and I did my best to preserve it. I even found a board to put on top of the sandbag wall to minimize the effect of the explosion on the ceiling. Pulling a ball of string out of my pocket, I unravelled a few feet and threw the ball out of the window. Tiptoeing back to the bomb I tied a loop of the string round the drogue. Satisfied with my work I went down the stairs into the garden, picked up the ball of string, carried it back to the wall of the house, took up the slack and gave it a short sharp pull – the explosion was quite an experience! I was standing between the ground floor windows which blew out. Only one bedroom window, the fixed one, broke. I had not realized the power of the bomb – it had in fact blown a hole in the bedroom floor and the blast blew out the ground floor windows. Whilst the bedroom furniture was unmarked, the room below was a bit of a mess.

Lieutenant G M Jensen had to dispose of a bomb in a seven-way sewer junction. If it had exploded *in situ*, it would have done untold damage to the town's drainage system. The bomb was almost submerged in sludge, which he removed with a spoon. A wall of straw bales was built round the manhole, with one ready to be slid across the opening once the bomb had been lifted clear. The bomb was withdrawn with the help of a magnet and once clear of the manhole, the straw bale was drawn across and the bomb gently lowered on to it and left for half an hour. As it did not explode Gordon used a slab of guncotton to do the job. (He was one of the three to receive a George Medal.)

According to an account in Major A B Hartley's book, Cliff Green had a bit of a shock soon after he arrived. One report lead Cliff to a bomb in an open space close to a corrugated iron fence. He built a sandbag ring around it, and a police officer was asked to go to the other side of the fence to ensure no-one was in the danger area. Having been given the "all clear", the bomb was exploded. When Cliff went to have a look he heard a sighing sound coming from the other side

Bomb lying on a grass verge.

of the fence and, expecting to find someone badly injured, he dashed round only to find that the "moaning" came from the punctured tyres of a furniture van and a private car.

Because of the damage being caused by using 1lb guncotton slabs – which more than doubled the weight of explosive and increased the blast effect several times over, other methods were explored to destroy 67 fuze bombs. One subaltern suggested opening a window, screwing a hook or ring into the top of the window frame, passing string through the hook or ring and tying it to the bomb. Another string would then be tied to the bomb going straight out of the window. The ploy was to pull the bomb across the room and up to the window with the first string and, once having got it within the window space the second string was pulled to swing the bomb out of the room and the first string let go so that the bomb fell, hopefully, into a prepared sandbag pit below. It could then be left for half an hour and exploded at leisure if necessary. This worked very successfully and a considerable number of houses were cleared without being damaged.

I was next sent to a coal merchant's yard, which had two railway sidings running from the main line to an area just past the railway station itself. It was not known how many bombs there were, only that a workman had emptied a wagon and a bomb had come out with the coal. Unfortunately, for him, it had exploded.

When I arrived the yard had been closed and it was left for Maggs and me to find out how many bombs there were. Not an easy job. I soon

Butterflies over Grimsby Cleethorpes (p203)

discovered that the full wagons were on one siding, whilst the empty ones were on the other line.

I climbed, VERY carefully, onto the buffers of each wagon to check whether it contained a bomb. If it did, the wagon was marked with a chalk cross. I also checked the track between each wagon, just in case! There was no way of checking the fuzes. Slowly, I worked my way along the two lines of wagons. It was easier, and somewhat safer, to look into an empty truck, than to discover where a bomb nestled in the coal of a full one. It took over an hour of continuous climbing and looking before the check was completed and I had found nine bombs, three on top of coal.

I decided to deal with those on top of the coal first, keeping my fingers crossed in the hope that they would all be 70s. I made a hook out of some strong wire, tied it to string and the intention was to throw it past the bomb so that the string lay over some part of it. I would then pull the string – from a distance I hasten to add.

I sent Maggs off to warn those still working in the station building that I was going to start exploding the bombs, and that they were to keep their heads down and keep well away from the windows facing the coal yard, which should be opened in any case.

Climbing on the buffers of the first wagon, I was able, with a bit of difficulty, to get into a sitting position on the top of the end of the wagon. Having made myself as secure as possible, I made my first throw which was way off and I had to haul it in and try again. The second attempt was a little better, but still not good enough. On the third try, the hook landed about 12in past the bomb with the string lying right over the wire cable. I thought I was home and dry. I carefully laid out the string back to the end of the line of wagons, climbed up on the buffers, checked with Maggs who was standing by the station door, blew my whistle and pulled. Nothing! Then I heard the "tinkle" of my hook hitting the ground. It took two more attempts to hook it. It went off as soon as it was moved. I was more successful with the second bomb but was a bit heavy handed in that I gave it a hefty pull so that it exploded as it came off the coal and was actually falling. Being in the open air, the blast effect was greater and some windows in the station building suffered accordingly.

The third went fairly smoothly, exploding as soon as it was moved and sending up a shower of very fine coal dust, plus some large lumps, which went considerably further.

That left the six bombs in the empty wagons. I remained unhappy about jumping into them, particularly as they might be 70s. Then I had an idea. I walked over to the station building to see the station master and explained what I proposed to do. The coal merchant's employees had all disappeared – and who could blame them. I asked for enough men to get one of the coal wagons moving. My idea was that we should unhook the first wagon – which was empty – move it up the siding as far as possible, then get up as much speed as possible for its return trip, so that it would hit the line of wagons hard and, hopefully, provide sufficient shock to explode all the 70s. The station master, a pragmatic man, agreed. Being an expert he knew that only four men would be needed. If my driver and I were two of them, he only needed to tell two of his men to do the job, and he could stay safe and sound in the station.

Having told two of his men to "assist" the officer, he left to seek safety. The first wagon was unhooked without difficulty. It was not too easy to move the wagon away from its friends, however inertia was overcome and we pushed it as far as the points. We then pushed in the opposite direction and as it gathered speed I yelled "DOWN!". We all threw ourselves flat on the ground. After a pause of a few seconds there was the usual thump, as the moving wagon hit the others, followed by clunk, clunk, clunk as wagon buffer hit wagon buffer on the siding. This was followed by bang, bang, bang.

I got up and thanked the two civilian helpers, saying that I was glad they were still in one piece, which did nothing for their morale!

I checked each wagon with a chalk cross. If it had a hole blown in its floor the bomb had gone off, if it hadn't then there was still a bomb in it – and it was probably still ticking! There were three wagons with holes in their floors.

During the next half hour only one more bomb exploded, leaving me with two to blow. After all the explosions and rocking of the wagons, I was a little happier about coming into close contact with the remaining bombs. Hopefully, they were faulty, or duds; I was never to know however, because armed with two slabs of guncotton, both of which had primers and electrical detonators fitted, I placed one by the side of each of the remaining bombs, walked back to the safe point, and pushed the plunger. Several coal wagons might now have holes in their bottoms, but at least the workers could continue to follow their chosen profession without fear of being killed while doing so.

Many fields outside the town contained both bombs and standing corn and I was surprised to find that I had two Crusader tanks, with their crews, attached to my unit. Their job was to tow the reapers. No farmer was prepared to put his tractor and driver into such danger, and the corn was needed. Even the tanks didn't come out unscathed, several times work had to stop because one or other of the tanks lost part of its track when it went over a bomb.

I had arranged to meet the local police inspector in charge of the field searches at the field where the tanks should have been working. They were stationary because one of them was having its track repaired. Most of my men and the tank crew were standing around drinking tea. As we approached, the inspector laid a hand on my arm to stop me. There in our path, about 6ft from the nearest man, was a bomb which no one had seen. I pulled out my whistle, blew it hard to still the men, then told them to get out of the field and to make sure they checked where they put their feet as they walked.

Returning to my truck I collected the ubiquitous guncotton slab etc then back to where the inspector was waiting. I suggested that he get into the tank. Having set up the explosive charge, I blew my whistle, lit the fuze and also climbed into the tank. Thirty seconds later the tank rocked with the explosion and both the inspector and I had a close-up view of it through the tank's periscopes.

The inspector then told me about a bomb just discovered in the yard of the very farm we were on. The inspector lead the way in his car, whilst I followed in my pick-up. At the farmhouse we walked to the back of the house where the farmer explained why so much time had elapsed before the bomb had been discovered. Apparently, they closed the door of the barn, which had been open for sometime, and there it was. I knelt down to identify the fuze. It was a 67.

I told them it would have to be blown and suggested they return to the house, open all the windows and sit in one of the rooms in the front. By the way, did they mind if I used some of their bales of hay to reduce the effects of the blast?

I went back to the truck to collect the guncotton and accessories. Calling Maggs, we returned to the barn and placed half a dozen bales of hay carefully around the bomb. I gently put the charge in place making sure it was in contact by using a lump of earth to wedge it in place. Telling Maggs to retire round the corner, I lit the fuze and walked back to where he was standing. Half a minute later there was a satisfying bang, followed by another about 30yds behind us. We both threw ourselves on the ground but were too late. A bomb, which must have lost its drogues, had come to rest in the gutter where it had lain completely hidden.

Neither of us was badly injured but we both received a number of pieces of shrapnel, mostly in the part upon which we usually sat and so were uncomfortable for a few days. A trip to the local cottage hospital resulted in the offending pieces (embarrassingly) being removed.

Within eight days the towns of Grimsby and Cleethorpes had been cleared of reported bombs and the officers and sergeants all returned to Tollerton Hall.

Butterfly bombs still abounded in the fields however and the next report I picked up was for six in a field of beans. The field had been searched some time previously by members of the local Home Guard, who had marked the position with two foot long sticks; unfortunately, by the time I got there the beans were three feet high! Maggs and I spent the whole of one afternoon searching, eventually finding all six and marking them with longer poles. Having identified each fuze, the 67s were to be dealt with first as usual.

The split was 50/50 – three 67s, three 70s. I decided on a multiple explosion and we cut up electric cable into lengths sufficient to reach each bomb from a central position. The cables and charges were laid and so we retired to our "safe point" pushed down the plunger and all three bombs exploded, plus one of the 70s.

Having tied string round the wire cables of our last two bombs, we again returned to our "safe point" and pulled. This resulted not in two explosions but three! – almost catching us out as we stood up after the first two exploded. Again, sympathetic explosion had set off a bomb which had not been found.

The Farmer, a very wise man, did not put anyone into that field to pick the beans until they had died down – ANOTHER FOUR BOMBS WERE FOUND. We had been walking round that field for the whole of one afternoon. It had a profound effect on me knowing that I might have been killed looking for six bombs when there had been, in all, 11.

There were a number of similar incidents and when I finally completed the task, I wondered just how many of my "nine" lives had been lost.

Background Notes on the Butterfly Bomb Attacks

MAJOR A S HOGBEN QGM

ABOVE, Colonel Wakeling describes some of his experiences in Grimsby and Cleethorpes following the German air raid when, for the first time in the UK, the effects of the mass use of antipersonnel submunitions were fully appreciated. The bomb used, the German SD2 (*Spreng Dickenwend* 2kg) or butterfly bomb, is illustrated in the drawing opposite

At the time of the attack upon Grimsby, the SD2 was far from being a new weapon. The first reported use of the bomb against the UK was on 28 October 1940, when a number were dropped on and around the town of Ipswich. A few failed to explode and members of 8 BD Section of 4 BD Company were sent to investigate. On arrival they found that several police officers had handled the bombs with fatal results. The section commander and his sergeant set about destroying the remainder, but found one in which the arming spindle had not fully unwound. With considerable risk to themselves they screwed it fully home, removed the fuze and thus acquired the first SD2 bomb and fuze. All fuzes in this incident were the No 41 direct impact or very short delay type. A few days later another 69 bombs, of which 18 failed to explode, were dropped in Sussex.

As a result of these attacks details of this new bomb were circulated to air-raid precaution organizations and BD units. However, at that time Britain was being heavily attacked with bombs up to 500 times larger, and so information about the SD2s tended to be filed and forgotten.

In early 1941 Lieut Colonel S M Lovell, was a member of the British Military Mission to the Soviet Union, and he reported the German use of SD2s against massed Soviet ground troops which had resulted in large numbers of casualties. In 1941 the RAF also experienced their first taste of the SD2, still fitted with the No 41 fuze, when they were dropped on airfields in Lincolnshire. In August 1941 two NCOs of 22 BD Company were killed clearing SD2s at Sarsted in Essex.

During 1942 there were no recorded cases of SD2s being dropped on the UK, although many hundreds were dropped in the Middle East, and the threat from these bombs was therefore largely forgotten until March 1943, when over 1800 were dropped on London, Kent, Sussex and Essex. It was at this stage that the 30 minute delay fuze, No 67, and the anti-disturbance fuze, No 70, were first reported.

After the first attack on Essex on 3/4 March 1943 real publicity was given to the SD2. Announcements were made on the radio, and photographs published in daily papers warning the public on no account to touch these bombs. Leaflets similar to those published in 1940 were distributed to every school and police station in the country – even so this still did not prevent a number of deaths and injuries later in the year.

The threat from these bombs was finally appreciated when over 9800 were dropped on towns, cities, RAF stations and army bases during June to October 1943. Drastic action had to be taken to reduce their effects, particularly amongst the civilian population, where the disruptive effect was much more noticeable.

The first attack during this five month campaign was perhaps the most publicized, the one against Grimsby and Cleethorpes. Following this attack 61 civilians were killed by SD2s, 14 during the raid, 31 within the first hour following the "all clear" and the remainder during the next 12 hours. Many of the later deaths were caused by a lack of awareness of the danger. There was one incident of children finding bombs, taking them home and being told to put them back where they found them!

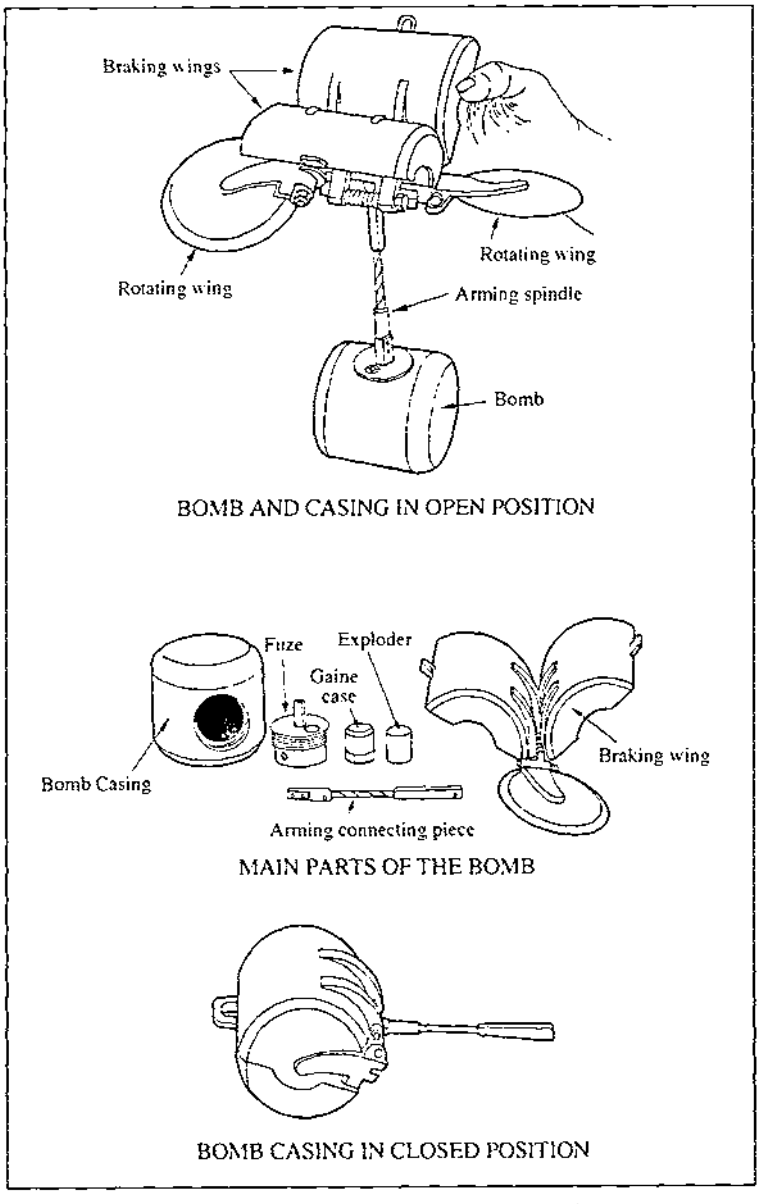
This then was the situation when Lieutenant Wakeling (as he then was) deployed to Grimsby with members of 3 BD Company to face over 2000 unexploded SD2s. As he indicated, many of the techniques used to remove these bombs from such inaccessible places as attics, bedrooms, church organs and a cinema projection room would have done credit to Heath Robinson.

