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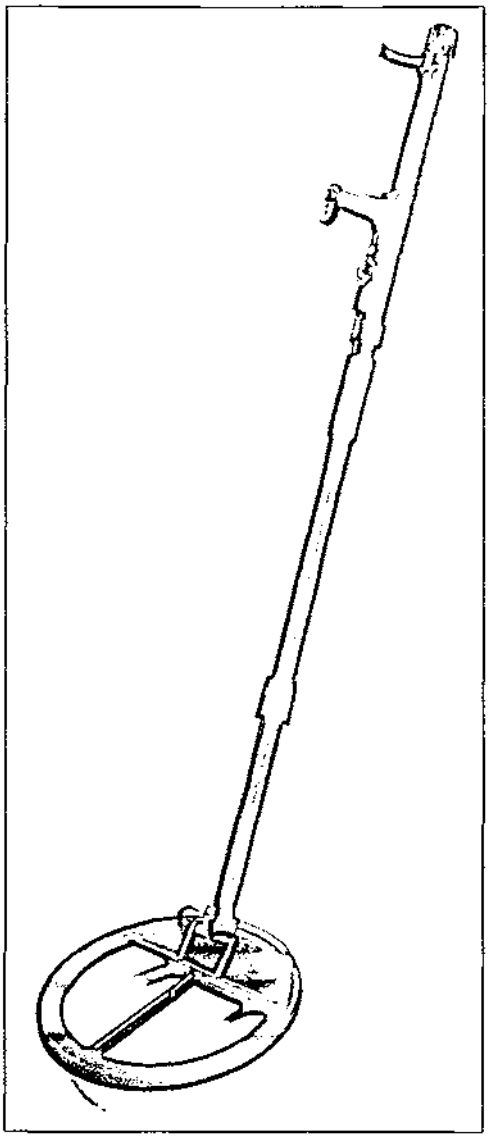

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Subject. Articles should have some military engineering connection but this can be fairly tenuous, especially if an article is well written and interesting.

Length. Approximately 4500 words plus illustrations.

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

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

Computers. Articles submitted on 3½in discs, or through the e-mail (see bottom opposite page for address), are very welcome. Please ensure that text is typed with no formatting, ie LH justified only, and please **NO** caps-only headings – all upper and lower case.

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

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

Rewards can be generous. The Publications Committee has about £350 in prize money to allot for each issue plus valuable annual prizes. All authors receive £20 to help cover costs.

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

Contributions should reach the Editor by:

9 February for the April 1998 issue
Early June for the August 1998 issue
Early October for the December 1998 issue

Submissions before the deadline are particularly welcome.

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Editorial

As many readers will know, the Institution has been conducting a review of its role. The report of the working party, which took account of the comments from members in response to the notice in the August 1997 *Supplement*, was taken by the Council at its meeting in November. A digest of the report will be published in the April 1998 issue of the *Journal*.

The high standard of articles in the *Journal* is frequently commented on by the Publications Committee and by many members of the Institution, both serving and retired. It is all credit to those who write them, for which everyone can be thankful. The correspondence section is now beginning to fill out reflecting an increase in thought-provoking articles, which after all is one of the main purposes of the *Journal*.

The theme of landmines continues. *Frankenstein's Monster* traces the historical use of mines whilst a letter in the correspondence section reflects a more contemporary view. As this is such an important subject, I hope others will be prompted to contribute to the debate.

Old Chestnuts Tossed Across The Pond comes from a past chief instructor at the Royal School of Military Engineering and reinforces the importance and primacy of management, and not technical expertise, in engineering project work. The new President of the Institution of Civil Engineers, Sir Alan Cockshaw, emphasized this point recently in his inaugural address and went on to stress the importance of what he called the holistic approach to engineering, of examining a concept in whole-life terms from every angle with all interested parties contributing in partnership, and to apply value engineering techniques to achieve quality results. This can only be achieved by good, innovative management practice in which, in this day and age, computer technology plays such an an important part.

For the increasing number of members who are becoming computer literate, *Daughters of Leo* may help to steer you away from potential problems which can catch out the unwary, and could point you in the right direction for your first or next computer buy. And if you think you are too old to start now, let me tell you that the author of the article is over 80 years old!

The shift in focus from combat engineering to construction engineering has been much in evidence in recent years. Lest we not forget our combat engineering role, *The Close Support Engineer Squadron and Batus Training – A Squadron Commander's Perspective* reminds us of the importance of battle procedures and battle communications in war-fighting operations. It is ironic that the only training ground used for formation level exercises by British Army units is now in Poland, a former Warsaw Pact country.

Potable water has often been a critical commodity in campaigns fought by the British Army. *Hi-Tech Stockings – Membranes in Drinking Water Production* gives an insight into the latest technology used by the Sappers to purify water. With critical water shortages forecast in parts of the UK, future developments in membrane technology may well have more widespread application in commercial production in the future.

The 250th Anniversary of Military Survey has been marked by several events including the granting of the title "Royal" to the School of Military Survey, the granting of the Freedom of Newbury to the Corps and the presentation of the Royal Geographic Society Medal to Military Survey. *Geographic Support to the Armed Forces – Military Survey's 250-Year History* is a tribute to this most important and increasingly high-tech branch of the Corps.

There are several historical articles which you will enjoy. *A Belgium Spring* is a good read, which like any good story must be read through from beginning to end. I would also draw your attention to *Ironbridge – First Structure of the Mechanical Age*. If art and engineering seem strange bedfellows, this article may persuade you otherwise.

I wish you all good reading. Have a very merry Christmas and a happy New Year.

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Opinions are an author's own and do not necessarily reflect the policy and views, official or otherwise, of the Corps or the MOD.

Frankenstein's Monster

MIKE CROLL

Mike Croll had a brief career in the Royal Engineers. He served with 38 (Berlin) Field Squadron and 33 Engineer Regiment (EOD). His last tour was as 21 EOD Squadron's Operations Officer in postwar Kuwait. Since leaving the Corps in 1991 he has led mine clearance projects in Cambodia, Afghanistan, Bosnia and Mozambique on behalf of the Halo Trust and the United Nations. He is currently writing a book on the history of land-mines.

THE much publicized debate over anti-personnel (AP) mines has revolved around moral and doctrinal arguments. Neither arms control protagonists nor supporters of AP mines have used historical sources to support their cases, partly because little has been recorded. The reasons for the lack of literature on AP mines are perhaps threefold. Firstly, defensive successes have been consistently under-reported. Secondly, mines have been considered something of a secret weapon and as such the dissemination of information about them has been limited. Lastly, AP mines are traps set by the cunning and initiated by the imprudent, neither of which are publicized with pride. There is no gallantry in mine warfare. This article draws upon seldom-read military literature to present a historical perspective on the use of AP mines.

The technology for producing AP mines has been available since gunpowder was introduced in the 12th Century in China. The Chinese employed gunpowder devices in the 13th Century known as "underground sky soaring thunder." These were charges buried under battlefield banners that were considered trophies by combatants. A captured banner was pulled from the ground initiating the charge and maiming those nearby. In Europe from the 17th Century onwards *fladdermines* were exported from the Dutch town of Heerlen to protect the glacis plates of forts. These were gunpowder charges packed inside a ceramic box with metal fragments mixed in with the clay to create a shrapnel effect. They could be initiated by a powder fuse or by a tripwire mechanism.

During the gunpowder era, the fougasse was occasionally employed as a defensive weapon. It was essentially a crude form of cannon. A hole was dug in the earth, primed with a gunpowder charge and filled with stones. They were initiated with a powder train and could spew the stones to ranges of up to 300m. Fougasse emplacements can still be seen on Malta where they formed an integral part of the island's defence during the 16th and 17th Centuries, and still featured in Royal Engineer field books until the 1920s. The modern Claymore directional fragmentation mine claims its lineage from the fougasse.

Gunpowder mines had two serious limitations. Gunpowder is hygroscopic, (it absorbs moisture from the atmosphere) and without efficient waterproofing soon becomes inert. Additionally, initiation by powder train was notoriously unreliable and defenders could never be confident that their efforts would not literally "fizzle out".

During the American Civil War (1861 to 1865) the technical limitations on the use of gunpowder were largely overcome. Gunpowder

Mike Croll
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remained dry in well-machined containers, electrical initiation was pioneered by Matthew Fontaine Maury and a reliable pressure fuse was invented by Brigadier General Gabriel J Rains. It is no coincidence that both Maury and Rains were Confederates. As the weaker side in the war they used mines both on land and water to compensate against the stronger Union forces.

The first recorded land-mine victim was on 4 May 1862. On a road leading into Yorktown a horse from a detachment of Union cavalry received fatal wounds. Later the same day one Union soldier was killed and three others were injured by mines. That night the Confederates, commanded by Brigadier General Rains, slipped out of the town and made for Richmond but were pursued by Union troops. Slowed by mud on the road Rains ordered more mines to be laid behind them, "... mainly to have a moral effect in checking the advance of the enemy and ... to save our sick...". After initiating several mines the Union forces hesitated and the retreating Confederates reached Richmond safely.

After occupying Yorktown, General George McClellan, Commander of the Union troops declared:

> "... the Rebels have been guilty of the most murderous and barbarous conduct in placing (mines) within the abandoned wells and springs; near flagstaffs, magazines, telegraph offices, in carpet bags, barrels of flour, etc ..."

The incident also caused much discussion amongst the Confederates. Rains was sacked by his commanding officer, General James Longstreet, who claimed the "barbarous" devices were not a "... proper nor effective method of war." Secretary of War George W Randolph eventually vindicated Rains stating that land-mines could be employed in roads to delay pursuit and in front of defenses to repel attack.

The Confederates continued to use land-mines throughout the war to slow General Sherman's relentless advance on the western flank. Sherman operated a savage scorched earth policy burning all buildings and destroying crops in his wake and the Confederates had little compunction about using land-mines. Eventually Sherman half resigned himself to their use:

Sappers disarming S mines – desert campaign 1942.

> "I now decide the (land mine) is justifiable in war in advance of an enemy. But after the adversary has gained the country by fair warlike means ... the case entirely changes. The use of (land mines) in blowing up our cars and the road after they are in our possession is simply malicious. It cannot alter the great problem, but simply makes trouble."

The Royal Engineers also found land-mines a justifiable weapon of war and used them against the Zulus, Sudanese and Boers with varying success. In 1879 Sapper road-building parties in South Africa laid land-mines to protect themselves, and engravings of the day celebrate the destruction of spear-wielding natives. General Gordon was positively gleeful about their use in the Sudan, "... land mines are the thing for defence in the future. We have covered the works with them and they have done much execution." Of the same war a Commander Kingscote wrote "... in warfare against the savage nations, mechanical mines were very useful in fighting the natives." During the Boer War mines were used to protect communications from Boer Commandos. After mining the Blomfontein to Kruger railway, Lieutenant Musgrove reported "... although the line had been injured for eight successive nights before the mines were laid, it was never interfered with after the first explosion."

Mines used by Royal Engineers in the African campaigns were locally manufactured devices with a wooden box containing a slab of guncotton and a

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AP mines inhibit movement – infantry advance behind a Sapper – Tunisia 1943.

detonator. They were initiated using a modified rifle trigger mechanism and buried with the trigger just above the ground or attached to a trip-wire. They were generally unreliable because their mechanisms became choked with earth and sharp eyed "natives" were quick to spot them. A case in point featured Lieutenant Asquith who was asked to lay "treadmines" to cover possible sniping positions overlooking the construction of a fort near Khartoum. Checking the location for mines the following day "... poor Asquith had evidently been on his hands and knees scraping to find the mine, for only his legs from knee to foot were found together untouched." The Sudanese had evidently found and relocated the mine to catch the young officer.

AP mines were used in only very small quantities during the First World War. Opposing armies had little need for them as no man's land was made sufficiently dangerous by the machine-gun and the steel splintering shrapnel shell. AP mines were occasionally used to prevent rapid reoccupation of abandoned positions, although strictly speaking these were booby traps or time delay charges and often incorporated tens or even hundreds of pounds of explosives. The Allied retreat from Gallipoli was covered by such devices:

> "The men in the trenches spent the last day turning every dugout into a death trap and the most innocent looking things into infernal machines. Some dugouts would blow up when the doors opened. Piles of bully beef tins were turned into diabolical engines of destruction. In front of the trenches lay miles of trip mines. Hundreds of rifles lay on top of the parapet, with strings tied to triggers, supporting a tin can into which water from another tin dripped. Really I never thought the British Tommy was capable of such diabolical ingenuity."

In the campaigns for the German colonies in Africa a more open type of warfare prevailed and AP mines were used to slow Allied advances and defend German positions. The Germans used similar devices to those employed by the Royal Engineers in Africa and also developed a more sophisticated mine with dynamite packed into a water pipe initiated by a chemical fuse. South African troops were outraged by the use of mines and on at least one occasion had to be restrained from killing prisoners who had defended their positions with them.

It is frequently stated that AP mines were used to protect anti-tank minefields during the First World War, however there is no evidence to support this. Enemy anti-tank mines were seldom encountered by tanks, and hand breaches in advance of a tank attack were never made. The potential of the mixed minefield was not realized until the 1930s with the Germans producing the necessary hardware.

To protect anti-tank minefields the Germans produced the bounding fragmentation *Schrapnellmine 35* more commonly known as the *S mine*. Produced in 1935, the *S mine* could be initiated by tripwire but more commonly featured a three-pronged pressure fuse. This was the first mass-manufactured AP mine and was capable of spraying shrapnel out to a lethal range of over 50m. It proved very effective; however, due to its metal construction it was easy to locate when electronic detectors were introduced to Allied forces in 1942 and consequently the Germans introduced the *Schutzenmine 42* or *Schu mine* – the ancestor of the ubiquitous PMD[1] wooden box AP mine. It is perhaps curious that this most simple of designs was not introduced before the sophisticated S mine.

During the Second World War the Germans laid perhaps as many as 23 million anti-tank

[1]PMD is a Russian nomenclature. It is a wooden AP pressure mine.

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mines and 12 million AP mines. The latter in particular "... took on a fiendish character in the minds of Allied soldiers." An American account related that when the Germans opened fire on minefield breaching parties:

> "... some men elected to remain erect through the intensive fire rather than risk falling on a mine. Nothing was feared more than mines, they were insidious, treacherous things ..."

"A double-edged weapon." Mines from the author's collection.

The folly of not including AP mines in anti-tank minefields was discovered by the Eighth Army in North Africa. "Mine marshes" that could not be covered by fire, were laid in between defensive strong points. German tank crews were able to dismount and walk in front of their tanks to clear lanes without fear of incident. German methods of mine-laying were much more effective. In March 1943, 201 Guards Brigade, attacking a German position at Medine in Tunisia, " ... arrive(d) in fine order – their vehicles clean, the men properly dressed and the convoy discipline perfect. Hundreds of guardsmen were killed or wounded in the attack, mainly by anti personnel mines, and the success signal fired by those who reached the objective only served to bring the supporting carriers onto the anti tank mines." A German report from the Eastern Front in 1943 stated: "Heavy casualties were inflicted on strong enemy assault units which entered the minefield. Even when the position of the minefield became known, and although the terrain was favourable, the Russians did not resume their attacks either with tanks or with infantry, so that our infantry enjoyed a substantial respite. This success is ascribed exclusively to the effect of mines."

The American General McNair was shocked to discover that the mine "... had become almost a new arm of warfare." The Allies found that "... mine warfare was perhaps the most serious training deficit. The prewar armies failed to anticipate or realize the great tactical importance of mines and booby traps." By 1945 around 20 per cent of vehicle and 5 per cent of personnel casualties had been attributed to mines. The land-mine had come of age and has featured in every subsequent conflict.

In the Korean war Lieutenant Starobin of the US Army Engineers noted that "... mines are a double-edged weapon. Properly used they are a strong instrument of defense. Improperly used they are a menace." He further stated that out of 120,000 mines laid by the Americans only 20,000 were recorded, "I have seen a large number of our own tanks and trucks destroyed by our own mines." Major Crawford of the American Korean Military Advisory Group reported some significant success with mines. "On one of the defended AP fields we accounted for 113 enemy casualties in a two-hour night attack." During the war American casualties from mines were 1.65 per cent (305) killed and 3.32 per cent (2401) injured including an unknown proportion who trod on "friendly" mines.

In Vietnam the Vietcong "... successfully substituted mines and booby traps for tanks and artillery." The use of mines prevented the use of roads and hindered off-road operations; by the end of the war they had accounted for 70 per cent of vehicle and 20 per cent of personnel casualties. Mine warfare entered a new age; the weaker side was able to use mines offensively to disrupt, delay and inhibit a vastly superior American force.

In the past two decades "small wars" in underdeveloped countries have featured the large scale use of AP mines. Their utility in combat is difficult to quantify but their postwar effects have been well publicized, returning an estimated 26,000 casualties worldwide each year. As most of the "small wars" were (and still are eg Afganistan, Rwanda) fought mainly on foot, one can assume that AP

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mines provided a significant level of defence in many situations. Indeed, Muslim enclaves in Bosnia manufactured their own AP mines as one of their few options for stabilizing front lines, and AP mines in Mozambique and Cambodia may have made the difference between life and death for many vulnerable communities. In the Falklands highly motivated British units were able to run through minefields accepting casualties. Had the Argentineans employed bounding fragmentation mines, the Battle of Mount Longdon may have had a different ending.

The Iraqi minefields on the Kuwait border that were breached so easily might have afforded many benefits to Saddam Hussain's forces. The use of mines forced the coalition armies to purchase and train on specialist clearance equipment, dictated the start line and produced the classic channelling effect by compelling armour to advance through narrow breaches. Had the Iraqi army been capable, after six weeks of aerial bombardment, of covering their minefields with fire, the losses imposed on coalition armies may have been considerable. Mines do not win wars any more than mortars or exocet missiles do. They are weapons of attrition, grinding down an attacker and demanding the use of additional manpower and resources to meet the challenge. To use a couple of military maxims: "... the defenders' chances of success are directly proportional to fortification strength... " and "... any attacker willing to pay the price can always penetrate the strongest defenses." A 1983 Royal Armament Research and Development Establishment report claimed "... the experience of mines since World War Two has been limited and in general confirmed the importance of mines as major anti-armour and anti-personnel weapons which cause casualties, affect morale and reduce mobility."

Any defensive utility imparted by mines, however, has now been overshadowed by the increasing awareness of the indiscriminate deaths caused by redundant mines. The problem was foreseen as early as September 1953 by Major Purser. Writing in the *Journal*, he asked "How easy is it going to be to recover our own mines?" after enemy activity, vegetation growth and hardening of the soil. In 1965 a Royal Engineers' committee on the future of mine warfare stated that "... self sterilization is desirable for AP mines, particularly in limited war, for ease of clearance." But, despite the experience of massive clearance operations after the Second World War, and the vision to appreciate future difficulties, no practical measures were taken to mitigate the dangers of redundant mines.

The development of mine systems without an effective clearance solution is now viewed as unacceptable and AP mines are an easy and appropriate target for arms control lobbyists. Mines have always been controversial, insidious weapons, but they have also been the economy weapon of the weak seeking to impose high attrition rates on their attackers. Whilst many countries enjoying peace support a ban on AP mines, those that consider war a real possibility: Israel, India, Pakistan, Iraq, Iran, Russia, Korea, China and the USA, resist a total ban. From this we can conclude that only by removing the circumstances in which mines are used – namely war – can mines be eliminated altogether. Like Doctor Frankenstein, the military have created a monster that cannot be controlled.

A Tale from Waziristan

BRIGADIER R A LINDSELL MC MA FIEE

WAZIRISTAN lies west of the River Indus along the frontier of Afghanistan, in what is now Pakistan. It formed the southern part of the tribal territories, comprising a belt some 250 miles from north to south and approximately 75 miles in width, which in the prewar years constituted a buffer zone between the North West Frontier Province of India and the so called Durand Line, the political frontier between India and Afghanistan. In this area there was no direct government control, no taxes, no post or telegraph, no public works and no schools, control being exercised by the Indian Army under the direction of political agents, appointed by the Government of India in Delhi. Local tribes were permitted to control their traditional areas with virtually no interference, provided that they did not harass settled areas along the Indus or interfere with well established trade routes.

The Army was based in three main camps within this area, each garrison consisting of a self-supporting brigade group. These camps were completely isolated from settled India, surrounded by wire and mud walls, and supplied at irregular intervals by motorized convoys along a single approach road. Life was simple and spartan – no women were permitted and recreation was limited to the area around the camp perimeter. A tour of duty was for two years, mitigated only by the grant of three months annual leave. It was to one of these garrisons, Wana, that I was posted as a young subaltern in the summer of 1938.

In the event of tribal wrong doing, the garrison at the behest of the political agent, would sally forth "on operations" to show the flag in the tribal area concerned and sometimes to destroy the fortified dwelling of the chief or headman. Since there were no roads in the tribal hinterlands, such forays were conducted entirely on foot with mules carrying the equipment, rations and stores.

At this time a well-known dissident, the Fakir of Ipi, was attempting to unite the tribes in an anti-British uprising and consequently we were called out on operations on several occasions. On one such occasion we approached a particularly forbidding area, where the rough track which we were following ran between towering cliffs, pock-marked with caves from which the dissident tribesmen opened a desultory fire on our forward patrols. These tribesmen were, for the most part, excellent shots but, apart from a few stolen British rifles, they were armed with locally manufactured weapons of dubious accuracy. Our object was to pass through this defile and into the valley beyond before nightfall and, whilst the infantry scaled the heights on either side, I was told to reconnoitre the track to ensure that it was passable for the mule column. I clambered up a rocky hillock, which appeared to offer a good view of the defile, accompanied by a young gunner officer and his two Madrassi signallers, who intended to establish an observation post among the rocks on the summit to support the infantry with fire from the mountain howitzers. These were the famous "screw guns", which could be rapidly dismantled into mule loads. We established ourselves beneath an overhanging rock face and, having satisfied myself about the feasibility of the track, I sat back to watch developments from this splendid natural grandstand. It was then I noticed that the second signaller who was not required to operate the radio set, was busy writing with chalk on the rear wall of our shelter. As he continued apparently oblivious of the military activity, I became increasingly intrigued. Eventually he was called forward to take his turn at the radio and I slipped back to see what he had been doing. I do not know what I expected to find – some mindless doodling or obscene graffiti or a sketch of a Hindu god or a message in an incomprehensible Southern Indian script. It was none of these, which I saw before me, for set in surrounding scrollwork, patiently drawn with his tapered chalk piece, I read the eternal message:

"God is Love".

A Belgian Spring

DONALD F COOPER OBE

The author enlisted in the Royal Engineers in May 1939 and served in the 48th and 4th Infantry Divisions in Europe and the UK until late 1941. He was wounded in the retreat to Dunkirk. From January 1942 until April 1946 he served with HQRE 1 Airborne Division in the UK, North Africa, Italy, Arnhem and Norway, leaving the service as a warrant officer.

Pursuing a commercial career he became a company director and later managed his own consultancy company, operating in the oil and gas industry within Europe and South East Asia. He was President of the Chartered Institute of Purchasing in 1972 and President of the International Federation of Purchasing 1979 to 1981.

He was appointed OBE (Civil) in 1978. In 1982 the King of Thailand appointed him to be Commander of the Order of the Crown of Thailand and in 1991 to be Commander of the Order of the White Elephant.

AFTER a war, and with the benefit of 20/20 hindsight, the critical student of history will realize that wars per se are mostly lost by one side rather than won by the other. The cock-ups which post-war analysis exposes appear monumental although they were obviously not apparent to the participants at the time. They are seen to be made by the good and the great not only from highly imperfect knowledge but also from imperfect judgement. Yet the good and the great see little of the peculiar incidents which win or lose battles and, with them, wars.

It is most unlikely that any student of the events of the spring of 1940 will ever have heard of my Belgian lady. She appeared early in the evening of 17 May walking briskly towards the bridge that we had prepared for demolition. She was a redhead, about five feet seven inches tall, well-structured, attractive rather than beautiful and very smartly dressed. Her requirement was straightforward: she wished to cross the bridge to the far bank where her family – a husband and two children – lived. Seemingly it was a very reasonable request. But was she genuine? For two or three days there had been rumours of spies. Was she crossing the bridge to make contact with approaching German forces? She looked too attractive for such a venture but so, I have been told, was Mata Hari. The prevailing rumour that night was that spies were frequently dressed as nuns. From her walk and from the cut of her jib she was certainly no nun.

The infantry platoon commander from 10 Infantry Brigade who was protecting the sapper demolition party, refused to allow her to cross. She argued with him, at first quietly, then loudly and very soon, hysterically. The young infantry commander, hardly out of his 'teens, quite properly maintained his refusal.

Neither is it likely that the student of history has heard of Fred Hoath, then a Regular Army reservist reluctantly recalled to the colours in the last few days of his time. He was a sapper and one of the bridge demolition party. Hoath knew more about explosives than most of us present that evening.

On that day, I had only a mere nineteen and a half years to my credit. Looking back now, more than five and a half decades later, I still retain a sense of curiosity over that apparently unimportant incident.

My leisurely peacetime training at Chatham throughout the summer of 1939 had been rudely interrupted by Prime Minister Chamberlain's announcement, on 3 September, of war with Germany. The RE training battalion had been hurriedly moved from the presumed air-attack area of Chatham to the peace and quiet of Ripon. Training took on a new urgency and at the end of October I joined 225 Field Company RE, a TA

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unit seemingly made up mostly of employees of the Dunlop Rubber Company in Birmingham. It was perhaps typical of some TA units mobilized at that time. To the new recruit it appeared that company directors became officers, managers became non-commissioned officers and the remainder became sappers and drivers. Military skills and experience played only a small part in the selection process. The company was in the process of being strengthened by an intake of young regular soldiers from the training battalions and from reservists who were being recalled to the colours. Because of its background the TA element brought into the unit a higher degree of trade skills than would usually have been available to a regular army field company, but offsetting this was a shortage of military skills.

At the end of December 1939 we were in France as part of 48 South Midland Division and established in half-built wireless studios in the town of Fécamp. The good news was that it had a roof: the bad was that it had neither windows nor doors and the temperature at night was a long way below freezing point. Within a few days it had become customary for many of us to repair to a local café at five o'clock in the morning for coffee and cognac. It was at one such session that I met Fred Hoath.

Hoath, a quiet man, had seen service in Palestine. He now saw something else: that few if any of the territorials in the unit we had joined had any practical training in the use of explosives. Over pre-dawn café-cognacs we exchanged information, he from a limited practice he had in earlier service overseas and I offering the latest theory being taught at Chatham and Ripon. Latest? Well, it had not changed much since the 1914-18 war. We – Hoath, me, and a number of regulars and reservists – came to an understanding that if demolitions became the job of the day, we would endeavour to work together and keep well clear of the untrained "Terriers". It was, of course, an arrogant attitude to adopt – possibly brought about by a larger than usual cognac that morning.

225 Company moved from time to time, each move taking it nearer to the Belgian border. We spent two weeks in the river city of Caudebec-en-Caux and admired its magnificent church, a gem of ecclesiastical architecture. We spent three awful weeks in the coal and steel town of Les Asturies: here, even at midday, it was difficult to see the sun for thick yellow smoke. The whole unit was ill with throats and lungs inflamed from the vile sulphurous atmosphere. Our issue of medical equipment had not then arrived and the medical orderly was only able to offer bandages or the notorious "number nines", neither particularly useful in the circumstances.

At the end of January we had reached the city of Lille where we were reasonably-well housed in its north-western suburb of La Madéleine. On 10 February 1940, 225 Company was transferred to 4 Infantry Divisional Engineers under the command of Lieutenant Colonel Coxwell-Rogers[1]. In exchange, 9 Field Company was transferred to strengthen 48 Division RE.

From La Madéleine we spent every day of the week extending the French defences. The famous, or perhaps infamous, "Maginot Line" of fortresses stopped short at the Belgian border. The Belgian government had protested at the line being built behind its border, thus implying that Belgium was up for grabs – provided that France was protected. Now the British Army, and particularly the Corps of Royal Engineers, was building a series of pill-boxes and other fortifications which it was hoped would contain the might of the German Army when it rolled west, as it surely would.

In April, the so-called "phoney" war came to an abrupt end. The German army and navy attacked Norway, Hitler having already made a pact with Stalin to divide Poland. Russia then attacked Finland and the company was withdrawn from the Belgian frontier to prepare to move to Scandinavia in some role or other. Delays frustrated the move and, on 10 May 1940, the German Army attacked Belgium and France through the old battlefield of the Sedan Gap. At the same time it attacked Holland across the bridge at Maastricht, and moved with ease into Denmark. That night we packed our operational equipment into lorries and twenty-four hours later we headed north-east into Belgium.

It would have been helpful if someone had told us where we were going and what was expected of us: but these were pre-Montgomery-style days. There was no-one yet to stand on a vehicle bonnet and talk common-sense directly to the troops. The ordinary soldier was not brought into the briefing sphere as he would be in the years ahead. The old 1914-1918 attitudes still reigned and our only sense that all was not well was reflected in the thousands of refugees fleeing for safety in the opposite direction to that in which we were heading.

[1] Major General N A Coxwell-Rogers CB CBE DSO.

There is little sadder in wartime than the plight of refugees, whatever their nationality. They are always the very old, the mothers, the disabled and the very young, collected in family or even village groups, a pitiful cart or barrow of belongings representing the whole of their assets after years of toil. They stare helplessly at passing troops. They hated our very presence and yet were hopeful that there might be scraps of food to spare. There usually were: fighting troops are more generous than life-long civilian neighbours.

Our first information of an approaching task was on 15 May upon our arrival alongside the Willebroek-Brussels-Charleroi canal in the general area of Vilvorde. The forward British infantry was expected to withdraw across the canal: there might be troop blockages on the few bridges which would make tempting targets for enemy aircraft. That evening and all through the night a 225 section, led by Lieutenant W J "Jock" Inglis but working under command of 7 Field Company, was engaged in building 90ft of small box girder bridge across canal barges. The positioning of the barges was made easy by the almost zero flow of the canal. It was to be Jock Inglis' last job with the company. He was already seriously ill and almost immediately evacuated with pleurisy.

We had barely finished when the first of our own troops retreated across the bridge and took up defensive positions along the near bank. All of that day the flow continued across both the newly constructed canal bridge and bridges within Brussels. With the late afternoon came fresh instructions: prepare all bridges across the canal for demolition – including the small box girder bridge which we had just built. It had already served its purpose.

With a Territorial lance-sergeant in charge, Fred Hoath and a small group of reservists and young regulars, including me, were sent to a major bridge not far from the centre of the city. It looked as solid as a rock. It was about 80ft wide and had a span of 80 to 90ft. The bridge was constructed of reinforced concrete with arched reinforced concrete ribs; tramlines were embedded within granite setts and tarmacadam and it was bounded by concrete parapet walls. The lance-sergeant was a wise man. He knew little if anything about explosives, but his industrial background ensured that he understood the basic principles of management. He immediately delegated the task of placing the explosives to those of us who had experience or training in their use – or at least thought we had – while he organized compressors, sundry tools and supplies of material. He also established good operational relations with the infantry.

It was no good any one of us kidding ourselves: not one was competent to make the calculations of how much explosive would be essential to drop this bridge, or preferably to drop the near half of it. It was going to be a by-guess-and-by-God job. There were helpful physical features within the bridge structure. Large and easily accessible service chambers were sited at the near spring of the bridge and these ran from pavement to pavement immediately under the arched roadway rib members. With Hoath in the lead, we attacked the ribs with guncotton. Huge quantities of ammonal were packed into sandbags under the concrete fabric of the roadway. On the surface, two compressors were chattering away at the setts to expose all of the tramlines immediately above the service chambers. The thump of pickaxes added to the noise on the road above our heads. The tramlines were then packed with guncotton. A single-slab riser of guncotton was fixed and sandbagged against each parapet wall. Someone calculated that well over 100 man-hours were taken up in preparation through the night of 16/17 May.

A lorry delivering explosives broke down. There was no time to re-load its surplus explosives and commonsense determined they should not be allowed to fall into enemy hands. As an added feature to the non-calculated charges, the lorry was manhandled down a slip-road to the canal towpath beneath the bridge. The whole gamut was electrically circuited and the lorry tied into the system. As a precaution, a number of key points were provided with safety fuse detonation to cover against the risk of electrical failure. It has been recorded that over 900 pounds of guncotton and 1500 pounds of ammonal were used. I suspect that there was probably as much again in the broken down lorry.

Fear of infiltration by German parachutists ensured that the 10 Infantry Brigade cordon around us was tight. All pedestrian traffic across the bridge had long since been stopped. We waited. Our last instruction had been to blow, or at least attempt to blow, at the first sign of enemy activity on the far bank. Small arms fire on that side was increasing and we gained the impression of tank encroachment. Time passed and the Belgian redhead now made her appearance; her request to cross the bridge was refused.

Everything then happened at once. About what in other circumstances might have been breakfast-time,

a young officer from the company hurtled up on a motorcycle, shouting that the bridge should have been blown an hour earlier. We raced back to the well-guarded electrical exploder and the built-in stand-by. The wire, which had deliberately been left unconnected to prevent any misfire, was wound around the terminal and the knurled nut tightened. The infantry cordon scampered back from the canal positions. The whirr of the hastily pressed exploder-plunger screamed at us.

Suddenly the whole of the bridge area was hidden in dust as the blast and the noise hit us. Huge lumps of concrete and masonry together with a shower of granite setts rained down upon neighbouring streets. A 10 Infantry Brigade soldier only 20yds away from the exploder was killed outright when a granite sett, which had been hurled high over a block of property, struck him on the head.

We had overdone it. The bridge had completely disappeared. A great semi-circular hollow had replaced the near bank-seat. A host of three and four-storey buildings adjacent to the bridge had also been wrecked and every street around was full of debris and shattered glass. The infantry took it all in its stride and re-grouped in positions along the canal side.

There was no time for an inquest on the performance. A demolition team was wanted at once about a mile along the canal for field-of-fire clearance work. When Hoath and I arrived, the infantry commander explained his problem. From a forward position in a brickyard he had a perfectly good field of fire but there were some twenty or more barges tied-up on the canal immediately in front of his position. They were below the level of the bank and therefore out of continuous observation. The enemy might be able to use them to harass his positions. They were to be sunk or otherwise removed – and quickly.

We had a look at the contents. Many were full of corn of some sort, others had seed and two were full of reddish-brown powder. They would not be difficult. We dug down through the seed and the corn with ease, placed two or three slabs of guncotton on the bottom of the barge, ran about 2ft of safety fuse up through the product itself and then shovelled part of it back on the charge. The safety fuse was lit and we climbed on to the next barge to deal with that while the first was holed and sinking. There was a problem with one or two of the barges as the corn caught fire and blazed merrily until the canal water got the upper hand. The reddish powder was obviously going to be more difficult. Digging a small hole through it proved of no use: it kept back-filling. We were also short of safety fuse. We strapped two slabs of guncotton on the outside of the barge, just above the waterline, slipped in a primer, detonator and the remaining few inches of fuse and ambled back to our guarded storage point to re-stock.

We had travelled only about 20yds when the most almighty explosion hit us from behind and scattered bricks all around the yard. Hoath and I were blown flat on our faces and when we looked up we saw the infantry company commander picking himself up off the ground. In expressions which might be termed to be brief, colourful and which covered both our parentage and IQ – or, more accurately, the lack of both – he pointed out that our results were not entirely what he had in mind. We went with him back to the canal to inspect the barges. That was a waste of time as there were no barges in sight. The reddish powder, which we now assumed to have been fertilizer, had gone, complete with both barges: others containing corn products which had been tied to them were in splinters in the canal. The task had been completed most effectively and expeditiously, even if in a manner not strictly intended. We took our leave, returned to 225 HQ and reported completion. There seemed to be no merit in going into details.

That night we moved again, back the way we had come and crossed to the west bank of the Escaut Canal. It was now a question of slowing down the German advance. The three days, 21, 22 and 23 May were spent on road cratering with an occasional night clearance task. We were frequently on the move.

The cratering was fairly routine: a pneumatic drill, if we were lucky, or an earth auger, a few pounds of ammonal, primer, detonator and safety fuse and the result – a nice big hole in the road, or rather where the road had been. A new hazard entered into these operations: hedge-hopping German fighters. It is all very well to be popping detonators into primers set in the explosive, but a machine-gun spray at the same time raised the excitement level. Fortunately, most French country roads have deep ditches and the dry spring made them a comfortable home-from-home for a few minutes when necessary.

By now the *blitzkrieg*, as it came to be called, was at full throttle. Over 120 German divisions were moving west. Spearheading them was the immense armour and fire-power of ten panzer

divisions which, between them, contained over 1000 heavy tanks. Life was getting more hectic.

