THE ROYAL ENGINEERS JOURNAL AUGUST 1991 VOL 105 No 2

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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 witty.

Length. Normally, chance of publication is in inverse proportion to length. More that 4500 words (5 pages of text) tends to lose most of our readers. Blockbusters can sometimes be serialised.

Clearance. Opinions are an author's own. The wise man clears an article with his boss on any policy matters. Security clearance must be obtained locally.

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

Computers. Articles prepared as straight text only (no tabulation etc) and sent to us on IBM compatible or Applemac 3.50 discs would be most welcome. A printout should accompany the disc and the file sent should be saved to disc as an ACSII file — check your word processing package manual for details on how to do this. Microsoft Word 3.0, 4.0 and 5.0 and Word Perfect 4.5, 5 and 5.1 are acceptable as normal files. Mrs Scanlan will be pleased to assist — ring Chatham Mil 2299 or (0634) 842669

Photographs should be black and white. Coloured photographs rarely reproduce well unless they are excellent quality with sharp definition and no red colouring. Slides are not acceptable.

Line Drawings, if possible should be drawn in proportion with the page size (144mm x 205mm).

Rewards, can be generous. The committee has about £250 in prize money to allot for each issue plus the valuable annual prizes. All authors receive £5 to cover costs.

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

Contributions to the Journal should reach the Editor by:

9 October for the December 1991 issue
Early February for the April 1992 issue
Early June for the August 1992 issue

Submissions before the deadline will be particularly welcome.

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Contents

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Editorial

THE rate at which changes have taken place in the Army in the last six months has been breathtaking. When preparing for the April *Journal* our minds were filled with concern for the war in the Gulf. There were grim forebodings about the number of casualties we would sustain. Mercifully our casualties were light though this in no way diminished the great sense of grief felt as a consequence of the deaths we suffered. Now as we prepare for the August *Journal*, the Gulf war is in the past (though the repercussions continue) and we are now faced with the effects of *Options for Change*. The proposed drop in the size of the Army is dramatic — from the present authorised establishment of 166,000 men and women (including trainees) to 116,000.

We are told that the Gulf war saw the biggest deployment of troops to a theatre of operations outside Europe since World War Two. I suspect that a year or two ago if someone had painted the Gulf Scenario as part of the basis for planning the size and shape of the Army, he would have had his prognosis firmly rejected. The Country was extremely fortunate to have an Army of such flexibility, adaptability and brilliant improvisation which could cheerfully meet the crisis. In his excellent report in this *Journal* the Engineer in Chief says "There is not a unit in the Corps that has not either provided men, or been substantially involved in these various operations [*Granby* and post *Granby*]." A strong, well disciplined, well motivated and highly professional Army is a vital part of the cement of our democracy. I trust that those who determine the size and shape of our Forces have got their sums right for the future.

To turn to the August *Journal*, the Publications and Library Committee debated whether this issue might be made a "Gulf Special". However, the Corps plans to produce the definitive story in a separate booklet in due course. I have included four articles on the Gulf covering broad aspects of the Campaign. Inevitably there is a measure of duplication between the articles but we have a story which involves all elements of the Corps. Reading the articles engenders a great sense of pride in the achievements of our Corps and a greater sense of pride in the magnificent performance of our officers and soldiers, sometimes using equipment which left much to be desired. And we must not forget the organisation in the UK and BAOR which provided the vital support for the operation in the field. Just to help us retain our sense of perspective I have included an article about a Gulf crisis in 1941-42! In the December *Journal* I hope to be able to include some of the fascinating Regimental stories from the Gulf. As, DV, we prepare for that issue, I wonder what our thoughts will be as we contemplate the initial effects of *Options for Change*?

The Royal Military Academy Sandhurst

ADDRESS GIVEN BY
HER MAJESTY THE QUEEN
TO THE SOVEREIGNS PARADE — FRIDAY 12 APRIL 1991

250 years ago this month, King George II approved the establishment of the first Royal Military Academy at Woolwich to train

"...good officers of Artillery and perfect Engineers"

Since that time, the 'Shop', as it soon became known, and subsequently its sister establishment here at Sandhurst, have striven to achieve those same standards of perfection. Since 1947 the combined Royal Military Academy Sandhurst has done the same, and in so doing has earned itself a very special place in the history and affections of the country. Sandhurst has become a byword for excellence, not only in the United Kingdom, but around the world. The large number of Commonwealth and other foreign nations represented here today bear witness to the high international esteem in which Sandhurst is held, as does the ever increasing number of countries wishing to send their finest young men and women.

Earlier this year we watched with pride and admiration the achievements of our armed forces in the Middle East. Many of you will soon find yourselves in equally challenging situations. You will all be put to the test in one way or another. The skills and knowledge you have acquired here will stand you in good stead, but above all you duty is the leadership of others, and I believe that it will be the attitudes and values instilled here that you will find most helpful. If you honour the memory of your predecessors, and recall the meaning of your motto 'Serve to Lead' you will not go far wrong.

The Royal Military Academy Sandhurst has a long and distinguished history of service and endeavour, and the new Colours I have presented today are a memorial to the loyal and devoted service of those who have gone before you, and a reminder and inspiration to you and to those who will follow you.

To those of you who are to be commissioned today, and to those who will shortly follow, I extend the greatest of responsibilities and honours — the command of your fellow men and women. I do so with the utmost confidence, and my prayers and best wishes go with you.

The following reports are based on briefings given by the Engineer in Chief and the Director General of Military Survey to a distinguished gathering of senior serving and retired officers of the Corps at Minley Manor on 23 May 1991 (See photograph at end of Reports). Members will be aware that the Engineer in Chief will not address the AGM this year. These reports replace those which would normally have appeared after the AGM.

Report by Engineer in Chief

Introduction

I AM delighted to have this opportunity to address such a distinguished gathering of Sappers and to say a few words about Operation *Granby* and the major issues facing us today. Before doing so I can say, without qualification, that over the past year the combined effect of the various studies associated with *Options for Change* and Operation *Granby* has produced an intensity of work for the staff which has been as great as anything I have seen in all my years of service. They have responded magnificently and I have been very impressed both by the quality of their work and by their stamina.

Options

I CAN say little about the content of the *Option for Change* proposals, since these are still under wraps and far from firm, but I can tell you about the timetable and how we approached the exercise.

You will recall that it was about this time last year, following the sudden changes in Eastern Europe, that pundits started to make noises about the 'Peace Dividend'. The Secretary of State himself referred to a 'Services Dividend', by which he meant that he intended to take advantage of this opportunity to correct structural inadequacies. CGS produced his own 'Design Determinants' and made clear his aim that a 'smaller' Army must also be 'better'.

During the first half of last year, a small team, sworn to secrecy, worked directly to Ministers to produce the new "blue print" for the Armed Services. At the end of July, the Secretary of State announced the outcome:

- Army of 120,000 including those under training
- BAOR to be reduced to roughly half present size
- RAF to give up two of its four operating bases in Germany

And so the work was launched, and we moved through options, known as X, X1A to W, each of which involved an immense amount of work, with response times often very short. On the engineer side, most of this initial work fell on an *Options* think tank I had set up in May headed by Robbie Reive, Colonel Doctrine & Weapons, which presented its findings periodically for debate and endorsement by my One Star COSI, which was meeting almost at fortnightly intervals. There is no doubt that this structure of working ensured that the Corps spoke with one voice, and 1 (BR) Corps, BAOR, UKLF and the MOD staff were all receiving consistent advice from their Sappers. We have put our case forward with great strength, losing a few friends on the way, but I am confident that we have been stating it correctly. It has been comforting to observe changes in the General Staff position, as our points have come to be accepted — not in every case of course, but enough to encourage us to keep going. What we are going through, of course, is a fight for resources during a fundamental review of the Army's structure and traditional groupings.

Originally we were working to a timetable which saw an announcement in early April with a phased implementation by 1995. However the work was put on hold in January, so as not to send the wrong signals to the Gulf, and also because it was not known at that stage what effect the Gulf War would have on our future plans. We have used the interval to good effect to refine our ORBATs and prepare our case for enhancements. We are ready to resume our work when the signal is given, and the indications are that this may happen soon.

Parallel Reviews

THERE is a number of reviews taking place in parallel to the *Options* exercise. In the Logistic Support Review the whole method of operating is being looked at to see whether savings can be made whilst remaining effective. At the same time Engineer Resources are again under the microscope. This audience will recall earlier similar studies by MacLeod, Odling and Somerville, and some of you will be aware of General Trant's strong support for the way we do our business, following the Falklands War. We have fought a strong case based on the integrity of the resources function from front to back, reminding people when necessary of the essential requirement for intelligent anticipation, which can only come from experience in the Corps.

As in the case of the main *Options* Study, I am not permitted to discuss the likely outcome before authorised by ECAB. I would only comment that I am considerably happier now than I was a few weeks ago — but nothing is decided yet.

The next major study is the Training Base Review. Inevitably, and correctly, the Training Base must make savings if we are to optimise the operational ORBAT. We must play our part constructively and responsibly in this exercise and I am confident that we are doing so. Currently we have four training establishments: at Chatham, Minley, Dover and Chepstow. Multiply this for the Army as a whole and it is inescapable that some have to close. I recognised this in the previous round in 1988/89 and recommended the closure of Dover; this was endorsed by ECAB in 1989 but as was the case in the Groom Study, it has not been implemented. Things have moved on since then and the current review is more far reaching than hitherto. The whole approach to basic training and to junior and apprentice training is being looked at and will be subjected to appraisal this year, for ECAB's decision. My major concern centres around our apprentices and I am determined to achieve, as far as I am able to influence affairs, a solution which is sensible and attractive to headmasters and parents. I have been locked in debate with the Inspector General this week, and whilst I could not begin to anticipate the eventual outcome, I am happier today about the understanding of the real issues than I was on Monday morning.

It may appear from what I am saying that we are at loggerheads with every MOD review, and to an extent that is so. My sole concern is that decisions are taken from an informed position and not from intuition which inevitably leads us into difficulty later. We are all quite clear that our task is to be constructive and supportive so long as the solutions make sense.

On this last point it has to be said that there is a remarkable degree of ignorance about the way we do our work and what our imperatives are. To an extent I hold ourselves responsible for this. Our weakness is that we are too modest. We simply get on with what we are told to do, do it to the best of our ability, usually to excellent effect, and then move on to the next task. What we should have done is to have been more pedantic and boastful about our achievements and let everyone know what we needed to do organisationally to achieve our objectives. The consequence of our failure to educate the Army in this way is that assumptions are made about us which are inaccurate and it falls to us all too often to claw back from a bad start.

There are two other studies of interest, because they both impinge on the position of the Engineer in Chief (EinC). In line with the *Options* review, a team was set up late last year, headed by Sir Kenneth Macdonald, the former 2nd PUS to look at savings within the MOD. The 'Prospect' team, as it was called, has just reported and made proposals about the future MOD structure, based on less duplication of functions between the "Centre" and the "Single Service" Departments, and a clearer division between policy (the MOD function) and implementation, which is properly a matter for the Commands. Assuming a reduced Army Department, it is for consideration how the EinC and his Directorate should fit in. I have taken the bull by the horns and proposed something which I know was considered by some of my predecessors, and that is the move of the Directorate, or certainly the bulk of it, under "Centre" control where it can discharge its responsibilities to all three services, in a responsible 'purple' fashion. I would stress though that this is no more than a suggestion at the moment, and we have not had sufficient reaction back to test how the idea will be received.

Also relevant to the position of the EinC is the proposal to create a Central Focus for Doctrine and Training. This has some admirable aims, in particular the establishment of a Combined Arms Training Centre, based at Warminster, a natural development from the All Arms Training Courses that have been going on there for years. However it also sets out to centralise all the Arms Director functions, working on the principle that Doctrine & Training are all that Arms Directors are there for. I have made it clear that only a small percentage of my and my staff's time is devoted to training and the Signal Officer in Chief's position is similar. Indeed that is why both remained MOD Directors when the others were rusticated. There is a good deal still to play for here, and that is what I shall be doing!

Operation *Granby*

And now to *Granby*. In the time available, it is impossible to do full justice to the Sapper contribution to the operation. The best I can hope for is to give you a flavour of the wide spectrum of tasks in which the Corps was involved, some of the problems which we faced and the solutions which evolved.

Chronologically, the build up to the conflict was in three phases: the Single Service deployments of the Royal Navy and the Royal Air Force; the 7 Brigade phase; and finally the dispatch of the 1st British Armoured Division. Sappers were involved from the beginning, and this only serves to underline our Tri-Service commitments. Thus it was that a 50 strong field troop joined the Tornados in Bahrain in early September, and this quickly expanded to a full squadron, 53 Construction Squadron, as RAF units moved into other air bases at Dhahran on the Saudi East Coast, and Tabuk in the West. Their tasks were far from the traditional Airfield Damage Repair — with the huge redundancy in runways, this was the least of their worries. Instead they found themselves adapting what were essentially civilian facilities to military use. In addition they had to design and improvise a range of protective structures, for fuel installations, the anti-aircraft Rapier sites, and the aircraft themselves. At Tabuk they even built an alternative Command Centre underground using the containers in which equipment had been shipped out. As soon as Kuwait City was recaptured, the squadron, along with elements of 49 EOD Squadron, was the first British unit in. Their immediate tasks secured this compliment by David English in the *Daily Mail*:

> "In the shot-up British Embassy the air-conditioners hum, the satellite fans are working, hot and cold showers are available and the ambassador's staff dispense ice with the drinks.
> "All this courtesy of the Royal Engineers who got everything up and running while their American allies down the road at their embassy were still 'working on the problem'."

Early Autumn saw the deployment of 7 Brigade. The General Staff's initial plan was to provide only one Close Support Squadron, but the extent of the likely operation soon altered this. In fact, the final Sapper force supporting 7 Brigade was some 1400 men. Intimate support to the Brigade was provided by 21 Engineer Regiment consisting of close, general and field support squadrons. Behind the Brigade rear boundary, the Force Maintenance Area alone required the best part of a Regiment, and 39 were the first on the scene. At the time of the decision, 39 Regiment were in the middle of an ADR exercise in Germany. It took them three days to pack up their equipment and return to UK; seven days later they were all in the Gulf. Their task was to build reception camps complete with power, water and sewerage, but initially at least, they found themselves responsible for just about everything, including all movements through the port of Al Jubayl, since the Movements Staff were yet to arrive. Instant Sapper flexibility at its best! Among the rest of the 1400 Sappers were an EOD squadron, a TOPO squadron, and a full complement of Specialist Teams from the Military Works Force.

With the deployment of the Division, the Sappers in theatre more than doubled to some 3300. 4 Brigade mirrored 7 Brigade having 23 Engineer Regiment in support, and there was a third specialist engineer regiment at divisional level, 32 Armoured Engineer Regiment, which was specifically designed for the break-in battle across the Iraqi obstacle belt. Included in 32 Armoured Engineer Regiment's ORBAT were some 20 or so Centurion AVREs. Like all the other tanks in the force they benefited from the addition of add-on armour, skirt plates and extra glacis and toe pieces. In many ways, they were better protected than the Challengers. The extra weight was certainly a problem, as it was for all the tanks. It not only put strain on the powerpack and transmission, but also raised the Military Load Class considerably. Challenger, already the heaviest tank in NATO at Class 70, rose to Class 80, causing us some anxiety for our assault bridges.

Overall control of the engineer aspects of *Granby* was exercised by Engineer 1 from our Operations Room in London, and we have been at pains to point out that EinC is the only level where all the different specialisations of the Corps can be drawn together and coordinated, and policies formulated and executed. An early decision, shortly after the Iraqi invasion, was to establish an Engineer Intelligence cell. Initially we were concerned purely with logistic intelligence — sources of fuel, water and engineer material, anything which might be of use in our support to the RAF. In gathering this, we made extensive use of our Territorial Army and professional engineer contacts with civilian industry, and in particular with the Engineer and Transport Staff Corps; and through their respective good offices we were able to talk to many firms with up to date knowledge of the Gulf area.

As a result of our work on water sources, the Central Staff in the MOD tasked us with formulating and putting into effect a water plan which was independent of the Saudi supply system, and which would meet the needs of British Forces wherever they were deployed in the desert. The plan required the purchase of a number of Reverse Osmosis Desalination plants which could operate from any desert waterhole, however brackish, supplemented

by newly developed water production units capable of filtering out chemical agents. Such machines led to a huge increase in the power requirement and a buy of special generators, as well as modifications to existing sets.

With the dispatch of 7 Brigade, we began to look more at the effect of ground on military operations. This closely involved Military Survey. Of particular importance to us was terrain analysis, which translated into a series of 1:50,000 going maps. It was immediately apparent how the going constricted assault from the South or the West into Kuwait. The salt marsh made for particularly difficult going on the coast just South of the Kuwait border. You will remember that this is the site of the town of Khafji, which was the target of an Iraqi incursion in January. At least seven Iraqi tanks drove off the road, and became immediately bogged, and were then taken out by Allied aircraft. The very difficult going all around the town was one of the main reasons why it took so long to recapture. The terrain was even more crucial in terms of logistic resupply, and so we bought several kilometres of mammoth mat and thousands of individual sand channels.

Another area for Engineer Intelligence to examine, was how the ground had been changed by infrastructure. We needed to know not only location, but also layout. For example, Kuwait is criss-crossed by a large number of pipelines, some up to 2m in diameter. These form a major obstacle to movement, especially in the area of the oil wells themselves. We needed to cross such pipelines quickly without breaking them, and this led to the design and manufacture of wedges for our assault bridges.

The most important part of the Engineer Intelligence function was to monitor and assess the effect of what the Iraqis were doing to change the terrain. Satellite imagery enabled us to watch the building of a formidable obstacle across the whole length of the Kuwait/Saudi border. In the event, of course, it was easily breached, but as we all know, an obstacle is only any good when it is covered by direct fire. If the Iraqi forces manning those positions had been even partially effective, the Allies would have suffered many casualties. The problem of the obstacle was of great concern to our Commanders, and influenced the overall battle-plan. We were called upon to brief on its implications at every level up to three and four Star, including a presentation to the Secretary of State, who made a special trip to see us at Northumberland House, prior to his first visit to the theatre.

CET working on bund

As Sappers, our main concern however was to ensure that we had the means to cross the obstacle. Climbing over the berm would expose the bellies of our tanks, and therefore there was a need to develop a quick means of making a hole. 21 Regiment came up with pipeline system pushed into the bund by a Combat Engineer Tractor, and then remotely detonated achieving the effect of a Bangalore Torpedo. The next major hazard was the network of oil-filled anti-tank ditches. They were primed to be set ablaze when the Allies attacked. The Defence Research establishments, industry and the Army Fire Service simulated the effect and combined in a highly successful development, sledges full of water, allied to a foam dispenser. This was sufficient to suppress a fire long enough to lay a tank bridge and cross a squadron of tanks.

The depth of the Iraqi minefields was well within the capability of Giant Viper but the 36 different

Report by Engineer in Chief (p105)

Challenger moving over bridge with wedges

types of anti-tank and anti-personnel mines, bought from all over the World and many of them blast resistant, caused us some worry. A local development was a copy of the Soviet roller system, designed in theatre and manufactured by 45 Field Support Squadron; unfortunately it proved too heavy for the tank and had to be discarded. A more successful development, this time by our research establishments was Magnetic Influence Mine Induction Coil (MIMIC). We also procured 16 flail units, made by a Scottish firm called Aardvark. Not the most beautiful or the most tactical of machines and also quite slow, but it is nonetheless the single most effective system for dealing with such a wide range of mines. Another equipment that was produced quickly was the Scatterable Mine Clearance Device mounted on the front of a 432. The segmented blades follow the contours of the ground. It proved very effective on operations and was used successfully to clear Multiple Launched Rocket System (MLRS) bomblets from the route chosen for the Divisional Main Supply Route (MSR), and after the war it cleared a 430m breach through one of the more sophisticated Iraqi minefields.

Turning now to mine laying, one of our deficiencies has long been a vehicle launched scatterable mine system. We therefore investigated and bought the newly developed Minotaur system from Giat of

Giant Viper firing and exploding

Report by Engineer in Chief (p106)

AVLB with MIMIC

AVRE with MIMIC, ploughing, towing

France and mounted it on an Alvis Stormer chassis. There were a lot of problems matching the two together and the collaboration between the two firms was remarkable. However, they could only produce three machines by the deadline date of mid-January — and this prompted an urgent request to the German Government for the release of four in-service Skorpion vehicles. From the time of our request to delivery in theatre, including training of the four British crews, was a mere ten days, an amazing achievement in terms of Inter-Government and Inter-Army cooperation. During the operation our Operational Requirements Branch (ORS) had more than 30 Urgent Operational Requirements endorsed, funded and met. This was one third of the Army total and accounted for 20 per cent of the money spent.

Even a quick gallop through *Granby* would not be complete without a mention of Postal. As always, Postal are represented wherever our troops are. At the height of the Gulf conflict, there were some 155 Posties in the Gulf. At home, Mill Hill was the hub of the operation, and extra troops from varying Arms and Services were drafted in to cope with the 24 hours a day operation. The BFPO 3000 indicator for welfare and unsolicited items put the whole system into overload and over the Christmas period alone some 2400Kgs of airmail and 76,000Kgs of parcels passed through Mill Hill. The number of "Blueys" posted numbered well over 4.5 million.

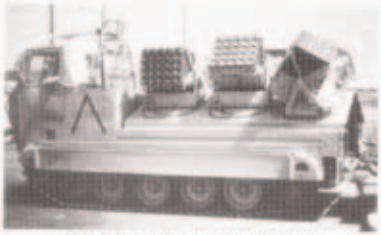
What are the lessons of *Granby*? Well, I will not bore you with a long list, but there are four major areas to which I have already made reference. First, that the best level of engineer representation at Brigade level is a CO. This is strongly endorsed by GOC 1 Division, and both the Brigade Commanders, and we intend to take this forward in our *Options* work. Second, the importance of engineer intelligence. There was a wealth of information which needed bringing together and analysing by engineers. The results of this work had a significant effect on the battle plan chosen. Third, the importance of an engineer HQ in London at the heart of the decision making machine. At a time when Arms Directors are under heavy attack, and those with little understanding of our role seek to disperse and marginalise our influence, our coordination of all aspects of the engineer effort during *Granby* is a valuable indicator of our worth and importance. Fourth, is the need for engineer tanks to have the same protection and mobility as those they are supporting. And finally, this time looking at the Iraqi problems for lessons for us, I would highlight the pin-point accuracy of modern aerially delivered weapons — with the ability to take out bridges. This emphasises as never before the need for military bridging, dry and amphibious.

My final word on *Granby* is reserved for the accolades. As I recorded in my message to the Corps in the April issue of the *Sapper*, Chief of the General Staff (CGS) wrote to me to express his personal thanks for the sterling efforts of our soldiers

Aardvark

Scatterable Mine Clearance Device

Report by Engineer in Chief (p107)



Vehicle Launched Scatterable Mine System

Skorpion (German)

and Chief of the Air Staff (CAS), on behalf of the RAF, at the 1st Meeting of the Chiefs in 1991, expressed "special gratitude for the outstanding work done by the Royal Engineers". Tom King was due to dine with us at our March Corps Guest Night and had taken the unusual step of asking to address us. At the last minute Government business got in the way, but he wrote to the Chief Royal Engineer as follows:

> "I am very sorry that I will be unable to be with you at your Guest Dinner tonight. It is particularly disappointing for me as I have so recently returned from the Gulf and seen for myself what a magnificent part the Royal Engineers played in the success of 1 (BR) Division. Their role was and continues to be invaluable to our Forces. I know that you and all your colleagues in the Royal Engineers are very proud of what they have done and are right to be."

He has accepted our invitation to the July Corps Guest Night.

Post *Granby*

Although *Granby* is over and the combat troops have returned home, there is still a military and Sapper presence in the Gulf. The recovery of all the equipment is a mammoth logistic task which will take most of the rest of this year to complete. The bulk of 36 Regiment deployed to Saudi Arabia as the others returned, and they have been busy recovering stores, water points, pipelines and other equipment and preparing them for shipment. The RHQ and 50 Squadron returned to the UK earlier this month and the Field Support Squadron will pull out in the next few days, leaving a 50 strong troop to finish the work. There is also a small STRE in Bahrain in support of the RAF.

You may be surprised to learn that there is still a British Battle Group in Kuwait and this will probably remain as long as the Americans keep a brigade there. Also in Kuwait, and you may have seen an article in the *Sunday Times* featuring him, is Lieut Colonel Mike Brooke, the former CO of 33 EOD Regiment. He commands the Battle Area Clearance (BAC) cell which was set up there immediately after the War, and which *de facto*, took control of the international EOD effort throughout Kuwait.

The BAC cell was intended as an advance party for 21 EOD Squadron, the newest squadron in the Corps, formed rapidly at the end of last year to provide relief for 49 Squadron as soon as the hostilities finished. We foresaw a massive EOD task, both immediate and long term, and envisaged a Government to Government contract under which an EOD Squadron would be employed, at least initially, to clear the high priority areas. In the event, it was decided that the whole business of BAC should be left to civilian contract. After six or seven weeks of negotiations, Royal Ordnance secured the contract with the Kuwait Government for clearance of one of the larger sectors and has come to agreement separately with the MOD here to hire 21 Squadron for a six month hire period (four month task) until they can gather together an equivalent civilian workforce. Agreement to the request was taken at Secretary of State level, and caused a great deal of soul searching about the ethics of sub-contracting soldiers to private enterprise. However, my staff have been fully involved in the contract process and clauses have been inserted about the degree of risk that is acceptable and the OC's discretion being final.

No sooner had 1 Division recovered to BAOR than the Kurdish problem broke on the World, and you will be aware of the deployment of the Commando Brigade on Operation *Haven*. If, like me, you have scanned the press in vain for any mention of engineers, rest assured that not only is 59 Commando Squadron with them, but 51 Field Squadron has also deployed, along with elements

Report by Engineer in Chief (p108)

of 6 Field Support Squadron, an STRE and a handful of staff officers. While 59 Squadron provide active support to Commando operations, the other Sappers are part of an integrated organisation under 18 US Engineer Brigade setting up the Camps, and particularly concerned with the provision of water and sanitation.

You will not be surprised to hear after all this that UKLF's carefully crafted Emergency Tour Plot is in tatters. There is not a unit in the Corps that has not either provided men, or been substantially involved in these various operations. Through it all, our other commitments have continued unabated.

On the exercise front, last summer saw 69 Independent Gurkha Field Squadron deploy to Canada for the first time for the annual *Waterleap* exercise which combines construction work with military training. At the training centre at Aldershot, Nova Scotia, they constructed a steel framed building and renewed the camp sewage system. They also refurbished two wings of the Officers' Mess, which included replacing plumbing and electrical fittings, internal partitioning and fixing a suspended ceiling.

Although the *Larchpole* series of exercises in Kenya came to an end last year, this January saw the beginning of a successor series known as *Oakapple*. Most of 48 Field Squadron (Construction) spent two months there undertaking worthwhile tasks in support of a wildlife charity, Rhino Ark.

In September 90 our second nine-man contingent on Operation *Salam* returned from Pakistan at the end of a successful six month tour providing assistance for the UN Rehabilitation Project for Afghan refugees. The task involved training Afghans to deal with the mines, booby traps and other unexploded ordnance likely to be encountered by the refugees on their return home. The RE contingent formed two four man training teams and provided the Chief of Staff (COS) in Quetta. The COS, Lieutenant Colonel Noel Mulliner, was responsible for coordinating the work of the UK, Italian, and Turkish teams. The training team achieved its target by training 1088 De-miners and 54 unit and section leaders.

Our assistance continues to be requested by other Government Departments, normally at the last moment. In July 53 Field Squadron (Construction) laid trackway in Green Park on behalf of the Foreign and Commonwealth Office (FCO) to provide a press facility for the NATO Heads of Government meeting at Lancaster House. And until the rail unions decided to cancel their tube strike, planned for early May, the Department of Transport had us stood by to lay trackway for car parks in the London Parks.

MWF advisory teams travelled all over the World, giving advice to the Indonesian Air Force on airfield construction and maintenance, recce and planning of an armoury in Diego Garcia, design of a new ammunition compound in Belize, and most recently design of a water supply system to augment resources at Akrotiri.

Northern Ireland, Belize and the Falklands remain permanent commitments. The main project in the Falklands at the moment is a swimming pool; this is an 18 month task which has been undertaken in four consecutive squadron tours; 51 Field Squadron completed the earthworks, 9 Parachute Squadron completed the foundations and the steel frame, 8 Field Squadron constructed the concrete pool, installed the plant and completed the cladding and 32 Field Squadron will do all the finishing and testing. The pool is due to be opened on 28 August 1991. (See April *Journal* pp 78-83)

Regimental Affairs

The Corps Band had another magnificent though changeable year. After gaining an excellent grading in its quinquennial review, the Band was re-roled for its operational commitment from HGV driver support in BAOR to Medical Assistant support to TA Brigades in UK. Operation *Granby* accelerated the retraining programme but in the event the Band did not deploy to the Gulf although it was on standby to assist in casualty evacuation from airports in this country. However, about one third of the Band at any one time was deployed to Mill Hill to help sort the mountains of mail being sent to the Gulf. On the musical front the highlights of the Band programme last year were its participation in the Edinburgh Tattoo and its involvement in Fortress Fantasia, a musical extravaganza which marked the end of the resident infantry battalion and Royal Artillery presence in Gibraltar.

Sadly on Operation *Granby* we lost two NCOs Killed-in-Action, Corporal Denbury and Corporal Lane; two officers died in traffic accidents, Lieutenant Colonel Alec Wright and Major Jim Kinghan; and there was one other fatal accident.

The REA and its benevolent work is central to much of the Corps' effort in helping retired sappers or their widows and also an increasing number of serving soldiers and their families who are in need, some through accident or injury. We are making

use of the Gulf support fund, which is being administered by the Army Benevolent Fund, to support Gulf casualties and the next of kin of those who died. Altogether the REA, through its benevolent committee, is now disbursing about £.5 million each year to those in need.

The Museum development continues to feature high on the agenda of Corps Affairs. The great achievement in 1990 was the construction of the roof over the inner courtyard of the Ravelin building. Its distinctive feature is a barrel vault made of transparent polycarbonate material. A Harrier GR1, shortly to be delivered to the Museum, will be just one of the centre-pieces of the new exhibition depicting the history of the Corps since 1945. Fund raising efforts targeted at industry have not been helped by the economic down turn but the Museum Foundation Fund Raising Committee has its sights firmly set on meeting the target of £1.75 million by 1995.

MS Matters

Changes in Colonels Commandant announced so far this year are: Major General Evans who took over from Major General Sinclair in March, Major General Fagan who took over from Major General Grey in April, Major General Fawcus who takes over from Major General Groom in July, and Major General Peck who takes over from Brigadier James in October.

The Corps continues to be nearly fully manned although some imbalances in our officer rank structure continue to exist. Nevertheless there are seams of exceptionally high grade officers who should serve us well in the future.

Premature Voluntary Retirement (PVR) this past financial year has been low which is a reflection of the "wait and see" attitude of the Officer Corps throughout the Army in anticipation of *Options for Change*. However a healthy pay rise and the industrial recession have also doubtless contributed!

This has been yet another year of studies with Major General Neil Carlier leading the Logistic Support Review, Brigadier Scott Grant representing the Army on the key Defence Programmes Option Working Group, and Brigadier John Lucken leading the Operation *Granby* Lessons Learnt Team.

We continue to be well represented in key appointments with promotion for Brigadier Scott Grant to be, nominally, "Director General Training and Doctrine (Army)" though it is not yet entirely clear how this appointment will fit into the Inspector General's organisation or what it will eventually be called. Also Brigadier Peter Sheppard is to be Chief of Staff HQ BAOR in September this year.

Honours and Awards lists show continued Sapper representation. Since October 1990 we have received public recognition by the award of three CBs, three OBEs, four MBEs, nine BEMs and one QGM. In addition we have received seven Mentions in Dispatches for service in Northern Ireland.

Corps Sports

As we head for 1992, it is inevitable that a great deal of attention will be paid to the Olympics being held next year. Incidentally, after that, the Winter and Summer Olympics are to be held two years apart and to start the new four year sequence the next Winter Olympics is being brought forward to 1994.

1992 will start with the Olympic Games in France at Albertville and some members of the Corps are already in line to take part. Three of our skiers, Sergeant Dixon, Corporal Woods and Lance Corporal Sklenar have been selected for the British Biathlon 'A' Team (the Olympic Squad) and a fourth, Lance Corporal Ryan, is in the 'B' Team and is a reserve for the Games. Captain Hugh Hutchison, after turning in the best British results in the Freestyle Moguls this season, has been placed British number one for next season and the Olympics.

Also Corps personnel are well placed for the Olympic Summer Games in Spain at Barcelona. Lance Corporal Morgan is in the Modern Pentathlon Olympic Squad and Corporal Daly-Ferreira is hovering on the edge of selection. Our other 1992 Olympic aspirant is Major Steve Pyatt who aims to compete in the Soling Class Sailing event.

Corps Canoeists achieved one of their best performances ever this year in the Devizes to Westminster Race. The Corps Team was first overall and the fastest services team, had the second fastest crew and fastest services crew. Sergeant Heath has been selected for the British Canoeing Squad again this year and is heading towards the 1992 World Marathon Championships in Australia in 1992 (there is no equivalent Olympic event).

Lance Corporal Innes has become the Inter Services Light Middleweight boxing champion and has considerable potential. Unfortunately he was below par when he took part in the ABA championships this year and went out in his first contest.

Recently Lance Corporal Ellingworth and Sapper Williams were selected for the 1991 Army cycling team.

In October 1990 Lance Corporal Williams became Captain of the Army Fencing Team. He is also a member of the British Sabre Team and is ranked second/third in the country.

On the skiing front the Princess Marina Cup changed hands this year having been held for the past four years by 35 Engineer Regiment. 28 Amphibious Engineer Regiment kept it in the Corps by the narrowest of victories, with 35 Engineer Regiment coming second and showing the Corps strength. 26 Engineer Regiment and Junior Leader Regiment RE were placed fourth and fifth respectively. Captain Hugh Hutchison dominated the British Services International Alpine Championships and became, for the third time, British Army Champion, British Inter-Services Champion and Commonwealth Inter-Services Champion.

It was an all Sapper final for the Army Football Challenge Cup this year, with 28 Amphibious Engineer Regiment retaining the cup after a replay against the Training Regiments RE. In the minor units competition 3 PCD RE won the BAOR title but unfortunately lost in the Army final 2-1.

The Corps won the Inter Corps Squash Championship for the second consecutive year and Lance Corporal Turton is the under 25 Army Squash Champion.

Again, the Inter Corps Water Polo Competition was won by the Corps thus keeping our 100 per cent record for the two years it has been held.

Army Apprentices College Chepstow have been showing their strength on the sporting front in a number of Junior Army competitions. They have recently won the Cross Country (for the tenth consecutive year), Badminton (for the second consecutive year), Football (Army Youth Cup), Squash, Rugby and Basketball.

Conclusion

I have reserved my final comment for the most important subject of all — our officers, NCOs and men. The standard we are recruiting is uniformly high. At the Sovereign's Parade at Sandhurst last month, 35 officers were commissioned into the Corps — an achievement which is the envy of the other Arms and Services. Our men are well motivated and find life in the Corps challenging and interesting. All of those who went to the Gulf faced up to their tasks magnificently — and perhaps it is worth reminding ourselves that we initially expected very heavy casualties. We can be very proud of them and their attitudes. They are fine servants of the Corps and ambassadors too.

Report by Director General of Military Survey

May I start by saying how delighted I am to have this brief opportunity to tell you something of the activities of Military Survey.

The responsibilities of Military Survey have developed over recent years and are now: "To satisfy the requirements of UK Defence Forces for the Geographic Support which is essential to their capability to plan, train and fight.".

This means meeting any defence requirement for maps, air charts or related information above Sea Level. As with the Engineer in Chief's commitments I am responsible to the Navy and Air Force as well as to the Army. I also support the Central Staffs, the Intelligence Community, the Procurement Executive and the new Defence Research Agency. My chain of command is directly to ACGS.

Military Survey divides into two main areas:

- First Operational support to Formations.

  This is met by geographic staff in Headquarters down to Division level plus military units in theatre. These include one squadron in BAOR, two squadrons as part of a Survey Engineer Group, and a TA Squadron in UK. We also have a unit based in the USA which operates worldwide.
- Second, work in the preparation of maps, air charts and other forms of information against contingency plans and training requirements in peace.

  This is done principally by civilian staffed units, mainly in the UK but also in Germany.

The two sides are complementary and are used very flexibly. The military units contribute to production in peace and, as has been proven during Operation *Granby*, the civilian base plant makes a vital contribution in war.

The last year has been extremely busy for us. In the short time I have I shall mention the five following topics which loom particularly large.

MAIN TOPICS

- Changing Requirements
- *Options for Change*
- Operations *Granby* and *Haven*
- Modernisation
- Defence Support Agency

CHANGING REQUIREMENTS

THE potential of computer based Command and Control Systems, precision guided weapons, sophisticated air navigation and mission preparation systems was made plain to all in the Gulf War. Many new systems and those now under development will either not work at all or would have their capabilities severely reduced without geographic information, usually in the form of digital data.

The scope of the requirements is very extensive indeed and we continue to find new developments which demand inputs from us. There is no reduction in the need for paper maps and air charts so we have a major challenge in both the amount of work we have to do and in the technology it involves. Almost anything new now means yet another even more sophisticated computer system.

OPTIONS

YOU have heard of *Options for Change* from the Engineer in Chief. The same pressure is on Military Survey to reduce our military strength by 30 per cent. However, we are arguing strenuously that our work depends on the area of defence interest and the technology deployed in the field. Apart from small numbers in Formation Headquarters and the relatively trivial aspect of printing smaller quantities of maps, the reductions in force levels have very little effect on us. Current possibilities of UK providing a Force able to go anywhere in the NATO area, and perhaps beyond as in the Gulf, means an enormous expansion in requirements for better terrain analysis and other more detailed information about the ground. We will no longer be able to claim, as has been done for 40 years within the existing I (BR) Corps boundaries, that we know the area. As ever in warfare, whoever manages to make the best use of the ground, wherever it may be, has a significant edge. With the sophistication of modern systems, that means a major commitment to geographic information. We are still putting our case on *Options* and I do not yet know how it will turn out.

OPERATIONS *GRANBY* AND *HAVEN*

(See also Brigadier Elder's report on pp 125-131)

THIS has of course been the main topic of the last year. The Military Survey involvement started on 2 August 1990 and of course the first question was "Where on earth is it? Get me a map". Contingency plans covered very small areas and large parts of the eventual area of interest were, to all intents and purposes, unmapped. In conjunction with our friends in the US, the mapping was eventually completed. Mapping was not quite on the critical path for the start of the land war, but it was not far off.

Our work involved the production and updating of hundreds of different maps, air charts, and terrain analysis products, many in digital form. We also coordinated many points as part of the targeting process. Our civilian staffs, as well as the military units, worked on shifts mostly on a 24 hour basis. Much of this work was to support the well publicised RAF Tornado strikes and other air operations. There was also a vast demand for map stocks. By the end we had printed 15 million maps and air charts and had air freighted a total of 600 tons to the Gulf. To produce these quantities was far beyond the capacity of our normal presses in UK and BAOR. We therefore invoked our wartime emergency agreements to use resources at the Ordnance Survey, we used commercial contract, training presses at the School of Military Survey (SMS) and Chepstow and even contracted the Belgian Army to print some for us.

However that is all the factory-like work in UK. We also had a large proportion of our military manpower deployed in the Gulf. Following on from my earlier point about needing more geographic support when the troops do not know the ground, we provided 50 men from 14 Squadron in BAOR with 7 Brigade, whereas in BAOR we would not have any Military Survey personnel with a Brigade. When the Divisional Headquarters and 4 Brigade were deployed we sent another 70 in comparison with about seven to a divisional headquarters in Germany. So what did they do? As the Brigades came direct from BAOR to a featureless desert the most immediate task was to train the formation in desert navigation. About 5000 personnel were put through brief, but apparently effective courses. Then navigation aids were established in a training area using satellite position fixes to position oil drums which were painted in Sapper colours and had their grid reference painted on the outside.