The next major attack occurred during August 1943 when about 3000 were dropped on Yorkshire, Lincolnshire and Norfolk, mainly on RAF bomber stations. In September a further 1500 were dropped on Norfolk, Lincolnshire and

Sussex. This pattern was repeated in October and by the end of the year a total of over 11,700 butterfly bombs had been dropped on the UK.

It is surprising that a similar or greater number were not dropped during the first half of 1944 on one of the best military targets imaginable, the many thousands of allied troops massed in huts and tents along the English south coast preparing for the invasion of Europe. Yet, apart from a few widely dispersed raids only one deliberate SD2 attack was launched and that was against a hutted camp near Bovington in May when, as expected, a number of casualties occurred among the troops.

Why then was this opportunity lost? One reason is given in Colonel Wakeling's article when he says "The whole area was designated as one vast category "A" bomb..." which resulted in BD personnel taking considerable risks just to protect property, the loss of which would have had no direct effect upon the war effort. It could be argued that their lives were far more important than residential property but it was essential to restore normality to the towns as quickly as possible and with the minimum of damage, not only for the sake of the morale of the inhabitants but also to minimize accounts of the results of this extremely effective weapon to those who might report them to the enemy. The men of all three services who dealt with butterfly bombs in a variety of situations, did so with the minimum of fuss and it must be assumed therefore that the apparent ineffectiveness of this form of attack was thus reported to Germany.



German SD2 antipersonnel bomb (butterfly bomb).

In 1944 BD units were deployed to the south of England to deal with possible SD2 attacks against the massed allied troops but, as I have already mentioned, these did not occur. Many believe that the lives saved by this nonevent were the result in part of the bravery and inventiveness of BD men in 1943. Today 50 years later we should remember them and give thanks.

Minefield Clearance in Guernsey

CAPTAIN H W BECKINGHAM

The author enlisted into the Territorial Army as a sapper and, after mobilization in September 1939, was posted for a period with 256 Field Company, before spending the remainder of his wartime army service with various units working on the disposal of unexploded bombs in north London and the West End, Fulham and Victoria, Leeds, Hull and Redcar.

Attending Pre-OCTU at Wrotham in January 1943, he was commissioned into the Corps in August that year. After a number of specialized courses with the Royal Navy, promotion to lieutenant, a final posting as OC of 24 Bomb Disposal Platoon, led to the events which form the basis of the story told below.

Promotion to captain came in February 1946 and demobilization in June the same year.

He is now retired and living in Southport.

This article is extracted from full notes, photographs and drawings, now lodged in the Royal Engineers Library.

Introduction/Background

I HAVE been encouraged to write about my work in the clearance of minefields, and other explosive devices used by the German Occupying Forces in the Channel Islands, so that future generations may understand how the Channel Islands became known as "The Fortress Islands" during the Occupation from June 1940 to May 1945.

Having spent the time between 7 September 1940 to 18 September 1944 working on bomb disposal (BD) I was posted to command 24 BD Platoon. This unit was to become part of *Force 135*, a task force assembled in the Plymouth area for the liberation of the Channel Islands.

I consider myself extremely lucky to be one of the very few who were in BD from its inception in April 1940 to have survived, when the average life expectancy of a BD officer was approximately ten weeks. I lost many friends killed by unexploded bombs (UXB) and mines in the course of their duties dealing with the silent enemy.

This is my tribute to them.

Colonel B S T Archer GC OBE ERD, whose career with BD started in 1940 and continued until the 1960s when he was appointed Honorary Colonel BD Regiments in 1963, stated in a letter lodged with the full notes that it is not normally appreciated that BD units are required to do their hazardous job, not only during war but for a long time after hostilities have ceased; therefore they spend more of their time "in action" than virtually any other branch of the armed forces.

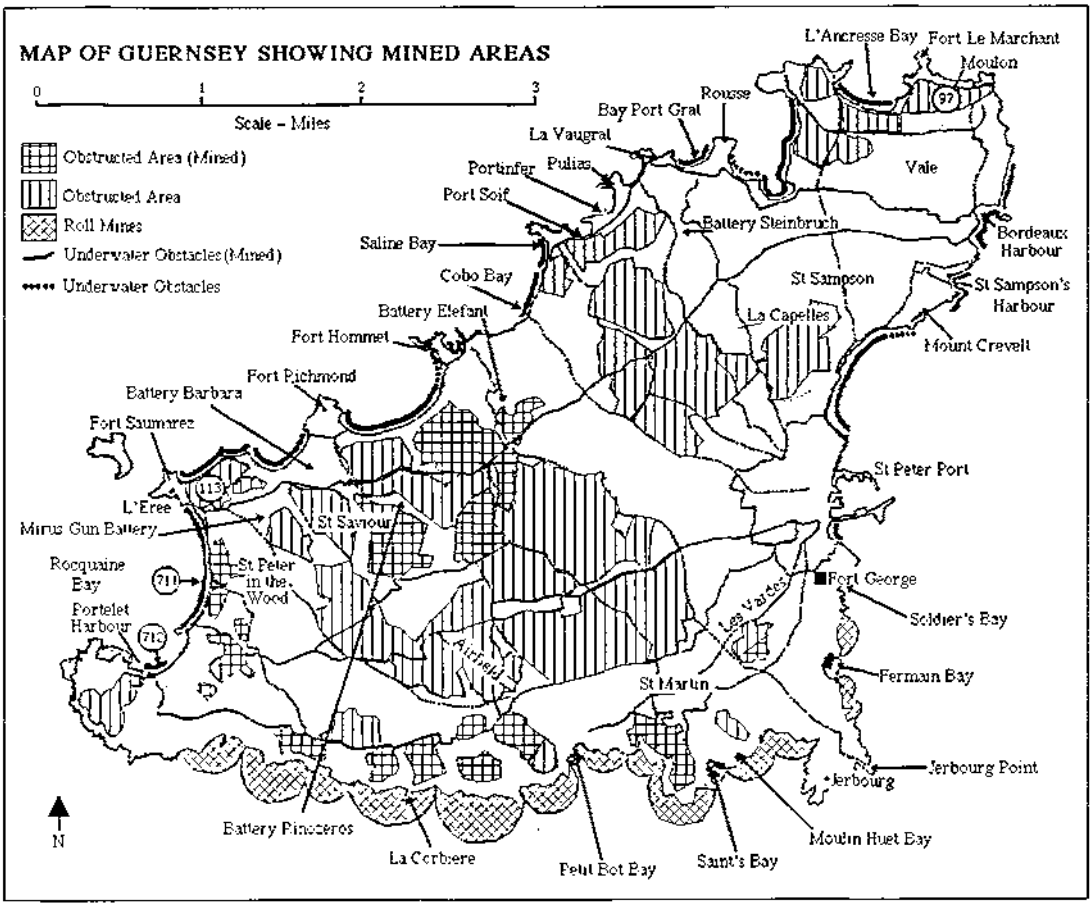
Guernsey

FOLLOWING their successful advance across France, the German forces, were planning to mount an invasion of the Channel Islands under the code name *Green Arrow*.

In the late afternoon of the 28 June 1940, *Luftflotte 3* (Airforce 3) carried out an armed reconnaissance over St Helier in Jersey and St Peter Port in Guernsey, in which nearly 200 bombs were dropped, causing death and destruction in the port areas. The main German Occupying Forces landed on the island of Guernsey during the evening of 1 July 1940 and consisted of units drawn from *216 Infanteriedivision*.

Although the Occupation of the island had been accomplished, life on Guernsey carried on

Capt H W Beckingham
Minefield clearance in Guernsey (p208)



much as normal. More than six months went by before any serious consideration was given to the fortification and defence of the island. Probably the German commanders anticipated that the invasion of mainland Britain was imminent and, therefore, the defence of the island was not warranted. However the first mines consisting of 21 "S" mines (short for *Schrapnellmine*) were laid in November 1940 in the approach lane to Fermain Bay.

During the following six weeks men of *216 Infanteriedivision* laid a further 103 "S" mines in small clusters in the areas of Saints Bay, Moulin Huet and La Corbiere in the south. In January and February 1941 a further 231 "S" mines were laid and then the whole operation came to a standstill. The mines used were placed in small clusters or in single lines across the access lanes and footpaths leading from Petit Bot, Fermain and Moulin Huet Bays.

When Germany invaded Russia on 22 June 1941, opening up the Second Front, Hitler was of the firm opinion that the Allies would launch attacks upon the Channel Islands to help pin down German forces in France and thus help to reduce the pressure on the Russian Front.

That same month, Hitler gave *Generalfeldmarschall* Gerd Von Rundstedt, the Supreme Commander (West), orders to strengthen the defences of the Channel Islands by installing heavy coastal batteries, laying more minefields, and securing beaches by the installation of underwater obstacles, mined Tetrahedra etc. Roll bombs were to be located along cliff tops ready for release should a landing be made. Flame throwers installed at road junctions and other strategic points and obstructions, in the form of poles fitted with explosive charges, against possible parachute or glider landings, were extensively used over the island's interior. On the Contentin

New Pier – St Peter Port showing demolition charges in position. 198 300lb French shells.

Peninsula, *General* Erich Marcks, who commanded LXXXIV *Korps*, had five divisions under his command for the defence of the peninsula, one of which was *319 Infanteriedivision* which was moved to the islands to replace *216 Infanteriedivision* in July 1941. Upon its arrival, the situation in respect of the defence of the islands changed dramatically.

On Guernsey the *Ingenier Bataillon*, under the command of *Hauptmann* Kias, began to lay its first minefield consisting of 189 "S" mines, at Fort Le Marchant on 27 October 1941. Minefield laying continued on the western promontories, and 3393 "S" mines and 8 Tellermines were laid at Fort Saumarez, Fort Richmond, Fort Hommet, Port Soif, Pulias, Infer and Rousse, before the year was out. The work continued unabated throughout 1942 when a further 9222 "S" mines, 446 Tellermines and 518 improvised mines were laid along the cliff tops of the south coast.

The following year saw the first introduction of "improvised mines" which were of wooden construction, similar in detail to the *Schu* mine (an abbreviation of *Schutzenmine*) but were designated by *Pionierbataillion 319* as *Behelfsminen*/B2 and *Behelfsminen*/B4. Some 10,519 of these mines together with 3904 "S" mines and 512 Tellermines were laid during 1943. These two particular antipersonnel mines were used extensively to form protective minefields around the gun batteries of Mirus, Rinozerous, Barbara, Steinbruch and Elefant and also at the airfield where some 4000 were placed around the perimeter.

In 1944 a further 43,842 mines were laid, the bulk of which were "S" and *Schu* mines. This same year existing minefields were strengthened, and gaps were filled in along the coast. A further 1082 "S" mines were laid at L'Eree, (minefield, number (113)), and an additional 1452 "S" mines introduced into minefield number (112) adjacent to St Sampson's Harbour. The last minefield (number (54)) was laid at Jerbourg on 23 March 1945 some six weeks before Liberation Day.

In all there were 115 minefields on Guernsey containing 72,866 mines. The Germans lifted 6110 mines from 21 minefields during 1944 so we were left with the task of clearing 66,456 spread across 94 minefields.

At the same time that mines were being put down other troops were engaged in installing anti-paratroop spiders over a very large area of the island. These spiders consisted of 300lb French Shells standing in the middle of a field with numerous wires leading from the detonators through an overhead ring to posts around the perimeter of the field. These wires were supported 8ft from the ground, which enabled cattle to graze in the fields. There was a similar arrangement to protect the areas around the airfield, Bordeaux Harbour, L'Ancresse Common etc against gliders and parachute landings. Poles were dotted over the areas and a shell buried 6ft from each pole. A ZZ35 igniter was then wired from the nose of the shell to the top of the post.

In addition to the above, over 1000 Roll Bombs had been placed along the south cliffs. These again consisted of 300lb French Shells secured by wire and a picket to the cliff top. A ZZ35 igniter was screwed into the nose of the shell and a wire lead from it to another picket. In the event of a landing, the wire holding the bomb would be cut, the fall of the bomb would activate the igniter and an explosion would take place.

Capt H W Beckingham
Minefield clearance in Guernsey (p210)

Mines were also set up above ground, with no attempt at concealment, as a direct defence against invasion. All the beaches were obstructed with antitank girders set in the sand and wired to shells to protect against the landing of tanks and landing craft. There were also thousands of Tetrahedra and Czech Hedgehogs, many with Tellermines attached. The piers and jetties in St Peter Port and St Sampson's harbours had also been prepared for demolition using 27cm captured French Shells, placed around the concrete columns supporting the jetties. There were also mined underwater obstacles in Petit Bot Bay, Fermain Bay and Saints Bay, consisting of Russian and French Shells with pull igniters.

This then was the background to the immense task facing us on arrival in the island of Guernsey, and it is no over statement to say that the Channel Islands were one of the most heavily fortified areas in Western Europe.

Force 135 – Operation Nestegg

Having spent five years in BD, my first "overseas" posting in 1944, was from 14 BD Company, Leeds, to Fort Tregantle, Plymouth, to take command of 24 BD Platoon, which was to form part of *Force 135*.

Force 135, consisting of some 6000 men under command of Brigadier A Snow, was being assembled to undertake the liberation of the Channel Islands under the code name *Nestegg*.

On reaching Plymouth, I reported to Lieut Colonel Wilkinson, CRE 158 Works Unit, who informed me that I would also act as mines officer and that we were to take part in the liberation of the Channel Islands at some unknown date in the future.

By the end of December 1944 continuous training programmes were becoming boring so I decided to seek permission to undertake real minefield clearance. We were allocated a stretch of beach minefields adjacent to the railway running into Penzance, where my men came face to face with the British "B" type "C" antitank mine. In April 1945 we undertook further minefield clearance in the Weymouth area, and it was whilst there that a signal was received notifying us that Operation *Nestegg* was to be launched. We returned to Fort Tregantle and commenced the task of loading all our vehicles and equipment ready for sailing.

Pomme D'Or Hotel, St Helier, Jersey. German Naval Headquarters.

The liberation force had been split into two, one section, code named *Agent*, going to Guernsey, and the other, code named *Booty*, proceeding to Jersey.

24 BD Platoon had also been divided into two detachments, one going to each of the islands. Sailing from Plymouth at 1600hrs on 11 May 1945, the islands were reached shortly after 0700hrs the next day.

Jersey

I went with the detachment bound for Jersey and landed with a small detachment of my own men plus four military policemen who had been seconded to me. My orders were to proceed to the Pomme D'Or Hotel on the Esplanade, which was being used as German naval headquarters. I was to take the German force commandant (*Kapitan* von Kleve), a prisoner of war (POW) and to have him escorted back to the landing craft by the military police who had landed with me.

The Pomme D'Or Hotel was checked for booby traps, mines etc and once cleared Colonel Robinson, established his Tactical Headquarters at the Hotel. I then moved into St Helier seeking suitable billets for my men and vehicles.

On the first two days I carried out a general reconnaissance noting positions of minefields, flame-throwers, gun emplacements etc. During the following week the platoon dealt with a large amount of gelignite which had been stored at Fort Regent and was in a very unstable and dangerous condition. This was transported in small

Minefield clearance in Guernsey (p211)

quantities by 3-ton lorries in which we had placed two layers of filled sandbags over the whole of the floor area. It was taken to the golf course and burnt.

Guernsey

On 28 May 1945 I left Jersey with the detachment and sailed for Guernsey. On arrival I made my way to Montville Road, Les Vardes, where a detachment of my unit had made their billets in three large houses.