More moves and we were back on the Franco-Belgian border at Commines. On that day, 27 May, rumour reached us that the Belgian army was about to surrender. We were on the exposed flank and the character of our war changed. Now we were digging-in as an infantry unit. Small arms fire was increasing. In the early evening the company moved out of prepared positions and advanced with bayonets fixed, seemingly aimlessly, across open countryside. Perhaps typical of the early days of the Second World War, the individual sapper had no firm indication of what was to be the specific objective. No one briefed us. I had advanced only a few yards when I was hit in the ankle and knocked clean off my feet; others also fell. I was dragged back into a ditch, a field dressing was slapped on my ankle and a stretcher appeared from nowhere.

I was unaware at the time, and indeed for decades afterwards, that I had taken part – but only just – in a unique episode in Corps history, the advance of the whole of 4 Divisional Engineers operating as an infantry regiment and pushing the enemy back over the Ypres-Commines Canal.

The Red Cross sister in the casualty reception station had all the appearance of a clean and polished angel straight out of heaven. A quick check of the ankle, a smile, a few words, and I was scheduled for the next available ambulance for the coast.

During the night and not particularly conscious I was taken away by ambulance in the direction of a hospital ship. But there was no hospital ship: it seemed possible as the hours went by that there would be no ship of any sort. At one stage, I and many others were lying in stretchers on the mole at Dunkirk. Later, we were on the sands away from the town.

People came and went. No one seemed to know what was happening. The sound of shelling was now a constant factor and attacks from the air were becoming more numerous. There was a dive-bombing attack but not too close to me.

A much closer dive-bombing seemed to raise our priority. A few of us were put aboard a small boat and we chugged out to a waiting destroyer. Oil-smoke and thick clouds of dust hung over the town behind us. Sailors helped me aboard, half-hopping, half-carried, and there was a partly-sheltered space on deck on which I rested. Many others joined me and we were laid out in rows. Cheery sailors were quick to inform us that all was well as the navy had taken over. A petty-officer and a sailor arrived with mugs of tea. The mugs were obviously multi-purpose vessels as the tea had a thick layer of grease on it and there, in the middle of the tea, was a piece of carrot. But never was there a more welcome drink.

It was a beautiful sunny afternoon in late May. A short journey and soon, as the destroyer slowed and turned, a view that had seemed to be all seascape was filled with white cliffs.

What of the Belgian red-head who insisted on crossing the bridge? As the infantry cordon scampered away, she thought that she saw a chance and decided to make a run for it. Someone yelled at her to come back. She was not even one-third of the way across when I last saw her. She was just another casualty of war and we shall never know who she was. Her family will never know what happened to her. The cruel explosion must have blasted her to pieces.

And what of RE reservist Fred Hoath? He soldiered on and fought his way out of Dunkirk. The following year he volunteered for parachute engineering and we met up again in the newly formed 1 Airborne Division. We went on to serve through North Africa, Sicily and Italy. He became everything that a RE sergeant was expected to be. On 20 September 1944, serving with 1 Parachute Squadron, he was killed in action beside the bridge at Arnhem.

Will the student of war ever be bothered with such detail? Of course not! The bridge was just one of many and the other activities were of minor importance – unless one was directly involved. The critical student will be too busy using his 20/20 hindsight to tell the world how the major battles could or should have been won.

Beware! It Mostly Won't Be All Right On The Night!

COLONEL H A ROLAND-PRICE

After attending the RE Manchester University Short Course in 1945, Hugh Roland-Price was commissioned at Bangalore, India, in early 1947. Posted from there to Malaya for three years, he then served as a captain in various Sapper regimental posts, and attended the Technical Staff Officers' Course at the Royal Military College of Science, Shrivenham. (Highlight in this period was as captain of Sapper rugby XV and beating the Gunners!) Then various regimental, intelligence, and Weapons Staff posts were followed by directing staff at the Royal Military College of Science, senior military officer at the Chemical Defence Establishment, Porton, Senior Officers War Course, Greenwich, and finally a five-year tour in the Ministry of Defence as the Project Manager of all Sapper things that go bang.

Since retiring, he has enjoyed 15 exciting, unpredictable and sometimes lucrative years running an antique shop with his wife, specializing in Georgian and Regency furniture.

In 1947 I was a second lieutenant in the only British field squadron in Malaya (553 Field Squadron). At the start of the year when I joined from the Engineer Officer Training School in Bangalore, India, the squadron was called 5 Field Squadron and had arrived recently from Japan. Then the MOD reorganization started and we were retitled first to 53 then, two days later, to 553 Field Squadron. Another squadron in BAOR was retitled 5 Field Squadron so we were ordered to send them most of our PRI money!

Those were interesting days with much scope for the young officer, and in October 1947 I was delighted to be given an independent task of helping to set up a RAF navigational beam station on the island of Car Nicobar, situated in the Bay of Bengal. With Burma becoming independent, the RAF had lost their Rangoon station, the third reference point offset from the line Ceylon to Singapore. Car Nicobar filled the bill nicely.

The island, which is approximately ten miles by five, is situated between the Nicobar and Adaman islands, miles from civilization. It has glorious sandy beaches and is surrounded by coral reefs. During the war the occupying Japanese built an airstrip and a dirt road running round the island. The local islanders were charming, very helpful and good workers. There was one resident commissioner, a forward-thinking man who had arranged for one of the Japanese army trucks left on the island to be used as a community bus, the remainder to be used for spares. He also calculated that there was sufficient Japanese petrol left behind to last the bus service for 15 years!

GHQ FARELF organized a ship to transport the 200 tons of stores, including two 4½-ton generators and a 3-ton vehicle, from Singapore. As the island had neither jetty nor harbour, the stores were to be ferried ashore by the Sappers, using two DUKWs[1] and a raft made from modified FBE[2] equipment. These essential items were also loaded onto the ship.

Our works party consisted of one officer (me) and 23 other ranks, of which eight travelled with the stores on the ship and were very badly

[1] American produced amphibious lorry which had wheels and a propeller. Designed for beach landings.

[2] A British floating bridge Class 9. Folding boats, transported folded flat, had collapsible fabric sides which were pulled up and kept in place by struts. The boats were spaced apart in the water but linked with a trackway over their centres. They could also be made up as a raft. The boats were designed to be load-bearing when floating but not to be loaded when grounded!

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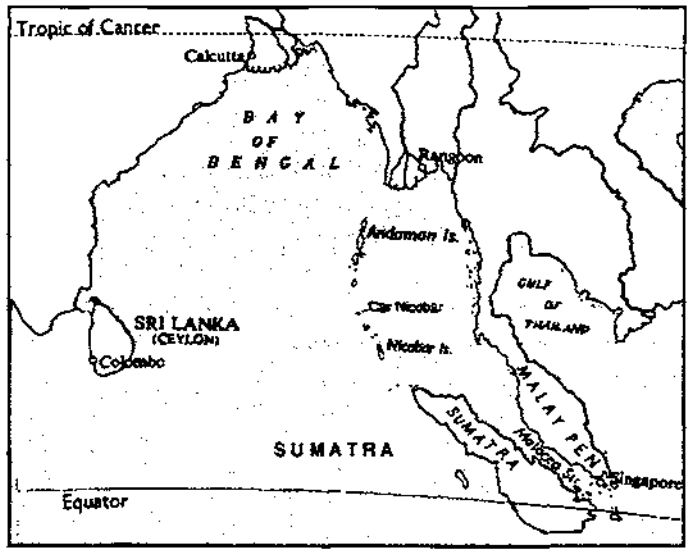
looked after into the bargain. The remainder were flown by RAF Dakota.

GHQ planning was based on the ship anchoring half a mile offshore and we were given 48 hours to unload. That at least was GHQ theory but reality proved to be very different! (Note the estimated figure of 48 hours to unload the ship: after that time the financial threat of demurrage loomed large.)

We had all sorts of panics even before we set out. First, Ordnance thought they had FBE in stock but what they had found turned out to be assault boats; in the end we sent some of our NCOs to hunt them out. Secondly, one of the Royal Army Service Corps DUKW drivers fell sick at the last moment and his replacement Had to be rushed by fast launch to the departing ship just as she was clearing harbour.



Map of area discussed in article.

However, it was when we reached Car Nicobar that it became obvious that the job was not going to be as simple and straightforward as the young second lieutenant had thought. It was a classic example of the maxim "if things can go wrong they will". Here are some of the major snags we had to contend with:

- The ship had to anchor 1½ miles offshore, and therefore not within the shelter of the coral reef.
- Although the weather wasn't particularly bad, there was a considerable swell, up to 10ft around the ship, making unloading far more difficult, dangerous and time-consuming than anticipated.
- There was only a narrow gap through the coral reef, made somewhat tricky to traverse by the numerous cross currents.
- The outboard motors for the FBE raft frequently failed. One Sapper was dedicated to each outboard and was given much individual training on its operation but in spite of this most of the outboards failed on the day.
- The DUKWs also suffered a continuous series of breakdowns. We later found that they had been used on the Operation *Zipper* (Malaya) landings in 1945 and had subsequently been put into depots and stored. They were all graded as Class 3.
- We had been told there would be two 4½-ton generators but in the event there were two 5-ton generators plus a 4½-ton generator. This presented us with an interesting problem. How do you load a 5-ton generator contained in a large wooden packing crate with wooden bearers running across its width onto an adapted FBE raft so that it can be off-loaded onto a sandy beach with minimum difficulty? We wanted to lash scaffolding as rollers onto the FBE raft but the ship's officer would not allow this, he being concerned that the 10ft swell might make the load slip off the raft, for which he would be to blame. So transporting the first 5-ton generator took ages. Timing was vital as it had to arrive on shore at high tide so that the load could be floated to the top of the beach. There was only one daylight high tide; at any other tide time we would be faced with a 5-ton load grounded half way up a wet, soggy beach. The problems of moving it above the high tide mark can be imagined – dragging loads on Somerfeld track is not recommended. Also, on this first trip, we had to find out whether or not an FBE raft with a 5-ton load would be crushed flat when grounded. Fortunately this proved not to be the case. Finally, neither the beach nor the island had anything in the way of mechanical aids, so to get the generator off the FBE raft and 50yds above the high water mark, we needed ropes, wooden rollers (made from local trees) and lots of native help – slow and hard work going back 2000 years! After all the difficulties of this first trip, we talked the ship's officer into allowing us to lash rollers onto the deck of the FBE raft. This was a considerable help.
- Even off-loading the smaller stores did not go according to plan and was hazardous. The ship's winch-operators were inexperienced and reluctant to work long hours. On several occasions part loads

Unloading one 5-ton generator onto beach. Note calm water inside coral reef. (Tackle was to stop generator running away down ramp and digging into the beach.)

fell out of slings onto the raft and we were fortunate to sustain only one minor injury. In the end, the task was completed with no major disasters, but it took five days!

What lessons can be learned from all this?

- The reconnaissance, whenever possible, should be conducted by the individual responsible for completing the task.
- No matter how carefully you try to anticipate problems, you can still fail to pre-plan for all that could go wrong. But then sorting problems out on the spot helps the rapid learning curve.
- Keep a good clear log giving all timings and itemize what went right, what went wrong and why. This will help (perhaps) if there are acrimonious post-mortems.
- For a YO on his own, miles away from anywhere with no-one to turn to for help or advice, an unusual project like this provides invaluable experience. As many have found, it is advantageous to make one's early mistakes "out of sight". Long may this continue to be the case for Sapper YOs.

What happened in the end? Did I have to pay demurrage? No, but I did write a full no holds barred report for the OC. He watered down my highly critical comments regarding the reconnaissance, the unhelpful ship's officers, the unreal estimates, the faulty DUKWs etc, etc and passed it on to GHQ. It must have done the trick because within two months I was promoted to captain and 2IC of the squadron.

May you be as lucky!

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Geographic Support to the Armed Forces – Military Survey's 250-Year History

PETER PARKINSON, British Geographic Liaison Officer in Washington

Peter Parkinson has been with Military Survey since leaving the University of Exeter in the 1960s. His assignments have been varied but with a tendency to focus on the collection and use of geographic data and materials from around the world in line with the Military Survey mission to provide geographic support to the Armed Forces. His work has taken him to many countries. One of his more enjoyable assignments was that of Military Survey liaison officer in the Middle East and Africa in the 1970s, during which time he spent over four years living in Cyprus. He is currently a member of the UK "geospatial" liaison team based in the National Imagery and Mapping Agency (one part of which is the US equivalent of Military Survey), just outside Washington DC.

This article is a reprint of one which appeared in *Surveying World*, September/October 1997. It is published here with the kind permission of the author.

In this brief overview, the author traces the history of British Military Survey from the Jacobite rebellion and William Roy's work in the Highlands to the demise of the Empire and today's internationalist role in places such as Bosnia with NATO and the UN.

"Accurate surveys of a country are universally admitted to be works of great public utility, as affording the surest foundation for almost every kind of improvement in time of peace, and the best means of forming judicious plans of defence against the invasions of an enemy in time of war; in which circumstances their importance usually becomes the most apparent."

Major General William Roy, regarded as the spiritual father of both the British Ordnance and Military Surveys, though he did not live to see the foundation of either.

This year the Directorate of Military Survey celebrates 250 years of geographic support to the Armed Forces. The title "Military Survey" only came into being in World War Two; and armies have been supplied with maps for a lot longer that 250 years; so what is so special about 1747? The answer is that it was the year in which the first ever British military topographic survey of an entire country began.

The Jacobite rebellion gave the Deputy Quartermaster-General the idea for a topographic survey of the Highlands of Scotland and over the next eight years, some 50 surveyors, including William Roy, then a civilian, were involved in detailed ground measurements for a map at the scale of 1:36,000. Much of the "fair drawing" of the 38 map sheets fell to the noted water colour artist, Paul Sandby. By 1752, the Highlands were mostly covered and attention switched to the rest of Scotland but, in 1755, with the approach of what became known as the Seven Years War with France, the soldier-surveyors were withdrawn. The survey was never resumed and Roy's map, now held in the British Library, has never been printed other than as extracts.

Military engineers were busy producing maps during the American revolutionary wars, working directly to the orders of their field commanders. There was no central government authority

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to control or coordinate their activities and, if the surveyors wished to have their maps published, they had to make their own arrangements with publishers like William Faden, back in London.

Working dress of the Sappers and Miners. 1854.

From Hounslow to Paris

The next undertaking of note was the geodetic connection between the observatories of Greenwich and Paris in the 1780s. This was a French proposal readily endorsed by the Royal Society and for which Roy, by now a major general, was given responsibility for the British part of the survey. [See *The Shortest Distance* December 1988 *Journal*.] From the baseline measured on Hounslow Heath in 1784, a network of triangles was extended down to the coast, where Fairlight Head and Dover Castle were chosen as the stations from which to observe across the Channel. For General Roy the logical next step was a national survey to complement the work begun in Scotland 40 years earlier. Sadly, he died before his proposal was realized but it was this vision that led to the establishment of Ordnance Survey and, in a more roundabout way, to the organization we now call Military Survey.

Depot of Military Knowledge

The survey for an accurate national map began in 1791, under the auspices of the Master General of the Board of Ordnance, but that is another story. A separate development was the formation by the Quartermaster-General (QMG), in 1803, of a Depot of Military Knowledge whose task it was to collect topographical information of lands overseas. The depot had a library and a drawing office and, in these respects, may be considered a forerunner to the Military Survey of today.

Spain and Portugal were poorly mapped countries, a fact soon evident to the British troops engaged in the Peninsular War. At the outset, they were wholly dependent on reproductions of local products; for example, the so called "Lopez" maps which were corrected and reprinted by Faden. Though of questionable value, such maps were nevertheless highly prized, and it was said that whenever the effects of a deceased officer were being auctioned off, they would figure prominently in the bidding. With time, however, the Army came to benefit from the topographical studies and sketch maps of the officers of the QMG whose efforts have left us with a splendid series of battlefield maps, many lithographed by the Military Depot. A collection of these, fair-drawn by Captain Thomas Mitchell, who later earned fame as an explorer in Australia, was published by Wyld as an atlas, in 1841. Another legacy from the period is a quarter-inch scale map of central Portugal.

After the Congress of Vienna a long peace settled over Europe. For the embryonic "military survey" this resulted in a kind of oblivion. The QMG's interest in topography waned and the depot found itself without the kind of employment for which it had been formed. Nevertheless, military surveyors were able to keep themselves occupied and two notable achievements from the second quarter of the century were the surveys of Ireland (1824-46), for which three Royal Engineers companies were raised, and of the Levant (1840s). The first resulted in a half-inch scale map series of the whole of Ireland and, the second, in a set of elegant plans of forts in the Near East.

The QMG's neglect of military topography could well have been the Army's undoing. At the start of the Crimean campaign, there was a

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Surveying and marking the 49th Parallel. A twenty-foot wide cutting was made through the forests in order "to mark the boundary in an undisputable manner."

lack of adequate mapping – shades of the Peninsular War all over again. Yet the War Office seemed complacent, despite the petitioning of Major Jervis, from the Survey of India, who wrote to the Foreign Secretary that "Great Britain is the only country of note which has no geographer attached to the government, and no national depot of geographical maps and plans."

Crimean Experience

The Crimea gave Jervis the opportunity to prove his point. He had been pressing the War Office to reproduce two maps he had acquired, one by the Russian General Staff of the Crimea and the other by the Austrians in Turkey. The War Office response was that, if he chose to undertake the work at his own expense, the government would probably buy. Jervis accepted the challenge publishing a ten-sheet map of the Crimea which the War Office did end up buying. With the start of the campaign, the QMG's officers were again active in topographic surveying. One of their number was a Lieutenant Gordon, who won fame and lost his head, in Khartoum, some 30 years later.

Jervis was rewarded, in 1855, with the appointment of Superintendent of the newly formed Topographical and Statistical Depot (TSD). Death allowed him only two years in office but, in that short space of time, he was to prove a powerful advocate of an activity still common in Military Survey, that of gathering maps and topographic information from around the world. It is for this that he is held in special regard in the service.

For the next half century, the work of the TSD reflected the fears and fortunes of the nation. With no major wars to be fought, surveying and map-making tended to revolve around the delineation and protection of the Empire. The result was a rich legacy of exploration and boundary maps, especially of Africa where imperialistic fervour had the Powers scrambling to frame their newly-won territories. Other late 19th Century border surveys of note include Afghanistan-Russia, the 49th parallel between the US and Canada and, not to be omitted as this is 1997, Hong Kong-China.

The Depot also produced a crop of maps to support the various campaigns waged in defence of the Empire, in the Sudan and South Africa. The determination to protect and preserve eventually generated a number of significant map series, including 1:250,000 scale cover of the Cape colony, Kenya, and the Anglo-Egyptian Sudan.

A military surveyor, active in the last quarter of the century, who later earned distinction as a national leader and whose wagging forefinger, in 1914, cajoled a generation to enlist, was Kitchener. He conducted surveys in Palestine (1872 to 1877) for the Palestine Exploration Fund, and in newly annexed Cyprus (1878) for the Colonial Office. Both resulted in first time cover at the scale of one inch to the mile.

In 1904, the work of the TSD was absorbed into the Directorate of Military Operations with the title Topographical Section General Staff. (Five years later this was amended to Geographical Section General Staff; hence the acronym GSGS, still in use today to identify Military Survey products.)

Peter Parkinson
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The Great Survey?

The First World War brought great organizational and technological change. A mere nine surveyors were dispatched with the British Expeditionary Force in 1914. Four years later there were, on the Western Front alone, 5300. The work by RE surveyors, many of whom were drawn from the Ordnance Survey, fell into three categories: support to the Artillery, in which new survey techniques known as "flash spotting" and "sound ranging" were introduced; the preparation of 1:20,000-scale sheets of France to fill gaps in coverage; and the production of trench maps.

Plane tabling and surveying in the Boer War, 1899.

Accurate surveying and map compilation in a theatre of war were new activities. The story is told of the arrest, as a spy, of a surveyor carrying a theodolite. Only a German it was thought would have in his possession such a splendid instrument of science!

There were two other significant developments in World War One, both arising from the advent of the aeroplane. One was the requirement to provide maps for the aviator, a new breed of customer. The other was the availability of aerial photography which was used to add or revise detail on topographic mapping, and also to provide details of trench alignments, hitherto only possible by plane-tabling, a hazardous occupation which earned one RE officer the Military Cross for gallantry.

A similar pattern of activity emerged in the Middle East – mensuration for the Artillery, map compilation (principally at the scale of 1:40,000) and trench mapping. Just as the Ordnance Survey provided valuable support to the European theatre of war, so did the surveys of Egypt (printing) and India (loan of surveyors) in the Middle East.

An important project of the day, involving draughtsmen at the War Office, was the 1:1 million-scale International Map of the World. Experimental sheets were appearing before the First World War and production continued until well after the Second.

Peace and Training

After 1918, all RE units were disbanded with the exception of three pre-war companies which returned to their peacetime role of supporting Ordnance Survey in the national mapping programme and serving as a source of trained survey-

Surveying on the Western Front.

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A tellurometer survey for the mapping programme in the Aden Protectorate in the early 1960s.

ors for any tasks overseas. In the 1930s one of the companies reformed as the training depot with the role of developing mobilization plans and training for war. Overall, this represented a considerable reduction in survey strength, a fact subsequently criticized by Brigadier Clough in his admirable book "Maps and Survey", which covers the Second World War. Clough was to describe it as a "hindrance" at the start of hostilities.

In the between-war period GSGS, or as it was also known, M14, was busy collecting topographic information and producing maps. In 1936, faced with the threat of war, work began on what became known as the "Rearmament" mapping programme. This involved the preparation of sheets at 1:25,000, 1:50,000 and 1:250,000 over northeast France and Belgium. Without the assistance of Ordnance Survey, which tended to be treated as a War Office map factory in times of crisis and intense activity, this major project would not have been possible.

The Second World War

To list even a fraction of what was achieved during the Second World War is beyond the scope of this article. Perhaps I will be excused with the simple observation that they were as widespread as the actual fighting and ranged over three continents. Total output for British Military Survey was unprecedented and will probably never be exceeded.

Two events worthy of mention are the adoption, in 1942, of the title Military Survey and, from the same year, the start of the long and continuing association with the United States following a meeting between Martin Hotine, the first director, and Colonel Loper, Chief of the Intelligence Branch of the US Army Engineers.

The period since the Second World War has been characterized by the preparation of maps associated with the end of the Empire; a growing involvement in international cooperation; and the advent of the digital geographic product.

In considering the end of the Empire we should draw an important distinction between the role of Military Survey and that of the Directorate of Colonial (later Overseas) Survey (DCS/DOS). The DCS/DOS's efforts were based on economic development. Military surveys were conducted in support of anti-terrorist operations, and the result was good quality mapping of territories like Malaya, Kenya, and the Aden Protectorate. After independence, much of this "military" mapping was incorporated into the national topographic series.

GPS survey for NATO in Bosnia.

It is worth recording that since the demise of the Empire, Military Survey has been involved in several overseas mapping projects where there was a whiff of "defence" interest. These include 1:50,000 scale series of Cyprus and Belize, a

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1:100,000 scale series of Oman, and larger scales for Hong Kong and Gibraltar.

Cooperation with other survey and mapping departments around the world and with organizations like NATO and the UN is a clear sign of Military Survey's growing "internationalism". With so many common objectives among nations this makes good sense. A consequence has been the production of well-known medium and small scale aeronautical charts like the Joint Operations Graphics, the Tactical Pilotage Charts and the Operational Navigational Charts. Of late, this production has also come to include digital products, both raster and vector. Another facet of international cooperation is the support Military Survey provides to the UN in the so-called global hotspots. Long experience in mapping countries all over the world has given the service something of an edge in this respect.

Conclusion

We have travelled a long and varied road from the survey of 1747 and it is perhaps fitting that we should conclude with a reference to General William Roy. Regrettably, we have no likeness of the man, no painting with which to adorn this article, but his memory lives on. The City of London saw fit to honour him with one of those characteristic blue plaques, affixed to the wall of what had been his home in Argyll Street. Also, I am pleased to report that his memory is enshrined in that most British of institutions, the public house. Not far from the gates of Military Survey, to the west of London, there is an inn which bears the name of the man commonly regarded as the pre-eminent military scientist of his day. This article is intended as a humble reminder of his legacy, 250 years after the start of his survey of the Highlands of Scotland.

Journal Awards

The Budget, Investments, Membership, Scholarship, Memorial and Publications Committee announces the following awards for articles of special merit published in the August 1997 *Journal*.

Is The Grass Really Greener Over There?
by Major T R Urch – **£100**

Transfer of Sovereignty
by Major P H James – **£75**

Building The Peace
by Colonel J S Field CBE – **£75**

The History of The Future (As We Knew It)
by Warrant Officer Class One C J Mortlock – **£50**

The Engineer and Logistic Staff Corps RE(V)
by Colonel J P Taberner OBE – **£50**

Rabbit's Foot or Reality?
by Brigadier J H Hooper OBE DL – **£50**

GPS and Gravity Survey of Lebanon
by Captain R W Pullman – **£50**

The Close Support Engineer Squadron and BATUS Training
A Squadron Commander's Perspective

MAJOR C R J SLOANE BSc

Major Chris Sloane was commissioned into the Corps in September 1980. The highlight of his early career was his 15 months as OC Pegasus Company Depot Parachute and Airborne Forces. After completing the Australian Command and Staff College he was Chief of Staff 54 (East Anglia) Brigade. Then followed six months as SO1 Plans HQ United Nations Protection Forces in Sarajevo, before assuming command of 37 Field Squadron in October 1995.

I HAVE noticed this before with the Engineers, that they tend to draw the shortest straw the Army is dealing out. Though if it comes to war they are actually out in front of the Infantry and Armour, clearing minefields and breaching obstacles, they are expected to do it with equipment a generation older than anyone else's.

Martin Bell – "In Harm's Way".

INTRODUCTION

THERE is no doubt that the Corps has achieved significant success on operations in Northern Ireland and peace support operations elsewhere. However the Army's training, other than for specific operations, continues to remain focused on warfighting which is potentially the Army's most demanding task. In this area the Corps' performance has been less assured and a subject of constant deliberation and debate. The Gulf War highlighted some of the shortcomings in the Corps' warfighting capability, but it was too short-lived to derive worthwhile lessons at the tactical level. It is therefore primarily through training at the British Army Training Unit Suffield (BATUS) that the Corps, and the Army, has been able to review and develop warfighting doctrine at battle group (BG) level and below. BATUS itself has changed considerably in the past three years since the introduction of tactical engagement simulation (TES) and refinement of the live-firing exercises. In 1996 the engineer order of battle (ORBAT) which consisted of a composite close support troop, itself a unique organization to the Corps, was enhanced to that of a small close support squadron. The logic behind this change was described by Major Peter Francis in his article in the April 1996 *Journal*. This ORBAT provided a basis for the engineer support provided on Exercise *Ulan Eagle 96* in Poland and will again on Exercise *Ulan Eagle 97*. By the end of my tour as OC, I will have completed the full BATUS training cycle twice (1996 and 1997) and deployed on both *Ulan Eagle* exercises.

Major C R J Sloane
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Tank bridge transporter launching 2 x No 12 close support bridge.

The aim of this article is to give an overall perspective on the concept of the close support engineer squadron with particular reference to BATUS. It is not my intention to deal with the manner in which training at BATUS is conducted but rather to cover four key areas: doctrine, training, organization and combat service support, as they relate to the close support squadron and training at BG level. The Corps is not alone in trying to come to terms with warfighting and the training at all levels required to achieve satisfactory competence. Other corps and arms suffer similar problems, particularly in adjusting to the tempo, pace of manoeuvre and inevitable chaos when dealing with a live, manoeuvrist operational force as at BATUS. For everyone the operational commitments, lack of training opportunities and dearth of experience at all levels have had an impact.

Doctrine

Over the past few years the Army has sought to introduce a common doctrine, understood by all and consistent throughout the Army. Unfortunately at BG level there is still a frustrating inconsistency in adherence to doctrine reflected by the variations in secure orders cards and standard (anything but ...) operating instructions, even within the same brigade. This is unacceptable and not what the Army has sought to achieve, which is uniformity in doctrine. As Commander BATUS recently highlighted in the *British Army Review*, compliance with doctrine is essential to the manoeuvrist approach and mission command. The situation is further exacerbated by units' fear of and reluctance to use battle code (BATCO). Hence the squadron has had to deal with ad hoc unit codes such as BREVCO[1], MATCO[2] and the Bundeswehr[3] reporting system. For an engineer squadron liable to switch to any one of four BGs within a brigade, the situation can be confusing. This is not a new difficulty and invariably it is sappers and gunners who are most affected by the lack of consistency. The Corps also has significant gaps in its doctrine which squadrons have overcome through adaptation and modification. Recent updates of engineer doctrine have led to some improvement but much of the revision has been based on circumstances prior to the deployment of the close support squadron to BATUS. It is difficult to make a fair evaluation of existing doctrine when no engineer regiment has had to support its parent brigade with both at full ORBAT, although Exercise *Ulan Eagle 97* will be a fair test. Experience and analysis suggest that the current concept of a two-squadron regiment supporting a four-square brigade is, if not unworkable, then certainly problematic and fraught with many difficulties. Another limitation when evaluating current doctrine is that nearly all training conducted at BG-level focuses almost exclusively on offensive operations. At BATUS, BGs rarely conduct more than one delay or defensive mission during the TES phase. Hence, much of the past debate regarding engineer support to BGs has centred almost exclusively on armoured engineer assets. Even in the Corps there are those who fail to understand that in all phases of war both field and armoured engineers have their place working in concert. Therefore the close support engineer squadron must maintain a balance of both.

Most BG commanders and their staffs know little about sappers and are poor at integrating sappers into the planning process, often excluding the battle group engineer (BGE) from the estimate and recce group. A squadron commander is inevitably better placed to make his voice heard and this has been proven over the past two

[1]Brevity Code.
[2]Matrix Code.
[3]German Army.

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years at BATUS. The command and control of engineers is a contentious issue and confusing to the combat arms. With the introduction of the squadron commander, few battle group commanders fully understand the relationship between the OC, BGE and squadron 2IC. In the close support engineer squadron, the BGE's function changes but is no less important. His role is more that of the engineer operations officer primarily involved in the planning of future operations; acquiring and preparing terrain data; assisting in the production of the IPB (intelligence preparation of the battlefield); maintaining the battlefield damage assessment and acting as a squadron's link into BGHQ. He is not however the key engineer advisor and has no command status within the squadron. A close support squadron, less the BGE, is under tactical command of the BG. Thus a BG CO can only issue the engineer squadron commander tasks, not missions, and cannot task subordinate elements of the squadron. This is critical as BG COs rarely understand how to employ engineers and tend to dissipate assets piecemeal.

Engineer assets should never be penny packeted, and command of these scarce assets should be retained at the highest level possible. Control of a squadron is exercised by the 2IC, an often forgotten figure yet absolutely critical for the smooth running of any squadron. With him rests the responsibility to monitor, manage and control current operations; submit all reports and returns to the regiment; co-ordinate the provision of engineer resources and combat supplies; and deal with the usual myriad of personnel and equipment-related problems. Surprisingly, in describing the command and control of engineers in the division, current doctrine (Tactical Doctrine Note 33) fails to define what is a critical post. The roles of the BGE and 2IC have to be carefully managed otherwise there is a danger that they can run counter to each other. This is especially true if the BG sees the BGE as the primary means of communicating with the squadron rather than through the BG command net.

Communications are always a contentious area. When supporting BGs, squadrons are expected to monitor the regimental secure very high frequency and high frequency (HF) nets and the BG command and engineer nets. Yet the current allocation of radios precludes the squadron from being able to cover all of these. Therefore, when on BG operations, only the BGE can monitor the regimental secure net with the remainder of the squadron monitoring the BG command and engineer nets. Only when static can the squadron 2IC switch to the regimental net. Kipling on HF and Ptarmigan help to minimize the burden and confusion of so many nets. It does work but only just. The RE (ARRC) call sign matrix is totally impracticable. It can only be used on engineer specific nets and requires that a close support squadron use four different call sign indicators using engineer specific BATCO. Concurrently the BG engineer matrix must be used on BG allocated nets but lacks sufficient call signs for a close support squadron. However it does include EOD (explosive ordnance disposal) and amphibious engineers, elements unlikely to be delegated to BG level. Squadrons need a single call sign matrix that can be used by any field, armoured or close support engineer squadron simultaneously on engineer-specific or battle group engineer nets. My squadron like others, has overcome this problem by modifying and expanding the BG engineer matrix to include all squadron elements. Most importantly it works and soldiers have only one simple call sign matrix with a single call sign indicator to remember. Considerable work is now needed to review and develop this idea so that there is greater compatibility in call signs across all engineer specific and BG nets.

Training

Doctrine provides the framework upon which the Army can then formulate its training. If the training is inadequate, poorly formulated, and fails to match doctrine, BGs fail to integrate and achieve the desired collective training standards. The main flaws, repeatedly identified in BATUS, are in the standard of individual training and low-level skills. Under the current system, BGs and squadrons have ample opportunity for special to arm and collective training. Invariably BGs launch too quickly into BG level training at the expense of developing the basic but essential squadron and company low-level skills and drills. Time spent on establishing the basics inevitably reaps considerable benefits when in BATUS.

Engineers are usually proficient in basic military skills but many of our soldiers and officers see mechanized operations as an alien environment. Most would prefer to return to their comfort zone of wheeled and dismounted operations.

AVRE with fascines and CI 70 trackway – pity about the chassis!

Because of this it takes at least six weeks of concerted field training to bring a field squadron with little or no mechanized experience up to an acceptable standard. Coupled with the other skills and drills that have to be learnt, this initial training period is demanding and some junior commanders are overwhelmed by the whole experience. The roles of the troop staff sergeants and section commanders do not change significantly. Their greatest challenge is to adjust to the increased tempo and need for flexibility. It is in the training of troop commanders and recce sergeants, that there are significant shortcomings. Both troop commanders and recce sergeants need to have a comprehensive understanding of the all-arms battle, and the confidence to work directly with other arms; sadly they rarely have these prerequisites. Our problems stem, I believe, from a lack of integration in training across the Army. Where possible we must all adopt a less parochial approach. Troop commanders should, as part of the troop commanders course, complete the tactics/all arms phase of their training with their infantry and cavalry counterparts at Warminster. The benefits to all parties would be immeasurable. The modifications proposed to the Royal Engineer Close Support Troop Commanders course (*Sapper Telegraph* Issue Number 7) in which students will complete a 15-day tactics module with the Armoured Infantry Platoon Commanders and Armoured Troop Leaders courses will go some way to improving the troop commanders all arms education but, in itself, it is not enough.

Similarly the Corps has formally been allocated vacancies on the Close or Armoured Recce NCO Crew Commander courses for 1998/99. It is essential that recce sergeants liable to conduct close support training complete one of these courses, otherwise they are forced to learn and develop their recce skills whilst completing pre-BATUS training, which is a more painful and less effective means of doing so.

Too often recce sergeants lacking experience and recce expertise have been thrust into the close recce role and have failed dismally. This is unacceptable as it undermines the Corps in the eyes of other arms and penalizes an individual through no fault of his own.

My final point regarding training relates to the specific engineer skills of troop commanders and recce sergeants. In BATUS and Poland, troop commanders and recce sergeants have been expected to conduct recces ranging from bridge classification and bridge demolition to water supply. Almost to a man they have proved incapable of producing precise, accurate reports quickly. Instead they are prone to producing lengthy, verbose tomes which are over complex, time consuming to read and largely irrelevant. Clearly they need to know how to produce high quality reports. However they will not always encounter ideal situations where there is ample time, manpower and engineer resources available. Life in the Field Army is very different. Training must also nurture their ability to deal with less than ideal situations and encourage a greater degree of resourcefulness – the ethos of "improvize, adapt and overcome".

Organization

The close support squadron as it exists at BATUS is a unique organization. It has only one armoured and one field troop yet retains the full squadron command structure and much of the echelon. The organization at BATUS has to a degree been driven by the unreliability of engineer equipment, hence the nickname of the "Antiques Roadshow", thereby creating an

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imbalance in the squadron structure. The adage from the Second World War was that three AVLB/AVRE were required to create two crossings (three for two). Sadly, in this age of modern technology this is no longer true; with the current Chieftain chassis it is more like three for one. This places severe limitations on task-organizing the troops and underlines the necessity of never penny packeting engineer assets. Too often this year the scope to support the BG was severely limited by the lack of battleworthy Chieftains. The Chieftains are tired and we cannot afford a delay in procurement of the future engineer tank. It was not uncommon to be down to only one AVRE and one AVLB even before meeting the enemy or an obstacle. As a consequence, the armoured engineer troop now has three AVRE and three AVLB with enhancements in the echelon and a REME fitter section to support these vehicles. With the BA 2000 study, the BATUS close support squadron is being held up as the possible basis for future close support squadron structure. Caution should be exercised in drawing any definitive conclusions from BATUS. It is difficult to define what is the best balance of armoured assets for a close support squadron. After two years of experience my conclusion is that if the squadron is to guarantee a BG two crossings then it needs to have four of each. The question is then, should they be retained in a single armoured troop or should two troops be created with the associated additional vehicles and personnel? I favour the former option particularly as in the field I prefer to task-organize the squadron. The "rule of four" is a fair guiding principle; however one hopes that operational analysis and not financial restrictions determine future squadron structures.

