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Contents

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4,250

Editorial

FORTY YEARS ON

IN August this year both India and Pakistan celebrated forty years of Independence. We take this opportunity of saluting our friends in both the Pakistan and Indian Engineers and wishing them all good fortune in the years to come.

Whatever judgement history may make on the political role of the British in the Indian sub-continent the legacy of British engineers is substantial and enduring, and it is with some pride that we recognise the great part played by military Engineers in this. Many of the great men who made such significant contributions to the country are still honoured in both India and Pakistan although their names are scarcely known here at home. Their achievements, often in the face of immense difficulties were epic. Reading about them today is a humbling and at the same time inspiring experience. The catalogue includes canals, irrigation systems, hydro-electric schemes, roads, buildings, telegraph and, of course, railways. The *sine qua non* was Survey. The roll of honour includes such names as Sydenham Clarke, Durand, Cotton, Napier, Scott-Moncrieff, Battye and Browne to mention but a few.

As the Royal Engineers have made their mark on the Indian sub-continent, so has the sub-continent left its mark on the Royal Engineers. We view with much appreciation the shared experiences of the past which enriched the Corps through the opportunities they gave for the development of professional expertise and the spirit inherited from these experiences of spectacular achievement against huge odds. But to those of us who never enjoyed the experience of this service what stands out preeminently from the recollections of those who did, is the strength of the bonds of comradeship and affection that were forged with the people of the sub-continent in their joint activities in peace and war, creating a mutual respect transcending in its significance any physical legacy.

This issue of the *Journal* marks the anniversary with the article by Colonel Shirlaw which recaptures the atmosphere of the tensions of 1947 with dispassionate affection. Future issues will contain an account by Colonel Lawrie of his recent visit to Pakistan and by General Rau of the work of Sir Arthur Cotton.

New President—Institution of Royal Engineers

MAJOR GENERAL E G WILLMOTT OBE MA

MAJOR GENERAL E G WILLMOTT was elected to succeed Major General P C Shapland as President of the Institution of Royal Engineers on 21 October 1987.

He is conscious of the debt we owe to our predecessors both recent and long past. He noted with pride the work of the Corps in all phases of the operations in the South Atlantic. Accordingly he will seek to maintain and develop the culture of the Corps by sustaining our heritage and providing for innovative ideas.

This work will preserve our ethos. He believes that the Corps heritage needs to be visible so as to act as a beacon and guide for those grappling with the issues of today—whether in combat, logistics or in the realms of survey and the postal service. He will seek to develop the codes and principles of our profession so that past experience will provide support for the present.

From early work done by officers of the Corps sprang our own Armoured Engineers, the submarine service, the Royal Flying Corps, the Royal Tank Regiment as well as substantial elements of the Royal Signals, Royal Corps of Transport and the REME. With this in mind, Major General Willmott will seek to offer the pages of the *Journal* for those with innovative ideas.

He will seek ideas relating to "engineering as applied to military purposes"—to quote from our Royal Charter. He notes the role of computer software in the control of the machinery of war, the use of composite materials in structures and the development of forms of biochemical engineering to harness the power of Nature. He will seek contributions from engineers in the civilian community with experience that may be used to good effect in military operations.

Major General E G Willmott was born in 1936 and educated at Redditch County High School, RMA Sandhurst and Gonville and Caius College, Cambridge. After two and a half years in the ranks he was commissioned into the Royal Engineers in 1956.

As a subaltern and captain he served with 54 Independent Field Squadron RE and commanded British troops in the Far East serving in Hong Hong, Borneo and Singapore. He took part in various land, airportable and amphibious landing exercises with infantry brigades. He commanded the Composite Troop at Kota Belud during the early months of the Indonesian confrontation. In 1963 he joined the staff of HQ 2 Division Lübbecke, Germany and then became Adjutant of the Divisional Engineers. Following that he attended No 2 Army Staff Course.

During the 1970s, he commanded 8 Field Squadron in 3 Division and 2 Armoured Division Engineer Regiment (for three years); for the latter he was awarded the OBE.

His staff appointments have included tours as DAA and QMG, 8 Infantry Brigade and as Colonel GS on the staff of MGO in 1979 and 1980. He has been a member of the directing staff at RMCS Shrivenham and was Deputy Commandant during the transition to the new contractual arrangement with the Cranfield Institute of Technology.

He commanded 30 Engineer Brigade based on Stafford with operational responsibility in 1st British Corps. He spent 1983 at RCDS during which time he toured South America.

He is currently President, Ordnance Board charged with upholding the Board's professional standards in its role of appraising the safety of weapon systems. He is thus deeply aware of the use of the "tools of history" in assuring MOD of the safety of its various weapon systems. He is also continually working at the interface between civilians in industry and uniformed and civilian officers in MOD meeting the operational requirements of all three Armed Services for "Engines of War". He is daily involved in the interplay between scientists, engineers, finance officers and project management and Service staffs.

Major General Willmott is married with a daughter and two sons, one of whom is a TA Captain RE. His sports include sailing and skiing, he is interested in canoeing but his main recreation is house renovation and gardening—in support of his wife!

New President-Institution of RE

Punjab Journey 1947

COLONEL J H SHIRLAW MA

The author travelled out to India as an officer cadet in October 1943. He was commissioned in India in August 1944 and served with the Royal Bombay Sappers and Miners until a few months after Independence when he was posted to Malaya.

Background

When the war in the Far East ended suddenly and unexpectedly with the dropping of the Bombs in August 1945, a Labour government was already in office in London and had confirmed its intention of handing over power in India as soon as this could be arranged. It was clear then that partition into a Moslem North and a largely Hindu South, probably accompanied by intercommunal disturbances, would be inevitable. In the event, the suddenness of Partition in August 1947 and the scale of the disturbances took everyone by surprise. Over most of the Punjab, several million people left homes where they had lived in reasonable peace under British rule and trekked on foot, or by any means of transport, towards their new homelands, on occasions being savagely attacked by members of opposing religions. Scenes like the massacre on a train in a recent TV serial were a common occurrence. A contrast with modern political violence was the absence of firearms and explosives, except in the vicinity of the North West Frontier where everyone carried a rifle as a matter of course. In the Punjab, the victims of the massacres were hacked to death with swords, spears, knives and similar weapons, a few of which appear in *Photo 1*. Some people did make themselves crude firearms from bits of wood and metal piping, also in *Photo 1*, but these nearly always caused more injury to the firer than to the intended target.

By 1947, the Royal Bombay Sappers and Miners had abandoned their traditional organisation of companies, with a platoon each of Punjabi Mussulmen, Sikhs and Mahrattas, and had adopted single religion companies. I was then second in command of a Sikh squadron at Mardan, in the hinterland of the North West Frontier. As a result of the regrouping caused by Partition, we were to change stations with a Muslim squadron in Ahmednagar, in India: so we found ourselves a long way from home with some decidedly hostile territory in between.

The move was to be accomplished by both units leaving their entire G1098 and stores in situ, officers and men with weapons and personal kit travelling by rail between the two locations. Because reports at the time showed that local armed gangs were being tipped off about planned movements, moves were to be made at short notice, starting late at night.

At this time my OC had been detached to Brigade HQ, two national service subalterns had gone home on repatriation and the third had taken our advance party by train with a Hindu regiment also bound for Ahmednagar. As the only remaining British officer, I was to be in charge of the move. The squadron was depleted, not only by the advance party but also by those on leave, who had been sent letters telling them to remain at home instead of attempting the dangerous journey through the Punjab, and was organised into three weak troops, each commanded by a *Jemadar* (an Indian Viceroy's commissioned officer).

Colonel J H Shirlaw
Punjab Journey 1947

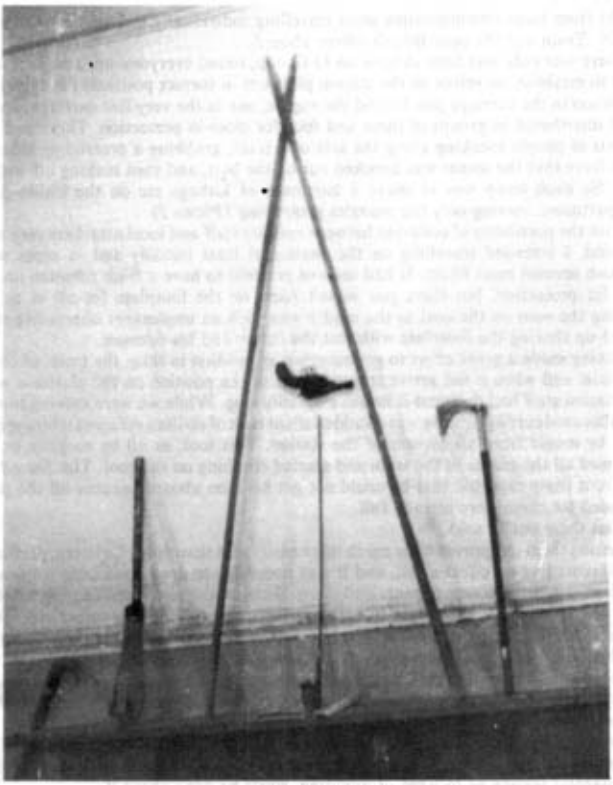

Photo 1. Typical weapons.

As things turned out we were required to make the first part of our journey by road from Mardan to Rawalpindi, acting as close protection to a large and unruly convoy of refugees in civilian lorries escorted by a Muslim regiment from our Brigade using Stuart tanks and Bren carriers. We were given about eight hours notice to move, and started at 0400 hrs. But these precautions did not prevent the convoy being shot up as we passed Attock: at a place so well designed for an ambush that I am convinced it was arranged by the local Police who were supposed to be helping to protect us.

On arrival in Rawalpindi the refugees were directed to a camp somewhere on the outskirts of the city; we were accommodated at Chaklala in what had been the Parachute Training Centre, but was then being used as a transit camp for Indian Army units travelling south.

Journey by Rail

We must have remained at Chaklala for a few days before I was summoned one morning to Area Headquarters for orders for the next stage of movement. We were to entrain at Chaklala that evening. The train load would consist of ourselves, a sub-unit of Rajput Military Police and a large number of Hindu officers and NCO

clerks from local administrative units travelling individually and unarmed. I was to be OC Train and the only British officer aboard.

There was only just time to have an O Group, round everyone up, and pack kit in time to establish ourselves on the station platform in correct positions for entraining: one troop in the carriage just behind the engine, one in the very last carriage, and the third distributed in groups of three and four for close-in protection. There had been reports of people sneaking along the side of a train, grabbing a protruding rifle with such force that the owner was knocked out by the butt, and then making off with the rifle. So each troop was to make a barricade of kitbags etc on the inside of the compartment, leaving only the muzzles protruding (*Photo 2*).

With the possibility of collusion between railway staff and local attackers very much in mind, I intended travelling on the engine, at least initially and in areas where ambush seemed most likely. It had seemed prudent to have a Sikh rifleman on each side for protection, but there just wasn't room on the footplate for all of us, and putting the men on the coal in the tender was such an unpleasant alternative that I ended up sharing the footplate with just the driver and his fireman.

Having made a great effort to get ourselves in position in time, the train, of course, was late; and when it did arrive stopped short of the position on the platform where the station staff had declared it would assuredly stop. While we were moving towards our allocated carriages there was a sudden silent rush of civilian refugees who appeared as if by magic from all corners of the station. This took us all by surprise as they occupied all the places in the train and started climbing on the roof. The *Jemadar* of the front troop reported that he could not get his men aboard because all the places intended for them were already full.

"Get them out" I said.

Getting them out proved to be much more easily said than done. Cajolery, persuasion and threats had no effect at all, and it was necessary to drag screaming women and children out of the compartments and dump them on the platform. The empty places thus created were immediately filled by other refugees from the other side of the train; when the Sikhs went back to deal with the newcomers, the original occupants climbed back in as well, and everyone disputed volubly and lengthily over the right to occupy the compartment. The eviction process ground to a halt with the refugees firmly established inside the train and ourselves, the rightful passengers, outside on the platform.

Everyone seemed to be looking in my direction; and not for the last time on that particular journey, unexpected disaster seemed to be engulfing us without my having the slightest inkling as to what, if anything, could be done about it.

Salvation appeared in the shape of Gurkhas: also not for the last time on that particular journey. On this occasion there were lots of them with several British officers including the Battalion Commander. He gave orders that the train would not be leaving but was to return immediately to wherever it had come from; everyone, troops, refugees, station staff were to leave the station area quickly. Apparently a Muslim battalion travelling up from India had got out of hand and was shooting up refugees on stations as they passed through. The Battalion Commander had orders to clear everyone from their path, and to prepare a suitable reception for the errant battalion.

Somehow the Gurkhas had no difficulty in clearing the train, the refugees disappeared as quickly and as silently as they had come, and we assembled in the station approach without any transport but with quite a lot of heavy personal baggage. The men could return on foot to the huts they had recently left, but there seemed no way of transporting our baggage: so we made a pile of it beside the approach road, positioned a troop under some trees where we could observe our property, and cover it by fire if necessary, and I spent a quiet night under the trees with them.

Next morning, activity around the station had returned to normal and there was a steady traffic of people on foot, on bicycles or in *tongas*. As no one showed any surprise or resentment at finding a band of bearded Sikhs established in a corner of

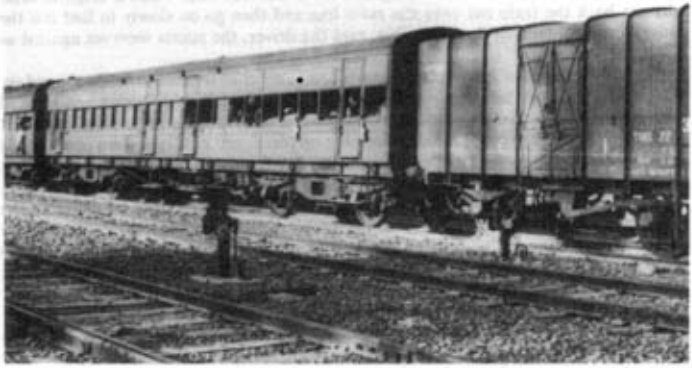

Photo 2. Troop position.

the station approach, it seemed safe to leave them there to go to Area Headquarters to find out what was to happen next.

Area Headquarters had not heard about the previous night's events and were not at all pleased to see me. A good deal of explanation, argument and telephoning was necessary before the train could be timetabled to leave at midnight with some extra carriages added for refugees. The movements staff did however find out where the carriages that would form our train, the "train unit" is I believe the correct term, would be assembled, and they arranged for me to visit the railway yard where it would be located. I had it in mind to arrange for the train to halt at a pre-arranged RV short of Chaklala station, so that we could claim our carriages before the refugees got to them. The railwaymen did not think much of this idea but suggested that a guard could be posted in the carriages concerned in the railway yard that afternoon. They cheerfully made light of anxieties about leaving a small party of Sikhs in such an isolated position. "No religious differences allowed on railway property" they said.

That evening everything went like clockwork! The train arrived on time, everyone entrained; there were fewer refugees about at the later hour and there was room for all who wanted to come; the fireman dusted off a knobbly corner of the cab for me to sit on; and we were off. On the way, the engine driver did blow the whistle when it didn't seem to be necessary, and it did seem possible that he was signalling information to local gangs, but nothing untoward happened. When we had passed through the hills, where ambush seemed most likely, I retired to bed in the train so as to be ready for our passage through Lahore and over the border in a few hours time, falling asleep to the comforting sound of train wheels taking us steadily south.

An hour or so later I awoke, not hearing train wheels taking us anywhere; but a glance out of the window showed a signal at red and I went to sleep again, comfortably reflecting that trains stopped at signals for all sorts of reasons. A little later, still not hearing railway wheels, it seemed time to roll out of bed to consult the engine driver. He thought that there must be a train coming the other way, but agreed that we had been kept waiting much longer than was usual in such cases.

Here it should be explained that Indian railways usually operated on single line working. The main routes ran on only a single line of rails: a train going one way could pass one going the other way only in major stations, which had an up and a

down line, or at specially constructed passing places. We had been diverted into one of these.

After a while I had a bright idea: why not ignore the red signal and proceed slowly down the line to find out the cause of the hold-up ahead. Not possible, replied the driver, because the points were set against us. Somewhat later I had a brighter idea: why not back the train out onto the main line and then go on slowly to find out the cause of the hold up. Still not possible, said the driver, the points were set against us behind as well.

As the full import of his words penetrated, a nasty chill seemed to settle around us. We could go neither forwards nor backwards! There had been collusion and we had been trapped for massacre! Indeed to the east, a dark wood with a road behind it parallel to the railway made an ideal forming up place, and rustlings were just audible in the undergrowth as of attackers assembling. To the west, an area of growing crops showed no signs of movement, but could still provide cover for large numbers creeping up on us. Everything fitted in! Dawn was not far off and at first light we could expect a sudden rush of fanatics with knives and spears and swords, possibly reinforced by tribesmen from the Frontier after loot and bloodshed. Fortunately we had time to prepare and I hastened along the train, urgently but quietly waking up sleepy Sikhs, getting them into 'Stand To' positions and pointing out aiming marks for the Brens.

While still in Chaklala all Bren magazines had been loaded with 1:3 tracer. The idea was to put a visible curtain of fire along the sides of the train from the troop positions at each end. The gunners, who were perched uncomfortably in their compartments with only gun barrels protruding, had orders to fire in long bursts, 10 to 15 degrees out from the sides of the train, choosing aiming marks which were past the other end of the train and which were solid enough to absorb the incoming rounds. Anyone getting through this curtain was to be tackled by riflemen: but, remembering the Muslim battalion of the previous night, I had impressed on everyone the importance of not shooting unless it was absolutely essential. We were a long way inside hostile territory and would undoubtedly be blamed for any incident that might occur.

To avoid accidental discharges, everyone travelled with weapons unloaded: the signal to 'Stand to and Load' was to be a single Very light fired from the engine along the side of the train. Fire orders could be given verbally to the troop just behind the engine if necessary. The signal to cease fire was to be two Very lights close together. Actually, it seemed most unlikely that, once out of the North West Frontier area, a mob would attack a train as heavily armed as ours: but in the dark they might not realise just what they were taking on, and there was always the possibility of a band of Pathans from the frontier, not so far away.

Consequently, just before dawn I was standing on the footplate, Very pistol in hand, awaiting attack, confident that the noise of the Brens and the sight of the tracer criss-crossing our front would turn away an attacking mob before they got close enough to be dangerous or to suffer casualties.

Half an hour later I was awaiting the rush of armed men with increasing impatience.

Half an hour later still, I was beginning to feel extremely foolish. The sun had risen; birds were flying unconcernedly about the wood, which was much thinner and less suitable as an assembly place than it had seemed in the dark; and the whole countryside was completely deserted. To cover my embarrassment I made everyone stand down with fierce exhortations about vigilance at all times, especially at dawn!

But, if we were not to be attacked, why had we been held up for so long? The engine driver had no idea, but volunteered the information that the signal was operated from a signal box just visible on the southern horizon, on instructions from the railway junction ten miles down the line. So, with the intention of using the telephone in the signal box to find out what was happening, I took an escort of two sections of Sikhs and we advanced in patrol formation along the line.

At the signal box, the signalman was irritated, but not at all intimidated, at finding his little cabin bristling with beards and rifles; and he was decidedly uncooperative until the owners had been sent outside. His information was of large scale trouble at

the junction ahead and all train movement within the sections controlled from there had been halted. He flatly refused to allow our train to go forward so that we could help sort out whatever trouble was going on. And when I demanded to use the telephone to speak to his superior he showed me his means of communication: a Morse key.

The instrument at the other end was located in the station master's office at the junction, and it was surprising how readily a conversation could be maintained, provided the exchanges were kept short and simple. A message dictated to the signalman would be translated into 'Railway English' for transmission in Morse. Fairly promptly a reply would come dot-dashing back for the signalman to write down and translate. By this means it became clear that riots and fighting were going on all over the station, the station master was barricaded in his office and intended staying there until the troubles were over. No train movement up or down the line was possible because no train could pass through the station. The station master also flatly refused to release my train so that we could advance along the line and stop the rioting. And when the suggestion was backed up by threats, the reply came that a lot of people had been threatening him with personal violence recently: I would just have to join the queue and he certainly wasn't going to release my train to help me do it.

Conceding game, set and match to the unknown station master, and completely baffled as to what to do next, I led my little band of Sikhs back along the line. It looked as if we were to be stuck in that siding forever. On the way back, I was perturbed to see that the refugees had left the train and gone off for anything up to half a mile into the open country to the west, to perform their morning bowel movements in the growing crops. I couldn't imagine a time when they would be more vulnerable to an assassin! But as the countryside was still deserted it seemed best, and certainly more hygienic, to leave them there.

A little later, I was standing by the train discussing matters with the VCOs when, on the northern horizon, on the otherwise empty road running parallel to the railway line, appeared an army 15cwt travelling southwards. With a hasty word to the assembled VCOs, I dashed across the intervening ground, past the wood that had caused so much unnecessary anxiety, and waved frantically at the vehicle to stop. Looking down from the cab were two Australian lieutenants, whom I had previously met in Rawalpindi. They said they were going to Bombay and looked very relieved when asked for a lift to the station in the next town. On later reflection it seems likely that, rather than face the train journey to Bombay for repatriation, they had stolen the vehicle and were hoping to be at sea before the theft was traced. Under the circumstances, it was good of them to stop—but Aussies are like that.

From inside the station came sounds of commotion. But, on the approach road outside, a company of Gurkhas was debussing from some three tonners like a pack of foxhounds arriving for a meet. I explained myself to their British major, and together we went to find the station master, who had indeed barricaded himself in his office. Talking to us through the closed door, he reiterated his refusal to come out until the riot, audibly going on at the southern end of the station, had been stopped. The major and his men went off purposefully towards the sounds of commotion. All the trouble was coming from the southern end of the station where there were several sidings full of trains. The platforms and the usual facilities of a railway station were deserted, though a few blood stained bodies showed evidence of recent troubles.

I was walking along a platform, feeling superfluous and rather vulnerable, when a Pathan bearer, in the red and white livery of the railway restaurants, suddenly suggested "Tiffin Sahib?" as I passed. This was, without a doubt, the best idea of the day. Breakfast, had been meagre, supper last night seemed a very long time ago; and, in view of the Pathan code of hospitality, the bearer's domain would be quite the safest place on the station. So, while the Gurkhas sorted out the trouble at the southern end of the station, lunch was served in the First Class dining room. It was difficult to follow the bearer's dialect, but he made it clear that if we, the British, were so foolish as to allow the locals to make all this trouble, he would soon be off home

to gather a band of his tribesmen for some profitable looting; and we would be welcome to whatever and whoever was left when they had finished.