I reported to the CRE, Lieut Colonel Wilkinson whose HQ was in St Peter Port and received orders to take over the responsibilities of minefield clearance etc, from 259 Field Company. A meeting was arranged between myself and a German engineer officer named *Hauptmann* Kias. He was the officer in charge of *Pionierbataillon 319* (the German equivalent of a field company RE). With *Hauptmann* Kias was a German corporal, *Obergefreiter* Adt who spoke perfect English and was to act as an interpreter between Kias and myself for the next 12 months.

It had been arranged that German Engineer Unit POW would be responsible for clearance of all minefields and explosive charges etc, under the supervision of British Sappers, and, it had been agreed that some 300 POW would be retained to undertake this work. We had 42 NCOs and Sappers in 24 BD Platoon, 30 of which could command a working party of ten POW making 30 working parties available daily.

Clearance Commences

Work commenced in three minefields: number (117), consisting of *Schu* mines which protected the airfield; (97) (Moulon) in the area of L'Ancresse Bay, consisting of "S" mines and Tellermines and a minefield situated at Mount Crevelt (adjacent to St Sampson's Harbour) which involved clearing of "S" mines, *Schu* mines, Tellermines and French antitank mines.

On Guernsey the Germans had adopted a system of designating all north/south roads *Rote* (red) and those running east/west as *Gelb* (yellow). I would meet Kias each morning at a pre-arranged rendezvous point, and Kias would bring the relevant plans for minefields in which we would be working that particular day. It was his responsibility to establish the base line of each minefield before the troops went to work. The base line was established from what were known as *Punkte* (points); small blocks of concrete carrying an identifying mark such as P1, P2 etc. First and foremost, it must be said that, when it came to lifting the mines, the thoroughness of *Hauptmann* Kias and his detailed minefield plans saved many lives. The charts were very accurate, all had serial numbers, and there was a separate chart for each section of the minefield.

The working parties were initially broken down to do the following tasks:

- Minefield clearance.
- Anti-landing pole clearance.
- Transporting mines to quarry dump.
- Clearing beaches of Tetrahedra etc.
- Check-sweeping minefields.
- Clearance of barbed wire to quarry dump.

The types of mine to be cleared were predominantly antipersonnel, with German antitank Tellermines and a large number of captured British and French mines. The perimeter of the airfield was cleared by 26 May 1945 after no fewer than 4100 *Schu* and 600 French antitank mines had been lifted. Clearance continued at a great pace throughout June and July with an average of 1500 mines being lifted daily.

In minefield number (79) which was situated on the cliff top above Soldiers Bay, a 500lb unexploded British bomb was found lying just below the surface – presumably one dropped during the raid carried out by the Royal Canadian Air Force in 1944 on the radar installations at Fort George.

In July work commenced to clear a minefield (108) at Baie de Port Grat consisting of Tellermines and French antitank mines, all of which had been fitted with anti-handling devices fixed beneath them. These mines could not be lifted without great loss of life, so I decided that each mine would have to be detonated separately. Notices were printed in the Guernsey press to warn local residents. The adjacent coast road was sealed off and residents with cottages fronting on to the road were evacuated. I sandbagged the first mine, placed a small charge on it with further sandbags on top to deaden the blast and retired to a safety point with the exploder. When I

pushed down on the plunger there was a terrific explosion and the whole of the minefield went up in one huge bang as the shock wave caused sympathetic detonation across the field. A Mrs Duquemin lived in one of the cottages and the blast took the roof off her property. However, when I met her to explain what had happened, her reply to me was simple, "Don't worry, you have got rid of the Germans, now you have got rid of the mines, so we can now rebuild our homes and live in peace." I then arranged for a number of workmen to start work immediately on repairing her property.

In the summer of 1989 I had the good fortune to meet Mrs Duquemin's son who asked me if I remembered the words his mother had said to me all those years before when I asked her to vacate her cottage. She had said, "I haven't moved out of the cottage for the Germans so I am not going to move out for you." Thank goodness she had carried out my wishes!

Another Guernsey man who remembers this incident is Leonard Le Tissier of La Vaugrat, St Sampson's, who told me that the blast literally moved one of the greenhouses in an adjacent field completely off its foundations. On a recent visit to the island, Mr Le Tissier took me back into the old minefield to show me some of the craters which had been formed by the explosion. A lot of these have been filled in, but many, although now covered with grass, can still be identified.

The fact that all minefield clearance in Guernsey was completed by 25 July 1945 shows the remarkable speed of the operation, bearing in mind clearance had only commenced on 18 May. It was an exceptional feat when one remembers that nearly 67,000 mines were dealt with over a period of two months.

Working 12hrs a day, seven days a week, it was inevitable that there would be casualties. Six German POW lost their lives and 14 were wounded, some seriously. The first of the six German fatalities occurred on 28 May 1945 when *Feldwebel* Gustav Schmeck and *Gefreiter* Erich Kotel were killed in minefield (97) at Moulon (L'Ancresse). The most dangerous time was just after the morning break at about 10am or restarting work after lunch, when concentration had been broken. Most of the POW were killed going forward and tripping an "S" mine. The person treading on the mine would hear a click before it exploded, and one brave soldier, on hearing the click, kept his foot on the mine to stop it blowing out of the ground. He lost a leg but saved his fellow comrades working around him.

It should be noted however that the sacrifice would have been much greater if we had not been provided with such accurate plans by the German Command.

Mine Types

THERE were six main types of mine laid in Guernsey. First the *Schrapnellmine* more usually referred to as the "S" mine. This was an antipersonnel device which was operated by direct pressure of about 15lb on a push igniter in the head, or by a pull from one or more trip wires attached to a pull igniter. The mine was cylindrical in shape and consisted of an outer casing and an inner cylinder which contained a TNT charge surrounded by approximately 360 ball bearings. At the base of the mine is a black powder propellant charge. When the igniter fires, the flame produced flashes down the centre tube, setting off this powder charge which throws the inner cylinder into the air. At the same time the detonators are ignited and they in turn set off the main charge. The delay in detonation permits the casing to rise to 2-3ft above ground level before exploding. The shrapnel filling is effective up to a range of about 200yds. This mine could be activated by a ZZ35 igniter with a three pronged antenna or it could also be used with a "Y" adapter and two pull ignitiers to which could be attached trip wires connecting a series of mines together. The third alternative was to use a three way adapter so that a three prong pressure antenna and two pull igniters could be used.

The second most common type was the *Schutzenmine*. The *Schu* mine (also sometimes described in English as the "shoe" mine) was a small wooden box with a hinged lid, containing approximately half a pound of explosives. It was activated by pressure on the lid which pushed out the pin from the ZZ35 igniter. The igniter could be wired to a small stake or alternatively two or more mines could be joined together by means of trip wires. This mine was generally constructed using tongue and grooved joints so that they were extremely difficult to locate using

Underwater obstacles in Vazon Bay – steelgirders with Tellermine on top.

the standard mine detector. They had to be located by crawling along the ground and prodding gently with a bayonet at an angle of 30° to prevent the mine being fired.

Another antipersonnel mine was known as the "stockmine" and was used in conjunction with the anti-landing poles and also as a warning that an attempt was being made to breach a minefield.

"Stockmines" consisted of a small hollow concrete cylinder made of weak cement mortar or clay pot (land drain) into which a shrapnel filling was introduced. An explosive charge was incorporated and activated by a ZZ35 pull igniter. This mine was mounted on the anti-landing poles or on a wooden picket driven into the ground. A trip wire from the pull igniter was taken to a suitable point and secured.

The main German antitank mine was known as the Tellermine. There were basically three types, namely, the 35, 42 and 43. They consisted of a flat circular steel bottom, a steel body having a cylindrical side wall and a slightly dome-shaped top with a centrally located well into which a pressure cap was fitted. The mine also contained two other detonator wells, one on the side of the body and one in the bottom. These two detonator wells were used in conjunction with a ZZ35 pull igniter when the mines were booby trapped. German field engineers made full use of their two basic igniters, which gave them much flexibility with all their mines and booby traps etc. The ZZ35 pressure igniter was used with deadly efficiency in the "S" mines and *Schu* mine whereas the ZZ35 pull igniter was used in conjunction with the *Schu* mines, Roll Bombs and also to booby trap Tellermines. It was also used effectively in conjunction with the anti-paratroop "spiders" which covered half the island.

Lastly there were the B2 and B4 mines. The B2 had been developed by *Pionierbataillon 319* for use in the Channel Islands, presumably because their stocks of the standard antipersonnel mines had been exhausted. It consisted of a wooden box with a separate wooden lid, attached to which were two metal strips leading down below the small explosive charge to the pin in the ZZ35 igniter. Pressure on the lid caused a pull on the igniter which in turn detonated the mine. A nail was used as the safety pin to the mine prior to it being laid.

The B4 also consisted of a wooden box with a small charge placed in its base. A cantilevered piece of wood activated the ZZ35 igniter when the small block of wood which projected from the main casing was depressed.

Tetrahedra on the beaches were "armed" with Tellermines, although after being subjected to the action of the sea for some two or three years, some of the mines had been washed off. Many were found scattered on the rocks or partially buried in the sand.

Minefield clearance in Guernsey (214)

Other Tasks

Whilst minefield clearance was taking place, a number of other operations were going on. One entailed the removal of all anti-landing devices on the beaches, the majority of which had a Tellermine attached. Every beach around the island was affected. Portelet Harbour was the first to be cleared, the area designated by the serial number (712). Rocquaine Bay (711), Saline Bay (705), and Cobo Bay (706) were then cleared on 31 May 1945. This was a two-part operation. One working party removed charges, and another party removed the stakes. Removal of the remainder of the obstacles around the coast and in the bays continued until the end of June 1945, with the exception of the special underwater obstacles situated in Fermain Bay, Saints Bay and Petit Bot Bay.

The third major task was the clearance of the anti-air landing poles covering a very large area of the island. This operation was systematically carried out by concentrating on one map reference square at a time until the island was clear. All the barbed wire was then removed and the job completed by the end of July 1945.

Having cleared the beaches and the interior of the island we turned our attention to the cliffs along the south coast where Roll Bombs had been hung on the cliff faces. In just over a month, nearly 1000 Roll Bombs were destroyed. Warning notices were published in the press warning people that these bombs were to be detonated *in situ* and asking people in the vicinity to open all their doors and windows to minimize damage caused by blast.

When the *Luftwaffe* bombed St Peter Port back in 1940 three 250kg bombs fell in the area of La Capelles and failed to explode. The Germans did nothing about defusing them and these three UXB lay silent and lethal for over five years. We found the holes of entry on the site of disused greenhouses. Each bomb had penetrated to a depth of 20 to 25ft. Two of the bombs had impact fuses fitted, the third had a delayed action clockwork fuse which could be set to detonate the bomb anytime up to 80hrs after it had been dropped.

Underwater Obstacles

With all known minefields, landing poles and beach obstacles cleared by the end of July, there remained only the underwater obstacles situated in Fermain, Petit Bot and Saints Bays.

These consisted of steel girders to which were attached wires leading to 300lb French shells buried in the sand. These obstacles were below water even at spring tides and, to add to the problem, I was told that the main telephone cable between Jersey and the island entered the sea at Saints Bay and under no circumstances could these obstacles be removed by detonation. I decided that the only way of tackling them would be to don a diving suit to enable me to stay under water long enough to render them safe prior to their removal. The diving suit and all the necessary equipment were obtained from the naval authorities in England. The next step was to wait for a spring tide so that I would be working in a minimum depth of water. The task of clearing the obstacles in Fermain and Petit Bot bays went without a hitch.

Having gained my confidence as a diver, I decided to tackle the obstacles in Saints Bay, and warning notices appeared in the press warning all civilians not to approach within 500yds on 22/23 September. We started work at low water and, having cleared about four obstacles, were about to start on the fifth when a wave suddenly rocked me back on my heels. I made an instinctive grab for the girder but a POW standing alongside shouted *"Nein Oberleutnant!"* He probably not only saved my life but his own too, although possibly it was the latter that was more important to him.

No further unforeseen incidents took place and Saints Bay was cleared of all its deadly impediments, yet I often wonder whether the thousands of holiday makers who sit on and swim off the beach in the bay each summer realize what it was like back in 1945.

At the beginning of April 1946 all the German POW who had worked hard and diligently over the previous months in clearing the island were transported to England. At my last meeting with *Hauptmann* Kias, he presented me with his map case and other military items, saying that he would have no further use for them.

Today Guernsey is a much safer place than when I first landed there in 1945, although I suspect that there could still be the odd Roll Bomb or Tellermine which had been washed off the various beach obstacles still buried under the sand on the beaches.

ACKNOWLEDGEMENT

The author is indebted to the Royal Court, Guernsey, for their kind permission to reproduce a number of photographs from *Festung* Guernsey.

Memoirs

MAJOR GENERAL W S COLE CB CBE

Born 29 March 1902, died 26 December 92, aged 90

AN outstanding staff officer and administrator who was one of Wavell's operational planners in the early days of the desert war, and Mountbatten's Deputy Quartermaster General in South East Asia, William Scott Cole was the brigadier who masterminded the British withdrawal from Palestine when the mandate was surrendered in 1948.

His father, also William Scott Cole, was a member of the Survey of India, being the Superintendent of the Trans-Frontier Survey of Baluchistan. His uncle, Sir Edward Cole commanded Probyn's Horse (the 11th Bengal Lancers). Cole was born in Karachi and educated at Victoria College, Jersey, where his family settled in 1910, and at the Royal Military Academy, Woolwich, where he passed out second on the list and won the Rainey Anderson prize for French. He was commissioned into the Royal Engineers on 22 December 1921 and won the Fowke Medal for construction while on his engineering course at Chatham.

Early years in the Army were spent back in India with the Madras Sappers and Miners at Bangalore. He was Garrison Engineer in Poona and Rawalpindi and served on the North-West Frontier at Razmak, Bannu and many other stations. Cole's temporary postings included ones to Rangoon, Kashmir, Mandalay and the Northern Shan States. He was in charge of planning for the raising of the Burma Sappers and Miners in the mid-1930s.

Recognized early in his career as a potential high grade staff officer, he obtained a competitive vacancy to the Staff College, Camberley, in 1937. On returning to India in 1939 he was appointed Assistant Commander Royal Engineers in Calcutta and, six months later, selected to be GSO3 (Joint Plans) at the new Military Headquarters, Middle East, in Cairo. He was a foundation member of GHQ Middle East when General Wavell had only five staff officers.

Cole travelled with Wavell, as his GSO3, to all the important political and military conferences with the French, Turks and Greeks in the run up to the Second World War and on visits to units around the vast Middle East Command.

Wavell promoted him to GSO2 in charge of planning in early 1940 and, after the Italian invasion of Egypt that autumn, he became GSO1 (Plans) to the planning staff in Cairo. In this role he played a full part in Wavell's highly secret preparations for the counteroffensive which culminated in the defeat of the Italians in the battle of Sidi Barrani in December 1940, and their expulsion from Cyrenaica early in 1941.

During a six month posting to the War Office as GSO1 Operations – Middle East Section, he dealt with all of General Wavell's active operations in the Western Desert, Abyssinia, the attacks from both Sudan and Kenya and then Syria, Greece and Crete. The Prime Minister used to ring Colonel Cole late at night, at least three times a week, for the latest information and, on the day Tobruk was invested for the first time, Colonel Cole had personally to brief Mr Churchill in the Cabinet Room at No 10.

Maj Gen Cole CB CBE

His only wartime command came as commander of the Royal Engineers at Alexandria for a short period in 1941, when he was responsible for the water pipeline from Alexandria to Mersa Matruh and for certain preliminary works on the El Alamein line. In 1942 he joined the Staff of General "Jumbo" Maitland Wilson's Persia and Iraq Command, when the Germans threatened to strike south through the Caucasus mountains from southern Russia. He made several visits to Moscow and Tehran to coordinate the defensive planning.

When the battles of El Alamein and Stalingrad ended the German threat to the Middle East, he was transferred, in 1943, to Mountbatten's South East Asia Command as his Deputy Quartermaster General, responsible for high level administrative planning and execution of operations in Burma, and then for the reoccupation of British, French and Dutch territory in the Far East.

