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Brooom! Brooom!!

A NEW broom may sweep clean but it takes an older one to know where to sweep! The Chief Royal Engineer in his article published in the June issue of the Journal wrote: "I fear for the poor Editor who will have to handle an ever increasing flow of your contributions".

The Editor is delighted to report that there are signs that this fear may be justified, as the Correspondence in this issue demonstrates. One has to go back more than twenty years to find more pages devoted to Correspondence. To further encourage this very acceptable trend the "dead line" dates for letters relating to *published articles* has been adjusted to give more time to would-be correspondents. The details are on the back cover of this Journal.

The Chief Royal Engineer also wrote that: ". . . we need to look afresh at the fundamentals". This issue contains an article, much longer than usual, "Improving the Battlefield Cutting of Reinforced Concrete Structural Members". It is based on the paper presented to the first Institution Meeting held in BAOR. It is a subject of great importance in itself, but in addition it suggests that effective professional military engineers must have an understanding of, or at least a feeling for, structures.

This is only one of the many areas in which the military engineer operates and in which he must have more than a passing acquaintance. The limited time available for formal instruction and training backed up by readily available "official" text books can only touch upon, or indicate, areas which require more detailed attention. From then on it is up to the individual, working alone, or, in some cases, informally with others, to investigate further and deeper.

In recent years we have been assailed by calls "to work harder". *This is a nonsense*. The call should be to "work better"! To work better requires self-motivation as a basic ingredient. Self-motivation to increase knowledge, to consciously look around in search of experience, to think longer and more acutely to come up with the best solutions to problems. Self-motivation is the hallmark of the true professional in the finest sense of the word. The older brooms can show the way, they can inspire, they can cajole, but fundamentally the new brooms must motivate themselves.

New President—Institution of Royal Engineers

MAJOR GENERAL M E TICKELL CBE, MC, MA, C Eng, FICE

MAJOR GENERAL M E TICKELL was elected President of the Institution of Royal Engineers on 14 May 1979 in succession to Major General J C Woollett.

He is aware of the heavy responsibility of taking over at a time when the engineering profession as a whole is undergoing change and the Institution is already the subject of important and highly encouraging evolutionary movement. The relationship which finally evolves between the Military Engineer and the profession as a whole will have an important influence on what is the ultimate concern of the Institution—furthering the support which the Corps can give to the Defence Services.

He comes from a family which is rich in Sapper tradition. His father, the late Major General Sir Eustace Tickell KBE, CB, MC was Engineer-in-Chief from 1945 to 1948 and President of the Institution from 1948 to 1950. His great grandfather was Lieut General Richard Tickell CB (1785–1855) and there are twelve Sappers in six generations among his direct descendants.

Major General Tickell was born in Chatham on 18 November 1923 and was educated at Wellington College. After two years in the ranks he was commissioned into the Royal Engineers at Newark on 2 April 1944. As a subaltern he served in the NW Europe Campaign with 100 Royal Monmouthshire RE Field Company. He took part in major bridging operations over the Seine, Maas (four times), Rhine and Weser. After the war he gained a First-class Honours Degree at Peterhouse, Cambridge and won the Archibald Denny Prize for the top "civils" graduate in 1949. He was elected a Fellow of the Institution of Civil Engineers in 1974. His military education included staff training in the United States and India. In Corps appointments he commanded 23 Field Squadron, 4th Divisional Engineers and 12 Engineer Brigade before becoming Engineer-in-Chief from December 1972 until March 1975. His staff experience included military operations and joint service appointments in Whitehall and a tour as Chief of Staff in Northern Ireland. He has had four instructional tours at the Staff College and the Royal Military College of Science from where he retired in June 1978 after three and a quarter years as Commandant. He became more than ever aware in that appointment of the need for continuous interaction between the Service officer, the practising engineer and the academic world.

His sports have included rowing, riding and gliding but his main recreation is sailing, particularly as an experienced ocean racer.

New President - Institution of RE.

1979 Corps Annual General Meeting

ADDRESS BY ENGINEER-IN-CHIEF

AT the Annual General Meeting of the Corps, held on 27 July 1979, the Engineer-in-Chief, Major General C P Campbell CBE spoke on Corps affairs. *He said:*

"When I spoke to you last year I devoted a fair proportion of my time to considering the broad stategy that the Corps should follow for the future. In doing so I acknowledged that there were many areas which would require careful thought and the answers to problems would be neither immediate nor easy. I stressed the importance of moving forward on a positive course in an atmosphere of stability. After the turmoil caused by the Army Restructuring Programme, future changes had to be evolutionary and not radical. I also made the point that as we moved forward year by year we must not only be well balanced to meet the demands placed upon us, but we must also be abreast of Army conceptual and doctrinal thinking and bring our innovative and influential talents to bear at all levels. I emphasized the fundamental importance of investing in the right quality of young officers as a sure safeguard for the lasting prosperity of the Corps. I underlined the need to prosper all officers to the limit of their merits and abilities. Finally I made it clear to all, both young and old, serving and retired, that I would always welcome fresh thought and helpful ideas.

Where then have we got to in the twelve months since I stood before you last? How have we fared and is the strategy working out? Are we for example enjoying the sort of stability that allows us to steer a positive way ahead? Let me give you a glimpse of the scene as I see it and I will first take you on a brisk survey of unit activities during the past year.

A REVIEW OF THE YEAR

Home

At home our attention has been, as ever, very much preoccupied with affairs in Northern Ireland. We have continued to maintain a regiment from BAOR in the infantry role in addition to field squadrons from both BAOR and UKLF in the engineer role. It is a sobering thought to remember that of the sappers in 1 (BR) Corps generally over one third have been involved in some way with Northern Ireland either training for it or operating there. These tours have recently been extended to four months and two weeks in an endeavour to reduce turbulence. The highlight has been the construction of a close quarter battle range—a fine achievement by 11 Field Squadron of 38 Engineer Regiment, finishing well ahead of time. The company base at Crossmaglen is growing like "Topsy" and will keep us busy well into 1981. Construction now seems to be the name of the game in the Province and we are committed to the hardening of another company base at Forkhill. All of this will tax our resources of professionally trained officers and technicians. So much so that it seems to me sensible to try to group together those deployed in South Armagh into a DCRE Works under the CRE. Our handling of the projects in Forkhill and Crossmaglen is something of an experiment. By agreement with PSA our responsibilities will span the gamut of design, contract work and construction. To some of you this will seem to be a return to days gone by when we ran the whole works business. It is a move which I warmly welcome for the benefits that will accrue to us.

In case you should get the wrong impression, let me hasten to add that our support to the three brigades continues in full measure. While search operations may have lost some of the limelight, this important aspect of our work demands our constant attention. Indeed with the recent increase in PIRA activity and the growing sophistication of their methods, it behoves us to try even harder to get ahead of the game.

EOD have had a busy year and amongst their achievements must be numbered the disarming of bombs at Tilbury and Epping Forest quite apart from their close involvement with "support" to the TV series "Danger UXB". A change in organiza-

tion has brought in 591 EOD Squadron RE(V) as full members of 33 EOD Regiment with 579 and 583 EOD Squadrons RE(V) to follow in 1981.

Postal and Courier units have had a full year and their services have, as always, been greatly valued. Their units have undergone some changes in title and they are now known as regiments and squadrons; a move which I welcome as it further signifies the cohesiveness of the Corps.

Survey's major Army commitment has been the continuing mapping support for operations in Northern Ireland. A further large part of their resources is committed to the production of digital topographic information primarily for RAF use. In Germany there has been greatly increased interest in improved geographic information and terrain analysis, which has led to a number of studies and some experimental products. Survey has continued to operate elsewhere in the world with, for example, two soldiers who were working in Chad at the time of the coup earlier this year and 512 STRE tracking satellites from stations from Borneo to Texas.

The regular units in UK have been very active with deployments of their squadrons to Northern Ireland, to operations and project exercises overseas, to support of the Royal Air Force in UK and Germany, and in support of the civil authority during the industrial strife of the past winter. In spite of this impressive list of commitments, commanding officers have found time to participate in formation training as well as to plan and run their own regimental and squadron training. This period of dedicated training has been unequivocally written into each unit's programme and it is a reflection of a very welcome improvement firmly supported by the C-in-C UKLF and his district commanders.

I will deal with overseas operations and exercises later but let me now just illustrate some tasks which our units carried out at home. The first of these was the construction by 38 Engineer Regiment of a Harrier Ski Jump at the Farnborough Air Show 1978. Undertaken at the request of British Aerospace, executed in co-operation with Fairey Engineering, it was undoubtedly the centrepiece of the Show. So popular were we that we have just been to Paris for a repeat performance. Next was a task for the Navy. The decision to retire the great warship HMS *Ark Royal* presented some major decommissioning problems, and we were invited to help out. Accordingly, in the depths of the recent winter, 22 Engineer Regiment constructed an enormous ramp at Plymouth to allow heavy vehicles to drive on board and remove the ship's gear.

Lest I forget the TAVR, let me tell you that they have, as ever, been fulfilling their commitments in noble fashion. In particular 30 Engineer Group (V) have a newly formulated role in BAOR which will provide a challenge not least for the commander and his staff. So industrious have TAVR units been that one of them, 72 Engineer Regiment (V) from Newcastle, has won this year's E-in-C's award. This is a notable achievement on their part in the face of competition throughout the Corps. The same regiment completed a useful and historic exercise in restoring and repositioning the memorial for the Light Division in Flanders. Finally, and before leaving the UK scene, I must pay a warm tribute to the RSME and the many UK units, especially 59 Indep Commando Squadron, for the quite magnificent RE Demonstration that they staged in mid-June this year, attracting as it did so many discerning and influential people in military and civil engineering circles.

Abroad

Many of the home based squadrons have been abroad on operations in Belize, on construction projects in Canada and Kenya and on NATO training exercises such as those undertaken by 59 Independent Commando Squadron and the AMFL engineer troop. In the overseas stations the resident sapper units have had a full programme; The Queen's Gurkha Engineers involved then as now with the illegal immigrant problems on the Hong Kong/China borders; in Cyprus the squadron continues to provide support to the UN force.

Our management and specialist teams have, as you would expect, been at work in many parts of the globe including St Helena, the Falkland Islands and Saudi Arabia

and of course I could go on much further. The list is almost endless and a great test of your geographic recollection.

In BAOR the divisional engineers have been much concerned with their Northern Ireland commitments. Nevertheless they have met other demands on their time including support to battle group training exercises in Canada, participation in formation exercises in Germany and some engineer project work. Even so engineer commanders, like their counterparts at home, now have a period of concentrated unit combat engineer training firmly written into their programmes with the total support of their divisional commanders. This too is a very welcome improvement and long may it last. No mention of Germany would be complete without some reference to the splendid work of the mobile civilian groups. The value of these units, their availability, speed of reaction and cost effectiveness is quite remarkable.

Stability

Thus far I have been talking about units and their performance over the past year. As you can see it has been a busy time for them but there are hopeful indications that as a result of action we have taken commitments are stabilizing and easing. That unwelcome pressure, or in the current jargon "overstretch", is moderating. The fact that our unit commanders now have some flexibility to plan and generally carry through their unit training programmes without the constant interruption of crisis management is encouraging. Creating a more stable environment has been a first priority. With that well on the way we have been taking stock and addressing ourselves to concepts, doctrines, structure and balance, manpower, training, equipment and other matters. I will now share with you some of the thoughts that I have been studying with my advisers.

Concepts

Restructuring amounted to some ruthless surgery, exposing gaps in our capabilities and so disposing our resources as to leave us wondering how well we should be able to meet all our commitments. As a first step it was very tempting unilaterally to tinker with organizations especially when so many misgivings were being voiced about the size of our regiments. However we resisted temptation because at the end of the day we realized that organizations must fit in with strategy and concepts. Much of the past year has been devoted within the Army to the study of future operational concepts to match the forward defensive strategy ordained by NATO. General agreement has been reached on the broad conceptual lines that should be followed by 1 (BR) Corps bearing in mind the short warning scenario coupled with the increasing threat from WP Forces, both in quality and quantity. It has been a year in which all arms, including sappers, have been thinking hard about their battlefield roles and capabilities and consequential organizational evolution. A process which is not yet concluded.