I was dozing in the waiting room while the bearer kept watch when the major returned with an English lieutenant in tow. Apparently, in the sidings south of the station, a train of Hindu refugees going towards India had found itself alongside a train load of Muslims just escaped from there. Fighting between the two had erupted, the local populace had joined in, and a major riot had resulted. The lieutenant was in charge of another train parked at the very edge of the sidings and had spent a sleepless night trying to keep his people out of the general turmoil. When I saw his train, I realised how lucky I was! It was of enormous length, at least twice as long as mine, and consisted entirely of open wagons crammed with refugees. And he had only one platoon to guard them.

But my problem was still there, still stuck in its siding. So we made our way to the station master's office and persuaded him to come out by threatening to throw in a hand grenade, which we did not actually possess. We explained that the riot was now under control, so there was no reason for not releasing my train: as it passed through the station I would board it and we would be on our way.

"Oh, no Sahib, no can do!" He explained that a train was already standing on the main line opposite one of the platforms. Consequently it was not possible for another train to pass through the station as it would have to come through on that line. I expostulated that if this train was sent out northwards, it would pass by my train, which could then be released to pass through the station on the main line unimpeded.

"Oh no Sahib, no can do! Silly buggers on train say they will not let it go forward. They are sitting down in front of engine to prevent it moving." We walked along to the front of the train and, sure enough, a crowd of about 500 people was sitting on the line in front of the train; and the crowd seemed to increase as we appeared. The solution seemed simple: back the train away into one of the sidings. We would then clear the people off the line if they were still there when my train came in.

"Oh no Sahib, no can do! Silly buggers on train have thought of that and are sitting down behind as well." At the rear of the train another, but smaller, crowd was indeed sitting down on the line. Completely bewildered, I demanded an explanation.

"Oh Sahib, I am not knowing. They are saying that they will all be killed if they go on. They will not listen to reason from me; but perhaps if you are talking to them they will see sense."

A small crowd of elders was assembled on the platform and I proceeded to harangue them in Urdu, about the necessity of going on to start new lives in Pakistan and the foolishness of insisting on remaining in this dangerous place. They looked back with that amused tolerance with which the Indian populace habitually regarded a British officer in a state of rage; and replied patiently that all I had said was, of course, true, and they regretted the inconvenience: but they knew that, in a siding ten miles down the line, was a train load of murderous Sikhs, armed to the teeth and just waiting to jump out and kill them all.

The penny, or perhaps it should be the anna, slowly dropped. I had a train load of Sikhs in a siding ten miles up the line; we were armed! The people in front of me were Muslims, they would have been subjected to attacks on their way through India, and the most ferocious of the attackers would certainly have been Sikhs. They had reason to be afraid! I explained that their information was correct; except that the Sikhs were there and were armed, because we were a unit of the Indian Army on our way south with our refugees. The Sikhs would not kill anyone because I would tell them not to.

Animated debate resulted, the crowd on the platform seeming to grow in numbers. "Supposing we do go, what will happen when we have to pass by the Sikh train?" I offered to put a guard in every carriage to protect them until they were safely past. This was debated and a spokesman suddenly said "We do not want any Sikhs near our train, but will you come with us?"

"Of course it will be my responsibility to see you safely on your way."

Debate reached crescendo, but somehow the matter was decided and the crowd started to disperse. Half a dozen greybeards detached themselves from the rest and stood to attention on the platform. "All right Sahib", they said "we have all served in the army, if you say so we will go. Our lives are in your hands."

Much bustle and activity took place as refugees crowded into the train, and a large number climbed onto the roof. Declining the offer of a compartment I climbed on the roof with them and we set off across the sunbaked plain. I must admit that I had not previously achieved much regard for Indian civilians: but I had to admire that lot. They had lost everything back in India, goodness knows what they had been through on the way, and the future seemed remarkably uncertain; but they were clean, cheerful and philosophical as the train trundled along.

Getting them past my train presented no problems. We stopped a few hundred yards away and I told the refugees to get inside the train, close the windows on the side between the two trains and keep quiet. I did the same with my train; and got the Bren gunners out to lie on the ground with the magazines off the guns. Back to the refugee train, climb on top and we went slowly past in complete silence. Much relief all round; as the train chuffered away festooned with refugees shouting "Pakistan Zindabad, Hindustan Murdabad".

I was explaining the situation to the VCOs and regretting that all now depended on a distant signalman, with whom we could not communicate, when the Military Police *Jemadar* came up with a most surprising suggestion. Unknown to me they had their complete G1098 in two sealed box cars at the rear of the train. Being Military Police, their G1098 included several motorcycles, and they even had, probably illegally, petrol. If I would provide written authority for unlocking one of the trucks, I could have the use of one of the motorcycles! While I was making out the necessary chit, a machine was unloaded and one of the MPs brought it to the head of the train.

I hopped on and proceeded publicly, painfully and embarrassingly to demonstrate that it is not practicable to ride a motorcycle along a railway line. The rails themselves are too narrow to balance on; the sleepers are so far apart that the front wheel gets stuck down between them, especially in India where they often seem to manage without ballast; and a little bit of a pathway between the sleepers and the edge of the embankment proved too narrow and irregular to rely on, and disappeared altogether at bridges or culverts. They picked the machine up and, to cover my shame at having fallen off and broken the headlamp in full view of its owners, I set off at top speed along the nearest available path; thus finding out by accident that the way to ride a motorcycle from one point on a railway line to another is to follow nearby paths, selecting those going in approximately the right direction.

A new signalman was on duty by this time and was not at all pleased at having his domain invaded by an impatient British officer. Yes, he knew all about us. And of course he would change the signal, and the points, as soon as the other train had cleared the section. That would not take long; and if I didn't hurry back I would miss my own train! I rode back, revelling in the freedom provided by the motorcycle and in the thought of getting out of that siding at last. The signalman was as good as his word and it was not long before the signal went down and the points went across. We were free!

Scrambling up onto the footplate, which was surprisingly high off the ground, I exhorted the engine driver to get going.

"Oh Sahib—no steam!"

"Of course there's steam, there it is coming out of the safety valve."

"Yes Sahib, pressure is there, but not enough water to make enough steam to keep pressure up and pull train." Unimpressed, I insisted that we made a start.

Trains then had vacuum brakes which had to be released by applying steam under pressure from the engine into the system. This was done by one of the handwheels, the vacuum pressure being recorded on one of the nearby dials. Although I made sure that the handwheel was fully turned, the gauge needle moved hesitantly across the dial until it reached the green mark indicating that the brakes had been released.

Photo 3. Sikhs, refugees and an immovable object.

Urged on, the engine driver opened the throttle; the engine went *CHUUUUUF*: pressure gauges went whanging down, and the train moved not a bit. The driver was right. The engine had been standing gently simmering all day and what little water was left in the boiler could not now provide enough steam to move the train. Not only were we stuck again, but we seemed to have a defunct engine as well!

The engine driver was sure that, if the train was uncoupled, the engine itself could be run along the line as far as the junction. He would then arrange for a replacement engine to be sent to us next morning. There seemed no alternative, but it was with some foreboding that we watched the engine running away from us along the line. There used to be a conundrum about an irresistible force and an immoveable object: for one of the latter I can recommend a trainload of refugees stuck in a siding, inside hostile territory without an engine.

Actually, forebodings, although rather prevalent at the time, were not really necessary. Another engine with another driver came for us next morning and took us on as far as another cause of delay. There were a lot of these; for it was at least ten days before we crossed the border south of Lahore, and a further two or three before we reached Jullundar where the train terminated. The refugees, their numbers increased by several babies, but decreased by some old people who died of natural causes, and an opium addict who went mad, were directed to a civilian camp. We eventually joined another train for an uneventful journey to Ahmednagar.

For most of the time in the Punjab progress was entirely dependent on the railway staff, and their staunchness was very much a feature of that particular period. People like the station master often barricaded themselves in their offices, but I never heard of one deserting his post; and they kept the railway system working as best they could despite the insanity erupting all around. I believe earlier reports of collusion between railwaymen and local gangs were much exaggerated.

Also a feature of the period was the rarity of assaults on Europeans. As in the recent TV serial, those who happened to be on a train that was attacked were usually unmolested, and were often deliberately segregated by the attacking side for protection. For my part, I regularly used the MP's motorcycle, riding across country in an area where nearly everyone carried a weapon. It never occurred to me at the time; but had we been the hated British Raj of current popular mythology, I doubt if I would have been allowed to survive to tell the story.

175 Years of the RSME

CAPTAIN S R COX RE

Captain Steven Cox was commissioned into the Corps in 1974. On completion of a University Cadetship at Nottingham University and basic training he was posted as a troop commander to 11 Field Squadron in Ripon. Having served in the USA, Northern Ireland, BAOR, and Norway he was posted in 1980 to 49 EOD Squadron for a second tour as a troop commander. In 1982 he volunteered for flying duties with the Army Air Corps and on successful completion of 282 Army Pilots Course at Middle Wallop he was posted as second-in-command of 652 Squadron Army Air Corps. After three years which included flying in the Pyrenees and the Falkland Islands he returned to the Corps. He is at present serving on the staff at the Headquarters of the Royal School of Military Engineering.

"that half a dozen companies might be selected from the Royal Military Artificers to be formed into a body under the name of the Royal Sappers and Miners . . . and that, after some instruction in their art, the six companies should be sent out to aid the troops in their future siege operations." Wellington 1811

THE Peninsular War revealed deficiencies in the training and knowledge of officers and men in the conduct of siege operations and bridging. During this war low ranking Engineer officers carried out large scale operations. They had under their command working parties of two or three battalions of infantry, some two or three thousand men, who knew nothing of the art of siegeworks. Engineer officers had to demonstrate the simplest of tasks to the soldiers often while under enemy fire. One officer was killed at the first siege of Badajoz while demonstrating picketing a fascine and another at Burgos while placing a gabion. These casualties could not be replaced and a better system of training for siege operations was required.

On 23 April 1812 an establishment was authorised, by Royal Warrant, to teach "Sapping, Mining, and other Military Fieldworks" to the junior officers of the Corps of Royal Engineers and the Corps of Royal Military Artificers, Sappers and Miners. (It was not until 1813 that the soldiers were retitled the Royal Sappers and Miners.) Captain Charles Pasley who had been pressing for such an establishment since 1809 was selected as the first Director with the rank of major. The location chosen was Chatham which was, at that time, a strongly fortified naval town. The town was surrounded by batteries, bastions and ditches designed to be defended by 7000 men and so provided excellent areas for training in siege operations. Pasley received his orders to move from Plymouth on 2 May 1812 and ten days later he was in Chatham.

In his memoirs, held in the RE Museum, Pasley describes the first courses. Training was done on an all ranks basis with the greatest regard for economy. To reduce staff the NCOs and officers were responsible for instructing and examining the soldiers. If the men could not read or write they were taught to do so and those that could read and write were taught to draw and interpret simple plans.

The course started by cutting brushwood from which fascines and gabions were

Captain S R Cox RE
175 Years Of The RSME

Photo 1. Pontoon bridge from Upnor to the dockyard 1874.

made for use in future exercises. This was followed by training on offensive fieldworks since it was felt that this would put the recruits in a good frame of mind. Defensive fieldworks came later. They were taught various kinds of batteries and saps, as well as parallels and approaches. The art of military mining was also taught but due to economies only a few pounds of explosive could be used. Throughout the course all the wood was recovered from the ground at Upnor to be used again or sent to the Dockyard for use as firewood.

The Royal Engineer Establishment quickly became the centre of excellence for all fieldworks and bridging. Improvements were made to fortification designs by foreign authors who had previously led in this field. The art of military bridging was also improved enabling bridges to be constructed in half the time without using boats. This skill was developed on the River Medway below Rochester bridge despite strong attempts by the authorities to limit bridging and pontooning to the quiet waters of St Mary's Creek for reasons of safety. From 1833 bridging skills were demonstrated annually by the building of a pontoon bridge across the Medway which was proved by the infantry of the garrison and the cavalry from Maidstone.

Pasley was keen to confirm his teaching. Regular exercises were held either as demonstrations or as experiments to improve the techniques and teaching of the Establishment. These had become a popular spectacle for the local people by 1843 when 43,000 came to watch a field day laid on to test a method of assaulting earthworks for a report to the Inspector General of Fortifications. Resources were more plentiful and the demonstration used live powder and involved over 2000 men from the garrison. Preparations had begun two weeks earlier with the instruction of the troops in siege work and the digging of saps. Before the demonstration started the public were allowed to inspect the fortifications to confirm that they had been properly constructed.

The attack involved assaults on the north, east and west fortifications beginning to the northeast of the present barracks. The attacking force crossed St Mary's Creek, now the site of the dockyard basins, on a pontoon bridge that had been preconstructed, carried forward and launched into the creek. As the attackers crossed the bridge they came under heavy (presumably blank) artillery fire from the guns of the Royal

Marines. The retreating defenders withdrew across a masonry arch bridge which was then demolished to try to slow the attack. The attackers then fired two breaching mines under the defences and opened two breaches each able to admit twenty-five men abreast. These breaches were then carried.

The day was to have finished with the firing of a submarine charge in St Mary's Creek to destroy a rock which was a hazard to navigation. Shortly before the charge was due to be fired three barges dragged their moorings and fouled the underwater firing cable pulling it from the charge. The powder had to be recovered and was used for improvised demolitions to complete the day's training.

Techniques for firing underwater charges had been developed at the Establishment as part of Pasley's insistence on evolving new techniques for use by the Army. In 1837 the brig *William* had sunk of Tilbury fort in a main shipping lane with a cargo of coal on board. Pasley offered to destroy the wreck if it could not be raised; a bold offer since the only other recorded destruction of a wreck was in Barbados in 1831 in 5ft of water. The *William* could not be raised and it was therefore decided to destroy it with two charges of 2500 lb each. Three ounce bursting charges were placed in lead cylinders and connected to the firing hoses which were placed inside lead drums containing the charges and made water tight. The charges were floated out to the wreck in wooden buoys and lowered into position using divers. There was one fatality while doing this when a corporal became entangled in the wreck and drowned.

On 28 May 1838 the first charge was lowered into position leaving only the firing hose leading to the surface. This charge was fired by lighting the end of the hose with a porifire and rowing clear before the charge exploded. This one charge successfully destroyed the wreck. The second charge had already been prepared and was subsequently used on another wreck that lay near by.

Pasley then became interested in the electrical initiation of charges and this was successfully achieved on 7 February 1839. By 24 March a model ship was destroyed at a distance of 500ft. Pasley had by now been authorised to remove the wreck of the *Royal George* in Spithead which was a navigational hazard. Teams from Chatham

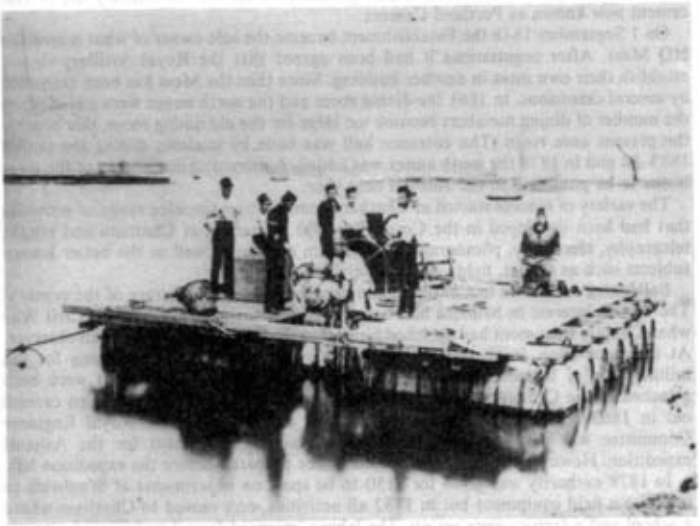

Photo 2. Cask raft and diver circa 1860.

worked on the wreck during the period 1839–43 salvaging all that they could and demolishing the rest by charges initiated electrically.

The same principle was used to great effect by the Americans during their civil war. Mines were laid underwater and fired under attacking vessels destroying some thirty-seven vessels between December 1862 and June 1865. The value of this technique was recognised at Chatham and in October 1865 a field day included the firing of a 440lb charge off Gillingham point. The charge had been in place for five days and was fired through two miles of wire. Other charges were demonstrated at different depths before moving onto the highlight of the day. The Admiralty had provided an old frigate, the *Terpischore*, as a target for two 75lb charges. Due to the strong current one charge was swept too far from the frigate to be of use. The other, fired alongside the frigate, lifted the ship 10–12 ft into the air. She then sank quickly until she rested on the river bed.

In 1867 the Sappers were given responsibility for the defence of the ports by static minefields. The school ran new courses to teach all ranks the skills required to lay, maintain, and remove these mines. In 1870 the Royal Engineer Committee, which looked at inventions and improvements to Engineer equipment, reported on the requirement and costs of these minefields. They recommended that the minefields must be covered by fire and by electric lights for use at night. They also recommended that the plans of the minefields should be kept secret and that dummy minefields should be laid. The purchase of stores started immediately allowing the first minefields to be laid in 1872. The School of Military Engineering (SME), as the Royal Engineer Establishment was now called, was responsible for the minefields at Chatham and these were used for teaching the large number of courses that were run for Submarine Miners.

Combat developments were not the only innovative ideas to come out of Chatham due to Pasley and those who followed on from him. By 1828 Pasley had been experimenting to produce a good quality artificial cement. He had given up his experiments on this when Major Reid was posted in to Chatham and showed an interest in this development. He used clay from a new pit close to Chatham and the results were successful. In 1830 Pasley published notes for the military use of this cement now known as Portland Cement.

On 1 September 1848 the Establishment became the sole owner of what is now the HQ Mess. After negotiations it had been agreed that the Royal Artillery should establish their own mess in another building. Since then the Mess has been expanded by several extensions. In 1861 the dining room and the north annex were added when the number of dining members became too large for the old dining room, this became the present ante room. The entrance hall was built by students during the period 1883–84 and in 1878 the south annex was added. A more detailed history of the mess is due to be published in the *Journal* next year.

The variety of schools started at Chatham demonstrates the wide range of activities that had been developed in the Corps. By 1900 the school at Chatham had taught telegraphy, electricity, photography, and steam engines as well as the better known subjects such as tactics, fieldworks, and civil engineering.

Ballooning had come to Chatham, and departed again, by the turn of the century. The British interest in balloons had been developed during the American Civil War when Captain Beaumont had attached himself to the US Federal Army as an observer. At the same time, in the UK, Lieutenant Grover had been campaigning for the military use of balloons and after the war he and Captain Beaumont were both attached to the Ordnance Select Committee on ballooning. Trials had been carried out in 1863 but the first serious interest was in 1873 when the Royal Engineer Committee was asked to prepare details of balloon equipment for the Ashanti expedition. However the equipment could not be prepared before the expedition left.

In 1878 authority was given for £150 to be spent on experiments at Woolwich to organise a field equipment but in 1882 all activities were moved to Chatham where a school and a factory were set up. The labour imported from London used a secret

Photo 3. RE balloon at Frensham Camp.

technique to produce gas-tight balloons from "goldbeaters' skin" which was made from animal intestines. When Sappers had to be used to help construct the balloons the Wienling family were most reluctant to teach them their secrets. The production of one balloon was delayed three months while the principal balloon hand served a prison sentence for assaulting the police. Field equipment was developed based on the GS wagon and ballooning became a part of warfare. Camps were held annually near Chatham and from 1886 teams were sent to the annual siege artillery camp at Lydd. Using the Photography School at Chatham the Ballooning School started experiments in aerial photography. By 1890 a Ballooning Section had been authorised and formed at Aldershot. In 1891 Aldershot assumed all responsibility for ballooning leading subsequently to the development of the Royal Flying Corps and later the Royal Air Force.

On 4 August 1914 at the start of World War 1 the engineer battalions based at Chatham were deployed to defend the local area. Immediately recruits started to arrive at the Royal Engineers Depot in Chatham. In the first six weeks of the war 15,000 men arrived. A hundred recruits per day had been expected to arrive but they arrived at a rate of two hundred rising to a peak of nine hundred per day. It says a great deal for the organisation and administration of the Depot that it could cope with this influx. Indeed it coped so well that on 3 October 1914, when the King and Queen paid a private visit to the Corps, 12,001 all ranks were on parade in uniform on the Great Lines.

The courses at Chatham had to change to produce soldiers at the rate required by the war. Training in the Construction, Survey and Electrical Schools was cut back to allow for increases in fieldworks and military training. Recruit courses were cut from eight months to four months and a batch of thirty officers arrived every month for five months training.

The increased output required from SME produced the inevitable accommodation shortage. This was overcome by the use of billets in winter and tents on Great Lines in the summer. The problem became worse when in January 1916 the barrack block

on the north side of the square was burnt down. The barracks were overcrowded and this was not solved until 1918 when huts on Great Lines were completed. The shortage of accommodation was at its worst when, during the winter 1916–17, 1 Reserve Battalion (formerly the Training battalion) reached its greatest strength of 3970 men.

Rationing began to take effect during 1917 when it was introduced for meat and sugar. Throughout the war cooking had taken place on a company basis and had not produced very good results. In March 1918 Lieutenant Colonel Weeks took command of 1 Reserve Battalion and by converting a stable and part of the wine cellar into a dining room and having a cookhouse built he introduced battalion cooking. This improved the quality of cooking but the Depot Battalion did not follow suit until 1921.

At the same time Lieut Colonel Weeks changed the style of the training carried out at Chatham. He introduced platoons to the companies and made platoon commanders directly responsible for the training of their men. This was now very similar to the initial system introduced by Pasley over a hundred years before.

Following the armistice the Depot demobilised over 15,000 soldiers in one year and gradually the SME returned to its peacetime training role. In 1920 officers started to go to Cambridge University for one year courses. This was limited to wartime officers who then also had to do one year at SME but by 1926 all officers spent two years at Cambridge, after their course at SME, and received a degree.

All did not remain quiet and on 5 April 1921 a national coal strike started which was declared a national emergency. On 8 April the Army Reserves were mobilised and two provisional battalions RE were formed at Chatham. Four provisional companies, each a hundred strong, were sent to London to provide camps for the Voluntary Defence Force that was being formed. Over two thousand reserves were mobilised through Chatham and it went so well that one of the provisional battalions was closed down. The emergency was over in June and the reserves demobilised. On 3 May 1926 another emergency was started due to the General Strike. This time reserves were not mobilised but detachments from Chatham were deployed to guard local key points. By 19 May they had all returned to barracks.