In 1946 he was posted back to the Middle East as the brigadier in charge of administration in Palestine. He headed a special committee controlling the building of permanent barracks for what was expected to be the long-term garrison of the mandated territory, but within a few months the Attlee government decided to give up the mandate and Cole became responsible for planning the administrative aspects of the withdrawal. The operation went remarkably smoothly from the administrative point of view and justified Cole's later claim that nothing of any value was left behind.

After a year's sabbatical at the Naval War College, Greenwich, he was appointed Director of Plans at the War Office in 1948 during the run-up to the Korean War and the start of the rearmament programme. He was then sent to Italy to head the British Military Liaison Staff in Rome in the early days of NATO. A couple of years later he was back in the Middle East for a third time, as brigadier in charge of administration in the Suez Canal zone.

Promoted major general in 1955, he ended his career in 1958 as Deputy Quartermaster General in the War Office. He decided not to seek a second career and returned to Jersey where he devoted much of his time to the scouts.

He was appointed CBE in 1946 for his services in Burma and the reoccupation of the Far East, and CB in 1949 for his services in Palestine whilst still a brigadier – a distinction normally reserved for major generals. He also won the American Bronze Star and was twice mentioned in Despatches.

Bill Cole was a first-class polo player and an excellent shot; pig-sticking and tiger shooting were among his other enthusiasms. Latterly he compiled notes for a history of India and a study of Hindu mythology.

He married first in 1948 Kathleen Coleing. They had one daughter, but the marriage was dissolved. His second was to Alice (Jane) Rose Pitts in 1971. He is survived by his widow and daughter.

(This memoir is based on the obituary published in The Times *on 1 Jan 93 and includes extracts from the obituary published in the* Daily Telegraph *on 3 Feb 93.)*

LIEUT COLONEL R H EDWARDS ERD

Born 29 August 1901, died 30 December 1992 aged 91

Roy Edwards managed to encompass at least two careers in his long and active life, for he was both a distinguished soldier and a widely respected and eminent engineer.

Educated at Monkton House School, in 1917 following the steps of his father and grandfather, he was articled to the then Chief Engineer of the Taff Vale Railway Company which was later absorbed by the Great Western Railway Company. He subsequently spent virtually the whole of his professional career in work on all the docks in the south Wales area, becoming Chief Civil Engineer, South Wales Docks, in 1954; a post he held until his retirement in 1965.

He first enlisted as a volunteer private soldier in the 2nd Volunteer Battalion of the Welsh Regiment in 1917 and served in the closing years of the First World War. In 1925 he was gazetted second lieutenant in the Supplementary Reserve of officers, in the Royal Engineers, and in 1937, now a major, assumed command of the 151st (GW) Railway Construction Company RE. This was a Supplementary Reserve unit formed, initially, entirely from personnel employed by the Great Western Railway Company. Officers and men were required to attend 17-day annual camps at Longmoor.

On declaration of war 151 Company commanded by Major R H Edwards, embarked for France on 13 September 1939 and worked on rail connections into POL and ammunition depots in forests around the Nantes area.

When No 8 Railway Group of regular sappers was withdrawn from the Belgian frontier and sent to Narvik, 151 went forward to take their place to put down rail track for heavy guns. However almost immediately the Germans broke through. A detachment from 151 was sent to Hazebrouck, close to the frontier, and while there a German plane shot down by AA fire crashed nearby. Although the pilot indicated that there was an unexploded bomb on board the crash was surrounded by French civilians. When the bomb went off, unfortunately the Section Officer Lieutenant Price and Sergeant Martin were both killed together with some civilians.

The German breakthrough outflanked the British Army and the unit was then ordered to move back in their own train to Boulogne but in the event did not get beyond Dunkirk because the Germans were already in Boulogne. The train was left nearby at Malo les Bains and personnel moved into the dock area of Dunkirk where, despite almost continuous bombing, they engaged in the extremely dangerous task of off-loading fuel and ammunition during daylight hours; sleeping on the dunes at night. Roy Edwards, one subaltern and three NCOs were Mentioned in Despatches for work done under these hazardous conditions. A number of casualties was sustained when a reinforced concrete store building, being used as a shelter, received a direct hit. Roy Edwards, with most of his unit, left Dunkirk during the night of 27/28 May on the *Maid of Orleans*.

The unit reformed at Longmoor prior to deploying in July to Druidstone House,

Lt Col Edwards

St Mellons, near Cardiff and constructed extensive sidings on the foreshore adjoining the steelworks.

Roy Edwards was then promoted to re-form and command No 5 Railway Construction and Maintenance Group RE which embodied 151, 157 and 165 companies.

In 1943 part of 151 became the nucleus of 935 Port Construction and Repair Company RE, which worked on a large depot at Marchwood where assistance was given to constructing parts for the Mulberry Harbour. Most members of 935 Company were taken to the Normandy beaches by landing craft on D+2, while others manned the floating caissons which were towed over and sunk to form the breakwater at Arromanches.

The No 5 Railway Group was the first of its kind to return to France, at the end of June 1944, to work on engineer store depots in the Bayeux area, placing up to one mile of track per day entirely by manpower. The railway bridging company in the group reconstructed the first railbridge over the River Seine (all having been destroyed by the RAF). Heavy rain that autumn raised flood levels to an extent requiring the bridge to be jacked up and the approaches regraded to allow barge traffic to pass freely beneath the bridge.

Roy Edwards took the group into Amiens before being recalled to UK in February 1945 by the Great Western Railway Company.

He was regarded with the greatest respect by officers and men under his command and his written administrative instructions are remembered as being an object lesson in providing newly joined subalterns, sent on detachment, with clear guidance and therefore confidence to do the work.

He relinquished his commission in 1949 and was granted the honorary rank of lieutenant colonel. In 1952 he was a second lieutenant, acting major in the then reformed Home Guard and in 1966 he was gazetted major in the Engineer and Railway Staff Corps, where he continued to serve as a Supernumerary officer until 1987.

Mentioned in Despatches for work at Dunkirk, in 1952, he was awarded the ERD with two clasps and in 1977 the Queens Jubilee Medal. He was a life member of the REA and was vice president of the Cardiff Branch from 1949.

Roy Edwards was a highly respected and active member of the Institution of Civil Engineers and of its South Wales Association, or Branch as it was then called. He was originally elected assistant secretary to the newly formed Bristol, Cardiff and Swansea Association in 1923 and held office successively as committee member, vice chairman, chairman, treasurer and territorial member of Council. He continued to assist in local activities until 1987. He was a founder member of the original Engineering Monuments' Panel, formed in 1969, and became vice chairman of PHEW on its inception in 1972 until his resignation in 1981. At national level he had been chairman of the Maritime & Waterways Divisional Board and he was a founder member of the Hydraulics Research Board; he held honorary life membership of the Permanent Way Institute. A Newport Harbour commissioner for 20 years he was chairman in 1953. He was appointed to the Governing Body of the Glamorgan College of Technology (now University of Glamorgan) in 1970 and served on the Management Sub-Committee for 15 years.

Such a list of attainments does not fully describe the whole man. He had an abiding interest in the training and careers of young engineers and helped many to reach positions of eminence. He was a character, unassuming and with an impish sense of humour; loved and respected by generations of his fellow engineers throughout the country. He will be very much missed.

OG WJE JJC RTJ CWE WBH

LIEUT COLONEL P R S BERRIDGE
BSc CEng FICE

Born 8 September 1904, died 2 January 1993, aged 88

ROGER died suddenly at home on 2 January 1993. He had led a good and interesting life, and was regarded by those who knew him as a perfect gentleman. He enjoyed numerous hobbies and interests, the two most engaging being philately and beekeeping. His wife, Mimi, passed away ten years before him, and he leaves two sons Anthony and Philip.

Educated at Berkhamsted school (1917-1922), he read civil engineering at Imperial College (1922-1926). His first job was in Spain, to build a section of the railway from Santander to the Mediterranean in difficult hilly country at Villarcayo. The project lasted for four years up to the abdication of Alphonso XIII.

After returning to England he built part of the Manchester to Liverpool trunk road for Lancashire County Council, carried out a short job in north Wales laying foundations for electricity pylons, built a cable factory for the Enfield Copper Company in north London, and then joined Wimpy to build sewers and roads for housing estates in Hounslow, Worthing and Bexley Heath.

Following this Roger joined Costain to build a section of the Trans-Iranian railway from Tehran to Ahwaz. In those days air travel was very limited and so he went overland via Berlin, Warsaw, through Russia and finally by boat across the Caspian to Tehran. The company was allocated an 11-mile stretch in the Zagros mountains between Dorud and Andimeshk. As chief engineer, Roger was responsible for cutting the service roads and for constructing the two viaducts and seven tunnels. During the work (1935-1939) three of the men were attacked by bandits and killed while bringing the wages from Khorramabad.

In 1940 Roger enlisted into a local tank corps and while with them he sustained his only war injury; a slight burn from sitting on the exhaust of a tank! After a few months he decided that he could contribute more usefully in construction, and so returned to England where he joined the Royal Engineers as 2IC 692 Construction Company under the command of Major Bonn. In a short time he was promoted to captain.

His first task was to build an emergency airstrip at St Pol in northern France. (For baths the men would dip in the water tanks beneath a cooling tower at Lens.) When the airstrip was completed, the company was sent to Ninove (west of Brussels), only to be sent back again a few days later. They then went on to unload a ship at Dunkerque which was to take them back to England. However, a bombing raid blew up an adjacent ammunition ship, causing much damage to the ship being unloaded, so a night was spent on the dunes and *HMS Vimy* returned them to Dover the following night. Major Bonn was promoted and left the company at this point, and Roger made his way to Tideford in Devon, where the company was reformed. He was promoted to major and moved with his men to Tavistock where they entrained for Wick. Here he improved the fortifications to the airfield, constructed sea defences, and also built defences for the airfield at Sumburgh in Shetland.

Then came a tour of duty in London, clearing up during the blitz. The unit was billeted around

Lt Col P R S Berridge

Clapham Common and was sent round daily to various bomb sites, mainly in Southwark but also as far as Greenwich. This was followed by a return to Scotland, this time to Islay, to lengthen the runway at Glenegedale airfield so that it could take Hudson aircraft from America. At that time there was also a large flying boat base at Bowmore. The men were billeted in the Laphroag distillery, and the officers in Kildalton Castle.

Roger's next posting was to Persia, to help maintain the allied supplies to Russia. He was based at Isfahan and was charged with keeping the main roads open in the south. Kits of parts for lorries were brought by boat from America and were assembled as soon as they arrived at Abadan and Khorramshahr before being driven through to the USSR. It was during this time that Roger was promoted to Lieut Colonel.

Towards the end of the war, Roger was seconded from the army to help repair damages sustained by the Anglo Iranian Oil Company. The work included rebuilding the track and bridges of a narrow gauge railway which had been washed away by floods, and the construction of new roads from Abadan to Haft Kel, and Ahwaz to Masjed Soleiman. By the time that this was completed in 1946, the war was over and Roger returned to England to be released from the army. It was at this time that he met his wife, Mimi, a Belgian whose sister had been his secretary in Persia, and they married the following year.

Roger was asked by Costain to tour English-speaking Africa to look for contract opportunities. One of the outcomes of the tour was the setting up of the regional headquarters in Salisbury and in Lagos. Roger was offered the directorship of the Salisbury office, but he turned it down in favour of returning, in 1947, to his much loved Persia where he spent the next few years. His work included laying drainage, piling foundations and building houses and a cinema for the oil refinery in Abadan. He was also responsible for a water treatment plant in Kuwait and road building in Baghdad.

Around 1950 Roger returned to England where he built the Weir Wood reservoir to supply the expanding towns of Uckfield and Crawley. This was followed by cutting the 3-mile water tunnels from the dam at Loch Quoich to an hydro-electric power station at Eilean Dubh near Fort Augustus. He was then called to tour the USA for a couple of months to gain experience on opencast mining for Costain. When he returned he spent some years in the estimating department at head office in London.

However, the attraction of Persia was still strong in his bones and so he left Costain for a while and joined Cementation, to build a road bridge across the river Karun in Khorramshahr. This bridge was later destroyed during the Iran-Iraq conflicts of the early 1980s. He then rejoined Costain to manage their office in Tehran. One of the main projects at this time was the trans-Iranian gas pipeline at Bid Boland running from the oilfields in the south to supply Russia.

Between the years 1963-67 Roger took charge of Costain's office in Spain. This was on the strength of his fluency in Spanish and his knowledge of the country. The work involved the building of housing estates, roads and churches in and around Jerez, as well as a block of flats in Sevilla.

In 1968 he returned to Iran to carry on where he had left off and remained there until 1972. When the Shah was overthrown in 1979 all personnel had to be evacuated and the office closed. Roger finally completed his diverse and exciting career at Costain's head office in London.

After retiring from Costain, Roger did a spot of consultancy work with Rendal, Palmer & Tritton, during which one of his more interesting projects was to advise on the building of a railway spur in Belfast.

AASB

LIEUTENANT GENERAL SIR JOHN COWLEY GC KBE CB

Born 20 August 1905, Died 7 January 1993 aged 87

Virtutis Fortuna Comes

JOHN Guise Cowley was born in 1905 in Mussorie, India, where his father the Reverend H G B Cowley was serving as an army chaplain. After his childhood in a Dorset vicarage, he was educated at Wellington College and at the Royal Military Academy, Woolwich, neither of which establishments he particularly enjoyed, perhaps because as an intelligent and original thinker he was disinclined to conform to the set patterns of contemporary military outlook. Not surprisingly however, his Christian background developed an outstanding strength of character which manifested itself in great physical and moral courage and in determination to express his own views whenever he perceived it to be his duty to do so.

He was commissioned in the Corps in 1925 and after 13 YO Course at the SME he joined 11 Field Company at Aldershot in time for operations in aid to the Civil Power in the 1926 General Strike. He noted the generally low standard of army equipment at that time and displayed unusual maturity for his age in his dealings with the strikers.

In the 1930s he served in India, in Queen Victoria's Own Madras Sappers and Miners. In the 1935 Quetta earthquake, several Sapper and Miner companies were committed to immediate rescue and repair work and as a Company Officer in 16 (Madras) Army Troops Company, Lieutenant John Cowley displayed outstanding courage and energy in organizing the evacuation of the totally collapsed civil hospital. Many patients with leprosy and other highly contagious diseases owed their lives to his total disregard for his own safety or health whilst crawling through dangerously collapsed wards to carry out casualties and to encourage others to follow him. Very few Sappers were decorated for gallantry between the World Wars and the Albert Medal then awarded to Lieutenant Cowley equated fully to a Victoria Cross in this "non battlefield" situation.

In 1936, he returned to the UK and for three years was an Instructor and Company Commander at the Shop where his efficiency and geniality were legendary.

At the outbreak of war in 1939, he was a student at the Staff College. In 1940, after a short period at the War Office, he began three exacting years as an operational staff officer for most of the early, difficult and intensive battles in the Western Desert. Just after Rommel's first major offensive in 1941, he was lucky to avoid capture with General Sir Philip Neame's Western Desert Force Headquarters, and he then took part in the defence of Tobruk with 9th Australian Division. His marked aptitude for operational logistic staff work led to rapid advancement on the "Q" Staff and he soon became a very young AA & QMG of 7 Armoured Division. By 1942 he was on the staff of 30 Corps with responsibility for the Corps' logistic plan for the battle of El Alamein which was to be the turning point of the war. After El Alamein, General Montgomery nominated him as the first British instructor at the US

Lt Gen Sir John Cowley GC KBE CB

Command and General Staff College at Fort Leavenworth. He returned to the Middle East as a principal administrative officer in AFHQ and finally, early in 1945, joined HQ 21 Army Group as a major general for the final campaign of the war in North West Europe. By the end of the war his established reputation as an outstanding logistic planner led to his selection as Deputy Head of the Economic Division of the British Control Commission where he was extensively relied upon, both by Lord Mills and by the Deputy Military Governor, the Lord Robertson of Oakridge, for the supervision of postwar German recovery.