Capability

As sappers we have been debating, especially at my Conference last November, how our techniques should be developed to combat enemy armour moving in mass, backed by formidable artillery and air support. This is fundamental to all our defence thinking. We have to move urgently to the development of new measures. Useful ideas are coming forward and the advent of scatterable anti-tank mines is an exciting prospect which could add a whole new dimension to the battlefield. But much has still to be done and time is pressing.

I do not need to remind you that time is the eternal enemy of the sapper but it is becoming more so. We must therefore enhance the capability of our units. We need to divest ourselves of the archaic image of a section of nine sappers leaping out of the back of an APC armed with picks and shovels to do battle. Means must be found of harnessing this manpower to realize quicker and more effective results.

Structure

In looking at our structure we have realized that we need to restore flexibility to give us a better balance to undertake all our tasks in war. Restructuring pushed very nearly all our units forward into the divisional areas leaving far too little engineer

support elsewhere in the corps area and behind it. In common with other arms we have made proposals, within the framework of an exercise launched at the end of last year by VCGS, to redress the balance and hopefully restore some of the flesh which restructuring stripped away. It is too early to say how this exercise will work out, but we should be clearer by the end of the year. One thing is quite certain, we shall still continue to be constrained by financial and manpower factors. Nevertheless we shall hopefully claw back some of our losses and put them to those places where the shoe pinches most. In doing so we shall have to take account of how the Army at large re-adjusts its tactical groupings to fit in with operational concepts and strategy. We have to pay due regard to a proper balance of engineer support without becoming mesmerized by an over identification with formation affiliations. "In support" and not "under command" must be our guiding light. Educating all arms commanders to a full appreciation of the enormity of our total tasks will be part of the campaign that I and engineer commanders will have to wage in the hard in-fighting for any additional resources.

Resources

A few words on equipment and engineer resources. CET is now in service albeit with some snags, but these will be put right. Long overdue studies are now in hand for a replacement for Centurion AVRE. Bridging for the 80s will come to the boil by the end of the year when we will have to decide what kind of new equipments will best meet our objectives of making a quantum jump improvement in overcoming the vexed problems of time and manpower penalties.

Engineer resources support is of course desperately important to us, and I regret it has been a neglected subject, neglected especially by those who most need it. Two far reaching reviews conducted this past year by Colonel Tony Kendall of my staff have sorted out much of our support management structure both in BAOR and in UK. I am totally confident now that we shall have a more efficient and well coordinated system in peace and war.

RAF Support

There are many other topics I would like to discuss with you but time precludes me from giving them full treatment. I should, however, mention Support for the Royal Air Force which is a rapidly growing commitment for the Corps. With the alarmingly increasing threat posed against airfields in UK we have launched a pilot study to determine the capability we shall need to deal with airfield damage repair. It is early days yet to say with certainty what the implications will be but I sense that we shall need to draw the TAVR significantly into this role.

Professional Engineers

I have been looking at our professional engineer specialization which is so important to our ability to meet the continuing and wide ranging construction engineering commitments that come our way. It is my concern to make certain that there are always sufficient and rewarding peacetime posts which are both relevant and satisfying in general military and specialist engineering terms. It is a front on which I have to try even harder than before, for I believe that our professional engineering specialization needs to be seen in a wider context.

Unless we are careful there is a real danger of the corps falling behind our fellow engineering corps in relative esteem and as technical leaders both within the Army and in the engineering profession generally. This is in no way our fault but we do need to watch it. Technology has moved much faster in fields such as electronics than in construction engineering. Also the weapons staff is becoming more powerful under the one-staff system and the real weapons problems fall more naturally into the hands of other Corps such as REME and Royal Signals than sappers. A lot of it is a bit too niggly for us. I suggest that we should capitalize on this point. The characteristics of the sapper are after all that he thinks straight, thinks big and gets things done without fuss and argument. Experience in the big engineering world I believe fosters these qualities and our professional or chartered engineers could be the key to that door and should have the quality if not always the numbers to fertilize the rest of the

Corps. The link between our military and engineering skills is the vital part of our structure that I referred to in my talk last year.

Training

Let me now return to training which has played a prominent part in all our thinking throughout the year. I have been very conscious of the disruptions to our training, of the cuts in staff and the leeway that we have to make up through wastage. Nonetheless we have had some measure of success in achieving more time for unit training. Running in parallel with this has been the evolution of individual training which I hinted at last year. The new career structure is well launched and results thus far are very encouraging. By separating skills from leadership training we are able more than ever before to push sappers forward much earlier to combat engineer class 1 and the resultant pay band improvement than was ever possible before. Training for NCOs on the new courses for section commanders and field sergeants is thus able to concentrate very effectively on leadership and command.

There are also particular benefits felt in BAOR in terms of stability where a soldier is able to complete a full tour as a combat engineer before returning to UK for artisan training. The inroads made into the debilitating effects of "turbulence" contribute noticeably to reducing frustration and improving professional competence. The establishment, after a successful trial period, of a sapper training centre at Hameln has enormously improved the standard of combat engineering in 1 (BR) Corps. Moreover the staff there are becoming the in-theatre experts for all arms and an encouraging development of this influence is the readiness with which the infantry battalions are putting forward their assault pioneers for training at the centre.

Manpower

Last year I sounded a cautionary note about recruiting and wastage and regretfully my fears have been well founded. Wastage has been running at far too high a level as both officers and soldiers have sought premature voluntary release in disturbingly large numbers. I won't go over the anxieties and dramas of the pay comparability issues but it was a great relief when the comparability gap was closed in April/May this year. It is too early to judge what the full effect of the pay award will be but it is gratifying to hear reports from many units of officers and men withdrawing their applications to leave the service. This all helps in the overall battle for retention. Of course pay has been only one element of the wastage problem, there are others which I shall mention later.

The recruiting for juniors continues to be good and as a result of a decision I have recently taken to alter the training at Dover, we should be able to push through more junior leaders in a year than at present. We could probably recruit more adults but in the interest of achieving a balanced Army the Ministry of Defence limits us to a quota of the whole intake passing through the centralized selection system at Sutton Coldfield.

Officer recruiting has been an encouraging feature of the year and our books are full of the names of young men who want to join us. Increasingly the quality lies amongst those applying for Army bursaries and scholarships at universities. This is no mean achievement and reflects the unrelenting effort by my recruiters. In particular we all owe much to the sterling work of Major Mike Stancombe who has been ERLO for the past two and a half years.

Before euphoria overcomes us I must remind you that the young man who is accepted by us now will not appear in a unit for another four years or so allowing for the lapsed time for university and YO training. Thus we shall continue to face difficulties for some time with considerable shortages amongst captains and majors to be added to the predicted serious shortfall of soldiers—unless wastage trends improve.

Prospering officers to the limit of their abilities and merits has been for me a major pre-occupation. To help me I have established a careers board on which sit the two Chief Engineers and three other one star sapper officers. This board meets regularly and its work is extremely valuable. The members have improved their own know-

ledge of our officers enormously and this is a great help to them when dealing with confidential reports and advising our officers on career matters. In the Corps at large the advent of the board has been welcomed. People feel that it is not just a "fliers" benefit but that everybody travels with hope.

Corps Affairs

The two-tier system for running Corps affairs is operating very smoothly and effectively and is doing much to improve communications within the Corps. Throughout the year I and others have been urging the promotion of thought and discussion through the medium of the *RE Journal*, the *Sapper*, other publications and at studies and seminars. As a Corps we tend to be a bit conservative and slow to push ideas forward especially in print. However there is a positive response emerging as evidenced by the March and June *RE Journals* both of which published most interesting material. Whether or not you agree with Colonel Mike Addison's views on "Sappers Fit for War", I daresay you would accept that his article touched a raw spot here and there. The *Sapper* too has taken on a new look and we have had a constructive article on the problems of realism in training featured in the Army Training Magazine.

In BAOR the first Institution meeting on record was held in March 1979. It was a small affair but it served a number of purposes. It reminded sapper officers that they belong to a professional Institution, it provided an opportunity for developing ideas in combat engineering, based on scientific advice and it awakened the interest of other arms. All of this is very welcome and much to be encouraged. Keeping the Corps in the "public eye", ie the rest of the Army, is something we have never been particularly good at. Keeping ourselves informed about our own affairs we have done with equal lack of flair. I earnestly hope the tide is now turning because it is an essential part of the strategy that the Corps voice is properly and fully heard in a wide range of Army circles where our influence needs to be brought to bear.

CONCLUSION

When I set out to draft this talk I wondered what I should be able to say to you by way of reporting on the Corps this past year. I realized as I wrote that there was a great deal of ground to cover and that inevitably I would not do justice across the full width of our affairs. I am only too aware that shortage of time has made it impossible to say anything about sport, adventure training and fun. However in sport the Corps flag continues to fly high, and these important aspects of life are flourishing.

The units have had a full and busy year and have as ever acquitted themselves admirably and this is due in large part to the high quality of our officers at regimental and squadron command supported as they are by excellent warrant officers and NCOs who are well trained and well motivated.

In terms of our strategy we have made a substantial inroad into cracking the debilitating effects of turbulence and overstretch. A measure of flexibility and stability is returning and the future looks a good deal rosier than it did last year.

There has been much to debate as concepts, doctrines, organizations and capabilities have and are continuing to come under scrutiny within the Army. We have a lot still to do and we must try even harder on many fronts in the crucial year lying ahead to get our fair share of additional resources of men and money.

Innovation must be our watchword as we endeavour to make substantial advances in particular in fields of countermobility and mobility. I urge you all to build on the reputation we have for thinking big and ensure that the voice of the Corps is properly and fully heard so that it has appropriate influence on the development of the Army. In the Army, as elsewhere, those who attend to their "PR" in a sufficient and balanced way tend both to be listened to and to succeed.

We must look to our most valuable asset our officers and men. After pay I believe the next most important consideration in all our minds must be to ensure that our men, particularly the younger ones, have no cause for disenchantment over the work they are required to do or the tools with which to do it. It is to be hoped that the pay

award has turned the tide of wastage; it is up to us to ensure that the soldiers are given worthwhile, realistic, satisfying and exciting tasks. The battle for retention is one that we must win.'

Finally, let me say I am very mindful and enormously grateful for the support and advice I get from within the Corps, from both serving and retired officers, young and old alike. We have made some very promising progress on the right course during this past year and there is a feeling of optimism about. The raft that I referred to in my last talk is weathering the passage very well and the crew are in excellent heart.

An Unusual Fire Drill

MAJOR GENERAL SIR GERALD W DUKE KBE, CB, DSO, BA, C Eng, FICE, DL

Commissioned in 1931, the author served with 2 Fd Coy in Egypt and Palestine, and as OC Det 8 Rly Coy attached to the Palestine Railways. In 1940 he joined 10 Rly Coy in the Western Desert as 2 i/c, and after a brief visit to Greece and Crete returned to the Desert as OC 4 Fd Sqn in 7 Armd Div. Following staff appointments in HQ 8th Army and 21st Army Gp, he finished the war as CRE 49 (West Riding) Div. Since the war his jobs have included MA Cairo, Comdt SME and E in C. He was appointed Col Comdt in 1966, and was President of the Institution from 1970 to 1974.

In the Palestine troubles before the second World War Detachment 8 Railway Company RE (one subaltern and about forty other ranks) was quartered in a hutted camp in an olive grove hard by Lydda Railway Station. Their role was to help the Palestine Railways keep the trains running, in the face of Arab attempts to stop them. The Detachment were quite independent of their parent, 8 Railway Company at Longmoor, and came for all purposes under 18 Infantry Brigade, at Sarafand about five miles away.

About eleven o'clock one morning a staff car drove into the camp and halted on the small barrack square outside the company office hut. A major emerged from the car and surveyed the peaceful scene; the camp silent in the sunshine and not a soul in sight. (We mounted a "prowler guard" by night, but no quarter guard by day.) Just as he turned to walk to the office a figure appeared from the far side of the square, in the shape of Sapper Quick the Q storeman, who threw the major a smart enough salute and a civil "Good morning, Sir". "Good morning, Sapper", replied the major, adding "That hut is on fire". "That hut, Sir? The QM store, Sir? But I have just come from there." Ernie Quick was of solid Somerset stock, a first class soldier but his name belied his nature. He was essentially a man who wanted to be sure of his facts before being stampeded into action. There followed, from Major Preston's point of view, a highly unsatisfactory dialogue. He was in fact the Brigade Fire Officer, and all he wanted to do was to persuade Sapper Quick to set in motion the unit fire precautions (if any) so they could be assessed and reported on, and this was going to be a slow business.