Between the World Wars sports were an important part of life at SME. The barracks had an open air swimming pool between the army and navy barracks (this is now the 30 metre range) and here the Training Battalion prepared for the Army Inter Unit Swimming Relay Race which they won five times in eight years. New sports fields were built on the Black Lion fields, the former grenade training ground, and a new hockey ground was built to the north of Great Lines. The enthusiasm for sport went so far that in 1921 three tennis courts were marked out on Brompton Barracks square and were used frequently.

In 1939 SME mobilised again and the Training Battalion left Chatham forming two training battalions at Ripon and Shorncliffe. Young Officer training was cut short to allow the officers to be despatched to units. No basic training was now done at Chatham since the officers were trained at the RE OCTU and the men were to be trained in the training battalions. The Corps library had to move from Horse Guards in London to Chatham where it was housed in the RE HQ Mess for the rest of the war. The Museum also had to close and all the exhibits including the stained glass windows in what is now the Computing Centre were put into storage in Tunbridge Wells.

Specialist, instructor and higher trade training continued at Chatham but from June 1940 training was seriously interrupted by German efforts to destroy the dockyard. Approximately one hundred bombs, and one Spitfire, fell on the SME damaging buildings including the Commandant's residence. One caused heavy casualties when it burst in the basement of a barrack block. Staff and students were also required to direct the building of defences in the dockyard and the surrounding area. It was difficult to continue training under these circumstances so it was decided to look for a new site for the SME. On 8 August the Commandant left on a reconnaissance for a new site and in September 1940 the decision was taken to move to Ripon. The

advance party left on 25 October and the main body in November. Despite the disruptions caused by the move only one month's training was lost.

Trade training remained at Chatham throughout the war due to the difficulty of finding suitable workshops elsewhere. The Survey School and the RE Depot left in 1941 and the barracks was used for a variety of purposes. The HQ Mess building was used by Royal Navy ratings after the Mess had moved, first to Pasley House and, when that was damaged by a bomb, to Gibraltar Avenue.

The school at Ripon was expanded to keep pace with the growing demands of the war. In 1940 an Experimental Tunnelling Section was formed and in 1941 Assault Engineer and Bomb Disposal Schools were formed. The school ran a wide range of courses for all arms and the long courses were designed to be taken in sections so that students could attend the relevant parts.

On 24 September 1945, 10 Depot Battalion RE was formed at Chatham as a holding unit for soldiers awaiting posting or discharge. The SME remained at Ripon while a decision was made about the future location of the school. Several sites with better training facilities were considered but in the end the Treasury could not afford the cost of providing new quarters and SME returned to Chatham. The move back was completed in March 1950 and had taken eighteen months compared with the three months for the move to Ripon.

Training now had to return to a peacetime footing and in May 1946 officers supplementary courses started and later that year officers started to go to Cambridge again. Officer training also improved with the start in April 1947 of the long Electrical & Mechanical course and in November 1947 of the long Civil Engineering course, both two years long as they are today. By 1949 the Young Officer courses restarted with eighteen month courses after Sandhurst and later one year courses for non-graduates or eight months for graduates.

Aid to the civil community was still required on occasions and in February 1953 two hundred men had to be sent to Tilbury to repair sea defences that had been breached by the exceptionally high tides and storms of that year. 11 SME Regiment was also required to build two floating bridges at Dartford to help in the relief operations. The close relationship the SME had always had with the civilian population led to the Corps being granted the Freedom of Ripon before the departure of the SME in July 1949. The SME was also involved in the parades granting the Freedom of Gillingham in September 1953 and of Rochester in May 1954.

In 1950 trade training courses were six months long. These courses were put to good use around the barracks and by 1953 they had built Burgoyne House for the Mess Secretary and Napier House for the Institution Secretary. Fieldworks training had also been improved with the construction of Gundulph Pool at Upnor giving improved facilities for ferrying and wet bridging. A plant training squadron was formed at Wainscott increasing the importance of the Chattenden side of the river. By the early 1960s both Gordon Barracks and Kitchener Barracks required extensive refurbishment if they were to continue to be used. Since the fieldworks training area at Darland was now too small for the type of training carried out and land was available on the north side of the river it was decided to build new barracks at Chattenden to house Fieldworks, Signal and Tactics Schools and to provide accommodation for students of the Plant, Roads and Airfields School. This was opened in 1966.

Throughout its 175 years association with the Royal Engineers, Chatham has been at the centre of Corps life. Our history can be seen at Brompton in the barrack buildings, in our memorials and in our magnificent new museum. From Pasley's days of the RE Establishment to the Royal School of Military Engineering today the school has always remained at the forefront of developments in the Corps. It is still so today. This long association has been marked by several Royal visits including the latest visit by Her Majesty the Queen to the Corps at Chatham on 20 May this year to celebrate 200 years of our Royal title.

Bomb Disposal
The Worst is yet to Come

BRIGADIER J B WILKS CBE
The author was commissioned from Sandhurst in February 1952. Since then he has served in Korea, Malaya, at RSME and as Adjutant 36 Engineer Regiment. He has attended the Staff College and the Joint Services Staff College and has filled staff posts in Army Staff Duties and Combat Development in MOD. He was OC 73 Field Squadron, CO 3 Training Regiment and on the staff of The Staff College. From 1979 to 1982 he was Regimental Colonel, Commander 30 Engineer Brigade in 1983/84 and from October 1984/86 was Commander Engineer Support. He retired in October 1986.

The Beginnings of Bombing

So few people today have experience of being on the receiving end of bombing and it was perhaps the bombing of the Royal Navy ships during the Falklands Campaign which graphically reminded us of damage and destruction. The German air raids of 1940–41, the attacks by the earliest cruise missile, the V1, and the V2 rocket (which would now be classified as an SSM), are only in the memory of those over forty-five. The people who experienced these attacks thought that they were bad enough and the Government was forced to react quickly to the threat and to the destruction. A massed air attack was expected on London and other cities at the start of the war in 1939, to test the resolve of the Government and the people. There was large scale evacuation in August 1939 but in the event the attacks did not materialise until much later.

The first recorded use of bombs in aerial combat was in 1911, by the Italians in Tripolitania, who bombed both Arabs and Turks. This was followed in 1913 by the Spanish bombing of the Moors in North Morocco. Aeroplanes were in their earliest stages of development and the bomb loads were very small. This concept of using air power was continued for several years by the British in imperial policing in Southern Arabia and on the Northern Frontier of India, to bomb recalcitrant tribesmen, to destroy their village and their animals.

World War I

At the start of World War I there were very few aircraft on both sides and these were unarmed and not designed for military use. The initial role of the embryo air force was to carry out reconnaissance; air warfare slowly developed with pilots and observers shooting at each other, initially with little accuracy, until the introduction of the machine gun. Small bombs, grenades and flechettes were dropped by hand, aiming was by eye. The results were very poor, the Royal Flying Corps analysis of 141 bombing raids on rail depots showed that only three were successful. Initially all air operations were adjuncts to army and naval operations, confined to the combat zone and were restricted by the payload and range of aircraft.

In January 1915 the Germans mounted their first raids against England by Zeppelins, which caused a flurry of alarm, but the raids were desultory. The Zeppelins could only operate in favourable weather and were unable to maintain stability in high winds. However they were able to operate at height, often beyond the range of searchlights and, so the Germans believed, at altitudes which could not be reached by British aircraft. London was first bombed on 31 May 1915, with some damage to buildings, 7 killed and 30 injured. A major Zeppelin raid was launched on 20 October 1915 with eleven Zeppelins; there were strong winds and although one bomb was dropped on Piccadilly Circus, three of the Zeppelins were blown across to France where one was shot down and two others crashed. In 1917 the Germans launched further raids using the Gotha bomber. Although their bomb load was smaller, the

Gotha raids were more effective in terms of casualties caused.[1] Nevertheless, the bombing raids of 1914–18 made little serious impact on the nation, the British people did not panic when faced with this new form of warfare. It was not until 1940 that the effects of bombing, with high casualties, destruction and disruption became apparent.

Developing the Concept

At the 1922 Washington Conference rules of warfare were agreed—aerial bombardment for the purpose of terrorising the civilian population, of destroying and damaging private property not of a military character, or of injuring non-combatants, was prohibited.

In the Spanish Civil War 1936–39, Germany, Italy and Russia, who were all nominally neutral, sent ground and air forces to evaluate the tactics of modern warfare. On 26 April 1937 a major air raid was mounted on the town of Guernica which lasted for over three hours. It was only a small town with a population of 7000, together with 3000 refugees, it was market day and the attack destroyed the middle of the town. The raid was carried out by German bombers dropping both 1000lb bombs and an estimated 3000, 2pdr incendiaries. As the population fled into the fields they were machine gunned by fighter aircraft; overall the death toll was assessed at 2000 killed. This pattern of bombing of civilians by indiscriminate and inaccurate raids was to continue into the Second World War.

World War II

The lessons of the Spanish Civil War led to studies of both the passive and active air defence of Great Britain. The expectation was that attempts would be made to burn down London and other great cities to test the resolve of the Government and people. If this policy were to succeed then the air offensive alone, might force a government to sue for peace rather than see its cities destroyed and its people killed. The only real defence that could be offered was the attrition of the attacking aircraft.

The attack on UK

In the event no air raids materialised in September 1939 and it was not until after June 1940 that bombing started in earnest on the UK. The Germans had previously attacked Warsaw and Rotterdam, bringing the war deep into their opponents' territory and causing great damage in what were completely unprotected cities. After the fall of France, the Germans turned their attention to the invasion of England. In the summer of 1940 the Luftwaffe had to gain command of the air over the English Channel to cover the crossing of the invasion fleet. The main phase of the battle of Britain started with attacks on shipping and airfields and with attempts to destroy the RAF fighters. The RAF by good control and tactics held on and inflicted considerable losses. From September 1940 the whole German attack was concentrated on London, initially with large raids by 450 aircraft by day, and 300 by night, but these quickly reduced as the numbers of aircraft available declined markedly. A new hazard was met, in large numbers of delayed action bombs which denied the use of key railway junctions, main routes and approaches to important factories. By October it was clear that Operation *Sea Lion* could not be carried out, as air superiority had not been achieved, and Hitler called off the invasion.

The bombing campaign continued throughout the winter of 1940 and spring of 1941 when the Luftwaffe turned its attention towards the invasion of Russia. The casualties were very high, between June 1940 and June 1941 43,381 were killed and 50,856 injured, with a great deal of damage caused in London, Coventry and other key cities. Thereafter there was only limited air attack on UK until the introduction of the German Flying Bomb, the V1, in June 1944 followed soon after by the V2

[1] Fourteen Gotha bombers, each carrying ½-ton bomb load, caused 600 killed and wounded in a single raid.

rocket. These two latter campaigns did not last very long, as the V1 launch sites were rapidly over-run during the breakout from the Normandy beaches and the advance to the Rhine; and the V2 launch sites were soon out of range of much of the UK. However over 6000 were killed by V1s and nearly 3000 by V2s before the threat passed showing what a serious potential danger they had been.

British bombing

The British strategic bombing offensive against Germany was started in 1940 with the intention of bringing about the progressive destruction and dislocation of the German military and economic system and of undermining the morale of the German people. Bombing was intended to complement the naval blockade and destroy particular capabilities, such as synthetic oil and rubber production. Thus we come to the concept of total war. Although this was the stated aim the policy took some time to come into effect. In 1940 and 1941 the RAF daylight attacks were in great danger from anti-aircraft fire and fighters; so reverted to night bombing which was not accurate, and little effect was made on German production. From March 1942 the arrival in service of the Lancaster bomber, with a larger bomb load, and with better accuracy and target marking, better results and a larger scale of destruction were achieved.

The BBC frequently announced that the marshalling yards at Hamm were a target in 1940 and 1941; but German records show that RAF Bomber Command only attacked them 13 times during the war. The raids initially were only by small numbers of Blenheim, Whitley and Wellington aircraft. The archives of Hamm record little damage, which was rapidly repaired. For example, on 8/9 July 1941, 73 aircraft set out to bomb Hamm, 31 actually bombed the target, seven aircraft were lost. The Germans recorded 15 killed and that the damage to the sidings was repaired in under twelve hours. It was not until 1944 that greater results were achieved: for example on 5 December 1944, 94 Lancaster aircraft attacked Hamm, 90% of the built up area of the town was destroyed.

The policy of mass bombing was first initiated with the 1000 bomber raid on Cologne on 30/31 May 1942. Over the next three years, 593,000 German civilians were killed and 3.3 million homes destroyed. Not all mass raids were successful, the attack on Essen, on 1/2 June 1942, for example, resulted in few casualties and minor damage. Undoubtedly bombing carried the war deep into the heart of the opponents' homeland and caused heavy civilian casualties and damage to property. At Hamburg, on 27/28 July 1943, where the attack was concentrated, the effects of the fire storm caused enormous damage and over 40,000 civilians were killed. It did not break the will of the people as had been predicted by Lord Cherwell in 1942. Although the Allies dropped more than 3.5 million tons of bombs in World War II the cost was high, Bomber Command alone lost 47,268 air crew killed in action, or died as prisoners of war, together with a further 8195 killed in flying accidents.

Bomb Disposal

The full story of bomb disposal in World War II is well covered in *Corps History Vol VIII* (p 122 *et seq*) and in a recent article in the *RE Journal* (June 1985). Bomb disposal had been a civilian problem under RE advice since the setting up of a centre in St James Park to deal with terrorist bombs in London in the 1890s. The Spanish Civil War was the first occasion when aerial bombs were recognised as a problem but without technical intelligence of enemy bombs and fuzes little was done. Bomb disposal was to remain in civilian hands but until civilians could be trained the War Office was given responsibility. In November 1939 a number of RE bomb disposal parties were set up, each of a junior NCO and two sappers, with a car, explosives, shovels and sandbags. The parties were sent out to likely targets for enemy bombers, their instructions were to build sandbag parapets around the bomb or shell before it was detonated.

The interest in bomb disposal faded as the expected air attacks did not materialise. The Home Office was unable to raise and train the civilian bomb disposal organisation. As the work was dangerous a properly equipped organisation was required and it fell

to the Corps. Bomb disposal sections of 1 officer and 15 other ranks were raised, divided into a sub-section for removal and a sub-section for sterilization, each to be self contained and mobile. A total of 109 sections were formed by June 1940 and distributed throughout the country and this number was soon increased to 120. It was found that a fully coordinated organisation was required and Major General G B O Taylor was appointed Inspector of Fortifications and Director of Bomb Disposal, in 1942 Brigadier H H Bateman became Director of Bomb Disposal.

As soon as bombing started in the late summer of 1940 a number of problems quickly became apparent, there was a greater need for removal sub-sections and very soon the organisation became swamped. By August 1940, 2000 unexploded bombs remained to be dealt with and, as a result, the size and number of sections was again doubled. The Prime Minister gave direct instructions for the development and production of specialised BD equipment. To raise these extra sections, seven general construction companies and four quarrying companies were reroled to bomb disposal. A company HQ was established to control twelve sections and to establish liaison with local Civil Defence HQs. This was a great success as it gave greater flexibility. Additional BD companies were raised by January 1941 and allowed the general construction and quarrying companies to revert to their original role.

The initial primitive methods of disposal were gradually improved as more details of enemy devices became available. Methods for sterilizing fuzes and their extraction were developed and improved. Even so it still remained a very dangerous duty. The total number of explosive items dealt with in the United Kingdom up to the end of hostilities was 45,441 bombs, 6983 AA shells and nearly 300,000 beach mines.[2]

The Falklands

The need for Explosive Ordnance Disposal in the Falklands campaign was greatly underestimated. The initial RE contribution was only two individuals but additional manpower was quickly deployed as the threat became clearer. Fourteen of the ships involved from the Royal Navy and those taken up from trade, were hit or had near misses. In eight of these the bombs did not explode and were dealt with either by Sappers or RN Fleet Clearance teams. In addition HMS *Glamorgan* was hit by a missile fired from the shore. The Royal Navy may consider themselves fortunate that so few of the bombs detonated. Six ships were sunk by attack. All this damage came from an Air Force which only had 175 combat aircraft, with a general shortage of spares, limited flying training and little serious night flying capability.

The Future

Although much attention in recent years has been directed at improvised explosive devices used by terrorists, the conventional bomb disposal work remains. The historical pattern of bomb disposal shows that some 33% detonate on impact, 33% malfunction, the remaining 33% are fitted with delay or anti-handling devices the range of which, in this electronic age, is widespread. Many of the new aerially delivered weapons contain a large number of sub-munitions with various capabilities. The beaten zone for a cluster weapon released in a single pass by one aircraft can be as long as 1km. In the battle zone such aerially laid minefields would seriously restrict mobility, and cause damage and casualties. The disruption in rear areas, on airfields, or the L of C would be enormous: false reports of dropping, and the checking of damage would cause further work. Aircraft navigation systems and weapon delivery systems are now both more accurate and targets can be marked for a weapon to home on. Thus large fixed installations and key points within them are very vulnerable.

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[2] Over the past 40 years this work has still continued; from 1950 to the end of 1985 the Royal Engineers have dealt with 631 bombs, 570,054 missiles and cleared 45,007 hectares.

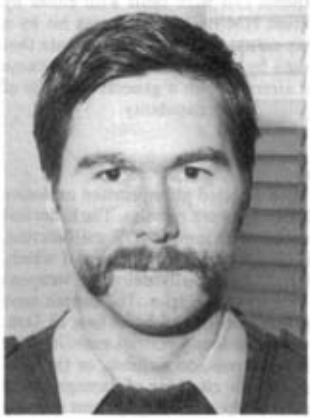
There really is a need to increase the education of All Arms on the hazards of air attack and the true effects on mobility and resupply. It is unattractive to face up to these problems on exercise but it is realistic to put in accurate air attack patterns, with the resulting damage and disruption on CPX, and, more importantly, on the battle group and brigade group trainers. The enemy input to the trainer must give true air raid pictures. One Backfire bomber can carry 12,000kg of bombs, or a Fencer a 3000kg load. What destruction can one aircraft achieve and they do not attack singly! Is this area of activity realistically portrayed?

What is most significant from World War II was how rapidly the organisation was expanded and was twice doubled in size. In 1940/41 there were many enthusiasts involved in bomb disposal in all three Services, who took time to train. Today bomb disposal is a very professional area where high levels of training and ability are required. There will not be time in any future conflict to train large numbers in bomb disposal. It is also obvious from the Falklands that the problems of air attack were greatly underestimated. Bomb disposal is not something to be left just to the experts, they are few enough, unless we arrive at the right numbers in this expertise we will be subject to heavy damage and casualties. It behoves us all to study this particular area, to convince All Arms of its importance as they too will feel its effects. After the Falklands the Royal Navy understood the problems of air attack and dealing with unexploded bombs. The Army in BAOR has not met this problem and I doubt really understands it. It is very real and must be faced up to.

* * * * *

Remote Explosive Destroyer Falkland Islands Royal Engineers (REDFIRE)

MAJOR R C SWANSON BSc(ENG) RE



Major Robin Swanson was commissioned into the Royal Engineers in 1974 and after YO training served with 12 and 20 Field Squadrons and 33 Independent Field Squadron. He subsequently served as Adjutant of 42 Survey Engineer Regiment and instructor at FE Wing, RSME. In April 1986 he took up the appointment of Operations Major in 33 Engineer Regiment (EOD).

DURING 1985 a new problem with the Falkland Islands mines reared its ugly head. Some of the minimum metal lines laid during the conflict were moving, both within and outside plotted minefield areas. These movements were particularly noted where a water course passed through a minefield and in the areas where tidal waters were encroaching on the beach minefields. Furthermore, due to soil erosion, continuous movement and ageing, some of the mines were deteriorating to a very sensitive condition. Previous attempts to clear any such mines had resulted in severe inuries to Royal Engineers personnel, leading to a directive that no operator would enter minefields until a remote control system had been developed.

A verbal specification was agreed in June 1985 with VS3 at RARDE, Chertsey.

Major R C Swanson BSc RE
Remote Explosive Destroyer

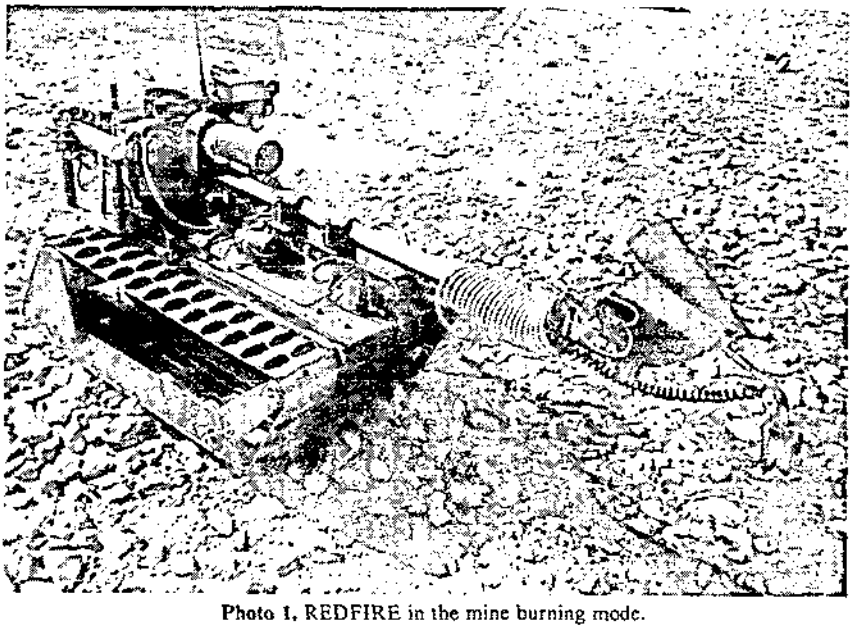


Photo 1. REDFIRE in the mine burning mode.

The main criteria were:

A ground pressure not to exceed 1½ lb/in², as the initiation of an APers mine was of this order.
High mobility.
Preferably radio controlled (although a 100m control cable drum was initially acceptable).
A means of recovery from a minefield area in the event of failure (a paid-out rope or possibly helicopter lift).
A suitable parent vehicle.