Next survey support to the Gunners. Although the Gunners can do their own survey with their inertial systems, in BAOR they quickly realised that this

depended on the dense network of fixed points we had established for them in Germany in the 60s and 70s. Once again the satellite position fixing came into its own and our field surveyors were with 1 Division Artillery through Iraq and into Kuwait.

The satellite system we used is a US military one, known as the Global Positioning System. It can give an instant fix to about 30-50 metres and can be used as a surveying tool to give relative positions to centimetres. A slightly simpler hand held version was used by the brigades during the advance. It was said to be one of the war winning factors. However remember that it only gives a coordinate. In most cases that is not much good until it is related to a map.

Other activities included operational updates of maps, plans and terrain analysis products using our tactical printing systems which sit in a four ton vehicle. Two of the big semi-trailers containing a larger press and supporting equipment were also deployed from Germany to give a much needed Theatre level production capability. Getting these semi-trailers out there was another epic story as they had been consigned to a static role ten years ago.

Last but by no means least was map supply. 600 tons from the UK plus much larger amounts from the US had to be sorted and distributed to the coalition forces so that the right units had the right stocks of the right sheet. Because of the size of the area and the speed of movement of our forces this was a mammoth task and we had to set up a copy of the NATO distribution system to cope with it.

We still have some men in Kuwait and have since deployed more to Turkey and Northern Iraq to support the Kurdish *Safe Haven* Operation.

We are obviously still learning the lessons from *Granby*. The most important is that dependency on Military Survey increases out of area.

Modernisation

We are just about to start on a fundamental update to our production systems in UK with an extremely large new build at Feltham. This will provide the technology to meet the new requirements for digital data plus efficiency improvements to allow us to meet them with no more than current staffing levels. It is a very major challenge in both technical and organisational terms.

Defence Support Agency

Finally as part of an extension to the Government's pressure to create Agencies from the Civil Service we found ourselves on a list for what is known as Defence Support Agency (DSA) status.

The Military Survey DSA was formed in April this year from those Military and Civilian elements of our organisation in UK. I retain my existing worldwide responsibilities as Director General of Military Survey but, with my new secondary hat as Chief Executive of the Agency, I now have considerably extended control in both financial and organisational terms over the DSA staffs and units.

The overall task of providing an integrated service to meet the planning, operational and training requirements remains unchanged and the DSA remains firmly in the chain of command. However there is greater emphasis on ensuring satisfaction by the users of our products and services throughout defence with the prime aim of providing agreed levels of support in an operationally effective and businesslike way. Having mentioned a businesslike approach, I must assure you that we will not be setting up cash registers at our map distribution points in the field — at least, that is, unless there are similar arrangements for other combat essentials such as ammunition and food.

The introduction of the DSA at the same time as Operation *Granby*, the *Options* exercise and our modernisation work has not made this an easy year so far. However we believe that the new Agency arrangements do give us a very valuable opportunity to increase the effectiveness of our support to defence.

Conclusion

My time is up. However I hope you can see that the Survey element of the Corps is in good shape and is hard at work. In good Sapper tradition we are tackling new frontiers and, despite the uncertainties of *Options*, we see a good future ahead.

General Officers (p114)

Tobruk 1941

COLONEL J E WELLER MC MA FBIM MICE

Looking back over 50 years presents a little difficulty for one who finds it hard to remember what happened yesterday; however I notice the Journal *is asking for articles on events of 1941 and the siege of Tobruk was part of the history of that year. Desert warfare is also topical.*

The 12th Field Company had moved from Palestine to the Western Desert in 1940 when the Italians entered the war. We were at Mersa Matruh, building defences until the end of 1940 when we took part in Wavell's campaign, in which our chief concern was the provision of water; we had had some experience of the Desert.

On Rommel's arrival we moved to Bagush (about 40 miles east of Mersa Matruh) to build defences, but Rommel's advance was halted on the Libyan-Egyptian border with the 9th Australian division besieged in Tobruk.

In the summer of 1941, there was a small war in Syria. 12th Field Company took part in this campaign going via Damascus to Zahle near Baalbek, where we found ourselves when hostilities ceased. There was a brief respite when I remember going to the races in Bierut.

In September 1941 we were given orders to go to Alexandria where after one night in a transit camp we were told we would be embarking on a destroyer the next day for an undisclosed destination. The odds were divided between Tobruk and Malta.

I should explain that I had joined 12th Field Company as a Section Commander in 1939. I had been promoted to 2nd in Command in late 1940 — from 2Lt to Capt in one step. A few hours before we were due to go down to the docks, the OC went sick and I found myself, at the age of 23, commanding 220 men with only two other officers to help me.

I can recall the voyage to Tobruk quite well. The ward room had white tablecloths and white bread, things we had not seen in the desert. The destroyer zigzagged most of the way and a lot of the Company succumbed to seasickness. This made disembarkation difficult to organise. I had been told it must be effected in nine minutes, as the Captain of the destroyer had to pick up the Australian Field Company we were relieving and get out of the harbour and back to safer waters in darkness. We managed somehow and found our way to a patch of Desert near the El Adem crossroads, the only turning off the Tobruk Bardia road in its entire length. It was, I think, late September when we arrived. 70th Division had taken over from the 9th Australian Division.

The fortress consisted of a perimeter anti-tank ditch behind which was a series of concrete underground platoon posts built by the Italians. Between each platoon post there was the main minefield and from each platoon post short minefields had been laid, radiating outwards to prevent tanks from driving round and round them. There was a second line of defence consisting of another minefield in which were gaps to allow communication with the perimeter platoon posts.

Our first job was to rehearse plugging these gaps with mines which had to be done in the event of attack. We had some difficulty in establishing exactly where mines had been laid. Although there were maps, there were few distinguishing features on the ground to which to relate the maps. The mines were (EP MK) (Egyptian Pattern) which comprised an explosive body with a cover with a central plunger attached. When a tank went over it the plunger would crush a glass capsule containing a substance which exploded the mine. The safety pin, a 1in nail, had to be sheared to allow the mine to explode but some had matches instead of 1in nails or safety pins. Our own minefields inflicted more casualties on ourselves than they did on the Germans.

Our work consisted mainly of maintaining the minefields, (a 100x strip went up with sympathetic detonation when one mine was hit by a shell), and providing water from our water point. Water was strictly rationed, I cannot recall exactly what the ration was (1 gallon/head/day?). The water was brackish and coloured, but we duly supplied several units with their daily ration from our well source which never ran dry.

Our living conditions were very rough. Everything was below ground. The Company Office, the mess, and our sleeping quarters were all in dugouts. The Desert in this area consisted largely of sandstone rock and excavating these places was difficult although revetting was not always necessary. Our transport was interspersed with innumerable unserviceable vehicles so that shelling or dive bombing was more likely to hit lorries that did not go rather than runners.

The food was bully beef and biscuits for breakfast, lunch and dinner, with occasionally a tin of fruit that was a great delight. We were never short of cigarettes; and we got an occasional bottle of whisky. George Martin (a member of my batch) was running the docks unit and his divers worked to retrieve useful things from the many ships on the bottom of the harbour.

We had taken a couple of packs of cards with us and every evening we would play innumerable rubbers of bridge by the light of the laterns.

In December we knew Auchinleck's offensive was on the way and we had to clear gaps in the minefields in preparation for our breakout to meet him. On one of these occasions, I can remember hearing the rumble of guns away to the South East. They were not guns firing at us, they were the relieving force: if anyone wishes to experience the sensation of relief I can recommend the sound of a relieving force after being confined (with heavy responsibility) for three months in a besieged garrison.

A Theatre Overview of Engineer Aspects Of The Gulf War

COLONEL A A WILSON OBE BSc(Eng) MIHT

Colonel Alasdair Allan Wilson was commissioned into the Corps from Sandhurst in 1967. He has seen service in the following areas in order of appearance: Aden, Sharjah, Northern Ireland, Kenya, Berlin, BAOR, Royal Navy Staff College, USA as an exchange officer, Falkland Islands, UK as SO2 Engineer Land, Commanding Officer 33 Engineer Regiment (Explosive Ordnance Disposal. He has had three tours at Royal Military College of Science, Shrivenham; Degree, Staff College and Directing Staff. He was free in September 1990 to go to HQ EinC as Colonel GS Operation Granby *where he wrote the job description for a Chief Engineer, British Forces Middle East. He returned from the Gulf in April 1991 to become Project Manager Mines and Demolitions, in the Ministry Of Defence.*

This article is an updated version of a letter written for the *Journal* to be published in the April 1991 issue. At the time it was considered too sensitive to publish for reasons of security. The security problems have faded so I have also added a little on the war and on post war activities in Kuwait City. It is only an overview and much detail has been left out. I am conscious that there are people and events omitted which should have been included and I apologise in advance.

Operation *Granby* began for me when I was summoned to HQ EinC on Friday 14 September 1990. The RAF had been involved since August and a small team of Major Sean Naile and three men had been giving Airfield Damage Repair (ADR) advice to the RAF in Bahrain since 26 August. Apart from that, the superb "posties" and a few signallers, there was no Army involvement. Rumour had been rife in the press that Britain would provide a land element to show solidarity with the US on their more romantically named Operation Desert Shield. The option chosen was to send 7 Armoured Brigade from BAOR with two regiments of armour and a mechanised battalion.

On arrival in Northumberland House it soon became clear that the Secretary of State (SOS), Mr Tom King, was about to announce the deployment of a brigade group of about 7500 men — the RE element of which was to be 250; a close support squadron (CS sqn), topographical (Topo) support, and a small works team. My task was to help to make sure that the Sapper ORBAT was adequate to sustain the force, a job I did with varied degrees of success for the next six months. I was ably assisted at EinC by Majors John Crompton and Tim Randle and a rapidly drafted in Lieutenant Colonel Mike Gill to start the engineer intelligence collection.

An initial assessment by experienced sappers, including those who, as the Chief Royal Engineer put it, were used to getting their knees brown, identified that the brigade would need at least a regiment of:

- RHQ
- Close Support (CS) Squadron
- General Support (GS) Squadron
- Field Support Squadron
- EOD Squadron
- Topographic (Topo) Squadron

In addition, they would need a field squadron and park squadron in the rear areas, with a RHQ in the initial stages to command the build and a Military Works Force (MWF) team to design and supervise the works. All this added up to about 1600 men. A quick phone call to 1 (BR) Corps confirmed that our views were totally in line and we were only echoing

Col A A Wilson OBE
A Theatre Overview of Engineer Aspects p116

their proposals, drafted by Brigadier Chris Elliot, that the all arms and services strength required by an independent brigade for desert operations would be 11,500 and that was what had been recommended to MOD.

Our advice went unheeded at this stage and SOS made his announcement; any embarrassment we might have felt at such an inadequate level of RE support was hidden by no mention being made of Sappers at all. We were not alone. The Joint Forces Operation Staff (JFOS) the tri-service staff set up at Aldershot to plan "purple" exercises and give OOA advice was also not consulted during the planning phase.

The brigade recce team was briefed at Strike Command, the four star Joint Headquarters (JHQ) for the operation. Lieutenant Colonel John Moore-Bick, CO 21 Engineer Regiment, was the Sapper on the team. At the last moment we managed to get Lieutenant Colonel Meryon Bridges, CRE of 64 CRE, added for the rear area recce. John duly reported back that the ORBAT suggested above was indeed required and that in addition a small RE cell was required at Riyadh. The cell was to be led by a Colonel RE. They also confirmed the requirement for a UK based regiment of RHQ, field squadron and field support squadron to deploy early to prepare the base facilities in advance of the brigade.

The proposed ORBAT was agreed by the Joint Commander, Air Marshal Sir Patrick Hine and passed by MOD. Meryon Bridges was to return with part of 64 CRE to do the design work. 39 Engineer Regiment, commanded by Lieutentant Colonel Bob Pridham, were nominated as the UK based Regiment and were to deploy with 53 Field Squadron (Construction) and 60 Field Support Squadron. They were in Germany at the time, on an exercise we could not get cancelled until final agreement for deployment was promulgated. The Regiment had to get itself back to UK, sand painted, kit loaded and off to the sun over a long weekend. I waved goodbye to them from Brize Norton on 29 September. For some reason, not entirely unconnected with having drafted the job description, I was to go to Riyadh on 4 October.

Support to the RAF was also proving difficult to get off the ground. Initial RAF recce had assumed that the Saudis or perhaps the Americans would take care of all Airfield Damage Repair (ADR), and Restoration of Essential Services and Functions (RESF). Hardening of aircraft dispersals and installations, to become known as Works for War (WFW), was not being addressed, as the threat to the airfields was considered too low to worry about. As time passed this perception changed.

An initial request for an ADR troop at Bahrain took two weeks to staff through MOD, only to be rejected at the last hurdle. It was not until CO 22 Field Hospital, sent to support the RAF at Muharraq airfield, said that he could not cope without RE support that things changed. A troop of 3 Field Squadron was put on standby and subsequently deployed to Bahrain by 24 September. You will notice that a field troop, not an ADR troop was authorised.

At the same time the RAF decided to base a detachment at Tabuk, a Saudi airfield to the north east of the Kingdom. There were very few facilities, just acres of concrete as Wing Commander Ron Elder the Detachment Commander put it. A troop from 48 Field Squadron (Construction) was stood by and the recce team despatched on 26 September. The story of this troop, under Captain Lloyd Banks, is worth a book of its own. It was bounced around between Cyprus, Bahrain, Riyadh and Tabuk for three months before leaving in a cloud of glory in December 1990. The enhancement they made to the operational capability at Tabuk was out of all proportion to their size, the resources support they received, or the degree to which they were messed about. They built, amongst other things, a command shelter, accommodation, air raid shelters, Emergency Bulk Fuel Installations (EBFIs) and hardened communication shelters. But, I am getting ahead of the story.

By the end of September 1990 we had a balanced Sapper plan for support of the Army, with the RAF not quite as well supported. My SO2, Major Colin Mildinhall, and I left for Riyadh on the morning of 4 October 1990. 16 hours of flying sideways in a Hercules later, and after being bust to Lieutenant Colonel, we arrived to join the growing HQ British Forces Middle East (BFME). The newly appointed Commander, Lieutenant General Sir Peter de la Billière, joined us two weeks later. Peter Nell and Roraigh Ainslie made up my staff, with Lieutenant Colonel Nick Fickling loosely attached (in more ways than one) as SO1 Geographic. The survey change of command was always a problem and Nick operated as a free spirit, coming to me when he needed help.

39 Engineer Regiment arrived at the airport to find the mobile steps bogged down in the sand, so they were stuck on the Tristar for hours. They eventually made their way to the huge warehouses, where they

made their homes amongst the sheep pens. They set to work in the Force Maintenance Area (FMA). Jubayl is a huge complex with the airfield 49km away from the port. They built a 2000 man camp, later to become Baldrick Lines, and constructed all the required services. They also set up the command and control required to receive the ships, aircraft, personnel and stores that began to arrive in ever increasing numbers.

Effectively they ran the FMA until a welter of briefcases and staff officers announced the arrival of the HQ. They wisely withdrew from the immediate chaos and set up Camp 4, which was to become a 4000 man (and woman) facility for training and fitness. Hospitals, water points and the construction of numerous bits and pieces necessary for the efficient running of the brigade occupied their time until the beginning of November.

By then it became obvious that it would soon be time for the RHQ to return to UK. Working as a team CO, CRE Wks and Chief Engineer planned the size and shape of the force required in the FMA to support the brigade, and on the airfields in support of the RAF. First, the need for a theatre park, rather than a support squadron, had been realised very early on. The park was based on 60 Field Support Squadron and commanded by Captain Doug Cooper.

Next, the need to support the FMA with a field squadron was reconfirmed. At the same time, it was becoming clear to the RAF that the work required on their bases was not going to be provided by the other coalition partners. It will not have escaped the notice of the discerning that we had ended up with an airfield squadron supporting the land forces and field troops in support of the RAF. There was a logical solution. After much lobbying it was agreed that Major Bill Fawkner-Corbett's 53 Squadron should go in support of the RAF with SHQ at Muharraq and detachments at Tabuk and Dhahran. This meant that the troop of 48 Squadron had to go home. It also meant that 3 Field Squadron, under Major Hamish Rollo, could come out to the FMA, picking up its field troop from Bahrain to complete its ORBAT. RHQ 39 Engineer Regiment and the balance of 60 Field Support Squadron also had to return, and very sorry we were to see them go.

It was about then that the term "rate capping" reared its ugly head. This was an attempt to ensure that all people deployed to the Gulf were justified. Unfortunately, our idea of what was required did not always agree with the MOD perception. By the way, 7 Brigade's final total was 11,500.

To give the new RE deployment proper technical support all PQEs, GEs, Clerks of Works and other specialist tradesmen were grouped together under CRE Wks to produce three STREs; Land under Major Alan Kay, Airfields under Major Charles Pickles and POL under Major Jim Kinghan.

Meanwhile, 21 Engineer Regiment had arrived and were training hard with 7 Armoured Brigade, Major Peter Davies and 4 Field Squadron in the CS role and Major Max Heron with 1 Field Squadron in the GS role. Major Steve Henly brought out 45 Field Support Squadron, only to hand it over to Major James Wood in theatre. Major Nick Larkin with 49 EOD Sqn and Major Nick Rigby with 14 Topo Squadron completed the ORBAT. Their story will be told elsewhere.

The hard work over and the ORBAT settled we were looking forward to some decent training when the bombshell of reinforcement hit us. For some time it had been growing apparent that Saddam was neither planning to attack Saudi Arabia, nor intending to leave Kuwait voluntarily. That meant that the Coalition would have to go over to the offensive if the UN resolution were to be met. That meant larger ground forces and more bomber aircraft. We found ourselves on the same treadmill as before. Planning for major deployments appears to follow a cyclical process, having the original sound plans thrown out and, after much effort, reinstated. Those of us who had been around the loop before were fairly relaxed about it; the new boys were panicking.

The affiliation of 21 Engineer Regiment with 7 Armoured Brigade was working so well that it was not sensible to change it. It was decided to bring out 23 Engineer Regiment with a CS and a GS squadron to support 4 Armoured Brigade. 45 Field Support Squadron and 49 EOD Squadron became divisional troops. Also required was a GS squadron to support division troops. The nature of likely operations and the defences we were facing required extra armoured engineers. 32 Armoured Engineer Regiment were added to the ORBAT, with Lieutenant Colonel Alwyn Hutchison in command, leading two squadrons of Centurion AVREs. The "antique road show", as it was known, had the only proven desert tanks in the ORBAT which, despite a worrying tendency to self destruct, managed a creditable performance. My personal view is that to expect Sappers to go into battle with 1960's technology is a stark

Desert Well, 3 Field Squadron

Drilling for water, 49 EOD Squadron

example of the indifference of the Army over the past few decades to the realities of the Corps' role in mobile armoured warfare.

The Logistic tail to the Division was now so large that the FMA had to become a separate command led by a Brigadier. 15 Field Support Squadron joined the front end, but under command of 1 Armoured Division. Major Max McNamara soldiered on at the FMA as the Engineer staff cell leader. It was decided that for good behaviour I could go back to being a Colonel. We celebrated in Diet Pepsi. The important thing was that Engineer Cell was to stay as a "purple" cell, and not be swallowed up in the Land Cell. Peter Nell went home and Richard Willett and Dick Mullins joined my team. For Christmas we went onto 50 per cent manning. I got Boxing Day off and was royally entertained by some expatriate friends. Those in the desert managed to enjoy themselves in their own way.

1 Armoured Division had fully arrived by 12 January 1991 and we now had over 3000 Sappers in theatre. We had to import a further team from MWF, under Bob Sheldon, to plan and supervise works required to accommodate the transitees and extra troops based in the Jubayl area. We built Blackadder lines to go with Baldrick. Other camps were known as "Melchet" and "Nursie". Was this the first operation to base itself on a television comedy programme? We certainly had a cunning plan.

The collection of Engineer intelligence, ranging from water supply and resources intelligence in Saudi Arabia to the position of the Iraqi obstacle plan, was a major part of our effort at this time. We were greatly helped in this by the cell set up at EinC under Lieutenant Colonel Steen Clarke, and were able to produce intelligence for the Division long before it came down either the British or US J2 sources. We were also helped by others who cannot be mentioned, but will know who they are when they read this article.

My new SO2, Richard Willett, was moved forward to be a Liaison Officer (LO) with the Americans. His relief was rate capped and did not appear for another month. On Sunday 13 January it became clear that no withdrawal could be expected by the deadline of high noon on 15 January. So BFME were put on war-footing and 53 Field Squadron took under command the MWF elements to give them their full ADR and RESF capabilities. The two elements were working so well together that the OC happily appointed Nick Clark the PQE at Dhahran to be the detachment commander on that base. 1 Armoured Division were watching with interest as they increased the pressure on training and preparation for offensive operations.

The deadline came and went, despite last minute attempts by the UN to find a diplomatic solution. At 0001Z on Thursday 17 January the air campaign started. The initial casualties on the Coalition side were extremely light and the co-ordination of the various national air forces, the Tomahawk cruise

Bulk fuel installation, Dhahran

Improvised air-raid shelter, 53 Field Squadron

missiles and the Navy air was outstanding. For the next 40 days up to 3000 sorties a day were flown without one mid-air collision or blue on blue air engagement. This could not have been co-ordinated by anyone but the Americans with their massive computer and communications power. It is not a question of was this power needed but a statement that without the full range of modern information technology the war could not have been fought in this way.

On the 22 January Saddam launched his personal vendetta on 249 Arabian homes, the house I shared with Nick Fickling, James Short and the RAF Chief Engineer Tony Lehart. The Scuds began to fly. They usually came over between 0200 and 0400 each night. We got about seven minutes warning, which was time to don full Nuclear, Biological and Chemical (NBC) kit and hide under the stairs. By turning on CNN News we could find out what was going on. The first indication, after the warning, that we were under attack was the Patriot Missiles crashing off. Then there was a bang as they exploded, this was followed by a pause of up to ten seconds before the warhead hit the ground.

I should explain that Patriot hit every missile aimed at us, but only destroyed ten completely. Seven exploded on impact, and we had one unexploded Scud.

As an ex EOD man I happily went round looking at holes, collecting bits of Scud and briefing the Headquarters on their effect. But as we plotted each impact point it became worryingly obvious that the main point of impact was our house! This was because we lived just north of the airfield, the true intended point of impact, and the Patriots nudged the warheads towards us. Being Scudded was a novel experience and would have been more fun had we not been so worried about the chemical threat, and had it not always ruined a night's sleep.

Later on in the "Battle for Riyadh" (the American term — not ours) the locals, on hearing the air raid siren, would all come out on the street to watch the fireworks display, and pretty impressive it was too. The COS at BFME was watching one morning in his pyjamas and respirator on his balcony when the blast from a landing warhead blew the windows out of the balcony door behind him. The Scuds were a terror weapon that did relatively little damage to Riyadh, but we were all relieved when it stopped.

Initial euphoria with the air war was slightly dampened as we began to lose Tornados and their crews. The tactics and weapons of the Tornado GR1s demanded low level attacks on airfields where JP233 was the main weapon. Low level is needed for the NATO Central Region to defeat Soviet radar, and the huge threat posed by their SAM systems. The Iraqis turned off their radars in fear of the coalition anti-radar missiles but proved to have very nasty "Triple A". The low level tactics of the GR1s meant flying through a barrage of exploding shells and the bravery of the crews deserves our highest admiration. Despite the accurate delivery of JP233 the Iraqis' large airfield and ADR capability meant that, though air superiority and then supremacy was quickly achieved, the airfields and runways were proving particularly difficult to close. To the pilots a successful mission was one in which they dropped their bombs on the target and returned home safe and sound. The task of the Battlefield Damage Assessment (BDA) teams was to detail

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what real damage had been done to the target, so that as the number of successful sorties went up and up the amount of damage, particularly to the airfields, seemed not to be moving. The result was a change in tactics to medium level bombing with initially free-fall 1000lb bombs and later laser designated SMART bombs. The results were spectacular and were well briefed in the press. Hardened aircraft shelters (HAZs), strategic installations, command bunkers and bridges were taken out clinically and cleanly. Any such bombs that caused civilian casualties were either rogues or mistakes. There was never any question of deliberate attacks on non-military targets.

CET with exploding hand heaters

The change of tactics meant that the RAF armourers had to work flat out to prepare the 1000lb bombs and new fuses required. More GR1s and a squadron of Buccaneers were flown out. 53 Field Squadron found themselves busier than ever preparing new aprons, taxi-ways, and HAZs and also managed to find time to help the RAF ground crews to "bomb up" the aircraft.

1 Armoured Division was working flat out to prepare itself for the inevitable land campaign. Training was all important; however up-armouring of vehicles, and the arrival of urgently required new equipment and spares had all to be accomplished at the same time. About this time we were devastated by the deaths in road traffic accidents of Lieutenant Colonel Alec Wright and Major Jim Kinghan. They were separate accidents, but both within 40km of Dhahran on a wide 6 lane highway.

Battle Casualty Replacements (BCRs) had begun to arrive. These reinforcements were intended to be individual replacements so we had a motley collection of all ranks and trades from squadron commander down and from units across BAOR and the UK, sent out without G1098 or tool kits. They, together with all the BCRs from All Arms, were put into Blackadder lines in Jubayl which had been increased in size to house over 4000 men. It was not a particularly happy place. The men were not in a proper command structure, the passage of information was poor and consequently morale was low. At the same time the units already in the Gulf were suffering from rate capping. The solution was first to change the name of the BCRs to In Theatre Reserves (ITRs). No one wanted to be known as a casualty replacement. Second, to use the rank structure available to form the ITRs into troops and

Reverse osmosis plant in Kuwait city

Briefing the Prime Minister in Riyadh

squadrons which was rapidly done. Third to absorb as many men as possible into existing units or staffs. So, all the BAOR Sappers went forward to join 1 Armoured Division units, the plant operators to the support squadrons and the UK based sappers to 3 Field Squadron, theatre engineer park and 53 Field Squadron both on the airfields and later in Kuwait. The armoured engineers went forward to man the War Maintenance Reserve (WMR) equipments and joined the armoured reserve battle group being formed up to act as the divisional reserve.

We tried to give everyone a job, which was unfortunately not 100 per cent successful. I apologise to those who missed out. However, all the lessons of previous wars suggest that the use of individuals is not the way to reinforce units in battle, and that unit identity and mutual confidence have to be built up over a period of training before they can be expected to perform effectively. It was clear to those of us on the ground that in any future operation only formed units, properly equipped, should be dispatched as reinforcements.

The problem of handling a substantial number of enemy prisoners of war (EPW) began to exercise our minds. Three battalions of infantry were finally sent to perform this role. After the usual fight we managed to get a troop of Sappers out to support them in their task of building a prisoner of war cage, finally known as Mary Hill. The troop commander David Catt suffered from a lack of support and no clear direction as to his task. Eventually we were able to put him firmly under the wing of 3 Field Squadron and the FMA and life began to get better. With hindsight I should have insisted that the Sapper support came from a properly formed squadron in an existing command and resources chain. The troop could have gone under 3 Field Squadron from arrival in theatre.

At 0100Z on 24 February the land war began. A 100 hours later it was over. The plan was a masterpiece of strategic planning, diplomacy and tactical sense. Each element involved, every national contingent, had a role to play which was designed to make the most of its size and capability. The highly mobile French were given the ability to show their élan and panache in a rapid advance to cut off the Iraqi lines of communication along the Euphrates valley. The balance of 18 US Corps with 82nd Airborne and 101 Air Mobile Divisions were placed in similar blocking positions. The heavily armoured divisions, including 1 UK Armoured Division were grouped under 7 US Corps to take on and destroy the Iraqis' best forces, including the Republican Guard. The Syrians and Egyptians were given the task of breaching the obstacle belt along the Saudi Arabian/Kuwaiti border and moving up to just south of Kuwait City. The US Marine Corps to their right were to exploit the preponderance of MARSENT air power. The Saudis, United Arab Forces (UAF), Qataris and Kuwaitis were to take the coastal road and eventually play the major part in liberating Kuwait City. Every one had a clear job, knew he was part of an overall brilliant plan and had confidence that it would work. Very few of us in theatre realised it would work quite so rapidly or so spectacularly.

The key to 1 UK Armoured Division working so well with 7 US Corps was their mutual confidence. How that was developed at the divisional level is chronicled elsewhere. All it is necessary to say here is that by the time they crossed the start line they were confident not only of their own ability to perform the task they had been given but also that their allies would support them fully in a coherent well thought through plan.

The cease-fire ended with 7 US Corps occupying northern Kuwait with 1 UK Armoured Division straddling the Kuwait City to Basra road North of the Mutla ridge. South of them were the US Marine Corps and South of them the Pan Arab forces. Kuwait City was liberated by the Kuwaiti forces and came under direct command of CENTCOM.

We still do not fully know what happened to the Iraqi defenders. The current best guess is that of the 500,000 plus soldiers in the KTO, 50 per cent

Prince Charles, General Schwarzkopf, Lieut General Sir Peter de la Billière

had deserted as a result of the bombing and lack of food and water. Psychological operations, the dropping of leaflets and radio broadcasts, were extremely effective and played a large part. We took 60,000 prisoners overall, and did not kill or injure that many. The rest simply ran away. Reports of mass casualties were grossly exaggerated. For instance, casualties of "tens of thousands" were reported on the road leading to the Mutla ridge. I personally drove that road later and would be surprised if the real casualty figure was more than a few hundred.

At this stage it became a matter of national pride to make sure each country's Embassy was liberated by its own forces. For the UK this meant a squadron of Royal Marines being despatched to take the Embassy and clear the compound. The Sapper input into this was a section from 49 EOD Squadron. Intelligence had indicated that the Embassy had not been damaged and it looked as though the buildings were intact, but we did not have the door keys. These were being held in UK and a complex arrangement was made to fly them first to Cyprus then on to Cairo then to Jeddah, from Jeddah to Riyadh, from Riyadh to an unknown destination in the desert and from there to the roof of the British Embassy in Kuwait. The Royal Marines proceeded to abseil down the front of the building and then blew the front door off. The Ambassador was distinctly not amused.

Kuwait City was in a mess. There was no running water, power or other essential life support systems. CENTCOM decided to run Kuwait City separately from the rest of Kuwait and delegated to ARCENT the responsibility for giving emergency life support to the civilian population and any EPWs that might be found. The British and French latched on to this organisation and a Headquarters BFME forward was established initially on the airfield to co-ordinate the British response. Our MWF organisation was sent forward to infiltrate the American organisation and set up co-ordination teams and damage assessment teams. 53 Field Squadron on the airfields were now almost redundant and they were moved forward to concentrate at Al Jubayl and within 48 hours of the cease-fire were on the Kuwaiti border awaiting orders to move forward if required.

General Sir Peter de la Billière and a small staff, of which I was one, moved forward to Kuwait City to meet the Ambassador at the Embassy. It was quickly appreciated that what was required for the Embassy was emergency power, water, food and other essentials such as sanitation. I was asked there and then how quickly the Sappers could perform this function and was able to say that the recce would be done immediately and that power and water would certainly be provided within 24 hours. This was achieved and

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53 Squadron were able not only to provide help to the Embassy but also on request of the Ambassador to those British nationals who had remained in Kuwait City.

The streets of the city were littered with unexploded ordnance and booby traps. CRE I Armoured Division was quick to realise the problem and released 49 EOD Squadron to go forward under command HQ BFME, for tasks in and around the city. We had previously established a Battle Area Clearance (BAC) cell in Riyadh in anticipation of a horrendous task in Kuwait and were able to move that up to join the forward HQ. Lieutenant Colonel Mike Brooke and his team were initially to work for the Americans but rapidly took over running all BAC tasks in and around Kuwait City. This was a vital task which included opening up the various Ministries, clearing the roads, and enabling other engineers to work safely in the restoration of power and water supply. At the time of writing they are still involved in that task, though 49 EOD Squadron were relieved with the rest of 7 Armoured Brigade and are to be replaced by 21 EOD Squadron.

There were many plans as to what strength of forces would have to be left behind by the Army in Kuwait and by the RAF in Bahrain. As it transpired the collapse of the Iraqi forces was so complete it was decided that all British forces would be withdrawn as quickly as possible from the theatre of operations. To this end 7 Armoured Brigade, who had been first in, were to be first out, followed by the theatre troops and then by 4 Armoured Brigade. To facilitate this withdrawal and to backload the enormous tonnages of equipment, stores and resources to UK the FMA was retitled the Logistic Support Group (LSG) under Brigadier Noel Muddiman. 36 Engineer Regiment with a small tactical HQ, a field squadron, 50 Field Squadron and 61 Field Support Squadron were sent out to relieve 3 Field Squadron and 60 Field Support Squadron in the Jubayl area.

I cannot tell you any more of their story, as at this stage it was decided that I had had enough fun and that Colonel Ian McGill was to be sent out to take over my responsibilities in HQ BFME. I am afraid that I handed over to Ian McGill a job that was rapidly disappearing with very little idea of what was going to happen in the future as things were moving so fast. I am glad to say that he has ended up as Commander of the British Forces in Kuwait and no doubt will tell his story separately.

Most of the lessons that I learnt concern command and control and are covered elsewhere, others I have brought out throughout the article. So, I will just leave you a few impressions of the various operations. The first concerns the overall outstanding quality of our own soldiers and officers on the ground, in the air and at sea. Their overall competence, training and sense of humour proved yet again that they are up to almost any task given to them and that provided they are given the equipment and resources to back up that excellence it is difficult to see how they could ever let us down. The second is of the devastating effect of modern weaponry on the battlefield and the professionalism with which it was co-ordinated by the Americans. We were proud to take part in an operation in which they had the lead role. Third was the genuine sense of purpose and comradeship that built up between all the coalition allies which for the period of the operation transcended all national, cultural and philosophical differences.

I feel extremely privileged to have been allowed to take part in the overall events of Operation *Granby*. I expect we will have to do it again, perhaps in a different part of the world and perhaps with different coalition forces deployed. I hope that the lessons we learnt are accepted in UK so that future deployments can be managed in a slightly less hand-to-mouth manner. Having said that — it worked, and I have no doubt that our successors will make it work again on future deployments, wherever in the world they may be.

Survey Operations

BRIGADIER J P ELDER MAppSci

Brigadier Elder was commissioned into the Corps in 1963, first serving with 40 Advance Engineer Stores Regiment RE and 42 Field Squadron RE. He moved into Military Survey in 1966, with a posting to 84 Field Survey Squadron RE. He spent the next three years surveying in Borneo. Following further training in the UK and participation, as surveyor, in a Joint Services Expedition to Antarctica, he was appointed an instructor at the School of Military Survey. He then commanded 1 Air Survey Liaison Section RE in Cyprus, Malta and UK. After obtaining a degree in Topographic Science at Glasgow University he had tours as SO2 Geographic, HQ 1 (BR) Corps and Commander Geographic, HQ BAOR. He returned briefly to UK as Commandant, School of Military Survey, before taking up the appointment of Chief Geographic Officer, SHAPE. In 1987 he was appointed Commander, Technical Services Group, Mapping and Charting Establishment RE. He took up his current post as Director Survey Operations, on promotion to Brigadier, in October 1989.

Introduction

Iraq's invasion of Kuwait on 2 August 1990 triggered the largest Military Survey operation since World War Two. All Military Survey units at home and overseas were involved in Operation *Granby* to varying extents. 114 officers and soldiers deployed to the Persian Gulf coming from 14 Independent Topographic Squadron RE, 42 Survey Engineer Group, 512 STRE and regular staff from 135 Field Survey Squadron RE(V). Fifty more were under training at 42 Survey Engineer Group when the fighting stopped in late February 1991. In these seven months Military Survey was at full stretch supporting UK and US forces in the field with tactical map production, field survey, terrain analysis and map supply. In the UK and BAOR base, Military Survey produced and distributed millions of maps for all three Services, undertook many terrain studies, and provided teams to train over six thousand troops in basic desert navigation techniques. This brief article describes how this huge task was achieved.

Preparedness

Outside the pre-planned NATO areas, there is no guarantee that adequate mapping or other geographic data will be available for supporting operations, unless the area is subject to contingency planning. Where plans do exist, they are likely to cover evacuations of nationals from trouble spots or disaster relief. They are relatively localised and normally involve lightly equipped troops.

Operation *Granby* posed problems of a different kind, involving as it did a wide ranging air-land manoeuvre battle of a technical sophistication never before seen on the battlefield. Not only did it require a far greater coverage, quantity and range of maps and charts than previously envisaged but required newer forms of data and products normally associated with weapon systems deployed in the Central Region. At the start of the operation, the coalition forces had less than one per cent of the eventual requirements for geographic support.

The mapping of Kuwait was reasonably up to date. Much of the Iraqi mapping, on the other hand, was dated. Significant areas were not mapped at all at scales of 1:50,000 and 1:100,000, nor were there any larger scale plans or special Moving Map Displays for aircraft navigation systems. Saudi Arabian mapping too, was dated or not even held for the designated training areas and force concentration areas in Northern Saudi Arabia. The situation was further complicated by technical difficulties with mapping based on different spheroids and datum and astride a grid zone change. The 1:50,000 mapping of Iraq, Kuwait and Saudi Arabia was produced by UK, US and Saudi Arabia respectively to different specifications. This caused edge matching difficulties at the series boundaries, which naturally enough conformed with international boundaries and created many difficulties in the early days.

It was clear from the start that Military Survey faced a challenging task. It was perhaps just as well that the full size of it was only made clear as events unfolded. The requirements and priorities for geographic support, particularly mapping, were rather like the sand dunes depicted on them — huge and imposing, constantly shifting and always growing!

International Aspects

One of Military Survey's immediate responses to the crisis involved intensive activity on the international front, aimed particularly at obtaining

mapping and geodetic information and making them available to UK forces. This involved discussion and transactions with overseas map production agencies and foreign embassies in London, principally those of the US, the Gulf States and France in:

- The acquisition of mapping and related geographical intelligence, eg topographic maps, terrain data, and information on the alignment and status of international boundaries and on place names.
- Release issues relating to maps on restricted issue; for example, obtaining Kuwait's permission to release maps of Kuwait to the multinational force.
- Coordinating joint map and aeronautical chart production programme with the US Defense Mapping Agency.

Geographic Support in Theatre

14 Independent Topographic Squadron RE — and a section from 512 STRE deployed to the theatre in support of 7 Armoured Brigade in the late Summer and was later reinforced from 42 Survey Engineer Group. In addition a Geographic Staff branch was established in HQ BFME. By December 1990, 114 personnel were deployed as follows:

HQ BFME/CENTCOM — Joint Geographic Cell in Headquarters British Forces Middle East/ US Central Command

14 Independent Topographic Squadron — Theatre Topographic Squadron

HQ 1 Armoured Division — Division 'all sources' cell plus TACIPRINT

HQ 7 Armoured Brigade — Brigade Terrain Analysis Section (TERA) plus Map Supply Point (MapSP)

HQ 4 Armoured Brigade — Brigade TERA plus MapSP

1 Division Artillery — Artillery Positioning Support by Field Survey Troop, 14 Topographic Squadron

HQ US 7 Corps — TERA assistance

30 US Engineer Battalion (Topographic) — TERA assistance to US Theatre Topographic Battalion

US CENTCOM TMD — Map supply assistance to US Theatre Map Depot

MARCENT — Map supply assistance to MARDIVs US Marine divisions in the Marine component of US Central Command

The manpower in the US Headquarters and units was all there at US request. The US valued UK advice and assistance at all levels not only because Military Survey officers and soldiers had received training that was more appropriate but also because UK Geographic representation was right down to Brigade HQ. UK forces have Military Survey personnel involved in formulating map requirements, coordinating production (both at home and in theatre), supplying the products and providing advice and assistance. As can be seen from *Table 1* below it is a 'cradle to grave' system unlike the US forces.