However, Quick was doing us a better turn than he knew. My acting CSM, Sergeant Smart, had observed the opening stages of the encounter from his office. Knowing Major Preston to be the Brigade Fire Officer he guessed the rest. He quickly despatched the Company runner through a window at the back of the hut to

The Unusual Fire Drill
Major-General Sir Gerald Duke

alert Corporal Maylam, in charge of the early-turn footplate and trolley crews, and tell him to raise a fire fighting party. They had just come off shift and would be resting in the barrack hut near by.

Waiting as long as he dared he then emerged from his office, saluted and asked whether he could help. "You certainly can", Major Preston replied. He was a man of uncertain temper and his efforts with Sapper Quick had not improved it. "That hut's on fire!". "The QM store on fire, Sir? Of course, Sir". "Quick, sound the fire alarm". Smart then drew a whistle from his pocket, blew a series of short blasts and shouted "Fire!", while Quick doubled on to the verandah and clanged the fire gong. This commotion brought me from my office next to the CSM. By the time I had buckled on my Sam Browne and emerged to join the party I was just in time to see Corporal Maylam appear from behind the office hut, crying "Where's the Fire, Sergeant Major?" "In the QM Store". Maylam retired behind the hut, and we heard him shout "Fire in the quartermaster's store! Action!". He re-appeared and doubled across the square towards the hut, followed immediately by a breathless party of soldiery armed with every conceivable fire fighting weapon; water buckets, sand buckets, stirrup pumps, a ladder, axes, coils of rope. The last two men were carrying respectively a broom and a poker; I suppose they did not want to miss the fun and grabbed what came to hand. If I was astounded at the response to the CSM's call it was nothing to the look of sheer disbelief on Major Preston's face. However there it was, for real, all happening right in front of him.

While the stirrup pumps were playing merrily on the QM hut the major looked round and noticed a piece of equipment we had all forgotten about. This was a chemical extinguisher about the size of a large pillar box, mounted on iron wheels and equipped with shafts. It sat on a concrete base alongside the office hut, and looked as though it had been left behind by Allenby's men. As I studied it closely for the first time I was reminded of that immortal paragraph in the 1896 edition of *Field Service Regulations*, describing in some detail the company cart. It concluded: "The cart is designed to be drawn by a mule, if no mule is available two intelligent NCO's may be placed between the shafts".

Well, Major Preston decreed that this fearsome engine should be brought into play, so two fairly intelligent sappers were placed between the shafts, and with some creaking and groaning it was dragged across the square. While this was happening Sammy Smart and I had a whispered conference on how to make it work. There were two brass wheels on one side, and it was a reasonable bet that if we twiddled these something would happen. So I turned one and he turned the other, with Corporal Maylam holding the nozzle. There were two ominous clicks from inside the machine, which then gave a convulsive shudder. However all was well and a very satisfactory jet of grey foam emerged, with which we sprayed the QM hut and nearby olive trees. After a few moments Major Preston declared himself satisfied, the wheels were screwed home, the flow stopped and the machine returned to its launching pad.

The major and I then retired to my office for him to write his report. He was still a bit puzzled, but had to admit that we had put up a first class show. He was in fact just telling me so when there was a dull boom which shook the windows, rather like a distant ammonal explosion, and the sun became obscured. We rushed out to find that the infernal machine had failed to stand the strain of being checked in mid-flow. It had built up a colossal internal pressure and finally blown the top off, covering everything for yards round with a thick grey foam, and producing a mushroom cloud which still hung over us. This was too much for Major Preston, who tactfully withdrew to the relative calm of Brigade to complete his report.

In due course we received a glowing tribute to our fire fighting arrangements, but we came across an unforeseen difficulty in writing off our fire engine. It transpired that this machine should only be used to fight a real fire, and as we had not had a fire it was inconceivable to authority that we could have used it, in defiance of the regulations. However we did not press the matter, and a few weeks later the outbreak of war squared the books for us.

Improving the Battlefield Cutting of Reinforced Concrete Structural Members

CAPTAIN D A S DAVIS RE, B Sc, C Eng, MIÇE

The author was commissioned from Sandhurst in July 1966 and took an Engineering degree at the RMCS. He served as a Troop Commander in BAOR, an instructor on the BAOR Northern Ireland Training Team, a GSO3 RE in HQ 2 Div and as Adjutant of a TAVR Regiment which was committed to BAOR operations. During his Long Civil Course attachments in Scotland he was heavily involved in the design and the construction of reinforced concrete structures. He is currently serving with 522 STRE (Works) in BAOR where much of his work is also devoted to reinforced concrete design and construction.

THIS paper was presented to the first Professional Meeting of the Institution to be held in BAOR. The Meeting was held in the Officers Mess 1 Armd Div Engr Regt on 14 May 1969. An edited version of the subsequent discussion is published at the end of the paper.

BACKGROUND

On the 21 June 1941 Hitler launched his tank armies east into Russia. The Russians were saved by the vastness of their space, the harshness of their winter and by the stoicism of their soldiery fighting in some of the grimmest and most bloody battles of the Second World War. The Russians learnt many bitter lessons not least of which were the benefits to be gained by the aggressive use of massed armour. Since 1945 Soviet and Warsaw Pact military planning has been based on the offensive use of such tactics.

In the past the West has enjoyed a stragetic nuclear superiority and the NATO ground forces' role has been to act as a trip wire or, more recently, as a controlled response to Warsaw Pact aggression. This situation has changed and, at present, a state of nuclear parity effectively exists. Thus greater reliance must be placed on conventional NATO ground forces. Soviet ground forces, however, which have always been numerically superior, are now improving in quality, making NATO's ground defensive plan more critical than ever.

The NATO defence plan relies heavily on obstacles to deny mobility to the enemy. Many of these are bridge demolitions of which some will be the vital reserve demolitions which will confer mobility on our forces. Increasingly these bridges are made of reinforced concrete (RC).

Given time, any RC bridge can be satisfactorily demolished. But in NW Europe time may be short for several reasons. The West Germans insist on NATO defending as far to the east as possible thus sacrificing space and, with it, time. The period just prior to any war is politically sensitive and provocative actions may be forbidden. Finally, in the case of the vital reserve demolitions, even if time is available for initial preparation, there will be little chance of time for a second attempt. In the next war in NW Europe much will depend on the ability of the military engineer to rapidly and effectively destroy RC bridges.

There are two current methods of demolishing RC bridges:

(a) *Atomic Demolition Munition (ADM).* ADMs are capable of destroying any

Improving the Battlefield Cutting of reinforced Concrete Structure Members - Captain DAS Davis

RC bridge either by blast or, if very close to the target, by vaporizing it to form part of the ADM fireball. However, ADMs may not be released for political reasons and at best can only be considered a bonus.

(b) *Conventional Sheffield Study Techniques.* In 1973 conventional military demolition techniques took a significant step forward with the advent of the Sheffield Study. The Study examined the structural aspects of bridge demolitions and advocated a design process based on the production of collapse mechanisms in an otherwise stable structure. Two methods of forming this mechanism were examined:

(1) *Plastic Hinges.* Plastic hinges can be formed by partially cutting concrete structural members. This can be relatively easily done. The method is very effective against simply supported spans where a single hinge will cause complete collapse (Sketch 1). But against continuous span bridges, which invariably cross the wider, more attractive obstacles, they are less effective (Sketch 2). A continuous span bridge requires three partial cuts in a single span to cause collapse. Apart from the labour involved the demolition suffers from the following disadvantages:

(a) Collapse may not be total.

(b) The distance between piers seldom exceeds 35m, thus the standard NATO demoliton gap is not created.

(c) Re-bridging is not hindered by demolition debris.

(2) *Complete Cuts* (Sketch 3). Complete cuts make a continuous span bridge into a much better obstacle.

The following cutting methods are in service:

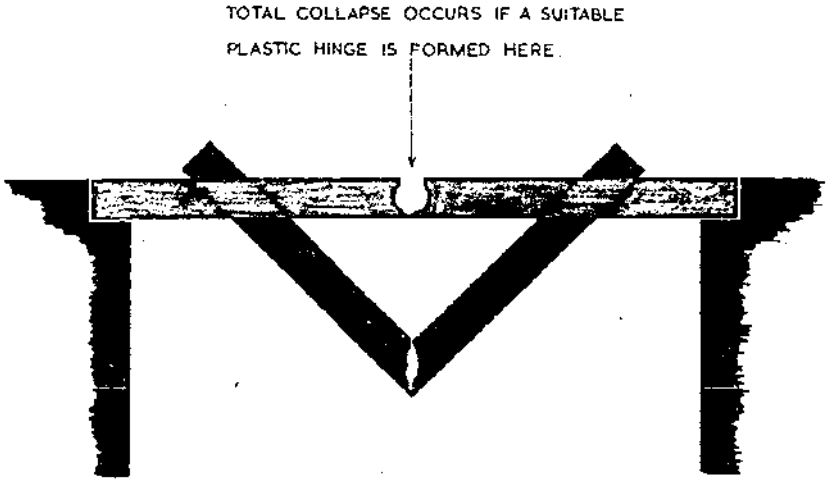
(a) *Cutting Charges.* Cutting charges will cut lightly reinforced RC members if their depth does not exceed about 200mm.

(b) *Linear Shape Charges (LSC).* Linear Shaped Charges at present in service will cut concrete section up to about 300mm deep by cutting from both sides.

(c) *Two-Stage Method.* In the first stage charges are placed to strip the concrete from the reinforced steel (Photo 1). In the second stage further charges are placed to cut the steel.

As the majority of targets that we are interested in greatly exceed 300mm and the

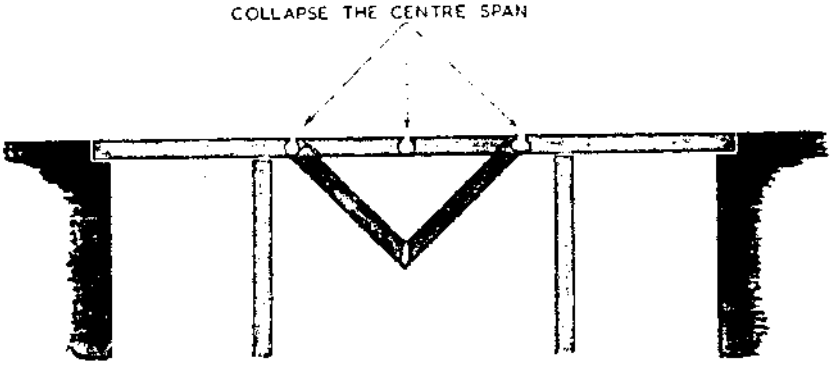
SKETCH 1A



EFFECT OF A PLASTIC HINGE IN A SIMPLY SUPPORED SPAN.

SKETCH NO 2

THREE PLASTIC HINGES REQUIRED TO COLLAPSE THE CENTRE SPAN



ATTACKING A CENTRE SPAN OF A CONTINUOUS BRIDGE

two-stage method is not desirable on the battlefield, the Sheffield Study was forced to recommend a demolition technique based on the plastic hinge.

AIM

The aim of this paper is to examine the problems and methods of cutting RC structural members to see if the full potential of the Sheffield Study can be realized.

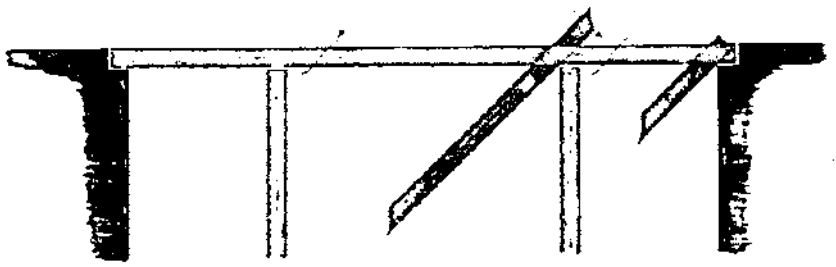
METHOD OF APPROACH

This paper is presented in the following order:

(a) Clarification of Aim.