The key lesson is that close support troops, divided into neat packages as was previously employed at BATUS (two each of AVRE, AVLB, combat engineering tractor (CET) and field sections) are not in themselves viable entities. In offensive operations mobility packages have to be thrown together rapidly off the line of march to meet various situations. To do this requires a mix of both armoured and field engineers; they are complementary. Therefore I strongly disagree with the contention that armoured engineer equipment should be handed over to the Armoured Corps (See April 1997 *Journal* article *Royal Engineers or Armoured Corps Engineers*). The Corps must have the ability to offer the full spectrum of support to the Army in all phases of war. Quickly reconfiguring the engineer group off the line of march is complex and requires slick drills. However it is practicable and offers the squadron greater scope and ability to respond quickly. As in defence or delay, engineers will be task-organized in order to achieve best effect with limited assets. In offensive operations the engineer grouping is primarily driven by the BG's order of march but the quality of engineer recce and vehicle serviceability are also critical factors in deciding how best to organize the engineer group.

The squadron is blind and unable to support the BG properly if it lacks prompt, accurate recce data. This comes from both the engineer recce forward and the BG close recce which should also provide a constant stream of information. Additional recce is necessary to cover the BG area to the rear. Therefore in 1997 I employed four recce sergeants, two with close recce and two with the main squadron group, giving me the flexibility and capability to meet most situations. This was achieved by replacing the support troop commander, for whom there is no role, with a recce sergeant. As to where all these recce sergeants are to come from is a moot point. The concept of regimental recce troop is a sound idea but in peace, considering the poor level of recce skills in the Corps, it has limited utility. In reality these individuals should lodge with the field and armoured squadrons. Only then can they gain the training and experience needed.

With the constant reorganization required on operations and need for flexibility, the concept of a support troop in a close support squadron is an anachronism. It is not a viable entity as its assets are inevitably spread across the battlefield. The CETs go forward with the lead elements while the wheeled plant (one medium wheeled tractor and one long wheeled tractor) remain to the rear under the echelon commander's control. This provides the squadron with sufficient plant assets for most tasks it is expected to complete. This proved to be the case in BATUS and on Exercise *Ulan Eagle 96*. My belief is that close support squadrons do not need to hold additional plant. Headquarter Squadron Combat Support Troop should be enhanced in order to have the capability to support squadrons as necessary particularly in defensive and delay battles. To retain the plant currently held by a field squadron makes the

echelon too large and unwieldy, particularly when working directly with a battle group.

Combat service support

Field squadrons are at an immediate disadvantage when taking the lead for BATUS training. They are not configured to maintain Chieftain in the field and lack sufficient logistic assets, particularly unit bulk refuelling equipments. A field squadron has no Chieftain-trained REME personnel and so maintaining the Chieftain fleet is a constant challenge. At BATUS Chieftain tanks represents 16 per cent of the total squadron fleet yet they occupy 75 per cent of REME fitter effort. Field squadrons therefore have to borrow tradesmen from the parent squadron of the armoured engineer troop. The situation is further complicated if the armoured engineer squadron is itself deploying to BATUS before or after the field squadron. The end result is that the field squadron suffers and has a greater number of problems in maintaining its "A" vehicles. BG light aid detachments rarely have any Chieftain-trained tradesmen and those they do have are usually senior ranks who are no longer directly employed in repairing vehicles. However this did not stop the ASM of the Queen's Dragoon Guards BG in BATUS this year, spending an entire night working on an AVLB and reminiscing about the "good old days"! Other elements of the BG were also horrified by the size of the squadron fleet and the paucity of REME fitters. Certainly this year, if the BG had not been so supportive then the squadron would have been unable to maintain its vehicle fleet for the entire BATUS exercise.

The echelon structure is also in need of review. The current vehicle allocation is of the wrong mix and insufficient to meet a squadron's needs. Relying on a mix of 4 and 8-tonne trucks to move engineer equipment and resources at first line is impractical. The Corps needs DROPS at first line as a matter of urgency; this should not be considered as an aspiration but operationally essential. Throughout the past two years on BATUS training and in Poland the squadron and the regiment have consistently been forced to borrow DROPS vehicles in order to have the ability to move engineer resources. The use of DROPS racks simplifies the logistic out load, particularly when establishing squadron forward stores locations and mines dumps. Without this enhancement we will continue to struggle and be ill prepared for our primary role in war. There are other refinements that can be made to improve the effectiveness of the echelon that in the longer term could produce manpower and vehicle savings. Troop G1098 vehicles have only limited utility in a field or close support squadron. They usually remain collocated with the echelon, only moving forward when requested by the field troop which actually carries sufficient G1098 items on their "A" vehicles. Meanwhile armoured troops have such a limited G1098 that they often have to "borrow" from the field troop. Holding an entire squadron's G1098 store centrally, less section and vehicle-issued items, would obviate the need for individual troop G1098 stores. This could be achieved by maintaining the G1098 store in a single ISO container mounted on a 14-tonne truck in the field.

Although not a direct consequence of BATUS, numerous close support exercises in Germany and Poland have highlighted other flaws in the echelon organization. It is not structured to meet the needs of a field squadron engaged on its primary function. Although every troop has a G1098 vehicle the squadron has insufficient lift to carry its mines and explosives, engineer resources and unit replenishment scales. The only alternative is to ground-dump non-essential stores which is difficult, time consuming and impractical when trying to follow a fast moving battle group. Old concepts and ideas which stem from when the former Warsaw Pact countries were perceived to be the threat are no longer valid. Manoeuvre warfare impacts on every element of the Army, even the engineer squadron echelon.

Conclusion

Although this article has highlighted areas of concern regarding engineer training and the concept of the close support squadron at BATUS, I have no doubt that the Corps will strive to redress many of these shortcomings. During 1996, which was the first year when the close support squadron was employed at BATUS, the presence of squadron commanders resulted in a significant improvement in the control and tasking of engineers supporting BGs. A squadron commander is in a better position to establish himself in the BGHQ and have an input into the planning process. However he needs to have a good command team; in particular the BGE must establish himself on an equal par with the BG staff. If the

squadron 2IC and BGE establish an effective partnership then a squadron can cope with whatever the BG throws at it, even at very short notice. Training, organization and combat service support are important factors, however it is doctrine that is the single most critical element, providing the framework upon which the Army can base its organization and training in order to prepare effectively for warfighting. As British doctrine states "Sound doctrine provides a common approach and way of thinking which is not bound by prescriptive rules." Not only must a common doctrine be established, which the Army has sought to achieve, but it must be adhered to in training so that everyone can understand how it should subsequently be applied on the battlefield. This will then lead to common standards and consistency in behaviour, key elements in the application of mission command. Consequently engineer squadrons following a clear, well-defined Corps doctrine can task organize and switch between battle groups and brigades with the confidence and knowledge that the same standards and drills will apply regardless. The challenge that now faces the Corps is to overhaul existing doctrine relating to close support, which is outdated and impractical. Operational analysis and the experiences of squadrons at BATUS over the past two years provide a framework upon which further work can develop concepts. Only then will squadrons have the means by which they can support the rest of the Army as it trains for warfighting.

Daughters of Leo

BRIGADIER JOHN CONSTANT MA EurIng CEng MIEE

Commissioned into the Corps in 1936, on the outbreak of war John Constant served with 7th Armoured Divisional Engineers in Egypt and Libya, where he was captured by the Germans and almost immediately escaped [see The Road to Rome *December 1991* Journal*]. He completed three years in the Middle East, then gravitated to India and Burma, where he was Brigade Major of 89th Indian Infantry Brigade [see* One More River. Some Personal Reminiscences About Burma *April 1995* Journal*]. Postwar, his appointments included secondment to the Arab Legion to raise a regiment there (subsequently being honoured by King Hussein as a Bey, or knight of that realm) and later, CE Middle East Land Forces. In 1967 he lead a team to investigate the feasibility of a channel tunnel [see* The Tunnel – A Feasibility Study, *April 1994* Journal*]. After retiring, he bred cattle in Devon for 27 years, was a director of a major public company, and undertook marketing in Saudi Arabia and China. He has been a Flag Officer of the Royal Thames Yacht Club, Master of the Company of Watermen & Lightermen of the River Thames, and Chairman of the Blythe Sappers.*

As we approach the end of the century, it seems likely that the number of our readers who regularly use computers at work, or at home, may now exceed the number of those who have not yet fallen under the spell, and the trend is likely to grow. This situation is a far cry from that of thirty years ago, when the then Commandant of the RSME was trying desperately to obtain authority for just one computer there, for training purposes. And a decade earlier, when I found myself posted from the role of a combat engineer in command of an arab regiment, to a desk in Whitehall as MI 1 Colonel, I found only one real computer in use in London; it was called "Leo" and owned by "Joe" Lyons, a well-known catering firm, as an experimental system of inventory control and supply, serving a hundred or more cafes and restaurants they owned/managed in the London area. Primitive by modern standards of course, but a useful aid to management as a pointer towards the development of subsequent logistics. To me, its main characteristic was the hundreds, possibly thousands of thermionic valves, all of which created heat and required an extensive cooling system. About that time the invention of the transistor to replace such valves led to many other early computers being developed and I soon found myself on a Treasury Committee with representatives of all the various Intelligence Services. With one of those, I wrote a conceptual paper, "Centref", about the future use of computers as they developed suitably for collation, storage and dissemination of intelligence data for the armed forces. When I was sent to the USA for a tour of their intelligence and signal establishments to discuss such ideas, it happened that I arrived in uniform at New York airport on the very day of the cease-fire at Suez, and the whole of my tour was punctuated by friendly, but searching, questions about the relevant political and strategic issues in the Near East. That general staff appointment in Whitehall led me to become in some way concerned with several other technical and electronic developments such as facsimile (fax). However, after my time there was up, I ceased to have any involvement in such matters until last year, when the family got together and gave me a computer for my 80th birthday. I should mention that my children and grandchildren are spread well around the world and they had a direct interest in my using a computer for e-mail to keep in touch with them. It was a kind thought, much appreciated, but I had to think very carefully about which additional tasks I was likely to use the computer for, in addition to the e-mail facility. Because computers can be utilized as the basis for so many of the household's "office" tasks, I wanted to select one which I could install and use without too much difficulty and which would not be too demanding in operation or in maintenance costs. Writing this article now is an attempt to share those thought processes with others who may be comparably placed and also to comment on the lessons I have learned so far, the main one of which is the reason for the title of this article being in the feminine. By long custom, reference to a ship or a boat is always made in the feminine, and I believe the same courtesy is to be applied to a computer and the train of hardware/software it soon gathers. Wonderful when at its best, I do find that my computer deserves very careful handling, and I do try to be

The author and his computer setup at home.

patient when an error occurs, comforting myself that it can only be due to my own faults. At this stage I should also mention the shock which greets any new computer owner when he/she examines the manuals accompanying each item. Such literature is written in a strange language which resembles English, using as it does a variety of ordinary words; however it turns out to be the jargon of Silicon Valley and can be confusing. The same problem arises on the shelves of most bookshops where the contents of books about computers use similar terms; an exception is the series of training guides by Professor Booth of Huddersfield University and published by Addison Wesley Longman of Harlow, Essex, which are clearly written and comprehensible.

In this article I shall try to avoid technical jargon, (although it is impossible not to use some of the terms which you will inevitably come across) and I presume that readers agree that the basic function of any computer is to provide a service which is reliable and "user friendly". Most new computers for the home PC[1] (personal computer) market are provided with a "package" or "bundle" of software to provide the operating system, eg, "Windows," and programs (sic), for word processing (typing letters or preparing speeches etc), with which you can manipulate text to a very satisfactory degree and add images if desired, and a simple spreadsheet program which can be used to work out the monthly finances or investment progress. There are many additional programs, such as holiday organizers, a diary and calendar, and educational items, as well as hobbies and games.

Once installed, programs do not need to be re-installed each time they are used, and can be removed when so desired. At the time of purchase programs are often pre-installed but if not come with instructions for the installation process.

The computer itself is usually sold together with a monitor (which looks like a television, but has a digital display), a keyboard and a mouse, although all of these can be bought separately if, for instance, you wanted an ergonomic keyboard instead of a standard one, or a larger monitor. Also required is a printer. Usually a small black and white laser or inkjet printer is available with the package or, if not, there are many makes/models available. Just check that the printer and its software are suitable for the computer you have chosen and the dealer should be able to confirm this. There are also machines which print in colour, but the cartridges for these can be expensive, and good colour reproduction, of a photograph for instance, is quite complicated for a beginner to get right, and does not depend on the printer alone. The "mouse" allows the user to move a pointer (which becomes a "cursor" (an "I" shaped visual marker) when used with text) about on the monitor screen, so that "icons" (which are boxes, or small illustrations depicting the contents they control) can be selected by simply "clicking" on the mouse button once the pointer is over the item required (the word "clicking" is used because of the little click which may be heard each time the button on the mouse is depressed and released). Text, or any item on a page within the word processing package, can be amended and changed at will by rolling the mouse along its pad, and using one hand to do the selecting, and clicking once or twice according to the set procedure. Successful operation of the mouse needs a flat pad (called a mouse-mat) with a surface providing enough friction for the ball in the mouse's

[1] PC is the name now generally used to denote an IBM compatible computer, as opposed to an Applemac, which is also a PC but is usually called a Mac or Applemac. *Assist Ed.*

base to be rotated; it can be bought in many different designs and colours (prices from about £3 up).

All new computers now come with a floppy disk and a CD drive. A floppy disk/disc is used to pass a limited amount of information to and from the machine; disks are about 3.5 inches square and the "floppy" bit is enclosed within a hard plastic case; these disks carry up to 1.4 MB (megabytes) of information and are very useful to store copies of important files as a backup in case the original file is inadvertently deleted or lost. A CD (compact disk) drive is used to read disks which look exactly the same as music CDs, but which contain relatively vast amounts of information, hundreds of MBs or even GBs (gigabytes); they often contain reference items such as encyclopedias, atlases, the complete "Oxford English Dictionary", absorbing interactive games and educational items, all at reasonable prices, although the Oxford dictionary is a bit steep at over £200. Again, most new computers for the PC market will include a built-in "modem", which is necessary to connect the computer to a telephone line so that the internet can be accessed; more about this later.

New machines purchased from a reputable dealer will usually have a good warranty period, which can be extended, and provide access to telephone help. Second-hand computers are very cheap to buy, but may have hidden faults; don't let this put you off however, you can learn a lot from an older machine which may help you to make a better choice when the time comes to purchase a new one. Have the machine fully demonstrated and make sure that it comes with all the manuals not only for the hardware (the computer, monitor, keyboard, mouse, and printer if included), but also for any software programs which are installed; you also need to ensure that the system software and program disks are included as separate items. It is not a good idea to purchase a machine which is more than about two to three years old (today, for the beginner, I would not recommend purchasing second-hand equipment which is less than a 486 system for IBM compatibles and a Power PC for the Apple Macintosh with a 604e processor), because computer technology sweeps along at an amazing rate and what is a good machine today is often unable to cope with the requirements of tomorrow, especially if you want to "surf the net" or access the world of the CD. Also, it may not be a good idea to purchase a second-hand machine which has no software installed, because the latest software available for you to buy might not be able to run on it if the machine is older than the 2-3 years suggested. One other word of warning; the RAM (random access memory), within the computer itself is very important to run larger and more complex programs adequately. In my opinion, you cannot have enough of it installed, especially if you want to open more than one file or program at the same time, to use educational videos or to "surf the web", scan coloured pictures and so on. Although extra RAM can be purchased at any time and installed relatively easily in modern machines, if purchasing a new machine do have a minimum of 32 MB installed before you get it home. RAM is sold in modules called SIMMs or DIMMs (Single/Dual Inline Memory Modules) and is usually purchased in pairs – to cut a long story short your dealer will explain the ins and outs of this. Inadequate RAM often causes the machine to slow down or even to "crash", or the screen may "freeze" refusing to work at all. You will then have to switch off completely and restart; this may not sound like too much of a problem but, doing the same thing more than a few times (sometimes even once) can lead to difficulties with the system or program software. Lots of RAM, and a hard-disk with a high processing speed, are important features if you want to start scanning and manipulating photographs, especially coloured ones, although this is something only a few home-users may want to do.

The hard disk should have as much capacity as you can afford – at least 2 GB – and with fast access, ie less than 10 millisecs. Indeed, I have two hard-disks, a 1 and a 2 GB, for backups, instead of using floppies which may not be big enough to store a picture. Second-hand computers will have a floppy disk drive, but will not necessarily have a CD drive or modem built in. These can be purchased separately; just ensure that the drive/modem and its software are suitable for your machine and, for the modem, check with your intended Internet Service Provider (ISP) that they experience no problems with the particular modem you have your eye on. Many computer advertisements show the monitor sitting atop a horizontal computer box, but wherever the monitor is situated, for ergonomic reasons the user should be comfortably seated, with his/her eyes about 40 cm from the screen and at a height level with the top of the screen, which itself should be as big as one can afford, and not less than the so-called 15-inch (37 cm).

You may feel that learning to type is too much of a challenge, but adequate speech recognition software is now becoming available to type up your

words as you speak. However, even the cheapest software for the IBM market (which has a vocabulary of 10-30,000 words depending on which version you purchase and the amount of money you want to spend – £35 to £70 at the lower end and from £400 for the really adequate stuff) will not work on a system less than the 486. It will take dictation at about 100 wpm – this may not sound too fast, but is absolutely faster than any two-fingered efforts! Although the software comes complete with a microphone headset (rather like those you see pilots using) you may have to install a sound-card for IBM machines. For the Apple Macintosh, you must have a Power PC (not a Performa) and the 7.6.1 or later software version of speakable items and, although all Macs come with the ability to carry out spoken commands, and read text to the user, when it comes to the type of software mentioned above there are no cheap versions available.

If you want to connect to the Internet for e-mail or for surfing the world wide web (www), the modem you purchase should be rated at least as 28.8 bps (bits per second), but speeds are creeping up, so choose the fastest on offer (56 bps is now available). The modem (which converts digital electrical signals to analogue or audio ones and vice versa) connects your computer to the telephone line which is used to connect you to the other service you will need, an ISP, to whom you will pay a monthly or a yearly fee for the services provided, usually about £10 or less a month although charges are still dropping; the ISP may also charge a connecting fee and/or a fee for the software required. Choose a server appropriate to the number of hours you are likely to spend on the Internet and make sure the one you choose has local call rates. (Local call rates means that when you want to make use of the services provided by the ISP eg the Internet and www, you will be charged only local call telephone rates by your telephone company.) There is a dilemma in choosing between big and small ISPs, and many beginners feel surer with a large one, with its own internal network; try to avoid accessing the web at those times of day when the server is likely to be deluged with calls, because this slows the whole process down, making your access time longer and more expensive.

I usually start the day by going through to my service provider to check for mail and to acknowledge incoming messages at once. Communication via the Internet is extremely cheap. For instance, if I am sending an e-mail to one of my grandchildren in Mongolia or Australia, once it is typed it will take about ten seconds to open a connection, send the message and close the connection. (Cost: either 10 seconds of the rate charged per minute or no more than the local rate for one minute.) In most cases the e-mail will arrive at its destination within seconds, and wait for the recipients to open their in-box. Compare that with the cost and time taken with envelopes, stamps and going to the letter-box for the conventional "snail mail".

Most computers for the home market are sold with some accessories and many include a pair of loud-speakers, so that music can be played, and the whole system can be used in a "multi-media" role for audio-visual entertainment. Before purchase, it is worth checking that such speakers are of an acoustic standard acceptable to you, if such a role is regarded as being important. If their uses include that of providing a hands-off telephone, in conjunction with a suitable microphone and software, the exact positioning of the speakers is important to avoid resonance. In that mode the system can also be used as an answerphone, but one has to remember to switch it on before going out and, if the situation is expected to last for hours, even for days, the monitor itself can be switched off. One small warning; a computer left connected to the telephone line is open to the hacker, although the likely incidence of this type of intrusion for home users is low; if this is a worry however, very adequate security software is now available.

By the time all the above has been successfully embraced, some owners seek a further dimension by buying an optical scanner, the results of which can usually be reproduced at once by the printer, or sent by fax. If illustrations from books or magazines[2] are to be scanned, a "flatbed" type is essential. Coloured pictures may occupy many megabytes of storage space on the hard disk and, as I mentioned before, printing results depend very much on the scanner, software, printer and paper used. Although some reasonable results can be obtained, high quality results generally require high quality equipment which does not come cheap. For those who want more than the average "dotty" results, some training is best sought, such as is provided on a training video entitled "Scanning", obtainable from Windows Academy, The Pleasaunce, Buckenham Road, Attleborough, Norfolk, NR17 2LZ. This firm sells an excellent range of videos on all topics to do with computing; and, as ever, "a picture's worth a thousand words".

[2] Copyright laws should be observed.

I have one more point to make. Faults do occur both with the hardware and the software, and in spite of all the technical support from the vendors and the service provider, it is a big comfort to have a trusty friend – or a bright grandchild – nearby with whom to discuss the inevitable problems as they occur, and to help put them right. Joining a local computer club can also be beneficial if there is one in your area; and there is always help available on the Internet when you get that far.

I do hope this article is of value to anyone considering the possibility of spending their money on a computer system; it can be daunting for a beginner, but it is a challenge which is really worthwhile. I am willing to hear your views and my e-mail address is: rivercot@eclipse.co.uk.

One point relevent not only to those thinking of purchasing a PC but also to those who already have one, and that is the dreaded "year 2000 (or Y2K) compliance." What *this means* is that some new and many secondhand PCs will not have a calender system which will go beyond midnight 1999; at midnight 1999 the system will simply reset to the year 0000. This is not a problem unless you want to produce say, accounts, for the self-employed, or use a date-reliant database, programme or diary. (Mac owners will not be surprised to hear that Applemacs do not suffer from the Y2K problem.)

Before purchasing a new or secondhand IBM compatible computer have the date system demonstrated. If you already have a computer and you would like to know whether it is Y2K compliant try the following test, but if your computer is used for critical applications, check with the manufacturer first. This same applies to software.

For a PC in private, non-critical "recreational" use:

- Make sure you have a system disk to reboot from and a backup of all essential files.
- Set the clock and date to: 23:55, 31 December 1999 and wait for 10 minutes. Type date, then time. If the date has tripped correctly you will see 1 January 2000 and the correct time.
- If the above test works, power off your PC and leave for an hour, then switch on and check the date again; if it is still 1 January 2000, then your PC's BIOS (basic input/output system) can handle the millenium change.
- If you own a PC which can't handle the change, ask yourself if it <u>really</u> matters? Do you use auto date fields in your word processed documents, or do you want to run a date-reliant database, accounts or wage-calculating package? If "yes", then it does matter. If not, who cares? Your PC will still work! For those connecting/connected to the internet, nothing will change; you will not be refused or disconnected.
- If you need to fix a non-compliant PC, check with the manufacturer or a local supplier or specialist – maybe they can help but apparently it can be a bit tricky, depending on the hardware installed, its age, and the software being used and its age, which means: yes you've guessed, it can also be a bit expensive!

Assist Ed

Contracts Please

MAJOR S P W BOYD BSc CEng MIMechE

Major Steven Boyd's recent experience has been with the Military Works Force, both in the design of construction projects at home and overseas and in Bosnia during Operation Resolute 1. *He is currently a senior instructor at the Construction Engineer School. He is looking forward to returning to the Field Army in his next post as a squadron commander.*

Introduction

Recently there has been much talk about a perceived lack of contract skills within the Royal Engineers. The Corps' lack of effectiveness in this area was clear during *Operation Resolute* and has been identified by many including the EinC(A) in his Development Strategy and in the Robertson Paper.

This article will attempt to establish what we mean by "contracts", identify the situations with which the Corps should be concerned, determine who should be involved in the provision of a contract service, and suggest the training they require.

The Meaning of Contracts

The term "contracts" is often used rather loosely, but we should try to be clear what we mean when it is used. There are three broad circumstances to which it could apply when used by the Corps:

- Agreement for the provision of materials: a purchase.
- Agreement that a variety of materials may be purchased from a list showing fixed prices: an enabling arrangement.
- Agreement for the provision of a service, for example: construction, maintenance, the hire of equipment or labour.

There are a number of Service regulations, which set out procedures for these circumstances, whose detail is outside the scope of this article. However, some important points are:

- Within certain financial limits, all the above circumstances are contracts but can be termed "local purchase" as described in JSP 332.
- In each case separate individuals must hold contractual authority (negotiating, agreeing and amending contracts) and financial authority (approving expenditure).

Under the current Management Strategy, financial authority rests with the chain of command supported by budget officers. Contractual authority is specifically delegated to individuals with appropriate training and experience.

It is clear then that for the Corps' purposes "contracts" means largely the local purchase of material and services. It is also clear that to improve the Corps' effectiveness in this area, we should seek to achieve delegated contractual authority for selected Royal Engineers, and to encourage appropriate delegation of financial authority down the chain of command.

Principles

In seeking to achieve these aims, I believe that there are three broad principles which should be followed and which have shaped this article:

- Separate and parochial regulations for Royal Engineers are unlikely to be successful and the Corps should follow existing Service regulations

Major S P W Boyd
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for local purchase and works. Some minor amendments to these regulations will be necessary.
- The Corps should prepare to fill any number or all of the works and contractual roles described in Service regulations depending on the circumstances.
- Skills required on operations should be practised in peace time.

Minor Works and Maintenance

ENGINEER construction tasks undertaken by the Corps can be broadly divided into minor new works and maintenance, and larger-scale new works. The first of these two categories is covered by Service regulations for property management. There are three main roles in this situation, two of which are normally filled in peace by civilian companies under contract:

- Property Manager (PROM).
- Works Service Manager (WSM) – responsible for procuring materials and services, and completing work, on time, within budget and to quality.
- Establishment Works Consultant (EWC) – provides professional advice to the PROM and inspects new and existing facilities.

Table 1 shows that the Corps currently fills these roles in a number of circumstances and has a structure well placed to suit the regulations. Indeed, in the early days of *Operation Resolute,* before a contractor was engaged to carry out the works manager function, RE squadrons took over this role. Although squadrons had the tradesmen to undertake the work required, progress was impeded by difficulties encountered in procuring materials and services. In order to correct this shortfall, squadrons should have ready access to local purchase under the existing Service regulations. Ideally, this facility should be available at progressively increasing scales at first line (HQ Sqn), 2nd line (Fd Sp Sqn) and 3rd line (Fd Pk Sqn). Concerns that money would be spent without adequate control under such a system would be unfounded if delegated contractual and financial authority are properly separated and if HQ RE had call on suitably trained professionals to monitor expenditure *(See Table 2).* These monitoring skills would normally be provided by the headquarters of one of the major units from MWF collocated with HQ RE to control STsRE working in the divisional area. This was not the case on *Operation Resolute* as no engineer works staff were deployed with HQ RE. Consequently, a military contract management team was deployed to work with the contractor. Subsequently, this situation has changed and on *Operation Lodestar* the Defence Estates Organisation (DEO) also has a representative in theatre.

Some may be concerned to see no mention of the regimental level of command in the descriptions above. However, there is a clear role for commanding officers as holders of delegated financial authority, in prioritizing the work of the HQ squadron including small-scale design activities undertaken by the design cell, and in coordinating the work of squadrons in the works manager function. Civilian companies can carry out these functions in peace time when a single contractor is responsible for a number of related sites each with its own WSM organization, as is the case in Cyprus.

Role	UK Barracks	Airfields	MFS (Works)	Operation Resolute	General war
PROM	QM	OC SSS	QM	QMs	QMs
Works Manager (WSM)	Contractor	Contractor	MES (Works)	Contractor or RE Sqn	RE Sqn or Contractor
Works Advisor (EWC)	Consultant	DCRE	DEO (Works)	Military Contract Management Team	HQ RE

Table 1. Typical property management structures.

Larger Works

LARGER construction works are described by the Service regulations on project management. Construction work of this scale requires a greater number of functions to be carried out to

Level	Financial Authority	Contractual Authority
JHQ	Joint Force Commander advised by Civ Sec	MOD Contracts Officer with engineer advice
Div	GOC advised by Civ Sec	MOD Contracts Officer
	CRE advised by an EO Finance (a new role for operations)	a. PQE on Engr (Works) staff b. Resources Offr in Fd Pk Sqn
Regt	CO advised by RAO	a. Resources Offr/Res Spec in Fd Sp Sqn b. TQM/Res Spec in HQ Sqn
Sqn	OC (limited delegation only)	Clk Wks/MPF attached for specific work

Table 2. Proposed delegation chains.

ensure the final product is to the satisfaction of the client:

- Client: determines the requirement for and funds the works.
- Sponsor: represents the client including monitoring expenditure to achieve value for money.
- Project manager: manages all stages of the works from conception to handover on behalf of the sponsor and co-ordinates the designer and the construction force.
- Planning supervisor: monitors health and safety aspects in accordance with the Construction Design and Management Regulations.
- Designer: designs the works.
- Construction force: procures materials and manages works on site.

These project management functions can be filled by RE organizations as shown in Table 3, with project specific delegations based on Table 2. Special to arm exercises, or construction projects, are a good way to practise Sapper units in the skills necessary for these larger projects. However, it should be noted that the critical interface between the Corps and the wider Army at the client/sponsor level is not widely rehearsed in these exercises. This lack of understanding was further exasperated on *Operation Resolute* by the absence of an experienced G4 Estates officer in the divisional headquarters and the absence of engineer works staff in HQ RE. These problems have been widely identified elsewhere. A second concern with special to arm exercises is that the squadron acting as the construction force is not able to exercise the purchase of materials and services fully. This problem also translated itself to Bosnia with squadrons finding considerable difficulty in obtaining the materials necessary to complete their tasks. Once again this is a local purchase problem which could be solved by access to the function at appropriate levels in the supply chain, properly supervised by the project manager who would form part of the HQ RE engineer works staff on operations.

Role	DEO(Works) Projects	Special to Arm Exercises	Operation Resolute	General war
Client	HQ LAND G4 Estates	HQ LAND G4 Estates	Division G3	Division G4 Estates
Sponsor	DEO (Works)	HQ LAND Engrs	HQ RE	HQ RE
Project Manager	Consultant 1	MWF	HQ RE	HQ RE
Planning Supervisor	Consultant 2	MWF	HQ RE	HQ RE
Designer	Consultant 3	STRE	STRE	STRE
Construction Force	Contractor	RE Sqn	RE Sqn	RE Sqn

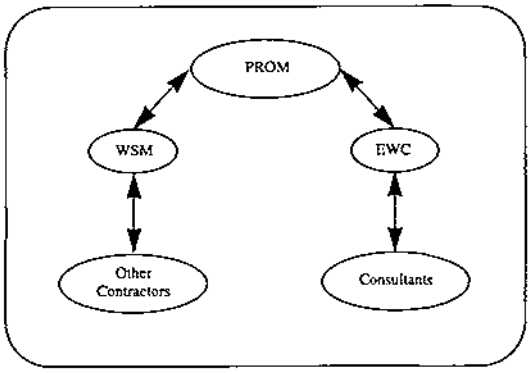
Table 3. Typical project management structures.

There is one exception to the division of responsibilities identified in Table 3 which should be noted. Currently overseas special to arm exercises are not allocated a MWF project manager and the squadron commander, who controls the construction force, also acts as project manager during the site phase of the project. This arrangement is necessary owing to the distances concerned, but should not be considered a model for all large-scale works. Although the arrangement is generally very successful, there have been instances of poor designer/construction force coordination leading to site problems. One of the main roles of the project manager is to ensure that such misunderstandings do not occur.

The Players

I have shown that the Corps' structure is well suited to the existing works regulations and that by proper use of delegated contractual authority and adequate financial delegation at an appropriate level, local purchase of materials and services should be achievable. I will now turn to those who may need to be involved in the process:

- PQEs/GEs should be trained to hold contractual delegation to let and manage works contracts, make agreements for enabling arrangements and equipment hire, and to advise on and monitor expenditure on the local purchase of materials. They would then be well placed to fill EWC and project manager roles and to act effectively as resources officers at 3rd line.
- Resources specialists are trained to hold contractual delegation to make local purchases of materials and minor services such as plant hire. Clerks of work and MPF should have similar training. These NCOs would then be well placed to fulfil essential local purchase roles at squadron level and above.
- Squadron commanders must have an understanding of procedures for property management, project management and local purchase to suit them to manage limited delegated financial authority.
- Brigade and divisional all arms staff must be clear on how Sappers can assist with works without recourse to UK DEO civilian contract staff. Although I have been very clear on the need for the



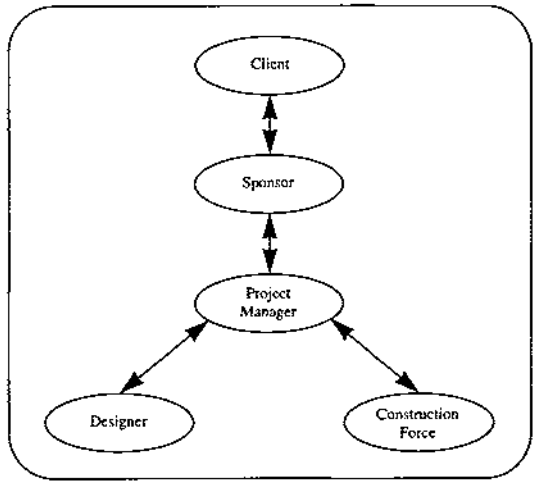
Property management.

Corps to use Service rather than specifically RE regulations, I believe that there is a case for a rewritten JSP 358, "Regulations for Royal Engineer Works Services." The new JSP would not set out separate regulations for works, but should explain how Sappers are organized to suit existing regulations, and importantly set out the responsibilities of all arms staffs in the control of Royal Engineers in this role. This lack of understanding of the Corps' capability was all too apparent during *Operation Resolute* and could usefully be addressed by a clear JSP and an introduction to works in the Staff College programme.

Recognition

THE Corps is appropriately organized for works and those who will need to play a prominent part in local purchase to support this role have been identified. Much of the training necessary to allow local purchase and contractual control is already provided by the Construction Engineer School.

However, all this will be wasted if these skills are not recognized by the appropriate authorities. The training, skills and experience of Royal Engineers must be recognized by Director of



Project management.

Contracts (Army) and his staff if the Corps is to be permitted to carry out its role effectively on operations. All Sappers should be clear that Royal Engineers can manage contracts effectively if permitted to do so. The Corps does have the skills to deal with contracts, but needs experience in this field in peace to prepare for operations.

Conclusions

IN order to improve its contractual effectiveness the Corps should:

- Carry out works under the existing Service regulations, in the two areas they describe.
- Train appropriate individuals to hold delegated financial and contractual authority.
- Persuade the appropriate authorities to recognize Sapper skills.
- Practise the skills required for operations in peace.
- Encourage the appropriate delegation of financial authority down the chain of command.

Ironbridge
First Structure of the Mechanical Age

COLONEL T H E FOULKES BSc(Eng) CEng FIMechE MIoD

Colonel Tom Foulkes, a third generation Sapper, has been lucky enough to follow a career in that region of engineering where the civil and mechanical disciplines converge: military bridging. Educated at Clifton, Sandhurst and Shrivenham, he has commanded the Allied Command Europe Mobile Force (Land) Troop, 1st Field Squadron and 28 Amphibious Engineer Regiment. Since 1980 his staff appointments in Operational Requirements, Procurement Executive and Equipment Support have all revolved around the development of new engineer equipment and bridges. He is currently the Equipment Support Manager at HQ QMG responsible for artillery, engineer and small arms equipment. A keen photographer, he enjoys gardening, history and running. He is also president of Corps football.

In the soft light of dawn, an elegant iron arch rises from the dark floor of the Severn Gorge. This is Coalbrookdale, once heart of Britain's iron founding enterprise and cradle of the Industrial Revolution. Here, where clayband ironstones meet the coal measures, the modern world began.