US and UK Map Provision Responsibilities

	US	UK
Formulate requirements	J2	J3(Geo)
Produce mapping out of theatre	Defense Mapping Agency	Mil Svy
Supply mapping to theatre	J4	Mil Svy
Supply mapping in theatre	US Corps of Engrs	Mil Svy
Produce mapping in theatre	US Corps of Engrs	Mil Svy
Use Products	J3	J3

Table 1

14 Independent Topographic Squadron and Military Survey personnel in formations carried out the full range of geographic support tasks including map production, Royal Artillery survey support, map supply, terrain analysis and desert navigation. The functional chain of command can be seen at *Table 2* and the in-theatre map supply system can be seen at *Table 3*, over page.

Theatre Map Production. TACIPRINT is the nucleus of our field map production support and deploys with the Division and Corps HQs in BAOR. This is ideal in the BAOR concept of operations with static units in the Rear Combat Zone (RCZ) to give greater map production capacity with larger format 'static' equipment. In the Gulf this all had to be provided by 14 Independent Topographic Squadron who met the demand by resurrecting part of the mobile print 'train'. This was introduced into service in the 1950s, and last left its hangar in Roy Barracks, Ratingen in 1980. Nobody in their wildest dreams considered it would make an operational move again; it had already been reserved for the RE Museum. Commander Geographic BAOR made the decision to deploy two of the trailers, and after a search for tractors with the right combination of fifth wheel to move them to the docks, and a similar exercise upon landing in Saudi Arabia, they finally

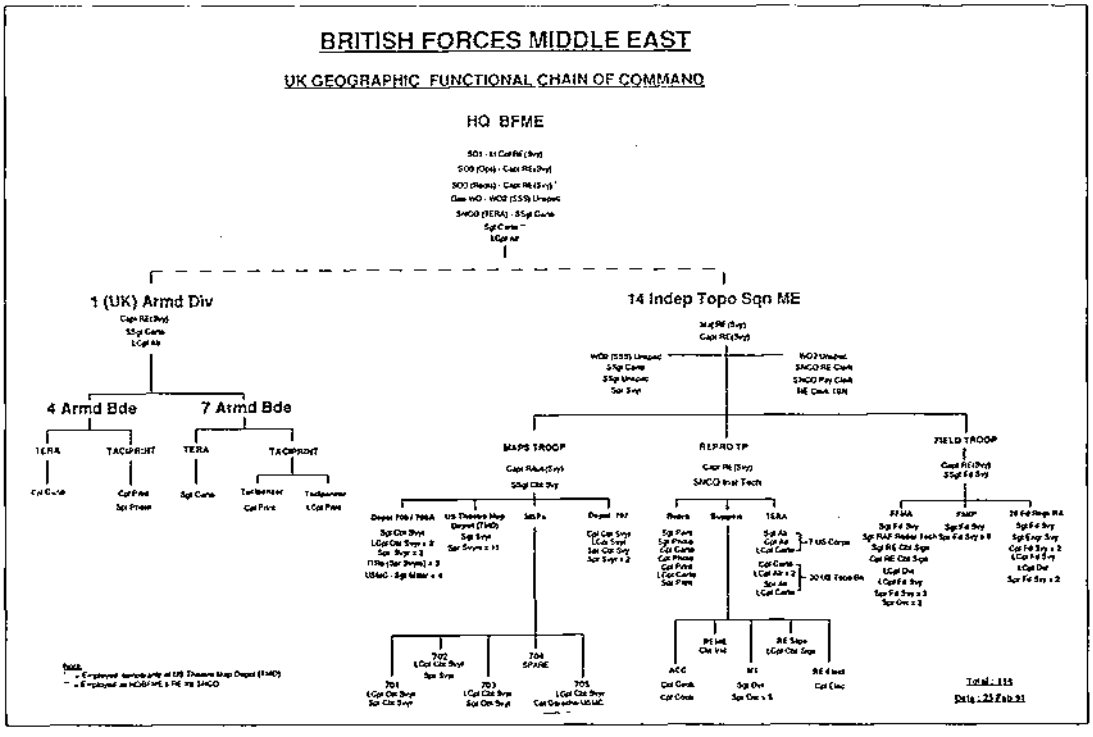

Table 2

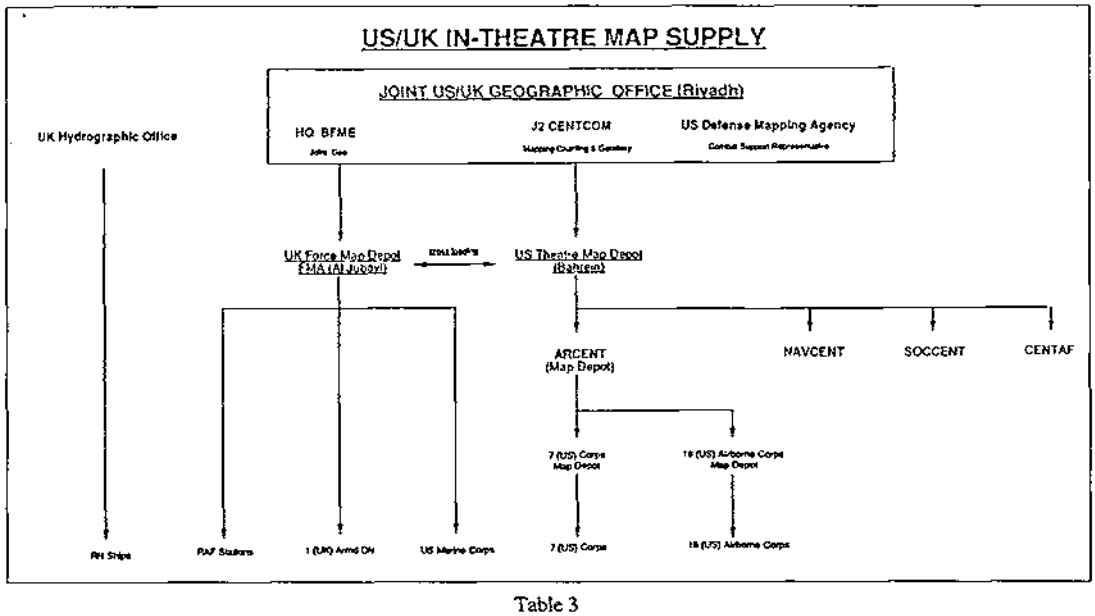

Table 3

Map Distribution Point established by 14 Independent Topographic Squadron RE in Forward Maintenance Area, January 1991

Sabkha in Northern Saudi Arabia. Terrain analyses studies by 14 Independent Topographic Squadron RE highlighted these areas

reached the Forward Force Maintenance Area (FFMA) where they provided a critical production capability and reminded us all that in this age of high technology much can still be achieved with old equipment with a bit of imagination and application. The quality of products printed in the desert might have been expected to reflect the adverse working conditions, but the soldiers continued throughout to produce excellent work, a credit to their training and dedication.

Field Survey. Field Troop, 14 Independent Topographic Squadron worked closely with Royal Artillery units. Their task was to provide the gun lines with pin-point positional data. Prior to the start of the land war, their time with the artillery was well used building up a network of control points essential for updating gunners Position and Azimuth Determination System (PADS) equipments. PADS is a vehicle mounted inertial navigation system which gives Universal Transverse Mercator (UTM) co-ordinates. It must be checked frequently against known position to retain accuracy. Field surveyors also practised their secondary skill of combat surveyor and helped out on the map supply side, an area which was always under pressure.

Map Supply. On the 5 August 1990, the initial issue of stocks to support Operation *Granby* was begun and continued until the end of hostilities. Theatre troops had to receive, sort, store, deploy, and issue some 14 million maps. 14 Independent Topographic Squadron established a map depot in the Force Maintenance Area (FMA) at Al Jubayl, a forward depot in the FFMA and deployed wheeled MapSPs with formations. The Military Survey map supply system, based on specialists moving the maps forward and issuing directly to units is well proven. As *Table 1* shows the US relies upon the standard transport and supply system. This method of issuing bulk to formations did not satisfy unit requirements. Military Survey soldiers were placed in the US Theatre Map Depot (TMD) to assist in the management of the US map supply. In due course, the TMD became a joint theatre asset. In addition, 14 Squadron provided MapSPs to the two US Marine divisions who had no integral map supply capability at all. In return, US Marines were attached to 14 Squadron.

Terrain Products. Graphical Terrain products produced in UK were used by terrain teams in conjunction with intelligence and other operational information to provide advice to commanders. The lack of a complete terrain database for the area led to a number of terrain recces by survey personnel, particularly along the Kuwait border in the early stages of deployment. These recces provided the most comprehensive information on the terrain for commanders and gave the TERA teams a basis for interpreting other data held. A computer assisted TERA system was fielded by 14 Squadron but the lack of digital terrain data and an unproven US system severely restricted its effectiveness.

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Field Survey support for Royal Artillery. A Global Positioning System Trimble 4000 SST set in use in Northern Saudi Arabia

Hand-held Global Positioning System. This instrument provided positions to 25 metres and was an acknowledge battle winner in allowing movement of formation in featureless terrain.

Desert Navigation. The relatively featureless terrain in the Persian Gulf region is inhospitable, impassable in parts and generally unfamiliar to troops more used to the well signed roads of NW Europe where navigation is never particularly taxing. In response to this need, Desert Navigation Training teams from 42 Survey Engineer Group trained over 6000 troops in basic desert navigation techniques and the use of sun compass and the Global Positioning System (GPS). This pocket sized navigation system provides position to ±20 metre accuracy and was provided in large quantities to troops. There is little doubt that the additional navigation skills and availability of GPS played a significant part in allowing formations to manoeuvre successfully. 14 Topographic Squadron also assisted by coordinating pillars erected in the Saudi Arabian training areas. This allowed units to test their navigation skills and so build confidence in their ability to navigate in the desert.

Geographic Support in UK and BAOR

Productions support to Operation *Granby* eventually swallowed all our resources but did not start in earnest until 2 August. At this initial stage, it was not possible to envisage the direction in which events would unfold, nor the UK's part in them. The initial Military Survey reaction was the standard one for the outbreak of tension in any region, namely the review of any existing plans, where appropriate, and of maps, data and source materials of the region.

The decision to contribute UK forces in support of the US led effort in the defence of Saudi Arabia was the initial trigger to major production activity with the early emphasis being on support to RAF Combat Aircraft. Some 57 air charts cover this region and the air routes to it and UK has responsibility for maintenance of 35 of them under NATO and various bilateral agreements. Updating for these was brought forward, together with Series 1501, a ground and air operations series at a scale of 1:250,000 which was subject to hasty revision. Moving map display film strips were also produced, based on these maps, for use in cockpit displays of Tornado and Jaguar.

It was at this time also that a start was made to an inventory of large scale maps for possible offensive air operations against Iraq, a task which was to continue up to the start of the air war.

The RAF also had a requirement for 1:50,000 mapping of selected areas but with the decision to deploy UK ground troops in the shape of 7 Armoured Brigade initially and later 1 Armoured Division, the priority for production of land mapping in Saudi Arabia, Kuwait and Southern Iraq increased sharply. The growing coalition forces required early planning stock of whatever products were available, and the Map Depots at Guildford and Ratingen in BAOR

Survey Operations (p129)

supplied small quantities to a variety of nations. Terrain analysis work was also started in conjunction with Engineer Intelligence, to examine both enemy choke points and ground forces options, and which continued until the start of the ground war.

Meanwhile, the production of updated materials in appropriate quantities was in swing. It was potentially an enormous task; nominally, some 1,200 1:50,000 sheets and 85 1:250,000 sheets cover the area of operational interest and the range of potential options was wide. Clearly these options depended on the US Commanders plan and there was no question of UK trying to support its own forces in isolation.

In fact the US had embarked on a major revision programme of Iraq at 1:50,000 supplemented with a programme of LANDSAT imagery photo-production at 1:100,000 scale in areas where no coverage existed. The UK cartographic contribution at these scales was modest by comparison.

The two nations cooperated closely over production, but it was in the map reproduction area where UK was able to offer back to the US some extra effort in compensation for its immense cartographic output. Through liaison by operations room coordinators in Feltham and Washington, it was agreed that each nation would produce the maps and charts in the quantity required by the coalition forces overall and not just by individual nations. UK would reproduce those maps for which it had taken production responsibility and in addition take on reproduction of US produced material to ease their load. To support the coalition force of some ½ million people, quantities of typically 30,000 to 80,000 of each sheet were required. The overall printing total was enormous, aggregating 16,000,000 sheets by the start of the air war, at an estimated tonnage of paper in excess of 600 tons. The production statistics can be seen at *Table 4*. The quantities dwarfed that of Operation *Corporate* and were some three times a typical annual output. The bulk of this work was achieved in four months. The brunt of the load was taken by military printers at 42 Survey Engineer Group at Hermitage and civilian printers at Mapping and Charting Establishment RE (MCE) Feltham, working round the clock in shifts, seven days a week. It did not end there however; at its peak the reproduction effort forced the interruption of trade training and the cancellation of short update courses, apprentices turned their hand to operational printing at Chepstow, the Ordnance Survey were requested to shelve their national print programmes to run Military Survey tasks under a long-standing Memorandum Of Understanding (MOU) covering emergencies and commercial contractors were also brought into the fray. In Germany, German civilian printers at Survey Production Centre (SPC) RE Moenchengladbach under the control of Commander Geographic BAOR had to put back Christmas leave plans to meet deadlines and the BAOR staff also arranged for the Belgian Army to print tasks which could not be fitted into the fully mobilised UK capacity.

OPERATION *GRANBY*
PRODUCTION STATISTICS

New Maps and Air Charts	292
Revised Maps and Air Charts	87
Terrain Analysis Databases	161
Raster Digitised Maps	600
Precise Point Coordinates	13,359
Maps Printed	1,197
Copies Printed	14.6 Million

Military Survey production figures
August 1990 — January 1991.

Table 4

The distribution centre of activity was 8 Map and Air Chart Depot at Guildford supported, for BAOR production by the BAOR Map Depot at Ratingen. The Guildford Depot moved the immense tonnage of maps in bulk by both UK and US aircraft via Lyneham and Molesworth respectively, and by sea and BAOR did so through the Defense Mapping Agency's (DMA) Combat Support Centre (Europe). In practice most went by air to meet the deadlines. This effort of bulk distribution represented some five times the routine annual movement and went on into early January 1991. The task was accomplished just in time.

EQUIPMENT PROCUREMENT

To achieve the level of geographic support demanded by the deployed forces, much equipment had to be procured to enhance our capabilities and to enable the Division to fight in the desert. The most significant equipment to the man on the ground was undoubtedly Global Positioning System (GPS), but also for navigation there was a requirement for the sun compass which was put back into production. Well over £2 million was spent on other survey related equipment such as raster data systems,

electronic total stations, and computers to run Terrain Analysis programmes. With the exception of the TERA equipment it was all introduced with the minimum of trouble. As already explained, the TERA equipment was running a US suite of programmes which was under development and inadequately supported by data. This caused it to fail with both US and UK forces, but this must not be allowed to dampen the commitment to computer-assisted TERA in the long term. Full development and a sound database will ensure the effectiveness of future systems.

Lessons

The lessons learnt are, as should be expected, many and varied, but there are a number worth highlighting here. The first major point is that the operation, the largest deployment of British forces since World War Two, and into an area of interest covering more than twice the geographical area of western Europe was successfully supported.

Military Survey planning and preparation is, and rightly so, based on British defence policy, an operation such as *Granby* was not envisaged and therefore not prepared for. The fact that it was so successfully supported serves to emphasise the importance of flexibility within our armed forces. For Military Survey it reinforces the need to collect and collate a large database of worldwide information on a continuous basis, to maintain liaison links with other governments, and to maintain a capability to exploit that database. The relationship, developed over many years, between Military Survey and the US agencies proved to be fundamental to the provision of timely and up-to-date geographic data. Wherever options for change eventually take us they must not be permitted to jeopardise the relationship with the US, this must be resourced fully.

Command, control and communications are as essential to Military Survey operations as they are to the rest of the British forces. The deployment of geographic staff to the major HQs proved decisive in the coordination and direction of geographic support effort. This was well recognised in Military Survey but we had to spend some time convincing the General Staff.

The Gulf war was portrayed as a triumph of technology and this was graphically described by the various news reports showing the use of 'smart' weapons. The database that makes them smart is based on digital geographic data. If, as would seem likely, UK defence policy requires this type of weapon in the future then Military Survey will have to be equipped to provide it.

The huge effort put in by Military Survey to meet operational requirements, including the deployment of a quarter of all uniformed surveyors to the Gulf, was as a result of the concept of operations, size of the geographical area and preparedness of geographic materials, rather than the size of UK forces involved. It shows that requirements for geographic support are not force level dependent.

Conclusion

Military Survey faced a massive challenge in providing geographic support to Operation *Granby*. A great deal was accomplished and this was entirely due to the commitment and dedication and technical skills of everyone in Military Survey.

Postal and Courier Operations in the Gulf

CAPTAIN J A FIELD

Captain Jeremy Field was commissioned in 1981 from Royal Military Academy Sandhurst into the Army Catering Corps. Following tours as a Specialist Catering Officer with the 4th/7th Royal Dragoon Guards, The Queen's Own Hussars, 14th/20th King's Hussars and 8 Signal Regiment he transferred to RE Postal and Courier Service (PCS) in 1986. Since then he has served as Assistant Adjutant 2 Postal and Courier Regiment RE at South Cerney, 2IC 13 Postal and Courier Squadron RE, Soest, Troop Commander Falkland Islands Postal and Courier Troop RE, Adjutant 1 Postal and Courier Regiment RE, Hanover and as G3 Operations Watchkeeper Headquarters Northern Ireland.

He is currently serving at the Directorate of Defence Postal and Courier Services, Ministry Of Defence London, as Staff Captain to the Director.

The first Royal Engineers Postal and Courier Service RE (PCS) detachment to be deployed to the Gulf arrived on 11 August 1990 to establish a postal and courier operational network between the UK and Dhahran, Riyadh and Thumrait for the RAF. The 12 soldiers were from 20 PC Squadron RE, South Cerney, which normally supports 3 Commando Brigade and 5 Airborne Brigade, and 21 PC Squadron RE, based in Bulford, which normally supports the ACE Mobile Force (Land) (AMF(L)).

By 1 October 1990 the number of Forces Post Offices (FPOs) and Forces Courier Offices (FCOs) had been increased to include Bahrain, Seeb and Dubai.

On Friday 14 September 1990 the Ministry of Defence (MOD) announced that 7 Armoured Brigade would deploy to the Gulf. 1 PC Regiment RE, based in Hanover and providing PCS support to 1 (BR) Corps, was tasked with training and deploying a PC Squadron. On Wednesday 10 October 1990 the advance party deployed from RAF Gütersloh and on Monday 15 October 1990 the main party deployed from Hamburg.

By the time the air war started, on 16 January 1991, five officers and 111 other ranks (ORs) were in the Gulf Theatre and when the land offensive commenced, on 24 February 1991, five officers and 150 ORs had been deployed. This accounted for over 18 per cent of the strength of the Service.

Both RE and Women's Royal Army Corps (WRAC) personnel from PCD RE, Mill Hill, 1 PC Regiment RE, Hanover, 3 PCD RE, Düsseldorf; 20 PC Squadron RE, South Cerney, 21 PC Squadron RE, Bulford and 23 PC Squadron RE, Cyprus, were deployed.

To coordinate and control operations the Directorate of Defence Postal and Courier Services (D Def PCS), MOD London, established an operations cell in PCD RE, Mill Hill, and an SO2 PCS at HQ British Forces Middle East (BFME) in Riyadh.

To provide a comprehensive postal and courier service the following British Forces Post Offices (BFPOs) were established:

BFPO 637	HQ Force Maintenance Area (FMA) Rear
BFPO 638	HM Ships
BFPO 639	Tabuk, Saudi Arabia
BFPO 641	Dhahran, Saudi Arabia
BFPO 642	Thumrait, Oman
BFPO 643	Seeb, Oman
BFPO 644	Al Jubayl, Saudi Arabia
BFPO 646	Riyadh, Saudi Arabia
BFPO 647	Muharraq, Saudi Arabia
BFPO 648	4 Armoured Brigade
BFPO 649	HQ 1 Armoured Division
BFPO 635	Kuwait City

From 16 August 1990 to 31 October 1990, when direct flights to Riyadh began, all Gulf mail circulated through 23 PC Squadron RE in Cyprus.

Captain J A Field
Postal & Courier Ops in the Gulf (p132)

A daily "round robin" service was provided by Hercules aircraft. Once the direct flights to Riyadh were established the mail circulation changed. The final format is shown in diagrammatic form at *Figure 1*, (see over page). A daily flight from RAF Brize Norton to Riyadh, Dhahran and Al Jubayl was made. The mail was then distributed by road and air to the FPOs listed above. From the FPOs rear echelon troops collected the mail for forward distribution to the troops.

All outbound mail from the Gulf was despatched to Riyadh where it was flown to RAF Brize Norton via RAF Wildenrath, where BAOR mails connected into the system. BAOR mails were taken from RAF Wildenrath to 3 PCD RE at Düsseldorf where forward distribution to FPOs was effected via the normal road system.

From RAF Brize Norton mails for private UK addresses entered the Post Office system in London whilst all other BFPO addressed mails were circulated through BFPO London at Mill Hill for onward transmission.

PCD RE, Mill Hill was the hub of the UK mail operation. The Depot worked 24 hours a day seven days a week to clear the vast volume of mail. To help in this task additional troops were attached for two weeks at a time. These included: The Corps Band; soldiers from the Guards Division; 13/18 Royal Hussars; 9/12 Lancers; Duke of Wellington's Regiment; Royal Corps of Transport; Royal Pioneer Corps and WRAC. Over 100 extra civilian staff were employed.

The Royal Navy continued to man the Fleet Mail Office and were supplemented by Royal Naval Reserve (Postal Section) personnel to cope with the vast quantities of mail for HM ships, and Royal Fleet Auxiliary (RFA) ships. The Territorial Army (Postal and Courier), who are mainly drawn from the Civil Post Office, volunteered their services and proved to be invaluable in the overall mail operation.

The diagrams at *Figure 2* and *3*, (see over page), give some idea of the volume of air mail and parcels moved during Operation *Granby*.

The mail to the Gulf from UK and BAOR peaked in late January 1991. A total of 590,530kgs of Air Mail was sent and 1,257,693kgs of parcels. From the Gulf to UK and BAOR the peak was in early March 1991. The Air Mail sent from the Gulf totalled 267,834kgs with parcels totalling 296,105kgs. Over 9 million "Blueys" (Forces Free Air Letters) have been despatched to and from the Gulf. Overall the volume of mail increased by 600 per cent compared with the same period (August to April) the previous years. An average 175,000 letters a day were being handled by PCD RE, Mill Hill.

RE (PCS) is also responsible for the worldwide movement of classified material. Based in Central London the Defence Courier Service handles 200,000 classified items a day. The Gulf war produced a 20 per cent increase in traffic. Each day couriers left RAF Brize Norton for Riyadh where the classified mail was then circulated by hand of courier. Classified mail for the UK and BAOR was sent to Riyadh for the flight to RAF Wildenrath and RAF Brize Norton from where it was moved to its delivery destination.

On 12 December 1990 the Secretary of State for Defence tasked RE (PCS) with organising welfare mail to the Gulf. A special BFPO indicator was established at Mill Hill, that of BFPO 3000. Letters and parcels addressed to unnamed military personnel serving in the Gulf would be free. Working closely with the MOD welfare desk at the Directorate of Personal Services some 300,000kgs of BFPO 3000 mail were handled. The British public were indeed very generous. Due to the strict rules imposed by the Saudi Arabian authorities the welfare mail had to be vetted at Mill Hill to ensure that no alcohol, illicit pictures or other banned items were despatched. A campaign by the *Daily Telegraph* and Royal British Legion, to allow for all personnel to receive a gift at Christmas was highly successful.

Transmission times of the mail varied. Once Air Mail had been received at PCD RE it was in the Gulf less than 24 hours later. It then took up to three days to find the addressee. Parcel mail took longer, from ten to 15 days. This was due to the lesser priority placed on parcel mail by the RAF to move them from RAF Brize Norton and the distribution difficulties encountered in the Theatre of Operations. Mail for the Gulf was sorted into units and BFPO numbers at PCD RE and 3 PCD RE, Düsseldorf. Mail for front line troops arrived at the FMA PC Squadron from various airheads. At Al Jubayl the mail arrived at the Forces Distribution Office (FDO). Depending on requirements of individual units, mail either remained at Al Jubayl for Unit Post Orderlies (UPOs) to collect or was sent forward by air to the Forward PCS Detachment and moved by the RCT to the Divisional Administration Area (DAA). From there it was moved to the Brigade Administration Areas (BAA) to await collection by UPOs. The system was reversed for outgoing mail to the UK, BAOR and the rest of the world.

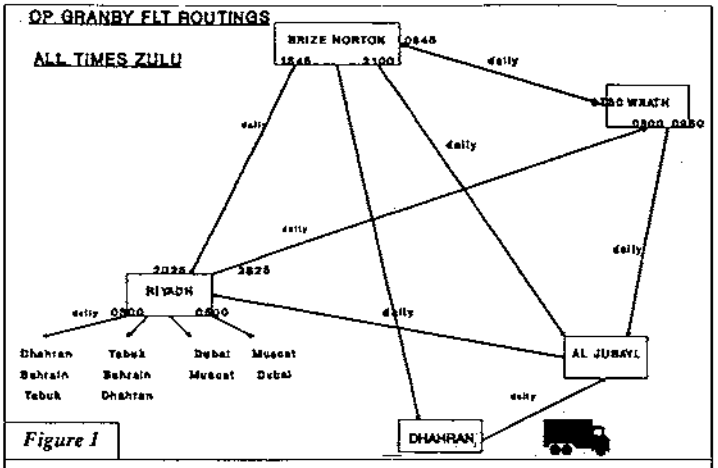

Figure 1

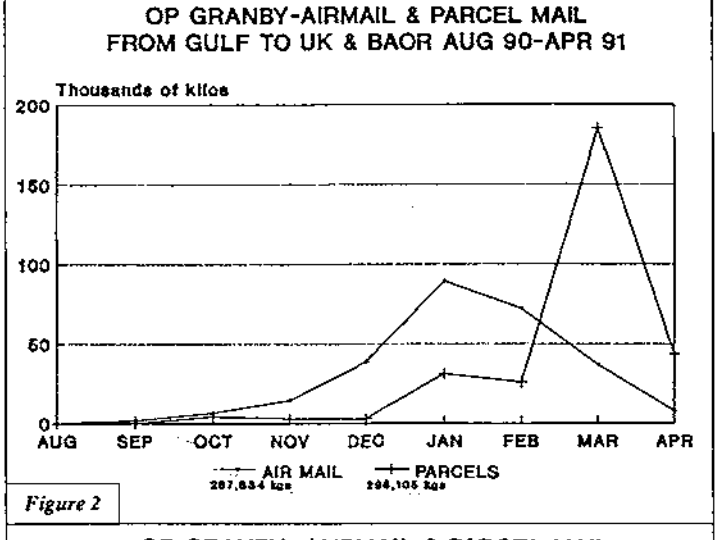

Figure 2

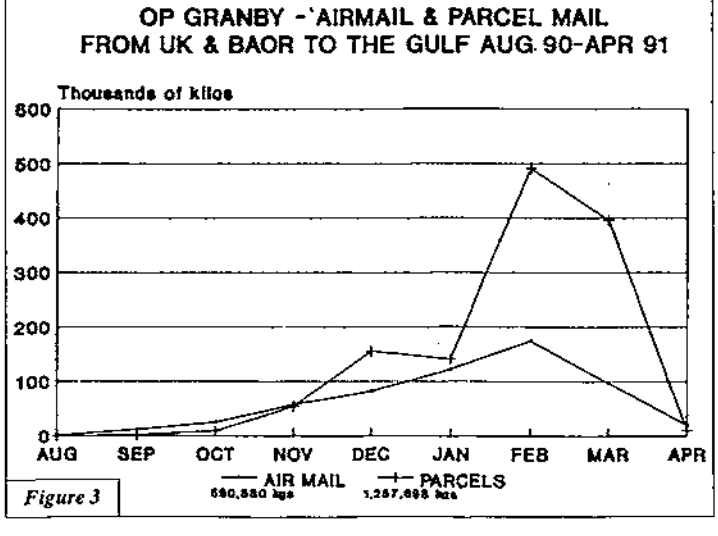

Figure 3

Mail for HM ships and RFA ships was either sent to a port where the ship was due to harbour or to Bahrain to await its arrival.

A most time consuming job was to deliver letters addressed to: "Pte Smith, The Gulf". Locations branches were established at Mill Hill, Düsseldorf and Al Jubayl, and the PCS Sherlock Holmes began their thankless task.

The mail service was twice suspended, once when the air war began and again when the land offensive began, but this was only for 48 hours. At Al Jubayl the parcel service forward delivery was suspended when the more mobile troops moved forward but the letter mail was always delivered.

A full counter service was offered to troops at each FPO. This was for stamped stationery, stamps, postal orders, Girobank, National Savings Bank and similar services. The turn-over of business between August 1990 and April 1991 exceeded £6 million.

RE (PCS) also runs a Rapid Response Courier Service (RRCS). This is for urgent operational despatches anywhere in the Theatre of Operations.

In the Gulf some 1000 RRCS runs were made carrying over 7000 items and covering over 200,000 miles. Land Rovers and Armstrong Motorcycles are used for this task and helicopters when available.

Many nations do not have their own dedicated military postal and courier service. The RE (PCS), in addition to providing a service to the British Navy, Army, Air Force, government departments and defence related industries, provided a service to the following countries:

A 7 Armoured Brigade PC Detachment

Canada	France	Hungary
Norway	New Zealand	Sweden
Denmark	Holland	Korea
Portugal	Singapore	

Following the cease-fire on 28 February 1991 and the gradual withdrawal of troops the Gulf PC Squadron now consists of two officers and 50 soldiers. Their task is to maintain a postal and courier service and deal with the aftermath of the war operations.

On 25 April 1991 RE (PCS) became involved in Operation *Haven*. Four BFPOs have been established:

BFPO 591 Sincnik	BFPO 597 Diyabakir
BFPO 594 Silopi	BFPO 598 Incerlik

The mail is circulated from RAF Brize Norton to Diyabakir in Turkey and moved forward by helicopter and road transport. It is staffed by one officer and ten soldiers from 4 PC Regiment RE, SHAPE, and 20 PC Squadron RE, South Cerney.

In conclusion the Service responded with true dedication and professionalism to the demands of the Gulf war. A comprehensive service was still provided to the families in BAOR and other personnel abroad. The effect of the Postal and Courier Service on troops and families alike in the maintenance of their morale is incalculable in addition to providing a vital link with London for official and classified mails. Once again the Service lived up to its motto!

EVERYWHERE — SWIFTLY AND SECURELY

A PC Operative receiving a "blues" from a Queen's Royal Irish Hussars trooper

Postal & Courier Ops in the Gulf (p135)

The following two articles on the Gulf War deal with Military Works Force aspects of the operation. Both are included as they deal with activities stretching from the mounting of Operation Granby *starting in September 1990 right up to relief operations in Kuwait in March 1991.*

في كل مكان

LIEUTENANT COLONEL M G LE G BRIDGES BSc(Eng) MIMechE MBIM

Lieutenant Colonel Bridges is a PQE (E&M) officer who more frequently contributes to these pages on subjects related to mountaineering and other forms of adventurous training. That he does occasionally earn his shilling is evidenced by the odd article on technical subjects. Most recently he has spent the six months from September 1990 to March 1991 setting up and commanding the CRE (Works) Middle East which was the fount of all technical construction engineering wisdom to the Land and Air Forces deployed in the Gulf War.

The title of this article is pronounced *Fi Kull Makan*, and translates as "In every place" or "Ubique" for short, because this accurately describes the function of the subject unit during the Gulf Crisis. The CRE (Works) Middle East was born following the reconnaissance for the deployment of 7th Armoured Brigade in mid September 1990, as the centre of technical excellence to work with the "FMA Field Squadron" in providing RE support to the Force Maintenance Area (FMA). The FMA Field Squadron was in fact initially a distillation of 39 Engineer Regiment, led by the Commanding Officer, Lieutenant Colonel Bob Pridham, with his RHQ, and included a substantial chunk of 60 Field Support Squadron as well as 53 Field Squadron (Construction). Just as the FMA Field Squadron was more than its title implied, so the CRE (Works) Middle East expanded on arrival to take under its wing those technical elements already deployed in support of the RAF.

The port and industrial city of Jubayl was a Godsend to anyone trying to introduce a sizeable force into eastern Saudi Arabia. Starting from nothing in about 1975, the Saudis had set out to build two huge facilities, one on the east coast and one on the west coast, of which Jubayl was the site for the east coast part of the scheme. The port at Jubayl consists of a northern industrial port, and a southern commercial port. The commercial port had been made over to military use for Operations *Granby* and *Desert Shield*, and this was capable of taking six or eight ships at a time, equipped as it was with Roll On Roll Off (RORO) container handling, and general cargo facilities. Behind the jetty lay three kilometres of hard standings and storage areas. The industrial city behind the port was zoned, with the major area being allocated to heavy industry — mainly petrochemical oriented but also including a large steel works. Smaller areas were allocated to service industries, accommodation for the expatriate community and, separated by a cultural Green Belt, housing for the future Saudi population. Housing for the Third Country National (TCN) labour force was provided in the form of camps built by the main contractors who

Lt Col M G Le Bridges
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had participated in building the city. Out to the West there was a complete but unused airport which was wide body jet capable, and this too was placed entirely at the disposal of the operation. The significance of all this is that before the deployment even started, there was a large modern port and airhead with extensive unoccupied camp accommodation and other facilities already on hand to support the arrival of large numbers of troops and large quantities of equipment.

Things in those early days were very *ad hoc*, in that after several false starts the CRE (Works) was eventually deployed without written orders, and without any clear tasking other than to build a tented camp for 2000 men. In practice 39 Regiment and the CRE (Works) worked together to do this, and in the same way we worked together to pave the way for the arrival of the FMA advance party some ten days later. This included such non-scheduled activities as negotiating with the US Marine Corps, who controlled all of the available facilities, for the use of real estate both within the commercial port area of Jubayl and out in the industrial city. It took some time to gather momentum and find useful employment for all of the team, a problem aggravated by the fact that 53 Squadron had brought their own Garrison Engineers and Clerks of Works with them, and initially they naturally were given those jobs allocated to the squadron. We had to establish what work was needed, what the pattern of work was going to be, and what organisation was going to be needed to do it. In due course a *modus operandi* was sorted out, whereby CRE (Works) took all technical assets of this sort under its wing, including those who had come out with us, those of 53 Squadron, and those already deployed on the airfields, and we subsequently redistributed them for best effect.

Based on the assessment that at each place where there was Sapper work to be done, there would be a need for a technical team, the configuration of the CRE (Works) evolved as the commitments grew, and in its final form it included: an STRE (Airfields), split into detachments at all airfields to which the RAF had deployed (ie Muharraq, Dhahran and Tabuk); an STRE (Fuels) which at first was primarily RAF oriented, but which still came under central control of the CRE, and subsequently blossomed into the provider of steel tankage for the Army and the builder of the Kinghan Pipeline; an STRE (Works) which worked with the FMA Field Squadron to provide facilities initially in the Jubayl area, but moved in due course to the Forward FMA

Steel storage tanks, designed, purchased, and installed for ground fuels storage in Jubayl

(FFMA) up towards Hafur al Batin to provide facilities there; an STRE (Contracts) which reinforced the STRE (Works) in the Jubayl area in early December 1990, but worked with contractors as its name implied, and subsequently took over complete support to the Al Jubayl area; and a Reverse Osmosis Plant team consisting of a series

High pressure pump station on the Kinghan pipeline — Captain Roger Norton is with VIP visitors

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Part of 32 Field Hospital near Quaysumah

of individual plant operating teams led by a Major RAVC. The CRE (Works) also provided the Force Fuels Officer in the HQ British Forces Middle East and, for a time, a DCRE Riyadh to support the HQ. At its peak, the CRE (Works) numbered over 80, and was spread out between every site in the theatre where forces were deployed on the ground, indeed "Everywhere". By December the complete pattern was resolved. RHQ 39 Regiment had gone home, 53 Squadron had moved to cover the airfields, 3 Squadron had become the FMA Field Squadron, and the Resources Troop of 60 Squadron had remained to become the Engineer Park, throughout all of which ran the Svengali like tentacles of the CRE (Works) Middle East.

Our first tasks in Jubayl were related to getting 7th Armoured Brigade into theatre, for which it was estimated that we should need some 9000 bed spaces, 4000 of which would be strictly transit only. This was to meet a concept of the troops flying in while their equipment arrived by sea. Given perfect timing, each unit would marry up directly with its vehicles over a period of only three days, and then move out into a desert holding and training area, clearing the transit facilities for the next unit. In addition we would need a variety of infrastructures in the form of field hospitals, water points, bulk fuel installations (BFIs), stores areas, protective works, and so on. To start with we had our tented camp for 2000 men which very quickly began to seem woefully inadequate. However, we managed to persuade the Marines to allocate Camp 4 to us, Camp 4 being a TCN camp for 3000 in pretty fair condition. We also secured the use of five of the large warehouses down on the port jetty, four of these being allocated as transit accommodation and each good for 1000, and one for modifications to the Challengers and Warriors. Two BFI sites were established, an Ordnance storage area grew up in a civilian cold store complex which immediately began to expand wildly, and at a distance of some 30 miles, an ammunition storage point (ASP) was set up in a disused quarry. Soon after the Brigade began to arrive a water point was set up out in their training area, replenished by bowsers from the port area. In practice the flow of manpower was sometimes less than perfect and there was one unit hanging around in Jubayl for three weeks which heavily stressed transit resources.

The design and technical input into all this was relatively elementary, but much of it was being relearnt, such as the design and construction of camp structures. Having none for issue, we developed our own, drawing on US Marine Corps ideas to improve traditional British patterns. For example deep trench latrines (DTLs) were unacceptable to the Saudis, so we produced "Burner Loos" in which the waste was collected in tubs (cut from oil drums) which could be removed via a flap in the back of the structure, topped up with diesel, and burnt. Of inestimable value in the solution of the sewage problem were the locally manufactured 'Turdises', as they were christened. These were individual fibre glass cubicles which held the waste in a tank, into which a stack was integrated so that they did not smell unduly, and which were emptied every day by a contractor with a "sludge gulper". Literally hundreds of these were procured and deployed to all temporary facilities within range of Jubayl. Without them the disposal of sewage would have created considerable difficulties. The Marines also had some very good designs for field showers which we copied. We took many such jobs on our books, and at about this time (late October 1990) we took on the refurbishment of the Old Port Barracks. This was just what its name implied, being a series of quite sound two storey concrete accommodation blocks, with an administration block and an amenities block in the middle. Maintenance is a word with little significance in the Middle East, and we soon

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found horrors like a grease trap with 1.5 metres of old grease in it, blocked sewage pipe runs, defunct sewage ejectors, and decrepit plumbing. A further problem arose from the 60 Herz electrical supply which could be guaranteed to give indigestion to the 50 Herz British communications and information technology systems. This necessitated the installation of a parallel 50 Herz power distribution system run off a 150 kW generator.