SKETCH NO 3

TWO CUTS FORM AN EFFECTIVE OBSTACLE



EFFECT OF CUTTING SPANS OF A CONTINUOUS BRIDGE

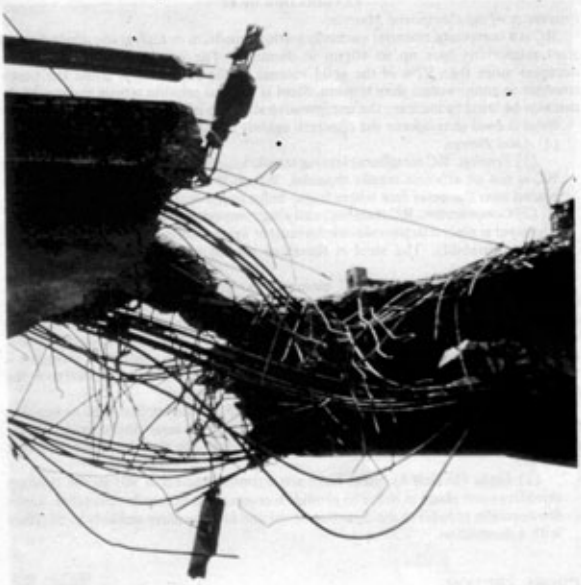


Photo 1. Concrete stripped from steel cage leaving reinforcement to be cut.

(b) An examination is made of the nature of RC.
(c) The methods available at present to military and civil engineers are described, together with possible future developments on the technical horizon.
(d) An assessment is made of the most promising ways of improving our performance.
(e) Conclusions are drawn.

CLARIFICATION OF AIM

The method of effecting a cut is a single factor in a wider appreciation on the subject of RC demolitions.

The other factors which are not considered in this paper are:
(a) Structural considerations (covered by the Sheffield Study).
(b) The accessibility of members under attack.
(c) Political problems associated with target preparation in peace time.
(d) Tactical considerations associated with particular demolition techniques.

This paper is only concerned with RC and although most of the arguments apply to prestressed concrete as well, the problem is slightly different and is not considered here.

Battlefield Cutting of Reinforced Concerete Structural Members (1)

EXAMINATION OF RC

Properties of the Composite Material

RC is a composite material normally made of medium or high grade concrete and steel reinforcing bars up to 40mm in diameter. The concrete, which normally occupies more than 92% of the solid volume of the structure, is some ten times stronger in compression than tension. Steel is used to provide tensile resistance. It can also be used to increase the compressive strength of a member.

Steel is used to reinforce the concrete against four types of forces:

(a) *Axial Forces.*

(1) *Tension.* RC members carrying tensile axial loads are not common because RC is not an efficient tensile material. Where it is found the steel tends to be placed near the outer face where it also helps to prevent damage to the concrete.

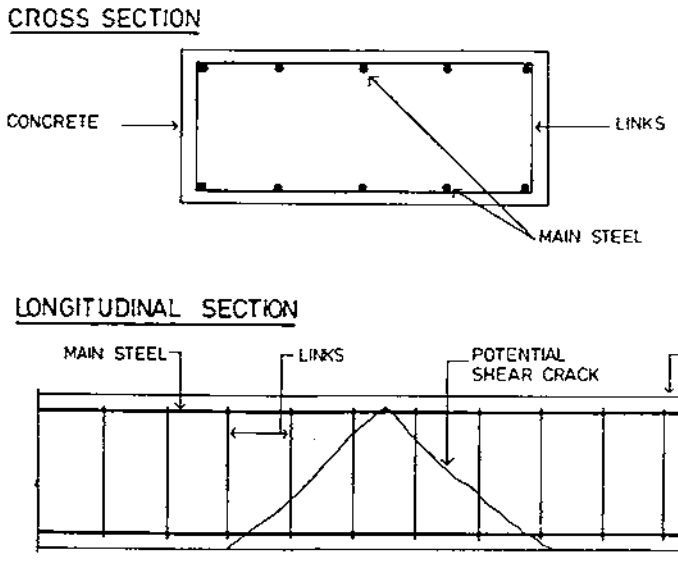
(2) *Compression.* RC members carrying compressive axial loads are common. The steel is placed to provide reinforcement against direct compression and also against instability. The steel is therefore placed near the outer edge of the member.

(b) *Bending Forces.* Many RC members carry moments which produce both tensile and compressive stresses in the members. These stresses are greatest at the outer edges of the member. Reinforcing steel to resist bending is normally placed within 300mm of the outer edge of the member. Distribution steel is also provided, normally at 90° to the main steel, to carry transverse forces in a member. Though it is seldom required to cut distribution steel, because cuts are normally parallel to it, the reinforcing bars will be near the outer edge of the member.

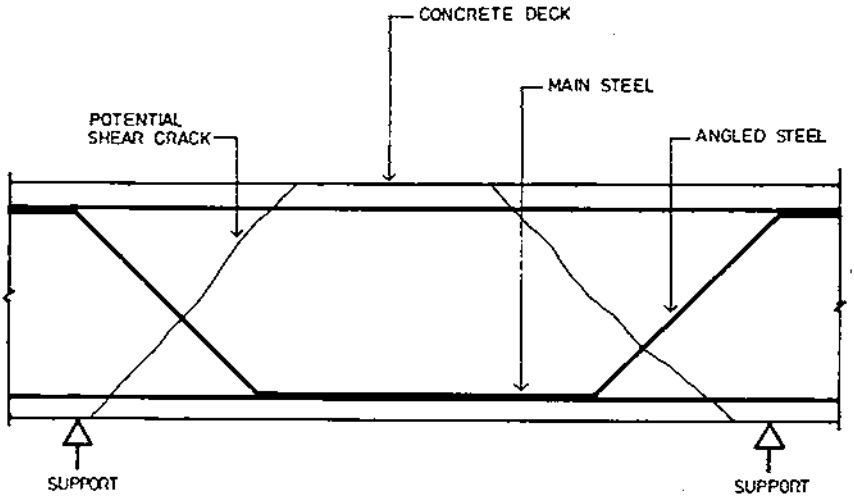
(c) *Shear Forces.* Shear forces act on planes at 45° to the applied axial or bending forces. Two types of reinforcement can be provided to resist the tensile stresses produced by shear forces. Neither type is confined to the outside of the member. These are:

(1) *Links* (Sketch 4). Steel links are normally placed at 90° to the primary reinforcement plane in order to provide a component of tensile resistance. Links are normally parallel to the direction of cut and are therefore unlikely to interfere with a demolition.

SKETCH No 4



SKETCH N° 5



ANGLED MAIN STEEL TO RESIST SHEAR

(2) *Angled Bars* (Sketch 5). These are primary reinforcing bars which could have been curtailed but instead have been angled up to resist shear forces. They are therefore found in areas of low bending moment. An RC designer will tend to prefer links as they are more versatile than angled bars.

(d) *Torsion Forces.* Torsion reinforcement is provided by a combination of links and longitudinal reinforcement.

Properties of the Concrete

Mechanical Properties. Concrete is a matrix of aggregates of various sizes held in place by cement mortar. The concrete, which is only as strong as its weakest ingredient, has an upper bound compressive strength of about 65N/mm^2. From this figure very approximate values for the modulus of rupture (tensile strength) and shear strength can be deduced as 6.5N/mm^2 and 32.5N/mm^2 respectively.

Thermal Properties. The effect of heating concrete has not been fully investigated. Much depends on the materials from which the concrete is made. Up to 300°C an increase in strength is experienced. At 570°C, concrete with a quartzite based aggregate starts to spall. However, limestone based aggregates can show little distress at 1200°C. Cracking and spalling would be resisted by any reinforcement present. If heated further concrete containing silicate aggregates will start to melt at temperatures in excess of about 1600°C. Molten silica is a viscous fluid; however, if iron oxide is added a slag is formed which flows readily. Higher temperatures produce faster flow rates.

Chemical Properties. Though concrete can be attacked chemically by many substances the resultant damage occurs too slowly to provide a practical demolition technique. Concrete cannot be burnt in oxygen.

Properties of Steel

Chemical Properties. Steel combines readily with oxygen when burnt. The local ignition temperature is approximately 900°C. The following reactions occur:

$2Fe + 0_2 = 2FeO$ + heat (0.80kWh/kg of steel)

$3Fe + 2O_2 = Fe_3O_4$ + heat (0.96kWh/kg of steel)

$2Fe + 3/2O_2 = Fe_2O_3$ + heat (0.99kWh/kg of steel)

One kg of steel can be oxidized completely to ferroso-ferric oxide (Fe_3O_4) by 0.30m^3 of oxygen.

Thermal Properties. Steel undergoes changes when heated or cooled:

(a) When steel is heated it undergoes a series of crystalline changes resulting in a loss of strength. At about 825°C it becomes soft and finally melts at 1570°C. About 0.28kWh/kg is required to melt steel from cold. Comparison with the chemical properties of steel indicates that the oxidation of one kg of steel releases sufficient heat to melt a further 3–4 kg.

(b) When steel is cooled to temperatures between minus 100°C and minus 200°C, a temperature easily reached using liquid nitrogen, it becomes susceptible to brittle fracture. At these temperatures the ultimate tensile stress increases but the ultimate tensile strain is dramatically reduced. Thus the energy (which is proportional to the area under the stress/strain curve) required to cause fracture at low temperatures can be as low as one sixth of that required to cause fracture at room temperature.

Physical Properties. Various types of steel are used for reinforcement, the common ones being mild steel, high yield steel, and cold worked steel. The Sheffield Study gives an upper bound yield stress of 550N/mm^2 for steel which indicates an upper bound tensile strength of 650N/mm^2 and an ultimate shear value of about 450N/mm^2.

Deductions from the Nature of RC

Depth of Steel. Much of the strength of an RC structure is provided by a small volume of steel. With RC bridges the depth of steel is unlikely to exceed 300mm except where angled bars are used for shear reinforcement.

Weakness of Concrete. Concrete is most easily attacked in tension; failure will occur at stresses in excess of 6.5N/mm^2. It can be melted but the large volume of concrete involved coupled with the distances the slag must flow make this uneconomic. Much less energy is required to attack concrete mechanically.

Weakness of Steel. Steel on the other hand is easily burnt in oxygen; failure will occur at temperatures in excess of 900°C, melting occurs at 1570°C. It may be that less effort is required to attack steel thermally than mechanically.

Energy Requirements to Attack RC. The strength and weaknesses of steel and concrete are complementary. If a single method is used to attack both the steel and concrete in RC then it must be a high energy source. The energy will only be fully efficient against one material. Much less energy would be required if the concrete and steel were attacked by different methods.

METHODS OF CUTTING CONCRETE

There are two different methods of cutting RC. Either a single stage method is used, where one technique is employed to cut both the steel and the concrete simultaneously, or the two-stage method is used, where the concrete is first stripped from the steel and then the steel is cut using a different technique. The two-stage method is the most common civil industrial demolition technique and is the only reliable conventional military one available at the moment and is therefore discussed first.

Current Two-Stage Methods of Cutting RC

Boreholing. Many concrete stripping methods require a borehole which is subsequently exploited. The following methods are in use:

(a) *Rotary Percussion Drilling.* Rotary percussion drilling is a common method of boring into RC. It is simple, safe, and requires little operator training. A tungsten carbide tipped bit is driven by a drill which can be powered by compressed air, electricity or hydraulic power. Concrete can be penetrated at rates of up to 3m/h. Light reinforcement can be cut, but heavy reinforcement must be cut separately by methods such as arc air gouging.

(b) *Thermic Boring.* This method uses a thermic lance to bore holes. The lance is a steel tube, normally between 13mm and 27mm in diameter, which is packed with steel rods. The end of the rod is heated to red heat and oxygen is then passed down the rod causing it to burn at temperatures up to 3500°C. When cutting concrete at this temperature an iron silica slag is formed which flows easily. The rate of penetration is about 12m per hour. The hole depth, however, is limited to about 2m

horizontally and 0.75m vertically down. Operator protection makes overhead boring difficult. There is a considerable fire hazard and large quantities of oxygen and iron lances are consumed. The holes must be allowed to cool if they are to be loaded with explosive.