And this is no ordinary arch; this is the unique and revolutionary span of Ironbridge, the world's first major civil engineering work successfully to use cast iron in compression as its principal structural medium. In rejecting traditional materials and in the originality of its design, Ironbridge stands out as an enduring monument to the ingenuity and intellectual inventiveness of the age of Enlightenment. The breathtaking audacity of its design anticipated the torrent of innovation which subsequently swept through England in the late 18th Century. Conceived more that 200 years ago during the reign of George III, before America declared independence, before Mozart composed *Don Giovanni*, before McAdam perfected the ideal pavement or Aspdin developed Portland cement, the brilliance of its originality still glows with the red heat of genius and illuminates the birthplace of the mechanical age.

Today, the eponymous town of Ironbridge has traded the bedlam of hellish blast furnaces for the quiet gentility of international tourism as a World Heritage site. My first visit there was on one of those soft autumn mornings when pale sunlight filters through mist above the shimmering Severn, and across the river coal smoke rises wistfully from quiet cottage chimneys. But even in the half-light there could be no mistaking the singular silhouette of that graceful five-ribbed arch with its elaborate balustrade mirrored in the river below. As a symbol of heroic materialism, Ironbridge has no peers. Its fusion of beauty and function, engineering and art, sparkles like a dewdrop in the dawn.

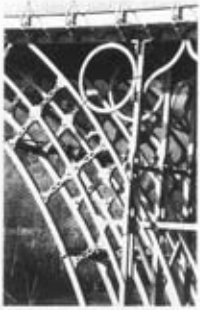
First conceived in 1773 and designed in September 1775 as an advertisement for the skill and versatility of Abraham Darby III's iron foundries, the bridge itself took more than two years to cast and erect. After a false start in the autumn of 1776, work eventually began in November 1777 and, following late completion of approach roads, the new crossing was finally opened to traffic on New Year's Day 1781. Its creator was an unknown Quaker joiner-turned-architect, Thomas Farnolls Pritchard, who collaborated closely with his friend and local

Col T H E Foulkes
Ironbridge (p232)

ironmaster, "Iron Mad" Wilkinson. Appropriately enough, they sited their bold new structure at the Severn Gorge's most dramatic point where the main arch would span more than 30m. Construction took longer than expected and had to be achieved without obstructing the passage of the barges and river traffic on which Coalbrookdale's iron industry and local commerce depended. Consequently, the design team were obliged to experiment with several models and for many months before they finally perfected all the construction techniques needed for an obstruction-free erection process.

Long before completion, Darby realized that the project would provide an extraordinary spectacle and attract large numbers of visitors. Indeed, artists and writers, spies and engineers flocked from all over the world to marvel at "the most incomparable piece of architecture", as the *Shrewsbury Chronicle* put it on 10 July 1779. Darby, a man of highly developed commercial acumen, promoted the project with paintings and engravings in a well orchestrated nationwide media campaign. But the pictures he commissioned showed nothing of the choking pollution of the gorge, famous at that time for possessing more satanic mills and blast furnaces per square mile than anywhere else in the world. Nevertheless, the pictures sold well. Thomas Jefferson, later third President of the USA, is known to have bought one in London in 1786 whilst Minister to France. In almost every one of these contemporary views, amongst the lambs and pleasant pastures, puny and insignificant human beings can be seen admiring the bridge in reverent awe. In retrospect, it is clear that its construction achieved more than just a triumph of engineering; it became a sublime spectacle which helped change the way the world would regard the achievements of the Industrial Revolution at large.

If visitors were thrilled by the bridge's astonishing construction, its engineering design details were no less fascinating. Each individual, 12-tonne rib was cast in two pieces and jointed at the centre of the 30.6m span. A total of some 384 tonnes of iron was used for the complete structure whose arches, supported on stone abutments, were lifted into place from scaffolding falsework high above the river's navigational channel. All iron components were cast in open sand dies, probably at Coalbrookdale. Not surprisingly in view of Pritchard's background, traditional carpentry techniques, including mortises and tenons, were employed along with dovetail joints for the base plates, wedges where the uprights meet the arches, and shouldered joints for holding the radials to the main ribs. The spandrels are filled with iron circles and ogee *(see above)* gothic arches, and the roadway consists of flat cast-iron plates. Not one bolt or rivet was used in the entire structure. Perhaps more surprising, in the light of today's sophisticated computer analysis and microscopic manufacturing tolerances, is the fact that the bridge has survived two centuries of floods and geological pressure in the mudstone beds on which it is founded, precisely because the resilience and "give" in these crude agricultural joints automatically relieves any unplanned internal stress. Evidence of consequential movement is clearly visible in the way the centre of the arch has been thrust distinctly upwards *(see below)*.



Gazing at it today, I am filled with wonder and admiration for the amazing confidence of its designers and the intellectual vigour of the minds which could conceive something so original and so enduring. It is hard to believe that

Ironbridge (p233)

more than 200 years have passed since its iron ribs were thrown across the Severn Gorge. Ironbridge is an historic monument to the conjunction of the new technology and innovative energy of the Enlightenment period. It announced an extraordinarily fertile chapter of British history which proved inspirational to Thomas Telford and great 19th Century engineers such as Isambard Kingdom Brunel. As the new shapes arose, its success blazed the way for the development of railways, steam locomotives, the great Menai, Saltash and Forth Bridges, Paddington Station, Crystal Palace and many, many other astonishingly original structures. Hence Ironbridge is the venerable progenitor of all subsequent metal structures culminating in today's great suspension bridges including the Storebaelt and the Pont du Normandie, and ultimately even our own aluminium alloy BR90 equipment. Thus, to adapt the words of Johnson, Ironbridge is not of an age, but for all time.

During the 18th Century the power of the Enlightenment changed everything: reason, religion, philosophy, botany, chemistry, physics and engineering – life itself. It produced intellectuals like Voltaire as well as practical men like Abraham Darby III. What they shared in common was the unfettered mind and freshness of thinking that allows the spirit to be truly independent and genuinely original. In their different ways, such men advanced our culture from the darkness of superstition into the light of the modern age.

So for me, the greatest glory of Ironbridge lies in its manifestation of this indefatigable intellectual freedom which is the authentic hallmark of civilization and without which there can be no great science, no enduring progress, no true enlightenment. If necessity is the mother of invention, then science has surely been its mother's milk. Education and training may bestow the courage to challenge received wisdom, but in the final analysis understanding is not enough. It is the wisdom and insight of the enlightened mind which is the most profound source of originality in engineering and science, just as it is in art. And true enlightenment is, I believe, much less to do with what you think than the way you think it. Thus Ironbridge represents something we should cherish and embrace. If the world's problems prove as complex as they seem today, I suspect our future will depend upon it.

50th Anniversary Articles

The Editor of the *Journal* would be pleased to receive for consideration, articles from anyone who took part in projects during the aftermath of WW2, or have something interesting to relate of happenings during the year of 1948, with a view to their publication on or near to the 50th anniversary of the event. Accounts of later events are also welcome as they can be kept for publication in the appropriate issue.

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North West Frontier Fort

READERS may like to know that a small puzzle has been resolved after a gap of some 35 years.

In 1962, the Pakistani engineers presented a silver centrepiece, known colloquially as the "North West Frontier Fort", to the RE HQ Mess. Its plinth has four silver plates attached, two of which have an identical inscription: "Presented to SME Chatham by the Officers of Corps of Engineers Pakistan".

A recent acquisition by the RE Library included a photograph album with many scenes of Roorkee during the early part of this century. One photograph shows this centrepiece quite clearly in the RE Mess Roorkee in 1925, with a handwritten note describing it as the Waziristan Campaign 1919-21 trophy, and the original inscribed plate on the front of the plinth is visible and readable. A number of similar pieces were transferred by the Corps in trust to the new Corps of Indian, and Pakistani, Engineers after the Partitioning of India in 1947, and this is obviously one of them.

A new plate will be substituted with the original wording "Presented to the Officers Royal Engineers Roorkee – The Officers 1st KGO Sappers and Miners – who served in the Afghan War 1919 and the operations on the North West Frontier".

North West Frontier Fort p235.

Hi-Tech Stockings – Membranes in Drinking Water Production

MAJOR L T QUINN BEng MSc CEng MICE

Major Laurence Quinn was commissioned in 1983. He served as a troop commander in Germany and the UK before becoming second in command of 49 Explosives Ordnance Disposal Squadron, as it was then. He became a professionally qualified engineer (construction) in 1993 and served with DCRE Northern Ireland, after which he went on to gain a master's degree in Weapons Effect on Structures, at the Royal Military College of Science in Shrivenham. He is currently OC 521 Specialist Team RE (Water Development) at Chilwell.

The Need for Water

Even with the meagre ration of 25 litres/day, a soldier will use more than twice his own body weight of water in a week. When facing the Warsaw Pact in north Germany, water resupply was not considered a significant problem, but deployments to the Gulf and Bosnia, where water supplies were less reliable, taught a different lesson: that developing and exploiting a water source may become a high priority on future operations.

The most significant advance in water treatment technology over the last decade has been the development of filtration using semipermeable membranes. Membranes have found wide application in industry where they are used to separate out or concentrate any number of mixed liquids or gases. To make full use of the advantages offered by membrane technology the military engineer must appreciate the range of treatment techniques available together with their strengths and limitations.

Military Requirements

Ideally, water treatment equipment should be cheap, light, air-portable, cost nothing to operate, require no skill to use, treat water from all sources, be capable of being stored for ten years and work first time every time. Membrane-based equipment is good but not that good! Like all other water treatment systems, it is best designed to treat a specific source with a known, constant level of contaminants (not always possible on military operations).

When drawing water for use, there can be four alternative sources of supply: existing mains, surface lakes and rivers, saline waters or groundwater.

- **Mains Water.** Future operations might be mounted in countries with an existing, though perhaps dubious, water supply system, and it is obviously sensible to make use of this whenever possible. However, the water may need "polishing" to bring it up to an acceptable standard, and the presence of free chlorine, dosed in at the treatment works, can actually be a problem for some treatment systems as shall be discussed later.
- **Surface Lakes and Rivers.** The most obvious source of water is surface rivers and lakes. This type of supply usually has a high biological content. Turbidity from suspended solids can be high too. Filtration-based equipment will quickly clog up and degrade unless it is designed to operate in water with a high fouling potential whilst ensuring a high log removal rate of bacteria and viruses.
- **Saline Water.** Sea and estuary water contains dissolved salt (sodium chloride) which cannot be removed by filtration. It can be removed by boiling

Major L T Quinn
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Log Removal Rate

"Log removal" is the term used to describe how effective water treatment is at removing bacteria or viruses. When 1/10 of the contaminants get through, the log removal rate is 1 (ie 10 to the power of 1). If only 1/100 passes through, the log removal rate is 2 (ie $100 = 10^2$). Thus:

% Efficiency	Log Removal
90	1
99	2
99.9	3
99.99	4

and carefully distilling the steam, but distillation equipment is bulky, expensive and uses a lot of power.

- **Groundwater.** Water from boreholes generally requires very little treatment to make it potable. However it is often high in dissolved minerals such as iron, manganese and calcium, although these are generally easier to remove than sodium chloride.

Semipermeable Membranes

Membrane Operation. A semipermeable membrane is a thin layer of material which is capable of separating out extremely small contaminants from almost any feed supply. Membranes are not defined as passive materials but as functional ones, and hence are principally classified by the type of separation they perform rather than by their physical structure. Permeation and dialysis operations rely on the properties of gases or electrical charge to carry out separation.

Pressure-driven membrane operations are of most interest in the production of drinking water. Pressurized raw water passes over the surface of the membrane and by the processes of exclusion and ionic separation, pure water is forced through the membrane leaving behind a reject stream in which the contaminants are concentrated. It is not simply a filtering process as it also depends on the solubility of the contaminants. Cleaned water is usually called the product or permeate. Reject water is known as the concentrate or retentate. If sea water is used as the feed, the reject is referred to as brine.

Three key factors govern the selection of the most appropriate membrane for any given situation: pore size, material and shape.

Membrane Pore Size. Membranes are divided into four groups according to their pore size and thus usage. Figure 1 shows the range of membranes and the size of the contaminants they remove. The smaller the pore size the greater the pressure needed to drive the process. The flux of a membrane is a measure of how much product it yields for a given surface area of membrane over a stated period of time. Membranes with tighter pores remove more contaminants but require higher operating pressures and have

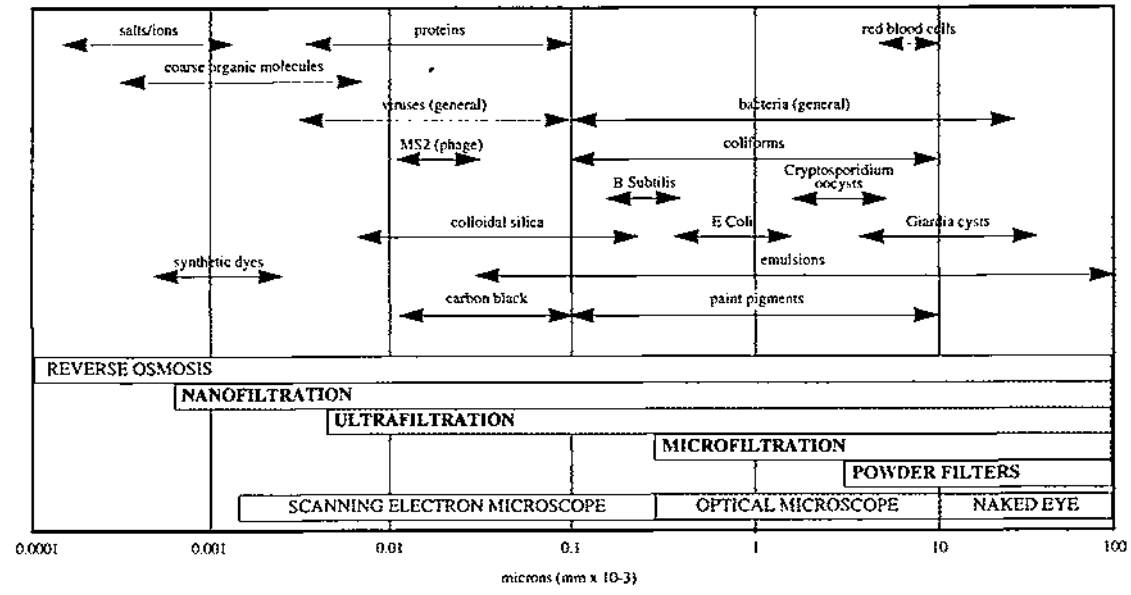

Figure 1. Membrane sizes.

lower fluxes. Table 1 gives a comparison of the four pressure-driven membrane operations each defined by pore size: reverse osmosis, nanofiltration, ultrafiltration and microfiltration.

- **Reverse Osmosis (RO).** The pores in a RO membrane are so small they cannot be seen, even with an electron microscope, this is therefore the most "exclusive" type of membrane. Indeed RO membranes do not have pores in the conventional sense. They are considered to be dense media, where diffusion takes place between the actual macromolecular chains of the membrane material. The membranes can deal with contaminants that are dissolved in the raw water and, operated at low pressures, the process can remove almost all molecular contaminants. However, higher pressures are needed to produce fresh water from sea water.

Reverse Osmosis (RO)

When two liquids containing different concentrations of dissolved solids are separated by a semipermeable membrane, a difference in concentration potential will exist between the fluids. This difference in potential will draw liquid from the weaker solution through the membrane in order to dilute the most concentrated solution. This natural phenomenon is called "osmosis". As more liquid is drawn in, the surface level of the concentrated liquid rises, creating a back pressure which eventually equalizes the osmotic pressure. By applying pressure to the liquid with the higher concentration, it is possible to reverse this process. Hence it is possible to force fresh water out of salty sea water.

- **Nanofiltration (NF).** The two main uses of NF membranes are to treat slightly salty (brackish) water or to soften water by removing dissolved calcium carbonate. They are also used to remove colour and nitrates.
- **Ultrafiltration (UF).** UF membranes remove all bacteria and viruses, thus sterilising the water without the need to use chemicals or potentially carcinogenic pretreatments.
- **Microfiltration (MF).** The primary use of MF membranes is particulate removal (clarification). This is often done as a pretreatment prior to passing the water through a RO membrane module. They are generally more effective than ordinary pre-coat filters which use diatomaceous powder, such as used in the old Standard Water Purification Unit (SWPU).

Membrane Material. Membranes can be made from two categories of materials: organic (eg polymers), or inorganic (eg ceramics). Ceramic membranes can withstand high temperatures, are not biodegradable in water, but are brittle and very expensive. The vast majority of membranes

Membrane Type	Pressure	Pore Size (nano m)	Flux ($l/m^2/hr$)
RO	2-3 MPa brackish water 5-10 MPa sea water	<1 (non-porous)	1-10
NF	0.5-3 MPa)	<2	10-20
UF	50-600 kPa	2-50	20-400
MF	30-500 kPa	>50	200-1000

Table 1. Typical Membrane Characteristics.

are made from polymers. Although all polymers may be used, only two groups are easy to manufacture, and give adequate performance: cellulose acetate (CA), and polyamide (PA) composites (which operate at a lower feed pressure than those made of CA.) Equipment designed to run at a lower pressure is generally cheaper and more robust, and PA has higher salt rejection capabilities, enabling more product to be removed from the available raw supply. Further, PA membranes are more stable over a wider range of pH in the raw water supply, so increasing their flexibility. However, they have a major drawback in that they dissolve if even small amounts of free chlorine are present in the feed, so are of little use when treating partially chlorinated mains water. The membranes themselves are not woven in the conventional sense and the pattern of "holes" is not regular. This means that the ability of a membrane to reject a specific chemical contaminant is quoted as a percentage efficiency.

Membrane Shape. Membranes can be manufactured as flat sheets or as cylindrical tubes. Large tubes (greater than 3mm diameter) are called "tubular", smaller ones "hollow fibre". They are manufactured into modules which provide structural support, a feed inlet, and outlets for the product and reject. The shape of the module can have a significant effect on the efficiency of the system as a whole, and ideally as much membrane surface area as possible is packed into as small a volume as is practicable. Figure 2 shows the different types of membrane module available.

- **Plate and Frame.** These modules are made up of flat sheet membranes and support plates stacked alternately. They have a poor packing density (100-400 m^2/m^3) but can easily be stripped and cleaned manually. This type of module is best suited to treating heavily contaminated waste water.
- **Spiral Wound.** The most common type of RO module is spiral wound. Two rectangular flat membrane

sheets are laid with a flexible porous spacer between. Three edges are sealed to form an envelope. The open end is fixed to a perforated tube which will carry the product water. The membrane envelope is then rolled up like a Swiss roll around the tube. Feed water is pumped into the top of the module and passes through the membrane into the spacer, working its way round in a spiral to the central tube. This type of module is very compact (700-1000 m^2/m^3) but is easily clogged and cannot be used directly on turbid water *without pretreatment.*

- **Tubular.** Most ceramic membranes are cast as a block of tubular elements with internal diameters of 3-40mm. The feed passes through the tubes and product water is drawn up radially through the sides. This type of module does not need fine pre-filtration and is easy to clean. Its main drawback is that it has a low packing density thus increasing the size and cost of the plant.
- **Hollow Fibre.** Thousands of tiny hollow fibres are bundled together into a steel tube. The water tightness between the feed and permeate flows is provided by a potting resin which forms a tube plate at each end of the bundle. Feed water usually passes through the tubes and permeate is drawn out (inside-out operation). Sometimes it is operated in the other direction (outside-in). This type of module has a very high packing density (from 1000 m^2/m^3 in UF modules up to 10,000 m^2/m^3 in RO modules). Although they are more prone to clogging than other types of module, the flow through them is relatively laminar which reduces energy demand.

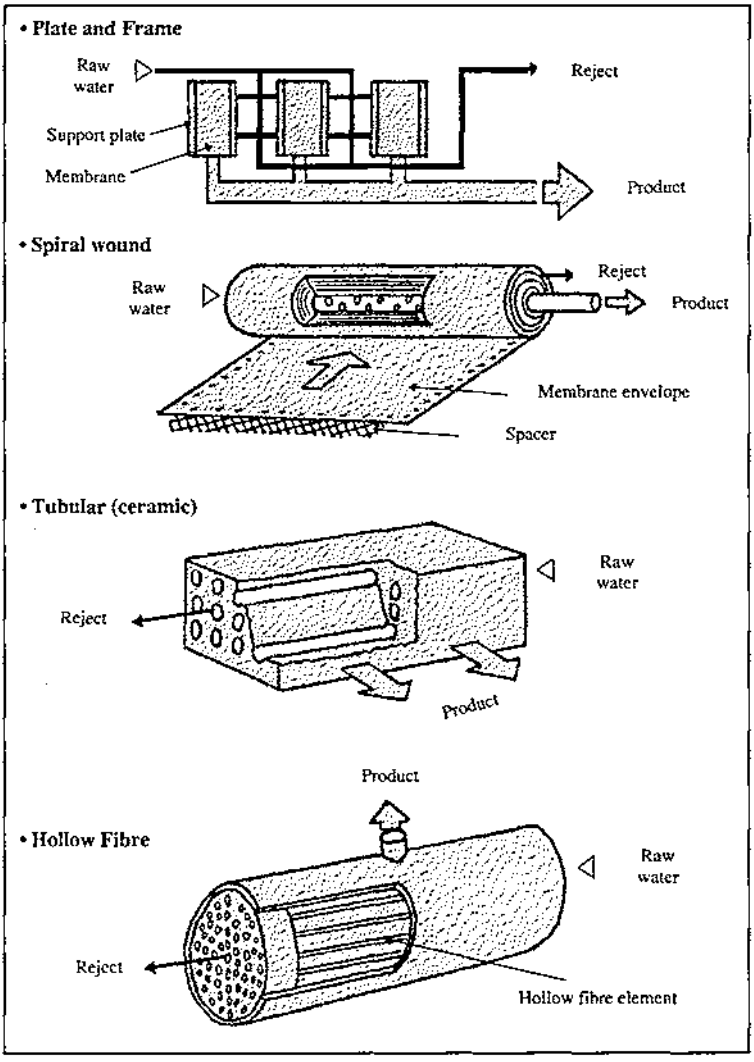

Figure 2. Four different membrane module types.

Using Membranes

Pretreatment. Although the membrane separation process does not require the feed water to be pretreated, the cleaner the water is, the less likely the membranes will clog up. Pretreatment therefore significantly improves performance and reduces costs. Water passing over RO or NF membranes is always pre-filtered, often by MF or UF membranes. Also when operating RO (and sometimes NF) equipment, the dissolved contaminants in the reject become so concentrated that they come out of solution and stick to the surface of the membrane; a common problem with dissolved calcium carbonate. Therefore before water is passed over a RO membrane it is dosed with a sequestrant to help prevent this precipitation from occurring.

Operation. Membrane modules are loaded into pressure vessels and water is fed through in one of two ways: crossflow or dead-end flow. The

backflushing, and they must be chemically cleaned, roughly once a month.

Post-treatment. Water treated by RO is so pure, it has almost no minerals left and is not only unpleasant to drink but also corrosive and will strip minerals out of the distribution pipework. A pacifier is therefore added to re-mineralise the water. UF and MF water does not need post-treatment. Chlorine is usually added to protect all water from contamination during storage and distribution.

Advantages

- **Small size.** Membrane plants are smaller than the equivalent conventional equipment. For a given equipment size, more product water can be obtained from a contaminated or saline source using RO than by any other means.
- **Low Power Requirement.** RO equipment draws much less power than a comparable distillation plant. This is because energy is not wasted in boiling the water. Smaller generators can be used, which in turn leads to lower fuel demand and a reduced logistic burden (often a very significant factor).

In-Service Equipment

WPU(NBC). The standard water purification equipment used by the British Army is the Water Purification Unit (Nuclear, Biological and Chemical) (WPU(NBC)). Made by Stella Meta, it has two operating modes "normal" and "NBC". In the normal mode, water is simply filtered then chlorinated. In the NBC mode it is filtered before passing over the RO membranes, and is then sent through a carbon filter (positioned after the membrane) to neutralise any remaining chemical contaminants, before being chlorinated. Normally water entering a plant is prechlorinated to prevent biological growth fouling the equipment. To protect sensitive RO membranes this chlorine is removed by carbon filters. Therefore normally these filters are in front of the membranes. In the WPU(NBC) biological growth is not considered to be a significant problem as it is intended for operation over short periods only (up to 30 days). In the RO mode it can produce 50m^3/day.

WPU(NBC)(Saline). The present, standard, equipment does not operate at pressures high enough to make use of sea water, but a new modified version of the WPU(NBC) will soon be available to operate at the pressures required.

Weir Westgarth Containerised RO Units. Several RO plants were bought for use on Operation *Granby* in the Gulf, built into ISO containers and designed for continuous use. They can produce 100m^3/day.

- **Chemicals.** The membrane separation process does not need chemicals to make it work. Conventional treatment often relies on dosing with a flocculant and then rapid sand filtration through a large (heavy) pressure vessel. UF disinfects without having to use chlorine or ozone, both of which can produce harmful by-products. Only RO relies on chemicals to reduce fouling and to restore minerals to the water.
- **Range of feeds.** Membrane treatment can produce drinking water from a wider range of sources. The "pore" size of an RO membrane is so fine it can exclude bacteria, viruses, toxins, hydrocarbons and dissolved salts, making it particularly versatile and capable of accepting almost any feed water, if only for a short period before precipitation and biological growth clog up the membrane's pores.
- **Cost.** Membrane treatment is generally two or three times more expensive than conventional equipment and is really only cost-effective when treating difficult water or when producing a higher quality product. However for sea water, the unit and operating costs of RO equipment are lower than that of a distillation plant. Although membranes are expensive, provided they are stored correctly they can last a long time. Typically a membrane lasts two to three years in continuous operation but as emergency equipment is run infrequently and for relatively short periods a membrane can be expected to last longer.

Disadvantages: the disadvantages of membrane equipment are mostly significant in long term operation.

- **Storage.** Once a membrane becomes wet, it must be carefully stored, which presents a problem for equipment designed for re-use during an emergency; the membrane requires careful, regular maintenance even when not in use. For instance, biocides used to preserve the membranes may drain or oxidise during storage, causing serious damage; they may also be corrosive, damaging seals and pipework.
- **Water Sensitivity.** Although almost any source of water can be treated by membranes, output is sensitive to changes in the chemistry of the feed water. This is particularly true for RO. Underground brackish waters are often more difficult to treat than sea water because unpredictable changes in the chemical composition of the water over time can affect the performance of RO units. Conversely, distillation processes have a wider range of tolerance to variations in salinity and are not affected by the presence of elements or compounds which can result in irreversible damage to membranes. This disadvantage however is only significant if operating the RO plant over a long period, not in an emergency or on a short operation.
- **Disposal of Concentrate.** As fresh water is drawn out of the feed, the contaminants in the waste water are concentrated. In the long term this may be a significant problem if the discharge point is fixed.

Standard WPU(NBC)

However, this is generally less of a problem during short term, military use.

The Future

DRINKING water quality is constantly improving both in Europe and the USA. The impetus for this is ever more stringent legislation. Conventional treatment equipment is struggling to meet the microbiological log removal rates required by law. Public awareness of the potentially harmful by-products of disinfection by chlorine and ozone is growing. As demand for water increases so does the pressure on existing resources and previously unused, poorer quality sources are now being exploited. Fortunately, to help meet these new demands and standards, advances in technology are making membrane operations more cost-effective, and equipment is becoming smaller, cheaper and able to operate at lower pressures with a lower energy consumption. The water problems found on military operations mirror those in the civilian world, where strict health and safety rules force us to reconsider current practices.

As future deployments could take us to locations where water supplies are scarce or unreliable, I hope that the foregoing has brought readers up to date with what is possible and available.

Recently, for the first time, the Corps' water specialists, 521 Specialist Team RE (Water Development), successfully built and ran a membrane treatment plant in Cyprus. Within the British Army, membrane-based water treatment equipment is becoming commonplace and is likely to become the "conventional" treatment equipment of the next century.

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Old Chestnuts Tossed Across The Pond

LIEUTENANT COLONEL C E ZIMMERMANN

Lieutenant Colonel Zimmermann retired across the Pond four years ago and has worked in a project management consultancy since receiving his green card. He has enjoyed being involved in projects ranging from $240M container terminals to proving impact claims because of survey work being out by fifteen feet and from helping bureaucrats improve their business processes to engineers improving earthquake resistance. He has found that some things never change: get the basics right and the rest looks after itself.

He is still an aspiring golfer and takes pleasure from presiding over a 90-year old society for expatriate Scots and their descendants.

I WAS reviewing an article on the work in Bosnia in a copy of the *RE Journal* recently and the phrase "... MWF may well provide the project manager ..." caught my eye. It struck me as a very haphazard way of assigning an extremely important command responsibility. Other phrases such as "... no antipathy with the professional side of our Corps, ..." "... Military Engineers, not engineers in uniform, ..." and "... A military approach rather than a commercial engineering one, ..." left me with the impression that there is still an unease within the Corps about engineering and its management. Introspective discussion about how the Corps' engineering work should be managed always seems to arise when successful operations highlight ability in fields other than the "fighting" skills, and which, despite a lot of protestations to the contrary, are generally considered the poor relation. These poor relations don't project the same glamorous image of fast-paced excitement generated by the "two up and bags of smoke" brigade, but that is no reason to pass responsibilities to others! Maybe the thought of leaving something "concrete" behind, for which they can be considered responsible and which can be commented on or judged for many years to come, scares people.

The concept of project management applies equally to fighting operations as to support work. It is not restricted to peace or war. Project management is a concept that has been practiced in the Corps since it was first formed, yet today it is treated with suspicion. Whether the operation is military or civilian, project management is undoubtedly a command responsibility which should not normally be delegated to others simply because they are more knowledgeable about the key elements of an operation. To use an analogy, would any of you budding all-arms commanders consider giving up your command to an infanteer or cavalryman, simply because the phase of an operation happens to be an advance to contact?! As we all appreciate, command appointments are given to those who have proven ability to organize and harness all the resources and abilities necessary to bring the task to a successful conclusion, whatever the manner of the operation.

In engineering work command responsibilities must not be delegated to the "professional" engineers simply because they are the most knowledgeable in that field. Indeed it is not necessary for the project manager of a complex construction project to be an experienced engineer. As an example, the project manager for the construction of Heysham nuclear power station was an economist. Engineering within a project is a totally separate issue to the command/management. In a

Lt Col C E Zimmermann
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small-scale project an engineer may well be able to combine these duties. As the project becomes more complex, the duties must be clearly separated and an engineer must be appointed (either full-time or part-time) to supervise the engineering and advise the project commander.

"Webster's Collegiate Dictionary" describes a project as: "Something that is planned or devised, a large or important undertaking, especially one involving considerable expense, personnel and equipment." All military operations and especially all military engineering operations fall into this category. Thus in this context the term project and operation can be comfortably transposed. However, the practice within the Corps seems to reserve the term "project" exclusively for work that involves sappers using their trade skills, the inference being that it requires some special form of management!

The Project Management Institute considers project management to be the expertise required to bring a "project" to its successful conclusion through the judicious consideration, management and control of the following eight factors:

- Scope
- Time
- Resources
- Cost
- Risk
- Quality
- Procurement
- Communication

In the military arena these factors are equally relevant to both projects and operations. I appreciate that the environments in which they are assessed differ dramatically and consequently the emphasis on any one particular factor differs too, but the philosophy is exactly the same. Thus the regimental open day, the officers' mess summer ball, moving house between postings and building swimming pools in the Falkland Islands are as much operations as constructing MGB, clearing minefields under fire and executing reserved demolitions are projects. The management philosophy and attributes required to be successful in both operations and projects are exactly the same. It is all part of good leadership.

From the very early days of their training, officers learn that one of their primary roles is to appreciate a situation and develop a plan to resolve it. When writing an appreciation, the young officer is taught to give consideration to all the factors he can think of and then discount any that have no significance. Although they will be measured under different parameters, risk and resources available are two examples of factors that need to be considered whether planning "fighting" operations, building accommodation or developing a new commercial product. Young officers learn to plan and manage platoon-level operations and then, as they become staff officers, take part in the management of massive affairs involving brigades and divisions. The risk of compromising plans or losing surprise are major discussion points in all operational planning. The commander's planning may be hasty or deliberate but always culminates in the giving of orders which clearly establish the scope of the task, the management of the allocated resources, the time line under which the operation is to be completed, the communication plan and the responsibilities. The orders card even provides an aide-mémoire for the topics to be addressed in the plan! In project management terms, "scope" could replace the "mission", resources are addressed under "Atts & Dets" and the schedule is apparent under "timings".

Our own young officers' and squadron commanders' courses concentrate on the planning, design and management of military engineering operations. The troop commander's role is shown as, amongst other things, reconnaissance, design, planning and control. They have the unit resources at hand, but may need to find more. They will, more than likely, have to communicate and liaise with other arms and services. They have the experience and invaluable assistance of QMSIs and SNCOs but the responsibility is always with the troop commander. At the troop level, the troop commander is the operation or "project" manager as well as being the lead engineer. If it is a squadron-sized operation, then he/she may be an assistant operations officer but they still have the responsibility for their troop's part. As the scope of the task increases, the command level probably rises and specialists are attached to help with engineering aspects and to advise the commander during the decision making process. In this situation the commander moves away from being the lead engineer to focus on a wider set of responsibilities. The responsibility for the completion of the operation still rests with the commander and does not pass to the engineer.

As far as the engineering is concerned, engineering is engineering and will always be engineering. It comes in many disciplines such as civil, construction, mechanical, electrical, aeronautical and environmental. The spectrum of

military engineering encompasses the traditional disciplines and a few exclusive topics to ensure that, in the old parlance, we help the Services to live, move and fight. None of the disciplines is pre-eminent although one is likely to be predominant in particular situations. The engineering is not dependent on whether the practitioners wear clothing of a uniform pattern or not. The manner in which the military execute their engineering operations is certainly exclusive to them, for it must be geared towards the varied environment in which they are working, but this does not change the engineering.

The Corps' "professional engineers" as they have been christened, still seem to be talked about as if they are from a different planet or have been polluted by the hand of commercialism during work experience attachments and are therefore less military in their method. In reality they are simply a cadre of officers who are interested in, and get job satisfaction from furthering their engineering skills, primarily in the disciplines of construction (civil and building), electrical or mechanical. The engineering they have undertaken has encouraged and given them confidence to apply principles and establish unique solutions to each problem, rather than generally relying on a workable solution from an existing library of standard operating procedures. Their experience and qualifications from the regulatory bodies of engineering are also a very necessary part of the Corps if it is to continue conducting engineering, rather than what is loosely and incorrectly referred to as advanced pioneering.

Project management is a command function. It is not a concept that is unique to the use of bricks and mortar or the good old "construction project" which seems to be the only time when the topic is raised. The philosophy and principles behind project management are equally applicable to the success of general operations as they are to engineering operations. Project management does not compromise the principle of regiments and squadrons having primacy of action because the unit commanders are the project managers. They are the ones who have the authority and connections to influence the successful outcome of the project or operation. Their actions may be restricted by limitations placed on them by the chain of command but they have the ability to negotiate with it for changes in scope, increase in resources etc. They may not achieve all that they want, but it was ever thus and plans must be adapted to suit.

Project management is a part of leadership and should be taught as such. The identical nature of project management and operations management should be recognized in command training. This would hopefully give all sapper officers the confidence to handle all projects successfully, irrespective of the level of engineering involved. Officers of the Corps, both commissioned and non-commissioned, must get away from the mind-set that project management is some abstract concept which is the prerogative of the professional engineers and MWF and one that only applies to construction work. Until they can get over this hurdle, the Corps will never be making best use of its assets.

Experiences in North Africa, 1941

MAJOR GENERAL BILL WOODS CB MBE MC MA AND MAJOR PETER DEAVIN

This is a series of short anecdotes put together jointly by Bill Woods and Peter Deavin, who, in March 1992, met again after not seeing one another since they served together in the desert in 1941.

AT the outbreak of war in the autumn of 1939 Woods and Deavin came together in 552 Army Troops Company RE, Woods as second in command of the unit, and Deavin posted as a newly commissioned officer from 142 OCTU. The OC was Major Teddy Longfield. In the autumn of 1940 the unit left for North Africa.

Woods writes: We had a one-day stop for refuelling and provisioning at Cape Town, where many of us were hospitably entertained. As we sailed out a striking farewell was achieved when hundreds turned out on the hillsides surrounding the town with hand mirrors reflecting the setting sun. Later on we saw many of these friendly South Africans who joined us with the 8th Army in the Western Desert.

Our arrival at Suez on 4 March 1941, 552 Company was equipped with additional vehicles in the form of captured Italian trucks and dispatched to Derna, a small Cyrenaican town lying at sea level, with steep passes taking the main coast road down at the east and west approaches from the desert plateau, thus making it an important link in the British Lines of Communication.