Also at this time we started in on the construction of 33 Field Hospital, with 200 beds. This subsequently became 33 General Hospital with 400 beds, and finally 33 General and Surgical Hospital (GASH for short) with 600 beds. We drew the line at a not entirely frivolous suggestion of making it a teaching hospital. The variation in size and title does not even give a hint of the number of variations we had to cope with in the layout, design, scope of works, and detailed requirements of that hospital. Each departmental head had his own ideas of what he needed, and each had the advantage of being free of any inhibitions which might have been imposed on him by a realisation of what changes to his stated requirements entailed in practical terms. Thus one gentleman started with a Pathology Laboratory in a 12 X 12, which grew steadily into a 36ft by 24ft unit in which he requested 76 socket outlets be installed. Exactly how he proposed to fit 76 electrical appliances into it was not clear. One ungenerous soul proposed providing all 76 sockets but only connecting up 18 of them, so the incumbents would be kept ceaselessly amused seeking the live ones and reporting defects in the others, (which would then be rendered live at the expense of other previously live ones!). We were also driven to the conclusion that the Hospital derived its number, 33, from the number of minutes for which any decision on layout or requirements remained valid. This theory was confirmed a month or two later when we built 32 Field Hospital, whose staff managed to be just a little bit more versatile in their planning!

On a slightly more serious note however, building those hospitals was a very interesting experience. It being the first time this had been done on such a scale since about the time of Agincourt, both we, the Sappers, and the RAMC hospital staff had a lot to learn. About 50 per cent of the hospital was set up inside a warehouse, but the remainder spilled out onto the surrounding hard standing areas. The extensive use of Colpro led to complex problems of

A shower block for a tented camp

cooling, since heat inexorably accumulates within the Colpro bubbles. The arrangement we derived was that, as the Colpro was set up inside tentage, we cooled the space between the two with conventional air conditioning window units, and drew in this cooled air through the Air Filtration Units (AFUs) to provide clean air inside the bubbles. This cooling required large quantities of electrical power, and the installed capacity put in was 600 kW using in-service 150 kW generators. A complete distribution system was installed using commercially sourced cables, busbar chambers, switchgear and so on. Festoon fluorescent tube lighting was fitted inside the Colpro to minimise heat generation. Water was provided from the mains which gave adequate pressure for distribution. In addition a 30,000 gallon fabric tank was supplied as emergency water storage. Sullage was necessary in most wards, so sinks were put in which drained to small sump tanks outside the tents. Each of these was supplied with a float-actuated electric pump to lift the sullage water to the main drain. Sewerage was limited to the provision of "turdises".

33 was the biggest and most complicated single hospital installation we built by virtue of the large percentage of Colpro deployed, but subsequently we also built the Norwegian hospital (200 beds) in Jubayl, 205 General Hospital (600 beds) in an uncompleted terminal at Riyadh Airport, and 32 Field Hospital (200 beds), 22 Field Hospital (200 beds) and the Canadian hospital (200 beds)

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Splinter protection units protecting aircraft on RAF Muharraq

all in the general area of the FFMA near Quaysumah. All of these facilities relied during their construction on a large technical input from CRE (Works) personnel, in the form of resolving the scope and requirements, design, supervision, and to some extent hands-on participation especially in the electrical installations. 205 in particular represented a major achievement by a WO1 Clerk of Works (Electrical), Mr Turner, over a period of some six weeks.

We had more or less got on top of the problems and requirements generated by the arrival of 7 Armoured Brigade, when the decision to deploy 1 UK Armoured Division under the guise of *Granby 1.5* confronted us with the problem of unloading the balance of the Division. The level of works really began to hot up from then on, and it was at this point that the STRE (Contracts) was summoned to help us. As with so much of the operation, many decisions which had infrastructure implications were left desperately late, when viewed in the context of the lead times involved in the provision of essential facilities. It was exceedingly frustrating for those who were already becoming "old hands" after two months in theatre that each new wave of arrivals had to go through the same learning loops, and make the same mistakes all over again, and the temptation to say, "I told you so..." had to be fought down as being both unhelpful and unlikely to achieve anything useful. For example, from an in-theatre perspective, having built the first 2000 men tented camp and seen the delays and log-jams in the inload of 7 Brigade, it was perfectly clear that the 1 Division proposal of coming in without any transit accommodation at all hadn't a hope of working, and that from the size of *Granby 1.5* much accommodation would be required. A second 2000 man tented camp was therefore requested, but was knocked back on the basis that Sapper foresight did not constitute a justification and no requirement for it had been identified by the staff at that stage. When the realisation dawned that we were actually going to need additional tented accommodation for nearer 3000 men, there was a flap on, all the stores had to be flown out, and the build time so reduced that the initial scale of provision was a rather unsatisfactory minimum.

The large requirement for accommodation anticipated for the inloading of 1 UK Armoured Division provoked a renewed flurry of activity, both on the real estate side, and in the provision of facilities. In addition to the construction of the second tented camp, designated Blackadder Lines and capable of accommodating around 2800 men, authorisation for the construction of four portakabin equipped camps was obtained, and the huts ordered from a local supplier. These were constructed over the ensuing weeks/months. The resources of flexible tankage were assessed as being inadequate to meet the full demands for fuel and water storage, and so steel tankage was designed and ordered with a capacity of 42 x 125,000 litres. A short diversion was provided by a search for floating accommodation of the Coastel variety. This provided an insight into the shipping market with its worldwide web of contacts, but more significantly, a free weekend in Dubai for me! The G5 side also went into overdrive in search of additional existing TCN Camps. Many of those leased were pretty tacky and required a certain amount of restoration by the CRE (Works) using RE or contract labour.

The activity originating from this period ran on for months as many of the projects were longer term, such as the hutted camps. Additional requirements arose such as the provision of a large tarmacked helicopter landing area, which was subsequently extended and provided with a Rubb shelter. Also provided were water bound macadam vehicle marshalling areas, car parks, fencing tasks, etc. The heavy outbreaks of rain which recurred from mid-January to mid-March created problems with dirt roads and hard standings, which rapidly broke up under the heavy trafficking to which they were subjected. The response of our contractors to urgent calls for repair work was very good, with work usually starting within about three days. Before the end of the list was reached, the third phase of activity at Al Jubayl arrived, which was the preparation for recovery and outloading of the British Force. This brought a requirement for

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Support to the Royal Air Force — on base bulk fuel supplies

further vehicle hard standings, convoy marshalling areas, Rubb shelters, and so on, but most of the requirements had in large part been foreseen, and so there was little increase in the intensity of work.

Concurrent with all these activities, the STRE (Airfields) was hard at work up to the end of January providing protective structures on the airfields with varying degrees of sophistication. Between Muharraq and Dhahran, contractors supplied 3000 reinforced concrete splinter protection units (SPUs) of varying shapes and sizes designed by the team. The largest of these were four metres high, weighed around ten tons, and were for protecting parked Tornados. Others protected ammunition dumps, buildings and equipment. Total expenditure on SPUs was about one million pounds. At Tabuk a complete semi protected Combined Operations Centre was constructed from sixteen 20ft ISO containers. These were lined with plywood, fully wired for power, light and communications, and air conditioned with split units. Air was introduced through Nuclear, Biological and Chemical (NBC) AFUs, and exhausted through airlocks. The structure was sealed, surrounded by a wall spaced four feet from the containers, roofed with timber joists and ten millimetre steel sheets, covered with a waterproof membrane, and mounded over. There were admittedly some defects in the design, but the originality of the solution, and the initiative demonstrated in designing and constructing it in three weeks deserved the highest praise for its architect, Capt Paul Sauberlich. Subsequently a similar structure was built at Dhahran. The service provided to the RAF Detachment Commanders for all works was so responsive and effective that they each dispensed with the function of an OC Station Services Squadron, and conferred this responsibility on the OCs STRE detachments. Indeed the RAF were full of enthusiasm for the support they received from the Sappers, both STRE (Airfields) and the 53 Squadron Detachments, and voiced their appreciation to the CGS.

Meanwhile the STRE (Fuels) had been occupied in deploying Emergency Fuel Handling Equipment (EFHE) on the airfields, sufficient to store small lakes of Avtur to meet the voracious thirsts of modern combat aircraft. Concurrent with this, members of the team designed and contracted out the construction of the 42 steel fuel storage tanks to enhance the Army's storage capability at a cost of 4.5 million Riyals, or about 0.6 million pounds. The team's numbers were then increased to build what became known as the Kinghan Pipeline, named after their very gifted OC who was tragically killed in a road accident. This was designed by the team and built under their supervision by a company of US Army personnel in 14 days, and consisted of 56 miles of cross country pipeline with six pump stations. It subsequently pumped about 1.5 million gallons of diesel, but it was a cause of frustration to them that the war progressed so rapidly that there was never a full dependence on the capacity of this line to deliver fuel.

In summary the main features of the works performed were:

- Six hospitals with a total of nearly 2000 beds
- Two tented camps of 4800 man total capacity, with mains water and electricity
- Four hutted camps of 350 man total capacity, with all mains services
- Black topped hard standings of approximately 55,000 sq mtrs
- A 56 miles fuel pipeline with six pump stations
- Fuel storage in steel tanks of 5.25 million litres
- A semi hardened and protected COC
- Provision of 3000 SPUs

Main projects undertaken numbered over 100, but many of these were composite projects such as the provision of a hutted camp. Total expenditure exceeded £6.0 million.

The high spot of the tour for the CRE and STRE (Works), which had been occupied supporting the

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A sprung shelter being erected — Eight men for two days

FFMA since early January was the move to Kuwait and the two and a half week period spent in resurrecting the damaged power and water supplies. These had been extensively damaged by Iraqi sabotage and work was necessary at all sites to get the power grid back into service, and water production back up to an adequate level. (See next article)

To conclude, this was a war for the technical Sappers because, while the ground forces spent only 100 hours actually engaged in live combat engineering and fighting, we were up to our necks in real projects for the six months from the day we arrived to the very last day we were in Kuwait. Despite the fact that we deployed to a developed country, and that excellent facilities were made available to us, there was still a very large requirement for Sapper construction expertise to facilitate the deployment of firstly 7 Brigade and secondly 1 UK Armoured Division. Due to the need for technical inputs to the field hospitals, the PW cage, and the provision of potable water in the field, tactical deployment of elements of the MWF is potentially a feature of future Out of Area operations, an area not emphasised in the past. In summary, this was an incredibly challenging and rewarding tour, and a marvellous opportunity for personnel of a technical background to get heavily involved in useful project work. The requirement to be flexible and to meet demands at short notice called for a wide range of skills including innovation, foresight, initiative, and individual responsibility. The widespread involvement in running contracts also provided valuable experience. I would like to finish by thanking all members of CRE (Works) for their tremendous contribution, and for their support. They worked long hours throughout the period without a break, were completely professional in all they did, and their comradeship made it all so much more worthwhile.

Completing The Jigsaw Puzzle

Oh dark, dark, dark amid the blaze of noon;
Irrecoverably dark, total eclipse, without
all hope of day.
The sun to me is dark and silent as the
moon when she deserts the night
Hid in her silent inter lunar cave.

John Milton

Driving north into Kuwait on 1 March 1991 promoted a mounting feeling of awe. The smoke cloud from the burning oil-fields, which stretches over 200 miles southwards across Saudi Arabia, thickened the further we went, so that by the time we reached the border, having passed through the battered town of Khafji now standing silent and empty, semi darkness prevailed in mid afternoon, rendering photography impossible. Across the border the Iraqi defences could be made out; the bunds, the minefields, the tank ditches cutting through the road, the improvised pipelines snaking across the desert to bring oil to the fire trenches. Spilled oil was everywhere and the air stank of it. The wreckage of battle in the form of smashed vehicles and bombed-out tanks lined the route. Night came down but in doing so merely confirmed the darkness rather than introduced it; a total velvety darkness such as is normally only encountered underground.

Approaching Kuwait city a low rise of ground on our left separated us from the oil-fields, but periodically a glow would flare through the smoke. Cresting this rise just south of the airport

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one was confronted with a scene from Dante's Inferno. As far as the eye could see the plain was lit by columns of orange fire, the towering roaring flames lighting up the whole sky with a lurid orange glow. A quick count revealed over a 100 fires in the vicinity, with more in the distance. The scale of the destruction, of the ecological disaster, and the mentality of the man who would perpetrate such an offence against humanity boggled the mind. So we arrived in Kuwait.

The "we" in question were myself as CRE (Works), my ACRE, and the STRE (Works), and we had been sent to Kuwait to see what we could do to help, within the framework of the American reconstruction effort. The ACRE, Maj Charles Pickles, was already integrated with them as a Liaison Officer (LO) to the Civil/Military Operations Centre (CMOC). After 24 hours, it began to seem that the thrust of the American effort was to visit, inspect, assess, report and try to obtain contracts to repair. There was little or no involvement of US Army engineer resources to bring immediate first aid. It also became clear that the highest priority of work in the eyes of the Kuwaiti authorities was the restoration of power and water supplies.

We were fortunate in that we had with us an extremely distinguished Kuwaiti consulting engineer, Mr Sabah al Rayes, who had volunteered his services as an interpreter and who knew everyone we needed to meet in the Kuwaiti hierarchy. He was an invaluable help, and through his good offices I started attending daily meetings with the Minister for Electricity and Water and his various departmental Under-Secretaries. Charles had already established that there was damage to the Ras Az Zawr power and desalination plant, some 30 miles south of the city, which was within the abilities of the STRE (Works) to repair, so they set off down the coast to live and work there for ten days. Restoring the operation of the primary chlorination plant, repairing the pneumatic control system, and restarting the main water pumping station. At about the same time I learned that there was damage to the Doha power and desalination plant, but that there was scope for us to help there too.

The burnt out fuel storage and pumphouse of the Doha East power station

When I first went out to the Doha power station, the fires were still raging, but mercifully they were mainly contained within the bank bunds. The East plant fuel pump house was a smoking mass of blackened, twisted metal; any approach was impossible to two of the five tanks in the East plant fuel storage which were blazing furiously, with dense black smoke shot with orange and red pouring out of the collapsed and crumpled shells; the other three tanks had caved in and melted in the heat, and now lay smoking in their own ruin, while little fires still played over the glowing layers of clinker which lined their bunds. Over beside the East plant a handful of station staff were still fighting the remnants of a fire which had run through the pipe ducts and flared up the side of the No 7 boiler, scorching

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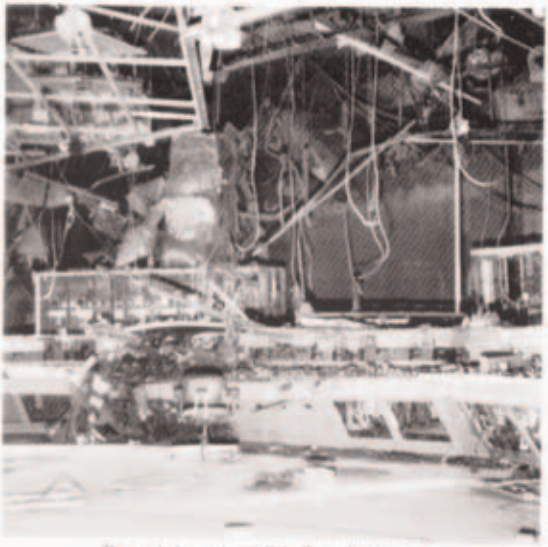

The wrecked control room Doha West (after tidying up)

the metalwork and melting valve stems into the guise of drooping candles. Halfway along the side of the nearby turbine hall the vitals of the electrical control room lay exposed by the blast which had wrecked it, distorting the steel frames, ripping off the cladding, and crushing the control panels into shapeless tangles of metal, glass and cables. (I did not realise it then, but over in the West plant the electrical control room was in a similar state.) Two shell holes gaped in the wall, the water treatment plant for boilers Nos 5-7 was a shambles of bent pipework and brick rubble, and some of the steam mains had been flayed by shrapnel. It was a dispiriting sight to one who had been sent to help restore power and water supplies in Kuwait.

We started with the Doha East power station Director and the remnant of his operating staff. "We" in this case were myself, Mr Al Rayes, Maj Pickles, and Maj Ed Seely of the US Army Engineers. Charles as a civil engineer soon found there was little for him to do in what was entirely an E&M problem, and in the ensuing weeks Ed and I worked to jury-rig the station, though Ed also concentrated much of his efforts on Shuaibah power station to the south of the city.

Of the 600 odd personnel who normally manned the two stations, some 150 remained, and few of these knew their way around in any detail, so there was a serious lack of experienced expertise. It took us two days to establish the scope of the damage, a process that was inhibited by the presence of quantities of explosives and discarded munitions. Seventeen unexploded charges were removed from the West plant alone, and we had to explore the damage through the silent, echoing turbine halls in the dark. To wander round a totally dead power station is a rare experience, since even one which is completely closed down can normally call on the Grid for lighting and power to start itself up again. With the transmission lines cut, if this one was going to be got going, it was up to us to do it on our own and from within the station.

The Doha power station complex consisted of several main elements. The West station was the newest, consisting of eight 300 Megawatt (MW) steam turbine generator sets, with a huge flash evaporation desalination plant powered by steam bled off the main boilers for producing fresh water. The East Plant included the East station of seven 180 MW sets, together with another large desalination plant. It also had a six unit gas turbine generator station, the units being each of 20 MW capacity, which was used for peak loading, such as when the commercial break came in the Kuwaiti equivalent of Neighbours. The East and West plants each had their own fuel supply installations consisting of tanks, a pump house, and pipework. The site was supplied with liquid fuel by one of two pipelines from the Kuwait National Petroleum Company's (KNPC) depot at Ahmadi, 75km away. One pipe carried heavy fuel oil (HFO), and the other carried Gasoil, but the pumps at Ahmadi were without power! Of these fuel systems, the pipelines and metering station, the West plant pump house,

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and two of the West plant storage tanks survived. All the rest, including all the vital interconnecting pipework between the two plants, had gone up in smoke, the steelwork having melted in the heat of the fire.

The first thing that had to be done was to generate some electrical power to run the station ancillaries. The obvious source was the gas turbines (GT) which were undamaged, but they needed fuel. One 20 MW turbine on full load requires around 20 cubic metres of Gasoil per hour, or 20,000 litres, delivered at 5 Bar pressure. It occurred to me that an EFHE Deutz hydrant/stripper pump delivers 450 gal/min or around 90 cubic metres per hour at 5.5 Bar, and one of these could be throttled back to supply one or more turbines. About 120 metres from the GT house were four water tanks for boiler feed and fire fighting water. If we could drain one of these down, fill it with Gasoil using road tankers to bring the fuel to site, make some connections to adapt its pipework to match six inch Victaulic, and connect it to the GT fuel line using the Deutz pump and EFHE pipelines, we would have the start of a workable fuel system. I would need the equipment, a good Fitter Petroleum and the coded welder from 516 STRE, and the brand new Pipeline Infrastructure Repair Kit (PIRK) trailer, which Maj Kinghan had had made up for 516 STRE. A call to Riyadh secured the promise of all of these things, but circumstances and "the Movers" combined to defer their arrival for three days, to my considerable embarrassment since they only had to come from Jubayl, having driven from Bahrain within hours of my call.

Effecting this connection went very well, and it was complete before the American side of the team managed to secure the fuel tankers to start filling the tank. However providing 20 cubic metres per hour would call for a pretty steady stream of tankers, so the next piece of the puzzle was to run an EFHE lay-flat line out to the metering station of the West plant, about 900 metres, so that if we could get the pumps at Ahmadi going we could have constant delivery to the turbines. We would in any case have to get Ahmadi going for the step after that which would be to fire up a boiler, since to do this we would need approximately 60 cubic metres an hour which no fleet of tankers could cope with. So the lay-flat line was brought up and installed, with the welder, SSgt Robson, making the connections with the aid of the PIRK. The "blue tank", as it became known, was already filling slowly as the tankers came and went, and as the power station staff then set about starting up the GTs, we considered the next link in the chain.

Given power from the GTs, and a bit of luck with the remains of the electrical system, we would be able to transmit power via the 132 KV circuit to the West plant. It we could do this, we could start up the ancillaries necessary to support firing a boiler, but first we had to move some fuel around. There remained to the West two plant fuel storage tanks, A and C, with the B tank a burnt out wreck in the middle. These tanks both contained HFO, which was the normal liquid fuel for firing the boilers. However the HFO can only be used when pre-heated with steam to reduce its viscosity so that it atomises properly through the boiler burner nozzles. Since we had no boilers, we had no steam, and so we couldn't use the HFO, at least in the first instance to start up a boiler. Instead we were to bring in Gasoil, in sufficient quantity to get up a head of steam in the boilers, and this would have to be stored in one of the two remaining tanks. The standby diesel generator in the West plant could produce power enough to operate the fuel transfer pumps, and mercifully there was sufficient ullage to shift all the HFO into the C tank, leaving the A tank empty to receive Gasoil.

At about this time one of the major outstanding stumbling blocks, the supply of electrical power to the 1.5 MW fuel pumps as Ahmadi, was solved by KNPC, who instead came up with a diesel driven pump as a workable alternative, and started pumping Gasoil through to the Doha metering station. With most of the transmission lines down, the only hope we had of getting electrical power to Ahmadi quickly was from the nearby power station at Shuaibah. Shuaibah however was an old station which had been extensively damaged, and the result of this, coupled with an inheritance of years of poor maintenance, was that all efforts to restart it were getting nowhere. Thus at that stage we had no solution for that particular problem. However, we now had fuel reaching the site, a fuel system for the GTs, storage for Gasoil for the West plant boilers, and the means to deliver it to the West plant boilers. Our next concern was to get fuel to the East plant boilers so that these too could be fired up to run their desalination units. We had no pumps which could meet the duty, which called for 60 cubic metres per hour per boiler at 30 Bar pressure, neither would our EFHE pipework deliver sufficient quantities for more than one boiler. However I knew, which Ed did not, that the US equivalent to EFHE would satisfy the needs of two boilers if we

WO1 Turner rebuilding the West Plant controls. The panel beside him is all that was used to control one 300MW set.

Sgt Jackson (left) and SSgt Robson making up pipe work to connect the fuel lines to the East Plant boilers.

could get the material. So Ed fixed the supply of the aluminium alloy pipe and a section from a US Army Petroleum Company to install it, while SSgt Robson and Sgt Jackson, the Fitter Petroleum, set about making the connections into the West plant pump house and the East plant boiler fuel header. Two lines were needed to provide both flow and return, since the pumps were constant output units and there was no way of varying their delivery to match the boiler's consumption. The surplus was therefore piped back to the storage tank.

Over at the East plant the skeleton staff had now managed to get two of the GT's running which gave them a duty and standby capability to supply station power, but one detail remained. Once the process of firing up a boiler started, it would be totally dependent for electrical power on the GTs and unplanned shut-down could not be permitted. We therefore had to enhance the security of the GT's fuel supply by adding in a second Deutz pump in parallel with the first, to give both a duty and standby capability there too. This was also done by Messrs Jackson and Robson during a three hour shut-down and the complex was now set to try to generate in earnest.

The final chapter of the saga centres on WO1 Turner (Clerk of Works, Electrical) who worked day and night with experts from British Electric International (BEI), alias the overseas wing of the erstwhile Central Electricity Generating Board (CEGB), who themselves had by now been flown out to reinforce the regular station staff. The destruction of both electrical control rooms meant that all normal means to control the generators, to parallel them with the Grid, and all the attendant protection circuits had gone. Working with a Mr John Scott, they set out to reconstruct sufficient parts of the West plant electrical control room to allow them to run up, parallel and control the No 3 steam turbine set. On Saturday, 16 March, just two weeks after we had started, the No 3 boiler was filled with distilled water, trucked in 120km from Az Zawr and cleaned in the West plant boiler feed water scrubbers. On Sunday it was fired, and after a few delays with clogged burners, it was ready to provide steam by Monday night. By Wednesday the turbine had been warmed through and was ready to run, but the start was postponed until the morning of Thursday, 21 March. During this week an incredible amount of work had been done in tracing thousands of cables, insulating damaged control and protection circuits, and making up an elementary control panel in which half a wall's worth of electronic technology was reduced to six instruments and a handful of switches, which would permit a run, albeit with a precarious lack of protection. Meanwhile contractor gangs had

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repaired the high voltage transmission lines to the Grid main control centre.

By midday on 21 March the turbine had been brought up to working temperature and spun up to 3000 RPM, the breakers were closed, and the station was back in business generating power, producing an initial 90 MW, while steam was being bled off to the desalination plant, which was producing around 6 million gallons of desalinated water per day. Power was being delivered to the water pump station which pumped the water produced to a high level reservoir for distribution to the city by gravity, and thus, in just under three weeks, all our primary objectives had been achieved. Furthermore the transmission lines from Az Zawr would also be back in service within a couple of weeks and then, given the STRE's contribution there, the city would have all the power it could use for the moment. Without expert operating staff it could not have been done, but equally without Royal Engineer resourcefulness, manpower and equipment it could not have been done either. Let it not be said that today's Sappers no longer have the capability to make possible the fixing up of damaged large plant installations. It was one of the best practical engineering challenges of our collective careers, and we wouldn't have missed it for the world.

There is a postscript to this story. In order not to threaten the security of the GT supply, the West station was electrically isolated from the GTs before connection to the Grid, so that all station power required was then being bled from the No 3 set. At 1330hrs the BEI staff and Mr Turner went off duty for a well earned sleep, leaving the station in the hands of the regular Kuwaiti staff. At 1730hrs the No 3 generator tripped, probably due to a fault in the much battered and abused control circuitry, but instantly the West plant was completely without electrical power. Because the battery powered DC lube oil pumps had not been switched to standby as they should have been, the turbine ran down with no bearing lubrication, and in due course the bearings seized. In 15 seconds the entire 300 MW turbo generator unit was reduced to scrap, and the whole weary process had to be restarted on the No 4 set. Time had by now run out for Mr Turner, who had to return to Jubayl to catch his flight home on 25 March. I however, had to return to Kuwait briefly, and paid a last visit to Doha on 26 March. I found the No 4 set had been successfully started on Sunday 24 March, drawing on the experience gained in starting up the No 3 set, and the main breakers had been closed at 1612hrs. The set tripped once due to a control fault that afternoon but it was running steadily when I saw it on Tuesday, and the BEI staff were already working to run up the No 1 set. Meanwhile over in the East plant the ancillaries for the No 1 set were operating in preparation to fire that boiler. I was therefore able to leave the plant very much up and running, a dramatic contrast to the state in which I had first seen it.

First signs of life returning. Start up of the No 5 Gas Turbine in Doha East.

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The Wasted Years – Part II

MR H W ASHTON

In Part I of The Wasted Years *Harold Ashton described how he was originally wounded and taken prisoner. That part ended with his escape from a train* en route *to Biberach near the Swiss border. Part II begins with his recapture and imprisonment in Biberach.*

This particular village is near Blenheim, where Marlborough defeated the French in 1704, though this did not much concern us.

With morning light we again looked out for a hide and found a place in an area of woodland. Everywhere was wet with dew and, although June, quite cold. But each time we were ready to bed down I saw houses, we were so exhausted and we just gave up and lay down. When we did wake up after a few hours sleep it was very much daylight and not a house to be seen anywhere. Hallucinations!

It was a patch of pleasant open woodland and it must have been at weekend; we saw people walking about.

A German soldier in uniform passed close by, his girlfriend on his arm. I could have reached out and touched him as he walked by. They had no idea we were lying there in the bracken.

Later in the afternoon all was still and quiet when we heard boys shouting. Looking over the low ridge we saw three schoolboys coming our way.

We lay doggo, there was plenty of space for them not to find us.

But the hundred to one chance happened and they crossed this ridge right on top of us. The shouting stopped dead. I listened.

Then I heard the boys whispering: *"Sie sind Englander"*.

The boys tiptoed away, back the way they came. I peeped over the ridge. They broke into a run, excited, to tell the village, a few minutes later we moved away.

After dark, we moved on along the railway line. About three in the misty morning, we suddenly encountered a very large through bridge, much bigger than any we had already crossed.

We could not see a sentry box concealed by a thick stanchion.

We decided to cross the bridge and, the moment we moved, out jumped the sentry, shouting excitedly. We were marched over the Danube, me with a bayonet in my back, the sentry shouting: *"Vorwarts, vorwarts"*.

When we reached the other side more guards appeared. I was carrying our water supply in a Lingfo milk can, one of the soldiers took this, removed the lid and emptied out the water. They all had a good laugh at our sentry; in the dark he thought the water can contained a bomb.

We were searched inside the hut. There was some Cadbury's chocolate; we had eaten two squares each per day. The soldiers were astonished, *"Schokolade, Schokolade"*, they kept saying, they had not seen any for two years.

They were not unfriendly, this was some relief from their monotonous routine.

We were taken to the nearby village of Offingen. The village policeman, Anselm Schmucker, was wakened and we were taken to the police station. There the policeman, in his dressing gown, sat writing all the details, a large picture of the Fuhrer on the wall over his head.

We were taken to the village lockup, there was only one bunk and one of us slept on the floor.

The following day we were taken to the policeman's house where his wife, Koletta, gave us a meal, the first real one for about five days. I remember it well, potatoes, tomatoes and cheese and, there was as much as we could eat.

On the sideboard was a photograph of a young soldier, Hans, with the Sixth German Army in France. (Later missing at Stalingrad in 1943.)

Later on we were taken, by train, under guard, to a POW camp for French soldiers at Memmingen. So, on this trip we had quite a connection with Marlborough's three battlefields in 1704, Donauworth, Blenheim and Memmingen.

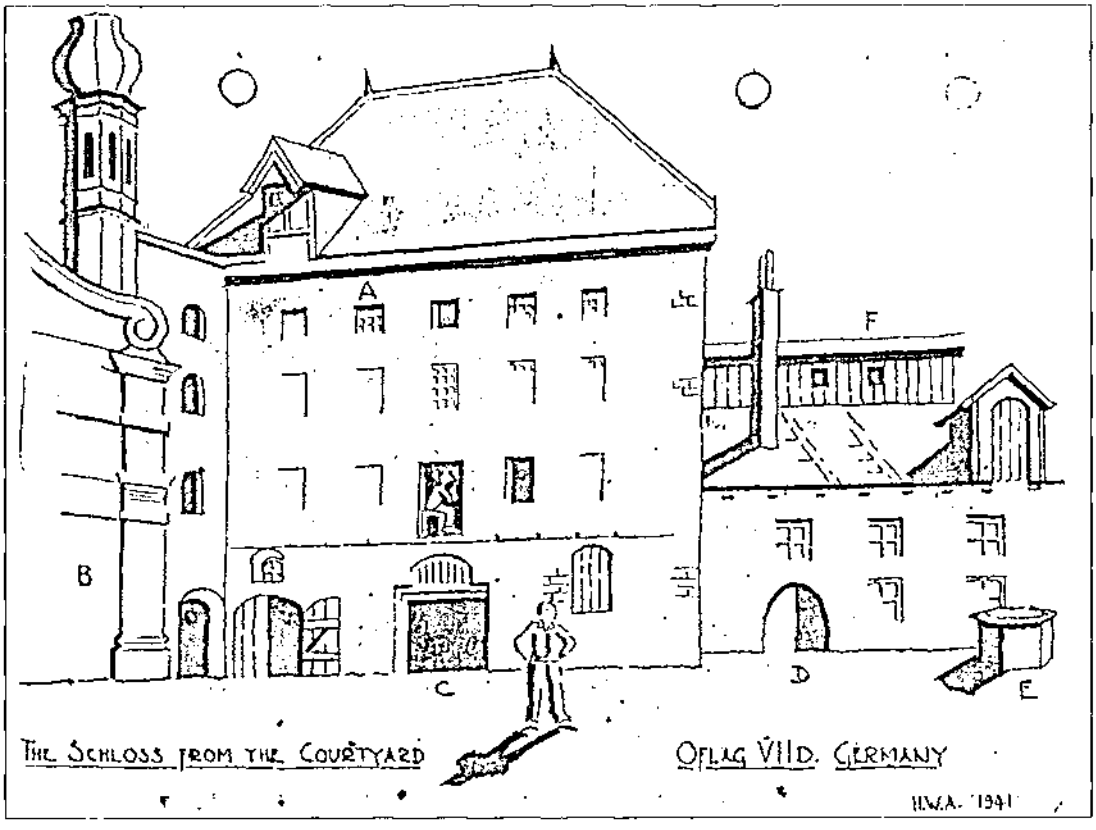
And, from the sublime to reality, we were once more in a lockup with a bucket in the corner!

Later, we were interrogated "Why did you try to escape?"

John Wallace, relating this later, said "I thought you were going to say, 'I thought they were taking me back to Laufen'".

The Officer noticed John was wearing a gold ring. "Is that a wedding ring?" he enquired. John said that it was although it was, in fact, a signet ring.

They looked at each other straight in the face for quite a while, the German knew that John was lying and John knew that he knew. The gold ring was not taken from him.



The German officer explained that any gold had to be taken from a prisoner-of-war but, by a special order of Hitler, not wedding rings.

At the end of this questioning he gave us each a packet of French Red Cross cigarettes, very welcome indeed.

A day or two later we were taken to the original destination, the camp at Biberach and so rejoined our comrades.

We had to go before the Commandant and were sentenced to twelve days solitary, each locked up in a very small cell but allowed two periods of half an hour daily for latrines and washroom.

I got a message through to my friends in the camp to send me a towel, soap and a book. The book was *Martin Chuzzlewit.* Mark Tapley inspired me; it was just the life for his special philosophy.

There was also a message from Tiny Waters (6ft 3in), apologizing for having eaten half a loaf I left in the train, quite a serious transgression. I sent back a message to thank them for sending things and to tell Tiny not to worry about having consumedmy bread; it would by now be like 4:2:1 concrete. But this note somehow fell into the hands of the Commandant. Next day he visited me, with his attendant staff. What did I mean by comparing German breadwith concrete?

I explained this was just a bit of English humour. But it took quite a while to get this idea across.

The Commandant, who was very much a soldier and a gentleman, carefully examined my cell and the washroom, just a cold water tap and a stoneware sink on the floor, found a fault or two and rousted the guards to improve conditions for me.

During the time I was in solitary a tunnel was started and, on completion a few weeks later, 26 officers escaped. Five of them reached Switzerland. One of them was sadly killed in the invasion of France on D Day, 6 June 1944, another officer got away on a solo effort by concealing himself in a waste disposal cart.

One morning, looking through the bars of my cell window, I saw a new batch of officers arriving. They were prisoners from Greece and Crete, very weary and hungry. They were mostly Australians and I heard that, as they entered the camp gate Brigadier Somerset remarked, "Good God, they're white."

There was a line of latrines near to the perimeter fence, an escape opportunity too good to be missed. So a tunnel was started beneath one of them, with an officer at all times sitting on the seat apparently minding his own business.

When I came out of clink my new quarters were with strangers from the recent inflow from the Balkans campaign.

They had been desperately short of food. When I opened my luggage left on the train after the train jump there to my surprise was some chocolate. I always tried to keep some for a possible escape; high food value in small volume. But when these chaps saw it every eye in the room was on me. So I gave it all away.

After a few weeks I was one of a small party on a train eastbound, a two-day journey with a chance of escape. But I had no food whatsoever to start with. Lieut Armstrong was in the same compartment and decided to have a go. We had no idea where we were going except that the train kept on moving east. Every mile lessened Armstrong's hope of making Switzerland. He knew I had done a train jump and asked my advice which was, (1) jump at a moderate speed, (2) jump out of the right side of the train to avoid being killed by a train coming the other way, and (3) try to avoid jumping near a bridge parapet; a grassy bank falling downhill is the best. As the hours passed Armstrong kept asking my advice, each time I said now was the time he hesitated. All the others in the compartment were now asleep. In the end fearing he would miss the boat altogether, I said "Jump now" when the train was travelling perhaps somewhat too fast. But he jumped. This point, he told me years later, was east of Munich and he was recaptured a few days later. Another few days and he was in clink at Tittmoning, our destination, a POW camp in an ancient schloss.

In August 1945, just after the end of the war, I was coming up in a lift at Russell Square tube station when I saw Armstrong at the other end of the lift, head above all the women passengers, and called out to him. He replied at once, "Hello Ashton. That train was going at a hell of a lick when you told me to jump. I nearly broke my bloody neck."

Tittmoning (Bavaria)

The prison camp was in a stone schloss about a thousand years old. The drawing, which I sent home to Kath, shows one part of it. Our quarters were on the top floor. Our contingent, together with officers already there, made a total of about four hundred. I am not saying I liked any part of captivity but Tittmoning was the nearest to it.

Here, for the first time as a POW, there was enough food and Red Cross food parcels coming through.

I noticed a hatch in the ceiling of our third floor room and suggested investigation. So, with a couple of chairs piled up on a table we got into a large attic, there was enough light to look around. Most of the contents were stores like blankets, crockery, cutlery etc which I passed down the hatch until everyone was satisfied. But the great prize was an old radio set. This was smuggled across the courtyard to the main building and here we made the thing work. After that we received English radio news, absolutely *verboten*, as well as the news extracted from the daily papers in German. And, having worked out the lies in the English news compared with the lies in the German news, we had a very good knowledge of the complete war situation. Books were reaching us from England, there was no shortage of books, a great pleasure.

The German censors stamped the word, meaning "Approved", on a page or two of every book coming in to the camp; and also on the pages of any personal diary or anything written by officers. Lieut Jock Hamilton-Baillie RE made a perfect *Geprüft* rubber stamp using a razor blade and a rubber heel off a shoe. Anyone could use it to "Censor" his papers so that in a search the Germans would pass over it.

Our part of the schloss was on the perimeter of the whole establishment, the outer wall, no windows, overlooking a sheer drop of about a hundred feet. From our room a locked door led to a staircase up to a timber covered catwalk along the outer wall. Most nights a guard unlocked this door and made his inspection, we could hear his heavy footsteps along the catwalk.

One night Lieut Roddy McLeod and I locked the door after the guard was doing his round. When he got back to the door and found he was locked in he hammered at it with the butt of his rifle, screaming in fury in the way Germans make their speciality. When we let him out he was so mad I thought he might shoot someone. This of course was reported to the Camp Kommandant who informed our SBO that he was prepared to lock us all in our room with a bucket in the corner every night as a punishment!

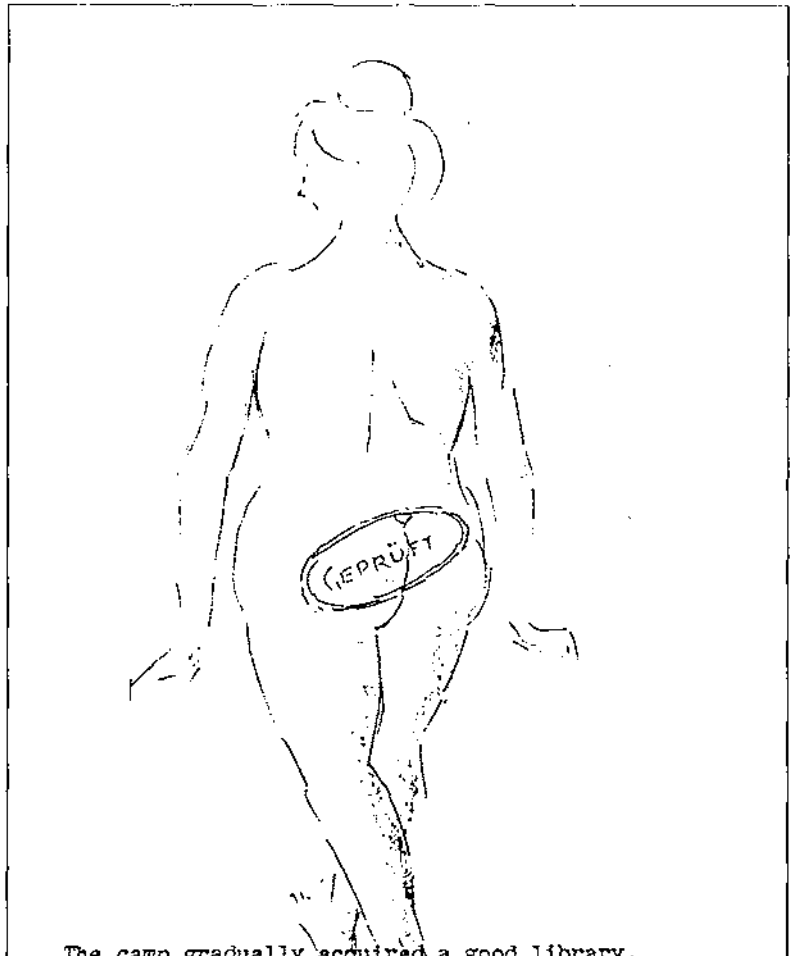
Lieut Hannay tried to escape by burying himself in the rubbish cart, as he worked at Biberach. But at

the gate a guard prodded the waste material with his bayonet. Bad luck for Hannay but fortunately he was not hurt.