The only suitable parent vehicle to meet the aggressive Falkland Islands terrain was the BV 206 and therefore the remote controlled vehicle was limited to the width and length of a BV 206. In order to meet this size requirement and the cross country mobility, the standard Wheelbarrow MK 8 with a nominal ground pressure of 2.3 lb/in² was a possibility. As the standard vehicle was too sophisticated for the needs, the MK 8 research hull was used as the initial trial vehicle. Its mobility was tested at Thorney Island under severe conditions, where it became apparent that the ground pressure had to be reduced. Double tracks on each side of the vehicle improved the ground pressure. In addition, removal of the 2-speed gearbox and the manufacture of a composite final drive sprocket further reduced the ground pressure to a nominal 0.97 lb/in². Once the final automotive trials were completed at Spade Adam everyone was happy that REDFIRE would cope with the Falkland Islands terrain.

While these mobility trials were in progress, others were considering the method of disposal of the mines. Three methods were considered: to blow up the mine in situ, to burn off the mine in situ or to retrieve the mine from its location to a more manageable area.

The burning process was achieved by using a gas torch applied to the plastic case of the mine. A propane gas bottle was slung on the rear sail rail of REDFIRE to provide the supply to the torch. The gas was piped through a flexible brake hose to a modified standard commercial burner fitted to a pan and tilt unit head. A safety

valve was fitted between the regulator and the burner. Remote control of the gas flow was by an ON/OFF solenoid, switched through the vehicle actuator circuit and hand control box. Similarly, an automatic ignition system was fitted consisting of a heating element wound onto a porcelain spiralled rod. The gas passed through the element as well as over it to ensure positive and rapid ignition.

The burning mode has since proved to be the quickest and most economical method of attacking the mines. Over 600 mines have been attacked in this way since December 1985, when REDFIRE was deployed in the Falkland Islands.

REDFIRE MK 2 has just been produced and has a number of modifications. These include a colour camera for the boom, a second camera for the rear sail rail, multi-actuation for the control panel and a number of improvements to the structural design. REDFIRE MK 1 is being updated to MK 2 standards and will soon provide the ability to deploy a second vehicle to the South Atlantic.

* * * * *

Discovery and Clearance of a Pucara crash site on Blue Mountain in the Falkland Islands

CAPTAIN P A S JEFFERSON BA RE

Having completed a degree in Architecture Captain Paul Jefferson was commissioned into the Royal Engineers in 1982. After YO training he served with 24 Field Squadron and in August 1985 joined 33 Engineer Regiment (EOD) as a troop commander.

HAVING been posted to the Falkland Islands for four months as OC of the Detachment of 33 Engineer Regiment (EOD), I decided that the Detachment would benefit from some unusual jobs if they could be found. Not that the unit's normal work is not interesting, being responsible as it is for the minefields, battle area clearance and response to all EOD tasks in the theatre, but four months of battle area clearance with diminishing finds can become monotonous. An obvious place to find tasks would be aircraft crash sites, but after checking through the records it appeared that most of these had already been cleared. However, I did compile a list of some eighty-five crash sites and their grid references, which I passed to both the Army Air Corps operations room and 78 Squadron RAF, with the request that during their routine flights they confirm that there was a crash site at each of the grid references.

On Tuesday 26 August 1986 I received a telephone call from a Flight Lieutenant John Harrison, a Sea King pilot from 78 Squadron RAF based at Mount Pleasant Airfield (MPA). He had been checking the location of crash sites with my list of grid references in the area of a routine flight, when he had come across some wreckage of what he thought was a Mirage. The wreckage was not near a previously recorded crash site and he claimed to have seen both of the aircraft's cannon, though he had not landed at the site.

Captain P A S Jefferson BA RE

Photo 1. Wreckage spread over an area some 400m by 400m.

I agreed to investigate the site within the next few days and succeeded in getting a flight to the location on Friday 29 August 1986 in an AAC Gazelle piloted by Captain Chafer and accompanied by Corporal Murgatroyd of the Royal Engineers. The crash site was located on the west side of Blue Mountain, which is approximately ten miles north-west of MPA and some twelve miles north-east of Goose Green.

When we eventually pinpointed the wreckage, it was obvious why it had not been found earlier. The site was on a ridge which runs approximately north/south off Blue Mountain. The aircraft had crashed into the western side of this ridge. It appeared that the aircraft had first contacted the rock scree about 100m below the point where the bulk of it had impacted into a rocky outcrop. This was borne out by an area of shattered rock 100m down the slope, while the main wreckage was hard up against the rock outcrop with other pieces of aircraft spread out down the slope, covering an area approximately 400m by 400m (*Photo 1*). Such items as the propeller blades, remains of rocket pods, the rockets from the rocket pods, weapon stations and undercarriage, all from the underside of the aircraft, appeared to have been ripped off the main aircraft some 100m down the slope, while the two engines and a few other heavy pieces had been thrown right over the ridge and were some 200m down the eastern side. The majority of the wreckage was a dull grey in colour and was almost invisible against the grey rock scree over which it was scattered, while the only brightly coloured pieces, such as the life raft and parachute, were with the tangle of wreckage tucked hard against the rock outcrop.

The aircraft was very rapidly identified as being a Pucara, a twin-engined propeller-driven ground attack aircraft built in Argentina. It was a two seater aircraft but was normally flown on operations by only one pilot. A Pucara could be armed with two 20mm cannons, four 7.62mm machine guns and it could carry attached to a weapon station under each wing, either two 500 lb bombs, two Napalm tanks or two

Discovery and clearence of a Fugara crash site (1)

Photo 2. The rear of the two Martin Baker ejector seats with propellant cartridges.

rocket pods each with twenty-one 2.75 inch rockets. This particular aircraft had been carrying rocket pods, witnessed by the dozens of 2.75 inch rockets (many in remarkably good condition) scattered about the site. The remains of the split open rocket pods could be seen amongst them. Other UXO on the site consisted of 20mm cannon rounds, which appeared to be everywhere, as well as 7.62mm rounds in equal abundance. An unsual UXO find were the two Martin Baker ejector seats, which had their propellant cartridges intact. (*Photo 2* shows the seat and the cartridges underneath it.) The 2.75 inch "Mighty Mouse" rockets represented a very real hazard to anyone visiting the site, particularly as they are inertially armed by subjecting their set back fuzes to 28G (I should not like to hazard a guess as to how many Gs a 200 knot collision with a mountain and the ensuing explosion would subject them to). Some of these rockets also had proximity fuzes and the warheads themselves were a mixture of HE and HEAT warheads.

Also discovered on the site beneath the main wreckage, which was against the rock outcrop, were the remains of the body of the pilot. He was wearing a flying suit, a badge of rank, a key and a wallet containing money and a drivers' licence and identification card (which identified the pilot as Lieutenant Miguel Gimenez, born 1954, Argentinian Airforce). No identity discs or watch could be found. There was evidence of there having been a fire and an explosion in the wreckage, which had burnt much of the remains and clothing. No maps or documents could be found anywhere in the wreckage.

Immediately upon my return from the crash site I reported my findings to the J1 cell at HQ BFFI, where it caused a gratifying stir. I handed over the wallet from the pilot and we started to plan the recovery of the human remains for the next day and the clearance of the UXO for a week later.

When the day dawned for us to clear the site, the weather, in true South Atlantic style, had changed from clear sunshine to freezing winds and some snow. The battle area clearance section of six men under Sergeant Dalton were not to be daunted and an area search of the entire crash site was conducted. This was a particularly difficult task, as the area to be searched was almost entirely rock scree, consisting of rocks

Discovery and clearence of a Fugara crash site (2)

Photo 3. 2.75 inch Mighty Mouse rockets being prepared for demolition.

varying from football size to Landrover size. Walking across them was difficult enough, with the snow and ice making it fascinating to say the least. By midday we had accounted for all 42 of the 2.57 inch rockets, both ejector seats and a large quantity of 20mm cannon rounds and 7.62mm rounds. Other finds on the site included both of the aircraft's 20mm cannon, all four of the aircraft's 7.62mm machine guns and the pilot's 9mm Browning pistol. The aircraft's fuselage number was also found, identifying the aircraft as Pucara A537, an aircraft of "Grupo 9". Part of this squadron had attacked British troops at Goose Green on 28 May 1982, Lieutenant Gimenez being amongst them.

All items of ordnance found were blown on site, the rockets being blown in two lots (*Photo 3*). The memory of the almighty bang and the size of the craters they left after detonation will stay with me for a long time to come. Throughout the task we had a Scout helicopter on site as a safety vehicle, and transport to and from the location for the section was by Sea King.

A week after we had cleared the site, the pilot's father, Senor Gimenez, attended the funeral of his son at Darwin cemetery and visited the crash site. He confirmed that according to his son's wing man, Lieutenant Gimenez had been involved in an attack on British troops at Goose Green on 28 May 1982, a day of particularly bad weather. He had started his return to Stanley when he flew into a bank of low cloud. He asked his wing man for a bearing on which to fly to get him back to Stanley. His wing man gave him a bearing and this was the last anyone heard from him. He was listed as missing presumed dead when he failed to return to Stanley.

During the remainder of my tour in the Falklands we were to discover a further two previously unrecorded crash sites, one a Mirage and the other a Skyhawk. The Mirage was in the water near Ajax Bay and therefore not investigated. The Skyhawk involved a three day clearance task, during a period of remarkably un-Falklands like weather, from which we all returned with brown faces, one thing which cannot be said of the Blue Mountain task!

Discovery and clearence of a Fugara crash site (3)

The Beckton Gasworks Bomb

MAJOR G S LUCAS MIExpLE RE

Major Guy Lucas was commissioned into the Royal Engineers in 1965. After the YO courses he served with the Queens Gurkha Engineers where he qualified as a diver. He completed the Long Plant course and became SI plant at AAC Chepstow. He has served as a staff officer in HQNI, HQ 3 Infantry Brigade and HQ 1 Infantry Brigade. He commanded 49 EOD Squadron during the Falklands conflict, has recently completed a tour as Second-in-Command of 33 Engineer Regiment (EOD) and is currently serving in MOD PE.

The incident began during routine maintenance of a gas holder in Beckton gas works. The holder was being lowered and before it reached its correct level was stopped by something solid jamming it. The construction of a gas holder is such that gas at a pressure of about 6 lb/in^2 is held within the holder and water is retained in the base of the holder to act as a gas tight seal. When the gas holder could not be lowered fully commercial divers were sent into the 40ft depth of water at the base of the unit. The divers, all ex-marines, located an object which appeared to be the cause of the problem. The object was described as being conical, about 17 inches in diameter and about 14 inches long. One of the divers suspected the object was part of a bomb.

A report was made to JSEODOC in Didcot, who tasked an EOD team from Hounslow to investigate the matter. As soon as it was realised the object was a bomb, 33 Engineer Regiment (EOD) was tasked with carrying out a full investigation using one of its diving teams, all of whom are Bomb Disposal Engineers. Major Hall, the Regimental Diving Officer, deployed to the site with a five-man diving team. He established that there were no secondary hazards from the gas holder which fortunately, because of the maintenance programme, was only partially full of compressed air and not gas. The team gained entry into the gas holder through an air lock in the domed roof of the gas holder. The air lock led to a bosun's chair, some 100ft above the water level. Each member of the team was lowered individually into the inflatable rubber dinghies already in the gas holder and the wooden pontoon used for maintenance. The only light available within the holder was provided by two gas-safe lamps on loan from the Gas Board. The water on the base of the holder was some 40ft deep and was totally obscure. It was black, filthy, and highly noxious, not having been changed in living memory.

Major Hall entered the 40ft of water and following directions from the commercial divers, quickly located the suspect object, the nose section of a large bomb. The nose cone still contained a filling, a sample of which was taken and subsequently identified by RARDE as TNT, one of the standard explosives used in German bombs. The team then waited for the full RARDE report which indicated that the explosive was perfectly intact, suggesting that the rest of the bomb was probably still in the gas holder.

On Monday 24 November the team returned to site with lifting equipment and using 'G' clamps attached to the winch rope, which doubled as the bosuns chair cable,

Major G S Lucas

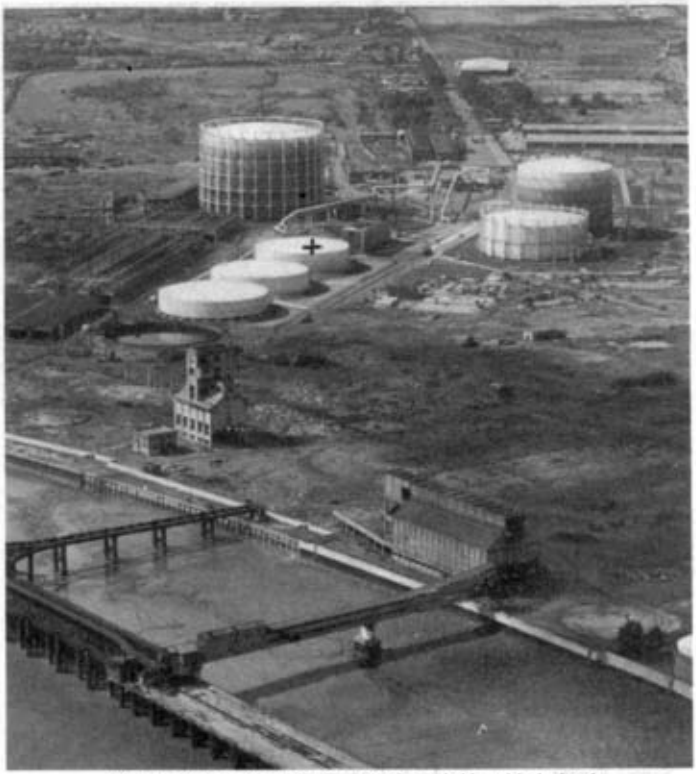


Photo 1. Beckton Gasworks. X marks the gasholder with the bomb.

the nose cone was recovered. The identification made by Major Hall was confirmed by Major (retd) Hogben, the Custodian of the EOD Technical Information Centre. The nose was that from a German 500 kg SC bomb. German bombs did not have nose or tail fuzes, but transverse fuzes and therefore the nose cone was safe, albeit full of explosive. This also meant that the main body of the bomb, still to be found, would contain either one or two transverse fuzes.

It was decided that the gas holder should be fully raised to allow a complete search of the base. As this was likely to take some time it was agreed that the Regimental Diving Team would return on Wednesday 26 November to continue the search.

On 26 November the crumpled remains of the fins were discovered at about 1300 hrs and the main part of the bomb, a steel case 17 inches diameter and 4 feet long, was found at 1400 hrs. It was almost upright and had penetrated the concrete skin covering the base of the gas holder.

At this juncture the Senior EOD Commander, Major Lucas, was called to the site to command the operation. The plans for the rendering safe of the bomb were developed and discussed with the gas works officials. Major Lucas was to command the site and overall operations from outside the gas holder at the ICP and Major Hall was to act as the Bomb Disposal Officer within the gas holder. The diving team within

Photo 2. Major Hall immunises the fuze whilst Sapper Wright holds the torch.

the gas holder was reduced to the minimum required to carry out the render safe and supporting operation. The team in and on the gas holder was:

Major Hall	—Diving Officer BDO
Staff Sergeant Daly	—Diving Supervisor and BDO's assistant
Sapper Wright	—Standby Diver
Lance Corporal Pethick	—Winch operator and radio operator
Sapper Fender	—Air lock operator

Major Lucas was located at the ICP with the police, fire brigade, ambulance and the Crash Crew with the steamer and heavy equipment required for the later stages of the render safe procedure. Command and control was effected using Pye Pocket-phones between Major Lucas, Lance Corporal Pethick and Staff Sergeant Daly.

Once evacuation had been effected and the area sealed by the police, the next stage of the operation started. It was essential to confirm the number of fuzes in the bomb case. Major Hall dived onto the bomb and confirmed there was only one fuze. This was extremely valuable information as it indicated that the fuze was most likely to be an impact fuze that had either malfunctioned or had never been armed when released from the aircraft. The impact fuze was designed to operate by discharging a charged capacitor to initiate a detonator on impact.

The case was lifted from the bed of the holder using the winch and then placed in one of the dinghies where the fuze was neutralised using the new Mk III fuze neutralising 'S' Set, recently developed by the Regiment. This was the first time it had been used on a live bomb. The immunisation was carried out to ensure the fuze was safe and to dissolve the picrate crystals which might have formed in the area of the fuze and fuze pocket. Major Hall drilled into the bomb fuze and the hiss of gas as he broke the vacuum indicated that the fuze was in good condition.

The bomb was then lifted using the winch, into the air lock and then manhandled through the 2ft square air lock opening onto the roof of the gas holder, an operation which sounds simple, but in the dark with a 1000 lb wet bomb swinging about, caused severe problems. As the bomb case dried out, picrate crystals were found in the area of the fuze. These crystals were kept well dowsed with water as dry crystals are very sensitive to both heat and friction. Any sudden knock could have caused detonation.

A lifting beam with block and tackle was attached to an access staircase and the bomb case, with immunised fuze, was lowered into the bucket of a site JCB. The bomb was taken to an area arranged by Major Lucas where Lieutenant Marot, the BDO, organised the steaming out of the explosive. The molten explosive was collected and then allowed to solidify in thin layers on hessian and then burnt. The final phase in the render safe procedure was the destruction of the neutralised fuze with the booster charge attached to the base of the fuze in the fuze pocket, in all about 0.5 kg of explosive. The fuze and fuze pocket were destroyed using a few ounces of PE at 0600 hrs.

It transpired that during a bombing raid in 1941, in which two gas holders were destroyed, a large hole was found in the top of gas holder No 4 which was subsequently repaired. The remains of the bomb were found directly under the repaired section of the gas holder roof. The bomb had lain undisturbed for the last forty years.

This operation was a unique incident for the Regiment. It employed not only the full range of bomb disposal skills but also field engineering, improvisation and sapper diving techniques. It also required physical strength, endurance and a cool analytical approach to an extremely dangerous task in a hostile environment.

Operation ANGORA

MAJOR J C WALMISLEY MBE BSc(ENG) RE

Major Jonathan Walmisley has served with 26 Armoured Engineer Squadron, 24 Field Squadron and 45 Field Support Squadron and as an SO3 in 5 Infantry Brigade. He did his service degree at RMCS and completed his PET(C) course. Whilst commanding 48 Field Squadron (Construction) and based in Belize he was sent to San Salvador following the earthquake of 10 October 1986.

INTRODUCTION

SHORTLY before midday on Friday 10 October 1986 San Salvador, the capital city of El Salvador, suffered a Tectonic earthquake measuring 7.5 on the Richter Scale. Over the next two weeks ten further earthquakes measuring up to 5 on the Richter Scale were experienced. San Salvador had been damaged many times before this earthquake, the last being in 1966, but never before had the strength of the earthquake been so great, nor had there been so many after-shocks.

San Salvador has a population of about one million and covers an area of ten square kilometres. The city is in a natural bowl surrounded by mountains, many of which are extinct volcanoes. Underneath the city there are numerous fault lines which move continuously, causing very minor tremors on a regular basis (*Figure 1*). Most of the areas of the city sustained some damage but the majority of the loss of life occurred in two areas. At Santa Marta, a suburb on the hills to the south east of the city, there was a major landslip which buried forty families (*Photo 1*). At the Calle Rubin Dario, in the city centre, numerous high-rise buildings were badly damaged, especially two

Figure 1. San Salvador fault lines.

Major J C Walmisley MBE BSc RE
Operation ANGORA

Photo 1. Landslip at Santa Marta which buried forty families.

five storey buildings, consisting of shops, restaurants and offices. These complexes collapsed until the highest parts of the buildings were only ten metres above the ground and trapped nearly 500 people inside. Initial estimates of the damage were very sketchy but by the 21 October 1986 a statistical picture of the devastation had emerged. Between 1300 and 1500 had been killed, 11,000 injured, 200,000 made homeless and over 500 buildings had either been destroyed or damaged so badly that they would have to be demolished. Of all those buried by the initial earthquake, only 120 were rescued alive.

As a result of a signal from MOD on 11 October 1986, HQ British Forces Belize brought elements of various units in-theatre, including 48 Field Squadron (Construction), up to immediate notice to move and tasked them to prepare equipment which could be of assistance to any subsequent disaster relief. Clearance to deploy was not received until the 12 October, nearly forty-eight hours after the earthquake. A reconnaissance team, commanded by myself and comprising eleven all ranks, including RE, R Signals, RAMC, RAF and Belize Defence Force (BDF) (interpreter) personnel, flew to San Salvador by Puma helicopter, arriving at 1415 hours local time. A larger team of specialists deployed some thirty-six hours later once a definite picture of the aid required had been clarified.

Civil Relief

El Salvadorean

On first impressions it seemed that there was no central organisation. By the fourth day after the earthquake it became evident that there was more than one group organising the disaster relief. Nominally the Comite Empresarial para La Distribucion de Ayuda Extrangera (COEDA), a civilian group selected by President Duarte, coordinated all the relief and rescue organisations. In practice, the military organised the security of rescue teams and the rescue operations outside the city centre, but were coordinated by the Director of the Policia de Hacienda. COEDA in conjunction with US AID distributed welfare relief, but left the coordination of repair work to the respective authorities. Rescue work at the Calle Rubin Dario was coordinated and

carried out by a variety of international rescue teams reporting directly to the Minister of Public Works.

The diversity of relief organisations led to some duplication of effort and other effort being wasted totally.

Search and Rescue

Many nations came to the assistance of San Salvador and two civilian teams came from the United Kingdom. A team from the International Rescue Corps used thermal imagers, sound detectors and tracker dogs to make a substantial contribution to the work on the Rubin Dario and other sites. As this team was preparing to leave a small contingent from the British Fire Service arrived, but unfortunately most of the rescue effort had been finished and there was little work for them to do.

British Military Aid

Reconnaissance

The reconnaissance party was met by the Military Attaché to Central America who took myself and the interpreter to meet the Policia de Hacienda. All our work was coordinated through this organisation and without their help very little could have been done. I was immediately asked for water purification equipment, lighting and telephone repair equipment. Once these requirements had been fed back to Belize I rejoined the team at the airport where we stayed the night, courtesy of the El Salvadorean Air Force.

The next thirty-six hours were spent reinforcing the team administration and carrying out further reconnaissance. The team was reinforced by three C130 flights from Belize which brought in the necessary equipment and operators.

Security

The physical security of the team was of paramount importance, not only against injury due to further tremors but also against the possible attack by left wing guerrilla forces. The Policia de Hacienda provided guards at all work sites and escorts for officers in the team. Even the Sheraton Hotel, at which the team based itself, was guarded. In retrospect this security was not required as there were no guerrilla attacks within the city against any rescue teams but it was a factor that had to be considered. There is something quite off-putting about being totally surrounded by soldiers, fully armed with a round in the breach and the safety catch more often than not on automatic, whilst one carries out the structural examination of a collapsed building!