From the limited intelligence information available, it was clear that the German force was advancing eastwards at some speed and in greater strength than anticipated.

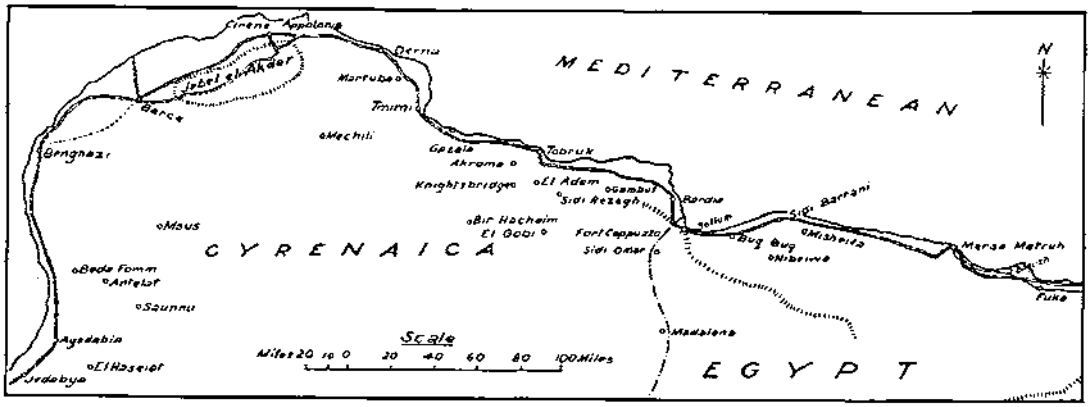
Our OC was instructed at short notice to carry out a reconnaissance in Benghazi with a view to our company undertaking some demolition work on the harbour facilities. Some 24 hours later I received a message that he had been killed on his way back.

The German force had occupied the port and we were to prepare certain demolitions in the Derna area immediately to deny them use of the main coastal road through Derna, and of certain facilities further west in the area of Cyrene and Appolonia. The denial of the road had to be achieved by blowing large craters using explosives at selected places. I was now in command of the unit. The weather was particularly poor with strong winds and heavy rain. Our plan was to make one large crater in each pass and we hoped to complete the work during the hours of darkness. Fortunately the demolition was eventually authorized and carried out successfully, much to my relief. Sounds of gunfire were clearly audible inland and to the west by this time and the leading German armoured cars had already reached a position from which they were able to cover the main road with fire. Although our vehicles were not in any way "desert worthy" we had to turn into the desert/scrubland at the top of the pass and make all speed (mostly in second gear) to the east. We were greatly relieved to reach Tobruk, and 552 Company was withdrawn further east prior to the siege which then took place there.

Deavin writes: In Derna my section, No 3, was detailed to work for the garrison engineer. He turned out to be an old school fellow of mine, who at school had been declared a pacifist. Having got a first in maths at Oxford, he heard that the Royal Engineers were the brains of the army and applied to join. However, in spite of a brilliant brain he hardly knew a nut from a bolt and was always in trouble with his CRE. I told him not to worry, all he had to do was receive instructions, pass them on to me and I would sort out the technicalities. This worked for a while but one day I was ordered to take over as garrison engineer while continuing to run my section. The poor chap had put his .38 in his mouth and pulled the trigger.

I was dispatched with my section to Cyrene and Appolonia. The section was split into five detachments, each with a NCO to prepare demolitions to blow the electricity power station in Appolonia, two craters in the pass, the transformer station at the top of the pass, and the pumping station above Cyrene. We had to use our initiative because the explosives consisted of material recovered from abandoned Italian ammunition dumps.

In due course, an Australian warrant officer arrived with the order to blow. We started at the power station and, after an initial loud explosion, the Australian and I proceeded to inspect the damage but were met at the door by a second explosion which blew us both off our feet. The Australian was more or less protected by the door, which landed on top of him, but I took the full blast, and my shorts ended in ribbons like a grass skirt. Luckily the only



Map showing area covered in article.

physical injuries suffered were punctured ear drums, (mine recovered after a month or so). Due to a shortage of Cordtex the ring main had not been completed. Officially, of course, I should have taken more time checking the setup, and waited longer before inspecting the damage, but we had to hurry to get to the top of the pass before the Germans arrived.

The cratering of the passes was not very effective because, with no compressor it was difficult in the time available to get the explosive deep enough; much of the debris went straight up and down. At one of the sites, owing to lack of Cordtex, the NCO had cut the cable to connect several electric detonators with the result that the exploder was too close for comfort. My driver/batman had mislaid my steel helmet and, of course, a sizeable stone hit me on the top of my head. By this time, I think I had achieved a measure of immunity to pain.

At the transformer station, sadly, one of the sappers had contacted a live wire with his neck and subsequently died. As we were demolishing the station, we were fired on by some locals with small arms. I had some difficulty restraining my sappers from starting a local war on these civilians. In the meantime, my section sergeant had demolished the pumping station so thoroughly that debris was scattered all over the historic amphitheatre of Cyrene.

I was again sent off on detachment and was to destroy Salum Pass and Crater "Hell Fire" Pass. The order to blow would come from the OC of a battalion of Durham Light Infantry. This time we had more time to prepare the demolition and after spending a freezing night on Salum, we blew such a hole in it that the enemy did not attempt to attack that way. The company paused for a while in Mersa Matruh where two other memories stand out in my mind, first a beautiful swim in the sea, and second the appalling stench from a camel that had blown itself up in a minefield.

Our next stop was adjoining Desert Force HQ in the delightful oasis of Ma'arten Berbeita, halfway between Mersa Matruh and Alamein to the east, where our mess was in a super dugout, the walls of which were adorned with pictures of "ladies out of uniform", not your soft porn boobs and buttocks of present day pin-ups, but beautiful pictures of the artist's wife clad in dainty lingerie. The pictures by David Wright had been extracted from the "Sketch". At Berbeita we were given the usual nearly impossible tasks eg building a concrete pill-box with little or no shuttering material or bar bending machine; soundproofing and sand-proofing the force commander's dugout. I was reprimanded for the bad language of my sappers while engaged on this task in earshot of the general. Construction of crates for transporting Force HQ china and glass. I had a row with a Guards QMS because I cut up some webbing to make hinges for these crates. I had been given the webbing by a Guards major who seemed a lot more scared of his QMS than I was.

Mention of the HQ glass reminds me that we had bought some sparkling burgundy in Cape Town. Our mess waiter had been a waiter at Claridges and one day in the desert our morale was a little low so the OC decided we should have sparkling burgundy with our lunch. "Jenks" rose to the occasion, and as we sat on upturned petrol tins, he appeared with our enamel plates, each with two slices of bully, two pieces of tinned tomato and two standard biscuits. He then came round and, very professionally, poured the burgundy into our enamel mugs. It may have been sacrilege, but it did us good.

A Greek Experience

MAJOR GENERAL J H S BOWRING CB OBE MC MA FICE

WHEN the war ended, my sudden reversion from acting colonel to my substantive rank of major was amply compensated for by the most desirable posting I could possibly have had – to the Military Mission to Greece (BMM).

During the German occupation there were two main resistance groups, the communists (ELAS) and the monarchists. The departure of the Germans triggered a civil war. A British force which landed in Attica in 1945 under General Scobie, expelled the ELAS forces occupying Athens. ELAS then retired to the mountains and waged a guerrilla war on the reconstituted Greek army which was under control of the restored monarchist government.

The BMM was soon set up to assist in rebuilding a properly constituted army along British lines, including command and staff, training organization, staff college and logistics. As the old army had been totally dismantled after the defeat in 1942, it meant starting virtually from scratch.

By the time I arrived in the spring of 1947 the new army was operational and fully engaged in fighting the guerrillas, while at the same time trying to expand, train and improve their systems and organization. There was still a number of British troops in Athens and Salonica. These took no part in anti-guerrilla operations and were there as a boost to confidence and possible use as a last resort. The HQ of BMM was in Athens, with detachments in Larissa and Salonica, the locations of two Greek Army Corps HQs.

My posting was as G2(SD) – the major in the staff duties branch of BMM, which was headed by a Sapper, Lieutenant Colonel Bill Aylwin. We had both British and Greek hats, being responsible for the organization of BMM itself, as well as providing advice to the Greek General Staff on the organization of the whole Greek army. The latter part called for considerable diplomacy, as no one likes to be told his job, least of all a Greek. The constant endeavour was quite naturally to raise ever more units to fight the "bandits", while we had to impose limits on manpower because His Majesty's Government was footing the bill. New units, and their establishments, had to receive our approval. We sometimes found that new units had been raised without our knowledge, and such situations needed much tact and black coffee to resolve.

Greeks are proud people, even conceited, so that in tendering any advice one had to expect an immediate rebuff, perhaps on the lines of "in this country we have mountains." The impression given was that every Greek is a born soldier, or sailor, or what you will. The tactic was to say nothing, and a few months later one would usually find that the advice had been taken. Much patience was needed.

Socially they were charming, with a lively sense of humour, especially at the expense of the Italians, and it was a pleasant change to be in a country which seemed genuinely to like and welcome the British. There was the Byronic and Philhellene tradition, and we were the only country to come to their aid in the war.

The Commander of BMM when I arrived was Major General Douglas Packard, a gunner. One winter he went goose shooting in the Evros estuary in north eastern Greece, with British and Greek army companions. On a fine evening it was so sunny and mild that they were all in shirt sleeves. The next day a freezing north wind blew and caught them ill-provided. Poor Douglas got frost bite in the fingers of one hand. The Greek prescription for frost bite is to drink lots of champagne. Though no doubt enjoyable, this cure was ineffective, and the General had to return home, where three fingers were amputated.

He was succeeded by Major General Ernest "Eric" Down, known as "the pike" because of his prominent lower jaw. Down was a "soldiers general" tireless in his concern for the troops and harsh on any failing by his own staff – a hard taskmaster. On Packard's departure, he had been transferred from command of British Troops Greece (BTG), who were quite separate from the Mission. As national service was still in force, British troops contained the normal small proportion of the criminally inclined. During the German occupation, when there was mass starvation, crime, especially theft, became for many a matter of survival, and such soldiers found the atmosphere conducive to taking part themselves in nefarious activities such as smuggling and theft. The result was that all British officers both of BTG and the Mission found much of their time taken up with courts of enquiry and courts martial. There was much illegal trading

in gold sovereigns, which had become the only stable currency, of which millions had been poured into resistance movements during the war. The Drachma was so unstable that all agreements, such as rents, were written in terms of gold. The value of sovereigns differed – thus a Victoria was not the same as an Edward or a George, or indeed a fake one dropped by the Germans trying to undermine the British ones.

Before long the financial burden became too big for the British government to bear alone, and an American mission arrived to work alongside us and to take over the costs. This was headed by a Lieutenant General van Fleet, who looked exactly like an Irish-American cop. With him he had a posse of "bird colonels" – all chiefs and no indians. It was interesting that although Down and van Fleet were barely on speaking terms and their Chiefs of Staff, Brigadier Steele and Brigadier General Jenkins, were at loggerheads, at the working level we in the Mission got on splendidly with our colonel opposite numbers, and laughed at the antics of our masters.

Down, on his tours, always visited the Greek front line units and his judgements carried great weight with the Greek General Staff, who did what he told them to. Van Fleet, by contrast, usually only went as far as Corps HQ, usually with the King. But he had to be treated with deference because he held the money bags. Naturally the Greeks tried to drive wedges between the two missions – and who could blame them? I had spent many hours with an American, Colonel Harding, mapping out organizations for the Greek army. One day I was summoned to Bill Aylwin's office to find there a scowling and furious Harding, who had been told by a very fly Greek that I had blamed some refusal by the Missions on the Americans – quite unfounded but typical of their tactics.

After a time I was promoted to AAG (Assistant Adjutant General, lieutenant colonel responsible for personnel matters, both British and Greek). Here, I dealt with the Greek Adjutant General, a Major General Karachristos who had just before been Engineer-in-Chief. He was a small tubby man, and we got on pretty well as fellow Sappers, but he was inclined to be prickly, not liking to be advised by a comparatively junior officer. I didn't blame him. In his outer office there was always a mass of officers waiting for interviews, for petitions or complaints or whatever. There did not seem to be any system for going through channels or filtering cases.

In Greece, the military was intimately bound up with politics, and every time the government changed, the military hierarchy changed too. The parliament dreamed up a law, which only they could have thought of. When an officer retired on change of government, and when the first government came back after another upset, and that officer was reinstated, he came back two ranks higher! The more changes of government, the more rapid the promotion.

When the campaign against the guerrillas was reaching its peak, General Down became concerned that some of the brigade commanders were not showing enough energy and aggression. He therefore arranged to post a number of high-powered British majors, one to each brigade, to assist the Greek brigadiers. This was, of course, not popular with the latter. They knew their performance would be reported to General Down, and thence to the Greek CinC. They did have the effect of stimulating some of the idler ones into activity, but it was a very difficult and thankless task, and they shared all the physical hardships, and often considerable danger, of their Greek comrades in the mountains. I think that this group of very able majors should have been given at least a General Service Medal. I don't think they got anything at all. The Greeks gave a number of their decorations to members of the US mission, but the British were barred for political reasons from receiving any.

My time in Greece was one of the most rewarding of my life, both from the professional point of view, and for the quality of life. One could enjoy the fleshpots of Athens and travel up-country on duty, enjoying the varied landscapes and the friendly hospitality of the peasantry. The monuments of antiquity were open to leisurely contemplation without the hassle of tourists. I remember sailing with two friends in my little yacht to Epidavros and climbing to the famous amphitheatre, a little inland from the coast. A man standing on the spot in the middle and whispering can be heard right at the back – wonderful acoustics. Soon after I arrived, I was lucky enough to be invited to join a "chummery" near Piraeus. It was a villa on a promontory of rock, just round the corner from the ancient circular harbour of Turcolimani, just east of Piraeus, where I kept my yacht *Katia*. The other residents were Colin Tod, a charming bachelor Gunner colonel, Lieutenant Colonel Richard Miers of the South Wales Borderers, Major Chris Waters, a Sapper who had been removed from the Canal Zone for being too prankish for some tastes, and a

Gunner Lieutenant Colonel Roland Symonds. The previous owners had been a Greek civil engineer and his German wife who had not survived the war. Their well-trained housekeeper Yanoula survived with us. There were masses of crockery and cutlery, and we could throw dinner parties for a dozen or so. Yanoula could not get used to the European habit of wanting hot plates with hot food, which is unknown in Greece. One day, fed up with being reminded again, she came in with a face like thunder, bearing plates so boiling hot they could not be handled.

The balcony looked onto Phaleron Bay, just south of Athens, and we used a high-powered pair of German AA binoculars to examine all the shipping. Sometimes the American Sixth Fleet would come in with much coming and going of pinnaces and tannoy blasts of "Now hear this!" Then they would vanish, and next day would reveal a lone, but very spick and span Royal Navy frigate or destroyer. We would always examine them minutely and see how long they took to paint the anchor cable. Then we would invite the captain to dinner and regale him with the findings. Most took it in good part, but one did not. We heard he was a very houseproud ex-lower deck man and therefore a little sensitive. When he came to anchor, it happened that the sun was glancing along the side of his hull and it showed up by its shadow a very slight indentation, which would otherwise have been invisible. We duly asked him to dine, and having ginned him up said "Do you realize there is a bloody great dent in the side of your ship?" He was NOT amused!

The climate was delightful. Even in winter there were sunny periods when I could be sailing in Phaleron Bay while Chris was skiing on Mount Hymettus, one of the hills north of Athens. We were also able to do a little rough shooting in the country – rather hair-raising on account of the very fierce dogs. But the country people, the fishermen and the artisan classes, were very friendly and helpful, unlike the rich of "Colonaki" the wealthy quarter of Athens, who were more standoffish. There were two yacht clubs at Turcolimani. Up on the bluff was the Royal Hellenic Yacht Club (patronized by the King and the Crown Prince) which provided excellent cuisine, and a small class of Stars, and a few "gin palaces" which never left the harbour. Down below was the Piraeus Sailing Club, to which nearly all the varied craft in the harbour belonged, and against which we had tremendous fun racing among the local islands. One comedian used to appear in bathing trunks and a bowler hat which he swept off on our arrival with the cry *"Iasou, beebeeceedes!"* This was because throughout the wartime occupation the BBC had been avidly listened to. Before a race, the Sailing Club would send an official onto your boat to put a seal on any oar or sweep to stop you cheating. But on at least one dark night in flat calm, we heard some splashing and came across a craft whose crew were paddling hard with dinner plates! They were charming, cheerful and friendly, but you could not be sure of right of way on the starboard tack!

Once I was invited by the owners of a small caique to spend the weekend with them. They plied me with retsina and ouzo, all the time saying "Enjoy! Enjoy!" and they could not have been more kind and hospitable.

Looking back, I count this as one of the most enjoyable and rewarding times of my bachelor life. I think of sunlit evenings, sailing with my friends among the islands, singing currently popular Greek songs (like *Prasina Matia kai Ble Ble Faridas* – Green Eyes and Purple Eyelashes) as an accompaniment to our sundowners. And the kindness and sense of humour of our Greek friends.

Wreck Survey in the Baltic

LIEUTENANT COLONEL J M GUNNS MBE BSc

Lieutenant Colonel Gunns joined the Corps in 1977 after completing a civil engineering degree at Imperial College, London. He fist dived in 1980 while serving on Operation Titan *in the New Hebrides although he was not formally qualified as a sport diver until ten years later. He is now a British Sub Aqua Club advanced diver and open water instructor.*

Lieutenant Colonel Gunns is currently employed as Chief G3 Organisation and Development (Organisation) in HQ Land Command at Wilton where he spends his work time plotting excuses to get out of the headquarters, and his free time teaching his daughters aged three and five to snorkel.

THE Baltic may not be first on everyone's list of top diving locations but the easing of tensions between East and West has opened up previously off-limits parts of the sea to sport divers where there are a number of tempting "virgin" wrecks waiting to be surveyed. Taking advantage of these opportunities a group of Army sport divers recently visited the Baltic on Exercise *Greifswald Dragon/Diamond*. Their aim was to locate, dive on and identify previously undived wrecks in order to update British Hydrographic Office records.

The seeds of the expedition were sown in the early 1990s when a group of sport divers grew frustrated with the limited diving opportunities in Germany and, with the assistance of the Hydrographic Office, a systematic survey of the Kiel area was conducted. After an 18-month search the first wreck was found, eventually leading to a number of other discoveries. Buoyed by this success it was decided to venture further afield and the first offshore expedition was mounted in 1995 from which, using lessons learned together with additional information from the Hydrographic Office, planning for the 1997 expedition got underway.

The 1995 expedition had relied on GPS and echo soundings to locate wrecks. This had proved satisfactory where wrecks were close to their reported position and standing proud of the seabed, but where wrecks were some distance from the reported site and/or well broken, their locations had proved difficult to confirm. One example from 1995 was a wreck which registered as only a small "blip" on the echo sounder but when dived proved to be a large, intact vessel that had dug itself into the seabed. In order to overcome these problems it was decided to employ more sophisticated search techniques and a magnetometer was hired.

Planning for the expedition took more than a year. One of the wreck sites was just off the Polish coast and political clearance was required to dive there. Also, permission to dive beyond the normal Army depth limit of 40m had to be obtained and an expedition charter ship found. Diving to depths of 50m was planned and it was therefore essential to select an experienced team with a minimum diving grade of dive leader. I was fortunate to be able to join the expedition, the only other Sapper being Major Chris Goddard, who is the British Sub Aqua Club European coach.

Eventually all was ready and the team met in Kiel on Saturday 10 May where the day was spent in making final preparations. The main work that day was to prepare the rigid inflatable boat (RIB) by fitting various electronic equipment. The magnetometer was a new piece of equipment to us all and some time was spent in rigging it correctly.

The magnetometer is a development of a World War Two submarine detection device, the

Lt Col J M Gunns MBE
Wreck survey in the Baltic (p250)

Magnetic Anomaly Detector or MAD. Any large metal object creates fluctuations in the earth's magnetic field and these are detected by the magnetometer. In theory sunken ships can be detected up to 200m away. The equipment consists of a control box connected by cable to a search head housed in a waterproof "fish" which is trawled through the water. It is important to ensure that the cable connecting the fish to the control box is separated from other electrical devices, including outboard motors, in order to avoid electronic interference, and a scaffolding arm was rigged out from the RIB for this purpose. The control box of our hired magnetometer was linked to a GPS receiver and displayed a record of the search pattern undertaken as well as the magnetic reading. An echo sounder was also fitted to the RIB to allow confirmation of suspect readings. With significant electronic work to be undertaken the signallers in the team were in their element! In the afternoon we tested the equipment over the site of a known wreck in the Kiel area and gained experience in interpreting the various readings.

Map showing locations of wrecks.

We boarded the expedition ship, the *Artur Becker*, on Sunday 11 May after an 8-hour journey to Greifswald in the former East Germany. In glorious sunshine, loading took some time as a result of the quantity of electronic and diving equipment, personal kit and rations. The RIB was prepared for towing behind the ship and we set sail, right into the teeth of a rain squall.

Our routine for the expedition was to sail overnight and anchor in the vicinity of the next day's search area. The RIB would then be dispatched with the "Away Team" to locate and buoy the wreck site. The first step in the search technique was to estimate the location of the wreck using Hydrographic Office data and the GPS. We would drop a buoy as a datum at this location and then conduct a circular search using the echo sounder. If no wreck was found we would then deploy the magnetometer to conduct a search. The magnetometer was trawled in a series of parallel east/west runs about 100m apart. We had to anchor the *Artur Becker* outside the search area to avoid fluctuations caused by the ship's metal content. After a series of false alarms we discovered that transmissions on the RIB's VHF radio also affected magnetometer readings. When a reading was obtained on the magnetometer a buoy was dropped from the RIB. On the next run a second buoy would be dropped at the corresponding reading and, in theory at least, the wreck would lie along an imaginary line through the two buoys.

The "Away Team" departing in the RIB to search for the next wreck.

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The propeller of the Knippla.

Once a wreck had been located we would confirm its shape using the echo sounder and assess the best place to dive, dropping a shot line onto the wreck to guide divers. The last job of the Away Team, when deep diving was anticipated, was to deploy a decompression station consisting of a bar with an air cylinder and regulator attached, hanging 6m below two large buoys. This provided comfort and additional safety.

We woke on Monday 12 May to find ourselves anchored close to an isolated danger buoy just off the Polish coast. Our research with the Hydrographic Office suggested that a 1600-ton Cypriot freighter had sunk in this area in 1980 in somewhat mysterious circumstances while in transit from Gdansk to Brest. Calculations put the wreck about 400m from the isolated danger buoy and the Away Team quickly proved this by echo sounder within 13 minutes, a record not beaten during the week.

We kitted up and descended the shot line to the seabed at 20m where we found the freighter upside down and broken in half. The keel stood some 8m proud of the bottom. Unsurprisingly there was no trace of the cargo of sulphur. Everyone managed two dives and appreciated the opportunity to dive on a virgin wreck. A brief survey was conducted and some penetration undertaken.

Throughout the day we had been expecting a visit by the Polish authorities and were glad to get underway without having to test the effectiveness of our soggy photocopy of a Polish letter to the British Embassy in Warsaw authorizing the dive. We also added another first to our log books – the furthest east in the Baltic for a Service sport diving expedition.

The RIB electrics had been playing up during the afternoon and eventually expired altogether. It was fortunate that the next day's diving had been planned for the area off the Danish island of Bornholm and we radioed for a mechanic to meet us there the next day.

The RIB was duly dispatched for repair and we took the opportunity of diving on the wreck of a Russian *Zulu IV*-class submarine. This class of submarine was the first large post-World War Two patrol boat built by the USSR. Six of this class were later converted to carry the first Soviet submarine-launched ballistic missiles. The wreck sat upright in 38m of water and the visibility in excess of 20m meant that everyone had a good dive. With the RIB repaired we were able to search for the wreck of the *Koromowa* which was duly found, but time did not allow us to dive on this trip.

Overnight we sailed for Swedish waters. The plan for Wednesday 14 May was to search for two wrecks, the *Odin*, a 5800-ton Danish vessel sunk in 1946, and the *Knippla*, a 500-ton Swedish ship sunk by a mine in 1916. We thought that we would have better luck with the larger vessel and so the away team was dispatched to look for the *Odin*. This search proved to be particularly frustrating. The magnetometer should have picked up the 5000-ton wreck easily but no trace could be found and the search was abandoned after two hours.

We then moved onto the site of the *Knippla*. On this site we borrowed a radar reflector from the *Artur Becker* and in misty conditions used the ship as a datum for the search. The skipper of the ship passed radar bearings to the RIB crew by radio and the wreck was quickly located and buoyed. The echo soundings from this site were not promising and we discovered that the wreck was well broken. Despite this the relatively shallow water and high ambient light level made for a pleasant dive. The propeller, anchor, wheel house, metal ribs and wooden decking were all identifiable although scattered.

Overnight we sailed east to the site of two deep wrecks. The Away Team was dispatched to find the *Tinda*, a Dutch ship sunk in 1956 after a collision. The jinx hit again at this site and no trace could be found. We then transferred our search to the second site, mysteriously captioned "unknown" in the Hydrographic Office records. We reviewed all available information and cross-referenced our

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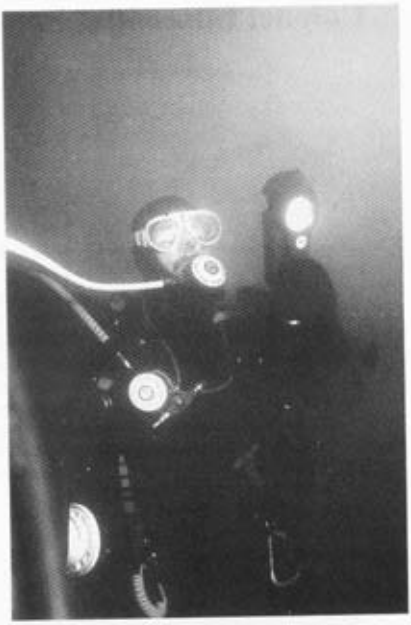
findings with recent German notices to mariners. As luck would have it the *Artur Becker's* echo sounder picked up the wreck as we sailed right over it!

This dive proved to be the highlight of the expedition. As we descended a massive shape appeared out of the gloom. At 20m we could make out the outline and we eventually reached the deck at 38m. The ship was upright and appeared to be well preserved although there was little superstructure still standing. All holds were open although there was no trace of any cargo. Moving into the current we swam towards what proved to be the stern. Slipping over the stern rail we descended to the seabed at 48m to view the three-bladed propeller. Once back on the *Artur Becker* it transpired that everyone had swum into the current in accordance with good diving technique but it was frustrating to realize that no one had visited the bows of the wreck, so it was agreed that another dive should be made the following day to carry out a detailed survey and try to identify the ship.

We rounded off Thursday with a search for a shallow wreck nearby. Despite a small echo sounding near the reported location the first pair deployed reported no sight of a wreck. Another failure – but, after the dive on the unknown wreck, our spirits were not to be dampened.

Friday 16 May found us back at the site of the unknown wreck. While leaving the site the previous day the skipper of the *Artur Becker* had reported a significant echo sounding some distance from the shot line on the wreck and we had speculated overnight as to whether this was the bow section which had become detached or perhaps a second wreck in the same area? The Away Team was dispatched to try to locate this object but failed to find anything other than the original wreck so we abandoned this search to concentrate on the original wreck. Pairs were briefed on parts to visit and we descended. Conditions were worse than on the previous dive with a stronger current, although from a different direction, and less visibility. Despite this conditions were adequate for a detailed survey to be undertaken. On reaching the bows one possible solution to the rogue echo sounding of the previous day was discovered. A fishing net had been discarded over the wreck which contained several floats that suspended it in the water several metres above the deck. On returning from the dive survey details were put together to produce a coherent plan of the 90m long wreck, but no firm identification was possible.



One of the team at a decompression stop.

We planned to visit three wrecks on Saturday 17 May but the weather blew up and so we returned to port and ended the expedition a day early.

Overall the expedition had been a great success with five wreck site locations confirmed, four wrecks dived (three for the first time) and an "unknown" wreck surveyed. Everyone on the expedition gained significant experience in wreck location techniques and deep diving. Using the experience gained on this expedition plans are already being developed for a follow-up expedition in 1998. Planning includes the possible deployment of enhanced magnetometer equipment as well as utilizing a remote controlled underwater vehicle to examine wrecks before diving. This additional equipment should allow for quicker confirmation of wreck locations and more accurate positioning of shot lines in order to make best use of the limited diving time available at greater depths. We also hope to dive on the unknown wreck again and complete our investigations into its origins.

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Colonel Eliott Nial Evelegh DSO MC (1890-1964)

ANDREW SAUNDERS MA FSA FRHISTS FSA SCOT MIFA

Andrew Saunders began his career in the Ancient Monuments Inspectorate, Ministry of Works, and became Chief Inspector of Ancient Monuments and Historic Buildings in the Department of the Environment/English Heritage. He is now a freelance consultant, lecturer and writer.

Author of Fortress Britain: Artillery Fortification in the British Isles and Ireland; Exploring England's Heritage: Devon and Cornwall; Channel Defences; *editor of numerous papers, guidebooks and articles chiefly relating to castles, fortifications and general conservation issues.*

Directed archaeological excavations in and around Britain. A founder member of the Fortress Study Group and currently its Chairman. Chairman of the the International Fortress Council, President of the Royal Archaeological Institute (1993-96).

Educated at Magdalen College School and Magdalen College, Oxford, which is where he met Robin Evelegh, who subsequently invited him to make a record of his father's military career.

COLONEL E N Evelegh's distinct, perhaps unique, achievement as a sapper was that besides commanding various RE units, he had also commanded an infantry battalion and a cavalry regiment in wartime. He fought throughout the First World War in France, being wounded five times. In addition to the awards of DSO and MC, he was mentioned in despatches five times. His active and distinguished military career ended in 1941. He died in 1964 yet his does not appear among the obituaries in *The Royal Engineers Journal*. Coming from a military family which included General John Evelegh, who served throughout the Great Siege of Gibraltar, was the first adjutant of the Corps of Sappers and Miners, and finally CRE Portsmouth during the Napoleonic Wars, this omission is a surprise. With the aid of official records, the survival of letters to his mother during World War One, from Ireland and later from Iraq, together with anecdotes recalled by his younger son, Colonel J Robin G N Evelegh, Royal Green Jackets, this memorial to a brave, inspiring, forthright and much respected officer is pieced together.

Eliott Nial Evelegh was born on 17 December 1890. His father was Colonel F J Evelegh, 52nd(Oxfordshire) Light Infantry, who died in 1907, and his grandfather was Colonel F C Evelegh, who commanded the XX (East Devon) Regiment, later Lancashire Fusiliers, raised initially as Evelegh's Regiment. His mother, Moriet Frances Creagh, was the niece of Field Marshal, Viscount Wolesely. After Rugby School, in 1909 Nial Evelegh entered the Royal Military Academy, Woolwich, and there is a photograph (see opposite) of him standing among "WO Winter's Batch" probably of that year. He was commissioned into the Corps on 28 December 1910. For just over two years he served at Chatham before moving to Limerick with No 6 Signal Company early in 1913. This was just the moment when a limited signals service was established as part of the Royal Engineers with companies at Aldershot and Limerick. In April 1914, he joined 2nd Division Signal Company at Aldershot, and it was from Aldershot that the company moved to Southampton to sail to France on 15 August 1914. A letter home of 19 August began: "So far things are more like a beano than anything else I can think of. ..."

A month later Lieutenant Evelegh was caught up in the retreat from Mons. During the retreat he was in danger of being charged by German Uhlans whose attention was, however, diverted by another group of British soldiers. The prospect of being stuck by a lance was so frightening that he temporarily lost all colour perception and the world turned to black and white. At Verneuil on the River Aisne, he was seriously wounded. As the War Diary for 14 September 1914 relates: "While the

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Company was drawn up at the side of a street in the village an HE shell fell against a wall at the rear of the column and detonated. Lt Evelegh (i/c 1 Section) and the Coy Sgt Maj were wounded and 3 men killed or died shortly after..." The following day Lieutenant Evelegh wrote at length to his mother to say he was "only slightly injured and can amble with a helping hand all right." He was next writing from No 4 General Hospital, (Trianon Palace Hotel) Versailles. He was in fact wounded in five places by shell splinters. His brother, Rosslyn, was killed in action, also on the Aisne.

WO Winter's batch.

W W Peache, R S R Kerr, V E Gunness, E N Evelegh
H S Briggs, P A Lewis, H W Wagstaff, G N Macready, A C Sykes, K D Yearsley, J K Douglas, A J Craig
C C Adams, G R H Deane, W O Winter, H C B Wemyss, G A Hutton

Nial returned to England, and after convalescence was appointed adjutant to a signal training company. He returned to France to join 27th Division Signal Company on 16 December. This was a company formed from Post Office telephones personnel based on the Exeter telephone exchange. Their prize morse telegraphist, who could transmit and receive at some amazing speed, had to be well tanked up with alcohol to perform at his best.

A letter from France dated 24 January 1915 reveals how quickly Lieutenant Evelegh had become shaken by the reality of war and especially disillusioned by its reporting in the English newspapers, with inflated claims and references to "glorious" death and honour: "The whole war is beastly, it is sordid, and so much useless waste of life. ... There is only one thing glorious in it and that is 'humanity'. The dirty guttersnipe from Woolwich, never known a more comfortable place than a barrack room, giving his life or limbs to pull in some wounded officer who has lived all his life before in comfort and vice versa, the two sharing a mud-caked bit of chocolate from home perhaps." "We all long for peace but not 'peace at any price' – too much has already been given to let any of it be wasted by not giving more." He also wrote to thank his mother for sending him a periscope. "Several of them [trenches] have got them now. They are most important things to have. ..."

Writing from Divisional HQ, he described his activities in the field. "The other day at about 6p.m. we got a message saying that the RA wanted some new lines; so Heymann & I rushed out in the new car to help Good who is now doing the RA part. ... I don't think I have ever been so physically tired in my life before; we had been through amongst other things about 3 miles of clay where you had to pull your feet out & plant them two feet further on & then pull the heavy 2 cwt barrow & cable drum up to you and then move & replant your feet, and at the end of it all we had 5 miles to walk back nearly past the Cloth Hall town [Ypres] on broken down, shell pitted & abnormally greasy pavé." The official version of his activities is summed up in the citation for his award of the MC on 3 June: "For conspicuous gallantry and devotion to duty. At the commencement of the War he was wounded in five places while with the 2nd Signal Company and was sent home. 1st December 1914, he returned to France with the 27th Divisional Signal Company, and since his return he has worked incessantly superintending the repair of cables and almost daily under fire. He has set a fine example to all by his energy, courage and devotion to duty."

During April and May he was involved in the second battle of Ypres. In the *London Gazette* of 22 June he was mentioned in despatches and again on 29 June. In September Evelegh was transferred to the Indian Cavalry Signal Squadron (known as "Iron Ration") at Doullens, south of Arras, and took over No 1 Troop as temporary captain. He then commenced a signals training course that was hard work, but being well behind the lines when regular hours and sleep were possible, with frequent rides

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on his horse, Paddy, and with a comfortable and warm billet, made it a period of recuperation. But this also had its down side as he described once he was back at the front at Braye en Somme, under fire and with a heavy workload which had its own beneficial effect. "It was also a God send from the point of view of getting rid of that depression which was rapidly verging on melancholia; the awful nothing-to-do-worth-doing 'Iron Ration' life had sort of eaten in to me & made me very flabby."

His formal posting from the Indian Cavalry Corps Signals to the Signal Company XIII Corps did not take place until 11 April 1916. He was then put in charge of Corps Heavy Artillery Signals "to supervise the very big system of communications now required." This was in advance of the Somme offensive.

The War Diaries illustrate the nature of his work. At Corbie 13 May: "Capt Evelegh ... is supplied with labour for digging the cable trenches" and throughout that month was using infantry working parties. On 18 June: "No.35 Airline Section employed by Capt. Evelegh on leading in all lines with the Corps Heavy Artillery Signal dugout and sends a party along 18 lines from Etineham to Chipilly to strain up wires and strengthen poles." Then on 1 July: "Capt Evelegh wounded while accompanying signallers and the assaulting troops who were to set up forward visual stations around the village of Montauban." His own account read: "I didn't last very long in the great push did I, started at 7.30 am hit at 8.0 am. I have got a clean bullet wound through the leg (left) just clear about three inches above the ankle. The fibula is broken or 'drilled' as they call it. I'm damned annoyed as I never got quite as far as the old Boche front line. I walked back about a mile to my back signal station but couldn't stay there long & so was carried to the nearest dressing station & have now come on here & expect to be in Blighty in a day or two." In fact the casualty handling and treatment system was completely overwhelmed. He was not treated but was put on a hospital train and not looked at by the medical team for 48 hours. He said later that the pain of being hit was as nothing compared with the agony of his untreated wound after 48 hours.