On the outer side of the schloss was a terrace, about fifty yards long by about seven wide, high above the surrounding land. It was enclosed by barbed wire, of course, and there was a sentry with a machine gun in a box above.

Here, walking around with others, I witnessed the daring escape of Lieut J R E Hamilton-Baillie.

He cut through the wire in daylight aided by another brave man sitting in a deck chair partly concealing what was happening and hid in a hut at the top of the rock face until night fall. This hut was for the benefit of sentries on their rounds in bad weather and whilst Hamilton-Baillie was there a sentry with an Alsatian stopped outside. The dog sniffed at the door but the sentry detected nothing. Hamilton-Baillie told me afterwards about his walk to the Swiss frontier, a distance of about 190 miles. On several occasions German civilians spoke to him, but, fair haired, in shorts and carrying a rucksack, he looked just like any Bavarian Jugend on a walking holiday.



The camp gradually acquired a good library. As I was continually drawing the art books attracted me. In one of them you could see that the German censor most positively approved of one of the drawings.

It was now our problem to fake the count which happened twice, sometimes three times a day. So a dummy was constructed and smuggled to the parade ground with a crowd of officers around him. For counting we paraded in ranks of five. The dummy, about five feet three to be inconspicuous, was in the middle of the five. The camp officer, counting, hesitated a moment at this rank but moved on. This worked for several counts before the Germans spotted it by which time Hamilton-Baillie was well on his way to Switzerland. The same method of escape was tried again but this time was detected by the watch tower sentry. He was wildly excited and spun his machine gun round in all directions, we quickly got out of range.

There was a water well in the courtyard. You can see the wellhead in the drawing on page 149. It would be not more than forty yards, under the building, to freedom, so a tunnel was commenced.

I was on this scheme but progress was very slow. Getting through the stone walls of the well with what tools we possessed took a long time. It never got far because the camp moved. Several officers concealed themselves in this tunnel, hoping to make a getaway from an empty camp. But luck was not with them and they turned up at the next camp at Warburg a few days after the rest of us. I can

remember Johnny Hopetoun, later to become the Marquis of Linlithgow, entering through the gates finger and thumb holding his nose in the air.

We left Tittmoning in October 1941 and I did not see the schloss again until seven years after the end of the war. It was just the same, without the barbed wire, and unoccupied except for maintenance staff.

A man living nearby was very interested in my visit and showed me something of a museum of POW artifacts made for escaping purposes. He made me most welcome showing me round and it was clear he had a great respect and liking for the officers it had been his duty to guard.

Warburg

There were 2,500 officers including 500 RAF imprisoned at Warburg, a camp about one mile in perimeter where we could take daily exercise, the food was very poor. I was there for about one year. Group Captain Douglas Bader was at this camp, now with both his artificial legs intact. He broke one landing by parachute in Germany after being shot down. The RAF dropped a replacement leg soon after his capture. I do not think he was the SBO of the RAF group at Warburg but he did sometimes take the parade for counting. It was his way on these occasions to lark about in a schoolboy manner to inconvenience the Germans. Nobody else could quite do this and the Germans tolerated his pranks in a good natured way. They had a great admiration for anyone with a record like Bader.

By this time arrangements had been made for educational and professional exams to be held in POW camps. I taught applied maths and civil engineering subjects. My students were mostly from technical regiments; one of them was Chief Surveyor of a Scottish county.

Professional exams were held at the same dates as in England and the sealed exam papers were unopened until the day and the hour of the exams. I invigilated on several occasions.

The winter of 1941-1942 was very cold, as low as minus 25 Celsius. There was a hut in the middle of the camp, quite isolated, where you could take a cold shower anytime. If you had a cold shower the water felt warm, with the water a little above freezing and the air temperature so low.

We received pay in lagermarks, useless outside a POW camp. In Germany there were many different kinds of currency during the war, each with its own special use. My lagermarks amounted to eighty one per month, the lagermark being pegged, we were told, at fifteen to the pound. My POW pay was £5.8.0d. per month. I had not the slightest idea that any of these lagermarks would ever mean anything until, after getting home, I received notice from the War Office, asking, "Did I have any claim to make?"

Now the Germans had stopped my pay for three days and nights walking across southern Germany towards Switzerland, eight days and nights doing the same thing in 1942, a year later, and for two stretches of twelve days in the cells, making thirty five days in all.

I acknowledged that they had a right under the Geneva Convention to put me in clink for my misdeeds; and in certain circumstances to shoot me. But I did not agree that they had any right to stop my pay. So I claimed it, and got it!

Money was regarded as of no value, never could one purchase food. You could buy German newspapers, razor blades — (quite as good, or better than English razor blades), art materials, if you were lucky; and once I spent money on an eye test.

I made many drawings and sketches of anything and everything. Many I gave away and, when we left our last camp in 1945 I decided to travel light and left a great number of drawings in a wooden box I had made with my name and home address, hoping that one day they would reach me, in the way a laundry bill in the Army will follow you anywhere in the world. But I found out afterwards that the first Allied troops to enter that camp were Americans. I regret that they never came back to me. They must now be anywhere between California and Maine. Anyway, good luck to whoever has them.

Now and again, at morning parade, the Camp Officer would inform us that he was about to make a special announcement to the effect that any British officer found having any contact with a German woman would be severely punished; in some circumstances death. The reaction was always the same. About a hundred voices called out, "Give us a chance".

In February 1942 someone suggested we get a tunnel going. For this our hut was as well placed as any. These army huts were just like those in England, one long timber hut of six rooms in a row, all built on a nine inch brick dwarf wall foundation. And, for us, about twenty five feet from the barbed wire. There were a couple of openings in the brick foundations just above ground level and every two or three weeks a German soldier crawled through one of these openings to search for a possible

tunnel. They were known as ferrets. It was simple for our ten to get through the floorboards to open up the ground. But how to conceal the tunnel entrance from the ferrets?

Then someone suggested we construct a curtain wall. I did not think this would work because the corner would now be an obtuse angle and very obvious. But the man with the idea was persistent. "You would notice this angle because you are a professional civil engineer but a German common soldier might not." And he was right. The plan deceived the ferrets for three months and was discovered because the SBO allowed another group to use our patent and they must have used a bank clerk to build the wall because it was exposed almost at once; our scheme spotted in consequence.

No sooner were we digging than the Germans suspected something and searched our hut; turned everything upside down. Finding nothing but still suspicious, perhaps with listening apparatus, they began to dig an open trench alongside our hut to cut across any tunnel. So we changed direction. If you were not down below digging you could sit in the open watching several German soldiers hopefully digging their trench and having no luck.

Two of us did the bricklaying, lying face down with two feet of headroom, someone always keeping watch for ferrets. There was no cement, so clay was used for mortar, actually an advantage in the freezing weather. In my pre-war work brickwork with estimating and supervision was all in the daily job. But never until now had I actually laid bricks and it gave me much pleasure that our craftsmanship fooled the Germans for so long. Where the bricks came from I did not enquire. You never saw any lying about in the camp!

The tunnel had to be 2ft 3in square in section for that was the length of a bed board. You had about ten to lie on, with a palliasse that never acquired any new straw. So many gave a bedboard for our tunnel roof supports. Some found it a real benefit to their sleep, the missing bedboard space making a good hip hole! But we were always needing more boards as the tunnel proceeded and Humphrey Marriott had a bright idea. He had made nets as a schoolboy and carved the necessary gadget out of a piece of wood. String from Red Cross parcels was *verboten* but we got it somehow and Marriott made many bed hammocks. These were traded to those willing to give up their bed boards. Unfortunately for them the Germans got wise to what was going on in this way and, at every snap search, bed hammocks were confiscated. So some frustrated officer had to scrounge, sleeping on the floor until he had "acquired" enough of someone else's bed boards to make himself a comfortable sleeping place.

Humphrey Marriott never lived to see England again. He was killed by a bullet from an American fighter plane a few weeks before the war ended.

The boards were 2ft 3in long by 3in wide by ¹/ in thick. It was important that one of the crossbeams, the main strength of the frame, should be "on edge" to resist the load of the earth above. In one other tunnel, they neglected this point, there was a cave-in and Lieut Du Pree was killed.

We worked half hour shifts, it was quite enough in that small space. Ventilation became a problem, so an air pump was made from a portable gramophone. The spring motor was removed so the table revolved by just turning the winding handle.

An officer made a remarkably efficient centrifugal air pump upon the gramophone table. For this he used plate from Red Cross tins, cut exactly to shape and soldered with great precision. He melted solder from the tins and re-used it all with heat from a bootlace in dripping and a miniscule blowpipe homemade.

The next problem was to get fresh air from the air pump along the tunnel. Every hut had a solid fuel stove of the sort you see in every contractor's site hut, with stove pipes about 30in long and five inches in diameter. So a couple of our chaps procured all we needed by careful larceny. They were suspended in the top left hand corner of the tunnel and added to as we progressed, one man always standing in the starting well of the tunnel continually winding the handle like the man with the hurdy gurdy but without the music. And there, at the working end of this passage, digging in the light of a shoelace burning in dripping, you could feel the cool fresh air of this very effective ventilation.

It was exciting when we knew we were digging under the cornfield outside the wire but the Germans, still sure there was something going on, cut the high standing corn for a width of about forty yards from the wire. At this point, the other tunnel I mentioned was exposed, making the Germans do a creeping search for like schemes, and that was the end of our effort.

They brought the latrine cart along and emptied its contents into our workings to make doubly sure.

Our midday meal was in a large communal dining room; and always about half a meal. Any other meals you had in your own room.

There was a cast iron stove in each room and, in the winter, always some, if not quite enough, solid fuel. Somebody suggested building half an oven around our stove, using bricks and clay. This was accomplished and greatly improved our meals. There was no fastening to the oven door, it was a steel plate just leaning against the opening. One day, just before the evening meal, there was a loud explosion and the oven door flew across the room with great force. Someone had forgotten to puncture his tin of peas before placing it in the oven. Every other plate in the oven got extra peas that night!

In June 1942 there was a most spectacular night-time escape. Ladders high enough to get over the wire were constructed, very lightweight for concealment during the countless searches.

At the right moment on a moonless night an officer cut one of the electric cables, blacking out a long stretch of the lighting on the perimeter. A good many went over the ladders up against the barbed wire and several succeeded in getting back to England. Lieutenants Roddy McLeod and David Ross, both part of our failed tunnel job, got away in this "over the wire" escape.

Not so long after that we witnessed one of the most audacious escapes. It was under the wire and only a few yards from our window, in daylight just before evening parade time.

Orders had been issued for us to walk in thick formation round about this spot and a mock fight between two officers had been arranged to distract the nearest watch tower sentry.

The first officer crawled from the tripwire to the main double barbed wire where the grass, never trodden on, was a few feet high. He cut through the wire and lay on the ground outside, we watched spellbound. The other two followed and then, the three of them stood up, by command, as one, and walked steadily across the field away from the camp. The sentry in the watch saw them, could have machine-gunned them in seconds, but we guess he was flummoxed, not sure whether they were German farm workers. This trio never made it, they were all recaptured.

Eichstatt

In September 1942 along with six hundred others, Harold Ashton left Warburg by train for Eichstatt. By that time he had been prisoner for almost two and a half years and had suffered all manner of privation and hardship, he was not to know it would be the same further period of time before he was released from captivity.

However en route from Warburg, he and an Australian Lieutenant Clive Dieppe, jumped from the train and after eight days hiding and walking towards Switzerland was arrested by a village Burgomeister, eventually being returned to his intended destination at Eichstatt where once again he was confined to 12 days solitary. Ashton's friend Dieppe was recaptured near Heidelberg and also returned to Eichstatt much dispirited. Ashton could not teach but found much comfort in the classes and particularly Trollope. He was in trouble with the Escape Committee (save us all from committees!) for not handing in a tiny compass enclosed in a 'phoney' food parcel, only to be told by the SBO that he could keep it "until it was required". In time Ashton resumed his teaching, (one of his colleagues Lieutenant Heenan was killed by a bullet from an American plane a week before the end of the war).

The Germans made their usual sudden searches here as at other camps, but one day there was a very special search. A squad of well dressed civilians arrived at the camp. They were Gestapo, we could see the German soldiers did not like them but quite clearly the Gestapo were in control. Instead of searching just one hut, the customary way, they had the entire camp out on the parade ground all day, and made a most thorough investigation. At the end of this five or six hour search one of the Gestapo men looked around for his overcoat but no one could find it. Everybody laughed, the German soldiers most of all. But the overcoat had to be returned, by order of the SBO, he also smiling. It was a grey greatcoat, very well tailored. I saw it after it had been returned, but as when it was stolen, no one saw it returned!

One morning at parade time, we sensed something in the air because Kommandant Blatterbauer was present in person. The late arrivals on the parade ground were gathered together and handcuffed. The Kommandant announced the camp was surrounded on the outside with mortars in case of a riotous disturbance and the reason for the handcuffs was that German soldiers taken prisoner at Dieppe had been put in handcuffsby theBritish, a most grievous indignity. The men now in handcuffs here would remain so until an apology was received from the British War Office.

Upon this announcement the entire parade roared with laughter. The Kommandant was purple with rage, but speechless. These handcuffed officers, about fifty in all, remained handcuffed, night and day, for several days, later they were handcuffed during daylight hours only.

I happened to be in one of the latrines when a guard looked in on inspection. On top of one of the unlocked WC doors was a British battle dress jacket. We heard the chain pulled and the jacket disappeared inwards. Twenty seconds later an officer opened the door and walked out wearing the jacket and handcuffs. The German guard could not believe his eyes.

In the winter of 1942-43 the south-east region of the camp became a soggy quagmire. There was no hope of the Germans doing anything so it became a sapper job. We did it the way they drained the enclosures in England about the year 1800, by making land drains using nothing but pebbles. With hundreds of infantry officers having nothing much to do they were our labourers collecting the thousands of small stones required. A few days after completion our quagmire disappeared into a nearby tributary of the Danube and on its way to the Black Sea.

There was an occasion when a New Zealand officer punched a German officer in the face, the New Zealander was court martialled and sentenced to six months in clink serving his time amongst German soldiers. When released he could speak perfect German.

In the summer of 1943 the camp held a King's Birthday parade. It was a smart affair, buttons polished, kilts and bagpipes. The Commandant and his officers sat in a special place above the rest of us, much impressed by the march past of Scottish officers.

Next morning, early hours, twenty seven British officers emerged from a tunnel high up on a bank beside the camp. The German commandant was furious and swore that our SBO had laid it on to lull the Germans into friendliness and relaxed security. But all twenty seven were recaptured.

Rotenburg am Fulda

In July 1943 I was moved to Rotenburg not far from the River Mohne. On arrival we were strip searched and suffered the indignity of having our backsides examined for concealed tools.

Of all the eight camps I knew Rotenburg was the least uncomfortable. The ground floor and two floors above were occupied by us for living quarters. Above the top floor was an attic and here the camp orchestra practised. I paid them a visit one morning. As I entered the attic room there came suddenly a tremendous fighter plane sound and firing just over our heads, everybody dived for cover. It was, in fact, a British fighter plane making a successful attack on a train on the nearby line from Kassel to Leipzig. The train stopped, steam coming from the loco, passengers and crew running up the slope among trees.

We saw this sort of attack several times, the fighter pilot always aiming at the loco only. Now and again a train of five or six shot up locos would be seen on the rails hauled by a sound loco on their way to the repair works at Kassel. This time, to get a right angle shot, the fighter pilot had just missed our chimney pots.

There was an elevator, now out of use, in the building from one floor below ground to three above. Someone had a bright idea for another use for the four vertical girders constructed as guides for the lift. For clear reasons these girders were in the first place made in sections. Over some weeks they were unbolted: using a spanner made from something else someone had made.

Late one evening, the beams were transported to the gymnasium on the ground floor. The small windows, high up in the room, looked out on a possible escape above the barbed wire very close to the building in an area *verboten* to us. In complete darkness the whole contraption was assembled and pushed out of the window piece by piece as it was put together.

Then catastrophe. Some fool struck a match, a guard outside spotted it and in no time Germans with loaded rifles and revolvers poured into the gymnasium. I was one of the helpers not put under lock and key!

We witnessed many night air raids over Kassel, twenty four miles away to the north-west. First you would hear the air raid siren, cadence as in England, then searchlights followed by searchlight blackout and the barely perceptible sparks of the German night fighters. If they scored a hit you would see a pinpoint of light moving across the sky slowly brightening in a downward parabola and a big flash of light as the plane struck the ground. We prayed the crew had safely bailed out.

After one raid which severely damaged Kassel with heavy civilian casualties the German barber who visited the camp never came again.

The Americans were making daylight raids with Flying Fortresses operating at exceptionally high altitudes. Although you could not see them you knew they were in very large numbers from their sound. Now and again you would see far away a parachute floating down to earth.

One *grand blessé* here was indeed a hard luck case. He had lost a leg at Lubeck from a British air

raid and stumped about the camp on a peg leg. I never saw him smile, he was repatriated towards the end of 1943.

Here, as in all other camps, you saw the oddest pastimes. I noticed a chap one day peering intently at a crack in a masonry joint in an old outhouse. This crack was the entrance and exit of a bees' nest. He would now and again capture a bee with a makeshift net, anaesthetize it, courtesy of the sick bay, mark the back of its two wings with different water colour domino dots for individual identification, release it on the next parole walk and, back at the camp, keep watch at the nest to observe if and how long it had taken flying back the two or three miles home.

There was plenty of snow every winter. One day during the winter at Rotenburg I saw a British officer skiing down a seven yard long slope just outside the wire, watched with obvious enjoyment by a couple of armed guards. The skier, loudly cheered by onlookers inside the wire, was Lieut John Cripps, nephew of Sir Stafford Cripps, our ambassador in Moscow. His skis had been sent from someone in England with strange ideas!

After the Normandy landings, we hoped we might be home by the end of 1944, but it was not to be. I was still teaching maths, the camp library supplied books on most subjects, but with increasing disruption of internal transport our mail almost ceased. The winter of 1944/45 was very cold, but much worse for those fighting. On 29 March 1945, on Hitler's order four hundred of us set out on the 160 mile march to Berlin. I left all my belongings behind in a box addressed to my Mother and travelled light.

On the evening of the 2 April we were encamped, with our guards, in the village of Windeberg and here I talked to German walking wounded who said they expected the Americans to be in Mühlhausen, six miles to the north, the next day. The next morning our column moved off eastwards. It was very cold and there was snow about. After an hour on our way Captain Maurice Johnson fell out of the line and asked me to help him adjust his pack, by holding the weight of his pack whilst he fiddled with the straps. Suddenly I saw that there was neither a guard nor an Alsatian near and the road ran right in the middle of a thick wood. I whispered to Johnson "there's a chance now and I'm going. Come on". I dropped his pack and ran for it, into the wood. He did not follow, he told me four months later at the SME at Ripon that a guard raised his rifle to shoot as I ran, but a German sergeant knocked the muzzle of his rifle down.

I watched the other four hundred marching on.

Everywhere was quiet and still. I walked back towards Windeberg keeping well off the road and getting quickly over clearances in the forest. And in due course I came to open ground with no hope of cover. I could see Mühlhausen to the north, being shelled or bombed.

My problem was how to get there. I could, of course, stay in the forest for the night and hope that the Americans would arrive next day. But this was not certain. Also I might freeze; or be picked up by retreating Germans.

I set off across the open country with my eye on a valley in the distance. The sun was shining and I was beginning to enjoy the walk when, to my astonishment, a shell exploded near me. And then another and another. I did not know at the time I had been spotted by American Sherman tanks.

I did not like this very much so I sheltered in a hollow. A few minutes later there were a couple of American fighter planes just overhead attacking retreating Germans now coming into sight. This continued for perhaps half an hour when, of all things, a yellow Caterpillar D4 tractor, towing a gun, turned off the road near by and trundled straight across the field to where I lay. The tractor stopped and a German soldier came at me with his rifle. This was the fourth time I had been captured; the first time at dawn on the 24 May 1940 near Arras, the second time trying to get across the Danube in the middle of the night at Offingen in June 1941 and the third time at daybreak in a hamlet on the River Kocher in September 1942.

As a friend said, to be captured once is careless, twice bloody careless but to be captured four times ...

I offered my captors an unopened tin of Rothman's, they offered me the choice of staying with them or taking a chance with the oncoming tanks. They each had rifles but without a word I set off westwards and was much relieved to get out of their sights.

But I was still behind that very thin front line and not yet free. There were many Germans about, we could not help admiring their steady, orderly method of retreat.

It was not long before a Sherman tank appeared, firing its machine gun; then another doing likewise. The third tank was not firing so I plucked up

courage and walked in front of it. The tank commander, was a bit nonplussed.

He wanted to send me back to his command HQ but I begged to be allowed to sit on the top of his tank as they moved in to take the next village, which was Windeberg. He agreed, asking me to get off five minutes later whilst they fired a few shots into the village. We moved into the burning village. Sitting on the tank I noticed a German officer's ceremonial sword tied onto the top, spoils of war. As soon as we halted a hand holding a bottle of red wine came up from the inside of the tank, and I had my first drink as a truly free man for five years.

They had me driven by road to Giessen. All the way we met American armour moving east, how I envied them fighting a winning war!

From Giessen they flew me (with twenty four wounded Americans) to Frankfurt. Most of the time was spent taking them drinks of water. One of them, wounded in the head, complained that all his life he had wanted a plane trip, "And now I can't even see out of the window".

From Frankfurt I was flown to Paris where the authorities kept me in a hotel for the night. Perhaps I was a Nazi on the run in disguise!

My uniform was in pretty bad state. I had not even a tie; and no money. But I had a good supply of Chesterfields given on the way. I gave a bell boy a packet of these cigarettes; like gold at the time in Paris, to find me a pair of scissors. And with them I cut two strips off the tail of my shirt to make the best tie in the circumstances.

In the morning I was questioned and cleared by MI5 and soon *en route* by air to Croydon, again vetted and cleared.

Well, there is nothing much more to say except one pleasant incident at Amersham where they sent me for the night and a clean-up. The first thing I did was to telegram my wife and my mother. The telegram, down the telephone, to my wife read, "Safely home see you tomorrow love Harold".

The operator at the other end did not quite get the word "love".

I said "Yes, love is the word. I haven't seen her for a long time." "How long?" she asked. "Five years." A silence, then "Where have you been serving?" "In German prison-of-war camps." Another silence. "Well how much money do I put in the box?"

A very long silence, then "Nothing, and I'd do a lot more than that for you."

Holes in the Skirting Board

MAJOR A D MACKLIN MA(H)

With an engineering degree as a University Cadet at Cambridge, Major Macklin gained four years practical civil engineering experience as a Troop Commander with 50 Field Squadron (Construction) and then Officer Commanding Independent Field Troop RE AMF(L). Since then Adjutant 23 Engineer Regiment, SO(2) PB7, Division 1 ASC and the RAF Staff Course have preceded a 'Black Bag' sentence in LSOR 10. The author very much looks forward to squadron command at the end of the year!

In days gone by, few would dispute that the solution to mice was to take on a pet. However, even this seldom claimed to offer an instant solution. As with so many things in life, a commitment to the task was essential and, after selecting your pet, further training would be required before you could expect to attack your target successfully.

But what do cats and rodents have to do with the *Journal* of the Royal Engineers? The answer is nothing. I am referring to the old days when the only military solution to Membership of the Institution of Civil Engineers (ICE) lay through Professional Engineer Training (PET). However, initiatives on two fronts last year have opened up new possibilities. The first of these came from the Engineer-in-Chief who is espousing wider membership of the Institution amongst Royal Engineers, particularly those who do not wish to follow the conventional path to membership through PET.

With this as an impetus, the hole has been opened in the skirting board by the Institution in its recent study of changes in the routes to Membership, the Chartered Professional Reviews (CPR). Although some of the Corps' Chartered Engineers and those aspiring to Chartered status may have been following the process of consultation, I suspect that few in the Corps at large will have appreciated just how sweeping these changes are. This was outlined at an Institution presentation given by Mike Stancombe, a former RE PQE and Deputy Commandant of the RSME, currently the chief training officer at the ICE. The point most firmly made was that the Institution is not lowering its standards, rather it is offering much greater flexibility in the formal milestones that have to be achieved on the route to the final and all important assessment.

In the old days of PE1 and PE2, the formal stringent technical criteria to be achieved before the award of PE1 effectively precluded any military officer not taking PET. Under the revised system, the first step should be an Experience Appraisal in which a candidate with an appropriate degree and four years of practical experience (this might reasonably be achieved in two tours in field squadrons with a variety of projects in their training cycles) would have to convince the assessors that he has met the Institution's core training objectives. There are other requirements which include a record of continuing education, assessment of competence against core objectives and a 2000 word report, but these should pose few problems to anyone with the communications qualities required to be an officer in the Corps.

The requirements for CPR are more stringent but in many ways the system seems to have tipped in favour of the Sapper officer. As an example, the 45 minutes interview starts with the candidate giving a 15 minute formal presentation.

Holes in the Skirting Board (p158)

I doubt that many applicants for Chartered status will have experienced anything remotely approaching the basic Sandhurst Methods of Instruction lessons let alone the vast experience earned during an officer's years of service! The requirement for written work, demonstrating command of the English language and the ability to argue your case on paper, still remains. On the qualities of English and logic, this should present few problems to anyone who has mastered military writing and CO's/Commandant's essays and will be very familiar to anyone who has sat or is now involved in the Progressive Qualification Scheme/Junior Officer Training and Education Scheme. In terms of civil engineering content, one essay is technical and the other addresses the wider responsibilities of a civil engineer to the environment and society but the examiners will be looking for the aspirant's abilities as a manager of a project, rather than for technical wizardry. The means of meeting the formal continuation (post degree) training have also been made more flexible. The required total can be aggregated from such things as the technical parts of the YO course, specific short training courses, the Army Staff Course MSc (formerly Div 1) and even attendance at ICE meetings. This increased flexibility should favour officers of the Corps.

However, do not be deceived that this change offers those not undertaking PET, letters on a plate: the hole in the skirting board is no chasm for us to stroll through at will. There remains a number of stiff challenges for non-PET aspirants to overcome. I believe that the primary ones are design experience and the necessary insight to civil engineering contracts and finance. These challenges will require determination and dedication, to say nothing of a little help from friends, if they are to be overcome. But that help is something the Corps can offer: it requires an

Above and top left: Design inexperience is likely to be the non-PET officer's weak link!

attitude of mind amongst our Chartered Engineers and a willingness from the Corps' hierarchy to offer tangible help.

The only group of people in the Corps who can offer the design, contractual and financial aspects that aspirants must assimilate are the Corps' Chartered Engineers. There will, I fear, be a few who will view with alarm the prospect of non-PET officers earning MICE. They will see it as a cheapening of the qualification that they worked so long and hard for, an undermining of the status they have attained. They need have few worries that their standing and status are about to be usurped; a qualification is only as good as the experience that backs it up and the non-PET officer will never challenge the PET officer's position as an experienced expert.

Rather than presenting a threat to the corporate body of the Corps' Chartered Engineers, wider Membership of the Institution might bring an easing of the divide between those officers known colloquially as 'PQEs', but more correctly as 'Chartered Engineers', and those in the 'Mainstream'. The unity of the Corps as a whole

Holes in the Skirting Board (p159)

Above and left: Challenging Projects I have known!

would benefit from a closer alignment of the different attitudes, an improvement in understanding of each other's work, and greater 'interchangeability' of employment within the Corps. For the latter, leadership is coming from the top with the current CE UKLF being both PET and a Chartered Engineer. The new D Engr Svcs is PET, but without yet holding Chartered Status, though I understand that both he and DEinC are applying for membership under the new rules. It is also worth noting that the EinC himself recently became a Fellow of the Institution. 'Where there is a will, there is a way' and here the Corps can provide that way.

The mechanism by which the required knowledge could be achieved is to allow aspirants to be attached to STREs during the design phase of a project, ideally one that the aspirant's unit will subsequently undertake. Not only would this help the aspirant but it might also help reduce the gulf between designer and constructor, usually manifest on site by the cry, 'These plans just don't represent practical reality!' (or similar less printable words). The more theoretical aspects of finance, contracts and health and safety could be covered by allowing aspirants to attend courses intended for graduates or potential students of PET or the relevant section of longer courses, such as PET itself. Even these subjects cannot be covered by theory alone but 'untying from PSA' offers a route to practical experience as, at unit level, we have to become more self reliant on those aspects of engineering and maintenance that used to be left in the much criticised hands of the PSA.

However, all this requires active commitment, not just lip service. Whether the hierarchy approves of the ideas and whether COs will relieve their officers to complete the necessary training remain to be seen. It also requires PB7 to post aspirants to units that are due to undertake appropriate projects, for without the hard experience there can be no hope of Membership. Whilst this will add to the burden of that hard pressed organisation, I know from personal experience that it can be done! Finally, but perhaps of primary importance, is the Institution

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Sappers tasks offer engineering challenges beyond the experience of aspirant chartered engineers in most civilian engineering companies. CPE can be expected to give credit for this?

of Civil Engineers prepared to grant Chartered Membership to individuals from our Corps who have not been through the rigours of the PET system and who perhaps do not aspire to the technical achievements of our ecclesiastical forefather, Gumdolf? The support of the Corps' Chartered Engineers, the RE hierarchy and senior members of the ICE is essential, for without it there can be little prospect of non-PET aspirants achieving the qualification MICE.

The correspondence columns of this *Journal* and the *New Civil Engineer* are now open! But those who consider themselves potential 'aspirants' should make their first call to Col Engr S, an enthusiastic supporter of the scheme, for advice on their particular circumstances.

Field Company Commander Responsibilities

Two short anecdotes written by
COLONEL S M HOLLWAY OBE MC TD DL

Correction

Please note that in the April edition of the RE *Journal* the surname of the author of the above named article is Hollway, not Holloway as printed. We apologise for this error.

Holes in the Skirting Board (p161)

The Liberation of Addis Ababa — Fifty Years On

BRIGADIER M W BIGGS CBE MA CEng MICE

Brigadier Michael Biggs, the son of a Sapper, was educated at Cheltenham College, the 'Shop' and Pembroke College, Cambridge. Commissioned in 1931, he saw active service in Palestine before being seconded to the King's African Rifles in 1936. With them he served in the Abyssinian campaign as a BM, GSOIII(I) and GSOI of a Division, and was CRE Mombasa Fortress, before going to India and Burma as GSOI and then CRE of 11 East African Division. After the War he served in Singapore, as a GSOI at the Staff College, as a CRE in BAOR and in Australia and as Col (GS) at the SME before being appointed Chief of Staff, East Africa Command in 1960. His last appointment was as Director of Quartering (Army) in the Ministry of Defence from 1963 to 1966. After retirement he was for 11 years Manager for the Commission for the New Towns of Welwyn Garden City and Hatfield.

In 1941 I was privileged to take part in the longest and fastest advance in the annals of military history, from the Tana River in Kenya through Italian Somaliland and southern Abyssinia to Addis Ababa, over 1700 miles in 72 days.

At the outbreak of war I had been Intelligence Officer, Northern Brigade, King's African Rifles (KAR), an appointment held by several Sapper officers before me, and then became GSO III (Intelligence) at East Africa Force HQ when it was formed in 1939. Both were in Nairobi, the city which grew up where Corporal Ellis RE leading a party of six Sappers surveying the route for the Uganda Railway, first pitched his tent in 1897. In these jobs I had been engaged in compiling the ORBAT of the formidable Italian forces in their East African Empire, which totalled over 300,000 battle-experienced troops, supported by tanks and artillery, and 325 aircraft. We had only two KAR brigades and the Kenya Regiment of territorials, with no supporting arms or aircraft. Had the Italians come into the war then, they might well have taken over Kenya: indeed we had evidence they had planned to do so and had even appointed an Italian resident to be their viceroy. When however in June 1940 they declared war their chance had passed; although they over-ran British Somaliland and captured some border posts in the Sudan and Kenya, including Moyale after a brave defence, our forces had expanded and were reinforced by Royal West African Frontier Force (RWAFF) brigades from Nigeria and the Gold Coast and the 1st Brigade of 1 (South African) Division, together with supporting arms and aircraft of the Southern Rhodesian and South African Air Forces (SAAF). Among the most important to the success of our future campaign were units of the South African Engineer Corps (SAEC), with such mechanical plant for road and airfield construction and maintenance as we in East Africa had never seen before, as well as geological survey and water boring units; also over 15,000 trucks, most of which came up by road from South Africa.

Lieutenant General Alan Cunningham had taken over East Africa Force in November 1940, coming under General Wavell, C-in-C Middle East, who was being nagged by Churchill not to reinforce Kenya, but to send South and West Africans to Egypt and "let the settlers defend Kenya". However Wavell decided he must attack Italian East Africa, at least to clear the Eritrean coast of the Red Sea, so that the latter would cease to be a "war zone" barred by act of the United States Congress to their merchant shipping bringing vital tanks and other war material to Egypt. His plans developed into a great pincer movement, in the north from the Sudan into Eritrea, and in the south from Kenya into Italian Somaliland and Abyssinia, supplemented by internal revolt in Abyssinia stirred up by Emperor Haile Selassie and "Gideon Force" led by Sandford and Wingate.

Cunningham planned to attack Italian Somaliland, and initially, within the logistic limitations of great

Brigadier M W Biggs CBE
The Liberation of Addis Ababa p162

distances and lack of water, to advance to the Juba and seize the port of Kismayu. Should this not be seized within ten days, our forces could not be maintained and would have to withdraw. Even at one gallon per man a day, to have moved water in jerricans from the Tana across Jubaland would have been a considerable undertaking, but Cunningham's decision was made easier by the South African Engineers divining, and then successfully drilling for and developing a fresh water supply at Hagadera, half-way from Garissa on the Tana to the Somaliland border at Liboi. These men, and their fellow Sappers of the road construction units of the SAEC worked often ahead of our main positions, covered from attack by banda*, or warned of air attack, by KAR patrols.

To regroup his forces for this plan, Cunningham concentrated 11 (African) and 12 (African) Divisions, each of two brigades, on the line of the River Tana on the right, put the rest of the newly arrived 1 (South African) Division on the left to make a limited advance into Southern Abyssinia, whilst the centre was "held" by a phantom 4 (Australian) Division, to keep the enemy guessing as to where our main attack would come.

By the end of 1940, I was Brigade Major of 22 East (African) Infantry Brigade, which comprised three battalions, 1/1 (Nyasaland), 5/1 (Kenya) and 1/6 (Tanganyika) King's African Rifles, with 22 (Indian) Mountain Battery and 1 (later 54) Field Company, East African Engineers. I had been personally involved in helping Major John Oates, a retired officer of Indian Sappers and Miners, to raise this last unit before war began. Some of the officers and men came from the goldfields where Oates himself worked, and most of the NCOs were found initially from the engineer section of the Coast Defence Unit, KAR, whom I had trained during my first tour. At my suggestion we had chosen for the East African Engineers the RE flash turned sideways (ie with the red and blue stripes horizontal) and as the badge the grenade common to Gunners and Sappers, but with "EAE" instead of "KAR" (or "UBIQUE"), which we had adopted in the Coast Defence Unit. The unit comprised three field sections and a water section with an establishment and GI098 based on those of a RWAFF field company, but had acquired two Craelius water-boring rigs in addition.

The Brigade Commander was Brigadier C C Fowkes, a fearless and formidable warrior with

*Lightly armed but mobile irregular levies.

South African engineers boring for vital water supplies at Hagadera

decorations and wounds from the First War, and a volcanic temper, which kept everyone on their toes. He was called "Fluffy" — a singularly inappropriate nickname from his distant subaltern days — but not to his face.

The Brigade had handed over to 1 SA Division at Marsabit, in the Northern Frontier District and moved to Garissa, with units strung out along the Tana. The Field Company was manning water points, and also assisted the SAEC to put a pontoon bridge across in place of the old ferry, when our advance was imminent.

On orders from the GOC 12 African Division, Major General Godwin-Austin, our Brigade advanced from the Tana on 23 January, immediately after I had arrived back from a quick trip back to Nairobi to see my wife and our newborn and overdue baby daughter. This led Fowkes in later years to say: "The whole attack on Italian East Africa was held up waiting for Katharine to have her baby. My BM wouldn't come to the war until he'd seen his baby, and I wasn't going without my BM!"