(c) *Conical Shaped Charges (CSC).* CSC, similar to the in-service beehive, are a rapid method of producing boreholes in concrete. A shaped charge uses the Munro effect to produce a jet of molten gas and material which is concentrated into a small area. Successive charges can be fired into the same hole to extend it but this is not economic for more than three firings. The hole requires time to cool down prior to loading with explosives. This is the only technique which could provide a borehole on the battlefield at the speeds which must be achieved in war.

Exploiting Boreholes. Having created a borehole the next step is to exploit it and break the concrete. The following methods are available for doing this:

(a) *Wedges* (Sketch 6). The simplest method of exploiting a borehole is to drive a wedge into it by hand or by using a hand-held breaker driven by compressed air. Feathers are used to reduce wear on the wedge.

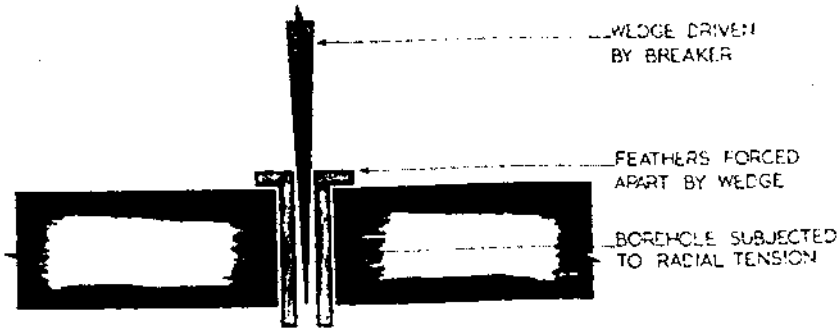
(b) *Hydraulic Bursters, Splitters and Jacks.* The next step up the power scale is to use hand-held hydraulic splitters, bursters and jacks. They are easy to use and require little training. There are three main types of equipment:

(1) *Wedge and Feather Splitters* (Sketch 7). These are very similar to the wedge and feather splitters used with percussion tools. The two feathers and a wedge are inserted into the borehole and the wedge is withdrawn by a hydraulic ram. Forces of the order of 100T can be achieved with these machines.

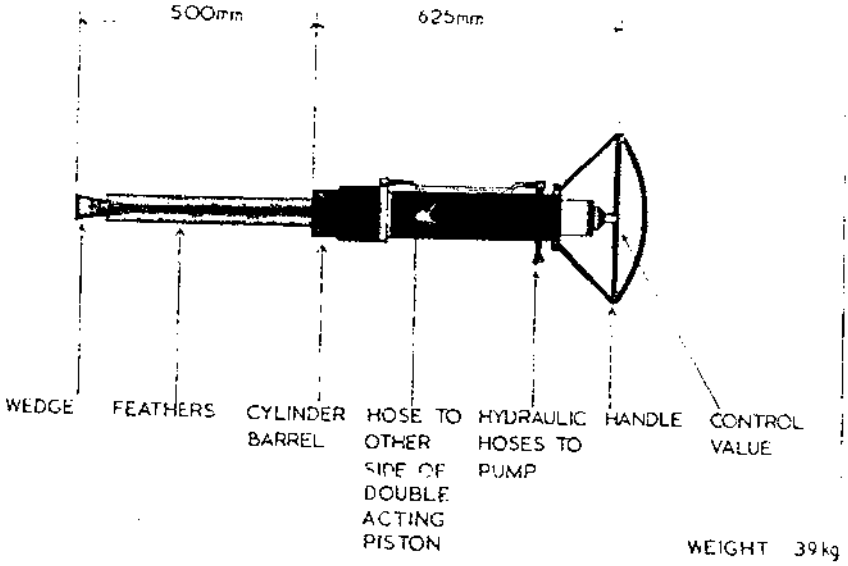
(2) *Piston Bursters* (Sketch 8). Piston bursters consist of a series of five or ten pistons operating in cylinders. The pistons are driven out by hydraulic pressure. Forces of up to 40T can be achieved with 5-piston models and 80T with 10-piston models.

(3) *Hydraulic Jacks.* Hydraulic jacks require larger holes than bursters but enable much more movement to be obtained, thus the reinforcement steel can be cut more easily.

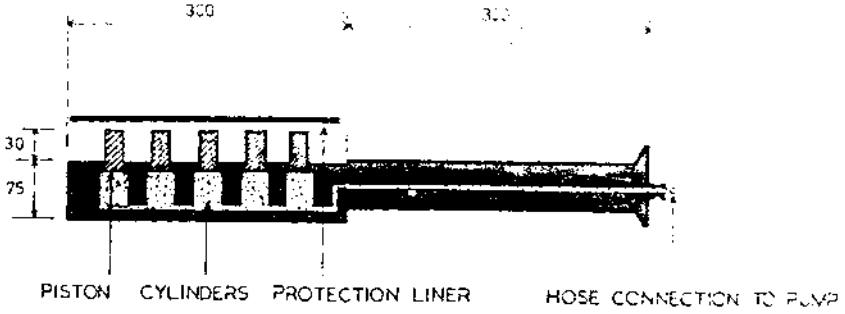
(c) *Adiabatic Expansion Charges* (Sketch 9). These cartridges are manufactured by the Cardox Division of Pikrose & Co Ltd. The cartridge consists of a rechargeable steel shell filled with liquid carbon dioxide and an electrically initiated chemical



SECTIONAL ELEVATION OF WEDGE AND FEATHER BITS



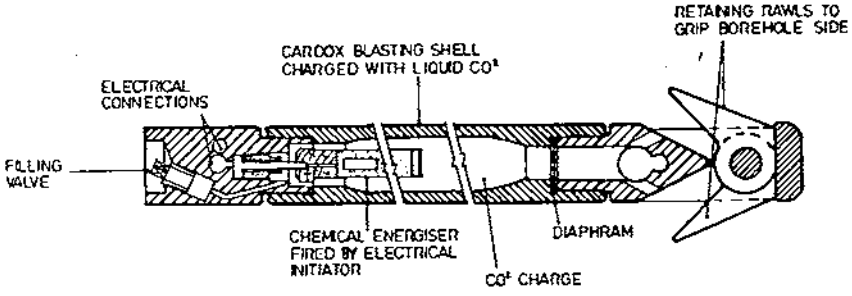
TYPICAL HYDRAULIC WEDGE AND FEATHER SPLITTER



WEIGHT 5 PISTON MODEL 11kg
10 PISTON MODEL 18kg

SECTION THROUGH A HYDRAULIC PISTON BURSTER

SKETCH N° 9



ADIABATIC EXPANSION CARTRIDGES

heating compound. When a current actuates the compound, the pressure of the carbon dioxide increases causing a steel diaphram to rupture. The gas pressure at rupture varies from 125N/mm² to 270N/mm² depending on the cartridge size and membrane strength. The cartridge acts as a low explosive without a shock wave. The charge will split concrete but will not cut reinforcement.

(d) *High Explosive Borehole Charges.* High explosive borehole charges are the most effective way of exploiting boreholes. The shockwave from the charge causes fragmentation, an effect which is increased by the gas under pressure in the fine radial cracks. Subsequent gaseous expansion throws the shattered concrete clear of the target. Advantages can be gained by the use of delay detonators which increase fragmentation and also regulate the flow of shattered concrete through the steel cage.

Breaking Concrete without Boreholes. The following methods of breaking concrete do not require a borehole to be produced:

(a) *Hand-Held Breakers.* Hand-held rock breakers driven by compressed air, hydraulic power or electricity can be used to drive a range of chisel and nail points which will break concrete.

(b) *Plant Mounted Impact Breakers* (Photo 2). Heavy impact breakers can be fitted to many types of plant. They are normally hydraulically operated. Their output is about ten times higher than hand-held machines. They might be a useful tool for the Royal Engineers for use during the preparation of demolitions.

(c) *The Nibbler* (Photo 3). The Nibbler is an excavator mounted tool which grips concrete sections up to 380mm thick and breaks them by bending causing the concrete to fail in tension. The machine is also effective against light reinforcement. Though primarily designed for breaking concrete roads, where it is very efficient, it can also be used against structural members within reach of the excavator. A machine capable of breaking 600mm deep sections is being produced. Though it is of no use in military demolitions it may have a use in Rapid Runway Repair.

(d) *Demolition Ball.* The demolition ball is one of the most common civil demolition tools. The ball weighing up to two tons is mounted onto a crane or heavy excavator. In use the ball is swung or dropped onto the concrete to be broken. Obviously this device has no use on the battlefield but other high kinetic energy sources are available such as the 120mm APDS round with an impact energy between 100 and 1000 times that of a demolition ball. It may also be possible to develop a large Misznay-Schardin charge. This device consists of an explosive charge and a metal disc which is set up remotely from the target. When fired the disc is propelled into the target shattering the concrete.

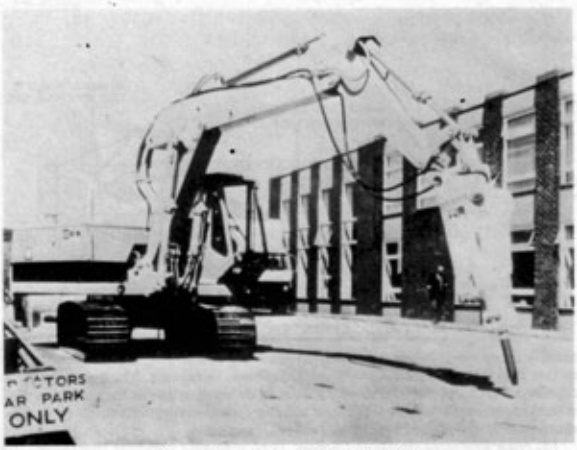


Photo 2. A plant mounted impact breaker.

(e) *Water Jet Cutting*. The concrete matrix can be cut by a high pressure water jet. Modern equipment produces a pulsating jet of water at pressures of up to 120N/mm^2. This erodes the concrete mortar and removes the aggregate. The method is very slow; a 300mm slot 3.5m long takes 7.5 hours to cut. The steel reinforcing is undamaged, thus the method is particularly useful in building modification where a new RC member is to be grafted on.

(f) *Explosive Concrete Shattering*. Shattering charges, which are placed on the surface of a target, are larger than borehole charges because the concrete is stripped by shock wave action only. As the shock wave comprises only about 15% of the total energy of the explosive and half of this is lost to the open face, the method is not as efficient as borehole charges. Shattering charges, however, do not require boreholes to be produced.

Methods of Cutting Steel. After the concrete has been stripped from the reinforcement, the steel must be cut. This can be done by shearing, sawing, burning or using explosives:

(a) *Sawing*. Reinforcement can be cut by angle grinders or saws. Hand-sawing is too slow to be economic or practical but mechanical saws powered by compressed air, petrol, electricity or hydraulic power are used extensively in civil industry.

(b) *Shearing*. Light reinforcement can be cut with bolt croppers or shears.

(c) *Burning*. There are a number of methods of burning steel reinforcement. The terminology is loose because a portion of the unburnt molten steel is carried away by the gas stream. After initial heating the steel provides the fuel which is burnt in oxygen. The following methods can be used:

(1) *Oxygen-fuel Gas*. Oxygen and a fuel gas are burnt to pre-heat the steel to red heat. Oxygen is then blown onto the steel which starts to burn. Natural gas, acetylene, butane and propane are commonly used as the fuel gases.

(2) *Thermic Lances*. Thermic lances can be used to cut reinforcement.

(3) *Electric Arc Cutting*. The normal method of arc cutting steel is to use a hollow carbon electrode to strike an arc. Compressed air or oxygen is passed

Battlefield Cutting of Reinforced Concerete Structural Members (2)

down the hollow electrode to burn and remove the steel. A particular use of this method is arc air gouging for cutting reinforcement in boreholes.