Returning to the Army in 1949, he served as Director of Administrative Plans where once again his courtesy and helpfulness were conspicuous, Chief of Staff Eastern Command and in 1956, he became VQMG. The untimely death of the QMG at the beginning of the Suez crisis meant that full responsibility to the Army Council for all the complex logistic aspects of the operation devolved on General Cowley. His quite fearless personality and wide wartime experience qualified him admirably for all his responsibilities and once again earned him great respect throughout Whitehall. It was widely assumed that he would be confirmed as QMG for a full tour. Instead in 1957, he was appointed Controller of Munitions at the Ministry of Supply where, before long, he was to achieve notoriety for strongly expressed views on nuclear defence policy which were seriously at variance with those of the Secretary of State of the day.

In 1960 he returned to the Army Council as the first postwar Master General of the Ordnance, responsible for the procurement of all land service equipment. He retired from the Army in 1962 and was Colonel Commandant RE until 1970. He was appointed OBE in 1943, CBE in 1946, CB in 1954 and KBE in 1958. His Albert Medal was converted to a George Cross in 1971. His so-called "retirement" was by any standard very active. In business he became a highly successful Chairman of Bowmakers, of Wilverly Securities, and of Keith & Henderson as well as being a Director of British Oxygen and of a number of other firms.

A deep interest in the young drew him towards education. As a highly respected Vice President of Wellington College, his military experience and business flair were of great value to the Governors in postwar developments and in many other ways. Proudly he welcomed Her Majesty The Queen and His Royal Highness The Duke of Edinburgh to the opening of Queens Court at Wellington in 1974 and continued to maintain close links with the College throughout his life. Near his New Forest home he also helped to found a sixth form college at Brockenhurst and even found time to be President of the New Forest Preservation Society.

He excelled at tennis, squash and golf which in later life gave place to croquet – woe betide anyone damaging his sacred turf! He also played a lot of hockey with his Madras Sappers who admired his skill. He was a clever bridge player, enjoying family bridge as much as a highly-priced competition.

His brother officers, friends, relations and family gathered to fill the parish church of Boldre on 19 January 1993 to give thanks for the life of this most distinguished Sapper. The Lord Greenhill of Harrow, a wartime Sapper who became Head of the Foreign Office, spoke of Sir John's long, varied and successful life, in which though a perfectionist, he invariably achieved the highest standards for Christian and generous reasons. Never for self advertisement, advancement or personal gain.

Christian soldier, industrialist and educationalist, no one could have done more to fulfil Sir John's deep faith in the infinite capacity of human minds under Christian influence. A wide circle of friends who are much enriched by having known him will always remember him with great respect and affection.

He was the centre of a large and loving family. Our sincere sympathy goes to Sybil, Sally-Jane, Susan, Elizabeth and David.

CLR DJW WGHB WGFJ DJNG

MAJOR GENERAL M MATTHEWS CB DL

Born 22 April 1930, died 7 January 1993 aged 62

Maj Gen M Matthews CB DL

FEW, if any, would argue that Major General Mike Matthews was the most popular and respected Sapper of his generation. His untimely death at the age of 62 was therefore an especially heavy blow.

He was a West Country man, brought up in Chagford and educated, as were his sons, at King's College, Taunton. He retained a deep affection for this part of the country throughout his life, and was particularly fond of Widemouth Bay on the North Cornwall coast. It was some "plant training" on the track leading to his cottage there which attracted a certain amount of flak!

Commissioned into the Corps from Sandhurst (Intake 6) on 9 February 1951, his first posting was to 35 Engineer Regiment where he immediately made his mark. His reports as a 2nd Lieutenant describe him as "...having all the qualities one would expect – loyalty, smartness, enthusiasm and power of command...". 35 Regiment shared a camp with 9 Independent Airborne Squadron in the Canal Zone. As a result he caught the parachute "bug" and never fully recovered from it. Joining the squadron in 1954 as 1 Troop officer, he was not best pleased subsequently to be given command of the Park Troop, particularly when command of 1 Troop went to an officer who had been an intake junior to him at Sandhurst! Nevertheless, Mike was a great "fixer" and he and the resourceful Sgt Sid Burrell made a splendid team. There wasn't an angle which could possibly benefit 9 Squadron that was not explored by them. One of the more remarkable objects made by Park Troop was a ten foot high model of Pegasus, made out of wire mesh and cement. It stood in front of the Officers' Club in Aldershot for 16 Parachute Brigade officers' ball, afterwards being returned to 9 Squadron where it eventually fell apart, having been ridden after sundry wild parties. Mike made his mark, too, as captain of the squadron shooting team and as a leading member of an outstanding rugby side.

It was during Mike's first tour with 9 Squadron that he met and married Rose. In accordance with Squadron tradition (if not Standing Orders) Rose was a nurse. (Five officers married nurses at about the same time!) Mike's powers of persuasion (much in evidence later in his career) were put to good effect. It was customary for the married "pads" to leave their wives at home during the annual camp at Wyke Regis. Mike astonished his fellow subalterns, not so much by installing Rose in a caravan next to the officers' Mess, but by persuading the OC to let him do so! "Airborne wives" have much to contend with but throughout Mike's service Rose gave the most tremendous support, particularly when Mike was in command.

He left 9 Squadron in June 1956 for a short tour with 3 Training Regiment but returned nine months later to command 2 Troop (which, in his absence, had taken part in the parachute assault on Suez). During this period a splendid letter was received by the GOCinC Scotland which was quickly relayed to GOC Aldershot District through the CinC Southern Command. The brigade commander (Tubby Butler) was summoned, as his BM recalls. The gist of the letter was: "I am General Sir A B C and I was CinC NW India from 1934 to 1937. I was stalking with my house party on my estate recently. After a long and arduous stalk my party were closing in on a herd of deer when all hell was let loose in the glen below. I am getting rather old so I sent my sister down to investigate and she informed me that a group of soldiers

from a unit called 9 Para Sqn were the cause of the trouble. These soldiers were firing live ammunition (bulletted blank) over the hill and using high explosive charges (Guncotton primers in lieu of thunderflashes). In my day we had ranges for such activities. Don't you have ranges nowadays etc etc." The troop commander was Mike Matthews and the ambush was set by Graham Owens, his troop officer. The last and final comment came from Tubby Butler as he left the GOC's office: "It sounded like a bloody good exercise!" Had the brigadier been aware of the Champ which was all but written off on the way back from the pub with 14 people on board he might have taken a somewhat less charitable view. It had been "fixed" of course by the Stirling workshops with no paperwork but much whisky.

In September 1958, anxious to retain his red beret, and no doubt his parachute pay, he went as Adjutant to 131 Parachute Engineer Regiment(TA). (He was to return to the Duke of York's Headquarters some 30 years later in a somewhat different guise.) His legendary abhorrence of paperwork was first revealed in this appointment. One of the adjutant's chores was to run the Imprest Account. Fortunately there was an excellent pay clerk who knew the job backwards. Mike simply told him to "fix it" which left him free for the more interesting things in life such as sampling the ales of the Kings Road. He did, however, manage to pass the Staff College exam – not without a bit of badgering by his friends – and went to Camberley in 1961. He clearly did well for he was appointed DAA & QMG of 24 Infantry Brigade on completion of the course.

The Brigade was stationed in Kenya as part of the Strategic Reserve for operations east of Suez. It deployed to Aden in October 1964 on an emergency tour. Mike's partnership with the BM, another West Country man, was a formidable one and created a dynamic spirit in the Brigade. Not only were they running operations in the Radfan but moved into the newly built Falaise Camp in Little Aden just as the first terrorist bombs were being planted in the town. One such bomb was a near miss for Rose, who had just occupied a quarter in Mike's absence in Little Aden. In his Confidential Report at the end of his tour, the GOC observed that Mike "should go a long way in the Army." He was to be proved correct.

When Mike handed over his appointment and took command of 9 Squadron, it was no time at all before he was back in the Radfan. The Squadron's task was to black-top the Dhala Road using the famous high-speed road surfacing unit. Command was not made easier by having a troop in Bahrein and another in Borneo. It was presumably no coincidence that reinforcements arrived in the form of 131 Regiment for summer camp. During operations on the Dhala Road the Regiment was attacked and suffered casualties, one fatal.

The Squadron regrouped in late 1965 at Haig Lines, Church Crookham, and having proved itself on operations, Mike's priority now switched to sport. It is doubtful whether any minor unit in the Army achieved more across the sporting spectrum thanks to his drive and example. He was a fine cricketer – the quintessential "military medium" bowler. He was equally good on the hockey field where his not inconsiderable bulk was used to great, if occasionally illegal, effect. A hockey stick was treated as a weapon and the ball not its only target. Shooting was also high on the list of Squadron priorities and Mike was one of the anchor men in a team that reached Bisley. It wasn't all play, however, and under his command the Squadron reached a peak of efficiency and competence. An unusually high proportion of the NCOs, for example, were later to achieve QM commissions.

After a short time in MS where he organized his own promotion, he returned to Camberley in July 1968 as a member of the DS taking over the SD Team from a fellow Sapper. Two years later he was selected to command 35 Engineer Regiment in Hameln. Despite never having served in Germany before (and despite some vulgar remarks about the colour of his beret) he was a great success and the Regiment flourished both professionally and (of course) on the sports field. It was Mike Matthews who, for example, laid the foundations for the long run of successes which Sapper ski teams have since enjoyed.

The measure of his success as a CO was that his next three tours were all in BAOR, all key appointments: Col GS of the Exercise Planning Staff, CCRE, and DQMG. As CCRE from 1974 to 1976, he was closely involved in the aftermath of the 1975 Defence Review with its controversial plan to improve the Army's teeth-to-tail ratio by abolishing the brigade level of command. This coincided with the Corps' desire to introduce the Combat Engineer Tractor, for which had been traded the AVRE, the only means available to the Sappers, apart from AVLBs, of guaranteeing close support in the

armoured battle. Mike appreciated this looming disaster but loyally kept faith with Corps policy on the CET programme, by then at a critical stage. It was recognized that the new organization would not work and subsequently the AVRE was reintroduced and an armoured squadron established.

He attended the RCDS in 1977. Given his legendary dislike of "bumph" the only cloud that hung over his posting to Seaford House was the worry of having to produce a thesis on some weighty theme. Grasping at a straw he invited his staff at Corps to produce a paper on digging as a strategy for holding back the Red Army in the event of war. Realizing the true purpose of this exercise his staff procrastinated and Mike left for the RCDS empty handed. In the end, with his winning ways, he persuaded the DS to accept a team presentation instead of a paper.

He left Germany on promotion to major general in June 1980 to assume the appointment of Director of Personal Services (Army). He was an inspired choice for this job. No one had a better feel for the ordinary soldier than Mike. He had a wonderful gift for communicating with people and always went out of his way to "chat to the boys" on every possible occasion. He was a powerful advocate for better conditions of service and although not a MOD warrior by inclination he certainly made his presence felt in the corridors of power.

He was a universally popular choice as EinC, the appointment he assumed in April 1983. In his leadership of the Corps, as in all his command appointments, he was determined that soldiering should be fun. Mike's visits to units were always a tonic. His enthusiasm was infectious, his energy boundless and his sense of humour irrepressible. Characteristically, sport was given high priority in Corps affairs in terms both of effort and funding. Success here, coupled with his pursuit of the highest professional and technical standards, did much to keep the Sapper image bright in the eyes of the rest of the Army. Mike's departure from the Corps in late 1985, marked by a particularly hair-raising display by the free fall parachute team he had done so much to encourage as their first President, was a most poignant occasion for all present.

Those who thought that Mike might slow down after he retired were to be disappointed. As Secretary to the TA Council he was far more actively involved with the volunteers than the job description demanded. He travelled widely to support all their activities at home and overseas. He was also a most effective champion of the TA cause and drew considerable satisfaction from being regarded as a thorn in the flesh of the MOD. He had an enormously wide range of contacts and used them to the full to influence policy-making at the highest levels. He had a marvellous gift for prizing highly confidential information out of almost anybody if he felt that it would help the Reserve Army or Cadet cause.

He was equally good at the lower levels and was proud to be the Honorary Colonel of both 131 Squadron and Southampton University OTC. It was a measure of the respect in which he was held that the Royal Marines presented him with an honorary Green Beret. He could never decide whether to wear this or his red beret when taking part in the annual "Sea Splash" parachute exercise in Guernsey. Not bad for a 60-year old. There is no better example of his way with people than in persuading the RAF that he was still in date as a parachutist!

Despite the demands of the TA he was a great supporter of Corps affairs. He was appointed a Colonel Commandant in 1985 and was a most active Representative Colonel Commandant in 1987. For seven years he was chairman of the Corps Finance Committee. He was a Freeman of the City of London, Deputy Lieutenant of Hampshire, a Life Vice-President of the Army Rugby Union, a member of the Parachute Regimental Council and President of the Airborne Engineers' Association. He was appointed a CB in 1985.

Mike Matthews was a big, robust and hearty man who lived life to the full. If he was dedicated to the Army, he was devoted to his family and they to him. He will be remembered by his many friends as a wonderfully warm and sincere person with a great sense of fun; as a highly professional soldier's soldier; as an inspiring leader whose example influenced all who had the privilege to serve under him; for his straightness and clarity of purpose; for his selfless support to so many activities. His booming voice, his impish smile, his lopsided gait and his cry of "fix it" or "Wahoo Mohammed" will be surely missed whether on the touchline or in the Mess. A cliche perhaps, but they broke the mould when they made Mike Matthews.

GWF CPC JPG JHH GWAN GRO RFS HGRT AND OTHERS

MAJOR GENERAL E M HALL CB MBE DL

Born 16 July 1915, died 31 January 1993, aged 77

MAJOR General Michael Hall was formerly Chief of Staff Western Command and Military Deputy to the Head of Defence Sales.

Hall was the fifth generation of his family to have served with distinction in India. The earliest was killed in 1812, commanding an East India Company frigate against a French privateer; the family still has his commemorative toothpick.

Another ancestor, his great-grandfather, was imprisoned with his family in Jubbulpore in 1857 when his regiment joined the Mutiny and was, at the time of his death in 1903 (aged 94), the oldest surviving officer of the Army of the Honourable East India Company.

Edward Michael Hall was born on 16 July 1915 – his father was wounded in Mesopotamia the same year when a bullet went down his throat as he was leading a charge on foot.

Young Michael was educated at Sherborne, Woolwich and Peterhouse, Cambridge. At Woolwich he earned numerous "hoxters" (extra drills), but eventually passed out first, winning the Pollock Medal and three other prizes. Discipline was strict and life arduous, but there was a lot of fun as well.

After taking a double first at Cambridge, Hall was employed in the construction of huge underground ammunition dumps around Bath. This posting came towards the end of his YO training and he therefore managed to avoid his E&M course, a subject about which he was always to remain oblivious.

In March 1939, he was posted to the Royal Bombay Sappers and Miners, which had just been mechanized from mule transport. The regiment went to the Western Desert, where Hall remained – apart from a three-month posting to Iraq to teach their sappers to make concrete defences – until the Battle of Sidi Barrani in December 1940.

He then returned to India and served in West Bengal, building defences and airfields. Later he joined 15 Corps in the Arakan, where he built "interminable" bridges, both piled and Bailey.

In this highly mobile theatre, Sappers sometimes found themselves ahead of the front line. Bridges were built with a nightmare mixture of British and American parts, and during the monsoons the current of the rapidly-rising rivers would occasionally wash away 90ft piles.

In 1945 he attended the Staff College at Quetta, and then commanded a training group. After returning to Britain he went on a short liaison tour to Fort Belvoir in America.

Hall was then appointed senior instructor in electrical and mechanical engineering at Chatham. He protested that he was ignorant of the subject, as his specialization had been in other fields. "I made it clear," he said later, "that I would only lecture on matters which I had made a muck of during the war." There were, however, no complaints.

His next posting, as GSOII (Ops), was to GHQ, Middle East Land Forces in 1950. On his return in 1952 he attended the Joint Services Staff College at Latimer and was then made second in command of 7 Armoured Division Sappers in BAOR. He went on to become GSOI in Weapon Development and then in 1956 was posted to command 22 Field Engineer Regiment and held the appointment of CRE 10 Armoured Division Sappers in Tripoli.