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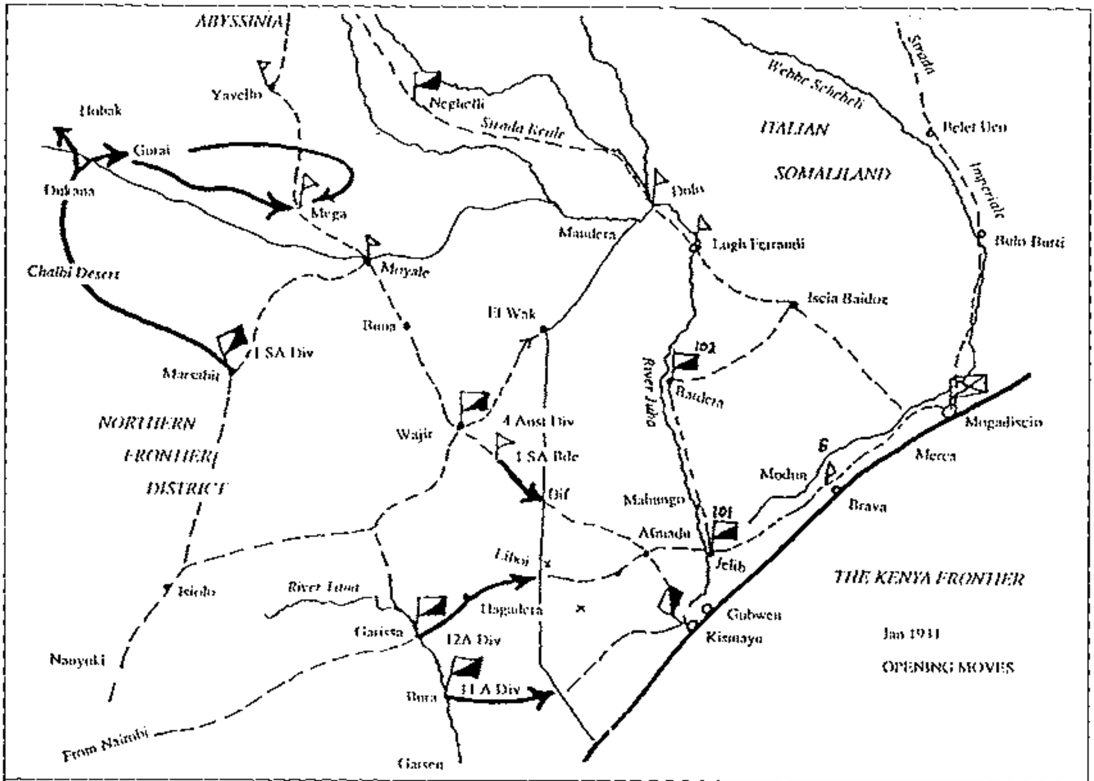
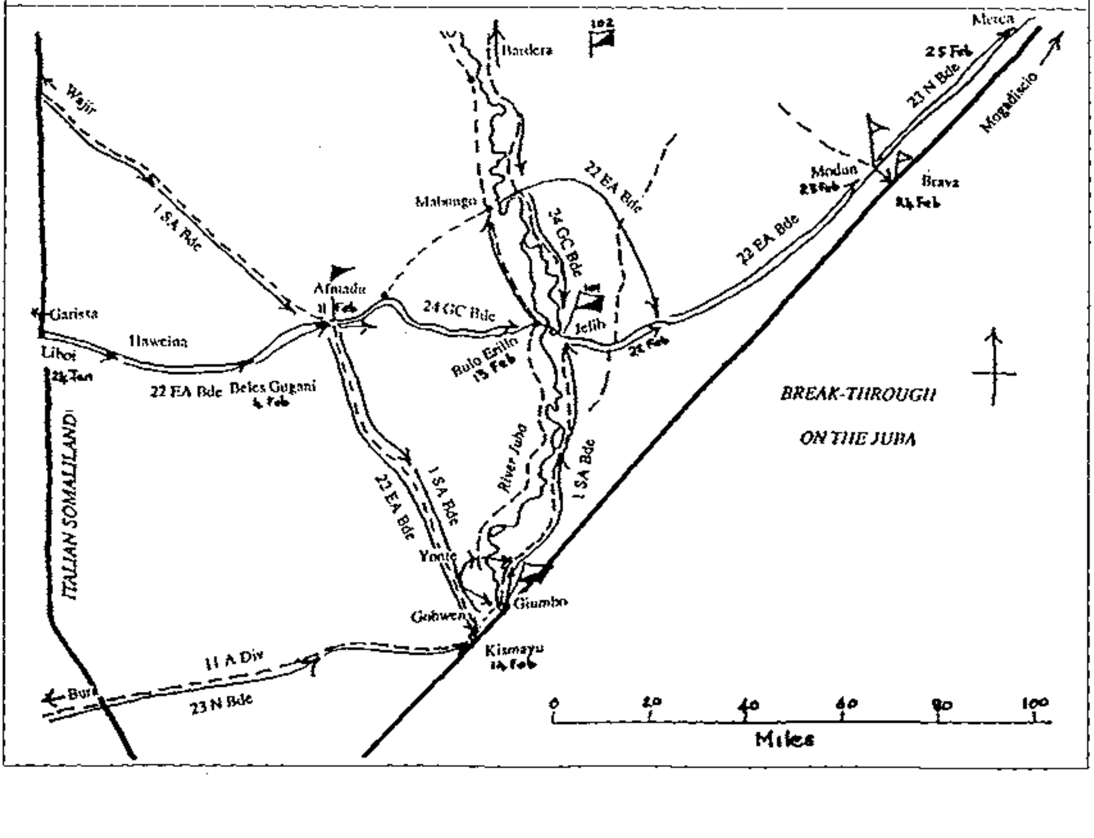

ABYSSINIA
Yavello
Hobok
Gorai
Dukana
Mega
Neghelli
Strada Reale
Webbe Schebeli
Strada
Belet Uen
Imperiale
ITALIAN
SOMALILAND
Dolo
Mandera
Lugh Ferrandi
Bulo Burti
Chalbi Desert
Moyale
Iscia Baidoa
Buna
El Wak
1 SA Div
Marsabit
102
Bardera
River Juba
Mogadiscio
NORTHERN
FRONTIER
DISTRICT
Wajir
4 Aust Div
1 SA Bde
Merca
Modun
Brava
Dif
Mabungo
101
Afmadu
Liboi
Jelib
THE KENYA FRONTIER
Isiolo
River Tana
Hagadera
Gobwen
Garissa
Kismayu
12A Div
Jan 1941
Nanyuki
OPENING MOVES
11 A Div
Bura
From Nairobi
Garsen


Bardera
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Garissa
24 GC Bde
Jelib
Liboi
Haweina
Bulo Erillo
22 EA Bde
Beles Gugani
BREAK-THROUGH
ON THE JUBA
ITALIAN SOMALILAND
River Juba
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Be that as it may, off we went with the additional support of a platoon of South African armoured cars, later to be replaced by one from the newly formed East African Armoured Car Regiment, which led the advance guard of two infantry companies with a Sapper detachment along the one and only track through the bush. An hour behind followed the striking force or main body, which included all the fighting arms in the order they would probably come into action, with the Brigadier and myself in the Main Brigade HQ well forward and the "O Group" of unit commanders immediately behind. The third or administrative column, comprising the second line transport, a water company and service units, with Rear Brigade HQ and sufficient infantry to protect them against attack by banda, followed some hours behind, but hopefully closed up into the defensive positions adopted when we all came to a halt before nightfall. All units were fully motorised, although in those days we had few four-wheeled drive vehicles, and the single dirt track along which we had to advance, although improved by the gallant South African engineers as we went, quickly cut up.

Our communications too were primitive compared to today, as our signal sets did not operate on the move, being carried in large clumsy trucks and needing aerials to be erected when we halted. This was the formation we adopted, with variations, throughout the advance, which worked well except perhaps as regards the tail catching up at the end of the day, and the communication problem on the move.

Intelligence had warned that we would probably meet resistance from the enemy's screen of banda, and sure enough on the second day a few miles short of the boundary the leading armoured car fell into a concealed pit, and came under close fire and a hail of "pillar-box bombs" — small red grenades which made a lot of noise but did little harm to the crews of the armoured cars. These banda, who had no Italians with them, stood their ground bravely and suffered casualties before being dislodged by the fire of the other armoured cars and leading infantry. Several similar engagements took place before we reached the boundary cut at Liboi, and on the succeeding days.

We camped for the night there, and slept fitfully. I was woken by a blood-curdling scream followed by a shot. Fearing we were being attacked, I rushed to the spot with drawn revolver, only to find that the commotion had been caused by a soldier woken by a snake crawling over his face, leaping up with a yell, whereupon a nearby sentry had taken a pot shot at him — but luckily missed.

From prisoners we learnt of concentrations of banda at Hawina and Beles Gugani, which were our next objectives. On 26 January 5 KAR attacked and overran the enemy at Hawina, and pushed on towards Beles Gugani, where a battalion of Italian Colonial Infantry, as well as a banda group, were located in defensive positions. These were attacked on 4 February by 1/1 KAR, supported by the guns of the mountain battery. The askaris, led by their British Officers, charged forward with bayonets fixed, and the enemy fled in disorder, leaving quantities of arms and ammunition. Although this was only a small action in which our casualties were minor, including two officers wounded, never again did Italian native troops stand against a bayonet charge by our askaris.

During this time we had been under occasional bombing attacks by the Regia Aeronautica. One day, when fortunately Brigade HQ was stationary, I received an "immediate emergency air attack" signal from the 1 South African Brigade HQ at Dif, to our north, that they were being bombed. I was able to 'phone this through on a temporary line to the advanced landing ground nearby, which had been cleared by the SAEC airfield construction unit, and where Captain Frost of the SAAF was sitting waiting by his Hurricane — one of three recently arrived in our theatre. Frost took off at once, got among the Italian aircraft bombing the South Africans and shot down all three Caproni bombers and their two escorting fighters. From the day of this remarkable exploit, and in consequence of other successes by the SAAF we were not troubled again in daylight by enemy bombers, although they came rumbling over at night from time to time, encouraging the energetic digging of slit trenches.

On 5 February, General Godwin-Austin issued orders to his brigade commanders for closing up to and crossing the Juba. Our Brigade was to capture the strategic road junction of Afmadu by midday on 11 February, no sooner or later: 24 (Gold Coast) Brigade was then to pass through to attack Bulo Erillo and Jelib, followed by 1 (South African) Brigade crossing behind them from the direction of Dif to capture Gobwen near the mouth of the Juba. Meanwhile 11 (African) Division on our right was to move up the coast to capture Kismayu.

By 7 February our Brigade had concentrated within two miles of Afmadu. Patrolling established the enemy positions, covering the strongly wired

perimeter, and artillery registration was carried out. Brigade HQ, well hidden under tall trees, fortunately escaped a fierce bush fire accidentally ignited on the other side of the track, which was still glowing that night and attracted the attention of Savoia bombers to bomb the area thinking it was our camp fires. On 10 February Brigadier Fowkes gave out his orders for a left flanking attack by two battalions at dawn next morning, with the third battalion demonstrating frontally. That afternoon SAAF Junkers 88s and Fairey Battles carried out heavy bombing raids, and our artillery augmented by the guns of the Divisional Artillery poured in 2000 rounds.

All this proved too much for the garrison, who slipped away during the night, so that when the flanking attack by 1/1 KAR and 1/6 KAR went in at first light they met no resistance — fortunately since some of the Bangalore torpedoes laid by the Sappers who led the approach march failed to breach the wire, and they would have suffered casualties from the machine-guns covering it.

The enemy however had not gone far, and the left company of 1/1 KAR, sweeping round East of the fortress bumped into their rearguard, and a fire fight took place in thick bush. This was observed by a SAAF reconnaissance pilot, who landed on the newly captured airstrip to tell us what was happening. Brigadier Fowkes, by then directing things from the roof of the enemy's old HQ, and furious at being unable to get through on the radio, despatched me to order a company of 1/6 KAR, by then on the far side of the airfield, to hasten to the support of 1/1 KAR. Unfortunately the latter had failed to keep contact and had withdrawn, with the result that the company of 1/6 KAR bumped unexpectedly into the enemy and received a bloody nose. In the aftermath of this debacle the Brigadier sacked two battalion commanders and two company commanders *pour encourager les autres.*

The airstrip was quickly restored by SAEC airfield Sappers, the first of whose officers to arrive checked it for mines by driving over it in his vehicle, after which SAAF aircraft started to use it.

As soon as we reported Afmadu had been captured and was clear of enemy, 24 (GC) Brigade and 1 (SA) Brigade poured through towards their respective objectives in accordance with 12 Division's plan. We remained at Afmadu in reserve. Towards the end of an exciting day the GSOI of the Division, a full colonel no less in those days, took me to task for having failed to send a company to protect Advanced Div HQ, which had arrived on the scene; this indeed has been my error in not having spotted this detail in another section of this voluminous written Operation Order. When I told Brigadier Fowkes that I had received this deserved rocket, he jumped in his car, drove to Advance Div HQ, tore a strip off the GSOI, and told the GOC that if anything went amiss in his Brigade it was his responsibility, and that he only would give rockets to his staff.

Early on 14 February Brigadier Fowkes was told by the GOC that 11 (African) Division's advance up the coast had been delayed by minefields, and that the enemy was believed to have evacuated Kismayu; if true, we were to occupy it. He went off with the IO telling me to get two battalions on the move and follow, which I did by 0800 hours. We drove down the Kismayu road, heavily churned up by the South Africans to the point where they had branched off towards Gobwen, after which there were few tracks on the road. Eventually we caught up the Brigadier, who had borrowed some armoured cars and an 18-pounder battery from Brigadier Pienaar, commanding the South African Brigade, in case we ran into trouble. Together we went on, until we drove down a long slope towards the frowning defences of the port, passing aiming marks for their artillery and hoping the enemy really had gone. At the crossroads, just short of them, to my amazement we came across my brother-in-law, Captain Tony Coombe, RE, then on the CRE's staff, who was checking for mines, and had found that the Italians had themselves recently removed mines from the middle of the road, presumably to use it themselves, and had left them on the verge. Together we dragged aside the wire barricades across the entrance through the defences, and drove on into town, which had been somewhat looted by the local Somalis after the Italians left. The port had a number of ships in it, and its capture, together with quantities of petrol, was vital to the maintenance of our force.

That evening Generals Cunningham and Godwin-Austin visited us and spent the night. Brigadier Fowkes complained that the radio reporting of our campaign always gave the credit to the South Africans alone. "Nonsense" said Cunningham, whereupon we listened to the next news broadcast which claimed that "today South African troops captured Kismayu".

Cunningham held a brief conference later, at which he urged more and faster movement forward, saying to the Divisional Commander "Your men

must stop fluttering about like a lot of old hens and get across that river".

The next morning Brigadier Fowkes ordered me to take a platoon of 5 KAR to confirm that the battery on the island of Miango Ya Papa, covering the entrance to the port, had also been evacuated. This we did in a commandeered dhow, en route boarding an abandoned cargo ship, but omitting to claim it as a prize. Our "assault landing" in the dhow's dinghy was fortunately unopposed, as it compared unfavourably with "Overlord".

Our refreshing stay by the sea was all too short, and we returned to reserve at Almada where we were bombed again by night, one stick ending in the RAP of the next unit close beside the slit trench in which the Brigadier and I were sheltering. The other two Brigades set about the battle of the Juba. 1 (SA) Brigade attempted to seize a crossing at Gobwen, but found the bridge destroyed and were pinned down by fierce artillery fire from the East bank. Brigadier Pienaar made an air reconnaissance up stream and chose a new crossing place at Yonte, where his men got across and made a bridgehead. An Italian counter-attack was annihilated by fire from the near bank. South African engineers then put across a pontoon bridge, brought up all the way from Nairobi on 60 lorries, and the South African Brigade passed across to turn right and capture Giumbo and left towards Jelib.

Meanwhile the Gold Coast Brigade had attacked a strong enemy defensive position at Bulo Erillo with great determination. The Italians resisted strongly, and their armoured cars counter-attacked down lanes previously cut through the bush. The Gold Coasters sustained heavy casualties, in one battalion all the British officers being killed or wounded, but attained their objectives. Towards the end of the day, the battlefield caught fire, burning some of the wounded lying there. Subsequently the Gold Coast Brigade reconnoitred and found a possible crossing place over a shallow part of the Juba at Mabungo, some 25 miles North of Jelib, where their engineers made an "Irish bridge" mainly of sandbags, into a bridgehead on the far bank.

Pontoon bridge over the Juba (later swept away by a flash flood)

On 17 February Brigadier Fowkes received orders to form a mobile column, with the welcome addition of a platoon of South African armoured cars, to be named "Fowcol", which was to cross the Juba at Mabungo and strike through the bush to cut the main Mogadiscio road East of Jelib, thereby completing its encirclement when the Gold Coast and South African Brigades attacked it from the North West and South.

Accordingly on 20 February we splashed across the Irish bridge, crossed the Jelib-Bardera road and plunged into the bush, which turned out to be much denser than forecast, and composed mainly of "wait-a-bit" thorn. For two days we struggled through this nightmare virgin bush, with relays of askaris slashing a passage with their pangas. We tried using the armoured cars as bulldozers until their engines boiled. The few camel tracks invariably led in the wrong direction. Some skirmishes with banda saw them driven off. At last, about midday on the third day, driven almost frantic by the sounds of battle around Jelib which made us fear we might be too late, we found a track leading in the right direction. Led by the armoured cars and the Brigadier standing up in his car urging them on, we

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Italian road demolition on the Mandi Pass repaired by our engineers

put on a sprint, brushed aside the resistance of a startled Italian post, overran a field hospital, and broke through on to the Mogadiscio road, just in time to intercept an enemy convoy which included a battery of artillery and a large number of Italian officers who appeared to have deserted their troops. Resistance was impossible and they were quickly put in the bag.

Contact was then made with the Transvaal Scottish, who confirmed that Jelib had been captured by the South Africans and Gold Coast brigades after stiff fighting. Petrol being short, a toss of the coin won by Brigadier Fowkes gave us such as was available for our armoured fighting vehicles to pursue the enemy eastward, which they did until nightfall.

I was sent to report to Advanced Divisional HQ that we had succeeded in our task, were exhausted but would be ready again after a day's rest. General Cunningham was there, and I was given a sharp message to my Brigadier to get cracking next morning at dawn. At 0600 hours a mobile force of light tanks, armoured cars and two companies of 1/1 KAR under Major Macnab, tore off Eastward to regain contact with the retreating Italians, which they did, coming under artillery fire from the area of the Modun crossroads. Helped by shell-fire from Royal Naval ships off shore, enemy resistance was quickly overcome, and they fled leaving guns and equipment behind them. Petrol having run out, we had to let 23 (Nigerian) Brigade through to push on and capture Mogadiscio, whilst we occupied the small seaside towns of Brava and Merca.

At Merca I was able to see at first-hand some of the logistic arrangements and improvisations made by the two ex-Sapper brigadiers, Brian Robertson[1] and Alan Duff who were Cunningham's joint DQMGs, which kept our advance going. I met Robertson on the beach, watching the landing of stores, petrol and ammunition from freighters off-shore, with the aid of some 200 British and allied seamen from sunken ships whom we had released from captivity. We in turn had to cope with thousands of Italian and native prisoners of war from their 102 Division, which had been virtually destroyed and cut off by the speed of our advance, as well as pacify the surrounding area and ensure the safety of Italian civilians and families.

Cunningham then reorganised his forces, transferring 2 EA and 1 SA Brigades to 11 (African) Division under Major General Wetherall, whilst 12 Division moved northwards up the Juba via the Strada Reale towards southern Abyssinia. The Nigerian Brigade found that the Italians had abandoned Mogadiscio and those who had transport fled northwards up the Strada Imperiale, leaving behind thousands more POWs, over 300,000 gallons of petrol and Avgas, and masses of stores undestroyed. The port was soon cleared of mines and taken into use.

Cunningham then obtained Wavell's approval to advance into Abyssinia, whereupon the Nigerians, followed by the South Africans, and later by our Brigade, set off in pursuit up the Strada Imperiale. This was a fine tarmac highway as far as the border, littered with abandoned Italian vehicles, which in the heat played havoc with tyres; amongst others we passed Tony Coombe[2] stuck by the roadside with punctures in his vehicle. After the border, the road degenerated into an ever-widening sand track as the hundreds of our vehicles pounded over it. There being no feasible defensive lines in the wide expanses of the Ogaden desert, the Italians had withdrawn to the escarpment of the highlands west of Jigjiga, 450 miles away, where they occupied a strong position astride the Marda Pass.

[1]later General Lord Robertson of Oakridge

[2]Major A F Coombe, by then OC of 54 Field Company was killed later in 1941, and was awarded the MBE posthumously

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After seven days monotonous driving though the dust and heat we caught up with the action, and were in time to see through our binoculars from the low hills East of Jigjiga, the Nigerian Brigade, supported by South African artillery, putting in a gallant and determined attack on the Marda Pass position, despite the attention of enemy CR42s strafing them. They gained the heights and at the end of the day white flags fluttering along the crests showed the Italians had surrendered or withdrawn: a surprising number of those who gave themselves up wore Red Cross armbands. Further actions ensued at the Babile Pass and Bisidimo River, leading to the South Africans capturing Harar, second city of Abyssinia. The South African Brigade then fought their way down the Hubeta Pass overcoming enemy resistance in several positions covering extensive demolitions on the torturous mountain road heading down into Diredawa, which with its important airfield they captured. SA engineers, with our 54 EA Field Company, set about restoring the road, and had it open by the night of 31 March, when the Brigadier sent me forward down it to report to Advanced Divisional HQ which had flown into Diredawa, that our Brigade having passed through the Nigerians, was concentrated at the head of the Pass ready and waiting to go.

I took back orders for us to advance down the Pass, and thence up the road towards Addis Ababa along which the South Africans' Brigade had started. The advance took place next day. Fortunately for us the South Africans had run short of petrol, and when General Wetherall visited us and told us to hand over our second line reserves to them Fowkes was able to assure him that we had none, but that our first line transport was full — having cleverly sent out an order to effect that a little earlier.

Accordingly we moved forward, passed through the halted South Africans on 2 April around Miesso, and took up the pursuit. Brigadier Fowkes had been determined since we left Merca not to be left behind, and had even organised by our own S&T the dumping of petrol supplies for our own use along the Strada Imperiale, to keep us mobile and our 1st and 2nd line transport constantly replenished.

At Arba we caught up the enemy's rearguard, and 1/6 KAR, with EA Armoured Cars in the lead, had a short brisk engagement, when some accurate shelling by our 22 Mountain Battery discouraged their medium tanks from a counter attack.

As we approached the Awash Gorge on the evening of 2 April, a big explosion and a column of smoke showed us that, as anticipated, the enemy had blown up the bridges across it. The gorge of the Awash River across the main road to Addis is some 200ft deep with almost sheer sides, and we expected the Italians to make a major stand here to stop our advance on the capital. Indeed it was defended by some 6000 Italian and colonial troops, with 70 guns and some tanks. Both the road and railway bridges had been demolished.

Awash railway bridge, demolished by the Italians

5 KAR, in the lead, sent forward probing patrols on the morning of 3 April, over the gorge wherever they could get across. These patrols, supported by fire from our mountain guns on the enemy artillery, were so successful that the CO, Major Hurt, reinforced their success and after some sharp encounters the battle of the Awash was won almost as soon as it had begun. Two MCs and two MMs were won in this brilliant action.

Despite some harassing fire from enemy artillery onto the site, South and East African engineers began at once to replace the destroyed road bridge, of which the enemy had failed to blow the

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abutments. 54 EA Field Company made and erected a timber trestle to shorten the gap, across which a box girder bridge was launched by their South African comrades. Meanwhile half-a-dozen East African armoured cars had been man-handled across the old "Habash crossing", about one mile south, and dragged up the steep track on the far side by dozens of askaris, to reinforce 5 KAR's bridgehead.

Road bridge over the Awash gorge, demolished by the Italians, replaced by South and East African engineers

The bridge was finished by midnight and at 0200 hours on 5 April the Brigade started crossing, to recommence our advance upon Addis. Brushing aside minor resistance and ignoring hundreds of would-be prisoners, we drove steadily towards the capital, dropping off companies at Adama and Moggio to secure our left flank from attack by the enemy's main forces, which had retreated southwards towards the lakes.

Brigadier Fowkes was absolutely determined to get to Addis first and was not to be stopped. He turned a Nelsonian eye to a signal ordering him to stop, rejecting it as corrupt, and gave instructions not to let anyone up the length of the column to forestall possible despatch riders. However General Wetherall managed to defeat him, by dropping a message from a Hartebeest aircraft almost on the leading vehicle, ordering Fowkes to stop at Acaci, ten miles from the capital. Here we were met by a posse of Italian motor-cyclist police and an emissary under a white flag with a message from General Mambrini, Chief of Police, begging us to enter Addis, which had been declared an open town, that night to protect the civilian population. Unbeknownst to us, the Italians had been negotiating the surrender of the city to save their many civilians and families from anticipated reprisals from the Abyssinians, whilst their forces had moved out to continue the fight in the North and West.

The following morning, 6 April, Major General Wetherall, accompanied by the commanders of

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the South African and Nigerian Brigades, Brigadiers Pienaar and Smallwood, arrived at Acaci and picking up Brigadier Fowkes prepared to drive into Addis, led by armoured cars of 1 East African Armoured Car Regiment. At that juncture a cry arose "Has anyone a Union Jack" By good chance, my wife working in Nairobi had sent forward my great-coat on hearing that we were leaving the heat of Somaliland for the cold mountains of Abyssinia, and in the pocket she had put a Union Jack, which had belonged to my father* and had flown over our house when as CRE and OC Troops Bermuda he became Acting Governor each year when the Governor went on leave, with a note "Hang it over somewhere for me". This I produced, it was hung on a stick and put in the turret of the leading armoured car, to fly over the ensuing surrender ceremony.

My flag, flying on an East African armoured car, at the surrender ceremony in Addis Ababa

I followed at the head of the brigade column, through crowds of ululating Abyssinians, into the city, and on the Brigadier's orders took a company of 5 KAR to seize the airfield. There we found over 30 destroyed aircraft and some 1200 Italian airmen, under command of a general, drawn up on parade. He was most reluctant to surrender to a scruffy major, supported by two or three other British officers and a handful of African askaris, but I persuaded him he had no alternative and proceeded to disarm his men. I declined his invitation to join him and his officers at lunch in their mess, but left them on the parade ground whilst my officers and I ate their lunch. This was, on reflection, somewhat churlish, but I had no idea what to do with all these prisoners; eventually I told them to get lost and report back tomorrow.

That night, after suppressing some minor looting, we received orders to leave the city before dawn, and be out of sight before the South Africans made a ceremonial entry the next morning. We did not then appreciate that political considerations made it imperative that General Smuts could demonstrate to his people in the Union military victories by their troops, who were serving out of the country and North of the Equator, against the wishes of a substantial minority. At the time we were peeved at being robbed of the credit for winning the race for Addis, although on reflection we had to admit that the contribution of our South African comrades, especially their air force, their engineers and their transport, had helped enormously to make it all possible.

As we drove out again, laden with Asti Spumante and Chianti from the Regia Aeronautica's cellars, we passed the Transvaal Scottish coming in "to liberate Addis Abeda" in front of the newsreel cameras.

*It was not, as the official story and several books have said "a Union Jack, home made by Katharine Biggs, daughter of Kenya's Attorney-General Mr Walter Harragin".

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The Engineer & Transport Staff Corps RE(V)

Background

The Engineer and Railway Staff Corps was founded in 1865, when there were many private railway companies, with the principal objective of ensuring "the combined action among all the railways when the country is in danger". One of the main duties was "the preparation, during peace, of schemes for drawing troops from given distant parts and for concentrating them within given areas in the shortest possible time".

Twenty one officers, including railway company managers and civil engineers engaged on railway works, were commissioned into the Corps at that time. In 1908 the numbers rose to 110, but subsequent changes to the rules reduced the establishment to 60 officers. The Corps was a volunteer unit, the members retaining their civil occupations. In the beginning they wore a uniform which was very similar to that of the Royal Engineers but the practice declined during the early part of this Century and was stopped altogether when the Corps was reconstituted in 1943. In 1927 the Royal Engineers invited the then Engineer & Railway Staff Corps to wear the Regimental tie.

Organisation and Name

Following a reorganisation in 1943, the Engineer and Railway Staff Corps recruited almost entirely from managers and civil engineers from British Railways and civil engineers who were specialists in road, railway and port design and construction. The rules of the Corps were changed in 1970 to enable new members to be recruited from Engineering Institutions other than that of the Civil Engineers. In 1972 the Royal Engineers requested that the base of expertise be widened to include, where possible, engineers and other experts in the fields of airport design and construction, electrical and mechanical services, petrol and oil engineering, geology and soil mechanics, water and sewerage. More recently, to meet the needs of the Royal Corps of Transport, the Corps has appointed experts in air, road, rail and sea transportation. It was partly to acknowledge this change of emphasis and partly to recognise the wider scope of the Corps activity that the name was changed in 1984 to the Engineer and Transport Staff Corps (E&TSC). The Corps currently appoints and retains officers in 12 general disciplines:

- Roads and Bridges
- Ports and Harbours
- Airports
- Water and Sewerage
- Railways
- Railway, Mechanical & Electrical Engineering
- Geotechnical Engineering
- Electrical Generation and Distribution
- Petrol and Oil Engineering
- Electrical and Mechanical Services
- Structural Engineering
- Transportation

A much wider range of expertise is available through the members and their firms including all the ancillary services that are associated with these main fields of activity.

Membership and Establishment of the Corps

The Corps is now constituted under the Auxiliary Forces Act 1953, and is administered by the Ministry of Defence (Army). The function of the Corps is to provide a body of professional engineers and transportation experts to advise the Ministry of Defence on such related matters as may be put before it. Members of the Corps perform no military duties, receive no pay or outfit grant and, except on specially authorised occasions do not dress in military uniform or carry military identification cards. The only cost to the Army is the annual Capitation Grant of £20 for each of its 60 officers.

The rules of the Corps state that it shall consist of officers who are either Chartered Engineers with particular experience in an aspect of engineering on which the Corps may be asked to advise, or are directors or other senior employees of contracting or industrial firms or undertakings. Membership is therefore made up of partners of consulting engineering firms and directors of private contracting and industrial firms, nationalised industries and statutory undertakings. The seniority of the membership is deliberate, in order to give authority and weight to the advice provided; the Presidents of leading Engineering Institutions are often among the members.

Appointment to the Corps is by invitation only, new officers being nominated by existing officers to maintain the base of expertise required by the Ministry of Defence. Appointments take into account not only the prospective officer's own expertise, but the expertise of the firm to which access would be provided by the officer's membership of the Corps. The establishment is ten Colonels, 20 Lieutenant Colonels and 30 Majors; promotion is generally by seniority in the Corps, but recognises the officer's status in his own business and the extent of his involvement in Corps activities.

The rules of the Corps require that any officer who ceases to be actively engaged in his practice must resign his appointment unless he is specially recommended by the Officer Commanding to retain his appointment or be retained supernumerary to establishment, subject to the approval of the Army Board of the Defence Council. The rules also require that any officer who reaches the age of 65 also resigns. However, he has the option of being retained as supernumerary to establishment.

The Corps is administered by a Council, composed of the Colonels and Lieutenant Colonels of the Corps; it is chaired by the Officer Commanding, a Colonel, who is appointed from within the membership of the Corps for a period not exceeding five years. All appointments and promotions are considered and approved by the Council of Colonels before being passed to the Engineer in Chief for endorsement and confirmation by the Military Secretary. The Administrative Officer of the Corps who acts as Secretary, Treasurer and main point of contact with the Ministry of Defence is the Acting Adjutant. (He is called Acting because Adjutants in the Army are usually Captains or Majors, whereas the Adjutant of the E&TSC is usually a Lieutenant Colonel or Colonel.)

Utilising the Corps

Lists of Officers within their disciplines, giving their addresses and telephone numbers are circulated to the main points of contact in the Ministry of Defence, Royal Engineers and Royal Corps of Transport; officers are advised through similar lists prepared by the MOD of the names of serving officers who may contact them for advice. In order to monitor the advice being sought and obtained, the preferred course of action is for the initial request to be channelled through the Acting Adjutant; once the appropriate source of advice has been established, communication can be direct.

In order to get more officers involved in the affairs of the Corps, in 1983 it was decided to set up two Liaison Groups: an Engineering Liaison Group to work with the Royal Engineers and the Transportation Liaison Group to work with the Royal Corps of Transport. Each Liaison Group meets twice each year and has a membership of four.

The Corps is a Royal Engineer unit and to maintain and develop the relationship, officers of the Corps are regularly invited to RE functions, including meetings and equipment demonstrations.

Recent Advice Provided by the E&TSC

The wide range of expertise provided by member officers and their organisation is best demonzstrated by illustrating the breadth of advice given during the past few years.

- Protective walls to army posts constructed and taken down by unskilled labour.
- Rapid repairs to scabs and craters after air attack on airfields.
- Training of officers in advance aspects of plant management.
- Checking the draft Corps manuals on earth moving and construction plant, concrete design, soils and port construction and repair.
- Providing critics for end of course papers by students at RSME.
- Types of wood suitable for use on structures in Saudi Arabia.
- Plant needed for constructing field defences and tank ditches.
- The rapid assessment of strength of damaged bridges.
- Assistance in finding firms who can accept officers for training on site or in design.
- Assessment of the load classification of an existing airfield.
- Concrete cutting equipment for use after earthquake damage.
- Study of the vulnerability of lines of communication.

Falklands

- Logistics involved in developing the existing airfield.
- Quarrying.
- Berthing of "Coastel" units (floating accommodation units).

Gulf

- Geology.
- Infrastructure including water supply, ports, fuel, distribution and design of fire fighting equipment for crossing oil filled trenches.

Summary

Looking ahead, amongst its other activities the Corps is providing help on how the Royal Engineers might be brought more effectively into plans for disaster relief, including suggested improvements to peacetime training and the establishment of a Disaster Relief Force.

The E&TSC is a vital part of the RE overall capability. It is constituted to assist all three Armed Services but primarily on engineering and transportation matters. If there are problems on which Corps advice can help to produce a solution or a better answer, the initial contact is through Engineer 5 in EinC(A) in Northumberland House.

The Gulf Crisis 1941-1942

COLONEL W G A LAWRIE MA MICE FIL

After the RMA Woolwich the author was commissioned into the Corps in 1934. Following Chatham and Cambridge he was posted to India and spent the next fifteen years with the Bengal Sappers and Miners, including Waziristan Operations, the Middle East, the Staff College and Military Adviser to the Indian States Forces. He commanded 4 Training Regiment in Aldershot and was later Defence Attaché in Jordan and Ghana before retiring in 1966.

THE article on Operation *Vantage* in the RE *Journal* of December 1980 reminded me of a sudden demand for air-conditioning plant for Kuwait which arrived at the Engineer Stores Establishment on the Friday before the August Bank Holiday of 1961 (as usual). Actually there have been no less than eight crises in that region in my lifetime and I have been involved in three of them.

In July 1958 when I was Military Attaché in Amman we had just been celebrating the forthcoming union of Jordan and Iraq under the two ex-Harrovian cousins, Hussein of Jordan and Feisal of Iraq, when this was forestalled by another Iraqi monster, Brigadier Qassem, who assassinated the entire Iraqi Royal family in Baghdad and was only stopped from repeating this crime in Amman by the prompt arrival of the Parachute Brigade from Cyprus.

In the 1941 crisis there was considerable RE involvement. Hitler hoped to link up with Rashid Ali's pro-German faction in Baghdad by marching across Turkey. This would have given him access to Iraqi oil and would also enable him to get round behind our bases in the Middle East. However Turkey refused to oblige, so Hitler was forced to invade Greece and Yugoslavia on 6 April 1941, intending to reach Iraq via Crete and Vichy-controlled Syria. He was only prevented from this by the heroic rearguard actions fought by British and Dominion troops in Greece and Crete. When Rashid Ali seized power in Iraq there were no German troops in the country.

Nor were there any British troops on the ground either. We were occupying the airfield at Habbaniya 40 miles west of Baghdad as a Flying Training School under the terms of the Anglo-Iraq Treaty of 1930. On the airfield there were some Assyrian Levies plus some RAF instructors and trainees and a number of non-operational aircraft. By chance Lieutenant Colonel Ouvry Roberts RE (later General Sir Ouvry Roberts) was on a visit to Habbaniya from AHQ India and Lieutenant Colonel John Glubb RE (later Lieutenant General Sir John Glubb) was commanding the Arab Legion in Jordan. Between them they organised *Habforce* while reinforcements arrived from India and the Middle East.

The Iraqi army had surrounded Habbaniya with two divisions of infantry and were shelling the camp from high ground nearby. However on 6 May *Habforce* broke out, and drove them off most gallantly. I remember Ouvry Roberts telling me later that the Iraqi commanders were indignant when he revealed the very limited strength of *Habforce*. They thought there should have been a replay. Rashid Ali capitulated on 1 June and the Regency was restored.

By this time German troops had reached Syria and the Luftwaffe were occupying Mosul airfield and demonstrating over Baghdad. The 8th Indian

Colonal W G A Lawrie
The Gulf Crisis 1941 - 1942

Division was hurriedly mobilised and landed in Iraq in the nick of time. The CRE was Lieutenant Colonel Clive MacLachlan and he had under him Nos 7 and 66 Field Companies and 47 Field Park Company all of the Bengal Sappers and Miners.

In Roorkee I was ordered to raise 69 Field Company to complete the divisional engineers. On 1 July five newly commissioned British officers who did not know a word of Urdu were posted in plus about 300 recruits from the Training Battalion and a few old soldiers with a very wise and experienced Subedar.

I did not like the condition of the barracks I was offered, so we put up a tented camp under some trees beside the Canal. This was a great success as the unit learnt to live, cook, wash, etc under canvas and we all got to know each other quickly.

Our clothing, weapons, equipment, tools and vehicles arrived with great efficiency from Ordnance depots all over India and we had to check them and repack them tactically. I had two first class RE NCOs who saw to all this. Our destination and departure date were TOP SECRET, but I went to Simla for the weekend and found out from a friend in Movement Control that we would be sailing for Basra on 16 September. This enabled me to make a proper plan and give everyone ten days leave in rotation.

At Bombay embarkation went like clockwork. We were sailing on the *Khedive Ismail* with four or five other units and each arrived in turn by special train at the docks. Our vehicles were in another ship and the stores in a third. The *Khedive Ismail* had recently been chartered by the Shah of Persia for his honeymoon cruise and as OC Ship I travelled in style in his pale blue suite. We sailed in an unescorted convoy, zigzagging and totally blacked out, passing the wrecks of several ships which had been sunk in the Persian Gulf by a German raider.

When we reached Basra the port officials seemed surprised to see us, but immediately asked me to build them a cage for several hundred German "tourists" who had been rounded up. No one knew where the division was, so we drew some rations, loaded up and pushed off north across a featureless desert. It took about a week to get to Mosul, where the division was encamped, with stops to draw rations and water at Baghdad and Kirkuk, where we found a complete Field Company of Rhodesian mining engineers getting ready to destroy the oil installations should the Germans decide to march across Turkey. Long ago the Prophet Daniel had been Governor of Kirkuk and I visited his tomb alongside Shadrach, Mesech and Abed-Nego. We carried on to Mosul across the wide prairies of Northern Iraq which had once formed part of the "Fertile Crescent", past Erbil, which had seen three of the most decisive battles in world history.

General Wavell had just been over and approved an extensive defensive position for two Infantry divisions and an Armoured division covering the bridgehead over the Tigris at Mosul. There were to be 140 miles of anti-tank ditches to be dug by 100,000 labourers with a few machines, and at every jink in the ditch a concrete pill-box housing an anti-tank gun or a 25 pounder. 2000 of these were to be built with sapper labour assisted by the Pioneer Corps. It was a formidable task in which we were encouraged by the drive and enthusiasm of the Chief Engineer, Laurence Grand.

We had various difficulties to contend with. One was a sudden cold spell. We were still in our Indian Khaki drill and temperatures down to -19 degrees C causing many deaths among troops from South India. We had no anti-freeze and lost 4000 vehicles in one night with cracked cylinder blocks, so I kept all mine running 24 hours a day for a fortnight. When we were running short of cement a train load was ordered up from the base. I took vehicles and a loading party to meet the train and watched it steaming in with a long line of sealed trucks — but they were all empty! On the other hand it was easy to buy common RE stores such as stop-cocks or angle iron pickets across the counter of any hardware shop in Mosul bazaar. These had obviously been left behind after World War One.

It was amusing to watch a team of experts at measuring trapeziums who appeared once a week from the MES to calculate the volumes of sand, gravel or conglomerate that had been excavated. Gravel was paid at twice the rate for sand and conglomerate eight times. For the latter we relied on gangs of professional qarez diggers from Iran. Every Friday a truck arrived laden with parcels of Dinar notes, wet and sticky from the Mint in Bombay, but perfectly acceptable to the workforce. I was offered cash, jewellery and even girls by wily headmen who wanted me to certify so many cubic yards of sand as conglomerate.

When I was ordered to build a concrete pill-box in the Great Wall of Nineveh (about eight miles round) I kept the labourers waiting while I consulted Layard's book in which he describes finding in 1845 enormous winged bulls guarding the ancient gates (now in the British Museum). I tried to guess where I might come on more of them, but

had no luck. They have since been unearthed by more expert archaeologists.

Somehow by the end of the year the job was more or less complete. The rest of the division left Mosul and went off to train for the invasion of Europe. I was appointed Camouflage Officer, North Iraq and told to conceal 2000 pill-boxes. This was an unexpected task since during the construction period we had been encouraged to make as much mess as possible. Every Saturday morning we watched a Messerschmidt carefully photographing our progress and imagined that the powers that be hoped this would discourage a German invasion. Perhaps it did — although there was no sign of any troops to occupy the positions, which we all thought were pretty useless. If the Germans did come they would surely by-pass Mosul and drive straight across the desert.

Anyway I did my best by building 4000 dummy pill-boxes of timber and matting covered with cement wash. Somehow the Iraqi army was now on our side and I was next asked to assist five of their field companies who were preparing a demolition belt right across the north of the country. I had not imagined that there would be much to demolish in a desert, but in fact there were some huge steel girder road and railway bridges. We were told that no piece of girder longer than 6ft was to be left intact, so this meant welding on thousands of boxes to take slabs of guncotton. The abutments had been built with demolition chambers. There was also a spectacular road which had been designed by a New Zealand engineer as part of a trunk route from Teheran to Aleppo. Much of it was excavated from the solid rock sides of a deep ravine and the only way to destroy it was to prepare huge demolition chambers deep in the rock.

This was all in the beautiful mountains of Kurdistan, rather like Switzerland, where Iraq meets Turkey and Iran. I was invited to stay with the Sheikh of Ruwanduz, a dignified old gentleman with a long white beard, who was known as the Shakespeare of Kurdistan. After an excellent dinner I was shown into a deeply carpeted room containing only a pile of blankets and a brass wash basin. Next morning I did not know what to do, being afraid of wandering into the women's quarters, but a large Kurd appeared and beckoned me to follow him. He led me out into the fields and stood by until he could use the shovel he was carrying.