There is then a break in the record until December when he was finally promoted captain, returned to France on 4 January 1917 and was again mentioned in despatches. In February he was posted to "C" Corps Signal Company and War Diaries show that on 24 March he took command of 32 Division Signal Company with the rank of acting major, operating in the Warvilliers, Bouvroy and Bouvines area. At the end of April he was reported to be wounded by mustard gas. On 31 July he was back in France. In August he wrote: "I sometimes get very fed up and tired, the particular sector I'm in is a virtual impossibility from a signal point of view, added to which troubles I can't get enough cable and all my men are becoming either battle or gas casualties or sick from overwork; these casualties of all sorts are the devil in a company of a collection of highly skilled men of so many different trades, in many cases only 1 or 2 of each in the whole company. But still the war goes on. I often wonder what will happen when it stops, after living at semi-fever pitch for 3 whole years I feel as if nothing will be worth the trouble of ever thinking of doing when the show eventually does stop; sometime in 1919 near the end of it I think myself."

On 14 December another mention in despatches was published in the *London Gazette* and on 1 January 1918 his DSO appeared in the New Year Honours List. He reckoned that he got his DSO because at one of the battles of Ypres all Army communications were passing through his signal company when all other means of communication had been destroyed.

At the beginning of April 1918: "Maj Evelegh relinquished command of 32 Div. Signal Coy on appointment as 2nd in command of a Service Battalion of Lancs Fus." On 14 April: "Maj E N Evelegh took command of [15th] Battalion from Lt Col L K Ulleron DSO gassed 13.4.18". This command he held for all of a week until Major D Lindsey took over. During that time he wrote: "Out of the whole battn HQ, I and 2 signallers who were away are the only ones who have not had to go down with gas, of course they should not be long but still it has left me in command and I have had to produce a new Adjt, 2nd in Cmd, Intelligence officers and signal officers to say nothing of Reg. Sergt. Maj. etc and servants & mess all while holding the line, and within exactly a week of my joining the PBI." He was also suffering from gassing himself so that he could hardly speak. He advised his mother: "if you get a report that I am wounded don't get the wind up as they report gassing as wounded now"! On 21 April he was writing to say that he was back at HQ 32nd Division. "I have not got the sack but they [GHQ] have insisted on recalling me ... if I shall be reported 'Wounded; at Duty' that is only gas & except for the subsequent bronchitis I am absolutely OK so don't worry darling." In a postscript he added: "I am very disappointed

as I simply loved commanding a battalion. But I suppose [it] is all for the best." On 23 May he joined 66 Division Signal Company as OC. This demanded a provisional programme of training at the Brigade Signal School and may have been the occasion when he was temporarily attached to United States forces, when they arrived in France, to help "show them the ropes".

There is a family anecdote recalled by his son relating to an incident in the spring of 1918. "When my father was CO of the Depot Battalion at Chatham [1935-38] and was out at an official dinner, a man called at the family home to say that he had been a soldier at the time when the final German offensive had pushed the British back. Their only experience had been of positional trench warfare and they were now badly disorientated by this sudden war of manoeuvre. They had been told to move back to take up positions on a river to hold the German advance. They were exhausted. The column of marching men ground to a halt and all down the long straight French road were British soldiers utterly defeated, exhausted and just waiting to surrender to the advancing Germans. Then the man looked down the road and he saw a wave as the soldiers got up, shouldered their arms and equipment and marched on again. He said that what he saw was a small red-faced Major in the Royal Engineers on a horse with four cable-laying horses behind him. These horses had a cable drum on each side on a pack saddle and paid out cable as they walked along. He said that as this little party passed him he too and the soldiers with him got up and resumed their march. Eventually they reached their positions and the Germans were held and this and the subsequent British counter offensive were to contribute to the final German defeat. The man told my Mother that he had seen this Major again that evening at the dinner, identified him as Major Evelegh and had felt compelled to tell her the story. He said that what had made the soldiers get up and go on was the realisation that here was a man who was not defeated, who was not going to surrender and was full of fight and 'full of beans' about it. He said that this realisation lifted the despair from the British soldiers, even though Major Evelegh did not say or do anything as he rode past; it was his presence which was so strong, so full of fight and determination, that induced the troops to get up again and march on. Unfortunately my Mother did not record the name or contact details of her informant."

Major E N Evelegh MC. Photograph taken c1917

In a letter of 13 September 1918, Evelegh reminded his mother that it was this day four years ago that he crossed the Aisne. "All that time seems very long ago doesn't [it] darling and yet [it is] as if there really was only a long long nightmare since Ascot 1914 ..." By 15 October he was laid out with half his company with "Spanish Flu" while the division was advancing. "On the day of the Armistice my father was in the front line and everyone was trying not to become a casualty before 11 am. Opposite him was a German Spandau medium machine gun post. All morning the German

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machine gunner poured belt after belt of fire at the trenches where the British troops were cowering. At 11 am precisely the German machine gunner stopped firing, stood up, took his helmet off and put it on the ground, bowed to the British troops, turned about and marched away leaving his machine gun."

There was an ambivalence in Major Evelegh's attitude towards the German soldiers. On occasion he might refer to "barbarians" and to some particular atrocious act in his letters; at other times he said that he used to ride his horse in the open to the forward trench during the German's lunch hour. They knew perfectly well what he was doing but did not mind until one day they dropped shells well clear of him in front and behind his horse. He interpreted this as a friendly signal that he should stop this practice. They could with complete ease have hit him if they had wanted to.

In November Major Evelegh returned to England on leave and resumed command on 23 December in time to address the men after the Christmas Day dinner at Ciney, southeast of Namur. For the fifth time he was mentioned in despatches. His command ceased on 13 January and he returned to the UK to be appointed officer in charge of signals at Plymouth. His promotion to Brevet Major came through on 3 June 1919. From November to May 1920 he was on leave in South Africa.

On his return he was posted to 6th Divisional Signal Company in Ireland; two months later appointed Assistant Corps Signal Officer Dublin, then Assistant Chief Signals Officer and on 30 May 1922 OC Dublin Signal Company. His experience of guerrilla warfare in Ireland with its assassinations, ambushes and sniping left him deeply embittered about the Irish and "... with what a burning hatred for the unutterableness of these beasts one is absolutely consumed." A year or two later he was overjoyed to learn of the assassination of Michael Collins. It was a time when his cousin, Commander Frederick Giffard DSO, RN was on secondment to the Royal Irish Constabulary and was to be fatally injured as a result of an IRA ambush. Frederick Giffard was married to Dorothy, later to become Mrs E N Evelegh. At the time she was helping her husband in undercover work in Ireland and the dangers and horrors of those times had a profound effect on her and Major Evelegh at GHQ, Dublin.

While Major Evelegh was in the process of disbanding his unit at Dublin Castle after the Treaty in 1922, he wrote home to say: "I have been more or less offered a good job in IRAQ which I have accordingly submitted my name for: I think I hope I get it as the pay is high." As a postscript: "I understand the IRAQ show if it comes off may lead to things." He was appointed signal instructor Iraq on 1 May 1922 immediately on leaving Ireland. At the end of the month, he disembarked at Basrah. By 1 July he was appointed OC 2nd Cavalry Regiment Iraq Levies based on Nineveh, near Mosul, with the local rank of lieutenant colonel.

His time in Iraq was not a happy one. "My father found the internal politicking, feuding and pushing for place and influence within the British administration in Iraq distasteful". Writing home at the time, Colonel Evelegh said that General Frazer was regarded as "a pig-headed old fool with a nasty kink in his temperament". "I am afraid I have an infinitely low opinion of anything to do with the India Office, Indian Army Staff and even of the Indian Army Officer once he has done about 10 or 15 years in the country." Evelegh was engaged in operations against the Turks mostly in Kurdistan. However, he captured a Turkish officer with whom he made a deal. The Turk became his adjutant and did the job well and loyally until Colonel Evelegh left Iraq. The acquisition of this Turkish officer increased from three to four the number of people in his regiment who could count above ten.

Near the end of 1923, Colonel Evelegh was far from fit and wrote home to say that he had an attack of shingles. Officially he was invalided home. His plans were nebulous and he left Iraq with "not much cash". He was appointed adjutant 2nd Division at Aldershot and assistant engineer for the Stanhope and Wellington Lines. While at Aldershot he married Rosemary Aspinall, but, tragically, she was to die in childbirth in November 1926.

On 24 September 1926 he received substantive promotion to major following his appointment as OC 7th Field Company, Rhine Army, and it was perhaps during leave from Germany in 1927 that he re-met Dorothy Giffard, his cousin's widow; they were married at the British Army Chapel at Wiesbaden on 6 September 1928.

On 9 March 1929 Major Evelegh embarked for India to become OC No 2 Company Bengal Sappers and Miners, based on Roorkee. Dorothy had spent much of her early life in India and this move was probably congenial for her. Almost a year later he was appointed deputy assistant adjutant general at Simla, where his first son was born on 15 September. He was appointed garrison engineer at Poona and in November 1931 assistant CRE (Works) at Bangalore. Their second son, Robin, was born on 23 November 1932 in Madras.

In 1934, Major Evelegh returned to the UK and joined Northern Command where he was promoted lieutenant colonel as CRE for the North Midland Area based on Derby. The next year he was posted to Chatham and took over as OC Depot Battalion. In 1937 he was promoted to colonel, and in January 1939, aged 48, he retired from the Army. "He had been persuaded to join North Eastern Trading Estates by an industrialist, later to become Sir George Walton, who had been a subaltern in a company commanded by my father. He had been most impressed by my father's good relationships with his troops and the affection and high performance which he inspired. He asked my father to take on an appointment as a mediator between employees and employers on the Team Valley Trading Estate, a sort of embryo Advisory, Conciliation, and Arbitration Service. My father was shocked at the levels of chicanery, dishonesty, harshness and deception which pervaded labour negotiations in the North East at that time."

With the outbreak of World War Two, Colonel Evelegh was called up and until February 1941 was attached to the Staff of Scottish Command as Deputy Chief Engineer. His main job was organizing the erection of anti-aircraft guns and anti-air landing devices. He was very disturbed at the vulnerability of the fleet anchorage at Scapa Flow and his concern that a U-boat could get in was borne out by the torpedoing of the battleship *Royal Oak*. Before the war it had been decided that the air defence of Scapa Flow would be provided by anti-aircraft guns of the fleet at anchor, but war experience had shown that this would have been completely ineffective. "My father described the situation as one of 'the fleet sailing round and round not daring to go into Scapa Flow'." Anti-aircraft guns arrived at Edinburgh for mounting on the hills around the anchorage. "When my father asked for a ship for the journey he was told that there was none available for some weeks and that the guns would have to wait. Knowing the extreme urgency of the matter, my father went to see an old school friend who worked as a ship broker in Leith Docks and arranged to charter a small ship immediately. Since he had no authority to charter a ship my father wrote out a cheque on his own personal bank account for the charter price although his bank balance was nowhere near sufficient." When the guns arrived they were immediately mounted and the fleet was then able to return to the anchorage. "Fortunately for my father the Luftwaffe attacked very soon after, were engaged by the anti-aircraft guns, and did not hit any of the ships. In view of this, the War Office agreed to pay the cost of the charter ship. However, they sent my father a letter, which decorated our lavatory for some years but is now lost, censuring my father as a relatively junior officer for expending money without authority and for 'chartering a ship when none was available!!!'(sic)

Then ill health in 1941 meant his being invalided out of the Army. There is, however, an element of mystery. In a letter to the *RE Journal* in 1981 drawing attention to the unique case of a Sapper officer commanding units of other combatant arms, Lieutenant Colonel A F Toogood, who was Evelegh's senior RE Staff Officer shortly after the outbreak of World War Two, added that he thought Colonel Evelegh "was shabbily treated in WW2". By 1943, now out of the Army, Colonel Evelegh was an Emergency Works Officer in the Ministry of Works. His final job was running a camp at Chandlers Ford for dockers who loaded the ships at Southampton for the D-Day landings and subsequent supplies.

After the war he occupied himself with much local voluntary work. In his son's words: "my father was both a physical and mental casualty of the First World War. This is hardly surprising." In the *Berkshire Churchman* of November 1958 his father wrote: "Now, in 1958, I sit looking at an Active Service Postcard signed by myself which my Mother had framed – everything else is struck out except the words 'I am quite well,' and '11.1 a.m. 11.11.18' underlined. Yes when that had been sent – after 50 months spent in France or recovering from wounds – it must have been a joyous time; but was it? After an hour or so of excited thought and speech, congratulations and jubilation, the reaction set in..." The terrible sadness that came over him that day and since, combined with the permanent physical effects of his wounds "gave him a short temper, and, although a clever man, a feeling that nothing was worth doing. However, he was basically a nice kindly man and was very well liked by many people in a complete cross-section of society." "He was much affected by the death of my elder brother aged 29 in an industrial accident in 1960."

Colonel Evelegh himself died on 12 February 1964. In his latter years he was among the team of officers who helped in the production of the *History of the Corps of Royal Engineers*, volumes V, VI and VII (Chatham 1952). It would have been typical of this very modest man to have expunged from them any reference to himself.

Is a NVQ in Construction Project Management What You Need?

MAJOR C N D CAPEL

Nigel Capel was commissioned into the Royal Army Education Corps in 1975. He served in the UK and Far East, specializing in teaching English as a foreign language. He was Senior Education Officer at the Training Depot Brigade of Gurkhas, between 1984 and 1989. His final tour was as Senior Education Officer at the Military Corrective Training Centre where, in addition to responsibilty for educational and resettlement support for detainees and permanent staff, he was heavily involved in both strategic and change management. Additionally, he was the armed forces member of the Prison Services lead body from 1989 to 1996, helping to develop and implement National/Scottish Vocational Qualificiations in Custodial Care.

After retiring, Major Capel was selected to produce the Army's policies and plans for the introduction of vocational qualifications on a consultancy basis. In January 1997, he accepted the post of RE Vocational Qualifications Officer and is currently based at the RSME Chatham. His remit is to ensure optimum access to vocational qualification training for all sappers.

Qualification in Construction Project Management

It is now possible to qualify as a nationally recognized manager of construction projects by having your skills and knowledge assessed while you apply them in your day-to-day work as a project manager. This can be achieved through the National Vocational Qualification (NVQ) system, which now includes a Level 5 award – the equivalent of a post-graduate degree or diploma – in construction project management.

What is a Project Manager?

A construction project manager is the individual who turns the client's requirements, needs and expectations for a built environment into a reality. This process will include factors of utility, appearance, time, project finance and budgetary control. It will certainly include management of resources and the interaction of the wide range of people and disciplines involved in the project in order to ensure an effective and dynamic team, and may also include the planning and implementation of the logistics of bringing the site into use, together with any related training. Much of this type of work will be familiar to sapper officers.

Why qualify?

Historically, those charged with managing construction projects have usually been architects, engineers, surveyors, contract managers or others with a traditional construction discipline background. Increasingly, instead of simply contributing their own special expertise, they have found themselves *managing projects* on the client's behalf, often independent of other project team members.

Until recently, the only recognition specifically aimed at those fulfilling this demanding role has been the status of member accorded to those with a good track record by the Association of Project Managers. Of course, a number of universities and colleges offer relevant masters degrees and diplomas – either full-time or part-time – for those wishing to acquire an academic qualification, but this route does not suit everyone – especially in view of its demands in terms of cost and time. More importantly, a university or college degree or diploma does not, of itself, provide proof of competence in practice – especially important in a field requiring advanced practical skills.

For those who feel that the knowledge and skills that they are acquiring *as they practice* construction project management deserve recognition – but who would prefer not to give up paid employment

Major C N D Capel
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while obtaining a relevant qualification – the NVQ route may be a sensible option.

How to Start

With care! Tackling this NVQ on an ad hoc basis, without preparation, advice and support, will almost certainly prove unnecessarily expensive and time-consuming. You are far more likely to succeed at minimum cost if you devise a *personal action and assessment plan* at the very earliest stage, preferably in consultation with an expert advisor who can help you to compare the knowledge, skills and experience which you have gained in education, training and practice with the criteria for the NVQ. This exercise will enable any "gaps" in your experience to be identified and positive, practical ways of filling them arranged.

The next step is to establish a *portfolio framework* – electronic or paper-based – into which will go evidence of your application of project management skills (*performance evidence*) and proof of the knowledge and understanding of project management that you have gained through training and education (*underpinning knowledge evidence*). This framework will be based on the units of competence which make up the NVQ – in effect, a series of project management tasks: these units are listed at Table 1. Although some of your evidence may come from work completed in the past, you will need to acquire the rest through current employment and/or special assignments. Clearly, identifying which is which (and, in NVQ-speak, that all of it is "sufficient, current, authentic, relevant and valid") is vital, as presenting a portfolio which meets the NVQ framework criteria is essential if *assessment* is to be efficient and cost-effective.

Number	Title
PM 1	Identify, assess and agree client, user and community requirements for projects.
PM 2	Establish client requirements for project procurement.
PM 3	Identify and confirm regulatory and legal factors affecting potential development, improvement and use.
PM 4	Appraise financial, resource and risk factors affecting potential development, improvement and use.
PM 5	Negotiate and agree a brief and project programme.
PM 6	Coordinate and verify the project development process.
PM 7	Advise on project design, statutory control and documentation requirements.
PM 8	Prepare and process estimate, bid and tender enquiries.
PM 9	Prepare and agree contracts.
PM 10	Obtain feedback and control project costs, quality and progress.
PM 11	Contribute to the resolution of disputes.
PM 12	Establish and maintain client relationships and provide solutions to, and advice on, complex, indeterminate problems within an ethical framework.
PM 13	Plan, allocate and evaluate work carried out by teams, individuals and self.
PM 14	Commission projects.

Notes
- Each unit comprises three or more component elements.
- Unit PM13 is based upon unit M7 of the National Standards for Management.

Table 1. NVQ Level 5 construction project management list of unit titles.

Who Will Be Responsible For Your Assessment

The assessment process is driven by you, the candidate. In outline, it will follow the format illustrated in Table 2. As with all NVQs, the Level 5 Construction Project Management award can only be achieved through formally recognized assessments by qualified NVQ assessors with skills and experience relevant to the occupation concerned, in this case experienced project managers. To gain access to these assessors, you will need to register with a centre approved by the awarding body, the Construction Project Management Group. There is already such a centre in Worcester, and it is hoped that another, to be based in the University of Reading's Department of Construction Management & Engineering, will open soon.

Apart from assessing your portfolio of evidence and conducting supporting interviews, an approved centre's staff will provide you with essential advice and guidance – and any necessary knowledge assessment through specially devised assignments. These approved centres will also provide any necessary "top up" training to overcome gaps in knowledge, and will provide assessable experience through simulated project management situations.

The 14 units of competency that comprise the NVQ can be grouped together conveniently for

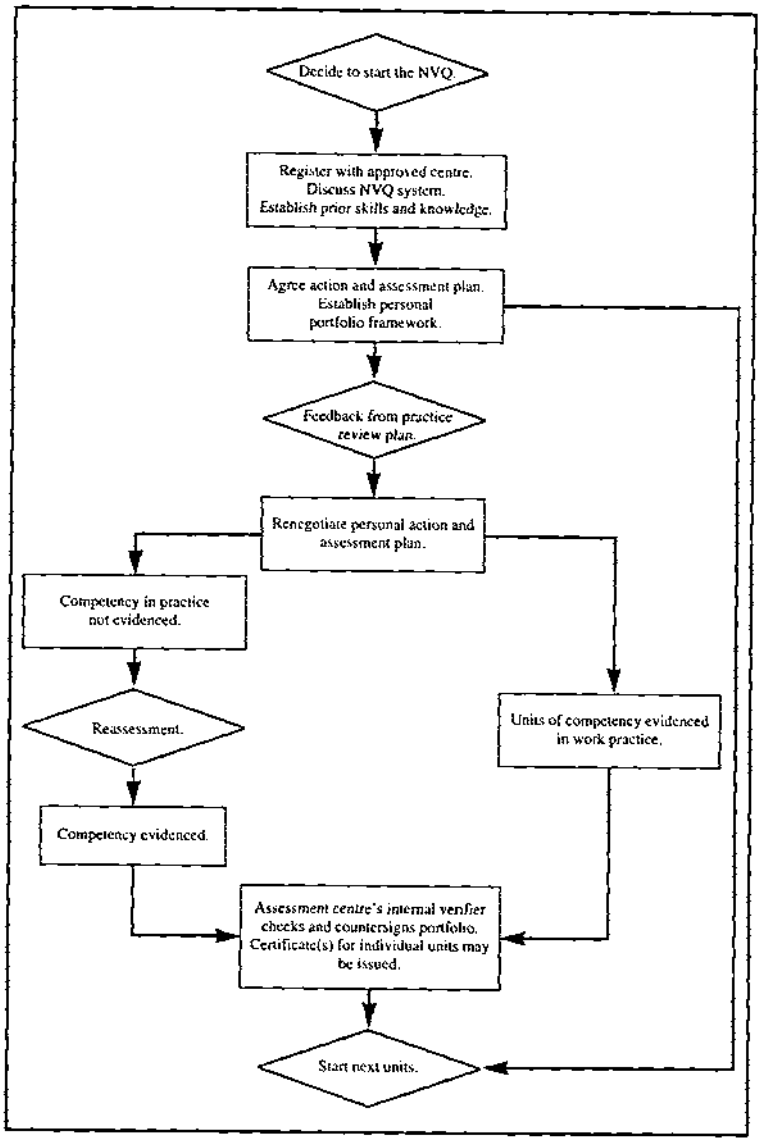

Table 2. An outline of the NVQ assessment process.

ease of portfolio and assessment management, and in a way that follows the life of a real project as you manage it on a day-to-day basis.

Cost in Time and Money

A typical prospective candidate will need to budget for the registration fee, assessment fees and at least one short training session. At the Reading centre, the total cost is likely to be about £2000 spread over the period of assessment; other centres may charge substantially more. In many cases, candidates may be able to benefit from tax concessions for vocational training and assessment, and service personnel may be eligible for reimbursement of some costs under the Individual Refund Scheme.

The period for assessment will vary from candidate to candidate, depending mainly on the following factors:

- Motivation.
- Speed of work.
- Availability for assessment and portfolio development.
- Frequency of suitable evidence generation and assessment opportunities.
- Pressure at work.

Although no one has yet completed this particular NVQ – it was only accredited by the National Council for Vocational Qualifications last year – it is thought likely that candidates in employment will take about two years to complete the award.

It is vital to get the support and commitment of your employer, as this will help to ensure that you get the required level of responsibility and opportunities to gain knowledge and experience. You can attempt the NVQ solo, but the process works much better if your employer is an ally in your endeavour.

Further details are available from the Royal Engineers Vocational Qualifications Officer, Major Nigel Capel, who is based at HQ RSME, Brompton Barracks, Chatham, Kent, ME4 4UG and can be contacted by telephone on ATN 766 (BT 01634 82) 2455.

The Partition of India – A Personal Account

SERGEANT DONALD C THYER

THE ringing of a telephone broke the silence in the office of the OC Geographical Section, General Staff (GSGS) located in the Old Secretariat Building, Delhi, India. The caller identified himself as being a military aide-de-camp to the Viceroy of India, Lord Louis Mountbatten. The month was August, the year 1947, one of the great dramas of 20th Century history was scheduled to take place. On 15 August, designated "Independence Day"; three centuries of British rule over the vast subcontinent of India with its mixed population of 400 million Hindus and Moslems was to come to an end. In its place Britain would welcome two new nations into the Commonwealth: India and Pakistan.

In London on New Year's Day 1947, a black Austin Princess sedan had made its way across the nation's capital towards the most well known doorway in the world – number 10 Downing Street. The passenger who had been called to the residence of the Prime Minister of England, Clement Attlee, was Rear Admiral Louis Francis Albert Victor Nicholas Mountbatten. At the meeting Mountbatten reluctantly acceded to the request of the Prime Minister to name him Viceroy of India; the government had placed in his hands the authority to negotiate with the Indian princes and politicians the terms on which British rule in India would be terminated.

From the moment of his inauguration as Viceroy, in March 1947, Mountbatten pursued with the utmost vigour the task of reconciling the divergent views of the leaders of the major political parties. At a news conference held on 3 June, Mountbatten announced he had secured the agreement of the Indian leadership to a plan which would divide India into two independent nations. Well aware that they could never agree where the boundary lines should be drawn, it was agreed that the chairmanship of the boundary commission should be placed in the hands of a mediator. Sir Cyril Radcliffe was chosen.

On his arrival in India, Sir Cyril was immediately briefed by the Viceroy, who explained that the boundary decision must be ready by 15 August – a deadline date only weeks away.

The telephone call to the OC GSGS was made during the second week of August. Radcliffe had completed his assignment and made the agonizing decision as to where the partition boundaries were to be drawn. The military aide advised the OC GSGS that he required the services of three RE sergeants with mapping experience for a highly confidential assignment.

The next morning at 8 o'clock sharp, three sergeants were driven to the viceregal residence and escorted to an air-conditioned conference chamber where a map of India and a folder containing official documents lay upon a large oval table. A military aide explained their assignment. The official Top Secret documents detailed towns, villages and physical features of the landscape. These were to be evaluated and then located, plotted in great detail and drawn in by hand on the map provided for that purpose, thus marking the boundary lines between the two new nations.

Lord Ismay, the Viceroy's Chief of Staff, also discussed the project with the sergeants and periodically checked on their rate of progress throughout the day. They were kept hard at work stopping only for refreshments provided in the form of tea and buttered biscuits delivered on a silver salver by a red turbaned and liveried Indian bearer. The sergeants were somewhat intrigued to note that the squares of butter were stamped with the viceregal crest.

The work was completed in the late afternoon and the three sergeants were driven back to their barracks at Irwin Stadium.

On 16 August, Mountbatten opened the dispatch box and took out two manilla envelopes. He handed one to India's Jawaharal Nehru, the other one to Pakistan's Prime Minister Liaquat Ali Khan. Each envelope contained a set of the new maps and other papers and were the last official documents Britain would bequeath to India and Pakistan.

In late September the three sergeants travelled to Bombay to embark for England and demobilization. Their role in the transfer of British power to India and Pakistan probably does not appear in any army record or government archive.

I was one of the sergeants who assisted in the preparation of the partition maps and the foregoing records just one of the military duties undertaken by personnel of the Royal Engineers Survey Regiment during the closing days of Imperial rule in India – the Raj and Jewel in the Crown of the British Empire.

Memoirs

MAJOR GENERAL F G C SUGDEN CB CBE

Born 27 July 1938, died 6 August 1997, aged 59.

MAJOR General Francis Sugden's tragic and untimely death from cancer has robbed the Corps of one of its much respected figures, and his friends and family of someone greatly loved. He rose to fill some of the most significant appointments in the peacetime Army and he passed away whilst thoroughly enjoying his key post in the Royal Hospital Chelsea.

Francis George Corlet Sugden was the son of Major General Sir Henry Sugden KBE CB DSO, Engineer-in-Chief from 1957 to 1960. He was educated at Wells House Preparatory School and Wellington College. Somewhat surprisingly he made an inauspicious start to his military career by failing to pass into Sandhurst. However, he resolved to follow in his father's footsteps and enlisted as a national service sapper, rising to the rank of lance corporal before being commissioned through Mons Officer Cadet School.

His first posting on commission in 1958 was with 24 Field Squadron. In Christmas Island, the squadron was known as the Island Borough Council and Sugden's troop was responsible for ditching and drains, excelling themselves one day by cutting a ditch through a new road completed some 20 minutes beforehand. Very properly he blamed RHQ for bad coordination, and perhaps this incident helped sow the seed for the meticulous staff work for which he later became so renowned.

In 1964 he married Elizabeth Bradbury, daughter of Surgeon Vice Admiral Sir Eric Bradbury, during his second regimental posting which was to 1st Divisional Engineers in BAOR. Here he learned his trade on the armoured battlefield. His CO described him as "an excellent troop commander, and a most delightful and engaging person, with a modest and unassuming manner which belied his determination and sense of duty. Not quite as silent as his father! But equally not given to verbosity; when he had something to say it was worth listening to."

After this he returned to Mons Officer Cadet School as platoon instructor and company 2IC. Many years later the Honourable Nicholas Soames, then Minister of State for the Armed Forces, described how Sugden had been responsible for getting him, as "a pretty scruffy cadet", commissioned. He observed that Sugden had a positive approach; his attitude was one of how to get people through the course and not, as many of the other instructors, how to fail them.

In 1968 his new CO describes meeting him already installed as Adjutant 4th Divisional Engineers in Paderborn. "On first meeting this slim, bespectacled, rather serious looking young man, and never having served in BAOR before, I think I was rather more frightened of him than he of me!" Things quickly changed and they became firm friends.

Next came Staff College, followed by a good posting to DS6 on the Central Staff of the MOD. In 1973 he took over command of 4 Field Squadron in Nienburg. His squadron was given the task of laying on a demonstration on the River Weser of MGB used as a floating bridge,

Major General F G C Sugden CB CBE

employing all the various different types of pontoon that existed at the time. All sorts of top brass came and, accompanied by the Sapper band, Sugden laid it on with such aplomb that it was the talk of all his contemporaries around BAOR. His thoughtfulness and concern for the military families showed when he invited wives and children to attend the dress rehearsal, a gesture much appreciated by all. His CO said "his sappers had tremendous confidence in and respect for him. To illustrate this, I had set a very demanding ten-day regimental exercise, the finale of which was a dawn crossing with FV432s and Stalwarts swimming the Weser. At about 0400hrs I stomped around to see how they were getting on and asked a corporal if they were going to be ready in time. "Sir", he replied "if the OC says we are going to be ready in time, we will be."

A Sapper staff appointment followed in 1974 as GSO2 RE in HQ 1 (BR) Corps. The GSO1 RE arriving in 1975 into this new post recalls: "I was much impressed by Francis Sugden's grasp of the complexities of the "Wide Horizon" proposals to drop the brigade level of command and the cheerful manner with which he processed staff work, laughing off many of the difficulties that beset us. His rapport with the staff and the respect in which he was held did much for the Sapper cause at Corps HQ." He left Bielefeld on promotion and joined CDS' staff as a GSO1 briefer.

In 1978 he went to command 22 Engineer Regiment at Tidworth, a period which he later described as "the time of my life". He delighted in the many and varied projects which the regiment undertook, and winning the Wilkinson Sword of Peace was the icing on the cake. This encompassed work in seven different overseas countries, including providing a detachment as part of the Commonwealth Cease-fire Monitoring Force in Rhodesia. General Sir John Learmont, said of him: "Francis deployed to Rhodesia with a small Tac HQ from his regiment. His task was to monitor the Rhodesian Forces in the south of the country and he was attached to a Rhodesian brigade HQ. To accomplish his mission successfully several qualities were required and Francis had them all. The first was to establish a professional "street credibility" with the Rhodesian brigade commander which Francis achieved in very quick time. Tact and diplomacy were necessary and more: considerable powers of persuasion to get the Rhodesians to accept the inevitable compromises which were to lead to peace, and a stubbornness not to be deflected from the true course by the innumerable obstacles laid in one's path. Francis was quite outstanding throughout this period and much of the eventual success of the Commonwealth Cease-fire Monitoring Force can be laid at his door." For his time in command, he was appointed OBE in 1980.

Promotion in 1980 took him back to Bielefeld, as Colonel GS (or ACOS G3 O&D) HQ 1 (BR) Corps, working for General (now Field Marshal) Sir Nigel Bagnall. It was here that he first really came to be recognized as a staff officer of exceptional calibre, one of the most gifted of his generation. His performance in this post put him into the RCDS in 1984 although he was still only a colonel. A year later he was back in Bielefeld as Commander Engineers 1 (BR) Corps and Commander Hameln Garrison. He realized that the fast moving scenario of the Corps' doctrine would not allow the armoured engineers time to take part unless they were integrated into the Sapper orbat at brigade level. Thus was born the close support/general support concept, from which stemmed a very fundamental reorganization of the Sappers of 1 (BR) Corps for which, because he enjoyed the confidence of everyone from the Corps Commander down, he was able to gain assent in principle and leave to be fully developed by his successor. One of the highlights of this tour was Exercise Makefast, hosted by 1 (BR) Corps at the RSME, the thirtieth occasion of the NORTHAG Engineer exercise (the oldest NATO exercise), started by his father, the first Chief Engineer NORTHAG, after the floods in the Low Countries in 1952. The exercise was very successful and two generations of Sugden were toasted at the finale dinner.

Following his next job as DMO in 1986, he was promoted to major general in 1989 and appointed Chief of Staff BAOR to General (now Field Marshal, Lord) Sir Peter Inge. He arrived in post just as the Warsaw Pact was unravelling, at the same time as Secretary of State Tom King was promulgating his Options for Change, and the "New Management Strategy" was being introduced. As if this were not enough, the Gulf War blew up and he found himself orchestrating "draw down", the new operational posture in BAOR, at the same time as mobilizing the necessary armoured forces for the Gulf War (including his

own son, Henry, as a subaltern with the armoured reconnaissance regiment). He succeeded brilliantly. These were exactly the conditions that suited his temperament and capacity for driving a complex bureaucratic machine. It was the pinnacle of his career for which his immense talent and broad experience uniquely fitted him.

His appointment on retirement in 1991 as Lieutenant Governor and Secretary, Royal Hospital Chelsea fitted well his capacity for good administration in a high profile role. It brought him great happiness and satisfaction. The welfare of the In-Pensioners meant so much to him. He loved the old soldiers in his charge and they loved him in return. As a keen gardener, he thoroughly enjoyed his involvement with the Chelsea Flower Show and he and Liz revelled in entertaining their friends to private viewing parties. He enjoyed family and friends in their lovely Wren apartment and was thrilled to see his daughter getting married in the Royal Hospital Chapel. He always said that his five years at Chelsea were the happiest of his life. He made a very deep impression there and is greatly missed.

During this time he remained closely in touch with and undertook many responsibilities for the Corps and other charities. He was appointed Colonel Commandant in 1993 (Representative in 1996); was Chairman of the Museum and Library Committee from 1993 to 1996 and of the Corps Finance and Investment Committees from 1993 to 1997. He was on the Council of SSAFA and was Chairman of an officers' widows home (with his wife on the committee) and a council member of a soldiers' widows home. To all of these he brought the same dedication, support and professionalism that he gave to everything he did.

Francis Sugden rose from an inauspicious start to become one of the most able officers of his generation. He was known particularly for his ability as a staff officer but was an excellent commander as well; a consummate professional soldier but remembered by all who knew him also as a true officer and a gentleman, modest and unassuming, a man of great courtesy, kindness and good humour with time and compassion for everyone. He was devoted to his family, and in return his wife Liz supported him wonderfully throughout their life together. He is survived by his wife and their three children.

GBF JPWS JIP JPG CJR GWAN

MAJOR P B DUNHAM FRIBA

Born in 1911, died 29 August 1997, aged 85.

PETER Browning Dunham was born in Luton, the son of a builder and the grandson of a farmer. He trained as an architect, in London, before being commissioned into the Corps in 1941 for wartime service until 1946. His training as an architect was very useful especially when carrying out construction tasks. An accomplished artist and draughtsman, he produced clear coloured diagrams of enemy mines and booby-trap mechanisms which were used for training purposes.

Peter spent his service years in Europe, holding various appointments before taking command of 617 Assault Squadron in 1944. He took part in fighting through the Low Countries, fighting in support of 1st Canadian Corps in the liberation of northwest Holland, then in the intense street fighting during the liberation of Arnhem, and joining 5th Canadian Armoured Division in the advance to Zuider Zee. He was mentioned in despatches for his services in northwest Europe.

Even in wartime he kept up his painting and in 1989 presented to the mayor of Le Havre, at the 45th anniversary celebrations, a picture he had painted in 1945 of the utterly devastated docks.

He leaves a daughter, Joanna, and a son Simon.

REW

LIEUT COLONEL J G WOOD OBE

Born 6 November 1912, died 5 June 1997, aged 84.

ARTHUR Henry James Guildford Wood or "Timber" as he was invariably known, was born to a London seafaring family. An unexceptional performance at school in Chiswick was followed by his entry into the Corps as a boy at the age of 14. He served 28 years, much of it in the Indian and Pakistan armies, and saw active service on many occasions from the North West Frontier and Waziristan through to North Africa and Italy during the Second World War.