(4) *Thermit Powder*. Thermit powder has been used to cut structural steel member. (Photo 4). The powder is a mixture of aluminium and magnesium powder with an oxidizing agent. The powder burns with great heat, ie

$4Al + 3O_2 = 2Al_2O_3$ + heat (8.15 kWh/kg of aluminium)

$2Mg + O_2 = 2MgO$ + heat (6.19 kWh/kg of magnesium)

Effective cutting of reinforcement will depend on the removal of molten material or the parting of the steel whilst molten. Thermit may be of military interest.

(d) *Explosives*. Steel can be cut explosively by cutting charges or by Linear Shaped Charges (LSC):

(1) *Cutting Charges*. Steel cutting charges form a high pressure shock wave which passes through the steel. When the wave meets a free boundary the particle

Photo 3. The nibbler.

Battlefield Cutting of Reinforced Concerete Structural Members (3)

Photo 4. Thermit powder charges burning through structural steel members.

energy is sufficient to overcome the nigh ultimate tensile and shear stresses in the steel and form a scab of steel which flies off from the parent metal. The subsequent gaseous expansion plays little part in the process. To be effective, the charge must be in intimate contact with the steel; a small stand-off, even of concrete, reduces the effect of the charge. The face opposite the charge should be free of concrete. The method is far too fiddly to be a battlefield technique.

(2) *LSC*. LSC will cut reinforcing steel at a distance (about 1 m through air for a standard service hayrick charge).

Current Single Stage Methods of Cutting RC

Concrete and steel can be cut simultaneously by the following methods:

(a) Diamond tools.
(b) Thermic lancing.
(c) LSC.

Diamond Tools (Photo 5). Diamond saws and drills cut RC with great accuracy. The tool edge consists of a bonded surface into which diamonds are set. As the edge wears new diamonds are exposed. These tools cut through the hardest of aggregates and steel but blade wear increases with the hardness of material cut. Cutting rates of diamond tools are very dependent on aggregate hardness and the density of reinforcement in the RC member.

(a) *Diamond Saws*. There are three types of diamond saw:

(1) *Wall Circular Saws*. Wall saws are mounted on a rail which has been bolted to the work surface. Using this surface they can exert the high pressure needed

Battlefield Cutting of Reinforced Concerete Structural Members (4)

onto the blade. Though called wall saws, they can be used on any surface. A maximum blade diameter of 1200mm gives a depth of cut of 525mm when powered by a 24kW hydraulic motor. By sawing from both sides, members of up to 1m deep can be cut to accuracies of ± 2mm. At rates of between 0.5m/h and 3m/h for a cut 375mm deep.

(2) *Floor Circular Saws.* These are lighter machines which are hand-controlled. Blade pressure is provided by the self-weight of the machine.

(3) *Reciprocating Saws.* These saws are a new development which enable sections up to 1.2m deep to be cut at rates between 0.5m/h and 2m/h depending on aggregate hardness and reinforcement density.

(b) *Diamond Drills.* Diamond drills can cut cores through RC members. Maximum diameters of about 550mm can be obtained with no practical limitation on depth at drilling rates of between 300mm/h and 900mm/h. If a member is too deep to cut by wall sawing, core drills can be used to stitch drill the member to form the opening.

Thermic Lancing. Although thermic lancing is a technique for boring holes, it can be used to cut a member. A series of holes are bored and these are linked up. Cuts of up to 2m deep can be achieved.

Linear Shaped Charges (LSC). LSC use the Munro effect to produce a jet of gas and molten material which is fired into the target. The in-service CD14 is an example of the charge. The effect of an LSC is dependent on the target and the charge geometry and weight. The charge weight increases rapidly with the depth of cut required. LSC have been used to successfully cut reinforcement at depths of up to about 300mm. Thus a maximum depth of cut of 600mm in concrete could be achieved by attacking from two sides. The shattering effect of an LSC on concrete is no different from that of an equivalent weight of concrete stripping charge.

Industrial Research and Development

Industrial Development. Industrial development of present techniques can be expected in most fields, but two areas deserve special mention:

(a) *Hydraulic Power.* In the next few years hydraulic power units can be expected to increase in power but decrease in weight. The two factors which suggest this are the increasing use of aluminium instead of steel components and the use of pressure intensifiers. The latter enable low volume, high pressure hydraulic machinery to be developed.

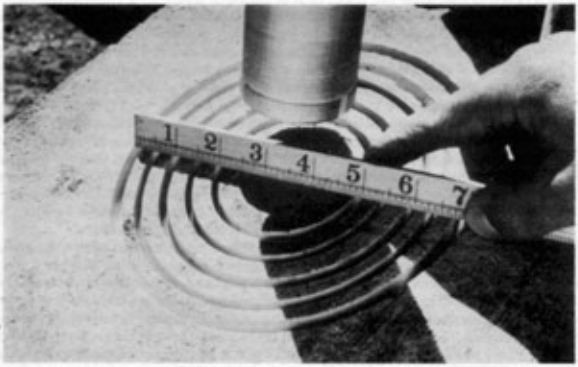


Photo 5. Concentric cuts made by different sized core drills indicating precision of cut.

Battlefield Cutting of Reinforced Concrete Structural Members (5)

(b) *Explosives.* In the last decade there has been considerable research into the use of explosives in mining and quarrying. Whilst it is unlikely that explosives power will increase, or that the energy available will be redistributed to make the shock-wave more effective, developments can be expected in technique. Improvements to ease the handling of charges can also be expected such as the widespread use of slurry explosives. These explosives do have two problems as far as the Army is concerned. Firstly the velocity of detonation, and thus the attendant shockwave, is low and secondly there are storage problems.

Experimental Research. Research is being carried out on a number of new techniques but whether they result in new industrial processes remains to be seen. A major problem is the quantity of electricity required to power them. Much will depend on being able to focus all the available energy into small areas of a target. The following processes are under research:

(a) *Plasma Troches.* Plasma is obtained by passing certain gases under pressure through an electric arc. The gas molecules break down to individual atoms which in turn are stripped of electrons to form free nuclei. These produce high temperatures in the range of 10,000–40,000°C. The Materials Research Laboratory at Southall produced a 30kW torch but the main problem was the slow flow rate of molten concrete. This has been overcome in a torch which is under development at the Battelle Institute in Geneva where oxygen is turned into plasma by the arc across two iron electrodes. The iron can be used to provide a flux to help the molten silica flow.

(b) *Lasers.* Birmingham University have weakened concrete with light emitted from a 10kW nitrogen-carbon dioxide laser. The light energy is converted to heat energy which causes cracking and melting of the concrete. Attacking reinforcement is more difficult because of the reflective properties of metal. Thus to be able to cut an RC bridge deck power outputs of between 1 and 10MW are required. Laser power losses are high and so energy inputs of the order of 10 to 100MW are required. This is the output of a small national grid generating station and clearly is not a viable battlefield power source.

(c) *Remote Heating of Steel.* The protection given to the steel by the concrete is difficult to overcome. A major advance would be made if the steel could be attacked prior to the removal of the concrete. Remotely heating the steel is a possible method of doing this. High power inputs are required; for example, at a 5% reinforcement volume there are 425kg of steel/m^3 of RC requiring 120kWh to melt it (6kWh/100°C and 25kWh to overcome the latent heat of fusion of steel).

(1) *Microwave Radiation.* Short electro-magnetic waves can penetrate solids. The shorter the radiation the greater the depth of penetration. During its passage through a solid some of the radiation is absorbed and the energy converted to heat. Thus if an ADM is placed on a concrete bridge X-rays from the device penetrate into the bridge. The X-ray energy is converted to heat which in the case of a nuclear explosion is sufficient to form a fireball. In 1956 the Building Research Station produced microwave equipment operating with a wavelength of 300mm to measure concrete moisture content. This was developed and sufficient power generated to raise a very small volume of concrete to temperatures of 1300°C. To be practical all the steel across a bridge deck would have to be raised to above 900°C prior to the structural member being overloaded. The high power requirements necessary to heat large volumes of concrete, in order to heat the steel sufficiently to cause its failure, make this method unattractive.

(2) *Eddy Current Heating.* There is a Japanese patent out for a process to heat prestress tendons inside concrete by means of eddy currents. Powerful electromagnets produce magnetic fields which alternate at frequencies of between 150 and 10,000Hz. These fields induce an electric current in a conductor which in turn produces heat. This method overcomes the objections to microwave radiation because the heat is only generated in the steel. However other energy losses are likely to be high. This coupled with the size of equipment required mitigate against its use on the battlefield.

Deductions from Current Methods

Civil industry has adequate means for the cutting of RC because it has the one commodity we have not got: time. Improvements will be welcomed but the main thrust of industrial research and development will be directed towards improving safety, reducing noise and cutting costs. The answers to military problems therefore are unlikely to come from civil industry because their aims are so different.

The primary military method for cutting RC must depend on explosives especially the linear shaped charge though there may well be a use for the Misznay-Schardin charge, the concrete shattering charge and the borehole charge. There may also be a military use for thermit powder.

There is military potential in the new hydraulic machinery and also in the plant mounted impact breakers in the preparation phase of a demolition.

Very precise cutting methods such as diamond tools and water jet cutting are available which should be acceptable to the civil authorities for the peacetime modification of structures to accept charges in war.

More powerful linear shaped charges can be expected in the future but these are unlikely to provide a complete solution to the problem of cutting reinforced concrete.

IMPROVING THE MILITARY RC CUTTING CAPABILITY

To improve the military capability a two pronged attack on the problem is required. Firstly there is a requirement for research and development to test and improve military charge systems and secondly our peacetime preparations can be significantly improved.

Research and Development

In the past effort has gone into increasing the power available to the military engineer. Unfortunately this approach is governed by the laws of diminishing returns. For example to cut twice a given depth of material requires more than a four-fold increase in explosive charge weight; a square or even cubic relationship exists. Power of the order required to completely cut a bridge deck by brute force alone is limited to nuclear demolition devices for all practical purposes. However improvements in our cutting ability may be effected by a more skilful use of the power available at present. The following examples are cited to illustrate the use of a composite attack against the composite material.

(a) *Borehole or Shattering Charges Combined with Linear Shaped Charges* (Sketch 10). This first combination makes use of the fact that the majority of the steel to be cut is near the surface of the target. That steel is cut with a linear shaped charge. The concrete is attacked by either a borehole charge or a shattering charge. Research is required to determine the best firing times of the two types of charges. The question to be answered is whether the linear shaped charge is fired before, at the same time or after the associated concrete charge. There is probably a dramatic difference in effect if the timing is correct.

(b) *Cooling Reinforcing Steel* (Sketch 11). The second combination relies on a change in the properties of reinforcing steel induced by low temperatures. If ducts existed or were prepared in peacetime within about 50mm of the steel we wish to cut then the steel could be rapidly cooled in war to temperatures between $-100°C$ and $-200°C$ using liquid nitrogen. Relatively small pressure charges would cut the structural member. Research is required to determine:

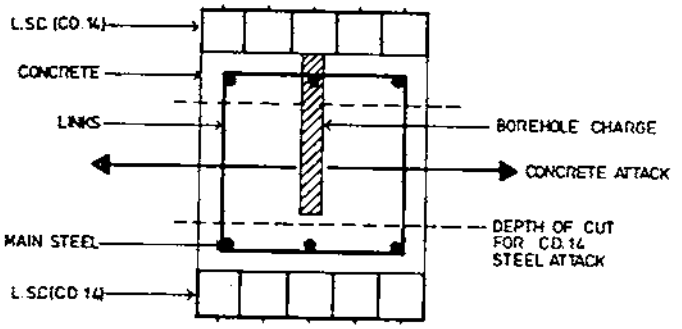
(1) How long the cooling process takes.

(2) What the residual strength of the member is when cold so that its use as a Reserved Demolition can be assessed.

(3) What size of charges is required to effect the cut.