The Sheikh took me out riding surrounded by a strong bodyguard (he said he had many enemies). We rode over the hills along an old track which he remembered being used by the Russian army in 1917 when they were coming to help the British in Mesopotamia. This completely by-passed the road we were preparing for demolition. He said we were wasting our time as the Germans would certainly know of this cross-country route. Before the Russians could play any part in 1917, the Revolution broke out at home, so they turned round and went back again.

We were still worried about the Germans and I had three gallant officers Attaché d to my Mess while they learnt Kurdish, which is a language somewhere between Persian and Pushtu. After the Germans had taken Iraq they were to stay behind with wireless sets to organise the Kurdish resistance.

It was now Spring 1942 and our warm battle dress had just arrived. I remember taking a huge pile of papers to the Chief Engineer, G C Clark, with detailed plans of all the demolitions we had prepared. I hoped he would tell me I could return to the division, but instead I was ordered to go down to a new position between Basra and the Kuwait frontier. It was still thought that the Germans would be able to overwhelm our 9th Army in Iraq, and there would have to be a sort of Dunkirk operation at the head of the Persian Gulf. I was ordered to prepare a defensive position for two Infantry divisions and an Armoured division to cover the embarkation area. There was no anti-tank ditch but I was allotted 10,000 labourers and told to dig trenches in the sand. It was a huge area and I travelled 50 miles every morning to inspect the work. But it was quite hopeless. All the excavations of one day were filled up with wind-blown sand in the night. When I was told to revet them I prepared alternative proposals using the only available materials — either empty petrol tins or timber and matting. In either case the quantities involved were astronomical, so we came to an impasse. It appeared from TV pictures in January 1991 that the problem was still unsolved. My CRE was 1000 miles away, then I remembered that the E-in-C 9th Army, General Taylor, had once served under my father, so I took a train to Baghdad and marched into his office. When I explained the position he told me to stop work and a week later we moved to the north of Iran.

In the meantime it was getting very hot. We had shade temperatures of 60 degrees C and no ice or fans. I heard that over 50 men a day were dying of heat stoke. I had to find something to keep my sappers busy. I had noticed a pile of assorted bits of metal which had been dumped in the desert. The RAOC told me that a ship had arrived from the UK

with two sets each of Hamilton Bridge, Inglis Bridge, Large Box Girder, Small Box Girder and FBE (Bailey Bridge was still unknown in those parts). They were very pleased when I offered to build two bays of each type of bridge as a sample, so we started work daily at 3.3 am and knocked off at 9.30 when you could fry an egg on any bit of metal. If these bridges are still there they will no doubt come in useful now. We played hockey after sun-down and slept out in the desert without nets (the heat had killed off all the mosquitos). In fact we had no sickness at all.

But Iran was another matter where dysentery and malaria were endemic. Our new camp was at 6000ft among pleasant green hills on the main road to Russia via Teheran. The Americans were assembling 80 to 100 trucks a day at Abadan and handing them over to Russian drivers, who raced home and were allowed a few days leave if they got back fast enough. The road was being improved and maintained by Danish contractors called Kamp Sax. Their Chief Engineer was a Swede called Christiansen, with whom we had to negotiate a contract for a new line of defences. His eight SDOs were all Greek and the work was to be carried out by my Indian sappers with a Persian labour force, so all the documents had to be in French.

This time we had to build concrete structures for HQs and hospitals. The actual defences consisted of carefully sited stone sangars connected by communication trenches. I had three parties working on different mountains all at about 9000ft so I got very fit walking up one before breakfast, another in the morning and a third after lunch.

Here we were very much out on a limb and far from any logistic support. The sappers were happy with meat on hoof plus flour and rice, while the officers had to make do with bully beef, compressed dates and dehydrated potatoes plus what we could shoot. Our closest neighbours were a friendly Polish Brigade who introduced us to Vodka and Persian Vermouth. I used to buy every day about a hundredweight of sweet red grapes for the equivalent of ten pence which went down very well. When we needed more boots I had to send a truck all the way back to Basra to pick them up.

The only time I met any British troops was when I went out one day to buy some Gouda cheese from a Dutch factory near by, I came upon a long convoy of vehicles halted by the roadside and a worried Brigadier looking at a primitive timber bridge. "Ah, you're a sapper. Is it safe for us to cross?" I noticed some heavy vehicles on tank transporters and asked for ten minutes to do some sums. For the only time in my career my Cambridge education was justified and I could tell him to carry on.

Towards the end of October 1942 we were ordered to rejoin the Division in winter quarters at Kifri, north of Baghdad and we set off through the first snowfall of the winter by the light of the full moon that was shining over the battlefield of Alamein. All fear of a German invasion of the Gulf area was forgotten and all our defences abandoned. Now we had to get down to serious training, especially the drills for laying and lifting minefields which were quite new to us. After building roads and putting up water points in our brigade area we took part in very realistic manoeuvres with two British divisions using live ammunition and mines. I borrowed the divisional bridging train for a week and drove across country bridging every gap we could find. Then there was a three week bridging camp on the Euphrates — a terrifying river even with no enemy on the far bank. It was 400 yards wide and flowing at eight knots.

The division ran football and hockey tournaments and it was good for our morale when we defeated several major units and got into one final and another semi-final. The Gulf crisis of 1941-42 had given us splendid opportunities to practise every branch of field engineering and had welded us into an efficient and confident unit. We felt we were ready to tackle anybody.

However I was sent off to the Middle East Staff College at Haifa and had to hand over 69 Field Company to my successor after emotional farewells. I never saw any of them again, since after the Staff College I was sent back to India to be an Instructor in jungle warfare (not having seen a tree for two years). But 69 Field Company acquitted themselves well in Italy, particularly by building the "Impossible Bridge" over the river Moro, which earned them the flag off the Army Commander's car (now in the regimental museum at Roorkee).

69 Field Company was on active service continuously for ten years, since, after the Italian campaign, they went back to Iraq, and from there straight to Kashmir to take part in the first of the tragic wars against Pakistan.

As a footnote, when I was in Roorkee in 1989 I asked if I could visit 69 Field Company. "Of course", said the Commandant, "we all know it is your company". I had a warm welcome and felt I had never been away. When talking to the men it was hard to realise that these were the grandsons of the men who had served under me 48 years before.

One Sapper's War

MAJOR F E SNAPE

It was August 1940 in the Western Desert and 42nd Field Company Royal Engineers had fallen in by works parties on the sandy parade square in Mersah Matruh.

CSM "Ginger" Sanders walked down the front rank, millboard in hand, dismissing each group of Sappers to their various tasks of minefield laying, pillbox construction, digging anti-tank ditches, quarrying and all those other varied tasks taken on by Sappers world-wide. Finally he came to the small squad on the left who had completed their previous tasks and were awaiting allocation to a new project.

His eyes caught mine and lit up with joyous anticipation. "Ah, Sapper Snape" he said, trying to disguise his joy, "I've got just the job for you, lad. Take Sapper Jones and Driver Brown and this map. Marked with a cross you'll find an un-exploded bomb — go out and deal with it."

"Right Sir" I replied in approved military fashion, for, after all I was almost an old sweat, having just turned 20 years of age and almost completed my field works training before being sent to Egypt just 12 months previously, "but how do you dispose of an un-exploded bomb?" (This minor detail had been omitted from field works training presumably on the grounds that it was too complex.)

"I don't know, lad, but if you manage it you can tell us how, and then we'll all know, — to your works — Dismiss" and the CSM moved on to avoid further discussion.

Having located the bomb and unloaded our shovels I sent the driver and truck off a safe distance and we set to work. Eventually there was only room for one in the hole we were digging and I was having a quiet smoke whilst my "mate", an even younger Sapper with about six months service, was taking his turn, when there was a metallic clang as his shovel hit the bomb. He burst into an even heavier sweat, turned a little green, and suggested that perhaps it was my turn!

I instructed my mate to sit in an adjacent crater while, very gingerly, I cleared the sand away from the bomb. Fortunately for my peace of mind I had never heard of delayed action fuses, and I found that the bomb had hit hard rock and turned upwards at an angle of about 45 degrees, bending the vane in the process. Well, I knew at least that I should try to disarm the bomb before moving it, and I had plans for that particular bomb, so I whistled up the Morris 15 cwt and borrowed the tool kit. Removing the vane was a simple task as it was only secured with heavy grub screws, and I then found a rod projecting from the flat base of the bomb. This was threaded, and on it was a propeller, whilst through the rod was a steel pin with a short length of wire attached. I sat and smoked another John Player whilst reasoning that the propeller was a safety device which stopped the plunger of the firing mechanism from hitting the detonator, the piece of wire was obviously fixed to the bomb rack and was meant to withdraw the pin as the bomb fell away, thus allowing the propeller to unwind and fall off. Good oh! Nothing to worry about (I did not know that there were such nasty things as anti-handling devices), so, with the help of a large adjustable wrench from the tool kit I calmly removed the "nasty bit" from the base of the bomb, and dumped it.

My two companions were not too keen on my next plan, but I was the senior so I got my own way, and we loaded the bomb onto the truck and headed back to camp, with the bomb safely between my feet whilst I hung onto the truck canopy. T'was only a 250 pounder and the driver drove very steadily so we had no problems. Just as we pulled up outside the Company HQ dug-out CSM Sanders emerged. "Did you do that job, Snape" he barked, "what did you do with the bomb?"

"I've got it here between my feet, Sir," I replied, and was delighted to hear him shout what I should do as he disappeared back into the dug-out. Then, armed with a slab of gun-cotton, primer and fuse with detonator drawn from our section explosive dump we headed out over the desert and blew the bomb up.

About three months later we had a sudden move. We were to proceed to Palestine for a rest and re-equipping, as all of our GI098 was worn out after 15 months on the desert. Unfortunately, our convoy leader was not really good at map reading because we found ourselves in Port Said being loaded onto a cruiser, and, a couple of days later when we landed in Suda Bay we realized that Crete was a Greek island and we were on it (and in it).

There followed six months of hard graft, building ammunition dumps, an Ordnance Depot, a Deacauville track from the docks, gun sites, and

roads, and a bridge designed by our 2IC, Capt C A O B Compton. The bridge had to carry the light rail track over a dry stream bed about 9 feet wide and we built two enormous buttresses which carried two really large girders shipped over from Egypt. The CRE was invited to perform the opening ceremony which he did, declaring the bridge be named 'Compton's Folly'.

Then there was 'Parker's Piece', named after our OC — Major 'Teddy' Parker. This was a new road built at the end of Suda Bay to serve the Bofors Gun positions dotted around the bay. There were four Sappers on the job, and each of us had his own gang of directly employed labourers who hand-drilled the shot holes to the depth and direction as directed by us. It was a matter of pride that each Sapper cut out more road in the rock, to eliminate fill as much as possible, than his comrades. Shot-holes were carefully sited and gelignite charges carefully assessed (guessed). Gelignite was the only explosive we had in any quantity, in fact everything was in short supply and so we had to economise. Fuses were kept as short as possible for this reason and in an area of roadway of about 240 square feet it was quite normal to have as many as 20 separate charges each ranging from two ounces to six ounces of gelignite. There were often some anxious moments when with 16 fuses hissing and smoking within a few feet, you were trying to find the others. Lighting so many fuses in a short time might seem difficult but with typical Sapper ingenuity we had hit upon the idea of sticking a lump of gelignite on a stick and lighting it with a match. The resulting torch burned with a fierce flame and only a touch was needed to ignite the fuses. We then had to retire a safe distance, walking (but a fast walk) and crouch behind a convenient rock to count the detonations. I think I was lucky, perhaps, never to have a misfire. Neither did I lose any teeth in spite of constantly crimping the detonators onto the fuse with my teeth. We didn't have enough crimping tools to go around! 'Parker's Piece' runs past the gate of the Commonwealth War Graves Cemetery and is still a well engineered road!

Then came the evacuation of Greece and the eventual attack on Crete by the crack German Airborne Division. Although we were only about eight miles from the dropping zone we had to listen to the BBC Overseas Service to find out how the battle was going, but it was soon obvious that our complete lack of airpower was going to be the main factor in the battle. Eventually we were given the order to load up all vehicles with as much explosives as we could carry and we commenced a withdrawal along the coast road.

Just after the turning off the coast road outside Suda Bay we stopped and volunteers were asked for to stay behind to blow up the road. I stayed and was joined by my long standing friend, Sapper Ralph Underdown. About 1000 pounds of gelignite, plus safety fuse and detonators were off-loaded. We were then given orders not to blow until so ordered by the Rearguard Commander, and the section moved on. Working by moonlight Ralph and I packed the explosive into a 36 inch culvert under the road, leading fuses out of each end and building rock walls at each end to act as tamping.

The next two or three days (I lost track of time over this period) were fairly uncomfortable as we had to guard the demolition on an exposed road on the only evacuation route and the Luftwaffe demonstrated only too well that they had plenty of Stukas and MI09s and knew how to use them. However, our morale was high in spite of shortage of water and lack of food, but we found it very galling that we were not allowed to fire on very low flying enemy aircraft in case we "gave our position away". I feel that this order was entirely wrong and had it not been issued general morale would have been higher. With the ability to "hit back", some planes would inevitably have been brought down, and the enemy pilots would have been more reluctant to fly over at about 100 feet.

Eventually we got the order to blow up the road and after lighting the fuses we came under mortar fire as we were illuminated by an undergrowth fire started by a previous demolition, but we suffered no casualties and followed the last Infantry Tank down the road. We then made our way towards Sphakia where we were to meet up with the rest of the company, and be evacuated by the Royal Navy, but we were given the job of defending one of the flanks and there we stayed for the next few days. One morning we saw white flags being waved to our rear and sent a few shots close to the flag wavers but a runner came over with orders that we were to cease fire and surrender to the Germans as the evacuation was ended. We had not eaten for several days and we were down to about five rounds of ammunition each but surrender was something that we just hadn't given any thought to, and it came as a bitter blow. Four of us decided to make a break for it along the rugged coast in the hope of picking up a boat and sailing to Egypt, so I picked up an abandoned belt with a holstered Smith and Wesson

and we set off. We had gone only a mile when a figure stood up on the hill about 200 yards from us and whistled. Thinking he was wanting to warn us of enemy being out ahead we made our way up the hill towards him, only to find when we got to about 30 yards from him that he was a German! I was the only one armed, and when my mates urged me to "shoot" I muttered "wait till we get closer, I wouldn't hit a barn from this distance". It was just as well that I waited, for as we got closer we saw another German crouched behind a rock with an MG trained on us!

There followed the long three day march back to a POW camp which had been established near Galatas, outside Canea and we were grateful for that first bowl of gritty lentil soup — our first food in over a week!

I didn't really appreciate the hospitality of my hosts and after resting for a few days to recover some strength I volunteered for a working party engaged on the construction of a war memorial. Whilst the guards were having their lunch I wormed my way along the ground beneath the vines and got clear away.

The following 15 months saw some of the most incredible experiences. During this time I was recaptured and escaped a further three times, held in various prisons on Crete, helped by so many incredibly brave Cretans who were well aware that they faced death for helping me. During this time my main diet was snails, bread, goats cheese, olives, garlic and fruit, and I was very grateful to the Cretans who had so little themselves. I wore any clothes I could scrounge, my boots fell to pieces, and I was dirty, lousy and without medical help except for one piece of good fortune when, in urgent need of an operation I reached an evacuation point and found Major Arnold Guerovitch RAMC and a medics captain from the RNZAMC, also escapees. They had just obtained a scalpel, forceps, and a small lemonade bottle of ether and were going to operate on "Ted" whose ramblings could be heard in the small church taken over as a hospital. Poor Ted had mastoids and his face was swollen hugely and his brain was damaged. At first light next morning the church door was lifted off it's hinges and laid in the doorway as an operating table. Ted was laid on the door and the operation began with both doctors kneeling on the floor. The level of ether in the bottle gradually diminished and Ted just wouldn't go under. I heard the Kiwi doctor say "this stuff must be as old as the hills", and I was anxiously watching the decreasing amount in the bottle when Ted suddenly ceased his rambling and the operation started. They did what they could for Ted and then it was my turn and I eyed the small drop of ether left as I laid down on the door. However, I'd had no sleep for four days and nights and had walked about a 100 miles over rough mountain paths — about four deep breaths was all I needed and I didn't wake up for over 12 hours.

When I awoke there was a rather strange figure looking down at me. He was tall and slim with a light complexion and fair hair and was dressed in Greek clothing, and he introduced himself as Captain Montague Woodhouse — Chief British Intelligence Officer Crete. He was sipping from a silver flask, using a minute silver cup, and when I asked for a drink he generously poured me one, I toasted him and knocked the drink back and said, in amazement "it's bloody water, Sir!" "Oh yes, but the finest spring water in Crete", he replied.

I recovered well from the operation, though it was agonizing when the wound had to be dressed and the drain-plug (a piece of shirt-tail) was pulled out and a clean piece re-inserted, but after a few days there was no need for more plugs and the clean wound could heal. Then we received word that we were to disperse. The boat coming to take us off had run into a severe storm and had to return to Egypt, and our Intelligence Officer had received information from both the local Commander and the Greek Police Chief that they knew we were assembled for evacuation and were mounting a raid. We all moved off and scattered, the doctors taking Ted, mounted on a donkey. Many years later I was to find that Major Guerovitch was the Senior Surgical Consultant to the Birmingham group of hospitals, so I was in really good hands.

A few weeks later I was betrayed by four Greek traitors including a policeman and they eventually overpowered me and dragged me to the nearby tavern. About half an hour later two German soldiers were brought to the tavern. They had walked to the village from another village where they were stationed about three miles away. Fortunately they both spoke English, and asked me who had beaten me, which I declined to answer. They ordered the tavern keeper to bring me a bowl of water and a towel so that I could clean my face off, and then we had a few glasses of wine and a quite friendly chat. Windows and doors of the tavern were packed with the local Greeks who could not understand that enemies were drinking together in their tavern.

On the walk back to their unit the Germans saw that I was limping and in answer to their question,

I showed them that I was wearing shoes which were two sizes too small. I had cut away the toe-caps so that my toes could stick out but they were also too narrow at the heels which had resulted in callouses which had turned septic and I also had a large carbuncle on my backside! When we got to our destination they put me in a cell in the local police station and told me that they would send an escort to take me to their Medical Officer. The German MO was a perfect gentleman. After applying a local anaesthetic to both heels and posterior he lanced them and applied proper dressings (such a luxury). He then invited me to a meal with him and his Commander, and it was with a little apprehension that I accepted, but I WAS really hungry and had not eaten a decent meal in months!

When I was escorted down to the medical centre that evening I felt rather apprehensive at the thought of dining with two German majors, but there was no need to worry. They were both really decent chaps, and spoke excellent English, and although at first they seemed to be a bit arrogant and stiff they soon relaxed, especially when the third bottle of wine was brought to the table and I am sure that, before the evening was over I had convinced them that there was no way that Germany could avoid being heavily defeated while they were against the combined might of the British Empire and Russia. It was a pleasant evening, and I was treated most courteously and escorted back to my cell feeling comfortably full of food (a strange sensation) and a little tipsy.

The following day I was taken in front of the local Greek Police Commander. He informed me that I faced serious charges of assault on a Greek policeman which could result in up to three years imprisonment, as I had knocked out four of the policeman's teeth! I told him that the policeman was a traitor, three years in a Greek prison was no problem as I would probably spend that time in a German prison camp, but if I managed to escape again I would come looking for the policeman. To my amazement the police officer grinned, stood up and shook my hand, told me charges would be dropped, and wished me all success for the future!

That day I was moved to a prison in Heraklion and joined several other recaptured escapees. A few days later we were lined up outside the prison and a car fitted with curtains drew up in front of us. An officer got out of the car, and after a conversation with a person behind the curtain I was called out of the line-up and taken away to the HQ of the Feldgendarmerie which is the equivalent to our Field Security Police; over the next four weeks I was held in a tiny cell and taken before a panel of officers every four or five days for questioning. It soon became clear that I had been identified by a Cretan as being in touch with Monty Woodhouse, the Intelligence Officer, and by association I was also suspected of being an Intelligence Officer myself. The interrogations became an amusing break in the monotony of being in a cell, and I looked forward to the battle of wits, the odd glass of wine and cigarettes. Naturally, they caught me out many times but took it with good humour when I told them that it was just as much my duty to tell lies as it was theirs to try to get information out of me. But I give them credit for always being "proper" and it was always my experience right up to the end of the war that the German officers, NCOs and soldiers always treated me with the utmost respect.

Eventually they must have tired of the interrogations and I was moved to a prison in Canea, where the prison warders were mainland Greeks and we were checked on daily by a German officer. Obviously, the Germans still had reservations about me and I was kept there for several weeks whereas several other escapees were shipped over to the mainland after only a few days. One day I was joined in the cell by Sapper Lofty Arthur. I told him of my escape plan and without hesitation he agreed to join me. Daily we were permitted to exercise in the prison yard for one hour and my cell was the first one to be unlocked. Everything depended upon getting in to the yard before the armed warder had taken up his post on the wall and, one day it happened! Lofty hoisted me up to a high window, then I reached down and pulled him up and we climbed up the bars and on to the roof. We crossed the roof, climbed over to an external wall, dropped about 20 feet and we were away to the hills.

Well, we got safely away but the Germans announced that a British Intelligence Officer and a soldier had escaped and if we were not handed over by the Cretans they were going to execute all the Greeks on duty at the time of our escape. I knew that the Germans were only really interested in me so told Lofty to sit tight (he was later killed when trying to escape from a prison camp in Germany). My Cretan friends pleaded with me to stay in the mountains, but I could not let innocent men be executed.

I walked into Canea at night, calling at a couple of taverns for a drink or two on the way. As I entered

the Feldgendarmerie HQ there appeared to be a complete lack of security and I walked up the stairs toward the sound of music. I stood in the doorway of what was clearly their canteen for quite half a minute before I was noticed.

A Feldwebel shouted in Greek "what do you want — who are you?". Automatically I answered in Greek "I am an English soldier". The music stopped, there was silence, then from the same German "Say that in English". It was really just like a comic opera when one looks back on it. Anyway, I said "I am an English soldier, my name is Snape, and I escaped from the prison seven days ago".

They sat me at a table, gave me a large glass of wine and sent to the kitchen for a huge piece of sausage and a hunk of bread. After many drinks and songs, they loved my rendition of "We're going to hang out our washing on the Siegfried Line", they took me back to the prison, where the Greek warders gave me a thorough beating up for getting their pals put in Ayah prison. They were not to know that I had surrendered to save them.

Next morning I was moved to Ayah prison, which was staffed by Germans and largely occupied by German troops and NCOs serving sentences for disciplinary offences. I learned that the NCOs were not deprived of their rank for such offences but suffered loss of pay for the period they were "inside" and whilst serving their sentences they carried out all of the disciplinary and administrative duties within the prison. This seemed a good idea to me as their army did not lose a good NCO because of a temporary lapse.

My surrender must have convinced the Germans that I was not an Intelligence Officer after all and I was shipped over to the Greek mainland, then put onto a troop train under escort through Yugoslavia, Austria and into Germany. Whilst waiting for a change of train in Vienna my eyes were opened to the power given to German NCOs. Our escort commander was a bad tempered Unter Offizier who had given us a hard time on the journey. When he found that there was not a reserved compartment on our train as detailed in his orders, he sent for the station master who duly arrived, decked out in his finery with lots of gold braid. He then received such a dressing down from the German NCO and was made to order all the civilians out of one carriage, and I thought to myself "I could just see that happening at Paddington!"

I finished up in the notorious Stalag VIIIb and what happened from then on could form another story, but I have rambled on enough for now. Suffice it to say that looking back on it all I wouldn't have missed a bit of it — it was a great experience and I have so much to look back on!

RE Museum News

COLONEL G W A NAPIER MA, DIRECTOR RE MUSEUM

Development

Anyone visiting the RE Museum in the months from April to June will have been disappointed at the restricted amount available to be seen. The reason has been the long awaited repair to the old Ravelin building roof which nearly vanished in the gales in early 1990. It was only spared worse damage by the quick reflexes of the Project Team who managed to clamber on the roof in the teeth of the gale and tie down a tarpaulin over the worst affected area. One moratorium and several reallocations of funds later a contractor appeared on site in late March this year. The museum staff had to take considerable measures to protect the displays from falling debris and this substantial part of the gallery remained closed to the general public until mid-June. A further section of the Museum was then closed in order to get the gallery refurbishment underway, of which more shortly.

Despite these snags, an understanding public has continued to visit although (or perhaps because) admission charges were waived to compensate for disappointment. The Museum enjoyed the services of a French marketing student, Etienne Crossile, on a work placement scheme, for some weeks, his most important contribution being a visitor survey carried out over two weeks in April, one during the school holidays and one after the start of term. Some interesting points emerged from an analysis of 93 questionnaires covering 281 visitors.

- The male/female proportion was 189/92 (67/33 per cent). We need to encourage more ladies.
- The number of over-50s was 73. This was less than expected.
- The number of under-35s was 171. This was a higher proportion than expected.
- 38 per cent of the visitors questioned had had no connection with the armed forces; an encouragingly high proportion but one we must improve.
- 38 per cent of visitors came from the Medway towns and 26 per cent from Kent. This bears out our Feasibility Study report predictions.
- The most important sources of publicity were leaflets, and road signs.

Also during the period under review the first four of the nine benches to be placed in the outside area was installed.

Another important step forward has been the opening of the Museum's refreshments room. This has simply involved converting the old staff rest room into a pleasant area where footsore visitors can sit and enjoy the offerings of some excellent vending machines. This long-awaited facility is already proving a success and if things go well could even show a profit.

Activities

The April evening lecture sponsored by the Chatham branch of the Friends of the Royal Engineers Museum FoREM was again a sell-out. So popular have these lectures become that the June talk by Colonel Tony Daniell on the Amazon bridge has been switched from the normal venue to the Brompton Study Centre. Details of these talks are given in the Supplement. It is encouraging to note that three more branches of FoREM are being set up, based in Salisbury, Camberley and Manchester.

Exhibitions

We have been fortunate in obtaining two small special exhibitions to enhance the Museum at the end of the year. *Ordnance Survey*. 1991 is the two hundredth birthday of Ordnance Survey and the Director General, Mr Peter McMaster, has kindly arranged for the exhibition which tells the story of the rise of Ordnance Survey to its preeminent position today.

Palestine Exploration Fund. A second exhibition, appropriately also largely on the subject of survey, has been provided by the Palestine Exploration Fund from material recently on display in the British Museum's exhibition on biblical archaeology. The then Lieut H H Kitchener took part in the Survey of Palestine, which provided the essential basis of the Fund's nineteenth century exploration of the biblical sites. Some of the photographs Kitchener took at the time will be on display.

Staff

It is sad to report that after seven years service to the Museum, our senior curator, Caroline Reed, has left to take up the post of Keeper of the Vestry House Museum in Walthamstow. Caroline joined the staff as Assistant Curator in 1984, taking over as Curator from Lieut Colonel Charles Holland in February 1985. Thus she has seen the Museum through all its upheavals to the present day and it is her professional knowledge and style which has done so much to establish the high reputation that the Museum now holds and for which the Corps will be much in her debt. She departs with all good wishes for success in this further step in her career.

Inauguration of new benches at the Museum – 5 May 1991

Colonel Gerald Napier MA
RE Museum News p183

The Indian Sappers And Miners

This painting by Johnny Jonas was completed in September 1990, and depicts a scene in North West India in the 1920's, with the Royal Sappers and Miners at work on a training exercise. In the left foreground, the Queen Victoria's Own Madras Sappers and Miners are clearing their road construction site. In the centre, the King George V's Own Bengal Sappers and Miners are discussing the completed suspension bridge, whilst in the right foreground a party of Bombay Sappers and Miners are clearing a water supply point.

The scene is composite; the elements have been assembled from contemporary photographs from the Indian Office Library, RE Library, and from individuals. The British Officer standing next to the staff car is (now) Major General W M (Tubby) Broomhall CB DSO OBE; this scene was taken from a photograph of him at a similar bridge site at that time.

The painting was commissioned by the Corps to mark the long association with the Indian Army Engineers from their beginnings with the East India Company in 1818 up to the partition of India in 1947. It was unveiled, in the presence of the artist and members of the three Sappers and Miners Associations, at the Corps Guest Night on Thursday 4 October 1990 by the Chief Royal Engineer, General Sir George Cooper GCB MC DL, himself an ex-Bengal Sapper and Miner. The working sketch, signed by the artist, hangs in the Ravelin Building, and the photographs and other material used for the commission are in the RE Library, or returned to their owners.

Colour prints of the painting, measuring 23" x 17" overall (picture size 17.5" x 13") are available from Corps Enterprises at a cost of £9.50 each (incl p&p)

The Indian Sappers & Miners (p184)

Memoirs

BRIGADIER G H OSMASTON MC

Born 26 September 1898, Died 31 October 1990, Aged 92

Brigadier Gordon Hutchinson Osmaston MC, was born at the Indian hill station of Chakrata. His father was a Forest Officer who eventually became Chief Conservator for the Central Provinces. He was educated at St Georges, Harpenden, and then Cheltenham College. In November 1915 he went to "The Shop", where he completed the shortened wartime course, and was commissioned into the Sappers in May 1916. He served in Britain until March 1918 when he went to France with 42nd Div Signal Coy. He was with 211 Bde RFA Signals from April 1918 to February 1919 and, on 20 October 1918, was awarded the Military Cross for devotion to duty under very heavy fire. He proceeded to India in July 1919 and joined the Royal Bombay Sappers and Miners at Kirkee. He was posted to 75 Fd Coy in Waziristan and was on active operations with this unit until it was disbanded in March 1921. He then took over 25 Rly Coy but applied to join the Survey of India and was transferred in July 1921.

After training and some planetabling in the United Provinces and Central Provinces, he was posted back to England to complete his YO training at Chatham and Cambridge. He joined the University Mountaineering Club and was initiated into rock climbing in the Lake District. He put his newly acquired skill into clandestine practice by climbing to the top of Kings College Chapel. After Chatham and Cambridge, he was married to June Archer at Ambleside in the Lake District before joining the Mounted Duties Course at Aldershot. He sailed again for India and was posted to Dehra Dun in November 1924. In 1925 he took over No 13 Party engaged on a gravity survey in Kashmir. In February 1926 he was promoted to Captain, having taken over 15 Party in Burma the previous year. He spent two arduous and adventurous years carrying out a primary triangulation in the densely forested Pegu Yomas. In 1927 he moved to Waziristan on the North West Frontier of India. On one occasion, he was threatened by hostile tribesmen who insisted that the survey markstone was a grave which he was desecrating.

After leave during 1928 and a spell as Assistant Surveyor General in Calcutta, he took over a party planetabling in Central India and Rajputana. He was soon back in the jungle, this time in Assam, where he was nearly killed when his tent was trampled by a wild elephant. He moved to Tripura State where he was employed, once again, on Primary Triangulation. In 1934 he left this work for the charge of a planetabling party in the semi-desert country of Sind and the Rann of Cutch.

In March 1936 he was given the job he had always hoped for, charge of a survey party in the Himalayas. No 1 Party was working in northern Tehri Garhwal and his first task was to provide a framework of trig points in this remote and largely unpopulated area with many peaks of a height of 20,000ft or more. He worked up the Gangotri glacier (which he discovered was about four miles out of position) and eventually he and his squad found themselves benighted at a height of over 19,000ft on its narrow bounding ridge. Next morning, after a dangerous and uncomfortable night in the open, with difficulty he found a place where the theodolite could be erected for the necessary observations. Some days later he carried out observations at a height of 20,980ft in snow so loose and powdery that the point of observation had to be marked by a chupatti. Later in 1936 he joined up with the celebrated mountaineer Eric Shipton to carry out a photo-theodolite survey of the Nanda Devi Sanctuary

Brigadier Gordon Osmaston MC (p185)

which Shipton and Tilman had penetrated for the first time the previous year. To gain access they used the same route along the all-but-impassable Rishi Gorge. For this section the guidance of Shipton was indispensable. Sherpa Tensing, who later climbed with Hillary to the summit of Everest, was one of the Sherpas with the survey.

During the next two years, in 1937 and 1938, Osmaston continued to be in charge of the Himalayan survey in Garhwal and Almora. Much dangerous mountaineering was entailed and the survey was complicated by the problems of injury and sickness. His camp officer became ill and died and a surveyor was killed by falling into a crevasse. Tensing, who was still with the party, was one of those who became sick and, at one point, Osmaston had to carry the invalid on his back.

After this high point, his life became much duller as the thoughts and preoccupations of all turned to preparations for the war which was about to break out. He returned to Dehra Dun and, after a brief spell in Iraq, he returned to India on promotion to Lieut Colonel in March 1942 and remained there until the war ended. He was promoted Colonel in November 1944 and was appointed Director of Survey (India) and promoted to Brigadier in March 1946. He left India in 1947 when it was given independence and finally retired from the Army in May 1948.

After retirement, until 1970, he took a job teaching at Huyton Hill, a preparatory school beside Lake Windermere. At the same time he and his wife, June, turned their house, Eller Close at Grasmere, into a holiday home for the young, most of whom had parents abroad. Gordon enjoyed initiating his charges into the joys of rock climbing, fell walking, sailing and other such outdoor activities. After the holiday home officially closed in 1963 Gordon and June continued to welcome family and friends from all over the world.

Throughout his life Gordon maintained a strong Christian Faith and latterly was much involved with the Church at Grasmere. He was always gentle, polite and a friend to all. He is survived by his wife and three sons.

RCAE

BRIGADIER H R de B GREENWOOD

Born 5 July 1909. Died 22 December 1990
Aged 81

Rodney Greenwoood was one of that select band of Canadians, all first class, who after passing out of the Royal Military College, Kingston, elected to take up commissions in the Royal Engineers. He and Bob Rogers joined 26 YO Batch at Chatham in the Autumn of 1931. As the most senior among us Rodney became head of the Batch, assuming a continuing responsibility which he discharged with charm and diligence for the rest of his life, organising wedding presents, get well cards, batch news and reunions for all of us. He died in the course of organising our 60th anniversary reunion lunch.

Rodney, who although born in Canada had been educated at Oundle, arrived at Chatham with a well deserved reputation as an outstanding gymnast and athlete. At Cambridge he ran and pole vaulted, played ice hockey (he was manager of the Cambridge ice hockey European tour), dabbled in mountaineering and took part in an Arctic expedition to NE Spitzbergen. He and his *half-section* Bob had rooms in a house in Hills Road which rapidly became famous for hospitality and good parties (one of them lasted three days). Typical of his enthusiasm for anything challenging that came along was a climb he and the writer did in the small hours of a dark night up the RC cathedral to put a cap and gown on the saintly statue on the top

Brigadier Rodney Greenwood (p186)

of the tower. Sadly we were defeated by the elegant steeple.

On completion of his YO courses Rodney was posted to the 1st A A Brigade at Bordon, including some time in Egypt, and then in 1938 to India to join King George V's Own Bengal Sappers and Miners. As a subaltern in 5 Field Company he trekked and climbed in Chitral and Kashmir; later in the early months of the war he served as adjutant to the CRE Peshawar engaged in training field companies for the Middle East and Malaya and building frontier defences.

In 1942-43 he was posted as a major to No 1 Engineer Group at Lahore, followed by a six month war course at the Staff College, Quetta. To get to the latter he had to take his family across the flooded Indus, 17 miles wide. After this amphibious exercise he was appropriately posted as a GSO 2 in Combined Operations. However, he was soon back at the Staff College as an instructor, where he took the practical side of his work so seriously that on a visit to the Burma front with General Festing he personally killed three of the enemy in close combat.

In the last year of the war he was 2IC to the CRE 7 Indian Division, assault planning officer for the 4th Indian Corps' crossing of the Irrawaddy at Nyaunga, OC of a Madrassi field company and finally CRE 25 Indian Division for Operation *Zipper*, the invasion of Malaya. His main responsibility after the Japanese surrender was the restoration of the East coast road from Kuantan to Kota Baharu, a major task as many bridges and ferries had been destroyed by the Japanese.

After that he was posted to Singapore as BGS Intelligence at GHQ Far East Land Forces, which he left to attend the 3rd Joint Services Staff College course at Latimer, from which he was posted to the Joint Intelligence Bureau, MOD, London. In 1951 he was CRE Düsseldorf and Lower Rhine, and three years later CO of 38 Corps Engineer Regiment at Osnabrück, a wonderful command of up to 900 men in National Service days. His Regiment was outstanding in training, administration and sport. The Regimental swimming team took rare pleasure from having the CO as its leading springboard diver. He was always the advocate of energetic competition, whether between individuals or sub-units, to bring out the best in all parts of his command.

At Suez time he was Chief Engineer (Col) Libya. Back in England in 1957 he commanded No 1 Engineer Stores Depot, a command not only of RE units but also of 400 Poles, 500 Pioneers and 900 civilians. He welded this cosmopolitan force into a well disciplined body who earned the friendship of the local population and the Freedom of Stratford upon Avon for the Corps. His last posting was as Chief Engineer Scottish Command, where once again he displayed his organising ability and enthusiasm in carrying out a number of RE works from the Outer Hebrides to the Border. He retired in 1962.

After leaving the Army Rodney joined Papplewick Preparatory School at Ascot, where for 15 years he taught mathematics, swimming and shooting. His exam results were good, but his proudest boast was that at the end of each summer term every boy in the school could swim 220 yards. At this time he also began a 25 year long association with the Gordon Boys School, becoming a regular member of the Foundation Committee.

On leaving Papplewick, Rodney moved to Headley Down. He had married Joan Bonnycastle, of a distinguished Canadian family, in 1939; they had two daughters, Deborah now living in France and Drusilla. As a young wife at Quetta, Joan took a full part in everything that went on and it was she who inspired that old apocryphal joke: DS "How did you like that last paper?" Student "You'll have to ask my wife — she wrote it. Was it all right?" DS "You'll have to ask my wife — she corrected it." Sadly Joan died of cancer in 1974. He married secondly Meg Braid, widow of a Gunner Lieutenant Colonel. Tragically she too died of cancer in 1984.

Rodney took great pleasure in being the family man, and to the delight of young and old he never missed a birthday, anniversary or special occasion. His well-known passion for detail shone through to the end!

In his later years Rodney devoted himself to the Headley Down Branch of the Royal British Legion caring for the needs of a large number of ex-Service people. He delivered "meals on wheels". His unselfish enthusiasm for all this work was recognised by the very large number of local people who came to his funeral.

Rodney was always a man who thought of others before himself. He was a disciplinarian who liked to have things cut and dried, though he was always open to sensible suggestions and never lacked enthusiasm. All this made him an excellent leader who inspired loyalty and affection. He did very well by his countries of birth and adoption, by the Corps and by 26 YO Batch

JMLG, GWD, PNMM, JFMG

BRIGADIER P A WOOD BA

Born 5 September 1908, died 28 December 1990, Aged 82

BRIGADIER Andy Wood was educated at Rossall School, the RMA Woolwich and Trinity Hall, Cambridge. He was commissioned into the Corps in 1929. After a tour at Chatham — during which he played hockey for the Corps — he became Captain and Adjutant of the Tyne Electrical Engineers.

In 1942, after attending the Staff College, Camberley, he commanded 591 (Antrim) Field Company in 54 (East Anglian) Division. Shortly after his arrival the whole unit was invited to become the 2nd Field Squadron in the newly formed 6 Airborne Division — an opportunity which Andy and his unit eagerly seized. By June 1943, 591 Parachute Squadron had completed its airborne training. Months of further vigorous training followed. AFJ, one of his Troop commanders, has an indelible memory of the spirit that existed in the unit during these months of intensive activity — a period during which Andy showed himself to be an outstanding leader. FHL, his CRE, recalls the energy and enthusiasm Andy devoted to training in his new role, and the high hopes with which the Squadron took off for Normandy on the evening of 5 June 1944. But fate was not to be kind. Just after crossing the French coast his Stirling was hit by anti-aircraft fire and crashed in flames. Andy managed to jump, and landed safely, but many miles from the Dropping Zone (DZ). Despite all his efforts he was captured and spent the rest of the war as a POW. That all his dedication in the airborne field should have so ended was a bitter blow. AFJ writes that in captivity Andy showed the same qualities which had endeared him to all ranks before D-Day which greatly helped others to endure the drab months before liberation in April 1945.