Emergency Lighting and Rescue Operations

The lighting team comprised three sappers and four REME fitters. This detachment was not tasked until 14 October when they deployed four 24kW 110V DC generators. The first two were deployed to the Rosales Hospital and the Maternity Hospital as a back up for the hospitals' emergency lighting system. The third generator and a lighting distribution kit was set up at Santa Marta to enable rescue work to continue through the night. Once set up this generator was operated by the local community who, within twenty-four hours, had wired up most of the village to it.

The fourth generator was taken to Calle Rubin Dario. That night the team rigged up emergency lights using twin flex and 110W bulbs. This lighting was supplemented on the 15 October by two RE lighting towers (*Photo 2*). By the 15th the whole detachment was working shifts, providing light by night and helping with the rescue operation by day. They repaired rescue equipment belonging to the international rescue teams and were actively involved in using oxy-acetylene equipment to cut up large sections of the buildings that were to be lifted off by crane so that the search for people could continue.

This detachment was the only one to become actively involved in the rescue operation. It was decided on 21 October that further survivors were unlikely and so night work stopped. The team recovered the equipment to the Hotel Sheraton and that night had a well deserved rest.

Photo 2. RE lighting tower at Calle Rubin Dario.

Water Purification

A detachment of four sappers, one REME fitter and an RAMC environmental health adviser, with two standard water purification units deployed to San Marcos on 15 October. The delay in deployment was due to the difficulty in finding a suitable source in an area that needed water. Most of the rivers were heavily polluted and totally unsuitable and a natural spring was used as the source. The detachment remained at San Marcos until 21 October and in that time produced nearly 500,000 litres of drinking water for the local population. The problem of distributing the water to other areas was unfortunately never resolved by the authorities. The capacity was there to provide half a million litres every day but this potential was never realised.

On a technical note the detachment found that their previous training on the equipment at the RSME, especially on the filters' endurance and the amount of chemicals to be used, had been inadequate and as a result the filter required constant attention. The equipment was found to be more than capable of constant operation and required only the minimum of maintenance and attention. However the dose meter when set on six parts per million only produced four parts per million!

Operation ANGORA (2)

Telephone Repair

The R Signals Telecommunications Team of five were deployed at the direct request of the Military Attaché to repair the telephones at the residency and to assist wherever possible. They inspected two telephone exchanges but, due to the nature of the exchanges were unable to carry out the repair work and therefore returned early to Belize.

Structural Survey

A Royal Engineer clerk of works (construction) worked for nine days with the Association of El Salvadorean Civil Engineers and Architects. In this time he inspected a total of eighty-five buildings including two hospitals and numerous office blocks. On his advice many of the buildings were evacuated until they were demolished or had had major repairs carried out. The first building inspected was the Direccion de Transito (Department of Transport) which had been badly damaged and it was agreed on his advice that it should be demolished and rebuilt at a cost in excess of £1 million.

In general the buildings which suffered damage were found to have been poorly built due to poor site supervision during construction. In only a few cases could the fault be attributed to poor design. The importance of site supervision is a lesson all Sappers on project work should take to heart.

No structural survey was carried out on the adobe type residential buildings which make up about 75 percent of the structures in the city. Thousands of these buildings were destroyed. These buildings have mud walls reinforced with timber and bamboo cane. Due to their light construction there was very little loss of life when they collapsed.

Command and Control

Because of the separation of detachments, command and control was very difficult. The communications centre was at the Chargé d'Affaires Residency and communications to Belize using a 647 ICOM transceiver and a VRC 321 were excellent. Communication with the detachments was by phone which proved very unsatisfactory. Telephone was the only means of communication available to the Team Commander who was either at the Headquarters of COEDA or visiting detachments. Local management radios were taken but were found to be too physically restrictive when working and could not be left unguarded for fear of theft. As a result they were withdrawn. All other rescue agencies and the Salvadorean Military used pocket phone radios very successfully and they were ideal for rescue operations.

Conclusion

San Salvador was the fourth disaster operation in which British Forces Belize had been involved, in the last eighteen months; Mexico, Columbia and Jamaica being the other three. In all four cases a relief team from Belize had been prepared to move within twenty-four hours of the disaster but, except in the case of Mexico, clearance from MOD and Foreign Office took much longer. On my arrival in San Salvador it was evident that we could offer little in the way of rescue work as there were enough rescue teams already doing such work. Finding work for the teams was difficult as all thought was on rescue and medical relief rather than the provision of drinking water and electricty.

Operation *ANGORA* was different to the three previous operations in many ways, not only in that the team was split into small detachments with some doing relief work and others doing rescue work, but also the possible security problems. There are a few low level lessons which the Force in Belize have noted for future use and they mainly involve command and control. The main lesson learnt by everyone is how horrific the aftermath of a natural disaster is and that every man in the team must approach the work in a detached and professional manner.

Crown Revisited

COLONEL J H G STEVENS BSc FICE

Colonel Stevens joined the Royal Hampshire Regiment in 1945 and transferred to RE on receiving his Commission in 1947. He graduated from the Royal Military College of Science with an Honours Degree in Civil Engineering in 1951. After regimental service in BAOR he attended a Long Civil Engineering Course leading to Membership of the Institution of Civil Engineers in 1961 and became a Fellow in 1975. He served as a Staff Officer in MOD and Aden and commanded 11 Independent Field Squadron in Malaya and 35 Engineer Regiment in BAOR. He is a graduate of the Army Staff College and JSSC and instructed at both of these institutions. His last appointment was as Colonel 'Engineering' HQ 12 Engineer Brigade. On leaving the Army in August 1975 he joined consulting engineers Rendel Palmer & Tritton and has served with them in Bahrain, Libya and Bangkok.

During his time commanding 11 Independent Field Squadron the author took the unit to Operation CROWN *in 1965 and 1966 at the start of the surfacing of the airfield in pavement quality concrete. This article describes what he found when he returned to the site in 1986 during his recent tour in Thailand.*

Enquiries made through the British Naval and Air attaché in Bangkok revealed that neither the Royal Thai Airforce nor the Royal Thai Army admitted to any responsibility for Crown Airfield. So, having obtained an official looking introductory letter on British Embassy paper, liberally sprinkled with rubber stamps, I planned a visit to Loeng Nok Tha. Accompanied by my wife and Lieut Colonel (Retd) B A O Ward RE—who previously served in SEATO Headquarters and is now Director of the Asian Disaster Preparedness Centre in Bangkok—we set off for Crown Airfield on 19 July 1986 at the beginning of the rainy season and just twenty years after my first visit.

The flight from Bangkok to Ubon took one-and-a-quarter hours in the comfort of a Thai Airways 737—a bit different to the lumbering Hastings and Beverleys with their netting seats and heaps of spare parts piled in the cabin! Ubon airport turned out to be a shadow of its former self—although the runways, aprons and other facilities are still there, the noise and urgency of USAF and RAAF operations at the height of the Vietnam conflict have gone long since. One Thai Airways flight a day and a small RTAF presence is all that is left.

However, Ubon town has grown out of all recognition—wide streets, modern buildings, a population trebled in size, a new bridge over the meandering Moon River all contribute to a much changed (and much improved) scene.

Off on the road to Loeng Nok Tha—a wide straight metalled road, raised above the surrounding paddy has replaced the laterite ruts, standing water and endless dust of the dry season. After a coffee stop at Amnat Charoen—remember the 16 feet tall Buddha image—the local village of Ban Kok Samnam and the entrance to Crown Airfield was reached in a little over one hour.

The airfield entrance is marked by a drop barrier (up) a guard bunker (deserted)

Colonel J H G Stevens
Crown Revisited

and a cannon (barrel—timber, wheels—discarded tyres). There is no perimeter fence and entry is free to all.

The approach track leads to two concrete plinths on which brass plates in English and Thai commemorate the opening of the airfield. The date seems premature—June 1965—presumably with the original asphalt surface. The English version has been used for target practice and now contains no less than fourteen bullet marks. Attempts to lever the plaque off the concrete plinth have been defeated either by the high quality concrete or lack of suitable tools! The Thai version has however not been so desecrated.

Photo 1. The runway looking north, Lieut Colonel Ward looking east.

On to the airfield itself—deserted and forlorn. The pavement quality concrete of runway, taxiways and apron appears in excellent condition, though one must remember it has received very little use by aircraft and a Thai water buffalo is hardly LCN30. No signs of differential settlement or surface deterioration—the bass broom finish marks are clear to see—and only one small, shallow area of standing water was evident. The joint sealing compound has however deteriorated badly and is missing in many places. Some vegetation has appeared in the over-runs, shoulders and stores handling area which were, of course, unpaved.

Photo 2. Culvert under taxiway.

Crown Revisited (1 & 2)

Photo 3. "Where are you now Foxy?"

The airfield drainage system appears to have worked well—all culverts are free flowing though minor damage has occurred to some sills and training walls. A ride down the runway was far from bone-shaking.

Nothing is to be seen of the infamous 'Iron Maiden' asphalt plant nor the concrete batching plant except for isolated concrete slabs and footings and a pile of discarded asphalt from Crown Mark 1. It was here that we saw the hand print—where are you now Foxy? That infuriating golf course has also disappeared!

Crown Camp has returned to the bush. The only clearly recognisable features are the swimming pool—whatever happened to the sand box filter?—and a concrete slab containing sixteen large holes—Polaris silo or perhaps something more mundane?

Photo 4. "Polaris silo or perhaps something more mundane?"

Crown Revisited (3 & 4)

Photo 5. Crown Camp main road.

A stroll down the main camp road and up into the nearby village—no beer tins or Mekong bottles now define the route—revealed a transformation. Ban Kok Samnam is now a model village—neatly laid out, tidy houses with a metalled road and mains electricity.

Farangs (Thai for foreigners) in the village caused quite a stir and perhaps evoked some memories. We thought we saw one unusually light skinned twenty-year-old but at least we didn't have any paternity orders thrust into our hands!

In spite of keeping a sharp lookout we failed to spot even the ghost of a Commer tipper!

Inevitably the visit brought back a host of memories—a Thai policeman's wedding, pouring water from a conch shell over the hands of the bride and groom and subsequently my last public performance of 'My Old Man' at the reception!

Australia v England cricket matches at Ubon airfield to the constant roar of combat ready aircraft on ground attack missions in Vietnam. ANZAC day 1966—the traditional dawn service in the camp church and the SSM (Bob Thornton) and I being hijacked by OC 2 Troop RAE (Alan Hodges) and royally entertained to barbecue, Fosters and water sports on a nearby lake.

The film that never finished when the generator was struck by lightning and I nearly stepped on a banded Krait in the darkness.

The Ubon fair where our Landrover gave up the ghost alongside the Wall of Death—where did you get to that night Gordon?

Runs with the Hash House Harriers—tugs of war with local children. Charming Thais, deadly Mekong whiskey. But perhaps most of all the relentless sun beating down out of a cloudless sky, the glare off the concrete and the agonising learning curve of how to produce, spread, compact and finish PQC.

Back to Ubon to our air conditioned hotel after a long and interesting pilgrimage. Perhaps not a lot to show for all the Sapper, REME and RCT "blood, tears and sweat" which went into Operation *CROWN* but the airfield is there, intact and with very little work it could quickly be made operational once again. With the emphasis on tourism in Thailand it might even become MUKDAHAN INTERNATIONAL!!

Combat Earthmoving—Are We Really Serious?

MAJOR (QM) E C BANKS RE

The author enlisted in 1961. Trained as a Combat Engineer and Design Draughtsman, he has served in Borneo, BAOR, Zaire, Hong Kong and Northern Ireland. Commissioned in 1982, he was Resources Officer to 60 Field Support Squadron and completed two tours in the Falkland Islands. In his last posting as Officer Commanding the Royal Engineers Sales Team he was deeply involved in Combat Engineer Tractor sales activities in India and USA, and during that time travelled extensively worldwide.

In the past military engineers have been largely dependent upon conventional commercial equipment for earth moving and allied tasks, that required the application of mechanical power. Those equipments, designed by civilian engineers for civilian tasks, had no amphibious capability, no armoured protection, no communications and poor mobility. In short they achieved little in providing the integral engineer support required by a modern battle formation.

The arrival of the Combat Engineer Tractor (CET) as part of the Royal Engineers Inventory in 1978, corrected the above deficiencies and gave the Corps an earthmoving machine, which combined the power and versatility required of an engineer equipment, with the essential ingredients of a battle group vehicle.

Now having obtained it, do we really know how to get the best performance from it and how to manage it? I believe the answer is no; for, ever since its arrival, this unique concept has been the centre of controversy. The vehicle can be likened to that mythological creature, the Centaur, because it is part A vehicle and part C vehicle. Half the Corps has views against the CET, while the other half is intensely enthusiastic, and to this day it seems these feelings remain. That so many of the fraternity decry the vehicle is indeed sad, especially since doubters, when questioned, invariably fault it, not from knowledge of the equipment or its operational capability, but more from seeing, or hearing about its mechanical failures. That the CET frequently fails mechanically, is a fact of life, but so do many other items of plant, but they are not so heavily criticised. This article aims to shed some light on why it can be unreliable, and also act as a plea in mitigation.

As a result of a series of unique opportunities during the last two years, the Royal Engineers Sales Team has assisted the Royal Ordnance Factory, the manufacturers, to obtain overseas sales. They have seen the CET perform through three intensive evaluations, one of which lasted for fourteen months. These tests have ranged from long drives in the Rajasthan desert in India and in the Bullion Mountain Range near Las Vegas USA; from swimming in the canals near the Pakistan border and in the lakes of Singapore, to the Pacific Ocean off the shores of California. The vehicle has been freighted in Hercules C 130 and Belfast aircraft, transported by RoRo ships, and embarked on the complete range of amphibious logistic vessels used by the US Marine Corps. It has been pushed, pulled, lifted, dropped, driven, dragged, bogged and unbogged and been in a temperature range from minus 25°F to plus 140°F. The

Major E C Banks RE
Combat Earthmoving- Are We Really Serious

operators have been British, Indian, Singaporean and from the US Marine Corps. The vehicles used were those first handed over to the British Army in 1978, and one was fast approaching the period for inclusion in the base overhaul programme. Throughout all these tests the CET has proved to be operationally superb.

I, a combat engineer ex-ranker, with no previous special experience of CET, was the officer responsible for these evaluations and was present for the majority of the time. I was assisted by a REME sergeant and a handful of JNCO operators, all experienced and mature, but none with any specialist CET background. It is not surprising therefore that I and my team have great faith in the vehicle's capability.

That the vehicle, being a first generation machine, has design faults, and some basic ones at that, is hardly surprising. The ergonomics are very poor and some of the basic design of components and their positioning within the vehicle, leaves even the mechanically incompetent doubting the expertise of designers and consultants. The mechanical faults and the frequency of their occurrence is very upsetting, and there is no reason why they could not have been solved long ago. Even now some of these could be corrected should the desire and money be made available. Many of the design problems have created maintenance difficulties, so that the machine's repair time, compared with operational hours is far too high. This, combined with a lack of spares, provides further ammunition for its critics.

It is however the management of the equipment, and the selection and training of the operators which concern me more. The equipment managers, at officer level, are generally naive about CET's operational capabilities and below them; at staff sergeant and sergeant rank, few soldiers, from a variety of trades mainly Plant and MT, have any knowledge of the vehicle's ability. It is therefore the crew members who, in effect, manage the equipment with all that that implies. These operators learn to drive, operate and maintain the vehicle on a four week course but have little technical or practical ability on earthmoving unless trained as a plant operator mechanic (POM).

The continuation training, however, is in the unit equipment managers' hands, poorly prepared for the task as they are, and it is they who should know and teach their men about the operational usage, ensuring that the non POMs are educated in the theory, as much as the practical application of vehicle management and earthmoving techniques. Because of our present equipment management system, operational education is something spoken about, but as results prove, rarely effective.

Most fleet vehicles are basic in construction and their operation is well known; frequently this year's model is just an updated version of the previous in-service item. Not so with CET, for if managers know little of the vehicle then all levels of operation and maintenance will fail. Defect reports do not get initiated, operators develop bad driving habits and when training is arranged, operators will do no more than practice their faults. Meanwhile, bit by bit, the image of the equipment becomes further tarnished.

CET is designed so that the vehicle crew can operate in the traditional role of commander and operator or commander and driver, but when maximum outputs coupled to haulage are required, the crew go into a back-to-back role. This function requires practice, but dramatically increases the vehicle's digging and hauling output. Not liked by the operator, little known by the managers it is rarely if ever done.

A unique equipment whose primary task is to "dig dirt" should logically be operated by POMs. However a recent exercise in BAOR illustrated that of thirteen operators employed, no more than seven were POMs, three of various trades, and three with no trade at all. Indeed one man did not even possess an ordinary car licence, and it is doubtful that other units will be in any way different. That POMs are not a priority requirement for CET but are still retained for the civilian types of equipments is surely another fault, for we must win in the Combat Zone before we attack the battlefield debris.

On present performance our conceptually capable machine, would operate at half its design capability, and probably less, and would be as rare on the battlefield assisting the teeth arms as a Scotsman giving away free drams.

Photo 1. The combat engineer tractor being prepared for her maiden flight on a Hercules C 130.

The training of crewmen is carried out at Bovington with further in-unit training in accordance with an EinC directive. The RSME with its plant managers', MPFs' and allied trade courses have no involvement in the training cycle. Nor are graduates of these courses trained in CET functions, and yet they form part of the equipment management team as mentioned earlier. Management courses (CET forms part of the AFV Management course) are available, but it is the experience of the trade and vehicle knowledge that are so sadly lacking, and how many plant men would wish to attend an A vehicle familiarisation course?

With this equipment plant experience is so very important. To illustrate the point, the digging output of the CET is quoted in the User Hand Book (UHB) as 300 m^3/hr over a 100m haul. The exercise mentioned earlier, using unit operators could only achieve 97 m^3/hr for POMs and 63 m^3/hr for other trade personnel with no haulage. If haulage had been required the above figures would be well below 60 m^3/hr. I sincerely hope our operational planners are not working on the UHB figure, for we would require a CET fleet at least five times as large.

So why is the performance so poor? Firstly the digging output claimed in the UHB is wrong. CET cannot achieve the designed digging figure, but no one discovered that fact for over eight years of in-service operation. Had it been in the hands of the earthmovers, or had someone noted this important factor in the QAD report of 1979, I am certain this would not have been the case. Secondly Bovington, who are not trained earthmovers and have little time or technical ability to teach that aspect within their syllabus framework, have to rely on unit training which, as the outputs above suggest, is not effective. And thirdly the managers' knowledge, and therefore control, is so limited as to make it insignificant. Adding all this up gives us a clue to CET's maintenance problems, and possibly another reason for its unreliability. For if the operators are so poor at vehicle operation, what is the chance of them being effective at preventive maintenance?

It is now time, during the mid-life improvements of the vehicle, to re-assess our equipment management, and clearly define the correct way to make maximum use of our only combat engineer vehicle.

Combat Earthmoving - Are We Really Serious (1)

It is time to address the 1979 QAD report's assessment of the operating ability of the machine, and its main failures.

It is time to get off the fence and decide whether CET is an A vehicle or a C vehicle, for CET was designed to replace the D4 in the Combat Zone and be armoured for the task. It is therefore a C vehicle; an earthmover that is armoured, not an armoured earthmover.

It is time to stop saying that it is obviously good but—so unreliable. For that means we are accepting, as we are, the unreliability instead of doing something positive and aggressive about correcting it.

It is time to man the vehicle with trained POMs; only they will produce the output required in the event of war. For no matter how effective the machine, if the wrong operators man it, it will produce substandard results. It is time to employ the professional earthmovers at RSME to train future operators and for MPFs to become as familiar with the vehicle as they are with a Caterpillar D6.

Anyone can make an excuse—we have, for eight years on CET's behalf. It is now time we took our only combat engineer vehicle's capability to operate seriously, and addressed the many failings at present inherent in our system. For the failure to manage the equipment is not at base roots but at the higher levels. It is time therefore for positive direction from the top. It is time to take the combat earthmover seriously. . . .

* * * * *

69 Gurkha Independent Field Squadron Detachment with United Nations Forces in Cyprus (UNFICYP) Tour June 1986 to January 1987

LIEUTENANT (QGO) JUDBAHADUR GURUNG

The author joined the Army as a boy in 1964. He was commissioned in February 1986 and was posted to 69 Gurkha Independent Field Squadron at Chatham as the Support Troop QGO. He has served with 67 Gurkha Field Squadron mainly in the Far East but has served briefly with 524 STRE in Kenya and the AMF(L) Troop in Norway. He was a Clerk of Works (Construction) on the Lantau Bridge and Road Project before his present appointment.

SINCE the coup of 1974, the island of Cyprus has been divided with the Turkish Cypriot community occupying the north and the Greek Cypriots in the south. UNFICYP occupies the Buffer Zone (UNBZ) separating the two opposing sides.

The UNBZ is the area between the two Cease Fire Lines (CFL) and, although part of the Republic of Cyprus, is controlled by UNFICYP. UNFICYP splits the UNBZ into five sectors; numbered ONE (Dancon), TWO (Britcon), FOUR (Cancon), FIVE (Swedcon) and SIX (Auscon). Although UNFICYP activities now concentrate on UNBZ, the Force is not restricted solely to UNBZ. UNFICYP is currently commanded by an Austrian general (Major General G Griendl) with an international staff composed of seven national military contingents and civil police from Australia and Sweden. Each national military contingent maintains a national contingent HQ such as BRITCON, UNFICYP.

Sector 2 is manned by an infantry battalion based at St David's Camp (SDC) with two rifle companies of the Battalion on a six month mandate tour with the other two companies of the unit at Alexander Barracks in Dhekelia. (3rd Battalion, the Parachute Regiment was the infantry unit whilst 69 Gurkha Independent Field Squadron detachment was on the UNFICYP tour.)

The Rifle Companies become Western and Eastern Companies. HQ Western Company is based at the Box Factory (an old orange box factory) at Pano Zodhia. HQ Eastern Company is based at B18 (an old primary school). Each rifle company is split into platoon and section sized packets to man observation posts (OPs) within each company's zone of responsibility.

The Royal Engineer Detachment, usually one officer, one SNCO and ten men, are all based at the Box Factory where there is a comprehensive workshop/stores area for each tradesman.