The next year he returned home, but was in Cyprus when events in Jordan gave concern. In 1959 he was appointed to command 26 Engineer Group, TA. After two more brief home postings he attended the National Defence College in New Delhi in 1964. Back in Britain he became Chief of Staff Western Command.

Hall's last appointment was Military Deputy to the newly-appointed Head of Defence Sales. He

Maj Gen E M Hall CB MBE DL

retired in 1970 and was appointed a Colonel Commandant, Royal Engineers, from 1973 to 1976. He was appointed MBE in 1943 for services in the Arakan, where he was also Mentioned in Despatches, and was appointed CB in 1970.

After retiring from the Army, he devoted much of his time and energy to the Order of St John in Cornwall. As Commander and Commissioner, he was held in great regard and affection by all members and was appointed firstly Commander, and then Knight of the Order. His time as Deputy Lieutenant for Cornwall (appointed 1971) and his tour as High Sheriff of Treworgey (1985) were extremely successful.

Michael Hall was a Corps tennis player and president Corps hockey. In earlier days he had been a successful horseman, although he recalled an occasion when his horse, Mah Jong, had bucked and thrown him off in the middle of a parade.

He was greatly devoted to his family. He married, in 1948, Diana McArthur. They had three sons.

TEH CWRS JCW

(This memoir is based on the obituary published in the Daily Telegraph *on 12 March 1993.)*

LIEUT COLONEL J S O JELLY MA FRICS

Born 27 October 1906, died 6 February 1993, aged 86

LIEUT Colonel John Steuart Osborne Jelly, who died peacefully on 6 February 1993 in Brighton, was one of the last of the group of surveyors who served with the Survey of India during the British Raj.

Educated at St Edmund's School, Canterbury and Selwyn College, Cambridge, he was commissioned into the Royal Engineers in 1926 and, choosing service in India, was initially stationed with the Bombay Sappers and Miners, before joining the Survey of India in 1929. Work in the field and drawing offices took him to many parts of the country including United Provinces, Karachi, the Punjab, Baluchistan and Waziristan; he was in Quetta at the time of the earthquake. In 1939 he married Mary Harris in Gwalior, Central India.

During the war he was in charge of map publication in Calcutta and later became Deputy Surveyor General.

Leaving India after partition in 1949, a period was spent at the War Office in Teddington, before joining the Ordnance Survey at Chessington. From 1950 to 1953 he was Ordnance Survey Divisional Officer, Edinburgh.

On retirement from the army he became lecturer in Surveying in the Faculty of Geography at Glasgow University until 1957. A brief spell in Australia with the Government of New South Wales, was followed by a move to Brighton where he remained for 34 years. Taking up the post of Lecturer in Surveying in the Faculty of Engineering, Brighton Polytechnic, he was much respected and liked (not always compatible qualities) by fellow staff and students. His summer field trips, meticulously prepared, were especially popular.

Retirement, in 1972, found him travelling in Europe with his wife Mary, spending weeks at a time under canvas in their beloved Italy. During this period time was found to research and write a valuable contribution to "A History of the Ordnance Survey", published in 1980.

A particular joy was a return visit to India with his wife in 1990, as a guest of the Indian Government, to attend the bicentenary commemoration of the birth of Sir George Everest. He read a paper of his experiences 60 years previously and was presented with a model of Sir George Everest's giant theodolite.

A scholarly man, widely read and ever curious about the world around him, he brought to everything that he did meticulous preparation, precise execution, and unimpeachable integrity.

He leaves Mary, their three sons and seven grandchildren.

Lt Col J S O Jelly MA

MAJOR GENERAL W G FRYER CB CBE

Born 1 May 1900, died 19 February 1993
aged 92

"Bill" Fryer spread laughter and happiness wherever he went, in peace and war. His superiors admired his mental and physical energy, and his quiet determination in overcoming obstacles. At the peak of his wartime career, it was said that, as an engineer planner and organizer, it would have been hard to find his equal. Over his subordinates he cast a magnetic influence, galvanizing them with his enthusiasm, and carrying them forward with a mischievous sense of humour. He liked to be unconventional: on active service in Belgium with snow on the ground, a junior officer in attendance was surprised to find his Colonel setting forth on reconnaissance with skis and a shotgun. With the young, his zest and sense of fun sprang from a genuine urge to lead them to that joyful fulfilment which he himself had found; for them, he was a Pied Piper, whose objective lay not under a dark and distant mountain, but in the completion by his team of the task in hand: in the achievement of it he would take an almost childlike delight.

Wilfred George Fryer, born on 1 May 1900, came from a farming family in Herefordshire. He was a descendant of Hodson, the adventurous cavalry officer who raised that Indian regiment and won fame by capturing the Mughal Emperor in the Indian Mutiny.

As a small boy, Bill had found that driving sheep to new pastures every week was unexciting and, after schooling at Christ's College, Brecon, he entered the Royal Military Academy Woolwich, where his mathematical ability became apparent.

At an early stage, he had contrived to suppress the name Wilfred: it was certainly out of tune with the dynamic personality who would soon be achieving renown in the skiing world with the "Downhill Only" Club at Wengen, and in first class rugger in Scotland.

During this period Bill met his future bride, Jean Binny, the sister of the late Brigadier R A G Binny, also a Royal Engineer. Bill and Jean were a splendid pair, with similar tastes and a shared sense of humour: the marriage lasted 60 years. They had three sons: Gay, the eldest (following his father, who had won the Lauberhorn Wengen Ski Club Challenge Cup in 1928), skied in the British team until he broke his leg, and was on the threshold of a great career in industry when he died of cancer; Angus, as a junior officer in the Corps, sailed a Flying Dutchman with Adrian Jardine; they were British champions and runners-up in the World Championships. Angus retired from the Corps to join Lafarge, the international cement corporation, in which he is now a senior executive. The third son Robert, from school days keen on printing, is now Managing Director of the Warminster Press, of which his father was Chairman.

Bill, who at the SME, had won the Fowke medal as the top young officer on the Construction Course, was appointed in 1931 Assistant Instructor in Electrical and Mechanical Engineering at Chatham, *Ilex's* home port. Bill soon proved to be an outstanding yachtsman, and his activities are recorded in the histories of the REYC and of the RORC. He presented the Fryer Cup to encourage dinghy sailing, and gave great encouragement to junior officers, whose mishaps he would always excuse unless caused by crass stupidity. A retired major general still remembers the occasion when the sloop in which he was sailing pitched into a head sea and the rudder jumped off, making the boat unmanageable. That evening, as the recently qualified mate in charge of the yacht, he reported with some

trepidation, to Bill, expecting at least to be told to pay for a new rudder. All that the Honorary Secretary said was: "A properly designed rudder should not have been capable of jumping off: I will have a new one made in the workshops right away."

As instructor (E&M), Bill demonstrated exceptional talent as a teacher: he had a deep knowledge of his subjects, but his particular skill lay in dressing up the dullest items in a uniquely humorous guise, so that his students invariably looked forward to the entertainment. One of them, 60 years later, still remembers Bill's exposition of "Stephenson's Link", in which he used a masterly technique of the absurd to demonstrate the brilliance of a classic invention.

In 1933, with his wife and two small sons, he sailed for India for a five-year secondment to the Royal Bombay Sappers and Miners. Inevitably, with his specialization of E&M, he was much tied to supervising technical instruction of Indian recruits at headquarters in Kirkee. With his family he might easily have subsided into quiet domesticity, but again his boundless energy and zest took over, resulting in his playing a leading part in the polo team, and organizing weekends for shooting parties in some remote dak bungalow in which young bachelor officers, in the cheerful, generous, atmosphere of the Fryer family, were introduced to the rudiments of shooting snipe, chikor, and an occasional illegal peahen for Christmas.

With no theatres, cinemas nor television, entertainment had to be created locally and, after a vigorous training period, the cocktail party season would arrive. Such parties would often be very dull but, typically, Bill and Jean became the instigators in 1936 of a novel entertainment taking the form of a satirical pageant based on Mussolini's Abyssinian war. Bill was the Emperor Hailé Selassie, a regal but piteous figure, as the libretto demanded, and Jean was the noble Empress. The villains were Marshal Badoglio in ceremonial uniform – a striking figure, magnified by the imposition of a brown suede spongebag on the top of his military cap – and of course Mussolini. The entertainment was much enjoyed, ending at 2am, with the cast being thrown into the swimming pool – whether by way of tribute or objection was never established.

Bill quickly established sympathetic relationships with the diverse soldiers of the Bombay Sappers and Miners, and soon acquired Urdu; he had passed the preliminary examination in French in 1928, and spoke fluently: nevertheless in France, after a technical interchange about water supply, he had surprised his companion by asking "what is the French for reservoir?"

Bill returned to the E&M School in 1938 as a senior instructor, and was able to take up ocean racing once more. In that year, with war clouds gathering on the horizon, the REYC decided to make an exceptional effort to win the Inter-Club Championship by entering as many ocean races as possible. Bill sailed with a scratch crew in a 25-ton ketch belonging to a TA Royal Engineer, which had never been raced and seldom sailed. The ketch came in second in its class and fourth in the race. The Royal Corinthian won the Inter-Club Championship, but the REYC came second, with the Royal Yacht Squadron in third place.

On the outbreak of the Second World War, Bill's career was checked by several months of illness. Fortunately, in July 1940 he was posted to GHQ Cairo as Assistant Director of Works (E&M) under the great military engineer, the late Major General Sir Eustace Tickell (*vide Journal* June 1973). They soon established a very effective and lasting partnership, and it was here that Bill won his professional laurels.

The vast area of the Middle East Command demanded great feats of engineering to support strategic plans and Bill, who had revised the Army Manual of Water Supply in his spare time at Chatham, found that he was charged with supplying the water requirements of the Army and of the Royal Air Force in the Western Desert. Despite the existence of primitive wells, some dating back to Roman times, the size and mobility of the forces deployed were seriously constrained by the lack of water.

Bill set about his quest by gathering together a team of geophysicists and geologists from the Johannesburg Rand, who worked under Professor Shotton of Sheffield University, to locate underground supplies. He organized well-boring teams with mobile rigs to reach the water, and pipelaying units to deliver it.

To cope with the enormous distances of the successive advances of Western Desert Force and of Eighth Army, he persuaded GHQ to buy him a light aeroplane, said to have been going cheap as the relic of an expatriate Englishwoman, and arranged for the RAF to maintain it. Normally he flew at 3000ft "to avoid small arms fire". However, the unpredictable weather of Libya was probably a greater hazard: a major general, now retired, remembers a flight with Bill from Alexandria to Cairo in a sandstorm. The flight

itself was exciting enough, but on reaching Cairo, the airfield was found to be closed, and permission to land was refused. "Nonsense" said the amateur pilot, and proceeded to land in defiance of red flares and hostile gestures. Fortunately when the plane came to a standstill, there were sufficient attendants on duty to hold down the wings and prevent capsize. "If we hurry," said Bill to his companion as he emerged from the plane, "we will just make the start of today's race at the Nile Yacht Club. Will you crew for me?" They made the start by about ten seconds, and won the race.

During General Sir Richard O'Connor's victorious campaign against the Italians in 1941 Bill, from GHQ, was one of the first officers into Bardia. Having quickly assessed the damage to the water supply system, he was back in Cairo organizing spares for repair before the news of Bardia's fall had reached GHQ.

Later that year, he was appointed Staff Officer RE (Lt Col) to Brigadier Kisch, the remarkable Chief Engineer of Eighth Army, who had fought in the First World War, then in peacetime had become an ardent Zionist in Palestine, and had rejoined the British Army for the second war. He was a Jew of great character and high intelligence, who fully appreciated his staff officer's qualities of mind and spirit.

Bill's rare combination of great technical ability with power of leadership was at that time recognized by many senior commanders, including Major General Harding, the future Field Marshal, who admired his quiet determination and the enthusiasm with which he infused his subordinates. There were some at that time who thought he should be lifted from his technical "rut", however vital might be his activities, and be given opportunities for wider experience. But this came too late.

Returning to England in 1944, he was appointed GSO1 to the Chief Scientific Advisor in the War Office. It must have been to his satisfaction that he was whipped out of that sedentary job after two months, and posted to 8th Corps in Normandy, as Chief Engineer; he served there until the end of the war.

As Chief Engineer of a Corps, driven by zest and good professional habits, Bill was often far forward in the victorious advance; there he heard of several German yachts moored in Kiel. The yachts were placed immediately under the guardianship of 8th Corps, and after the German surrender, the British Admiralty seized all vessels belonging to the German Armed Forces. Four of these "Windfall" yachts became, after the war, the property of the REYC at a most convenient time, when *Ilex's* days were done; and soon afterwards the British Kiel Yacht Club was founded with Brigadier Fryer as the first President.

In 1945 he was Chief Engineer on the British Army Staff in Washington, concerned with obtaining engineer equipment under Lend/Lease. There, his tact and determination were most effective in the diplomatic relationships with the United States' authorities. He was fortunate to have assigned as his Personal Assistant a United States lady of great charm and ability, who remained devoted to him until his death. In recollecting Bill's talent in this unusual job for a man of action, her phrase "he went on quietly winning people" sums up his success.

Returning home in the autumn of 1945, he was responsible for engineer equipment policy in the War Office for the next three years, and in 1948 became Chief Engineer Singapore District at the start of the Malayan Emergency. In 1951 he returned to England to become Chief Engineer Southern Command.

Promoted to Major General in 1954, and posted back to Egypt, he decided to sail his 36-ton yacht to the Mediterranean with his wife, family and friends on board. After many days at sea, they were approaching Malta when they were surprised to find a BP tanker closing on them rapidly from the rear, signalling Morse with a lamp. This ceased when the tanker drew alongside and a voice through a loud-hailer shouted: "General Fryer is to report immediately to the Military Commander in Malta." Bill was then flown to Cyprus, his "battle station" for the imminent Suez operation. His wife Jean took over, reinforced by volunteers from Malta, and successfully sailed the yacht to Cyprus.

Bill retired in 1957, but had a busy and successful career in industry. At Lymington, where he and his wife lived very happily towards the end of their lives, he was actively involved in the Royal Lymington Yacht Club, and its open days, which were organized to encourage local children to start sailing. Aged well over eighty, he could still be seen manning the rescue boat in all weathers.

A great sapper, who contributed much to the Corps, he had led an adventurous and successful life, marked by great generosity. His many friends will remember him with admiration and affection.

CLR EA, JMLG JPG JdeVH WJ ECWM LCR OMCR MET DS SV JCW

MAJOR JOHN LUCK

Born 23 September 1911, died 18 March 1993, aged 81

Major John Luck displayed outstanding courage, skill and perseverance during the Normandy Landings of June 1944.

Mulberry, the artificial harbour at Arromanches, was in danger of being destroyed by drifting craft in stormy seas. With the storage capacity of the Port of Dover, it was one of two such harbours (the other was Gooseberry, off "Omaha" beach), which required two million tons of prefabricated steel and concrete to be towed across the Channel and assembled at the Normandy beachhead.

The Germans had no suspicion of this ambitious undertaking, which took eight months and the labour of 20,000 men, and when the existence of the harbours was first reported few Germans would credit it.

As the harbours were being put in place, the worst recorded storm for 40 years began. It continued throughout the next four days, with 30-knot winds creating enormous waves.

The storm left some 800 ships stranded on the shore. Others, drifting out of control in the high wind and tide, were a major cause of damage to the artificial harbours, colliding with pier heads and floating jetties. The destruction would undoubtedly have been much greater if Luck and his crews on their tugs had not ceaselessly pursued the runaway craft and towed them to safety. Their efforts saved Mulberry from the fate of Gooseberry, which broke up in the gale. Even during the worst of the storm Mulberry managed to shelter 400 landing craft and other vessels.

Securing these craft, in the chaos of darkness, smoke screens, floating mines and drifting beach obstacles, required inspiring leadership from Luck. He exhibited endless patience and skill, and complete indifference to danger.

"He made heroism look no more than a routine job of work", observed one of Luck's colleagues.

Thanks to his efforts the damage, though considerable, was contained, and when the storm abated it was possible to repair much of the harbour and use it for the vital task of supporting the invasion.