On entry to the Corps he was selected for training as a stonemason. He served at Gosport, Shorncliffe and Chatham as a boy and young adult. It was at Shorncliffe where he first distinguished himself by failing to secure the tailboard of a horse drawn cart loaded with herring and by spreading the garrison's lunch along the uphill route to barracks. Prompted by this and other administrative disasters he volunteered for service with the Indian Army and was sent out to Quetta (around 1930) where he was seconded to King George V's Own Bengal Sappers and Miners.

He served in Quetta and on various outposts, possibly as a Clerk of Works, and reached the rank of WO2. He also became a keen rugby player and oarsman. Recognition of his lack of ability as a stonemason came in the granting of a Special Regular Commission in 1935, no mean feat in those days! He took part in the North West Frontier campaigns in 1935, 1936 and 1937. During the Second World War his unit deployed with 4th Indian Division to the Middle East, where they were employed mainly on Lines of Communication work in Iraq. During the war he commanded 301 Field Park Company and later No 1 Field Company during the Italian campaign, in which he earned a Mention in Despatches. He also managed to meet and later marry, Sally Dale, a big band singer and member of an ENSA party operating in North Africa. It would be a source of mild irritation to him in later life that his wife was awarded the African Star for which he did not qualify!

After the war, and newly promoted to lieutenant colonel, Tim returned to India. First to Sialkot and then on the partition of the sub continent to Rawalpindi and Jhelum where he commanded 474 Army Engineers in the new Pakistan Army. From August 1952 till his retirement from the active list in 1955 he was Commander Royal Pakistan Engineers, 474 Army Engineers. Sally, sailing on almost the last voyage of the troopship *Empire Windrush*, had joined him in Jhelum in 1946 and the family, which by 1955 included two children, returned to the UK for the last time in September of that year. He was one of the last British officers to leave the Indian continent having helped to establish the Royal Pakistan Engineers after partition and was appointed OBE (always referred to by him as "Other B...ers Efforts") in the New Year Honours list.

Tim became a businessman running several successful small businesses, including a mushroom farm, until his final retirement in 1974. He lived at Coed Poeth near Wrexham for many years and moved to Rhos-on-Sea, North Wales eight years ago. He was a great supporter of the RNLI locally and remained throughout his life a staunch friend of Pakistan and her people for whom he always had a great affection. He is survived by Sally, son David (Major "Chip" Wood, recently retired) and daughter Patricia. He was also the much loved grandfather of Larissa, Zoe, Alex, Sam, Ben, Ellen, David and Katie. He will be sorely missed.

DJGW

Lieut Col J G Wood OBE

LIEUT COLONEL M D MACLAGAN MA

Born 22 May 1907, died 5 August 1997, aged 90.

MALCOLM Maclagan was descended from a distinguished line of Sappers, and his father and both his grandfathers were Sapper officers. On his mother's side his forebears included Lieutenant General Tickell (1785-1855), Colonel Lang who played a critical part in the assault of Delhi in 1857, and Major General Duperier, Colonel Commandant Royal Engineers (1922-1940). Many of his cousins have served the Corps in recent years and two, Major Christopher Tickell and Captain Peter Daniell, are serving today. His great uncle, William Maclagan, who had also been a Sapper officer had to leave the Corps because of illness, and later became Archbishop of York.

Malcolm spent his childhood in India, and after the war returned to England and was sent to Haileybury, like his father before him. At school he excelled at cricket, racquets and fives. He passed into the Shop in 1925, and after being commissioned into the Sappers in 1927 went up to Caius College, Cambridge and represented the university at both racquets and tennis.

After leaving Cambridge in 1929 he was posted to 59 Field Company in Bordon. In 1932 he was posted to India and served with Queen Victoria's Own Madras Sappers and Miners, as Assistant Adjutant, 2IC of the training battalion, and as GE in Ramzak. In 1939-40 he was GE Quetta and Peshawar. He returned to the UK in 1940 and served as Staff Captain and Brigade Major at the SME Ripon. In 1941 he became Staff Officer RE at the RE Depot Halifax. In 1941 he returned to India to serve with Queen Victoria's Own Madras Sappers and Miners, first as OC 12 Engineer Training Centre and then as CRE Fortress HQ. From 1943 to 1947 he served as Superintendent of Instruction at No 1 Group ME Lahore, OC 16 Engineer Battalion and finally Commandant of the Group.

On return to England in 1947 he was posted to HQ Bomb Disposal where he remained until 1950. He was then posted to Nairobi as CRE Works, and later served as CRE Works Fanara and Canal North. He returned to the UK in 1953 to become CRE West Riding. His last appointment was CRE Hanover from 1956 to 1959.

On leaving the Army, Malcolm moved to Somerset where he taught mathematics for several years at Millfield School in Street. In addition to teaching, he spent a great deal of time helping the young tennis stars at Millfield develop their skills and, as Master in Charge, he had the pleasure of travelling with the teams and seeing them in action during a period when it was virtually unheard of for the school to lose a match.

Although Malcolm had devoted much of his energy whilst in the Army to sport, representing the Corps at both cricket and hockey, it was at tennis that he excelled and for which he is best remembered. He first played in the Army Championships at Hurlingham in 1931, and played in the Wimbledon Doubles Championships in both 1939 and 1948. He won 33 Army titles between 1947 and 1980, one being the mixed doubles with his sister Myrtle, who had by then made her name as a cricketer; she had scored the first century in Ladies Test Matches against the Australians.

His record of 21 consecutive wins in the Veterans' Handicap singles between 1960 and 1980 is unlikely ever to be equalled. However, his great ambition to play against the famous French player, Jean Borotra, had to wait until Malcolm, 85, and Jean, 90 plus, met in the annual match between the international clubs at Wimbledon in 1992 – honours were even, at one set all.

A friend of Malcolm's who also played tennis for the Corps and the Army, recalls him as a very clever, thinking player, and writes: "You had to be very alert when playing Malcolm, ready for a sudden surprise under-arm heavily cut service, which

Lieut Col M D MacLagan MA

had you charging to the net to get to the ball before it died, or spun back into the net; or to cope with a prolonged lobbing campaign which tested your smashing to eventual collapse."

Another tennis friend wrote a few years ago: "Should you see a figure, clad in roughly equal proportions of bandages and tennis kit, walk slowly on to a court, where opponents have been knocking-up for some minutes, and then retrace his steps to collect that racquet which he has forgotten, and should he then on arrival at the scene of play proceed to gauge the direction and strength of wind by dropping a handkerchief, there is a high probability that the object of your gaze is the Army Lawn Tennis Association's most senior title holder!"

His wife, Laura, whom he married in 1944, and their son Bill, survive him.

MWDM MWB RAB

COLONEL F W SIMPSON OBE DSO

Born 27 March 1909, died 13 August 1992, aged 83.

COLONEL Frank Simpson who died in 1992 aged 83, won a DSO in the landings of the Normandy beaches on D-Day, 6 June 1944, when he was second-in-command of 5 Assault Regiment, RE.

The regiment's task was to land ahead of infantry and tanks, to clear and mark paths through such obstacles as mines, booby traps and barbed wire, and also to fill in or bridge anti-tank ditches. All this was done under relentless fire from snipers, machine-guns and heavier weapons.

The Sappers were equipped with a variety of unusual devices: flail tanks, which exploded mines by chains; "Bangalore torpedoes", which could be pushed under barbed wire entanglements and blow holes in them; and heavy tanks equipped with petards (AVRE), which could lob drums of high explosives over walls and parapets and demolish gun emplacements. This activity took place after a rough crossing in unstable boats. Speed, concentration of effort and total indifference to enemy fire and noise were essential.

Casualties were inevitably high, but the Sappers never relaxed their efforts knowing that if they did not clear lanes through the minefields, tank and infantry losses would be horrific, prejudicing the whole operation. Simpson jumped out of an AVRE and captured a German pillbox single-handed. He also took over the regiment after the CO was killed.

Frank William Simpson was born into a Liverpool shipping family on 27 March 1909 and educated at Merchant Taylors', Crosby, the Royal Military Academy at Woolwich, and Trinity Hall, Cambridge.

Commissioned into the Royal Engineers in 1929, he served in Malaya before the Second World War.

After returning to England he went with the British Expeditionary Force to France in 1939 and was evacuated from Dunkirk in 1940.

Later in the war he was concerned with training for the Normandy invasion. After his CO was killed he commanded the regiment up to the operations in Holland.

Subsequently Simpson was chief instructor at the School of Mechanical Engineering, Ripon, and then became Colonel AQ with 16th Airborne Division. He took part in parachuting, although as a staff officer he did not have to do so.

From 1949 to 1951 Simpson was the RE representative in the British Joint Services Liaison Mission in Washington, where his sociable qualities made him extremely popular. During a stint at the War Office he was appointed OBE.

From 1953 to 1956 Simpson was Chief Engineer under Glubb Pasha in the Arab Legion; and later in the decade was Deputy Director of Fortification and Works at Chessington, after which he retired. He then took up an appointment with Birds Eye Foods and also reorganized the fund-raising activities of the Red Cross.

Frank Simpson was a modest man who exuded confidence; his contemporaries said he did not know what physical fear was – an attribute which served him well in both military and sporting activities.

An exceptional all-round games player, Simpson played scrum-half for Cambridge in 1930 and 1931. Although never himself "capped" for his country, Simpson was twice reserve for England.

He also played rugby for Waterloo, Blackheath, Kent and the Combined Services. He captained the Army at cricket in his fifth decade and turned out for I Zingari, the Free Foresters and MCC.

His wife, Dilys, predeceased him. They had a son and a daughter.

[This memoir has recently been sent to the editor and is therefore published retrospectively.]

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BRIGADIER B C ELGOOD MBE BA

Born 10 March 1922, died 10 July 1997, aged 75.

BRIGADIER Bernard Cyril Elgood, known as Bruno, was so universally known for his sporting prowess that it was all too easy to overlook his distinguished military career. He belonged to that generation of Sappers who went straight into war service after OCTU and commissioning.

Born in London, he was educated at Durlston Court prep school, Bradfield College, and for six months at Pembroke College, Cambridge University, before joining 53rd (Welsh) Divisional Engineers, in 1941. Serving initially with 555 Field Company, he then joined 244 Field Company for their landing in Normandy on D+3. The Division took part in the fighting southwest of Caen in June 1944, XXX Corps advance to Arnhem, the Ardennes battle, Operation *Veritable* and the Rhine crossing, and Elgood was mentioned in despatches.

As soon as the war in Europe was over he was posted to Burma where he took command of 60 Indian Field Company (Madras Sappers and Miners) and was much involved in postwar reconstruction where his labour force included the best part of a brigade of Japanese former combatants.

In 1946 he went back to Cambridge to complete his degree and there distinguished himself by winning blues or half-blues for cricket, squash and fives, as well as obtaining a good degree.

After Cambridge he was appointed staff captain in AG7, and in 1951 moved to Nienburg, as 2IC 48 Field Squadron. A year later he was appointed Squadron Commander 60 Field Squadron, 26 Engineer Regiment in Hameln. Of this time DJNG writes: "Bruno came to command the squadron when BAOR was expanding and reorganizing. It was a time of serious training and competition between the Sapper regiments of I Corps, which obviously appealed strongly to our newest and youngest squadron commander. 60 Squadron, which had formed from drafts from other units, had had two commanders in its first two years and was lacking spirit and confidence. Bruno wasted no time in sorting out morale and discipline. His infectious enthusiasm and strong leadership soon gave the squadron a new pride and confidence and they gained a fine reputation."

An interlude then followed as DCRE Tel el Kebir, Egypt, before attending Staff College, Camberley, in 1955, and from there being posted to MI3; his appointment as MBE at the end of this tour indicates that he was as much at home on the intelligence staff as on the A staff.

In 1958 he went back to the Far East again where, as GSO2 in GHQ, his main task was the planning of the Kota Belud training area in Borneo. After only a year he was appointed to command 11 Independent Field Squadron based at Butterworth. This tour included work on the roads in Kedah and taking the squadron to Kota Belud to carry out some of the plans he had made as a GSO2.

He returned to England in 1960 and, after the Joint Services Staff course, joined the RSME as Brigade Major. A short interlude followed as ERLO until moving to Dover in 1964 to take command of the Junior Leaders Regiment. There, not surprisingly, regimental sport flourished and an enduring tradition of Army-wide success was established. It was an ideal job for Bruno and he welded together a happy team of Sapper and RAEC instructors. He believed strongly in the importance of the regiment to the Corps and of keeping it at Dover; he fought an intelligent, capable and successful campaign to prevent the closure and move of the regiment at that time.

In 1967 he was back at Latimer as an instructor at the Joint Services Staff College after which he

Brigadier B C Elgood MBE MA

went to the MOD as OIC Defence Operations Centre (1968-69) arriving at a very busy time including during the Russian intervention in Hungary. In 1969, he was appointed College Commander of Victory College at the Royal Military Academy Sandhurst. Leaving at the end of 1970, he took command of 30 Engineer Brigade. He quickly impressed his enthusiasm on the units of his command. At the same time, he filled the post of Chief Engineer Western Command, the last officer to hold the post before the command was disbanded in 1972.

He became Deputy EinC in 1973 until he retired in 1975. He brought to this, as to all his senior appointments, a rare combination of qualities. He was exceptionally quick thinking which gave him a head start in any argument; he had a finely tuned feel for what was important; and was decisive and determined. Furthermore, he had an all-pervading sense of humour and ready wit. He was the greatest fun to be with and could lighten the mood of the most earnest of committee meetings with a flash of humour and accompanying twinkle in his eye.

On retirement, he settled in Gloucestershire where he quickly immersed himself in local activities including being both secretary and then chairman of the county branch of SSAFA. His involvement in this and other affairs was clearly demonstrated by the many local people who attended his memorial service at Pauntley.

He is survived by his wife Jacqueline, whom he married in 1951, and their son, two daughters and nine grandchildren.

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Memoirs in Brief

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

Alexander Cordell, who has died aged 82, wrote historical sagas, many of them set in Wales and expressive of his horror at the sufferings of workers during the Industrial Revolution.

Born on 9 September 1914 in Colombo, Ceylon, he was one of four children of a RSM in the Royal Engineers, and in 1932 followed his father into the Corps, attaining the rank of major. He spent some time at Fort George in the winter of 1943/44 preparing and training for the forthcoming invasion, and was later at the Specialised Armour Development Establishment where he remained until demobilization in 1945.

After the war, he settled down on an estate in Abergevenny, working for the Civil Service as a quantity surveyor. He described his first novel "A Thought of Honour" as an attempt to expunge "the dirt of the war."

He married first, in 1937, Rosina Wells, who died in 1972; they had a daughter. His second wife, Donnie, died in 1995.

Andrew Gray, who died recently, aged 85, was awarded an MC and mentioned in despatches when serving with the Royal Engineers in the North West Europe Campaign of 1944-5. He was commissioned in 1940.

He served in Britain until June 1944, when he landed on Gold Beach with the Canadians as Beachmaster. He was mentioned in despatches. He then moved forward to control the British between Caen and Ouistreham, and in September was with 30 Corps during its desperate but unsuccessful thrust to reach Arnhem and relieve 1st Airborne at the "bridge too far". Gray's responsibility was to preserve the vital bridge at Nijmegen, which was threatened by floating mines and debris, German frogmen, shell fire and aerial attacks. His particular task was to put a boom across the river to protect the bridge from being destroyed by mines floated down the river for that purpose; and it was here that he won his MC.

After demobilization Gray rejoined Unilever, and was soon promoted to Production Manager at Port Sunlight. In 1952 he joined Burroughs Wellcome, and after three years was promoted to Production Director. In 1963 he was appointed chairman of Cooper McDougall and Robertson, the veterinary subsidiary, and in 1971 he became chairman of the Wellcome Foundation.

Away from business, he was a governor of Joyce Green Hospital, Dartford, and chairman of the Herts Area Health Authority.

He married, in 1939, Eileen Haines, who died in 1980; they had three sons. In 1984 he married Jess Carr.

Milner Gray, who was the elder statesman of British industrial design, has died aged 97.

In 1930 Gray was a founding member of the Society of Industrial Artists, an organization dedicated to promoting the interaction between design and technology. A skilled artist and designer himself, he believed that if Britain was to maintain its position as an industrial world leader, then art and industry would have to work together to ensure that advances in technology were matched by parallel advances in design.

During the First World War Gray served in the 19th London Regiment and the Royal Engineers, where he was attached to the camouflage school, the first such unit of its kind. During WW2 he worked for the Ministry of Information.

Gray was deeply involved in all aspects of art and design; he was appointed Master of the Faculty of Royal Designers for Industry, awarded the Society of Industrial Artists' first Gold Medal for outstanding achievement in commercial or industrial design and appointed CBE in 1968. He published many articles and books.

Milner Gray married, in 1934, Gnade Osborne-Pratt, who survives him.

Tom Greeves, who has died aged 80, was the saviour of the artistic suburb of Bedford Park, in west London, the first important architect-designed garden suburb. Its principal buildings were by Norman Shaw, while some 350 houses were designed by many of the most important architects of the late 19th century.

During WW2 he served with the Royal Engineers and was posted to India, where he found time to study the buildings, including Gilbert Scott's Gothic buildings for Bombay university.

Completing his training after the war, Greeves soon turned to architectural illustration and started on his series of original and fantastical drawings

of Victorian buildings in ruins. These were exhibited at six Royal Academy exhibitions. He had a keen sense of fun, was a sensitive pianist and interested in 17th and 18th-century poetry.

Tom Greeves is survived by his widow, Eleanor.

John Leslie Lutyens, who has died aged 79, was chief executive of Brown Boveri Kent, the industrial instruments group, from 1974 to 1978; he remained on the board until 1983. He was director of research, British United Shoe Machinery Company, and in 1960 joined Pressed Steel, which merged with the Jaguar and British Motor Corporation to form British Motor Holdings.

In 1939 he was commissioned in the Royal Engineers with the 1st London Division Territorials, but his academic qualifications meant that he was seconded almost immediately to the Ministry of Supply (Directorate of Tank Design). Disappointed at not being on active service, he complained that he felt like a civil servant in uniform.

Part of Lutyens brief was to demonstrate new technology to the General Staff. On one occasion it fell to his lot to show Winston Churchill a small, remote-controlled tank, packed with explosive. Churchill gleefully seized the controls and drove it straight at the assembled generals.

At the crucial moment, a contactor in the tank stuck and it began circling madly round the General Staff, who leapt for their lives. Churchill was not amused; and Lutyens was left regretting more than ever that he was not on active service. Later he was posted to India to undertake similar technical work.

He married, in 1941, Ruth Hotopf; they had a daughter and two sons.

Gerald Mortimer, a member of the Institution, has died aged 78. He joined the management of Consolidated Gold Fields in London in 1955, becoming chief executive from 1976 to 1978. When the company diversified in Britain into the quarrying of aggregates, done through a series of acquisitions (of Greenfields, Amalgamated Roadstone and Amey) to form ARC, Mortimer was the first chairman.

Mortimer, who was born on 2 September 1918, took a First in mine engineering from the Royal School of Mines at Imperial College, London. In 1939 he was one of the first "Belisha boys" and in 1940 was commissioned into the Corps where he became a tunnelling expert and was responsible for excavating an underground barracks for gun crews inside the White Cliffs of Dover.

Promoted major, and despite repeated efforts to be posted nearer to the Front, he remained in England until 1944. Put in charge of airfield construction materials and other engineering supplies for the British and Canadian forces during the first fortnight of the *Overlord* landings in Normandy, Mortimer landed on D-Day plus 2, and remained with 2nd Army, taking part in several of the river crossings in the North West Europe campaign. He was present at the German surrender at Lüneburg and, having been sent forward to find a suitable route for the main British occupying force, was one of the first Allied officers to enter Berlin.

Gerald Mortimer was appointed MBE (Mil) in 1944 and CBE (Civ) in 1979. Keenly interested in military history, he published a book in 1993, "Never a Shot in Anger", which detailed his own wartime experiences.

He married first, in 1942, Connie Dodds, who died in 1989; they had two sons and two daughters. He married secondly, in 1990, Ella Walker.

Adrian Robert Plint, who died on 18 June 1997 aged 74, was a member of a well known Henley-on-Thames family, where his father, the inventor of the "Stuart" pump, had served as mayor.

Adrian joined the Corps in 1942 after a brief spell with Simmons and Sons, an independent firm of chartered surveyors land and estate agents. He was commissioned from 140 OCTU at Newark, and posted to Queen Victoria's Own Sappers and Miners at Bangalore in India, later joining 25 Indian Division Engineers in southern India, where we first met. The division was preparing for the landings in Malaya on 9 September 1945. After landing at Morib he moved up to Ipoh to deal with unexploded demolitions and road and bridge repairs. He was then moved to the east coast, where he and I were involved in building the Class 9 fair weather road from Kuantan to Khota Bahru. After demobilization, he rejoined Simmons and Sons, later becoming a partner. He specialized in the design and construction of modern farm buildings, land drainage, and the restoration of old buildings. For over 25 years, he was Chairman of Turvill Parish Council, where he lived for 43 years, participated in many other local activities and was a member of the parochial church council. He is survived by his wife Joan, their children Guy, Richard and Deborah and six grandchildren.

Correspondence

ROLE AND OBJECTIVES OF THE INSTITUTION

From: Captain A J Slee FIMgt

Sir, – I cannot resist writing in response to your article in the August 1997 *Supplement.*

I served for only ten years as a Sapper and I credit the Corps with giving me the best engineering education available for young men in my time. I never finished a degree or any other form of technological diploma but my sapper training has kept me head and shoulders above the technicians and engineers I have had working for me as a general contractor (20 years with over 3500 employees at its strongest) and more recently as an environmental and engineering consultant/project manager.

This is not boasting: it is only to demonstrate that being a Sapper means a lot more than getting a degree or academic qualification in project management (for engineering projects), civil, structural, mechanical or electrical engineering. I am not alone in holding this view and can put you in touch with many very successful project managers, engineers, and businessmen who had RE training as their only qualification. Being a Sapper is much more than being a member of other clubs, societies and institutions. There is a latent value in Sapper training which puts ex-Sappers above the rest in engineering management, and I believe the Institution of Royal Engineers should capitalize on it now. Yours sincerely – A J Slee.

From: Lieutenant Colonel H P Munro TD BSc FInstP FIChemE MIMechE

Sir, – Technical articles in the *Journal* are of the greatest help, particularly if they highlight the errors of one's way! However they must be supported by an information retrieval system, which could be (indeed should) be the responsibility of the Corps Library. Whether it does so, I do not know. As an example, in the early 1960s, as a TA squadron commander, I was given the task of demolishing some old wartime concrete pillboxes, that were on the land of a Borstal establishment. The pillboxes were too close to the buildings (around 200yds) to use conventional boreholes. However, by pure luck, I recalled an article in the RE *Journal* published not long before, about demolishing edifices by explosives, having first filled the building with water. The amount of explosive required was, from memory, only some 20 per cent of that required for boreholes, and, as the water acted as a tamper for the explosives, there was no debris hurled about. We used this; unfortunately the pillboxes leaked like sieves, particularly at the join between the walls and the base slab, so we had to render the internal walls first. The article was 100 per cent correct: no blast wave was felt. At that time there was no mention of such methods in the RE Recce Pocket Book, or the various field engineering manuals – from memory called the "Field Engineering & Mine Warfare" series of booklets. It might be useful if this subject could be used to test the retrieval system. In passing I would add that we had some very attentive pupils helping (the inmates!).

Perhaps I could be permitted to include another story about demolishing pillboxes which comes to mind. At our last TA camp in 1966, we aided the civil power in the West Country, which included blowing up two old pillboxes on Rame Head. We used the conventional borehole methods. On the first one, after blowing, the pillbox was shaken, but still intact. It received a second treatment (with double charges), and was demolished. For the second one, we put in virtually treble charges and blew it. The pillbox "vaporized". It then came clear why. Way back in 1940, a vehicle could easily get to the first one, but not the second. All the steelwork for both had gone into the first one; but the second had none! Pre-examination with a mine detector would have been time well spent. Yours sincerely – Patrick Munro.

ANNUAL REPORT TO THE CORPS BY THE ENGINEER IN CHIEF

From: Brigadier John Constant MA CEng Eurlng FICE FIMechE MIEE

Sir, – The Annual Report to the Corps by the Engineer-in-Chief, as published in April, was full of interest as always, and I must offer my congratulations on its lucidity, as well as commenting on the brilliant way in which the draconian reductions in manpower appear to have been digested in order to leave such a credible orbat.

Having begun to take an interest in the Corps in childhood, and deciding in 1932 to make my career in it, I am quite cognisant of the many changes in the Armed Forces, which have created so many headaches for the EinC and his many predecessors over an era of 65 years. However the results have not all been downhill and there have been genuine improvements too.

In particular, it is good to see the formal recognition of the Sappers' role in support of the RN and RAF, as well as our contribution to damage control after many disasters, and keeping the peace with and without the UN. The specialist task of bomb disposal has been firmly established and the surveyors' importance is more clearly visible.

In our support for the Army, the balance between combat and construction has been clarified, and professionalism is added by the Engineer and Logistic Staff Corps.

The greatest single improvement is the battlefield support of a sapper regiment to each brigade, with a squadron affiliated to each armoured or infantry unit.

The orbat also includes the retention of many well-established squadron numbers, such as 1st, 4th and 51st, in all of which I served, as well as 45th which was my old 143 (not the 43 existing too). I am sad not to see my other one – 32nd – but that may perhaps be resurrected, when the day dawns for an increase, as an old fortress squadron number like that might usefully accommodate pile-driving, pipe-boring and underground E&M, which may become Sapper tasks again one day.

In conclusion, I was glad to see the April *Supplement* referring to a "young officer leading his troop", as we troop leaders did in the old field squadrons. There are those who believe "troop leader" to be an appropriate nomenclature for that level rather than the "troop commander" often used today. More "hands on"! Yours sincerely – John Constant.

50 YEARS ON

From: Major General P J M Pellereau MA FIMechE FIMgt

Sir, – You continue to invite contributions from those who can remember life in the Corps 50 years ago. The resultant articles mostly relate to splendid operations worldwide. Here for a change is one about a splendid sporting achievement.

In the years immediately following the end of the Second World War those of us who had been granted regular commissions during the conflict were brought back to the SME (as it then was) to take a supplementary course. In 12 months or so we were taught about every facet of Royal Engineer work from railways to bomb disposal. We were in essence shown how we could have won the war in a totally professional manner instead of the basically amateur way which had seen us through.

Army sport was by then emerging seriously and inevitably individuals were drawn into their particular game. For me and several others (such as Steve Goodall) it was hockey. Being on the nominal strength of one of the SME HQ regiments we could be included in their team for the Army Inter-Unit Hockey Competition. So in the autumn of 1947 we assisted 10 Regiment through its early rounds. Nor could we be omitted from the team when our supplementary course moved up to Ripon where the other half of the school still remained in its emergency location. Down south we came regularly for further successful knock-out rounds.

Until the marvellous situation arose that in the final of the UK Cup in the spring of 1948 we were to meet the other SME HQ regiment – the one which was based at Ripon! Everyone knew everyone in both teams but the rivalry was intense. Ripon had its stars including GB Olympic Cap, "Dodger Green". But Chatham was perhaps better balanced and we won a spirited match in splendid fashion. So far as I know such a final between two regiments of the same organization has not occurred again and seems unlikely to do so.

After that UK final, the match against the BAOR champions was almost an anticlimax. Certainly we won – cup and all – but the previous contest had been much more important and a truly unique Sapper occurrence. Yours faithfully – P J M Pellereau.

RABBIT'S FOOT OR REALITY

From: Brigadier Roddy Macdonald MBE BSc CEng EurIng FIMechE

Sir, – I would like the opportunity to thank you for the high standard of both the Royal Engineers *Journal* and the *Sapper* and add some support to the comments of Brigadier John Hooper in his thought-provoking article entitled

"Rabbit's Foot or Reality" (Volume 111 August 1997 *Journal*, p139).

When we took part in the assault landings on the Falkland Islands in 1982, I was privileged to be commanding 59 Independent Commando Squadron Royal Engineers. Shortly after the landings due to incessant air attack, 3 Commando Brigade found itself isolated with few supplies and was forced into a defensive position. Cries came from the commandos and parachute battalions for mines to be laid to enhance their defences.

Prior to the landings, the then Brigadier Julian Thompson and I had discussed this issue. As a result, we had stated that no mines would be laid without authority from 3 Commando HQ. Brigadier Julian and I discussed the mine laying request from his subordinate commanders and had little hesitation in agreeing that this request was unacceptable. Our task was to recover the Falkland Islands for the islanders, not contaminate it forever. No mines were ever laid by 3 Commando Brigade.

Later on in the campaign, my own prejudices against minefields were further reinforced by the casualties we took both running through Argentine minefields in the assault and clearing some of them after the conflict was over. Both were unpleasant, but the former did not prevent the achievement of our military objectives and the latter remains a legacy of human folly to this day.

After the war, I found myself understandably in some hot water, and the subject of a silencing order from the then EinC, as a result of unwisely expressing my controversial views on mine warfare in my post operational report and to the press, who widely reported it at that time.

When I look back over my happy career in the Corps, a decision that still gives me great satisfaction to this day was not to lay mines during the Falkland Islands War. Yours aye – Roddy.

CAPTAIN G B ALEXANDER'S 1945-1948 STUDIES ON THE GEOLOGY OF GIBRALTAR

From: Colonel E P F Rose TD

Sir, – Two articles in the *RE Journal* have drawn attention to the significance of studies on the geology of Gibraltar in the period 1945 to 1948 by Lieutenant/Captain George Baker Alexander RE – vol 103 (for 1989) pp.248-259, vol 106 (for 1992) pp.168-173.

Alexander was one of very few Corps members ever to be appointed to a full-time geologist post in peace time – an appointment primarily to support the work of Corps tunnellers. Major W H Wilson, a former OC of 172 Tunnelling Company RE, has recorded that in the layout of tunnels through the Rock it was necessary to avoid major faults and broken ground as far as possible; when constructing large chambers, to do this where practicable parallel to the dip of the strata; and to take account of horizons in which caverns and solution fissures had been developed preferentially. Moreover, when Wilson's Cave (now re-named Gorham's Cave) off Governor's Beach was recognized as a site of major archaeological significance, Alexander "took charge of operations, and displayed considerable skill in making the preliminary examinations and report to the British Museum" (Wilson, W H 1945. Tunnelling in Gibraltar during the 1939-1945 War. *Transactions of the Institution of Mining and Metallurgy*, vol 55, p.193-269).

Yet when Alexander left the Rock and the army, he mysteriously disappeared without completing his work. It is now known that he died in Brighton in 1980, after a life in which there were several such disappearances (Rose, E P F and Cooper J A 1997. G B Alexander's studies on the Jurassic of Gibraltar and the Carboniferous of England: the end of a mystery? *The Geological Curator*, vol 6, pp.247-254). Some of his geological material collected in Britain and in Gibraltar is presently curated (although not displayed) at the Booth Museum of Natural History, Brighton; the Natural History Museum, London; the British Geological Survey, Keyworth, Nottingham; the Sedgwick Museum, Cambridge; and the Gibraltar Museum, Gibraltar. He published very little, certainly nothing on Gibraltar, but these specimens at least are carefully preserved for others to use. – Yours sincerely, Ted Rose.

TRANSFER OF SOVEREIGNTY

From: Colonel W G A Lawrie MA FIL MICE

Sir, – Major James's excellent article under the above title carries on the theme of my article "1946 – A Fateful Year" in the December 1996 *Journal*. I arrived in Amritsar to take over as Brigade Major on 20 August 1947, the same day that two of his officers were murdered by Hindu soldiers. By then the situation was already out of

control. I never once met my brigadier, who was trying desperately to arrange a cease-fire, and I was the only other British officer in the HQ, which had ten or eleven units under command spread out around dozens of rioting villages on the Indian side of the new frontier.

Major General Rees dropped in to see me every morning by helicopter but was unable to appreciate that the Indian Army units that had fought so gallantly in Burma under his command were now completely unreliable. Not only had most of their British officers left, but also senior *subedars*, *jemadars* and *havildars* had been released and the ranks filled up with raw recruits imbued with communal hatred. The result was the horrific massacres of innocent civilians described by Major James, which make recent killings in Rwanda and Bosnia appear like Sunday School outings.

All this stemmed directly from the defeat of Churchill in the General Election of 1945. The plan put forward by Lord Wavell for the gradual handover of sovereignty province by province over a period of two to three years could have been successfully implemented without bloodshed and without partition. The Mountbatten plan supported by Nehru and Jinnah was doomed to failure, since all three of them were out of touch with Indian opinion in the country at large. They were all more concerned with their own careers than with the welfare of the people.

When I was in India earlier this year a senior Indian officer said to me, "Why on earth did you go off and leave us in 1947? Look at the mess we are in now." The armies of India and Pakistan brought up in the British tradition provide a strong core in support of crumbling administrations and are filled with nostalgia. As an example of this the Bengal Sappers with whom Major James and myself had the honour to serve, and who are the successors of the Prince of Wales' Own Bengal Sappers and Miners, named after the then future King George V, have just given me one of their newly designed regimental ties emblazoned with the Prince of Wales' feathers between RE colours. This is in spite of strict governmental instructions in 1947 that all British insignia were to be abolished. Yours sincerely – Aitken Lawrie.

THE LAST OF THE KOI HOIS

From: Lieutenant G P Webb BSc(Eng) PEng

Sir, – How delightful to have a response to "The Last of the Koi Hois" from Mrs Désirée Battye.

I know of course that the usual rendering of the phrase in Roman Urdu is "Koi Hai" and not "Koi Hoi".

However, I can assure that when spoken in a strong voice, by a thirsty officer, entering the mess ante-room, the expression sounds much closer to "Koi Hoi".

The etymologist will certainly agree that to use the near approximation to the well known English exclamation, "Oi" or "Hoi" is a temptation too powerful to be resisted!

As a coda one also remembers that Urdu script cannot be represented exactly by Roman letters. Sincerely – Geoff Webb.

Reviews

THE YEARS OF DEFEAT 1939-41
HISTORY OF THE ROYAL REGIMENT OF ARTILLERY
GENERAL SIR MARTIN FARNDALE KCB

Published by Brassey's, Marston Book Services, PO Box 269, Abingdon, OX14 4SD – Price £40
ISBN 1-85753-080-2

UNTIL the late 1980s the official history of the Royal Regiment existed only as far as 1914. A major project was initiated by the Royal Artillery Institution in the 1960s to bring the history up to date. This is the fifth and latest volume in the new series, bringing Gunner history up to 1941, where it lags some 40 years behind our own official history! The author is General Sir Martin Farndale, who was Master Gunner at the time, a fact strangely omitted from his biographical details on the dust cover.

The book concentrates on the fall of France and the North African campaigns, but also covers the fighting in Norway, East Africa, Greece, Crete, Iraq and Syria, as well as the defence of the United Kingdom. The 235 pages of text are lavishly illustrated with 48 photographs and 54 maps, although the latter are not well-keyed to the text; there are a further 140 pages of annexes. The description of the campaigns from a Gunner perspective is interesting, but the constant listing of all the Gunner units and commanders involved in each action is rather indigestible. Many spirited actions are described and individual acts of gallantry recorded.

The shortage and antique nature of much of the artillery at the start of the war is described, which was alleviated only by the increasing availability of the 25-pounder. The importance of the direct fire capability of the 25-pounder in defeating enemy armour is well illustrated, in contrast to the ineffectiveness of most other anti-tank weapons available at the time, including the 2-pounders manned by Gunner anti-tank batteries. There is much criticism of the employment of artillery, particularly in North Africa, where it was all-too-often dispersed in penny packets around the battlefield where it could not be coordinated when necessary into divisional concentrations of fire. It was surprising to discover that only about one third of the men in Gunner units were issued with small arms, which led in a number of instances – notably in Crete – to batteries being over-run by infantry.

There are a few apparently suspect facts recorded; an example is the statement that of the Commonwealth casualties in Crete, only 188 were killed (including 57 from one HAA battery alone), whereas the Germans lost 2000 killed.

The rapid build-up of the Royal Regiment and the formation of field, medium, heavy, survey, coast, heavy and light anti-aircraft, searchlight (taken over from the Corps), anti-tank, and maritime regiments is listed. The strength of the Royal Regiment rose from 250,000 in September 1939 to 700,000 (a remarkable 40 per cent of the Army) in June 1943; at the same date, the strength of the Corps is reported as 230,000. Unsurprisingly, there are few mentions of Sappers in the pages.