The RE Detachment has three main areas of tasking and the primary one is the maintenance of fourteen manned and seven unmanned OPs. In addition SDC is also maintained by the detachment together with three PWD tradesmen who live within the camp. However, their working hours are limited and the detachment has to shoulder much of the responsibility.

Lieutenant Jubahadur Gurung.

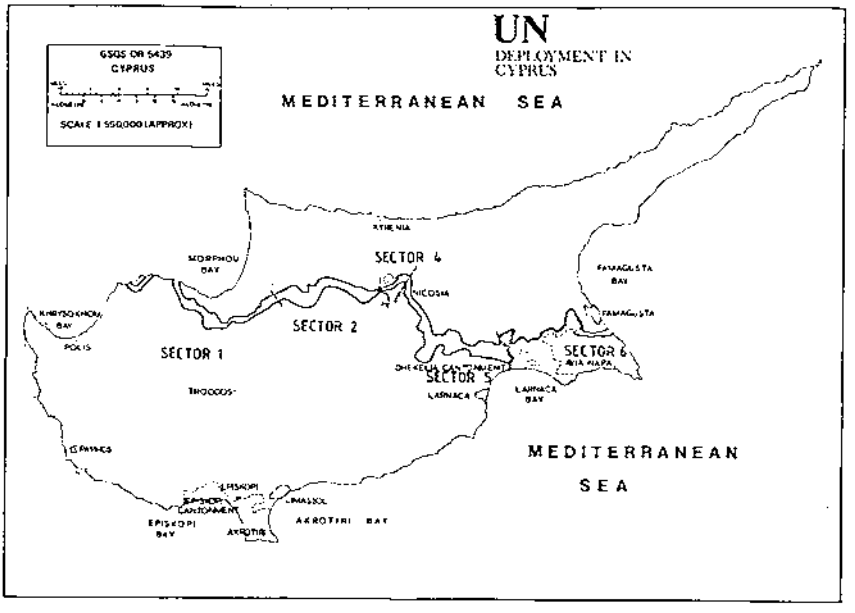


Figure 1. UN Deployment in Cyprus.

In addition there is a certain amount of project work during each detachment's tour designed to improve, replace or establish structures to provide a suitable standard of living within the UNBZ. These are designed and costed by the previous RE detachment commander for the incoming detachment.

Finally there is the operational task of maintaining all minefields within the sector. The minefields were laid by the Turkish or Greek Cypriots and are fenced off by angle iron pickets with two or three strands of barbed wire and a mine sign. The detachment can also be tasked in emergencies to clear minefields as it is the only usable clearance unit within the UNBZ besides the Cancon.

The Force Engineer who is a Canadian major co-ordinates all engineering works within the sectors of the UNBZ. He has a Force Engineer Warrant Officer (FEWO) as his deputy who is usually a British WO1 Clerk of Works (construction) and they are based at HQ UNFICYP. In addition, they also control the plant work on the patrol track which is usually carried out by the plant troops twice a year on Operation *LONELINE*. All plant machines are provided by 62 (Cyprus) Support Squadron RE based at Dhekelia.

The main role of the detachment is maintenance but this can be monotonous and minor projects are most welcome. They not only give experience to all the tradesmen but improve the quality of life in the sectors.

THE UNFICYP TOUR JUNE 1986–JANUARY 1987

69 GURKHA Independent Field Squadron Detachment started the UNFICYP tour in early June 1986. This tour was extended by a month resulting in a seven month tour. Our 'client' for the tour was 3rd Battalion, The Parachute Regiment, with whom we developed a very good working relationship.

Having arrived in the hot weather period, the usual requirement is to acclimatise but the detachment felt at home straight away even when temperatures rose to a high of 44° Centigrade, as the lack of humidity offset this. The summer period reached its

peak in August after which it started to become cooler. A few occasional heavy downpours in November caused havoc to the electricity system as well as the culverts.

Command and control on works was difficult due to the layout and the distance of the operations (Sector 2 stretches for twenty-seven miles) but this was partially overcome by listing all maintenance work in 'bulk order'. This proved to be the ideal solution to the situation and it also saved mileage on the vehicles.

One of the main problems was the sewage system, particularly at Battalion HQ at SDC. This was not helped by the lack of up-to-date drawings of underground services and only when blockages occurred did the detachment discover the 'lost' septic tanks and drainage pipes. The sludge in the main septic tank had not been emptied for a very long time and it had solidified to such a state that a pressurised hose from a fire engine had to be utilised to break it to manageable pieces so that the 'orgy' (the pump) truck could clear it. 506 STRE (V) team came to SDC to carry out a detailed study of the services and up-to-date drawings were produced which now eases the problem considerably. They have also produced a design and recommended that SDC be brought up to the minimum British Standard.

Water supply is another essential service that is a constant problem. When the detachment arrived in June 1986, the water tower at the Box Factory was leaking badly. The water to the tower was provided by the Turkish Cypriots and both the UN Forces and the Turks benefited from this. It took three months for the Turkish engineers to seal the leakages from the day of the notification. In the meantime water had to be supplied from elsewhere. In addition water is supplied by water trucks to three other OPs on a daily basis. The water is obtained from Jubilee Camp which is some thirty-three miles round trip. This is costly and time consuming. The detachment did manage to link one OP to a nearby local pump but it became difficult to do likewise for the others as it involved long drawn out negotiation with either the Greek or the Turkish Cypriots. However, if this policy is pursued then there is every chance of success in the future!

The Force Commander had a keen interest in the programme of building concrete pipe shelters. This involved excavating to a depth of approximately 2.3 metres followed by placing two metre diameter concrete pipes which were a metre in length. The male and female joints in the concrete pipes never matched and the best possible joint had to be made before sealing it with a concrete mix. Internal finishing within the pipe shelters included fixing benches and sleeping tiers as well as the electrical fittings. The detachment managed to complete three of this type of shelter.

Exercise *LONELINE* brought much needed plant help to all sectors. This exercise involves a plant troop coming out from UK who use the plant machines from 62 (Cyprus) Support Squadron RE to maintain the patrol tracks in the UNBZ. The detachment can borrow the plant and by using their own operators can complete a considerable amount of work such as excavating and back filling of pipe shelters. Among the more interesting plant works carried out by the detachment was the filling in of a seventy foot shaft on a hillside constructed by the Greek Cypriots in the UNBZ which was a suspected Forward Observation Officer (FOO) post.

The Force Engineer aims to standardise the electrical system for all sectors, especially after the fatal incident at Swedcon where a soldier was electrocuted due to the system not being earthed. The detachment were lucky enough to be allocated some money to renew the electrical system at B18 which is the HQ of the Eastern Company. The two electricians had a busy time in designing and installing the system which greatly improved the living standard as well as making the system safe. This also involved putting in isolators for each electrical appliance in the kitchen. The electricians were then tasked to reconnoitre, design and make safe all the electrical system along the sector. This was duly carried out and the results are noticeable as we have fewer emergency callouts than we did prior to this work.

The bricklayers were involved in the finishing of the kitchen at B18 where they laid two thousand tiles which has given them experience as well as confidence especially as they had never laid tiles before. However all tradesmen were working towards our

Photo 1. Roof purlin being fixed.

main project which was the construction of the operation and restroom at B33. This meant demolishing the old CGI clad hut and then erecting a blockwall on an area of 11 metres by 7 metres. The roof consisted of six roof trusses with a CGI roofing to complete the structure. This construction work got underway in early September and each tradesman was tasked to produce their own stores list from the master drawing

Photo 2. HRH The Prince of Wales talking to members of the detachment.

United Nations Forces In Cyprus (1 & 2)

which was also designed by the detachment. The building took shape at a steady pace even though the detachment held no plant machines at all. The main structure was completed in five weeks and the finishing touches were then started. Maintenance tasks had still to be carried out as this remained the priority, however by early November the building was virtually completed.

3rd Battalion, The Parachute Regiment were impressed by the detachment's effort and the commanding officer decided to have the building officially opened by HRH The Prince of Wales in late November 1986 whilst on his visit to the Regiment as its Colonel-in-Chief.

The detachment were actually tasked to clear a small area of 'live' minefield near the Box Factory and our combat engineering skills were put to the test. Although no mines were found, the exercise gave the detachment an insight of going into a live minefield and a few hearts must have fluttered in the process. The heavy downpour of rain in November had washed away the top soil of another minefield exposing anti-personnel mines. One of the first things that one notices is the sunlight's reflection on the mines.

The heavy downpour also completely washed away the culvert at B14 which had only been constructed in the summer by the troop on Exercise *LONELINE*. This illustrated quite vividly the extremes of weather conditions where in one instance there is the problem of concreting in hot weather and then in the next instance the havoc caused to electrical systems and culverts by torrential rainfall. The electrical system in the Force Engineer's office was completely burnt out which goes to show that no-one is immune to the elements.

The Britcon Medal Parade was looming over us and the usual format had to be changed drastically due to the recent threats to the Sovereign Bases where manpower had to be diverted. The detachment were asked to perform a kukri dance to add variety to the parade. We obliged by producing four dancers. The sheet music was despatched to us by the 2nd Gurkhas Band and the Nepalese traditional costumes were hastily stitched up in Hong Kong and air mailed to Cyprus. The Falkland Band of the Parachute Regiment could not have done more justice by playing the music exactly as we wanted it.

On the day, the combination of free fall display, the music of the Falkland Band and the kukri dance display added colour to the whole atmosphere and with two members of the detachment receiving the UN Medal from the Force Commander, Major General G Griendl.

Looking back there is no doubt that the detachment had a very fulfilling time. The tour at times had been frustrating due to variation and procurement of stores but adaptability by the detachment was the key word. The detachment feel proud of their contribution to the United Nations peacekeeping force as this is only the second time that Gurkhas have been privileged to have the opportunity of working for the United Nations in Cyprus. We came away from the tour, richer in experience of construction work and also proud to have upheld and continued the high standards set by The Queen's Gurkha Engineers as well as the fine traditions of the Brigade of Gurkhas.

The Professional Military Engineer

MAJOR C D YULE, MBE, MA, CENG, FINSTE, RE(RETD)

The author was educated at the Shop just before World War II, and later at Cambridge and the Staff College, Camberley. After war service including France (1940) and the Burma Campaign (1944–45), he held a succession of field and staff appointments, retiring at his own request in 1958. For the next twenty-five years, partly on the staff of one of the chartered engineering institutions, but mainly in industry, he was closely involved in the recruitment, education and training of young engineers for industry.

IT is evident from contributions to the *Journal*, under the heading "Are we playing at being a technical corps?" that there is deep concern about 'professionalism' in engineering in the Corps and a dilemma in reconciling the activities of a 'teeth' arm, undertaking combat engineering, with other technical Corps activities in peace and war which are more closely associated with civilian engineering works. The erroneous impression seems to be that there is not enough engineering in the military role and not much that is military about the other activities.

It has long been the policy that RE officers should be graduates in engineering (preferably at honours standard) and be given initial practical training and experience to fit them as regimental officers in a field or combat role. However, if an RE officer wishes to become a professionally qualified engineer (PQE), he must go outside the military engineering field to qualify for chartered membership of one of the fifteen or so civilian engineering institutions, there being no comparable qualification in military engineering. It is astonishing that this should be so, and it prompts one to ask what has happened to the great tradition of engineering for military purposes which stretches back into antiquity and which gave birth to all the modern developments of engineering for civil purposes. Colonel Stancombe, referring to the problem of attracting high quality recruits with engineering potential, hit the nail on the head in his letter in the June issue of the *Journal*: "I joined the Army to be a military engineer not a civilian engineer". Yet there appears to be some reluctance within the Corps and the Institution of RE to demonstrate that there is still a profession of military engineering demanding high quality engineers as never before, and it is absurd and sad that military engineers, having no qualifying body of their own, should have to beg at the doors of their civilian colleagues and ask to be let in! This situation also causes a conflict of loyalty for many Sappers in mid-career through having to choose between a regimental combat and staff progression or a semi-civilian future in 'works'. Any blame for the present state of affairs rests with generations of Sapper officers rather than the hard working Council of the Institution now in office. Indeed the author is indebted to the Secretary for information and references to previous work within the Institution.

The 200th anniversary of the Corps is a special opportunity for looking back, not just for two hundred years but to classical and earlier times, to the engineering of Roman or Norman times when nearly all engineering was military in character or

Major C D Yule MBE
The Professional Military Engineer

purpose. It was not until the nineteenth century that engineering for peace and prosperity (or civil engineering) branched off following the great transportation works of canals, railways and roads, ships, docks and harbours, industries of all kinds and public utilities for water, sewerage and power which now form part of the infrastructure of western countries.

The typically British approach to the recognition of a profession has been to set up a voluntary institution of its members to promote and develop the profession and to demand of its members and future members suitable standards of competence. Doctors, lawyers, accountants, architects and, of course, engineers pursued this course. The Institution of Civil Engineers was formed in 1818 and granted a Royal Charter in 1825, following Thomas Tredgold's description of civil engineering as the "art of directing the great forces of nature *for the use and convenience of man*". The words in italics clearly distinguish *civil* from *military* engineering. There followed the Institution of Mechanical Engineers (1847, Royal Charter 1930), the Institution of Electrical Engineers (1871, Royal Charter 1921) and, over the next hundred years, with advancing technology, a proliferation of other chartered institutions. More recently, there has been a further growth to provide professional status for technician engineers. The roles of the institutions have generally included the following:

Learned Society:
Developing the art and science of engineering and representing the interests of their profession to government, employers and the public.
Providing a forum for discussion and dissemination of their subject through meetings and conferences.
Publishing a journal and other professional papers and reports.

Qualifying Body:
Providing a membership structure (and subscription pattern) including corporate grades for those qualified, and non-corporate grades for others with an interest in engineering, but not qualified.
Publishing a list of its members.
Prescribing minimum standards of education, training and practical professional experience for admission to corporate membership.
Establishing a code of conduct for its members.

The Engineering Council has assumed the overall role of registration of membership, defining (in its SARTOR document) the standards for accreditation and certification of academic and practical training courses, for *chartered engineers* and *technician engineers*, for all its nominated institutions.

The Institution of Royal Engineers, established in 1875 (Royal Charter in 1923), might well have been expected to follow this pattern. Its building, now HQ RSME, included a lecture theatre, modelled on that of the Royal Institution, and was a worthy headquarters. Its aim, set out in the Royal Charter was "the promotion and advancement of the science of military engineering". It publishes the *Journal* and maintains the RE Museum and RE Corps Library. So far so good. It organises professional meetings, but almost always jointly with another body and not independently. It publishes the RE List in which it meticulously records individual membership of other institutions. It used to honour its own membership with the letter "I" which indicated only that the subscription had been paid. Even that has now disappeared. It has never assumed the role of a qualifying body. A special resolution was prepared for the AGM twenty-six years ago (*RE Journal* Vol LXXXV Mar 1961 pp. 92–98), to provide a graded system of membership, but the amendments to the Bye-Laws and Rules were never put through. The proposals were basically sound but would need some updating to bring into line with today's trends. During the national debate on engineering over the last fifteen years, the Corps took a low-key attitude, but the Institution coordinated a Corps contribution to the Finniston Committee in a paper presented to the

Department of Industry. During this time, the Civils undertook a thorough overhaul of their education, training and qualification standards, culminating in the Chilvers Committee Report. Other bodies followed suit. Our Institution commissioned the Read Report of 1980/81, a lengthy study which certainly took note of the Chilvers Report and made a series of recommendations about status, membership and qualifications (corporate and non-corporate), and publications. Yet again there appears to have been no follow-up. There has been no active participation in the former Council of Engineering Institutions and Engineers' Registration Board, nor in setting up or in dialogue with the new Engineering Council. This amateur attitude might have been excused fifty or even twenty years ago, but in today's professional world it effectively denies a profession of *military engineering*. The last opportunity to remedy the situation was prior to the setting up of the Engineering Council. Now that edifice is complete, entry will be problematical. Yet if our Institution sets its house in order, meeting in full the criteria for nomination, rejection would be difficult to sustain indefinitely.

Let us just examine the case for a Sapper officer in his quest for the status of *chartered military engineer*. He is an honours graduate in engineering. He undergoes a YO's course of practical training which is as thorough as any initial training course in civilian life. His career development ensures early practical professional experience in the most important aspect of his profession, combat engineering. His continuing education and training are structured in a way that is seldom matched by any civilian employer or institution. What is missing is a clear statement of the purpose and scope of military engineering, and that it accords with the accepted EUSEC definition for the work of a *chartered engineer*. The Read Report gave some attention to this matter and General Cooper's letter in the June issue of the *Journal* is a helpful prompt. The role of the Corps has for years been broadly but inadequately stated as "helping the Army to live, to move and to fight". This does not even mention engineering; it is a role shared by other arms and by most of the services, and every taxpayer in the land has a share in it!

For as long as our Institution remains out on a limb and rejects the role of a qualifying professional body, those who profess to be *military engineers*, whether within the Corps or employed elsewhere, will be denied a professional qualification; recruitment to the Corps will continue to be hampered, and many Sappers in mid-career will continue to look over their shoulders at their colleagues in civilian life, or retire early. The Institution did at one time provide a Royal Engineer Advisory Board, but generally the Corps and the Ministry of Defence are not deriving the benefit that they could.

There is a potential conflict of interest, apparent rather than real, which may explain the lack of progress. This needs closer examination at the risk of labouring the point. The EinC's Branch has always been held to be the *qualifying body*, and its authority comes from the Director of Military Training, not from the Institution. But this is no different from the situation throughout industry. The employer determines the kind of people it wishes to employ and the standards of qualification and competence that it requires of them. The employer is responsible for recruitment from school, college or university, or the open market. The employer is responsible for (and must bear the cost of) providing the necessary training and professional experience, with help from whatever agencies it chooses. The institution has no authority over the employer, only over its own members, for so long as they wish to remain so. In the complex network of industry, relations between the two vary widely, but most substantial employers find it to their benefit to heed the standards of qualification and competence recommended by the institutions and encourage their staff into appropriate membership. In short, the employer values the support in running its business, whilst the institution, free from operational or commercial priorities can contribute to improving the quality of engineering. The link between the two is provided by the engineers themselves. The Corps is presently in an unusual one-to-one relationship with its institution, whose role is in danger of being seen either as superfluous or as

possibly encroaching on the authority of the employer. In reality, the Corps will continue to manage the operational and training role but with the support of the collective wisdom of all those in the profession.

There may be a minority of officers who will fear change, but for most, and certainly for the Corps as a whole, this subject needs widespread discussion in order to draw up a statement of intent and to start an early informal dialogue with the Engineering Council and our friends in the 'Civils', 'Mechanicals', 'Electricals' and elsewhere. There is much goodwill towards the Corps. Officers seconded to civilian posts are generally highly praised and there is no shortage of ex-Sappers at the top of the profession and of industry.

Professional status for military engineers will produce many benefits. The Institution will continue to be independent of the employer (the Corps), but the two will be mutually supportive. The Corps will have the freedom, as it wishes, to stipulate PQE (military) status for a proportion of its strength or for certain appointments. The need for PQEs with civil qualifications will be less critical, though some officers may yet seek a second (or dual) qualification. It should not cause concern that officers, posted for part of their careers to combat units or to the staff, may not be exercising their full professional competence. They yet need that competence for emergency. Military security requirements should not prevent the Institution's fulfilling its role; there are thousands of engineers working on classified defence contracts and in commercially sensitive areas whose professional life is not jeopardised. A corps of mainly professional status will have fewer problems when undertaking works in peace, especially in collaboration with civilian engineers and contractors, and on expansion of the Corps in time of war.

This paper has discussed only the officer corps and the *chartered engineer* as a starting point. It is likely that an additional grade of membership will be needed for *technician engineers*, a grade suitable for other ranks as well as officers. The Read Report (at Annexure E, para 8) equated chartered engineer status with officer rank and technician engineer (or technician) with other ranks. This is erroneous. Rank and professional status are of different kinds, both contributing to the whole man. With only the Corps in active membership, the Institution would be relatively small and financially not very strong. But there would surely be pressure for an extension of membership to others, if qualified. There are numerous activities that were originally Sapper tasks, taken over by other arms and services. There is a whole range of military engineering in ordnance procurement and in defence contracting throughout industry, and many civilian engineers might see an advantage in dual membership of our institution, as we do in theirs. There are potential members in the reserve army and Territorial Army. The title is exclusively Royal Engineers, and change might later on be necessary to embrace an enlarged field of military engineering in several sections, in a single institution. However, all this is mere speculation until the essential first steps are taken, and these should be started now. The Corps will look for leads from the Council of the Institution and from the Engineer-in-Chief. Blowing the dust off the 1961 proposals and the Read Report would provide a start, but this time we must continue and complete what we start.

(A letter on this subject appears in the Correspondence section.—Editor)

The Cooper's Hill Memorial Prize

CAPTAIN S R COX

At their meeting in September 1986 the Council decided to award the Cooper's Hill Memorial Prize to Lieut Colonel C T P Holland MBE for his work in planning and preparing for the move of the RE Museum to the Ravelin Building. The prize is awarded by the Institution every third year and until recently it was competed for by the submission of an essay. In 1986 the basis for the award of the prize was altered and it is now awarded to the person who, in the opinion of the Council, has done most for the Institution over the preceeding three years. This short article explains the background to the prize.

The Royal Indian Engineering College at Cooper's Hill had been founded in 1871 to meet the demand for engineers to work in India. The Public Works Department in India had, in the 1850s, started major projects to develop the country. There were not enough engineer officers available in the Corps of Bengal, Bombay and Madras Engineers to manage these projects. In 1858 Lord Stanley, the Secretary of State for India, decreed that men should be selected by open competitive exam for service as engineers in India. These became known as "Stanley's Engineers" but the terms of service were not good enough to recruit the right calibre of man.

In 1869 Lieutenant Colonel Chesney, Royal (Bengal) Engineers, was on furlough in England and spent many hours considering the problem of supplying suitable engineers for service in India. He concluded that the solution was to establish a college, entry to which would be by competitive examination. On graduation from the college the students would be guaranteed a job with the Indian Government. He submitted his proposals to the Secretary of State for India who accepted them and appointed Chesney the first President of the proposed institution. Chesney chose a site for the college at Cooper's Hill, near Runnymede, engaged an experienced staff and on 5 August 1871 Cooper's Hill College opened.