From 1946-1948 he served with the Madras Sappers and Miners in Malaya, before serving in BAOR from 1948-1951. During this time he was selected to form up 38 Corps Engineer Regiment and in January 1951 the flag of the new unit was hoisted in Osnabrück. Andy seized this opportunity to fashion his own Regiment in his own way. His sense of humour, insistence on high standards from the start and the great affection in which he was held by all ranks was soon to produce a new unit well up to the high standards set by the longer established RE regiments in BAOR. In February 1953 his HQ was in command of an engineer force sent to Holland in a life-saving and rescue role arising from the Dutch floods. It was fitting that Andy was thanked personally by Queen Juliana.

From 1954 until 1958 he was in the War Office before serving again in BAOR as Director of Works. He retired in 1960.

No account of Andy's career would be complete without acknowledgement of his great interest in shooting and fishing. The prospects for the next season's shooting were always of the greatest importance to him. In 1960 he became an RO3 in G(Training) at HQ East Anglian District. This appointment gladdened Andy's heart as it had much to do with the organisation of the Stamford Training Area. This included the control of the pheasant shooting. He spent many happy years in East Anglia until he finally retired in 1977.

All through his life Andy had the great gift of making friends, and one of his main concerns was the consideration of others. In 1934 he married Margaret Sedgwick, and his generosity to others was amply illustrated by the devoted way in which he cared for her during her final years of declining health. She died in 1987. He is survived by his daughter, Penelope, and her three children.

WHA, GB, AFJ, FHL, DRC, MLC, RFS

Brigadier Andy Wood (p188)

BRIGADIER G J BRYAN CBE TN

Born 29 December 1902, Died 24 March 1991, Aged 88

BRIGADIER Godfrey Bryan who has died aged 88, was an all round athlete whose youthful achievements surpassed those of the heroes of the most imaginative fiction writers.

At the age of 17 he scored 124 for Kent against Nottinghamshire, and the next year took five wickets for 148 when playing for Kent against the Australians. He followed this up by scoring 235 against the New Zealanders. For four years he scored more centuries than any of his contemporaries.

In the meantime he passed out from the Shop, where he won the long jump, high jump, 100 yards and quarter mile. In 1927 he played for the Kent Rugby Football team, which won the County Championship by beating Leicestershire.

The son of a Lieutenant Colonel, Godfrey James Bryan was born on 29 December 1902 and educated at Wellington. From Woolwich he was commissioned into the Royal Engineers.

He spent most of his early career in Malaya in road and bridge building and fortification, and became an expert in the problems of construction in the tropics. In 1942 he was appointed Deputy Director of Army Transportation in Ceylon, then took a similar appointment in India, before returning to Ceylon in 1944 as Deputy Director of Movements.

GW recalls "Brigadier Godfrey Bryan was ADTn in Singapore at the time of its fall.

"I arrived in Singapore as Second-in-Command of 153 Rly Operating Company RE in early January 1942. I was also Temporary Adjutant of the *USS America*, the ship which brought us in. Also aboard was part of 18th Division, a squadron of RAF and our sister company 155 Rly Workshops Company, RE.

"We had been switched from our original destination (Persia) because of the deterioration of the situation in Malaya.

"Godfrey Bryan met us on our arrival and explained that there was virtually no railway left to run and that his Headquarters wanted us to work as dock labour.

"He on the other hand, knowing we were required for vital work in Persia, considered our technical expertise would be wasted and persuaded Army HQ to use us to assist the large civilian evacuation and help the ship's crew to look after them on what was likely to be a hazardous journey to Ceylon.

"This in fact happened and I and all members of 153 and 155 Companies will be ever grateful for his foresightedness.

"At the time he was always calm and kind, as he always was when I was in Longmoor Camp as a very junior ranker from 1936-39."

From 1945 to 1946 he was Director of Transportation in Malaya and the Netherlands East Indies (Indonesia). After a spell as Director of Railways Home Group, he became Director of Transportation for Middle East Land Forces and Chief Engineer for the Home Counties Area.

In the early 1950s he was back in Malaya, this time as Chief Engineer. His last appointment was as Director of Transportation at the War Office.

At 6ft 3in and weighing more than 14 stone, Bryan was amazingly mobile. In character he was extremely modest, thoughtful and kind. In retirement he amused himself by building a complex model railway.

Bryan was appointed CBE in 1953. He married, in 1926, Gladys Wilkins, who predeceased him; they had two sons.

ESdeB, GW

Brigadier Godfrey Bryan CBE (p189)

MAJOR GENERAL R E LLOYD CB CBE DSO

Born 7 December 1906, Died 10 April 1991, Aged 84

Dick Lloyd worked at the centre of British Intelligence throughout the 1960s and early 1970s, first as Director of Military Intelligence at the War Office; then as the Secretary of the newly created Defence Intelligence Staff; and finally as the first Head of the Arms Control and Disarmament Research Unit of the Foreign Office.

He was a man of integrity, intellect and judgment, whose incisive mind inspired great confidence. He will also be remembered as someone quiet and thoughtful, with a touch of shyness whose rather dry manner, went with great charm. His abilities spoke for themselves.

Lloyd was born and bred to serve the Raj. His grandfather was Surgeon General of the Indian Army and his father was Lieutenant Colonel W E Eyre Lloyd of the 97th Deccan Infantry. He himself joined the Bengal Sappers and Miners in 1930 after being educated at Eton, the Royal Military Academy, Woolwich, and Pembroke College, Cambridge. His early service, which was on the North West Frontier, had an Intelligence bias, with trekking on foot to Gilgit and other remote outposts in the North of Kashmir and the Himalayas. But the war came and he never had the opportunity to develop a career in India as his forbears had done.

During the war, he served on the War Office Staff and in Engineer appointments. He saw active service in Normandy where he was GSO I in 59th (South Staffordshire) Division during the battles for Caen. He then took over 8th Corps Engineers and won his DSO during the Rhine Crossing in 1945.

His first Intelligence appointment was as GSO I (Intelligence) in HQ BAOR in 1946. Thereafter he held a wide spectrum of policy staff appointments until he returned to HQ BAOR in 1954 to head its Intelligence staff for three years. Before being appointed Director of Military Intelligence (DMI) in the War Office in 1959, he did two years in the Middle East as Chief of Staff.

He was DMI when Britain was recovering from the Suez debacle; Duncan Sandys was ending national service; Harold Macmillan was re-slanting British Foreign and Colonial policy with his 'wind of change' speeches and attempting to join the EEC; Britain intervened in Kuwait; the Vietnam War was starting; and the Cuban missile crisis broke. There can rarely have been a busier and more fraught time during which to be DMI.

It was also the time when Mountbatten was colocating the Service Departments in the new unified Ministry of Defence in Whitehall, and establishing, against some opposition, the Defence Intelligence Staff (DIS). Dick Lloyd was due to retire from the Army in September 1962 and was an ideal choice as first secretary of the DIS, a post which he occupied with distinction for three years.

By 1966, the Wilson government's policy of maintaining a deterrent stance while seeking effective disarmament, led to the establishment of the Foreign Office's Arms Control and Disarmament Research Unit, which Lord Chalfont, as Minister for Disarmament, invited Lloyd to head.

After he retired from Government Service in 1973, he devoted much of his time to Army and local New Forest affairs. He had become a Colonel Commandant of the Intelligence Corps in 1964.

His great relaxation was cruising under sail.

He is survived by his wife Gillian, their son and two daughters.

W G F J also writes: Dick Lloyd was a very human person who placed great store by his close knit and

Maj Gen Dick Lloyd CB CBE DSO (p190)

happy family life. His one great relaxation was cruising under sail. He married Gillian, daughter of Rear Admiral J F C Patterson in 1939. She was an outstanding sailor, who introduced him to the sport and later sailed the Atlantic. They were senior members of the Royal Cruising Club, which they joined in 1953, and members of the Royal Lymington Yacht Club.

Lord Chalfont in a letter to the *Times* also wrote: May I add a footnote to the very perceptive obituary of Major General Richard Lloyd. During my military service I served under Dick Lloyd in various intelligence appointments and when I became Minister of State at the Foreign Office in 1964 an opportunity arose for me to serve with him again. When setting up the Arms Control and Disarmament Unit, based on the model of the Arms Control and Disarmament Agency of the US State Department, I needed to recruit to its staff people of special experience and qualities.

Above all, I needed someone with an extensive military background, equipped with a powerful intellect, a capacity for penetrating analysis and the ability to fit smoothly into the formidably effective but often forbiddingly exclusive hierarchy of the Foreign Office. Dick Lloyd was the only man I knew with all these qualities.

He shared my view, unfashionable in those days, that arms control and disarmament was not an end to be pursued for its own sake, but was, like defence, an important facet of national security. His contribution to the formulation of this aspect of foreign policy in the 1960s and early 1970s was a fitting end to a distinguished career.

I shall miss him greatly as an understanding friend, a loyal colleague and wise mentor.

Memoir in Brief

A Brief Memoir is published below on a distinguished man whose death has been notified recently in the national press and who served in the Royal Engineers during World War Two.

DENNIS LENNON CBE was born on 23 June 1918, and educated at Merchant Taylors' and University College London.

On the outbreak of the Second World War he went to France with the 51st Highland Division, which had the misfortune to be trapped by the Germans at St Valéry-en-Caux below Dieppe. But while being marched along a French road by his captors, he took advantage of the temporary invisibility conferred by a sharp bend to jump over a hedge.

He then took a bicycle and made his way first to Paris, and then, by way of Marseille, to Spain, where however, he was imprisoned in Madrid. Fortunately a British official secured his release, and organised passage to the safe haven of Gibraltar.

Subsequently Lennon became one of the Desert Rats, serving with the Royal Engineers in 7th Armoured Division in North Africa, where he won the Military Cross, and with the 6th Armoured Division in Italy.

Lennon had qualified as an architect before the war, and afterwards he worked with Maxwell Fry and Jane Drew, before becoming Director of the Rayon Industry Design Centre in 1948. Two years later he set up his own architectural and design firm.

Lennon was appointed CBE in 1968.

Though quiet and gentle in manner, Lennon had considerable presence and carried natural authority in his professional capacity. He was an accomplished water colourist.

He married in 1947, Else Bull-Anderson; they had three sons.

Correspondence

Annual Corps Dinner and Summer Ball

From Major T F Croxall BSc

Sir, — The announcements in the April *Supplement to the RE Journal* concerning the Annual Corps Dinner and the RE Summer Ball both of which lack support, makes one consider what action should be taken.

Undoubtedly the main concern is cost and having attended the Assault Engineer Reunion Dinner in April last year the overall cost including dinner and travelling, but not staying the night was close to £50.

I understand that consideration is being given to holding both the Corps Dinner and the Summer Ball in the SAME year, namely 1992. Surely these should occur on separate years, in order to spread the cost.

Most of us who are retired both from the Corps and subsequent business life, live on relatively good pensions, but every year the cost of maintaining one's standard of life NEVER keeps up with inflation, whatever governments may say.

Maybe the time has come to hold a 'Special Luncheon' in lieu of the Corps Dinner and to hold it every other year — preferably in London maybe at one of the 'Institutions' where the 'rate' would be reasonable. It may even be possible to persuade a company or bank to 'host' the function. It needs to be on a Friday for the convenience of the majority of people.

It may even be sensible to consider holding these functions every three years to enable people to attend a 'special to arm' — function in the third year.

I would like to see the views of others. Yours sincerely — T F Croxall, *Ormonde Cottage, 2 Market Square, Petworth, West Sussex, GU28 0AH*

Gulf War

From Lieutenant General E R Heiberg III US Army (Retd)

Sir, — The 1991 Gulf War has again put Brits and Yanks together in an important military endeavour. By all accounts the August/September 1990 developments that led up to the "line in the sand" was a direct result of Mrs Thatcher's discussions with our Commander-in-Chief while she was Prime Minister. The earliest and most steady partner of the US deployment was the UK, as you and your knowledgeable readers know.

There have been a series of occasions that have found the Brits and Yanks closely aligned on events that changed the World. When Commodore Perry opened up Japan in the mid-19th Century, he found some prickly common ground with the Royal Navy. The two World Wars, Korea, and a long NATO and nuclear sharing, gave our military services much in common. But until I read the enclosed account* of the Boxer Rebellion in 1900, I did not realize that my own grandfather was a part of that tradition of UK-US military cooperation.

While I know that the Royal Engineer *Journal* is primarily for the sappers and field engineers, I thought your readers might be interested in a tough moment that tested our field relationships that had a cavalry flavour. I never knew my grandfather who was killed as a Major in World War One. But I do know that his US Army Corps of Engineers grandson found much pleasure and satisfaction while working over half a century later with Royal Engineers in Europe under the NATO banner. I have also immensely enjoyed my experience outside the "sapper world" with senior representatives of the British civil engineering scene.

I have enclosed a copy of the journal that tells about the 1900 cooperation between our military forces. If you have an interest in publishing that article (pp 38-44), I would be glad to approach the *Military History* editorial staff to see how that can be done. I leave that to you. Yours sincerely — E R Heiberg III, *J A Jones Construction Services Company, One South Executive Park, 6060 St Albans Street, Charlotte, North Carolina 28287*

Editor's Note

*It is hoped to publish the article in a future issue of the *Journal*.

Sanitation In The Sand And Other Tales

From Major J D Beamount

Sir, — Having just read Major Max Heron's article on the deployment of Sappers in support of 7 Armoured Brigade Group in the April issue of the *Journal*, I would like, without wishing to detract from his comments, to correct one or two misleading impressions.

Firstly in connection with water supply, he mentions the realisation within 21 Engineer Regiment of the need to store large quantities of water in tanks fabric, collapsible (TFC), allied with scepticism and an eventual design by 64 CRE (Wks). In fact, from the very beginning of the planning to deploy ground forces it was realised that water supply and storage would be a problem and I was involved, initially in Engineer Branch HQ UKLF, and later on the logistic

staff at the Joint Headquarters at High Wycombe, in planning the means of achieving this. A standard design for a 2000-man water point using a number of high-capacity pumps, WPUs and TFCs, was produced. Although this design was later modified to suit local circumstances, as described in Major Heron's article, it was due to this early, largely speculative work, that the necessary equipment was loaded on to the first ships and transport aeroplanes. At the same time steps were taken to identify and purchase suitable Reverse Osmosis (RO) plants from civil industry, in order to be able to draw water either from the sea or boreholes. I would like to pay tribute here to Engineer in Chief, (especially Engineer 5), Headquarters Military Works Force, and Headquarters Engineer Resources who made much of the running on this work in those early frantic days.

Secondly, whilst I understand that Major Heron is writing from a personal perspective, it would be unfortunate if your readers thought that the logistic engineering support to the British Forces in the Gulf was limited to water supply, sanitation and a few helicopter landing sites. A wide spectrum of tasks in support of both ground and air forces in the "Rear Areas" was undertaken and I look forward to articles from 39 Engineer Regiment, CRE (Works) Middle East, and others who were involved in this work.

My final point is that it came as no surprise to those of us who have been involved in Sappering in parts of the World other than BAOR that 'logistic engineering' played such a major role. My own view is that we have focused for too long on combat engineering in support of the All-Arms Formation, to the detriment of our other skills. As a result the rest of the Army does not understand our full capabilities. Operation *Granby* demonstrated yet again, should it have been necessary, that an Army has to be able to live in the field before it can fight and that where we do not have ready-made infrastructure such as exists in Germany, then we must improvise and adapt. This has always been a Sapper's forte and we must ensure that our colleagues in the other Arms and Services realise it. Yours — Derek Beaumont, *Engineer Branch, Headquarters United Kingdom Land Forces, Wilton, Sailsbury, Wilts SP2 0AG*

Christmas Island 1957-58

From Wing Commander K R Richardson OBE DFC

Sir, — I am prompted to correct your correspondent, the then Major (if he was in command of a Field Squadron) R Britten, in the April 1991 issue of the *Journal*. His geography is some thousands of miles astray.

Christmas Island is not part of the Gilbert and Ellice Islands group, it is, as the largest coral island in the World, one of the Line Islands, which were administered by the Resident Commissioner of the Gilbert and Ellice Islands, based at Tarawa. The District Commissioner for the Line Islands, Percy Roberts, no doubt fondly remembered by many who served with Task Force *Grapple*, was based on Christmas Island.

If he completed his 12 months tour, Major General Britten will be eligible to wear the Line Islands tie: I still wear mine, now over 30 years old, with pride on suitable occasions.

May I take this opportunity to salute the many fine officers of the Royal Engineers that I met whilst serving as Wing Commander A, and later Base Commander, on that distant and evocative island in the Pacific. Yours sincerely — K R Richardson, *Fleet Cottage, 21 Main Street, Cherry Burton, Beverley, North Humberside, HU17 7RF.*

ICE/RE Sailing Rally

Sir,— I write on the subject of the ICE/RE sailing rally at St Vaast over the weekend 24-26 May 1991.

The event was a success although the serious shortage of wind meant motoring all the way across the Channel on Friday night. Saturday was a lovely day and we put in to Barfleur on a falling tide for more fuel, had breakfast, and proceeded towards St Vaast. The wind picked up in the afternoon so we had a nice sail including getting the spinnaker up with our relatively novice crew, and we went into St Vaast that evening. Sunday was a lazy day, terminating with a very pleasant dinner together with the ICE people, we were about 21 in all, and we set off back after dinner with a fair breeze which brought us to the Needles by 0930 on Monday morning. We then had a lovely fine day to work up through the Solent, clean the boat, have lunch in the Beaulieu river, and get back to Whale Island by the evening.

It was a most friendly occasion and it was a great pleasure to meet the members of the ICE. I can recommend the occasion to those who might contemplate joining us in future. — Yours sincerely, Meryon Bridges, *64 CRE (Wks), Chilwell Station, Beeston, Notts, NG9 5HB.*

Reviews

DOUGLAS HAIG THE EDUCATED SOLDIER
John Terraine

Published by Leo Cooper Ltd, 190 Shaftesbury Avenue, London, WC2H 8JL — Price £12.95
ISBN 0 85052 7627

EVEN the professional soldier finds it difficult to be objective about the First World War. The sacrifices were so great, and, in many battles, the gains so meagre, that there is an understandable desire to look for scapegoats. Faced with the need to attribute blame, it is all too easy to characterize the First World War commanders as unfeeling incompetents. However, as John Terraine's recently re-issued book *Douglas Haig The Educated Soldier* makes clear, there is — unfortunately — no easy route to victory in modern war.

By the time that Douglas Haig had become the Commander-in-Chief of the British Forces in France in December 1915, the industrial might of Germany, France and Britain had been mobilised for war; the battle front had become rigid, continuous and heavily fortified; and the vulnerability of the attacking infantryman to barbed wire, artillery bombardment and machine gun fire had been well established. In such circumstances, the military requirement was not too difficult to define: to create a gap in the enemy's defences through which reserves, in sufficient numbers and with sufficient mobility, could be deployed to achieve operationally decisive results. This requirement, as those who have read Fuller's book *Memoirs of an Unconventional Soldier* will know, was most clearly described in a short paper called *The Manuscript in Red Ink*, which was written in 1916 by Captain F H E Townshend, a Sapper officer. However, when he wrote his paper, neither Townshend nor Fuller, one of the most imaginative officers in the Army, knew how this simple requirement was to be met.

In *Douglas Haig The Educated Soldier*, John Terraine suggests that the means to achieve operational success was probably not available to Douglas Haig until 1918 when he was able to deploy the Mark V tank and the Whippet on the battlefield. Thus, when the Allies attacked prior to 1918, it was always, in John Terraine's words, open to the Germans "to make a small withdrawal, nullifying the whole advantage gained, and forcing the whole process to be endlessly repeated". Whilst it is often argued that Haig was wrong to continue to launch offensive operations in such circumstances, there were, as John Terraine's book makes clear, remarkably few alternatives: defensive operations on their own were hardly likely to produce victory. Furthermore, as the Gallipoli Campaign had shown in 1915, even the "indirect approach" was no guarantee against the horrors of trench warfare and heavy casualties.

Although John Terraine has written a rather kind biography of Douglas Haig, in which Haig is probably given greater credit for imagination and political honesty than he deserves, *Douglas Haig The Educated Soldier*, is nevertheless, an important book. It attempts — unlike other more polemic works on the First World War — to show the pressures under which 20th Century military commanders, particularly those fighting alongside allies, must operate. Indeed, John Terraine's book confirms, with a wealth of analysis and detail, the truth of Clausewitz's dictum that "in strategy everything is very simple, but not on that account very easy".

SCG

IT NEVER SNOWS IN SEPTEMBER
Robert J Kershaw

Published by The Crowood Press, Gipsey Lane, Swindon, Wilts SN6 6DQ — Price £25
ISBN 1852233508

It Never Snows In September by Major, now Lieutenant Colonel Robert J Kershaw, is a remarkable book by almost any standards. The title is taken from the remarks of a German artillery officer based in Arnhem on 17 September 1944 who looked up into the clear skies, hardly believing what he saw. White "snowflakes" appeared to hang in the air. 'That cannot be' he thought, 'It never snows in September! They must be parachutists.'.

The book tells the story of the German view of Operation *Market Garden* and the Battle of Arnhem in September 1944. Lieutenant Colonel Kershaw is a serving officer in the Parachute Regiment with a degree in history from Reading University. He is a fluent German speaker who attended the German General Staff course at the Fuehrungs Akademie in Hamburg. It was during a tour as an infantry

instructor at the Bundeswehr Infantry, Airborne and Mountain School that he carried out much of the original research for this book.

There have been many books written about the Allied Airborne Operation to outflank the German West Wall the most famous being Cornelius Ryan's *A Bridge Too Far* but nothing has been published on the German perspective. As a result of this one-sided approach many myths have proliferated some such as, "the British would have succeeded had they dropped closer to the Arnhem Bridge", have almost become accepted as fact. Robert Kershaw's exceptional work succeeds in debunking many of these simplistic solutions in a most creditable way.

The book is thoroughly researched and brings to light a host of material and photographs that have not been seen before. Much of his material is drawn from the diaries of German soldiers who took part in the action. However the book seeks to be more than a history of personal experiences and attempts to cover all aspects of the operation tracking German units in retreat from France to Holland and dealing with the overall German operational plan. It is the vastness of Kershaw's project coupled with the incredible detail that he has included about the many German units involved that make the book a momentous achievement of historical analysis spiced with personal anecdote. Kershaw has produced an excellent reference book as well as many more interesting stories of human endeavour. As a result it is not a book easily skimmed through. It needs digesting in chunks.

The publishers are to be congratulated for producing a book that is original in layout. I have long missed the excellent maps that used to grace earlier military history books. Crowood Press and Kershaw have produced a book which is a cross between a novel and a coffee table product. The maps and photographs are of exceptional quality, my only criticism being that I would have liked some of them to have folded out (as in books of old) to prevent having to turn back pages whilst reading at the same time.

Kershaw leads the reader from the German retreat from France through to a portrait of the German soldier in Holland. No matter how much you know about the fighting qualities of the German soldiers in World War Two you cannot but be amazed at the speed of reaction to events, the ability to improvise and to coordinate *ad hoc* units in battle that make the German Army of that period unique in military history.

"Generalleutenant Kurt Chill had suffered heavy losses with his 85 Division in France ... on 4 September, his troops were ordered to the Rhineland for rest and reinforcement. The fall of Brussels, however, prompted him to disregard this order. Instead, on his own initiative, he disposed his troops along the northern bank of the Albert Canal between Massenhove and Kwaadmechelen. Reception centres were set up at the bridges between his sectors to pick up small groups of German soldiers fleeing northwards ... Now more or less a cohesive battle group... It was sufficiently strong to repel the first British forays against the canal."

Kershaw deals with Arnhem in the context of what was going on in the whole area of operations. He leads the reader through every stage of the operation from the German perspective. Readers of the RE *Journal* will be pleased to know that German engineers feature strongly as rugged fighters in many parts of the book. Every statement, every fact is meticulously documented; every move is covered by a map and there are appendices that give the breakdown of every German formation by date with details of personnel and equipment. He has 19 pages at the end of the book covering sources used and notes on the text.

This book is a major contribution to military history and is strongly recommended for all who are interested in the art of war. Robert Kershaw has demonstrated that he is a military historian of considerable talent. This is his first book, I very much hope that it is not his last.

RM

SO MANY BRIDGES
Ned Petty

Published by the Walcot Press, 12 St Mary's Gardens, London SE11 4 UD — Price £3.95
ISBN 0 9516082 0 7

NED Petty joined the Corps as a Sapper in 1939 and ended the war as a Sergeant with the MM, something he does not even allude to in these modest memoirs, sub-titled *One Sapper's War*. After enlistment and a couple of days at Chatham he was posted without any uniform, let alone training, to 244 Field Company, a Territorial unit in 53rd Welsh Division and commanded by Major Heseltine (father of Michael). Training seems to have been sporadic in those early days, with shortages of everything, and it was nearly a year before he fired his rifle for the first time! However, by 1944 they considered

themselves well trained, with all the right equipment and ready for the invasion of Europe.

The author spent the whole war with the same unit and his account of their activities from Normandy to Hamburg is very much a worm's eye view. It is a shade parochial, but that is war at the lower level. In fact, it is a very ordinary story, and none the worse for that — it fills in the gaps that military historians tend to ignore. He talks of prodding for mines, of snipers, of being shelled, of leave in Brussels and many other day-to-day activities. Some of his stories are rather naive and the book could have done with a bit of editing — there is rather too much of the "I think" and "I believe" but, this apart, it is a very readable story, of interest to all ranks. It is of particular interest to those who have ever served in 53rd Welsh Division and also The Royal Monmouthshire Royal Engineers (Militia) where 108 Field Squadron (TA) have inherited the mantle of 244 Field Company.

GLC

THE ECONOMICS OF DEFENCE POLICY
Keith Hartley

Published by Pergamon Press, Headington Hill Hall, Oxford OX3 OBW — Price £25
ISBN 008 0336256

KEITH Hartley, who holds a chair of Economics at the University of York, is well known for his work on the economics of defence. This book is a short and unassuming primer to the whole field of defence policy-making as seen through an economist's spectacles. Choice and efficiency are its central concerns. Hartley explains the types of questions raised by economists when studying defence so as to show how economic analysis can be used to answer these questions and hence to provide a critique and evaluation of existing policies over a wide field. The book was finished toward the end of 1989, too soon to take account of such developments as the collapse of the Warsaw Pact, the unification of Germany, the transformation of NATO, the CFE Treaty, the emerging pan-European security regime, Options for Change, the Gulf War and the implosion of the Soviet Union. While economists have much to say about all of these, the book loses little from having come too early for them. The issues which Hartley discusses are of abiding relevance and he handles them in a way which survives short term dislocation.

Beginning with a general analysis of defence economics Hartley derives five "principles" for evaluating defence policy options: outputs, substitution, rivalry, self-interest and incrementalism. These are perhaps not so much principles as useful headings under which to evaluate particular issues. Hartley applies these analytical tools to issues of budgeting and defence expenditure, political and public choice, procurement policy and standardisation, the UK Defence Industrial Base and International projects and finally the political economy of Arms Control.

The book is simply and clearly written, amply referenced and well indexed. This reviewer found no inaccuracies and only one omission — failure to label the co-ordinates of the graph on page 65, rendering it all but unintelligible. It is indeed a wider criticism that, to one unversed in economic theory, the graphs are mostly difficult to grasp and are perhaps the only part of the book which a general reader would find obscure. Hartley's attachment to free market economics is unconcealed; in one interesting short section on the Defence Industrial Base entitled *Questions for Policy Makers* he states bluntly: "A free trade and free market approach will lead to an efficient procurement policy and will maximise GDP". In the defence context this produces an inverse relation between "protection" in the market sense and the resulting national "protection" purchased thereby. But if this principle is now regarded as axiomatic why is it still so much honoured in the breach — for instance in the Common Agricultural Policy of the EEC?

Hartley's book is an interesting and meticulous introduction to an aspect of defence policy-making which no one who takes it seriously can afford to neglect. It should be compulsory reading for all on first posting to the MOD. Turnover is such that this alone would secure it a lucrative, if scarcely free market!

WGHB

MILITARY ARCHITECTURE
The Art of Defence From Earliest Times To The Atlantic Wall
Quentin Hughes

Published by Beaufort Publishing Ltd, PO Box 22, Liphook, Hampshire GU30 7PJ — Price £25
ISBN 1 85512 008 9

THE urge to build fortresses and castles seems to be as old as man; it is the very urge to survive. The

proliferation of forts, particularly after the introduction of gunpowder was a phenomenon comparable to the appearance of the cathedrals in terms of the resources of money, materials and manpower required. Their execution called for skills in design, planning, workmanship and organisation that are rare enough today, we can only marvel at how it all came about. The best brains of the day were employed. Leonardo and Durer were both first and foremost military engineers it seems, and Michelangelo was also involved in this art. The subtleties of line, angle, curve and profile necessary to counter enemy weapons and tactics also resulted in structures pleasing to the eye and of impressive grandeur. The forms often made successful and attractive dwellings for the rich and powerful. Where the threat of attack was of less concern such as in England at Lulworth or Hurstmonceaux, and in France in the Loire chateaux, some concessions to creature comforts and a few flights of aesthetic fancy were required.

Later, more powerful weapons called for sterner measures and the arrival of iron and concrete led to structures to which it is difficult to attribute much aesthetic worth. Impressive they may have been, even majestic (the adjective applied to the *gros-ouvrage* of Sainte Agnes in the Maginot Line) but never beautiful.

All this we discover in Dr Quentin Hughes magnificent book *Military Architecture*. Students of the subject will be familiar with the version published in 1974. This new edition contains all the material of the original to which has been added about a third more text including an extra chapter *The Return of the Tower* and many new illustrations. It has been produced in a slightly more generous format, which benefits the layout. One must not be mislead by the title. The term "military architecture" in this book is limited to fortifications. No mention of barracks, hospitals or other military accommodation will be found.

The book is something of a compendium; not really easy for the uninitiated to read from cover to cover without tending to be overwhelmed by the vast size and complexity of the subject. It is however lavishly illustrated with photographs and diagrams supporting the text. Eight pages of glossary, also with diagrams, help the reader through the technical language which, as the author warns us, is inescapable in any discussion of the subject. Machicolation, mantlets, merlons and moyenaus hold no more mystery; redans, remblais, retirade and rondels are all revealed.

Despite all this the author modestly claims "this small book merely touches the fringe of the subject and can be no more than a meagre introduction to military architecture". As a former Professor of Architecture at the Royal University of Malta and Reader in Architecture at Liverpool University, with an adventurous wartime in special operations in his early career, he writes with some authority. Meagre introduction or not the average reader would be dull indeed not to be stimulated by the clarity of the analysis or to obtain vastly more enjoyment from a casual visit to a castle or fort with the benefit of this book. For the serious student this must be the definitive foundation book from which to move on to wider fields and it does not take long to grasp just how wide those are.

GWAN

THE PRACTICE OF CONSTRUCTION MANAGEMENT
Second Edition
Barry Fryer

Published by BSP Professional Books, A Division of Blackwell Scientific Publications Ltd, Osney Mead, Oxford, OX2 0EL — Price £12.95
ISBN 0 632 02827 0

THIS book concentrates on the variety of management philosophies and techniques which apply to the construction industry. However it must be said that the majority of the book is equally applicable to many other endeavours requiring management expertise. It is not a project management guide, although elements of project management techniques are covered along with personnel management, corporate planning, problem solving and decision making to name but a few. By its wide coverage of management activities the book is a very useful guide and reference to those in management at all levels and quite obviously of particular value, but not exclusively so, to those involved in the construction field.

In reading the book I could not help feel that it has a lot of useful guidance for those trying to grapple with new management strategy and for those yet to be convinced that the Army is in anyway a business. Certainly those involved in staff and command responsibilities away from regimental duty will find useful parallels between the world of construction management and the corporate world

of defence today. Of particular relevance is the Chapter on Managing Change!

The Chapter on Health and Safety is a useful guide through this potential minefield. Barry Fryer outlines the legal aspects in simple terms and describes the particular areas of construction activity historically susceptible to accidents. He also explains the role of the Health and Safety Executive as well as that of the employer and the employee.

All round a comprehensive and very readable book on a significant subject for Royal Engineers.

WMD

SAND, WIND AND WAR
Brigadier Ralph Bagnold

Published by The University of Arizona Press, 1230 N Park Ave, Suite 102, Tucson, Arizona 85719 — Price $29.95
ISBN 0 8165 1211 6

MANY explorers feel that the real force that drives them on is curiosity. Usually the urge is strong enough to stimulate the active steps needed to satisfy this craving. Ralph Bagnold was no exception and it was the burning desire to discover the reason why and how things worked that led him into a life of adventure and discovery.

His achievements were remarkable, all the more so, as he had little formal scientific education. He freely admits that he did not take his degree course very seriously and rather sought to enjoy Cambridge, making up for three lost years spent as a Sapper Officer in the trenches and mud of the Western Front.

However, all the time his inquiring mind was developing and leading him to pursue new quests with enormous energy and determination.

His book tells a fascinating tale of a life of travel and excitement. We are taken from Childhood (What made my toys work?) to the Shop, Flanders, Passchendale and Ypres, where, single handed he crawled out through the morass of mud and blood to push a bangalore torpedo into a German machine gun post then returning to his own lines, detonated the device with his exploder.

Bagnold's keen powers of observation pop up on every page, whether it is dealing with ghostly foot falls on Dartmoor, climbing Kilimanjaro, observing a total eclipse of the sun in Hokkaido or pursuing his favourite study of the movement of sand. This fascination with the desert led him to write his authoritative work *The Physics of Blown Sand and Desert Dunes*, still one of the most well regarded books on the subject. When he began the research in 1935, he could hardly have guessed that his findings would be called on by NASA to interpret data on the sands of Mars — and later lead him to become a Fellow of the Royal Society.

Early in the war, Ralph Bagnold's unique knowledge of the desert attracted Wavell's attention and thus he became the founder of the Long Range Desert Group that was to pin down thousands of enemy troops and play a significant part in the allied victory in Libya.

We follow him on as a civilian whose expertise was eagerly sought by oil companies and governments and in later years, as he travelled to the Arctic or, at the age of 70, through the raging rapids of the Grand Canyon. Even when he died at 94, his active mind was still seeking new answers.

His initiative and humour are clearly evident throughout this remarkable book. My only regret is that his tempting asides are so short — if only he could have written more. However, he writes clearly and it is not difficult to imagine the results of many of his encounters and experiences.

Sand, Wind and War is the life story of an explorer, an engineer, a traveller, a scientist and a brave man — and a Sapper of whom the Corps may be proud.

JNBS

FESTING — FIELD MARSHAL
Lyall Wilkes

Published by The Book Guild Ltd, 25 High Street, Lewes, Sussex., Price — £9.50
ISBN 086332 532 7

THIS book is sub-titled *A Study of Front Line Frankie* — he must be wincing in his grave at the description, surely conjured up by some enthusiastic journalist? Soldiers, in your reviewer's experience, just don't use expressions like this and it tends to put one off reading any further. This would be a mistake, as this slim volume is a joy to read.

The author describes his book as 'a study', but in fact it is little more than a vignette: an affectionate portrait of an unusual and engaging man. Festing was certainly a 'character', more at home in the country, or with soldiers in the field, than in the corridors of Whitehall. He was an exceptional Brigade Commander in Madagascar, an excellent Divisional Commander in Burma, though there

were better, and a somewhat eccentric Commander-in-Chief after the war. The author's efforts to persuade one that he was a great soldier are, however unconvincing; in no way can he rank 'alongside the other giants of the immediate post-war period, Slim, Templer, Montgomery', as the 'blurb' on the cover asserts. One has to ask oneself what impact did he make on the post-war Army? What will he be remembered for?

Nevertheless, this is a very readable book and perhaps one day someone might be tempted to write a serious biography of this relatively little known soldier. After all it is not every General who chases snipers with his walking stick, who spends most of his time away from his Command because 'I do not like this part of England', who was the only non-Japanese ever to be elected to membership of the Japanese Sword Society, who went to mass almost every day of his life. He used to say that 99 per cent of the jobs in this world are boring and boring people do them best! There would be no shortage of material for the aspiring biographer, and it would be fascinating story, but a great soldier? Sadly, no, but this little book would surely whet his appetite. Do read it.

GLC

December 1990 *Journal* Awards

THE Publications Committee announces the following awards for articles of special merit published in the December 1990 *Journal:*

OPERATION VANTAGE
by Major General E Fursdon — **£60**
THE BAOR CLOSE SUPPORT ENGINEER TRIAL
by Colonel P J Russell-Jones — **£50**
BEST PRACTICE IN TRAINING
by Brigadier K J Drewienkiewicz — **£40**
A WATERCOLOUR FROM ABYSSINIA 1868
by Stephen Bell Esq — **£30**
BEAM ME UP SCOTTY! OR AT LEAST LOOK! HERE I AM!
THE MILITARY APPLICATIONS OF A HAND-HELD NAVIGATION DEVICE
By Major J F Prain — **£20**

April 1991 *Journal* Awards

THE Publications Committee announces the following awards for articles of special merit published in the April 1991 *Journal:*

SANITATION IN THE SAND AND OTHER TALES
by Major J M Heron — **£60**
THE TESTING AND VALIDATION OF COMBAT ENGINEER TRAINING
by Major I G Hitchcock — **£60**
CHINK
by General Sir Charles Richardson — **£40**
THE CHALLENGE OF THE MOUNT PLEASANT COMPLEX SWIMMING POOL
by Lieut Colonel C E Zimmermann — **£40**
A FAREWELL TO DHARAN, THE END OF AN ERA
by Major J T Yerbury — **£40**
THE ROYAL ENGINEERS IN THE BRITISH FORCES ARABIAN PENINSULA AND THE MIDDLE EAST COMMAND 1958-1967
by Brigadier H W Baldwin — Special Award — **£100**

50th Anniversary Articles

The Editor of the Journal would be pleased to received further articles from anyone who took part in World War Two, with a view to their publication on or near to the 50th Anniversary of the events described. We are now considering, in particular, the events of December 1941 — April 1942 but acccounts of later events are always welcome as they can be kept for publication in the appropriate issue.

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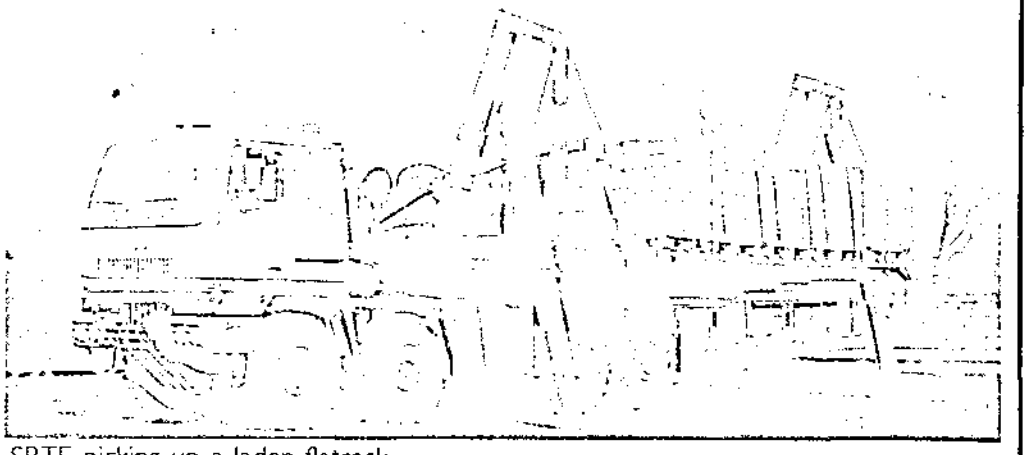

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