John Lewis Luck was born in London and educated in London. To the despair of his parents he left school early for a seven-year apprenticeship as a Thames lighterman; it is interesting that, unknown to him, one of his grandfathers had also been a lighterman.

By the time war came he had become a tug-master, performing such hazardous assignments as towing petrol barges up and down the river while the *Luftwaffe* rained fire on the city.

Luck then joined the Royal Engineers, was commissioned, and appointed OC Tugs at Mulberry Harbour (Arromanches), where he worked with the close collaboration and total understanding of his American counterpart John Heming, with his Motor Towing-Launches, and with Lieut Colonel Ronny Cowan RE.

Johnny Luck was invariably cheerful, even in the most daunting of circumstances. Although he was twice Mentioned in Despatches, his colleagues thought this an inadequate recognition of his achievement at Arromanches and petitioned, without success, for a higher award.

After the war Luck was employed in the reconstruction of the harbour at Singapore and then returned to England to work for Esso, becoming an expert on heating and lubrication. He was made a freeman of the River Thames.

Quick and perceptive, with many friends, he enjoyed adventurous holidays – notably in New Guinea, where he became thoroughly lost in the jungle and nearly drowned crossing a river. He was also an accomplished pianist, and treasured his antique Steinway.

His wife predeceased him; there were no children.

(Based on the obituary that appeared in the Daily Telegraph *on 15 May 93, and notes from AH.)*

Major John Luck

LIEUT GENERAL SIR IAN JACOB GBE CB DL

Born 27 September 1899, died 24 April 1993, aged 93

SIR Ian Jacob was one of Churchill's closest aides during World War Two, in what has been described as a companionship of honour, affection and achievement.

Thereafter he moved to the BBC, becoming director general in 1952, and steered the corporation successfully through seven critical years of expansion and turbulent change.

The son of Field Marshal Sir Claud Jacob, who ended up as Commander in Chief India, Edward Ian Claud Jacob was born in 1899. His family were of Kentish origin and had a long tradition of service in India. John Jacob, a forebear who commanded the Scinde Irregular Horse (later named Jacob's Horse), was described as "the greatest cavalry commander in India in the 19th century". His father had a distinguished career in active service on the North-West Frontier, and in France during the First World War, where he commanded a British Army Corps; later he became CGS India, having never attended Staff College.

Ian Jacob, educated at Wellington and Woolwich, gained honours at both work and games and was awarded the Pollock Medal. However he did not derive any great enjoyment from the Royal Military Academy: "Anyone who devised that ridiculous timetable" he remarked later, "would nowadays be thought crazy."

Despite his family background, Jacob was commissioned into the Royal Engineers on 6 June 1918, his father advising him that "as a Sapper he could live on his pay."

He had been too young to see active service in France, but served in the Army of Occupation in Germany before being posted to India to join the 1st Sappers and Miners at Roorkee, 100 miles north of Delhi. He saw active service on the North-West Frontier of India, where he took part in constructing the Waziristan Circular Road in territory dominated by hostile tribesmen. In 1923 Jacob went up to King's College, Cambridge, taking a degree in Mechanical Sciences. He was one of the first to take the young officers' course at Cambridge. In 1930 he passed first into the Staff College, and went on to serve as brigade major of the Canal Brigade in Egypt.

After leaving Egypt in 1938, Ian joined the Committee of Imperial Defence in Whitehall as military assistant secretary, working with General Ismay and Colonel Hollis. Soon his capacity for producing analyses of complex defence problems rapidly, became known to the Prime Minister.

At the outbreak of war, he became military assistant secretary to the War Cabinet as a brevet lieutenant colonel. Churchill, on becoming Prime Minister in 1940, soon designated Jacob a member of his so-called "Secret Circle" (Ismay, Hollis and Jacob) on whom he relied to produce by day or night the memoranda that he required to discharge the nation's business.

Jacob initiated and controlled the defence registry, handling all the Prime Minister's military correspondence, and therefore frequently receiving Churchill's "Action this day" minutes.

Despite great success in that role, after the fall of France he applied to return to active service as a regimental officer; however his application was refused "in the national interest". Reconciled to that decision, he became one of Churchill's closest associates, accompanying him on almost all his critical overseas conferences with Roosevelt, Stalin, Ismet Inonu of Turkey and others, and playing a major part in the deliberations of the Combined Chiefs of Staff, and later of the United Nations.

As his stature and responsibility increased, his promotion to brigadier and then to major general was requested by the Prime Minister. Sir George

Lt Gen Sir Ian Jacob GBE CB

Mallaby, who worked with Jacob in the Cabinet Office, wrote in 1965, that Churchill greatly admired Jacob's character, which was "so utterly different from his own, the stoic calm, the absolute self-control, the mistrust of exaggerated and excessive emotion."

After the 1945 general election, Jacob undertook similar duties for the new Prime Minister Attlee, and Ernest Bevin, the Foreign Secretary. By then he wished to revert to normal soldiering but was told that his prospects were limited, because of his lack of battle experience, and he therefore decided to seek a second career.

An attractive vacancy opened up immediately. After retiring from the Army in 1946, he became controller of the European Service of the BBC. With his strong leadership skills, his analytical brain and good humoured self-confidence, Ian Jacob was ideally suited to the task. After two industrious years he became director of External Broadcasting, with a seat on the board of management.

In 1952 Churchill, after his return as leader of the Conservative Government, summoned Jacob to the Ministry of Defence: "Jacob, you must come back" was the call to which the answer could only be "Yes." But he spent an unsatisfactory six months trying to serve a defence minister, Field Marshal Earl Alexander of Tunis, who seemed to him reluctant to launch the initiatives needed to solve the complex problems of Britain's postwar defence role. One of Jacob's assignments was to study and make recommendations on NATO.

He was fortunate that a new opportunity in the BBC opened up with the resignation of Sir William Haley as director general. Churchill acknowledged that Jacob "had some claim" to the appointment, and Attlee pressed him to take it; he was released from the Ministry of Defence with the honorary rank of lieutenant general and assumed the appointment on 1 December 1952. He served as a director general until he was 60, the normal retiring age for BBC employees.

His seven-year tenure was marked by the rapid development of worldwide television, including the entry of colour, the introduction of commercial competition to run in parallel against the BBC's "public service", and the establishment of the European Broadcasting Union, of which Jacob was the first president.

Those years were marked not only by great technical development, for which Jacob's ten-year plan pointed the way, but also by controversy in which his leadership, based firmly on moral principles and supported by the governors, kept the BBC on course.

During a very active life at the centre of the nation, unlimited service had been his ruling aim; even in retirement, this intense activity continued, with great benefit to the County of Suffolk, and to other institutions and charities.

He entered a very active retirement based on his home at Woodbridge in Suffolk. He was a trustee of the Imperial War Museum, and a member of the Royal Commission on the Police from 1961 to 1963, during which period he joined Lord Ismay in remodelling the Service Ministries. Apart from numerous other appointments he was Chairman of the Covent Garden Market Authority, a director of Fisons and EMI, Chairman of Matthews Holdings, a magistrate, a county councillor, an alderman, a Deputy Lieutenant, and a lay canon of Bury St Edmund's Cathedral.

Neat and bespectacled, Jacob tended to give, on first acquaintance, an impression of ascetic intellectualism, but he was also a cricketer and hockey player. He played for the Corps against the Gunners at Cricket, Hockey and Golf and in the 1930s won the Corps Golf Championships at Deal.

He married, in 1924, Cecil, daughter of Major General Sir Francis Treherne. She died in 1991. They had two sons both of whom served in the Royal Navy.

(This memoir is based on the obituary printed in the Daily Mail *and written by General Sir Charles Richardson with extracts from the* Daily Telegraph *obituary and from Royal Engineers' archive material.)*

Memoirs in Brief

BRIEF memoirs are published below on distinguished men whose deaths have been notified recently in the national press and who served in the Royal Engineers during World War Two.

SIR MICHAEL BLUNDELL KBE, the Kenyan politician, farmer and botanist who has died in Nairobi aged 85, was largely responsible, along with Jomo Kenyatta, for Kenya's peaceful transition from colonial rule to independence.

The son of a London solicitor from Yorkshire stock, Michael Blundell was born on 7 April 1907 and was educated at Wellington. He was expected to read law at Oxford, but preferred to go out to Kenya to try his luck on the land.

During the Second World War he served with the Royal Engineers and in 1940 was given command of an African pioneer battalion which had recently mutinied. Blundell restored morale and led them during the lightning advance against the Italians through British and Italian Somaliland and Abyssinia. The advance culminated in the fall of Addis Ababa and eight month's later in the fall of Gondar. He finished the war as a Sapper colonel in South East Asia.

After the war he returned to Kenya and later entered the Kenyan Legislative Council and in 1952 was chosen as leader of the European elected members, in effect leader of the opposition. He played a distinguished part as a member of the emergency war council during the Mau Mau emergency. He was made minister of agriculture in 1955, a post he held until his retirement from politics in 1962.

Blundell married and had a daughter; his wife predeceased him.

SIR KELVIN SPENCER CBE MC, formerly chief scientist at the Ministry of Power, who has died aged 94, played a leading role in Britain's introduction of nuclear power.

A civil engineer's son, Kelvin Tallent Spencer was born at Lausanne, Switzerland, on 7 July 1898, and was educated at University College School, Hampstead. In 1916 he volunteered for the Army and was commissioned into the Royal Engineers. In March 1918, as a second lieutenant in charge of a field company, he won a Military Cross for bravery, throwing a pontoon bridge across the River Scheldt, under fire, which facilited a successful surprise advance by the infantry and which consolidated a valuable bridgehead.

After the war Spencer studied at the City and Guilds Engineering College, London, before entering the Scientific Civil Service in 1923. After 12 years at the Royal Aircraft Establishment, Farnborough, he transferred to the Air Ministry and then, in 1940, to the Ministry of Aircraft Production. In 1950 he moved to the Ministry of Fuel and Power. He was elected a Fellow of the Royal Aeronautical Society in 1945.

Spencer married and had a son; his wife predeceased him.

Correspondence

SEVENTY MEN

From Lieut Colonel G E P Mulhern OBE

Sir, – The following paper, as it states, is a "Follow-on" to the article which appeared in last month's *Journal* under the pseudonym/nom de guerre of "NITEBAR".

You may perhaps consider it for publication.

My curiosity was certainly aroused as to Nitebar's identity but in any case I congratulate him, whoever he may be, on his splendid account of what happened in those far off days. Of the officers killed during the period it was a personal loss in the case of four of them (Tandy, Purser, Kisch and Shannon). Yours sincerely – George Mulhern.

Nitebar's account of his troop's activities at and around Wadi Akarit in early 1943, prompts me to offer additional information and comment which may be of interest.

The life of Brig Kisch CB CBE DSO, his outstanding courage and distinguished career, have been well documented but the timing and circumstances of his tragic demise on 7 Apr 43, to me, are particularly poignant.

Firstly, the timing. It was some months earlier (Nov 42) that Brig Kisch's South African DCE (Roads), Col Shannon and I (Staff Capt RE with Rear Army HQ) were seated on a wooden box on a flat featureless site at Fort Capuzzo in a sandstorm. Brig Kirsch was a tall, slim, gangling figure irreverently known to his fellow South Africans as "Shuffle dem feet" or affectionately, as "Daddy".

We drank from his own bottle of Cyprus gin. It was awful stuff – nitric acid and razor blades and he urged that we drink it quickly before it took the enamel off our pint tea mugs. However, it did dissolve the sand in our throats.

He confided his profound admiration for our Chief Engineer and said also that it was their mutual intention to retire at the end of the North African campaign which it seemed, and in the event, was not too far distant.

And so, when their lives ended on 7 April they were within 35 days of their goal when, on 12 May all enemy resistance ceased. Kisch was 55 and, from his appointment as Chief Engineer, Western Desert Force on 27 Feb 41, his service there covered an unbroken two years.

Incidentally, killed with him and the others mentioned was Maj Bell, the OC of a South African Roads Construction Coy of which Capt Voight was the 2IC. It was very sad too that along with other officer casualties, 3 Sqn lost two fine sqn commanders (Majors Clive Tandy and David Purser) who were on Kisch's staff at Alamein. (Tandy was his IO) and it was Kisch who personally made the field appointments in relief of battle or other officer casualties – never sparing his own staff from the chance of earning their spurs.

Bob France, mentioned as the last to command 3 Sqn for most of the rest of the war and survive, went on to win two MCs and 20 years later a CBE on retirement as Chief Engineer Western Command.

Secondly, the circumstance. As part of Monty's 8th Army Study Week in Tripoli (mid-Feb 43) wherein the problems of the current campaign were identified, presented and discussed, the Sapper contribution, on 17 Feb, was a demonstration in a natural amphitheatre, of all types of enemy mines and booby traps. Eighth Army gapping drill with techniques for passing through wire defences (eg Bangalore torpedoes) and minefields using Scorpion tanks, etc, etc. 51 (Highland) Div and the South African Sappers played the major part in staging the event.

Senior officers from other theatres attended including General Eisenhower – British, American and French as well as from Home Forces in Britain.

For further name dropping I remember, as though it was yesterday, standing on tiptoe behind Maj Gen Sir Bernard Freyberg VC (NZ Div) looking for the wound in his neck which had been reported in an 8th Army Intelligence Summary some days earlier. I managed to spot a little inflamed scar just below his shirt collar line.

I recollect also, a large hole in the heel of one of Maj Gen Wimberley's (51 Highland Div) socks. This "potato" was visible as he was wearing his uniform black brogue shoes. How the devil did he keep the sand out of such unsuitable footwear? I would hazard a guess that he, alone in the desert army, wore shoes. And Gen Sir Bernard Paget (CinC Home Forces) – his hands were of such silky smoothness as to be almost translucent.

This was Fred Kisch's day and he rose to the occasion in full Sapper Majesty. So appropriate to the subject of mines and booby traps and to his Old Testament philosophy, he opened his address with:-

"Ponder the path of thy feet and let all thy ways be established – Proverbs, Chapter 4, 26th Verse"

In the end, either he or one of his tragic party sadly lapsed.

NITEBAR made mention of Brig Kisch's dedication to Zionism and, of course, he was Dr Chaim Weizmann's (the father of Zionism and Israel's first President) deputy in Palestine between the wars.

I was given an example of his vigilance in this direction when I ran into a Max Chichek, the OC of a Jewish Artisan Works Coy. Prior to bringing his employees to war in the desert he operated as a building contractor. He showed me some correspondence between Kisch and himself of some months earlier which ran like this: "Dear Max, I'm told that you are employing too many Arab labourers on your contracts in the Lebanon to the exclusion of Jews. I urge you to do better." The reply said "Dear Fred, It is much easier to get Arabs to work at these remote sites but I'll try to improve things." The next from Kisch said "Dear Max, I believe too that you are using Arab donkeys to convey stores up the hills there. Could you not engage more Jewish donkeys?" The reply:- "Dear Fred, I'm arranging to have the offending donkeys circumcised!"

Epilogue

In 1958, as ACRE Planning to CRE Singapore, Brig Sewell, IC Administration, Singapore Base District, was carrying out the annual inspection of my unit, when he glanced at my African Star with 8th Army clasp, he asked – "In which unit did you serve in 8th Army?" and on my reply "The Staff of the Chief Engineer Sir", he pursued the enquiry – "And who was the CE?" When I answered "Brig Frederick Herman Kisch", he said "I buried him." Astounded, I said "I beg your pardon Sir", so he confirmed "Yes, I was a Maj in the South Wales Borderers and I took charge of the burial party."

The four officers were buried side by side within a hundred yards from where they fell. Three graves were headed by crosses and one by the Star of David. It has been said that they still stand.

Post Script

Monty recorded his tribute to "The best Chief Engineer any Commander would want to have."

I was surprised therefore, that Nigel Hamilton's second volume of this most definitive and best selling biography of "Monty, Master of the Battlefield 1942-44" makes no mention of this outstanding Sapper officer, although included is a small photograph of him with others from the Imperial War Museum.

AUSTRALIAN ADVENTURE – PART I

From Major M R R Goulden

Sir – In a recent issue of the *Journal* you published some memoirs of Major Love in which he mentioned his friendship with my father R R Goulden (Sculptor best known for the Margaret Macdonald memorial, and the Bank of England Memorial in London).