The Public Works Department in India had guaranteed fifty jobs each year for the graduates of the college but after only three years the number of jobs began to be reduced. This reduction caused a drop in the number of students and, since the college was financed by fees, in the income of the college. To overcome this the Government of India changed the rules of admission and in 1878 admitted students for the Indian Telegraphy Service. In 1884 Forestry students were also admitted and occasionally graduates were nominated for commissions in the Royal Engineers or other branches of the Indian Army. This, with the money earned by testing materials in the laboratories, enabled the college to be self-financing by 1887. However by 1890 larger institutions had started training engineers and Cooper's Hill College could no longer remain financially viable. In 1903 the Government decreed that the college should close and despite much opposition the last graduate left in 1906.

After the First World War the Cooper's Hill War Memorial Committee was set up to establish a memorial to the graduates of the college who died in the war. In 1921 the committee initiated a fund to provide prizes for the School of Forestry and the Institutions of Civil, Electrical and Royal Engineers. The Institution of Royal Engineers is able to award the prize every third year.

Institution Publications

YOUR JOURNAL AND SUPPLEMENT IN 1988

THE Publications Committee has completed its review of the style, layout and frequency of publication of the *Journal* and the *Supplement* which started with the 1986 questionnaire to which many members responded and an analysis of which was published in the December 1986 *Journal*. The Committee has concluded, and it has been agreed by Council, that some modest changes will be made to the shape and layout of the *Journal* to allow for improved page layout, better quality of reproduction of photographs and better value for money. A two column layout on a slightly bigger page will make it possible for a larger size of print to be used for the same overall amount of text.

The first issue in the new style will be published in April 1988 and from that date there will be three issues a year instead of four. Each issue will contain 96 pages instead of the present 72. A number of advantages will accrue both to the reader and to the Institution as publisher and we are confident that the changes will represent worthwhile improvements.

More controversial are the arrangements for the *Supplement*. This will be produced in a smaller size than the *Journal*, (A5) and on lower quality paper. However, it will be published only every second month. This step has been taken because the Publications Committee is convinced that the financial saving of six postal distributions a year will be very worthwhile in comparison with the slight loss of service. It will mean that subscribers will have to plan a little further ahead than at present in submitting notices for publication. On the credit side there should be more space for announcement of Corps events due to the saving of space from items which are unnecessarily repeated under the present system. The editorial staff will make every effort to remind subscribers about deadline dates and it is hoped that people will soon become used to the new system. It will, in any case, be reviewed after a year's operation.

Worthwhile financial savings will result from these changes, which will be reflected in the increase in the proportion of its income which the Institution can put to its activities other than publications, as well as in the improved quality of the *Journal*.

Finally, the Publications Committee is alert to the truth that the most important need is to maintain the highest possible standard of the material which is published in the *Journal* and to make it as interesting to as wide a cross section of the membership as can be. They will keep this matter under constant review and hope that members will also play their part both by producing the quality of articles we all seek and by keeping the editorial staff informed as to what they think of what they read.

June 1987 Journal Awards

THE Publications Committee announces the following awards for articles of special merit published in the June 1987 *Journal*.

"The General Design and Use of Hardened Defences in Twentieth Century Warfare" by Capt G Taylor RE, £150.

"Think First About the Motherland and Only Then About Yourself" by S P C Dalziel, £30.

"Demolitions in a Retreat" by Maj Gen I H Lyall Grant MC, £20.

The Committee wished particularly to congratulate Capt Taylor on his outstanding contribution.

Memoirs

LIEUT GENERAL SIR KENNETH McLEAN KCB KBE

Born 11 December 1896, died 5 June 1987 aged 90

KENNETH GRAEME MCLEAN was educated at Edinburgh Academy and joined the Territorial Army in 1915. His First War service was less than exciting, involving, as it did, a spell in command of Inch Mickery, an island in the Firth of Forth. He received his regular commission in the Corps in 1918 and was posted to 59 Field Company at the Curragh during the troubles. He attended courses at the Shop and at Christ's College Cambridge and spent a year at the Mounted Depot at Aldershot.

He had always wanted to serve in India, and he got his chance when appointed Assistant Adjutant of the Bengal Sappers and Miners at Roorkee in 1921, remaining with them for seven years; taking command of 41 Divisonal HQ Company in 1925 and 5 Field Company at Rawalpindi in 1927. He was still in touch with them up to the time of his death. In 1930 he was a student at the Staff College in Quetta whence he was posted to Army Headquarters as a GSO2.

He had been promoted brevet lieut colonel in July 1936, evidence of his early ability as a staff officer, and in June of the same year he returned to the United Kingdom, initially as DCRE Tidworth and, in 1939 as Assistant Secretary to the Committee of Imperial Defence chaired by Admiral of the Fleet Lord Chatfield.

At the beginning of the Second World War he undertook a number of staff appointments, in 1939–1940, GSO1 52 Lowland Division based in Melrose; 1940–41, GSO1 Joint Planning Staff; 1941–42, Director of Selection of Personnel, War Office and 1942–43, BGS 2nd Corps.

In 1943 came the post for which he proved ideally suited and for which he is best remembered. He was appointed Brigadier Planning Staff to Lieut General Sir Frederick Morgan, Chief of Staff, Supreme Allied Commander (COSSAC). In this capacity he helped draw up the plan for Operation *OVERLORD*, the D Day assault and follow-up, showing a brilliant grasp of the technical and logistical problems which faced him. The *Daily Telegraph* obituary quotes Morgan's description of him as "a weaver of plots beyond compare and moreover, an expounder of the same who 'appeared' . . . before crowned heads and chiefs of state, earning universal applause, and none more justifiably". HM King George VI was one before whom he "appeared" and expounded the plan. He also travelled to the Ottawa conference with Churchill who refers to his "expounding" the *OVERLORD* plan in his War Histories. He went to Europe with Eisenhower after D Day remaining with his staff until the Rhine was crossed. For these services he was the recipient of the CB and also high honours from the United States and France.

In late 1944 he was appointed Deputy Adjutant General (DAG) Allied Land Forces South East Asia, first in Ceylon and then, after the end of the war against Japan, in Singapore. After a year in the Canal Zone as DAG, he returned to the War Office as Vice Adjutant-General in 1947. There were a good many problems at the time with the release of wartime conscripts, the issue of gratuities, the introduction

Lieut General Sir Kenneth McLean KCB KBE.

of national service, the start of short service commission schemes and the reconstitution of the TA. WGL who was on his staff recalls "the then Adjutant-General, General O'Connor, once said to me 'Kenneth knows so much about everything that there is really very little left for me to do'. I found him brilliantly clear thinking, immensely patient and kind and far more knowledgeable about any subject on which I was required to brief him than I was myself."

In 1949 he went to Berlin as Chief of Staff of the Control Commission and Deputy Military Governor and was involved in much of the negotiations with the Russians following the Berlin blockade. The same year he was appointed Military Secretary at the War Office, and when the late Lord Shinwell was appointed Minister of Defence he went with him as his Chief Staff Officer. He retired in 1954 after chairing a number of War Office committees.

He was a man of wide talents and great energy. He was an acknowledged botanist and gardener. He had a deep interest in music and played both the piano and the organ. His classical education brought him back to New Testament greek in retirement. He was an ethusiastic sportsman as a young man, and remained a lifelong member of the Himalayan Mountaineering Club.

On retirement, after a spell living in Spain, he and his wife returned to Melrose in 1965, and he threw his abilities as a staff officer into the administration of the Kirk, being an elder, not only of his own parish church, but of the local Presbytery, and he served on committees of the General Assembly, both the Chaplain's Committee and the Panel on Doctrine.

He will be remembered as having an exceptional gift for communication, accompanied by a quiet, dry sense of humour.

He was Colonel Commandant from 1956–1961; made KCB and KBE in 1954 and an Officer of the Legion d'Honneur and the US Legion of Merit. He also held the Croix de Guerre avec Palmes.

In 1926 he married Daphne Steele, the daughter of a colonel in the Indian Army. She died in 1979, and he is survived by their two sons. *IGM, WGL, MBA, ES*

COLONEL G H B MOSS

Born 22 June 1901, died 29 May 1987 aged 85

Colonel G H B Moss

GEOFFREY HUGH BUCKTON MOSS was the younger son of a member of a well known company manufacturing railway rolling stock. He was educated at Richmond and the Shop. His elder brother, Lieutenant J S N Moss RE had been killed in France in the 1914–18 War, so his choice of Railways (from his father) and the RE (from his brother) seems to have been predestined and he was commissioned second lieutenant RE in 1921. After two years in 6 YO batch at the SME Chatham, and two years with the Training Battalion, he went to the Railway Training Centre at Longmoor for four years, which included two years training with the GWR.

His next posting was Garrison Engineer Hong Kong, where he met Barbara Franklin, daughter of an export analyst working for the Hong Kong Government, and whom he married at Selsey in 1934. From 1934 to 1938 he was again at Longmoor as OC 10 Railway Company RE, then two years at the War Office as DADFW in QMG 8,

with the rank of major, and in 1940 was promoted T/Lieutenant Colonel and posted to 10 Training Battalion RE at Derby.

In September 1941 he was sent to the Middle East as AQMG (Movement and Transportation), working in Palestine, Syria and Sudan. In 1943–44 he was AD TN CMF, working, among other places, on the landings at Sicily and Taranto for which he was mentioned in despatches.

He was posted to the Allied Commission, Roumania in September 1944, as Head of Secretariat and DD TN (for which he received the American Legion of Merit), and promoted War Substantive Lieutenant Colonel in 1945, and Substantive Lieutenant Colonel in 1947.

In January 1948 he returned again to Longmoor as CO 5 Railway Training Regiment, and later as CO Railway and Movements Wing, TN Centre Longmoor. In July 1950 he was transferred to the RE Manning and Records Office as Second-in-Command, and in December 1953 he retired from active duty, but remained in the same appointment as a Retired Officer 2, until 22 June 1966.

In 1968 he moved to Sturminster Newton in Dorset, where he lived to the end of his life. He leaves a widow and three sons, one a major in the Royal Corps of Transport, and one a former battery commander in the TA Gunners.

HLM

MAJOR GENERAL C R PRICE CB CBE

Born 13 June 1905, died 16 July 1987 aged 82

Major General C R Price CB CBE.

CEDRIC RHYS PRICE was educated at Wellington, the Shop and Trinity College Cambridge. He was commissioned into the Corps in 1925. He was thereafter almost invariably known by his nickname "George" earned from his likeness to a stage celebrity of the day. After his YO training at Chatham he went up to Cambridge and graduated with first class honours in the Mechanical Sciences Tripos.

He joined the Bengal Sappers and Miners in 1932 and after extensive exercising as a member of 1 Field Company, including on the newly arrived Everall bridge, he was appointed Adjutant of the Training Battalion at Roorkee in 1933 and Superintendent of Instruction in 1936 before returning home to go to Staff College in 1937.

He became Military Assistant Secretary in the War Cabinet Office in 1940 and remained one of Winston Churchill's "backroom boys" throughout the war.

In 1946 he was appointed Secretary to the British Joint Service Commission in Washington returning to England in 1948 as Secretary to the Chief of Staff Committee. After attending the Imperial Defence College he returned to the British Joint Service Commission as Chief of Staff in 1952. From 1955 to 1956 he was BGS Eastern Command and finally Director of Military Intelligence as a major general.

GOMJ, who was a close friend from Woolwich days for the rest of his life, recalls "he was absolutely reliable, kind and understanding. He had a fine brain, commonsense, a quiet manner and a very good sense of humour. . . . Although in his career he knew

many well-known and famous people, he never, to my knowledge, did any 'name-dropping' in his social life. He also faced his Army career with a brave outlook after losing a kidney at the Shop through injury, and I never knew him refer to it at any time."

He was awarded the OBE in 1943, appointed CBE in 1945 and CB in 1951.

His wife, whom he married in 1935, died in 1977 and he is survived by two daughters.

GOMJ, MBA

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MAJOR GENERAL W A M STAWELL CB CBE MC

Born 22 January 1895, died 11 June 1987 aged 92

Major General W A M Stawell CB CBE MC

WILLIAM ARTHUR MCDONALD (BILLY) STAWELL was born in India where his father was in the Indian Civil Service. He was educated at Clifton and the Shop and commissioned in to the Corps at the beginning of the First World War. He first saw action at Loos and by 1917 was commanding a signal company as an acting major. He was awarded the MC in 1917 but was badly wounded at Vimy Ridge.

He returned to England to recover and spent his convalescence with an eccentric landowner who had a theory that any animal of suitable size could be ridden. The young, recuperating Stawell was set to put this to the test and was briefly successful with a bull, a cow and an ostrich.

He returned to active service in Salonika and finished the war in Constantinople. There he organised a pack of hounds which he claimed eliminated the jackal from Europe.

After a course at the SME Stawell joined the Madras Sappers and Miners and according to his own account devoted much of his life to the horse, his main occupation in command of his company being either playing polo or training ponies. Professionally, though, he was proud that his mixed-caste Hindu and Moslem company always worked happily together, eating the same food and using the same cooking pots.

In 1926 he returned to England and served as Garrison Engineer, Weedon and, after Staff College and a brief spell as GSO 3 in the War Office, he became Brigade Major Aldershot. His passion for riding continued and at Staff College he frequently set the drag which at that time was compulsory. His courses were apparently an unwelcome challenge to a number of infantry officers who were forced to turn out on ill-tempered troop horses hoping only for survival with the minimum of injury.

Just before World War Two, Stawell was CRE 1 Divison under General (later Field Marshal Lord) Alexander. He was back at the War Office, as a brigadier, in 1940 and had a short spell in command of 148 Infantry Brigade. He then took over his most important job of the war, in command of SOE Middle East, operating in Italy, Jugoslavia and Greece. This task with its political and operational complications had been the undoing of several of his predecessors but he held the ring with great determination and skill and SOE's success in the field must have owed much to Stawell's ability to argue their cause with Allied Commanders, including his former chief, Alexander.

By the end of 1944 he had to return to England on sick leave and in 1945 he was appointed Deputy Chief of Operations for the United Nations Relief and Rehabili-

tation Administration (UNRRA) set up to handle the massive refugee problem in Europe and the Near East. He resigned from UNRRA, together with his American opposite number, in sympathy with his chief, General Morgan, who had been obliged to resign "after some perfectly truthful remarks about Jewish emigration from the refugee camps". He retired in 1948 after a year in the Control Commission in Germany as Deputy Chief of Intelligence.

In retirement in Lowestoft he spent some time market-gardening and a good deal of time yachting, sailing his Dragon and later a small cruising boat until he was well into his seventies. He also sat as a magistrate and once made the national press by telling a defendant, caught speeding by a police car, that he was lucky not to be charged with careless driving as well, for not looking in his mirror. He was President of the local branch of the British Legion and, until 1975, Honorary Colonel of the Suffolk Army Cadet Force.

General Stawell was made CBE in 1944 and CB in 1945. His wife, the former Amy Bowring, whom he married in 1926, died last year and he is survived by his son.

WBS, REJ

BRIGADIER A PRAIN CBE

Born 15 August 1894, died 5 June 1987 aged 92

Brigadier A Prain CBE

SANDY PRAIN was born in Montrose, the son of a master saddler and attended the engineering course at the University of Glasgow. He joined the Bombay Sappers and Miners having completed training at the Shop. He saw service in France during World War I. He recalled once how he made contact with a distant Prain relation while home on leave. This Prain was acting manager of a Scottish distillery. He promised to send Sandy a bottle. Soon after returning to France Sandy was wounded and evacuated. His brother officers feared the worst and so when a crate of whisky arrived, drank to his memory. When Sandy returned to his unit he was rather disappointed!

Between the wars Sandy undertook a university short course at Corpus Christi College, Cambridge. He then became involved in several survey tasks in the Middle East. He claimed to have started a couple of wars while delineating the boundaries of the new states including that of Transjordan.

By 1941 Sandy had risen to the rank of colonel and was then Deputy Director Survey, HQ Ninth Army. Under his control was the 2/1 Australian Survey Company RAE. It had worked in Palestine and Syria before being recalled to Australia in January 1942. The Australians remember Sandy with fondness referring to him as a tall and lean Englishman (Scotsman in fact) with a handlebar moustache, more suited to the Junior Service, together with an accent and a monocle.

By January 1944 Sandy had risen to the rank of brigadier and became Director Survey, HQ 21 Army Group. He was based at St Paul's School and was deeply involved in the planning for *OVERLORD*. He was awarded the CBE in 1945. At this time he was still a confirmed bachelor living in the Naval and Military Club. Subsequently when in France with the allied forces he was informed that a group of

ATS girls were to join 14 Field Survey Company. He told the 2IC he wanted nothing to do with them!

Sandy eventually retired from the Army in 1948. He later became a founder member of the Rhodesia Air Survey Company.

In 1955 he married Joan Burton. They set up home in a remote cottage in Somerset. Sandy set to, applying his Sapper know-how to improving his property. In 1968 he and Joan moved to Malta for health reasons. Unfortunately the Mintoff regime forced them back in 1974. They moved to Eype near Bridport.

Despite his advancing years Sandy retained a sharp mind ever questioning the events around him, and was always a practical man. He was a regular contributor to the *RE Journal* including an article in recent years on sun dials.

His nephew served and his great nephew is still serving in the Corps. He leaves a widow, Joan.

JFP

Memoirs in Brief

Brief memoirs are published below on a number of distinguished men whose deaths have been notified recently in the national press and who served in the Royal Engineers at some stage in their careers.

JUDGE PEARCE, died in September aged 57, a Circuit Judge since 1982; national service in the Corps and TA (119 Field Engineer Regiment) for six years until 1956.

MAXWELL FRY CBE, died in September aged 88, eminent architect of the Modern Movement. Emergency commission in the Corps 1939–45.

COLONEL NORMAN BASTER GC, died in June aged 95, awarded the Edward Medal (later converted to the George Cross) for heroic work in the South Kirkby Colliery disaster in 1935. Served in the Corps 1914–18.

WILLIAM MAXWELL, died aged 61, distinguished engineer and railway operator, designer and developer of the Victoria Line. Colonel in the Engineer and Transport Staff Corps.

DR HUGH COTT, died in April aged 86, zoologist and illustrator of wildlife. Lectured to the SME on camouflage in 1938 using the visual concealment of animals to support his case. Served throughout 1939–45 in the Western Desert and as a camouflage adviser.

EDWARD CHITTY, died in June aged 92, eminent orthopaedic surgeon and amateur painter and astronomer. Served in the Corps 1914–18, awarded MC for gallantry on the Somme.

COLONEL J A DAVIS OBE, died in August aged 86; as a director of International Computers and Tabulators (later ICL) played a leading role in the development of the British computer industry. He was a regular soldier. Commissioned into the Corps in 1920 he served in India before the war and became a supply specialist during the war, closely involved in D Day planning, but retired in 1946. He had been a vice-president of Toc H, a keen sailor and an exceptional water-colour artist.

BRYAN FRAYLING CBE, died in December 1986 aged 93, a mining engineer who spent a good deal of his life in the Colonial Mines Service in Africa. As a member of 171 Tunnelling Company in WW1 he worked on the calculations for undermining the German trenches at Messines the destruction of which he observed. His private memoirs are held in the Corps Library.

Correspondence

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MInstRE?

Dear Sir,—Captain R D Thomson's letter (June 1987) raised a valid point when it was suggested that the status of professional Military Engineers should be recognised by the granting of the designation CEng, MInstRE or similar title. The problems encountered when trying to convince the Engineering Council of the merit of such an action may not be totally insurmountable as many officers of the Corps already hold engineering degrees which would exempt them from the Engineering Council Part 1 and Part 2 examinations. The Part 3 examination leading to chartered status and the professional experience required prior to sitting it would then be the only contentious matters for discussion. The completion of the YO's course could be used as the basis for practical experience combined with the requisite number of years service. It would be likely that, in common with other Engineering Institutions, a minimum age (probably twenty-five years old) would have to be set as the lower bound for holding full chartered status. Members of the Institution who did not hold the qualifications necessary to satisfy the Engineering Council could possibly adopt "Associate" status with the designation AMInstRE without the addition of the Chartered Engineer designation, CEng. The system could be tailored in such a way that members of the Institution at AMInstRE level could upgrade their membership by either sitting and passing the Engineering Council Parts 1 and 2 examinations or by a mature candidate route after a number of years service prior to sitting the Part 3 examinations.

Each of these alternatives would have to be carefully thought out and some effort put into the preparation of a case to be put before the Engineering Council if such a scheme was to succeed.

Notwithstanding the establishment of Chartered Engineer status for members of the Institution of Royal Engineers, I believe that an important improvement in the professional status of the Military Engineer could be achieved by the acceptance of military engineering subjects into the list of suitable subjects prepared by the Institution of Civil Engineers for the continuing education and training of graduate Civil Engineers prior to their gaining chartered status. Appendix E to ICE 43, *The Route to Corporate Membership*, published by the Institution of Civil Engineers lists such training within four main headings:

Group A Engineering theory
Group B Engineering practice
Group C Management
Group D Associated disciplines

By the time that he reaches chartered status a graduate Civil Engineer is expected to have undertaken a minimum of thirty days post-graduate education or "off the job" training within these categories. The sub-headings contain a variety of subjects of relevance to Military Engineers including earth structures, metal structures, timber structures, bridges, highways, railways, water supply, construction activities (equipment, management and methods), demolition, earth moving, setting out, surveying, temporary works, communication, man management and management methods and systems. Within the list of approved associated disciplines are such diverse subjects as Architecture, Electrical Engineering, Environmental Sciences, Mechanical Engineering and Town Planning but no-where is there a mention of Military Engineering

despite its closer direct links in certain fields of operation and the historical links between the Institutions of Civil and Royal Engineers.

An approach by the Corps or the Institution to the Institution of Civil Engineers would, if successful, yield two distinct advantages:

Regular Officers of the Corps of Royal Engineers seeking chartered membership of the Institution of Civil Engineers would be credited directly for their military engineering experience, and

graduate Civil Engineers working in industry would be attracted into the Royal Engineers, Territorial Army, not only as a worthwhile and satisfying pastime but also as a direct benefit to their civilian careers.

Close cooperation in this manner and the resulting cross fertilisation of ideas could only benefit both groups of engineers.—Yours faithfully, L M Smith.

Colonel F H Foster, DSO, OBE, TD, DL, RIBA
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The Bailey Story

Sir,—I read with interest Mr Richardson's letter with particular reference to the Hamilton Bridge and I have since had a few minutes phone conversation with him.

In July 1941, as CRE 4 Corps Troops, I was responsible for bridging the Sussex Ouse at Southese near Lewes to provide an additional crossing for 40-ton Churchill tanks. The actual site chosen was immediately north of the existing 3-ton limit swing bridge. My Chief Engineer (Brigadier Alex Mason) arranged for a Hamilton Unit Construction Bridge (Bailey was then only just coming into production). The river is tidal and we could not cut into the bunds.