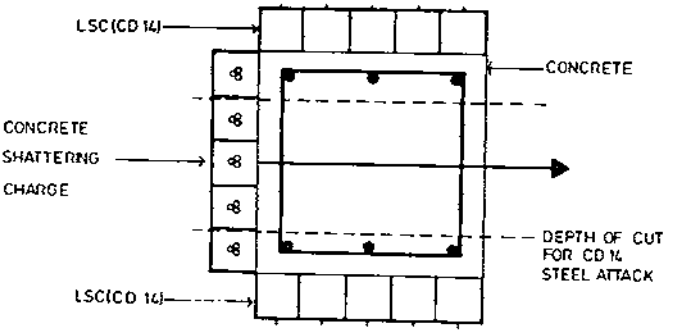
(c) *Borehole and Thermit Charges* (Sketch 12). The third system consists of a low order borehole charge which is used to strip the concrete from the steel. At the same time as the borehole charge is fired a thermit charge contained in a perforated steel canister is ignited. The holes in the canister permit heat and flames to go to the

SKETCH Nº 10



BOREHOLE CHARGE

SHATTER CHARGE



BOREHOLE & SHATTER CHARGE USED IN CONJUNCTION WITH LSC

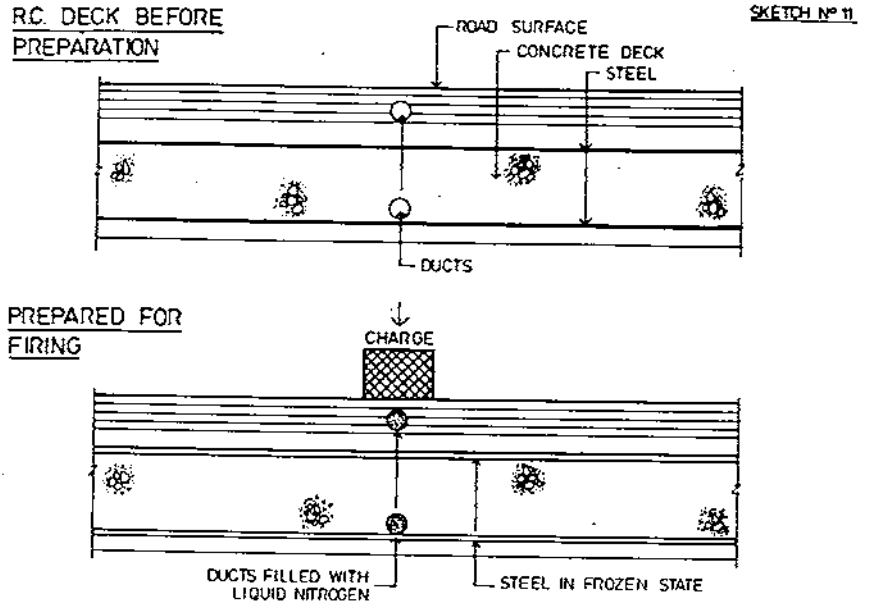
outside of the canister before the canister itself is consumed. The thermit charge and container falls slowly under gravity severing successive layers of reinforcement as it drops.

(d) *Multi-stage Attack Device* (Sketch 13). It may even be possible to develop a three-stage single shot device. When the charge system is initiated the following sequence of events happen:

(1) A conical shaped charge fires into the target creating a borehole.

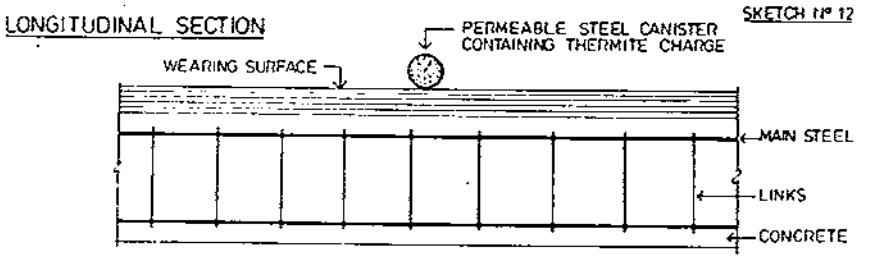
(2) A charge is fired into the borehole and initiated to strip the concrete.
(3) A linear shaped charge fires to cut the steel cage or alternatively a thermit charge is used to sever the reinforcement.

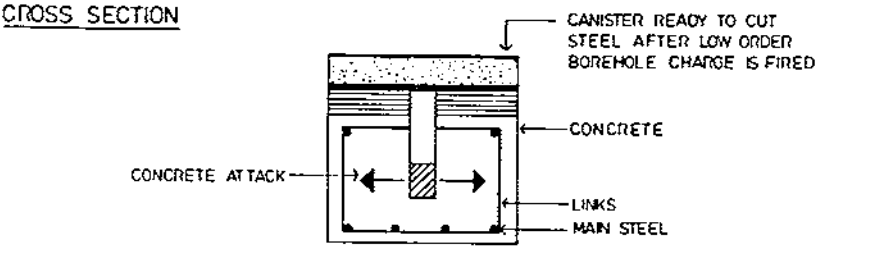
SKETCH Nº 11



LIQUID NITROGEN FREEZING ON DECK + CONVENTIONAL PRESSURE CHARGE

SKETCH Nº 12





THERMITE & LOW ORDER BOREHOLE CHARGE

SKETCH N° 13

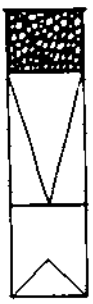
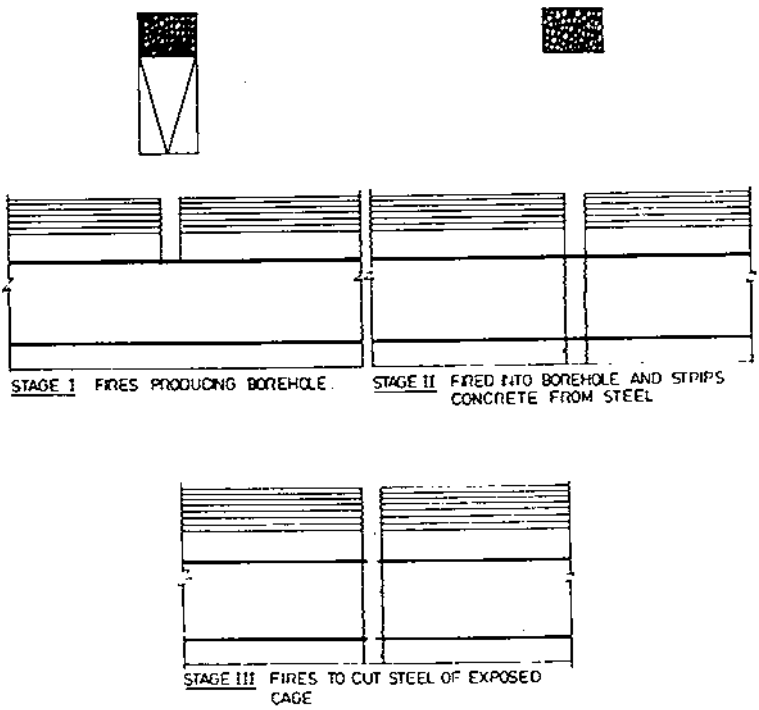


DIAGRAM OF R.C. ATTACK DEVICE



3 STAGE SINGLE SHOT R.C. DEMOLITION DEVICE

Peacetime Preparatory Work

The purpose of peacetime preparatory work is to enable a demolition to be rapidly and effectively executed in war. It consists of two parts:

(a) Planning.

(b) Target preparation.

Planning. Steel structures are relatively predictable demolition targets. They are easy to reconnoitre and the calculations of amounts of explosives and stores are straightforward. RC structures, on the other hand, have many unknown factors,

especially the location and quantities of reinforcement. A far more rigorous and sophisticated approach is needed. The following are required:

(a) *Manpower*. The demolition of major RC structures in BAOR is complex and vital. The planning should be done by the Corps civil engineers who have a specialist knowledge of RC.

(b) *Information*. Many of the bridges in BAOR could be cut now, in a single attack, with in-service equipment and techniques. However, because assumptions based on worst cases are made, excessive manpower and materials are committed to their demolition. If the original construction drawings were obtained, plans would be realistic and economic. In the unlikely event of the drawings not being available the reinforcement levels must be located by other means; such as X-ray techniques.

Target Preparation. Time is available in peace to plan and construct the charge holes and fixings required in war. This is already done on many bridges in West Germany but the quality could be improved and the work extended. It is possible now for a bridge to be constructed or modified so that all the boreholes and the LSC containers are cast in situ. The bridge is charged just prior to demolition with a slurry explosive pumped into the charge containers, just like grout into a prestressing duct. The details of this and other types of preparatory work would be determined by the detailed demolition plans made in peacetime.

Limitations. Preparatory work is not an easy solution to the demolition of RC. Modification to structures is resisted by the civil authorities. Technically, the solutions will tend to be unique to individual targets. Tactically, preparatory work may prejudice surprise and it is also vulnerable to sabotage. Nevertheless, it is a way to significantly improve our capability of cutting RC members and it could be introduced at short notice.

CONCLUSIONS

This paper has examined the engineering problems associated with the cutting of reinforced concrete as such. It has discussed a single factor in the wider appreciation of the problem of the demolition of reinforced concrete.

The answer to the military problem is unlikely to come from civil industry where economy and safety are the prime requirements.

Research and development is required to give the Corps a good RC cutting capability. The way forward is probably by the more skilful use of the power we have available now and not in the creation of larger power sources.

Many of our problems would be solved if the demolitions were designed from the original construction drawings, thus designing for the actual problem and not an assumed worst case. For the most critical or complex targets the Combat Engineer may need to enlist the aid of the Corps Civil Engineers.

Finally the detailed demolition plans made in peacetime must show what preparatory work must be done prior to a war and that work must be done.

* * * *

DISCUSSION

Mr L Furze (RARDE) had been invited to attend the Meeting. He opened the discussion as a "nominated" speaker and spoke in amplification of some of the aspects of the main paper. He joined Captain Davis to field questions from the floor.

Colonel R A Pinder, CRE 1 Div, took the Chair for the discussion.

Q. Brigadier Groom. In the multi-stage charge, how would you control the firing of the stages?

A. Mr Furze. It would be controlled by a single act of firing but the device itself would require complex electronic fuses to produce the microseconds of delay required between stages.

Q. Major General Pollard. In a RC beam used in a bridge, the underside would normally be in tension and the upper part in compression. Since concrete is much

weaker in tension would it not always be better to attack a bridge from the underside?

A. Captain Davis. In continuous span bridges tensile forces are set up in the top steel of a bridge deck over the piers and cuts of this tensile steel could be easily made there. However, in general terms, if one wanted to cut a span, one would have to aim to cut both upper and lower steel reinforcing bars.

Q. Lieut Colonel Peck. If the lower steel reinforcement in bridge beams were cut and a heavy weight, like a tank, attempted to cross the bridge, would you not expect the upper steel reinforcement to fail?

A. Captain Davis. Yes, but failure of the bridge deck would be by the formation of a plastic hinge which may not lead to complete bridge collapse before loading by the tank.

Discussion. This point was developed further and included discussion on the suggestion that if the reinforcing steel plans were available then a point of attack could be selected at which only 50% of the normal strength of the steel would be encountered. This point would be found from examining where the steel reinforcing bars were joined inside the beams.

Q. Lieut Colonel Coe. Mention has been made of the use of explosive slurry. Could it be pumped into bridge conduits or preformed chambers and what storage problems are associated with it?

A. Mr Furze. A specialized pumping vehicle would probably be needed and possibly also a mixing vehicle. The latter would be required if the explosive slurry was stored as harmless constituents. The slurry has a relatively low velocity of detonation but a longer pressure wave than plastic explosives so it is not ideally suited to the cutting of steel. However it does have the great advantage that it can be stored as harmless constituents.

Discussion. Colonel Pinder added that there would be inevitable problems with civil authorities on the question of drilling existing bridges. Methods of saving time in target preparation were needed.

Q. Brigadier Groom. Bearing in mind the clear difficulties in successfully attacking a RC bridge, would it be better not to attack the bridge at all and attack the abutments?

A. Captain Davis. Abutments do present an alternative target and alternatives should always be considered.

Q. Major General Pollard. Are there any particular problems associated with the use of thermit powder?

A. Captain Davis. The components used are stable and acceptable civilian techniques already exist. Its use poses no greater risk than that associated with conventional explosives. It burns the target and does not smash it as does a conventional explosive so the time taken to induce failure would usually be longer.

Q. Lieutenant Anderson. Could Fuel/Air explosives be used in the voids which often occur in bridge structures?

A. Mr Furze. It has proved difficult to get reliable information on this subject. RARDE did some work on it a few years ago. In general, the Fuel/Air explosive appears to have low destructive power when used against RC.