This well-produced book gives an interesting summary of the various campaigns in the opening years of the war but is clearly written for internal consumption in the Royal Regiment and is unlikely to appeal to members of Other Arms, unless they are serious students of military history.

CPRB

IN THE EYE OF THE STORM
COMMANDING THE DESERT RATS IN THE GULF WAR
MAJOR GENERAL PATRICK CORDINGLEY

Published by Hodder & Stoughton Publishers, 338 Euston Road, London NW1 3BH – Price £6.99 – ISBN 0340 68246 9

7 ARMOURED Brigade, commanded by Brigadier Patrick Cordingley, deployed to the Gulf on Operation *Granby* in early October 1990. It was the first British Army formation to deploy in the aftermath of Iraq's invasion of Kuwait and it played a pivotal role in Operation *Granby* and the subsequent land battle to liberate Kuwait. Major General Cordingley's book is based on his personal Gulf War diary and vividly captures those exciting – if uncertain – days which many readers will remember well. The five years interval between Operation *Granby* and publication of this book have also permitted the author to

interweave balanced reflection and opinion with the immediacy of his diary notes.

The book is an intriguing amalgam of diary-based extracts (sometimes disarmingly candid), realistic and accurate descriptions of life and preparation for battle in the desert and clear (if at times simplistic) story telling. Major General Cordingley captures well not only those early days of heady anticipation (recall the worry of being "left out"?) but also of uncertainty and confusion, painting a realistic picture of the hectic round of preparation, recces and deployment. His description of work-up preparation in the desert is particularly vivid, clearly capturing his frustrations (not least with the media) and concern (a sentiment no doubt long shared by others?) that despite endless training in BAOR, there was still much to be done to weld his brigade and particularly its equipment into a war fighting machine.

7 Armoured Brigade initially supported 1st US Marine Division and the author describes the relationship which soon built up between his brigade and the US Marines. He also leaves the reader in no doubt of his strong views regarding the subsequent decision for the brigade to be redeployed away from the Marines to become part of the UK 1st Armoured Division operating to the West, under VII US Army Corps.

Of some 240 pages of narrative, it is initially surprising that only 40 are devoted to the land campaign itself (Operation *Desert Sabre*). However this single statistic in itself serves to remind that despite being the culmination of nearly five months living and training in the desert, the land battle was over in some 100 hours. The reader is of course well aware of the outcome in advance, but what of the fear and apprehension of those crossing the start line for a full scale operation with no scripted ENDEX? The author paints a powerful picture of his brigade in battle, capturing well not only the pressures on a commander, but perhaps more importantly, in fast moving, violent and confused battles, the dependence on the initiative and leadership of subordinate commanders.

Major General Cordingley's book is not a treatise on the use of the Royal Engineers in desert warfare. Nevertheless, throughout his book (which is illustrated with some well chosen photographs, including a page of armoured engineer equipment), there are a number of references to the important role of the Sappers. What is also very clear (albeit implied) is that if Sappers are to provide that crucial front line support in the right place and at the right time, there is a powerful need for appropriate equipment and vehicles. The term "antique road show" might have been applied with affection, but it was, sadly, also true.

"In the Eye of the Storm" is a short, fascinating and thoroughly enjoyable book written by a soldier who not only knows what he is about but writes well too: read it!

AREH

WALKING THE SOMME
PAUL REED
Price £10.95, ISBN 0850525675,

THE HINDENBURG LINE
PETER OLDHAM
Price – £9.95, ISBN 0850525683

Published by Leo Cooper/Pen & Sword Books Ltd, 47 Church Street, Barnsley S70 2AS

THESE two further guides in the "Battleground Europe" series follow much the same pattern as those previously reviewed and, in their convenient A5 format well furnished with maps and photographs, can be reliably recommended either for armchair or more active exploration of the detail of the First World War battlefields they cover.

"Walking the Somme" gives much broader coverage than earlier books dealing with the episodes in that battle area, reaching from Gommecourt in the north to Montauban, virtually the whole of the British sector. It is designed specifically for the walker and would suit many people who would like a general overview of the battle backed up by eyewitness accounts, while they enjoyed the countryside.

"The Hindenburg Line" is a valuable reminder of an aspect of the war which is sometimes glossed over: the German reaction to the mauling that their armies suffered both at Verdun and on the Somme and the problems that were then presented for future Allied offensive action. The Sapper aspects of design and layout of this formidable defensive system are well brought out – the author has researched extensively in the RE Library. Nineteen sectors are covered, each with a map and a description of fighting in the area. The detail of the research is remarkable, adding

life and colour to so many of the massive lumps of concrete and curious holes that still litter the area. The coverage is from Arras in the north to St Quentin in the south focusing on the battles of Arras, Cambrai, the Ludendorff offensives and the Fourth Army breakout.

GWAN

THE TERRORS
16TH (PIONEER) BATTALION ROYAL IRISH RIFLES
STUART N WHITE

Published by The Somme Association Limited, Craigavon House, Circular Road, Belfast, Northern Ireland, BT4 2NA – Price £16.95
ISBN 0 9527529 0 5

THE 36th (Ulster) Division was a product of Kitchener's New Army expansion early in the Great War. Its foundation was unique, unlike any other division of the New Army. Kitchener's appeal for recruits was taken up in Ulster by Sir Edward Carson, leader of the loyalist opposition to the Westminster proposals for Irish Home Rule. This opposition was manifested in the formation of a trained and armed para-military force, the Ulster Volunteer Force (UVF), in order to protect Ulster's place in the Union, if necessary by force. Setting politics aside, Carson had agreed with Kitchener that Ulster would raise a force for the defence of the Empire provided that it could fight as a formation like the all-Ireland recruited 10th and 16th Divisions. Thus the Red Hand Division was born, in many cases with recruits and units from the UVF. The Division had a unique personality, characterized by close-knit comradeship and local pride compounded with the zeal and fervour of the UVF; it was these essential elements which contributed, in due course, to its proven operational effectiveness.

The 2nd Battalion County Down Volunteers formed at Lurgan on 20 October 1914 as the pioneer battalion of 36th Division. Such battalions were used as divisional troops to add depth to the field engineering capability provided by the divisional field companies Royal Engineers. The opening chapters deal with the formation and training of the 16th (Service) Battalion Royal Irish Rifles (Pioneers) (16 RIR), the official title of the 2nd County Downs, initially in Ulster and then in England until embarkation for France in October 1915. In these somewhat innocent early days each battalion had its own unit training programme; there was no recruit depot and collective training was the exception. The founding commanding officer, a Southern Irishman from the Bedfordshire Regiment, and a cadre of regular officers and other ranks, set the new 1139-strong battalion a demanding schedule which has many parallels today. Fitness, sport, weapon-training, fieldcraft and tactics up to company level, as well as trench digging, were all carried out on private land in the Lurgan area. In addition to being proficient as infantry, 16 RIR also had to master many field engineer skills such as field defences, demolitions, roads and drainage, bridging and railways. This was carried out under the general direction of the divisional CRE but appears to have been very ad hoc. Pioneer training was done at Antrim and Reading (Chatham is never mentioned) whilst railway training was with the Great Northern Railway of Ireland and road construction with local authorities.

The majority of the book deals with 16 RIR's activities in operations on the Western Front. The move to France was characterized by the endemic military bungling of that time: no ship, no food, no accommodation and no train on the other side. However, once settled, the battalion was tasked with improving the Amiens defence line (used in March 1918) and with the construction of a 50km-long railway in order to improve logistic links for the Somme offensive, all of this apparently with hand tools. The rights and wrongs of the great battle will always concentrate military historians' minds; suffice to say, the 36th Division attacked at 0730hrs on 1 July 1916 to the battle cry "No surrender" and by midday had secured all its objectives but was forced to yield much of the ground gained because flanking formations were unsuccessful. And all this at a cost of 5500 casualties. A detailed account is given in subsequent chapters of the battalion's involvement in the attack on Messine Ridge, in the Third Ypres, the Battle of Cambrai, the Kaiserschlacht offensive and the Battle of the Lys. By early August 1918 the Germans had shot their bolt and the last hundred days of the Great War had begun. 16 RIR eventually finished their war on 17 November with the completion of repairs to the Scheldt bridge approaches. The final chapter deals with the demise of the battalion which, like many an old

soldier, having done its duty, just faded away through a protracted demobilization which was completed on 2 July 1919.

This book, written by an ex-Sapper whose father served with the battalion, draws widely for its information on personal papers, war diaries and contemporary newspaper reports, and is full of delightful vignettes. A tad expensive for a paperback, it nevertheless is a meaty volume which might have benefited from some more contemporary photographs. The subject is possibly specialist but, for anyone with a preoccupation in the triumph of the human spirit over appalling adversity which was the Great War, it is absorbing stuff. And its title? The 16 RIR adopted the "South Down Militia", a UVF marching song, as its regimental song and march. The last line of the chorus runs "The Sixteenth Irish Rifles are the terrors of the land."

MDC

AMPHIBIOUS ASSAULT FALKLANDS

The Battle of San Carlos Water

Michael Clapp and
Ewen Southeby-Tailyour

Published by Pen & Sword Books Ltd,
47 Church Street, Barnsley, South Yorkshire,
S70 2AS – Price £18.95
ISBN 0-85052-420-2

In the Author's Note Michael Clapp said that he had tried hard not to fall into the trap of hindsight. He did not succeed. Clapp begins by lamenting that the Royal Navy was under-appreciated by everyone and then goes on to pour criticism upon the naval chain of command outside his small circle. His is an extraordinarily blinkered, single-service view of the events which surrounded the Falklands Campaign. For one who emphasizes, constantly, how pivotal his role was in this combined operation, he displays little understanding of land warfare.

At the same time his approach to naval operations seems to have been pedantic. It was strange that he should have headed Chapter 7 with the Nelson quotation "... not a moment should be lost in attacking the Enemy ... boldest measures are the safest", when he also claims that, where boldness and initiative were shown, such action put his logistic plans at risk. For example, using hindsight, he levels heavy criticism of 2 Para's bold initiative in leaping forward to Fitzroy, because of the difficulties he experienced in supporting this move; although he admits to having joined in the general, contemporary, approval at the time. What he failed to appreciate was just how much the extremely arduous battle at Goose Green had taken out of 2 Para and the urgency which was felt in the battalion to get on and get things over with. There was indeed a shortage of assets, particularly of helicopters, but, as far as the ground troops were concerned there were also serious question marks over the efficiency with which these were being managed.

Clearly Clapp's relations with Admiral Woodward were not good. Perhaps this was because Woodward did not see Commander Amphibious Warfare as equal in status, whatever the latter's assertions to the contrary. Perhaps it was because Clapp did not enjoy Woodward's style or tactics.

Here, as a "land" reviewer one might have some sympathy. It is still rather puzzling to the soldiers who took part in the campaign that the aircraft carriers were there to carry aircraft but that the main purpose of the aircraft seems to have been to protect the carriers! Clapp is scathing about Woodward's decision to take the carriers away for a boiler clean at a critical stage of the land operations. However he is happy to gloss over the fact that he himself took the divisional headquarters to sea and out of communication with the brigades just when the offensive was beginning and divisional control was crucial. He also seems to have completely missed, or misunderstood, the confusion and frustration felt by those on land with the comings and goings (mostly the latter, at short notice and before off-loading was complete) of the ships which had much needed stores on them. Having claimed the credit, throughout the book, for the movement of all ships in his operational area of command his failure to address this issue is a major blind spot.

One is left with the inescapable opinion that Clapp had little real "feel" for what conditions were like outside his own small world. Perhaps if he tried living for three weeks in the open, in winter, on combat rations cooked in a tin which doubles as a shaving mug and which smells of hexamine, he might better appreciate that he did not experience as much an all-encompassing understanding of the campaign and the campaigners as he claims in this book. As it is, his stated view that he felt most comfortable when he was

back in the security of the San Carlos anchorage probably reveals more than he intended.

On a point of detail, there is only one map (in fact two copies of the same map) and, frustratingly, Michael Clapp constantly refers to places which are not marked on it. More maps and fewer photographs of people would have been a greater aid to those wishing to understand the movement of ships and troops in detail.

This book may find a useful place on the bookshelf of a commander amphibious warfare for it does describe the, sometimes invidious, position in which the individual will find himself. However, as an after-the-event, somewhat blinkered view it is unlikely to find much favour elsewhere.

CMD

SLAVONIC CONNECTIONS

MIESZKO MICHAEL DANECKI

Published by The Book Guild Ltd, 25 High Street, Lewes, Sussex – Price £15.00
ISBN 1 85776 135 9

MICHAEL Danecki and I corresponded in 1995, as two budding authors. His book was to be called "Slavonic Connections" and he detailed all the topics he intended covering; my thoughts at the time were that it would be heavy reading.

It is an autobiography and, whilst the book is not laid out in sections, there are really three separate parts. The first covers the history of commercial and industrial connections between England and Poland, covering seven centuries, which is quite fascinating.

The second tells of life from his early years, including all his wartime experiences; an extraordinary tale about an extraordinary man. Interspersed with the story of his life he recounts some events to which he compares his own situation, such as Operation *Barbarossa* and Stalin's problems. I think he has a very retentive memory even though he revealed that while a prisoner he had kept a diary; unfortunately this was taken by the Russians when he was released to join the Second Polish Corps, newly formed from the prisoners of war the Russians had been holding.

The third part covers the postwar period up to the present day, and includes the evolution of the chartered organizations of the professional engineers. During most of this time he was a mining engineer in the coal industry, having been trained as such in Poland before the war. Whilst being a story of his life, including much detail of his extensive family both in England and Poland, it also brings in the trials and tribulations of the British mining industry, both before and after nationalization.

In his (stated) attempt to attract the attention of the nostalgic Slav races, particularly the large numbers of Polish Army nationals who settled in this country after the war, I am sure he will be successful. It is a most interesting book.

EEW

A MILITARY ATLAS OF THE FIRST WORLD WAR

ARTHUR BANKS

Published by Leo Cooper/Pen & Sword Books Ltd, 190 Shaftesbury Avenue, London WC2 8JL – Price £19.95
ISBN 0-85052-563-2

THIS is an extraordinary book. At first sight it looks somewhat down market compared with many of the much glossier publications produced today using modern colour graphics, for it is all in black and white and was first published in 1974. Nevertheless it has 250 maps (the "Viking Atlas of World War I" has less than half that number) and a wealth of supplementary facts and figures; also masses of diagrams and drawings of the principal weapons and equipment employed in the war by all sides. The black and white maps manage to convey their message with great clarity by using cunning symbols and designs and the overall result is a minutely researched compendium of immense value. Pen & Sword have done a great service republishing this work and your reviewer will be among their earliest customers.

GWAN

THE DEATH OF THE PRINCE IMPERIAL IN ZULULAND 1879

WILLIAM PETER PHILLIPS

Published by Hampshire County Council Museums Service – ISBN 1 8 5975 112 1

THIS well-produced booklet explains the background and traces the course of the Zulu War of 1879. It gives the circumstances which led to the Imperial family of France settling in England, first at Chislehurst in Kent and later at

Farnborough in Hampshire, and Louis, the Prince Imperial, serving with the British Army. The events leading to his death on 31 May are covered in great detail.

After his death, his widowed mother the Empress Eugénie lived at Farnborough until she died in 1920, aged 94.

Royal Engineer interest in this sad affair centres upon Lieutenant Colonel (later General Sir) Richard Harris, QMG to Lord Chelmsford's force in Africa, to whose staff the Prince Imperial was attached.

The book will clearly appeal to readers with an interest in the Zulu War. It will also be of interest to local historians of Farnborough, Hampshire.

Copies are obtainable from the RE Museum at £4 a copy including postage and package. Telephone: 01634 406397, or Chatham Military: 766, extension 2312.

JEN

FIRE BY ORDER
Recollections of Service with 656 Air Observation Post Squadron in Burma
E W Maslen-Jones

Published by Leo Cooper, Pen and Sword Books Ltd, 47 Church Street, Barnsley, S70 2AS – Price £19.95 – ISBN 0 85052 557 8

Maslen-Jones was a Gunner captain who commanded a section of five Auster air observation posts in the Arakan in 1944, in the recapture of Burma in 1945 and in Malaya after the war had ended. This is a personal story and covers the author's experiences both in and out of action. He enjoyed flying and was delighted to find that the 90mph Austers flying at low level could make a valuable contribution to the war in the forests of Burma. The Japanese were adept at concealment but at their slow speed Austers could see what Hurricanes could not. Their manoeuvrability allowed them to call up artillery fire on enemy positions, disappear behind cover and then pop up to observe the fall of shot and make corrections. Flimsy as the aircraft were they did not have many losses, partly because the Japanese disliked giving away their positions by opening fire and partly because the pilots were adept at using low-level cover.

The author is an enthusiast and was clearly a very skilled and dedicated pilot. He writes well and the book is an enjoyable and interesting read. However, like everyone else in the war, he knew very well what was happening in his immediate vicinity but is sometimes wildly inaccurate in his comments on the rest of the Burma campaign. This, though, is irrelevant to his story which is one of considerable professional interest to all Gunners. For Sappers the direct professional interest is small but it requires little imagination to see how very useful low-level air reconnaissance can be for a hundred and one Sapper tasks. I recommend the book as a very useful read for those interested in this aspect of Sapper activity.

IHLG

MAD MIKE
David Rooney

Published by Leo Cooper, an imprint of Pen & Sword Books Ltd, 47 Church Street, Barnsley, South Yorkshire S70 2AS. – Price £19.95. ISBN 0 85052 543.8

Not the most imaginative of titles, this book is subtitled "A Life of Brigadier Michael Calvert". David Rooney has painted a sympathetic portrait of one of the bravest men the British Army has ever produced and, like his three older brothers, he is a Sapper. For the first half of his life, the author has relied heavily on Mike Calvert's own accounts, "Fighting Mad" and "Prisoners of Hope", both of which have been reviewed recently in the *Journal*, and culminated in his return home from Malaya in 1951. From then on his career took a downward path, as David Rooney explains.

Mike Calvert's active service started back in 1937 and for the next 15 years he was in the thick of things: Norway in 1940, the withdrawal from Burma in 1942 and then the two Chindit campaigns, followed by command of the SAS Brigade in North West Europe in 1945 and the forming of the Malayan Scouts in 1950. A brigadier at 30 with two DSOs and a reputation for incredible bravery, he could have expected to reach the highest echelons of the Army, but sadly it was not to be.

In October 1951 Calvert was posted to BAOR as an engineer staff officer based in Soltau with responsibility for works (shades of General Gordon reverting to being CRE Gravesend on return from commanding the Chinese "Ever Victorious Army"). He was manifestly unsuited

to the life, was drinking heavily and was court-martialled for gross indecency, a charge he has always vehemently denied. Whatever the rights and wrongs, Mike Calvert's judgement was singularly flawed and drink was often his undoing. The author writes sympathetically about this period and draws a parallel between Calvert and other great leaders such as Alexander the Great and Julius Caesar and the celebration of romantic love between virile warriors. Whether his references to previous civilizations, where homosexuality was accepted as normal, does Mike Calvert's cause any good is a moot point.

Discharged from the Army as a major and drinking even more, Calvert went to Australia where he drifted from job to job, his alcoholism getting ever worse until he returned to England towards the end of 1960. Even then he carried on drinking, but slowly conquered his addiction and finally gave up alcohol in 1964. His rehabilitation was slow and painful, with employment difficult to find. After various forays into the business world, he decided to become a full-time writer in 1970 and set himself up as an expert in guerrilla warfare, but the world had moved on in the intervening 20 years since he had been so heavily involved. This is never more apparent than when he made a visit to Belfast, wearing an SAS tie, with a SAS badge on his car and seemingly trying to solve the whole IRA problem single handed. His naïvety and lack of political awareness was astonishing. Many Sappers though will remember his stimulating talk in 1973 at Chatham on the theme of "The Role of the Engineer in Counter Insurgency" but his proposals that the government should give priority to the security aspect of public buildings and that bridges should be built to ensure that no ducts were available for the saboteur to place explosives, while being entirely laudable were just not feasible and completely unrealistic in the political and economic postwar world of the 70s.

Readers who have not read Calvert's own accounts will no doubt find this biography absorbing, but it is a pity that David Rooney does not really comment on Calvert's ability as a commander and fails to assess properly his personality. The reader is left to draw his own conclusions: that while there is no disputing his bravery, his judgement was often flawed, either through prejudice, preconceived ideas or the effects of drink. The book also contains some irritating errors which could have been corrected with better editing; eg, Quetta could hardly be described as being in the foothills of the Himalayas any more than Bangalore can be described as a hill station! It is a pity too that he dwells at such length on Calvert's Court Martial and alleged homosexuality; Mike Calvert should be better remembered as a gallant man, a great Sapper and a renowned Chindit leader.

GLC

DIPLOMATIC DAN

Dan Raschen

Published by The Book Guild Ltd, 25 High Street, Lewes, Sussex BN7 2LU – Price £16.95
ISBN 1 85776 266 5

Diplomatic Dan is said by the author to be the last of his four light-hearted autobiographies. It tells of the three years he spent in the early 1970s as the Military Attaché in Sweden where his individual and obviously successful style made his act a very hard one to follow. Furthermore his novel approach appears to have led to the acquisition of useful information which those taking a more orthodox line might not have garnered.

There is much in the book about the diplomatic round and the almost non-stop entertaining orchestrated by Judy his wife, who from time to time picked up the pieces. As ever, in situation after situation, Dan is laughing at himself, whether it be the constant loss of his indispensable glasses in the snow or his inability to stand up on skis when, along with other attachés he is being towed many miles across wild country behind a half-track.

Dan's descriptions of his many journeys over almost every part of a sparsely populated little-known country will whet the appetites of those who enjoy wild and beautiful scenery.

One page in particular made your reviewer burst into eye-watering convulsive laughter. Dan tells how he came to the aid of his very serious friend, Mr Wang, the Chinese attaché, by freely "interpreting", with virtually no notice, the latter's farewell speech at a special gathering of the Attachés to mark Mr Wang's departure.

Unconventional as Dan's approach was, potential attachés and their wives would be wise to read the book before accepting or declining such a posting. Those who have done such a job will want to compare notes.

JNE

BRASSEY'S BOOK OF CAMOUFLAGE
Tim and Quentin Newark

Published by Brassey's (UK) Ltd, 33 John Street, London, WC1N 2AT – Price £25.00
ISBN 1 85753 164 7

Readers will know that Sappers have for many years been linked with the art and application of camouflage and concealment. Perhaps less well known will be the origins of modern camouflage uniforms which owe more to artists and painters than to military engineers (though an early commander of the camouflage section was a Sapper, Lieutenant Colonel Francis Wyatt).

This short volume covers briefly the early origins of camouflage, concealment and deception, delving into the middle ages with Shakespeare's reference to Birnam Wood moving to Dunsinane, before charting the emergence of rifle green in the early 19th Century and later khaki (khaki, incidentally being Urdu for dusty or dust-coloured). Once we enter the 20th Century it is the start of the First World War which provides the impetus for the myriad disruptive patterns with which we have sought to adorn ourselves since; it is a little surprising therefore that it was not until the early 70s that most armies chose to dress all their soldiers, as opposed to just the elite units, uniformly in what we would now regard as DPM (disruptive pattern material). There is an interesting section on the dazzle patterns adopted, with some well documented successes by the Royal Navy on their warships; and the lessons from this can be applied still in aiding the concealment of large areas such as airfields.

Before closing the first section of this book, the authors describe the current research focus in areas other than the visual band of the electromagnetic spectrum, perhaps the greatest challenge being to defeat the increasing number of thermal imagers on the battlefield. Our artists and tailors in the research department at Colchester can be justifiably smug if a suit or covering costing a few pounds eventually defeats a sensor costing many thousands of times more than that.

The second part of this book is merely a catalogue of patterns adopted on uniforms throughout the century, so some may baulk at the £25 price tag before considering this for a Christmas present. The book is however the first history of camouflage uniforms ever published and is a useful reference as well as an interesting read.

JRW

NISSEN OF THE HUTS
A Biography of Lt Col Peter Nissen DSO
Fred McCosh

Published by B D Publishing, Bourne End, Bucks – Price £8.00 – ISBN 0 9525799

The ubiquitous Nissen hut was well known to service personnel of both world wars, but today's youth might be excused if they think that their fathers and grandfathers were accommodated in portable buildings which were supplied by a Japanese car manufacturer, as the huts' genesis and the inventor have been neglected by military historians. However, this omission has now been rectified by a delightful and well researched biography of the son of a Norwegian mining engineer and part-time inventor who emigrated to the USA. Peter Norman Nissen's first patent was registered in Canada by 1896 and was for "Pneumatic Boots and Shoes". His next invention was the Nissen Stamp Mill for crushing gold ore, and he supervised installations across the USA, South Africa and Mexico.

The family returned to England in 1912, when Peter was 41 years-old and founded Nissen's Ltd, a building contracting company. Joining up as a temporary lieutenant in the Sherwood Foresters in January 1915, he was transferred to the Royal Engineers. By April 1916, Temporary Captain Nissen was based at Ypres, where he identified the need for a semi-portable, easily erected, mass-produced building for accommodating both men and material. Prior to this, huts for men were constructed of timber, stiflingly hot in summer, draughty in winter and easily damaged by shellfire or bombing. The "Nissen Hut" was the subject of a patent applied for in June 1916, just before the start of the Somme battles, and the huts were first in use in France by September of that year. Nissen was awarded the DSO in March 1917.

By May 1918, Acting Major Nissen was the OC of a unit that liaised with a unit of the newly constituted Royal Air Force at Nancy, in Southern France. Various patents for improvements to his design were now applied for, until his demobilization in 1920, when he worked on possible civilian applications for his designs.

Nissen Patent Buildings Ltd was housed in a new factory at Rye House, at Hoddesdon, Herts, where the prefabricated units were mass-produced. Used for many applications; from garages to village halls; farm buildings to at least one church; contracts were sought by Nissen abroad and the largest of these was for the ten-acre National Wool Sheds at Hull to accommodate wool imported from Australia, South Africa, New Zealand and the Falklands. Cheap and easily erected unit housing was also needed to accommodate returning service personnel, and the new company, Nissen-Petren Houses Ltd, was founded to design and produce these; some are still preserved at West Camel near Yeovil, Somerset.

In 1922, Peter Nissen purchased "Deepdale", on Westerham Hill where his family lived, where three of his children were born, and where he died on 2 March 1930. It was during the Second World War that Nissen Huts became so well-known in all branches of the Services, and were in use around the world, including Iceland, where they acquired the apt soubriquet "tin igloos". Even during the recent Falklands conflict, the Nissen hut was still in use and although Nissen Steelwork Ltd had ceased trading by 1977, having been absorbed by Schreiber Furniture of Harlow, many still remain today to remind the ex-serviceman and woman of a man who designed the barracks, canteens, hangers or drill halls they still remember.

Copiously illustrated with line drawings and photographs, a family tree, chronology and list of patents, this little booklet will provide much of interest for the military, social and architectural historian, as well as those who have an interest in little-known Kent personalities.

DGC

EPIC ACTIONS OF THE FIRST WORLD WAR

R W GOULD MBE

Published by Spellmount – Tom Donovan, 2 Newport Street, Brighton BN2 3HL, – Price £25 – ISBN 1 871085 39 X

TWENTY-EIGHT epic infantry actions of the First World War attractively laid out in 246x155mm hardback format and illustrated with photographs, maps and sketches. There is no particular Sapper connection but the book is a good-value collection of stories some well-known, others less so, all breathtaking in the account of the courage and endurance displayed.

GWAN

THE RIDDLES OF WIPERS

AN APPRECIATION OF *THE WIPERS TIMES*, A JOURNAL OF THE TRENCHES

JOHN IVELAW-CHAPMAN

Published by Leo Cooper (Pen & Sword Books), 109 Shaftesbury Avenue, London WCH2 8JL – Price £25.00 – ISBN 085052 494 6

THE author's idea with this excellently produced and laid-out book is to break the "code" of the jokey allusions in the famous satirical paper produced under bombardment in the Ypres Salient to enable the reader to share something of the safety valve effect that the publication must have had on men undergoing an otherwise horrific experience. Extracts from the paper, including many cartoons by Bruce Bairnsfather and others, are set as illustrations to the activities and events on which they were a commentary in true British Tommy-humour style, alongside photographs of the real scenes of the time. In 246x155mm hardback format and copiously illustrated this is excellent value as a keepsake volume.

GWAN

A WALK ROUND PLUGSTREET SOUTH YPRES SECTOR

TONY SPAGNOLY AND TED SMITH

Published by Leo Cooper (Pen & Sword Books), 109 Shaftesbury Avenue, London, WCH2 8JL – Price £9.95 – ISBN 085052 570 5

SIMILAR to other Western Front tour guides in its A5 laminated format, and in the detailed research that has gone into its preparation, this book is less of the "... turn left at the second crossroads and on your right you will see ..." variety than others in the genre reviewed in the *Journal*. It does describe the country in a four-leg walking tour starting at "Plugstreet" (Ploegsteert) but in a general way so that you do not feel obliged to follow an exact route. The excellent maps and affectionate description of the ambience combine with the vignettes of the war to make this an enjoyable companion for a visit to this little-known area. The main Sapper

interest lies in the work of 171 Tunnelling Company in the preparation of the Messines mines two of which lie within the area described. Two Sapper VCs, Sapper William Hackett and Captain William Johnston, are commemorated on the Ploegsteert Memorial to the Missing.

GWAN

DONATIONS TO THE RE CORPS LIBRARY

RECENT donations to the Library by authors include:

HEADQUARTERS, ROYAL ENGINEERS 1 AIRBORNE DIVISION, by Donald F Cooper MBE. Donald Cooper served in HQRE 1st Airborne Division from 1942 when it was raised until its disbandment in March 1946. This typescript account produced from notes taken at the time and now made up in a hardback limited edition, records the story of the divisional Sappers as seen from the top, including the background and actual events of Operation *Freshman*, the Sicily landings and Arnhem.

BERMUDA FORTS 1612-1957, by Dr Edward Harris. This is a detailed and magnificently illustrated book with 78 colour and many black and white plates and diagrams. Dr Harris is a distinguished archaeologist who was brought up in Bermuda and returned there in 1979 as Director of the Bermuda Maritime Museum. In the course of his research for the book Dr Harris made many visits to the RE Library. It is well described by Professor Quentin Hughes as "... a marvel of industrious investigation. ... No story has been left untold, no important episode unrecorded. It is a wonderful record of what has been and what still remains. ..."

CHANNEL DEFENCES, by Andrew Saunders, available from English Heritage at £15.99, ISBN 0 7134 7595 1. Rather less magnificent but equally authoritative and well illustrated as the Bermuda book by the present Chairman of the Fortress Study Group and author of many other similar publications, this is a handy and excellent value account of the fortresses that have contributed to the defence of Britain's south coast from the seventeenth century to the present day.

Explanation of Abbreviations and Foreign Words Used in This Journal

2IC ..... second in command
AA ..... anti-aircraft
Adjt ..... adjutant
AQ ..... short title for: Asst Adjt and QMG
ARRC ..... Allied Command Europe Rapid Reaction Corps
ASM ..... Artificer Sergeant Major
A Staff ..... Assistant Adjutant's Staff
Atts & Dets ..... Attachments & detachments
AVLB ..... armoured vehicle-launched bridge
AVRE ..... assault vehicle RE
BAOR ..... British Army of the Rhine
Battn ..... battalion
BBC ..... British Broadcasting Corporation
Bde ..... brigade
CinC ..... Commander in Chief
Civ Sec ..... Civilian Secretariat
Clk Wks ..... clerk of works
cm ..... centimetre
CO ..... commanding officer
Comd ..... command
Coy ..... company
CRE ..... Commander Royal Engineers
CSM ..... Company Sergeant Major
DCRE ..... Deputy Commander Royal Engineer
DEO ..... Defence Estates Organisation
Div ..... Division
DROPS ..... demountable rack offloading and pick-up system
DUKW ..... D=1942/U=Utility/K=All wheel drive/W=twin wheeled vehicle
E&M ..... electrical and mechanical
eg ..... *exempli gratia* (for example)
EinC(A) ..... Engineer in Chief(Army)
ELAS ..... communist movement in Greece (1945)
Engr ..... engineer
ENDEX ..... end of exercise
ENSA ..... Entertainments National Service Association
EO ..... executive officer
EOD ..... Explosive Ordnance Disposal
ERLO ..... Engineer Recruiting Liaison Officer
etc ..... et cetera
EWC ..... establishment works consultant
FARELF ..... Far Eastern Land Forces
Fd ..... Field
Fus ..... fusilier/s
G4 ..... quartering/logistics
GB ..... Great Britain
GE ..... general engineer
GHQ ..... General HQ
GOC ..... General Officer Commanding
GPS ..... global positioning system
GSO ..... general staff officer
HE ..... high explosive
HQ ..... headquarters
i/c ..... in charge
ie ..... id est (that is)
Inf ..... infantry
IQ ..... intelligence quotient
IRA ..... Irish Republican Army
ISO ..... International Standards Organization
JHQ ..... Joint HQ
JSSC ..... Joint Services Staff College Course
JSP ..... Joint Service Publication
KGO ..... King George's Own
Lancs ..... Lancashire
m/M ..... metre/million
Maj ..... major
MCC ..... Marylebone Cricket Club
ME ..... Military Engineer/s/ing Middle East
MES ..... Military Engineering Services
MGB ..... medium girder bridge
mm ..... millimetre
MOD ..... Ministry of Defence
mph ..... miles per house
MWF ..... Military Works Force
NATO ..... North Atlantic Treaty Organization
NCO ..... non-commissioned officer
No ..... number
OC ..... officer commanding
OCTU ..... Officer Cadet Training Unit
Offr ..... officer
OIC ..... officer in charge
PBI ..... poor bloody infantry
Pk ..... Park
PQE ..... professionally qualified engineer
PRI ..... President of the Regimental Institute
QMG ..... Quartermaster General
QMSI ..... quartermaster sergeant instructor
RAEC ..... Royal Army Education Corps
RAF ..... Royal Air Force
RAO ..... Regimental Adminstrative Officer
RE ..... Royal Engineers
REME ..... Royal Electrical and Mechanical Corps
Res Spec ..... resource specialist
RN ..... Royal Navy
RSM ..... Regimental Sergeant Major
RSME ..... Royal School of Military Engineering
SD ..... staff duties
SME ..... School of Military Engineering
SOS ..... save our souls
Sp ..... Support
Sqn ..... squadron
TA ..... Territorial Army
TQM ..... Technical QM
US/A ..... United States/ of America
VHF ..... very high frequency
RA ..... Royal Artillery
RAF ..... Royal Air Force
RE ..... Royal Engineers
Reg ..... Regimental
RNLI ..... Royal National Lifeboat Institution
UN ..... United Nations
USSR ..... Union of Soviet Socialist Republics
SAS ..... Special Air Service
Sgt/sergt ..... sergeant
SNCO ..... senior non-commissioned officer
Sqn ..... squadron
SSAFA ..... Soldiers, Sailors and Airforce Association
SSS ..... Station Services Squadron
STRE ..... Specialist Team RE
wpm ..... words per minute
W02 ..... Warrant Officer Class 2
UK ..... United Kingdom
UN ..... United Nations
US ..... United States
YO ..... young officer

HAVE YOU FACED YOUR DEMISE?

Are you married or do you one day hope to be married? Do you have, or plan to have children? Are you perfectly happy that your spouse and children will be looked after financially and personally when you die?

Do you know that the Royal Engineers have their very own Society to help you provide for these eventualities? Do you know that when you die – and one day you will – the Society will pay to your spouse an immediate lump sum, an annuity for the rest of her life and an additional annuity to each of your children up to the age of twenty-one? Do you know that if you hold the maximum ten units in the Society the lump sum will be **£30,000** and the annuity **to spouse and each child** will be **£3,500 per annum?** Do you know that this will be paid out (assuming you die first) at whatever age you die but that you cease to pay subscriptions at age sixty? Do you know that the younger you join, the lower the rates you pay throughout your subscription years? And that there are special rates for newly joined and single officers? And that the maximum you will ever pay over the years will be far less than the lump sum alone, never mind the annuities? And, finally, do you know that the Society is run by serving and retired Sapper officers, that they take no commission and that overheads are minimal. And that you can have the peace of mind of knowing that your widow will be unobtrusively supported as necessary by your brother officers for the rest of her life? Do you know that all of this adds up to a far better deal than any insurance company can offer?

The Society is the
ROYAL ENGINEERS
OFFICERS' WIDOWS SOCIETY
You can become a member if you are a Sapper officer under 55, regular or TA, male or female. If you are already a member with fewer than the maximum ten units you can take out more.

Contact the Secretary, Lt Col (Retd) Michael Fraser-Allen,
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