My father died in 1933 when I was 12, but the name Love must have been much in use since the name is fresh in my memory. The article established for me the name Love and cleared up a minor mystery.

My son is in the process of editing my father's letters from World War One when he was serving as Lieut/Captain Royal Engineers in the 2nd London Division in France, '14, '15, '16? and it is possible that they will tie in with Major Love's experiences. If so, or if they are of interest, I will pass either the edited material or the originals on to you whichever you may wish. You do have his handwritten copy of Royal Engineer Field Notes which I handed to the Museum some time ago. I think they were the basis of the famous "RE Pocket Book" – the "Field Bible" for many years. Yours – M R R Goulden.

TRAINING AN ARMY TO NAVIGATE – EXPERIENCES FROM THE GULF WAR

From Major A R Jermyn ERD

Sir, – I have just read Major J F Prain's interesting article in the April issue of the *RE Journal* especially his remarks regarding the difficulties of using magnetic compasses for navigation in the Gulf terrain and the use of sun compasses.

My mind immediately went back to the little book "Libyan Sands" by Ralph A Bagnold, in

which he describes so brilliantly the exploits of himself and colleagues in the Libyan Desert in the late 1920s. The dust cover on my edition of the book reads "A small party of British officers devoted their leave and all their spare cash to obtaining information about this unknown waste that was bound to figure in future wars ...".

Bagnold's travels over the desert were made in suitably adapted Ford cars and he too describes the difficulties of using magnetic compasses in a vehicle as an aid to desert navigation (except for "challenger tank" read "Model T Ford car"!) He goes on to describe how he overcame these difficulties by making a sun compass and I quote: "This set me thinking that the sun could be made to act instead of landmarks. More than this, if its position was known at any time it could be made to act as a compass too, eliminating all the uncertainties of the magnetic compass, for one could read off the bearing of the car from the position of the shadow cast by a vertical needle on a graduated dial. All that was wanted was a second set of graduations by which the whole dial could be turned round to follow the horizontal movement of the sun in the heavens, from east to south and south to west. As the sun's bearing in the sky is known, and can be looked up from published tables, there was no difficulty about the dial setting, which need be done only every quarter or half-hour from notes extracted from the tables each morning.

I had the first sun compass made up by the end of September (1927) and trials found it most successful. It gives, of course, true bearings instead of magnetic ones, it is deadbeat and very clear to read. To steer a course, all that is necessary is to keep the sharp black shadow of the needle on the required figure on the dial, which, if silvered or painted white, shows it up even if the sunlight is partly obscured by thin cloud."

It was good to read that Major Prain and Warrant Officer Starbuck have recently developed and modernized the Sun Compass but in view of Bagnold's writing was another sapper officer the inventor of this new vital piece of equipment?

Bagnold died recently (an *RE Journal* contained a memoir) but I believe his military career was divided between the Signals and ourselves. Maybe someone can enlighten me. Yours faithfully – A R Jermyn ERD.

Reviews

GALLANTRY MEDALS AND AWARDS OF THE WORLD

JOHN D CLARKE

Published by Patrick Stephens Limited, Sparkford, Nr Yeovil, Somerset, BA22 7JJ – Price £18.50
ISBN 1 85260 303 8

IN an era of lessening respect for standards and morality any book that takes a serious approach to the recognition of courage and sacrifice for others is to be welcomed. Although entitled "Gallantry Medals and Awards of the World", the author, in his introduction draws attention to the fact that he has made a selection of nations and also of the awards of each nation – to have attempted to cover the whole world and every award would have been a monumental task, and one which still awaits an author.

It is however difficult to understand fully just who the audience is for this book. It will not satisfy the serious collector who will get wider coverage from for example: "Ribbons and Medals" by Taprell Dorling and much more detail from specialist authors such as Abbott and Tamplin. However it does introduce the reader to the concept of awards for gallantry and to the principal awards.

The coverage of the awards of different nations is perhaps a little unbalanced – eight pages for South Africa – six to Ireland and five to France, albeit that some illustrations of awards not usually found in other reference books, are made available.

The inclusion of examples of actions and conduct which prompted the awards are a welcome, if patchy addition, and I imagine their inclusion is part of the author's attempt to make the book have a general appeal. However a "non-collector" – buying this in the hope of reading primarily about heroic deeds would I think be disappointed – both as regards quality and number. The inclusion of the stories behind the action that led to the awards to

servicemen of our enemies in World War Two is particularly interesting and welcome – too often it is assumed that gallantry and acts leading to the relief of human suffering are the privilege of one side only in a battle or war.

As regards the colour illustration of awards; selection must always pose some problems. I found some difficulty in reconciling the selection made in this book – a whole page devoted to one award of the Federal Republic of Germany; three quarter page illustrations of Irish awards balanced by two quarter page illustrations of the Albert Medal. The principal UK awards are to be seen in two groups which share a page. The group containing the DSO, MC and DCM could surely have been "straightened out" before being photographed!

There is an unfortunate lack of consistency in the display style of the black and white photographs – most have a white margin before the edge of the pages – others do not, particularly in the section devoted to the USSR.

In conclusion I return to my original comment regarding the market for this book. It has little attraction for the specialist collector of gallantry awards and medals and I fear for its attraction to the non-specialist reader. For the latter, a book covering fewer awards with more examples of acts leading to the award would be more attractive.

GH

THE ZULU WAR THEN AND NOW

IAN KNIGHT AND IAN CASTLE

Published by Battle of Britain Prints International Limited, Church House, Church Street, London E15 3JA – Price £24.95
ISBN 0 900913 75 4

THE story of the 1879 Zulu War is one packed with action, drama, tragedy and heroism. Amazing feats of endurance, improvisation and raw courage strongly pepper every single recorded action. The Corps was well represented by the 2nd, 5th, 7th and 30th Field Companies and C Troop, a pontoon bridging unit. Elements of the first three were all prominently involved in the actual fighting at some stage. The latter's great achievements were the maintenance of the key ferry crossing over the lower Tugela at Fort Pearson and its associated lines of communication and fortifications during the second invasion of Zululand. The challenges and conditions were awesome and some of the great names of the later Army surfaced to prominence in this war: Redvers Buller, Garnet Wolseley, Evelyn Wood, Horace Smith-Dorrien, Bindon Blood.

Ian Knight is a prolific writer on Victorian military topics most prominently on the 1879 Zulu War, having a number of well regarded books currently in print. His method is to collate key primary source material and the best-surviving illustrations and photographs, into what are effectively anthologies with a linking text. His researches and visits to battle sites bring him into contact with leading professional and amateur historians in this popular field and he freely acknowledges their considerable input.

It would be easy, but churlish, to dismiss this joint effort with Ian Castle as a purely commercial product which fills a well spotted opportunity in a highly competitive market. There are small errors, not every interpretation or strongly held opinion is commonly accepted. Never mind, that should encourage healthy debate.

The "Then and Now" theme can only be sustained by comparing the accounts, sketches and photographs of contemporary witnesses with the modern remnants. This has been done successfully despite some technical and presentational difficulties. The result is well worth having and this tautly edited, sensibly explained compendium of all the best sources, battlefield sites, memorials and artefacts is a bargain even at £24.95.

What makes it a compelling read is the plethora of carefully chosen and vividly portrayed personal experiences of the key participants which make up the greater part of the text and provide broad-based interest. Significant amongst these is Lieutenant Chard's second and longer report on the defence of Rorke's Drift which is striking in its simplicity and modesty.

The short-term trends of modern soldiering seem likely to make growing demands on the personal quality and capabilities of the individual regimental officer and soldier. We could do well to reflect on the increased importance of the more conventional virtues of physical and moral courage, endurance, leadership and determination. This book provides rich pickings on which to base those deliberations. Buy it, especially if you are thinking of visiting South Africa to see it all for yourself – something also to be recommended.

MC McM

Bent Bridge – St Albans – New South Wales

LIEUT COLONEL J S FARMBROUGH

In my days the YO course bridging module included the design of a "sticks and string" bridge with one design chosen by the staff to be actually built. The completed bridge was then crossed by the designer in his own car, to prove that he had faith not only in his design but also in the work of the rest of his YO course.

In New South Wales about 50 miles northwest of Sydney there is a wooden bridge that really has stood up to the trials of life. It spans the river known variously as the "The Branch", "The Lower Branch", "The First Branch" or "The Macdonald River" (Macdonald was a convict who explored the area in the early part of the 19th century). The river flows into the Hawkesbury River at Wisemans Ferry about 16 miles downstream. The date of construction of the bridge is not known but in "about 1980" floods moved the central pier several metres downstream and subsequent floods have each moved it a little further. However the stoic structure remains unbeaten and still operates today.

This area of New South Wales is subject to severe flooding every few (unpredictable) years when the river can rise 15 metres. It was for this reason that Governor Philip, the first governor of the colony, in 1789, only one year after the arrival of the first fleet, decided against settling the area. However by 1850 the population of the valley had reached 1000, but as a result of disastrous floods between 1850 and 1870, the population dropped to 788 in 1861 and 491 by 1891. The last serious flood was in 1986 and today the area has just 149 inhabitants and is a delightful place to visit.

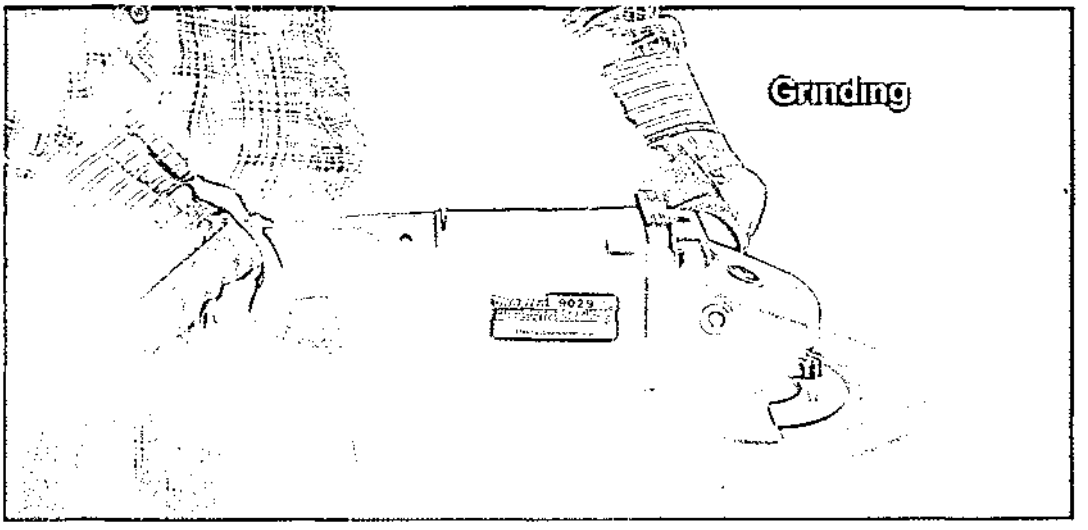
The East India Company Memorial (1862)

During the early 1960s, the Institution of Royal Engineers published "The Portraits and Silver of the RE Headquarter Mess Chatham" by Colonel J M Lambert, which replaced the 1909 edition by Lieut Colonel B R Ward.

In comparing the two books, it became evident that the silver-bound plinth for the East India Company Memorial (1862) was not included in the 1960's photograph, possibly because it had been mislaid! The engravings around the plinth gave a wealth of detail about the *raison d'etre* of the Memorial.

Unfortunately, there is now no trace of the plinth, and the Custodian of Mess Property, would therefore be glad to hear from anyone who can throw light upon the omission and subsequent "loss". Please ring Major R L Smallman on Chatham Mil 2402, civil (0634) 822402.

Bent Bridge - St Albans - New South Wales (p240)



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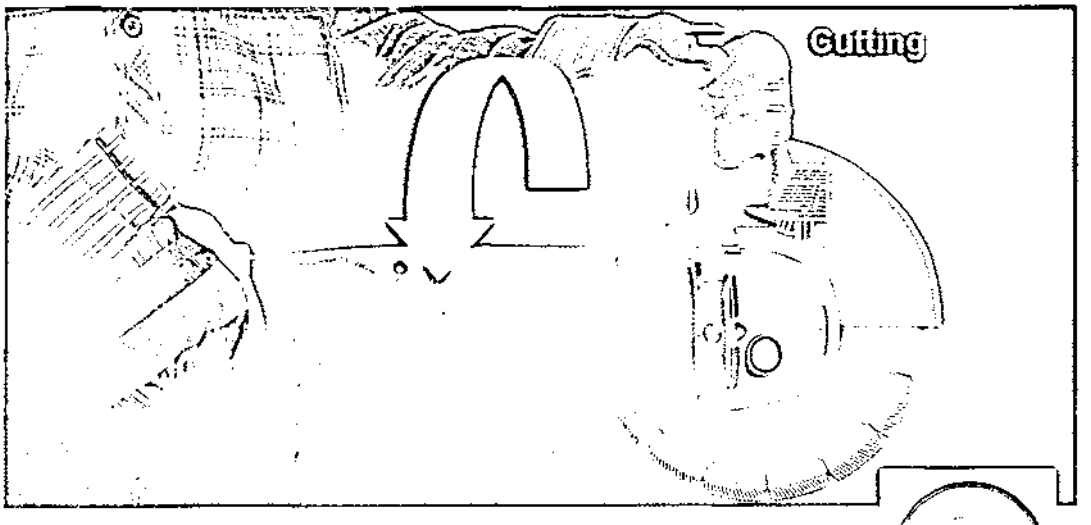

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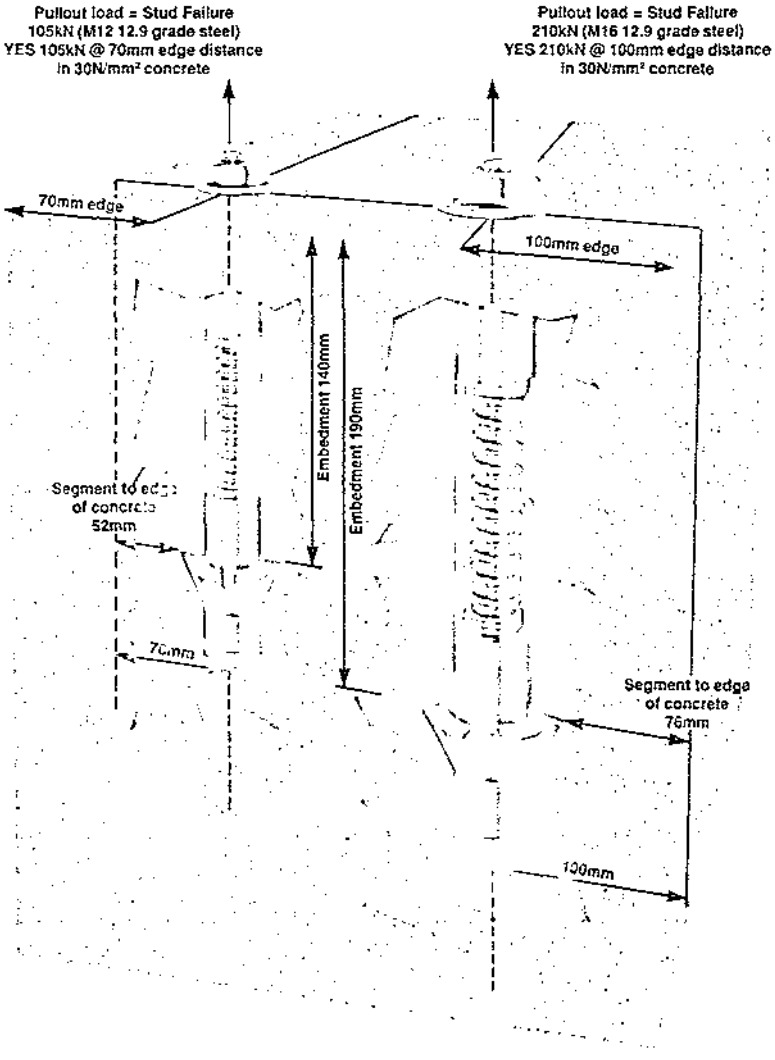

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