578 Corps Field Company (Major Stewart) carried out the work. Progress was slow as we had had no previous experience in construction and many tons of spoil had to be transported from about a mile away to build up to the level of the top of the bunds for the launching plane and for the embankment approaches.

When all was completed, a squadron of Churchill tanks (20) crossed the bridge closely watched by the squadron commander and myself. A few days later I received an irate letter from the Ouse River Board and a bill for the replacement of some of the timber decking and ribbons to the 3-ton swing bridge.

On consulting the squadron commander, I was told that we saw only nineteen Churchills cross. The twentieth had broken down and lost touch with the column. Later the direction signs were ignored and the tank crossed the 3-ton limit swing bridge. Lucky tank crew but miracles sometime happen!

I have always believed that this Hamilton Bridge was one of the few in use during World War Two but pehaps someone will correct me.—Yours truly, F H (John) Foster.

Colonel W M Crawshaw, OBE
HQ Engineer Resources
Long Marston

New Avre, New Concepts

Sir,—Three whole articles in the September 1987 *Journal* on armoured engineering, and a measure of good news as well! Perhaps it is unkind to carp, but the Chieftain conversions are rumoured to be of the oldest of their breed, and the first seventeen are costing less than half a Warrior or one eighth of a single Challenger. This may be a tribute to RE ingenuity, but it says a great deal about General Staff priorities as applied to RE equipment. We should also be well aware that this is 1963 all over

again; we are receiving a one generation behind tank to replace one which is two generations behind. There is, therefore, no reason for any Sapper to feel unduly grateful to anyone outside the Corps for the undoubted capability enhancement represented by the conversions. We should congratulate those concerned with the project, and reflect on the inability of commanders and staffs to view the battlefield from a truly all arms standpoint when it comes to the allocation of resources.

Excitement over the AVRE may also conceal the plight of mechanised engineers. FV 432 and Centurion AVRE entered service almost simultaneously. Mechanised (now "armoured") infantry, gunners, and REME are receiving Warrior; RE will be operating 30-year old FV 432 alongside Warrior until we receive FLAV. If Brigadier Sheppard's comment on this equipment is to be interpreted as I see it, engineer FLAV will be another armoured box on tracks with perhaps "a pusher beam and/or a lifting arm". This is not good enough as the engineer general purpose vehicle for the Central Region (or the Middle East?) not just for the 1990s but into the 2010s. We ought to be looking instead for a base machine with a variety of working payloads, of which only a proportion would be personnel. Such an equipment should also pick up the CET replacement commitment (which won't go away!). David Holtby's final paragraph seems to be working towards a similar concept but from the heavy end; I don't think a full MBT solution is the answer, if only because it means too many REME, but there is a great deal of merit in the idea of one vehicle to cover both the AVRE and mechanised combat engineer commitments. This indicates a middleweight vehicle intermediate in size between the APC/MCV and MBT ends of the market; I am thinking in terms of commonality with 155mm SP artillery requirements which tend to fall into the same area.

The history of armoured engineering from 1944 to the present day highlights the need for a non-sectarian approach to operational concepts and the equipment programme. RE tanks have always lagged one or two generations behind RAC, even in 1944. The present programme should eventually ensure that armoured engineers will, by the mid-1990s, be reasonably well equipped to support the tactics and weapon systems of the mid-1980s. Even this cannot be said for mechanised engineers. To avoid a repetition of this state of affairs, we should be thinking *now* in terms of the requirements for engineer support to forces fighting under the new rules which will take effect once the firepower revolution becomes a reality. The tactical emphasis should then be swinging away from armoured manoeuvre to air mobility, "no target" defence, and assault by fire. Engineer requirements will change, but are unlikely to diminish. This time, let's be ahead of the game!—Yours faithfully, W M Crawshaw.

Brigadier J H Hooper, OBE
Goodrich House
Goodrich
Ross on Wye

Management of Today's Sapper Officer

Sir,—I agree with most of Major Norbury's comments and suggestions (*Journal* March 1987). I believed that writing the annual confidential reports was about my most important job and that it gave me at least one formal opportunity to discuss the recipient's career with him. I also used the event to give a few hints to the other officers who were not receiving reports at that time. It came as quite an eye opener to me as a CO to find the acute interest which young officers were taking in their careers. I must admit that my view was that second lieutenants were better off making sure they got a good chit from me for commanding their troops than bending my ear on their views as to what job they would prefer from Staff College.

As one who has strong family connections with a Welsh infantry regiment and a son-in-law in a very tightly knit cavalry regiment I do feel with Major Norbury that we are not particularly good at keeping our family together and we do not take a keen

enough interest in the welfare of our officers generally. This is not entirely the fault of the top hamper of the Corps but some blame must rest there. As I was, until fairly recently, hovering around just below the cloud base I include myself in the criticism.

When I took over my squadron I only knew three officers in the Divisional Engineers. This was not too surprising as apart from courses I had never served outside Airborne Forces until then. However when I took over my Regiment I did not know any of the officers there either except three who had served as Warrant Officers or senior NCOs in 9 Squadron during my service there too. This fact, ie not knowing people in my own Corps, and the other fact that house prices at that time were escalating madly, prompting officers to buy houses rather than to occupy quarters prompted me to write to some senior person in the Corps suggesting linking regiments.

Basically the idea was that we would establish a link between a UK based regular regiment, a BAOR based regular regiment and a TA regiment. A young officer would serve initially in either the BAOR or UK regular regiment. His next regimental posting would be to the linked regular regiment and at some later stage possibly to the linked TA regiment. There would be some geographical proximity between the TA and UK regular regiment. In my case as a Welshman I saw myself serving in say the Tidworth regular regiment and the Royal Monmouth Royal Engineers and any one of the BAOR regiments but any time I served in BAOR in a regimental job it would be in the same regiment. Of course there would always be exceptions but in general terms it overcame two problems which bothered me and I suspect many other Sappers: where to buy a house and how to get to know other Sappers well. The idea was considered quite seriously but in the end foundered on the grounds that it would have been divisive and have created a "family within a family"; maybe that is what we need.

Frankly, apart from a very closely knit group of officers who have served in units such as 9 Squadron, I am not aware of any great family feeling in the Corps. I would not lose my membership of the 9 Squadron family for the world. It would be very rare for me to see a Sapper airborne tie and not know the owner. It is rare for me to see a Sapper tie and know the owner, but I always say something to the unknown owner, so I do try.

I know that the Engineers in Chief make enormous efforts to get to know as many of the Corps as possible and so do the representative Colonels Commandant and Chief Royals but we are a very large family and if we are to give the comfort and advice to junior officers which they deserve and must have if we are to keep them then I believe we have to create smaller groups where members can learn about the other members to their mutual advantage. I am reluctant to give the Gunners credit for anything but I gather they now do something similar and have the Geordie Gunners or the Taffy Gunners or something similar. I believe we should at least give some serious thought to creating some geographical linkage to Sapper units and if that is not possible how about Sapper godfathers to look after smaller groups of officers?—Yours sincerely, J H Hooper.

Book Reviews

SEND FOR FREDDIE

GENERAL SIR CHARLES RICHARDSON

(William Kimber—Price £12.95 ISBN 0-7183-0641-1)

THIS book gives well-merited recognition to the brilliant and versatile man who was Montgomery's Chief of Staff throughout the latter part of World War II. The author was closely associated with him for much of this time and therefore writes with authority based on personal knowledge as well as a lot of well-researched material. He gives a picture of a man who, despite almost continuous ill health and a liking for the "bright lights", was a most successful Chief of Staff both of the Eighth Army and of 21 Army Group.

Much of the interest of the book lies in de Guingand's relationship with Montgomery, a complex subject which the author handles with skill and sensitivity. A great deal has been written in the past forty years about Montgomery; but very little, except incidentally, about his Chief of Staff who contributed so much to his successful campaigns. As Montgomery himself wrote in a letter to de Guingand at the end of the war "No commander can ever have had or ever will have a better Chief of Staff than you were . . . together we achieved much". Although complete opposites in many ways they were good friends and made an ideal team. Sadly after the war de Guingand did not get the rewards which were his due and on several occasions was slighted by his old chief, so that their relationship suffered. Many people found Montgomery's behaviour at that time incomprehensible, but the author, although not excusing it, suggests some possible reasons and concludes by saying that compared with Napoleon's shameful treatment of Berthier, Montgomery's treatment of his Chief of Staff was exemplary. De Guingand was no doubt responsible for initiating several of the battle-winning plans both in North Africa and in NW Europe, but they were only adopted because he had the art of putting them over to his chief; though, as he would himself have admitted, there is a big difference between proposing a plan and deciding to carry it out.

Perhaps de Guingand's greatest contribution to the Allied victory in Europe was his ability to work with the Americans and smooth over the rifts which began to appear in the high command soon after the Normandy landings. Montgomery was very criticial of both Eisenhower's strategy and his method of command, and de Guingand invariably had to represent him at SHAEF conferences and put across his chief's views in a tactful manner. He made a close friend of Bedell Smith, the SHAEF Chief of Staff, and also established a warm relationship with Eisenhower, which he maintained up till the latter's death.

De Guingand was one of the first to publish his war memoirs in *Operation Victory*, a well-written unbiased account which became an instant success. After the war he settled in South Africa where he became a successful businesssman. Besides continuing to correspond with both Montgomery and Eisenhower about their war memoirs, he tried to influence the political scene in South Africa with his realistic and forward looking views, which he expressed in a book called *African Assignment*. The author gives a good summary of his qualities as a Chief of Staff saying that he had "an intuitive grasp of the articulated activities of a group of Allied divisions on a vast battlefield, a remarkable perception of enemy reactions 'over the hill', a brilliantly responsive intellect, a faultless memory and grasp of detail, and finally a deep-seated desire to generate co-operation at all levels by the exercise of humorous, friendly persuasion on a very personal basis".

This is a very interesting and readable book, well-produced with a lot of good photographs and not too long, unlike so many modern biographies.

ROHC

have been well chosen and have the ring of sincerity. The author has succeeded in welding them together to form a lively and readable story which gives a good general account of the campaign. One or two pieces seem to be the products of fantasy and would have been better omitted and the same applies to an occasional purple patch where the author has been similarly carried away (eg p 242 "barricades of bamboo stakes which disembowelled so many that even the most fanatical Japanese were deterred"). Few of those in Burma knew much of what was going on outside their own little area and inevitably there is much uninformed criticism of the Governor and some of the Generals. The author's views on the chief personalities are generally well-balanced but he is less than fair to the indomitable General Wavell on whom the pressures were greatest and who struggled hard to make the best of the impossible hand he had been dealt.

Except at the Sittang bridge Sappers are rarely mentioned, the demolitions being either attributed to the rearguard ("the Gurkhas then blew the bridge") or apparently occurring by spontaneous detonation ("there was a deafening explosion as two spans of the bridge toppled into the Irrawaddy"). Nevertheless this book is worth reading by anyone interested in the war in Burma or in the problems of a retreat. It brings out clearly the desperate plight of the wounded and the refugees in such a campaign and highlights the countless human tragedies which spring from lack of foresight and preparation, faults which may be impossible to remedy once the fighting has started.

IHLG

GAS ATTACK
Chemical Warfare 1915 to the Present Day
WILLIAM MOORE

(Published by Leo Cooper—Price: £14.95 ISBN 0 87052 4550)

WILLIAM MOORE is a full-time writer of military history. This book deals with the use of gas in war.

The author begins with a brief survey of the theory and practice of chemical warfare up to the Hague Congress of 1907 which forbade the employment of poison or poisoned arms. Britain subscribed to this convention.

Early in the Great War both the French and the Germans employed grenades and artillery shells with various chemical fillings, but with no apparent effect upon the opposition. With the resources of their huge chemical industry the Germans decided to undertake the first large-scale use of chemical warfare at Ypres in Flanders. The agent was to be chlorine and rather than fill it into scarce artillery shells, it would be released from cylinders to form a cloud which would drift across the Allied lines. Engineers and scientists were formed into Pioneer Regiment 35 and tasked with handling the cylinders. The operation was delayed for days, awaiting a favourable wind. Meanwhile odd releases of gas occurred from cylinders damaged by shrapnel and splinters.

The Allies knew something of the plan from spies, prisoners and deserters. This information was passed down the chain of command annotated "for what it is worth". No precautions were taken. The gas was finally due to be released at 0545 hrs on 22 April 1915. However it was not released until about 1600 hrs. Then 168 tons was released from almost 6000 cylinders on a 4 mile front in less than 10 minutes.

The author vividly describes the resulting panic and confusion. By last light the Germans had broken in against the French to a depth of three miles. Had the attack taken place at 0545 hrs as planned, the result might have been very different with a full day available for exploitation.

There were two immediate consequences. The first was a demand from the British press and public for retaliation in kind. The second was urgent action to identify the agent used and to devise protective measures.

Retaliation in kind was not possible. The British chemical industry at that time did not have the capacity and the ethical considerations of sinking "to the level of the degraded Germans" generated intense debate from the cabinet down. The agent used was quickly identified and a protective mask, based on a German model and remarkably similar to the modern facelet just introduced into service, was soon in production.

Subsequent events relating to the use of gas during the Great War are described in detail. Also covered in detail is the part played by the Royal Engineers—the appointment of Major Charles Foulkes RE as the first "Gas Adviser", the formation of the Special Companies RE from chemistry students who graduated in 1915 and the winning of a Victoria Cross by Corporal James Dawson at the Battle of Loos. The story is brought up to date with a brief account of events since the Great War.

A central theme throughout the book is the moral enigma of the use of poison gas. It is the only weapon introduced in the First World War but not used in the Second. Yet it was available to both sides in large quantities. Its use arouses universal loathing yet it is no more horrible than other weapons of mass destruction. Britain has long since abandoned chemical weapons. Yet, "if deterrence is your mission, you have to convey that you are prepared to use every system in your inventory in order to defend—otherwise your deterrent isn't credible, and that includes chemical weapons": (General Bernard Rogers).

JEN

A GUARDS GENERAL

THE MEMOIRS OF MAJOR GENERAL SIR ALLAN ADAIR
(Edited by Colonel Oliver Lindsay)

Published by Hamish Hamilton Ltd—Price £12.95 or £8.05 (incl. p&p) from RHQ Grenadier Guards, Wellington Barracks, SW1)

MAJOR GENERAL SIR ALLAN ADAIR has recently written his memoirs. He will best be remembered as the Commander of the distinguished Guards Armoured Division throughout the fighting in Europe in World War II.

Your reviewer served with 14 Field Squadron RE in this Division and regarded him as one of the finest soldiers under whom he had the privilege to serve.

General Allan's memoirs cover, of course, much more than World War II for he commanded a company of the Grenadier Guards on the Western Front in the First World War when he was both wounded and decorated—as was the case in the Second. One of his contemporaries was Harold Macmillan, who wrote the book's foreword shortly before his death.

Inevitably General Allan includes references to the Royal Engineers—in World War I, during the General Strike of 1926, in Egypt in the 1930s, training in England before D Day and in Europe, during which time in one period of seventeen days, the Sappers built no less than twenty-four bridges for the guardsmen. And then also in Greece, where General Allan commanded a division in the civil war.

Amongst the officers to whom he refers are General Sir Charles "Splosh" Jones, his Commander Royal Engineers, 1943–44, his successor General Sir Noel Thomas and, of course, Major General Tony Jones, who cut the wires, removed the demolition charges and took seventy prisoners on the Nijmegen Bridge during the bitter fighting while endeavouring to reach the Airborne Forces trapped at Arnhem.

A Guards General is no ordinary book for it encompasses eighty-nine enthralling years. Indeed, by the time this review is published, General Allan may have celebrated his ninetieth birthday. The memoirs were edited by Colonel Oliver Lindsay, who has written two earlier books on Hong Kong 1940–1946, despite still being a serving soldier. The appeal of this splendid autobiography is such that it is almost impossible to put the book down before reading the final paragraph; it is highly recommended.

ART

SAPPERS: THE ROYAL ENGINEERS IN BRITISH COLUMBIA
BETH HILL

(Published by Horsdal and Schubart Publishers Ltd, Box 1, Ganges, British Columbia, Canada—Price $9.95 ISBN 0-920663-05-2)

IT is possible that many Royal Engineers, past or present, do not realise how much our Corps contributed to the founding days of British Columbia. During the period 1858–1863 the Sappers completed the demarcation of the boundary with the United States, surveyed road and rail routes, built roads and bridges, laid out towns and villages, built churches and fortifications—and much else. They even by their presence enabled Governor Douglas to discourage the Americans from using armed force to protect the squatters and gold seekers from the Indians. All this by a force of less than 150 all ranks.

Beth Hill is to be congratulated upon writing this brief account of the life and the work of Colonel Moody's Sappers. It is not a definitive history, although it is clearly well researched both in the archives and on the ground. It is primarily a tale of people and places, and therein lies much of its fascination. By the clever use of diary and letter extracts, connected by a well-written and descriptive narrative, Mrs Hill lets those involved tell their own tales. Photographs and sketches add further interest, but sadly the maps are inadequate for those who do not know British Columbia. Of particular value are the chapters telling of those who stayed in the province after the detachment was disbanded in 1863, and the traces still left of their works. There is also a commendably full bibliography.

All in all, a most readable and enjoyable book that deserves a place among our unit histories.

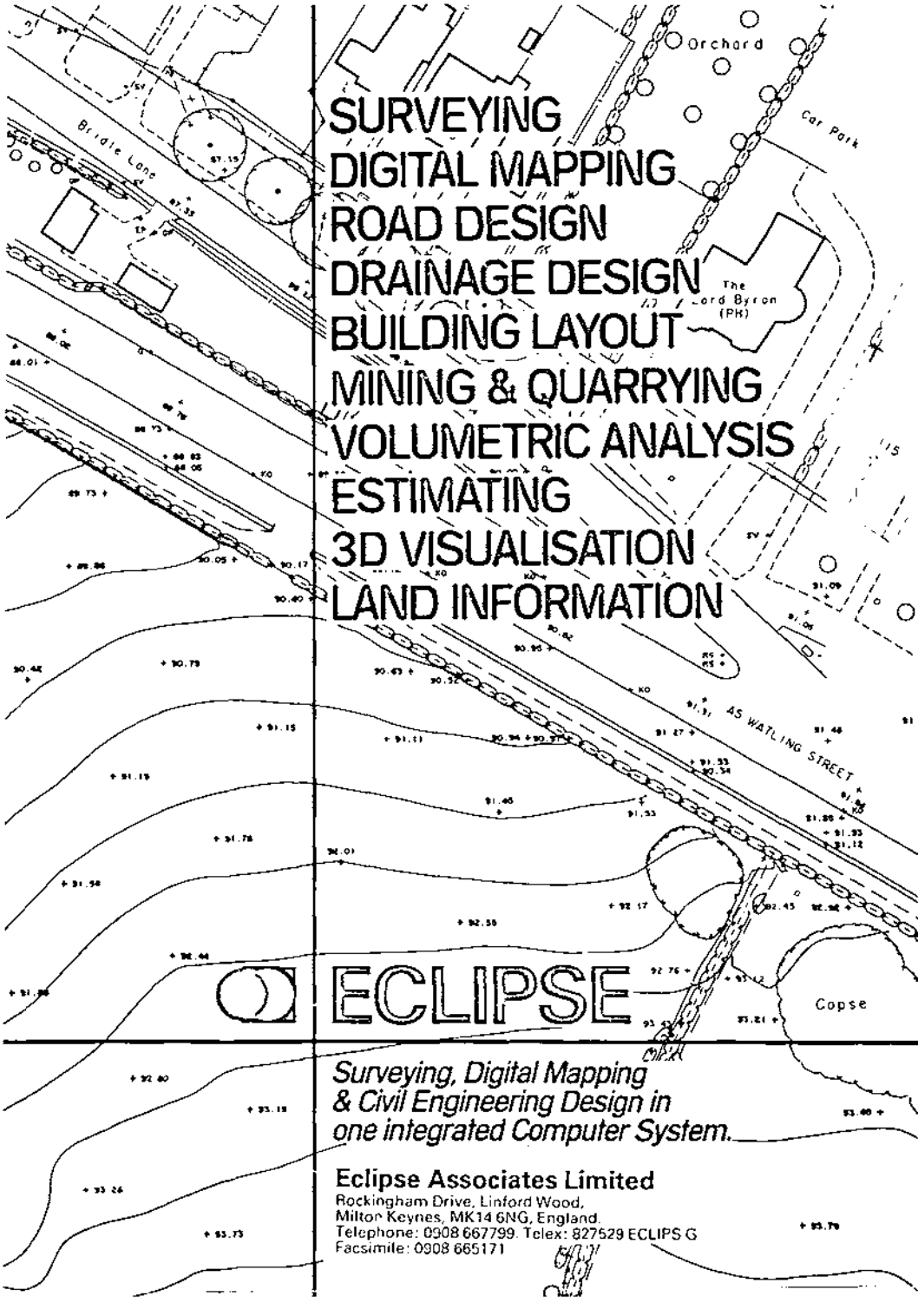
JFMG

DAWNS LIKE THUNDER
The Retreat from Burma 1942
ALFRED DRAPER

(Published by Leo Cooper—Price £17.95 ISBN 0-85052-1319)

IN 1939 Burma was a backwater of Empire directly administered from the UK. Repeated requests from India to assume the responsibility for its defence were unwisely refused and this task was delegated to HQ Fareast in Singapore. When the Japanese attacked at the end of December 1941 the country was totally unprepared for war. Within five months all the British and most of the many Indians in the country had either died, been killed or captured, or had been driven over the mountains into India. This book is based on the accounts of those at all levels who were there, either attempting to stem the Japanese advance or doing what they could to ameliorate the catastrophe which had so unexpectedly overtaken them. It does not pretend to be historically accurate in all respects as the opening sentence indicates ("The war was a little more than two years and three months old and Britain stood alone.") but the many eye-witness stories give a vivid idea of the confusion and tragedies which stemmed from the failure to prepare for the impending attack.

The great interest of the book is the wide spectrum of views that the author has assembled to cover not only the military but also the civilian problems of the campaign. One of the features of a retreat is that alarmist stories gain wide credence and are subsequently enshrined as truth. Conversely, many cases of heroism, both military and civilian, are unknown and unrecorded. This book, while not ignoring the chaos and the rumours, helps to restore the balance. Extracts from the diaries of the two or three experienced reporters who were present give notably balanced views. The great majority of the accounts, both of the fighting and of the dramas further back,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