Q. Major Lane-Jones. Have methods been examined whereby the harmonic frequency of a given bridge could be used to destroy the target?

A. Captain Davis. The problem is that as vibrations start, the coefficient of damping tends to increase. This means that the bridge would not be able to store enough energy to destroy itself.

The Chairman closed the discussion and, on behalf of the forty-two Members who attended, thanked Captain Davis and Mr Furze for providing an interesting and stimulating evening.

Success Out of Failure
Ex Waterleap 1978

MAJOR J B BENNETT RE, B Sc, C Eng, MICE, FI Plant E

The author was commissioned in 1966 after taking a physics degree at Nottingham University. In his first appointment as a Fd Tp Comd he saw service in Canada, Cyprus, Bahrain, Sharjah and Masirah. A desk-bound job with HQRE 4 Div was followed by his appointment as Adjt of 22 Engr Regt. In 1973 he was on his Long Civils Course followed by an RSME tour as an instructor in the Civil Engineering School. In 1977 he spent a sabbatical year studying for professional examinations. He took command of 52 Fd Sqn (Const) in May 1978 a few days prior to their departure on Ex Waterleap.

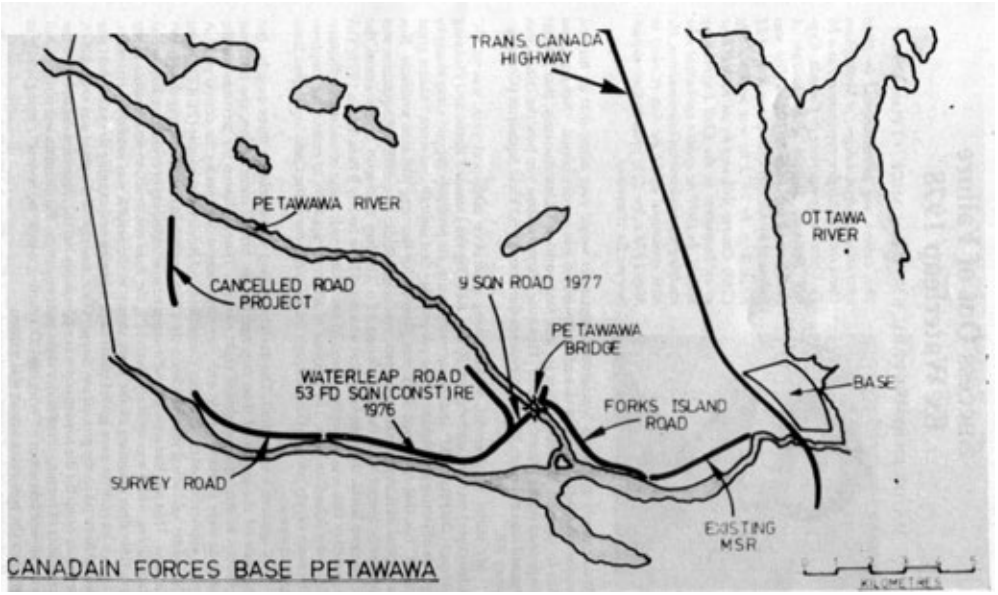
WHAT newly appointed Squadron Commander would ever admit that on his first major exercise the primary task of the Squadron was not completed. "Not me", you say to yourself, "I would never get into that position". Unfortunately, that is what happened on *Ex Waterleap 1978*. However I hope to show you how the failure was turned into a success, if only to redeem the name of 52 Field Squadron (Construction) RE.

My initial involvement, whilst having a carefree sabbatical year, was as OC (designate) on the Confirmatory Recce. Reading the Detailed Recce and Planning Report (DRPR) "cold" and then arriving at site, are probably as good a way as any to get an objective assessment of the project. My first impressions were "what a great place" but that too much work was planned for the time and men available. Not untypical of many overseas projects, you might think. In detail, the Squadron was primarily tasked with the completion of a 210 feet twin-span bridge across the Petawawa River, the foundations of which had been laid by 9 Para Sqn in 1977. The secondary task was the construction of two 3km roads some considerable distance from the Squadron base. The purpose of all three tasks was to extend and improve the main supply route (MSR) through the training area of the Canadian Forces Base at Petawawa.

My concern was twofold. The exercise period was nominally three months, but because of the length of time required for the bridge construction, the task was planned to stretch over almost eight months. Times allowed for activities on the cascade were extremely tight with pier construction dominating the critical path. A quick application of the Program Evaluation and Review Technique (PERT), learnt during my sabbatical year, showed only a 25% probability of completing the project on time. That was bad enough and it assumed over-manning of critical trades, such as carpenters, which was unlikely. Secondly, the road construction was feasible in the available time assuming all the plant shown in the DRPR was available. However, the two hour drive over gravel roads each morning and evening to the farthest site would have taken the grin off any Sappers face, and not all the plant was available. A separate camp for the road teams was a possibility but the Squadron did not have the capability of running three major tasks and two camps. My dilemma was obvious, but what should I do about it? With the CO's parting words "be honest" ringing loudly in my ears the post recce report was written.

It obviously caused great consternation at Engr Branch UKLF. I was hurriedly

Ex Waterleap 1978 - Major J B Bennett RE



Success out of Faliure Ex Waterleap 1978

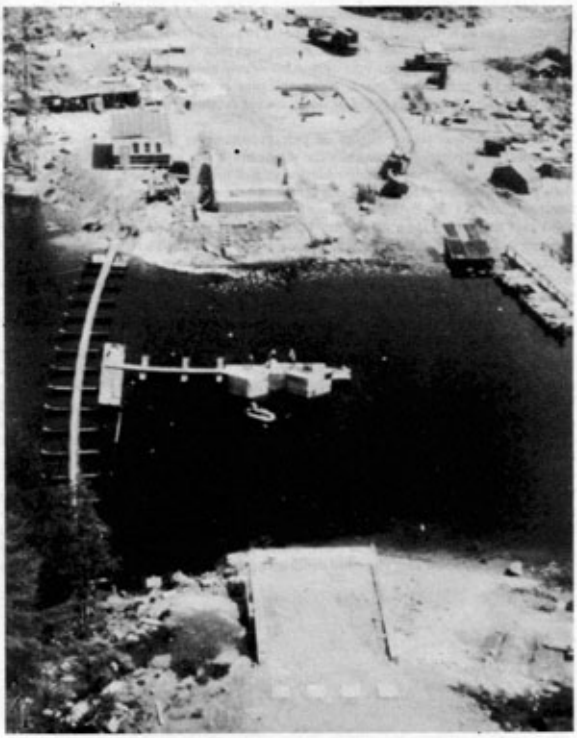


Photo 1. Petawawa River Bridge. On the near bank are four of the concrete grillages ready to accept the steel bridge beams. The pier has reached the level at which the tendons are stressed.

two week attachment with Tarmac Ltd, working on the rocky new A9 South of Inverness. The attachment was arranged by Civil Engineering Wing RSME so that the teams could gain experience on the same type of drilling rig as they would be using in Canada.

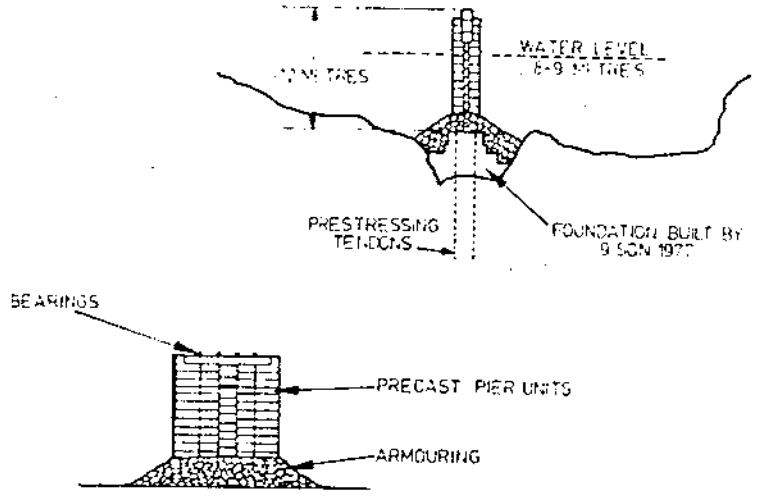
Deployment started with the Resources Sergeant accompanying the recce team to Petawawa to start his eight month sojourn. His vital work started with the takeover of stores stockpiled under four feet of snow by 9 Para Sqn (not deliberately, I hasten to add). Following closely on his heels the oddly named Pre-Advance Party flew out in April 1978 whilst the remainder of the Squadron was still at RAF Bruggen on its annual ADR exercise. This party consisted mainly of divers and drillers who were to start on the first important task on the bridge critical path; that of drilling the numerous 13 metre deep tendon holes beneath 8–9 metres of fast flowing river

Success out of Faliure Ex Waterleap 1978 (1)

summoned to give an explanation and as a result one of the road projects was cancelled and 62 CRE's aid was enlisted to try to reduce the critical path length of the bridge project. The problem with the bridge was that the Squadron had to squeeze almost two summer projects into one. Also nearly every activity lay on the critical path with the major bottleneck being the pier construction. Until the pier was complete few others things could be done, except fabricate the three section continuous steel beams.

The simple and clever design of pier produced by 62 CRE was of pre-cast segmental construction. Essentially the segments which had been cast in 1977 by 9 Para Sqn, were stacked on the foundation in 8–9 metres of water. The blocks were then post tensioned vertically by pre-stressing tendons anchored 13 metres into the fissured granite. (Fig. Petawawa River Bridge pier). The two stacks of blocks, now solid pier legs, were then made into an immensely strong portal frame by a large capping beam cast in-situ. This capping beam was redesigned so that most of it could be pre-cast. Also the labour intensive timber deck formwork was largely replaced by modern conventional steel "permanent" formwork. This could be rapidly fixed by Ramset bolts and did not need removing after the deck was cast. We seemed to be getting onto firmer ground now and at last the exercise taskings were manageable, even if shift working would be necessary on the bridge.

This complex technical project required all ranks to undergo pre-project training. The planning for this started with the thorough DRPR produced by 62 CRE. This suggested what training was appropriate, and costed it. Unfortunately life was not to be so easy; *Op Burberry*, snow clearance, flood relief, taceval (Tactical Evaluation of an RAF Sation by NATO) in BAOR, and a major ADR exercise in BAOR all ate deeply into the pre-project training period. Fortunately the major problem likely to be encountered on the bridge had already been isolated by 9 Para Sqn in 1977. The drilling of the 4 inch holes into the fissured granite for the pier tendons had caused so much difficulty that none had been drilled successfully. Consequently, drilling received priority with a civilian course and then drilling and grouting practice in a flooded Cornish quarry. Pier construction was practised and a small composite steel beam concrete deck bridge was built, which highlighted the shortcomings of our inexperienced tradesmen. The road drilling teams became highly proficient during a



PETAWAWA RIVER BRIDGE PIER

complete with ice floes. The remainder of the party was made up by a troop from 9 Para Sqn, who had taken on the task of rebuilding all the rafts, piers, footbridges etc, which they had used the previous year and dismantled for the winter.

Progress was good and then on 26 April the fateful signal arrived telling us that the civilian firm fabricating the steel bridge beams was on strike. Optimistically, and with assurances from local people, we thought there would be no problem and the latest delivery date of 1 July would still be met. With the warning bells ringing the Advance Party or Pre-Main Party (I was never quite sure) drew their ration of insect repellant and went into the bush in mid May. The weather was now warming up and all the ice and snow had disappeared. Life was beginning to get easier so the troop from 9 Para Sqn decided it was time to return home now that their tasks were completed.

The Main Party (at last) joined for battle with the deerfly and mosquitoes at the end of June just as the last of the tendon holes was drilled for the bridge pier. Work also began in earnest on one of the 3km stretches of road called Survey Lake Cut-Off Road, which for obvious reasons was renamed Survey Road.

Unfortunately the steelwork strike had not been resolved and so it was now not possible to achieve the Squadron's primary task. (Looking on the brighter side however there could be a chance we might return in 1979 to complete the bridge). At least now the Squadron had some spare capacity and could move its back from the proverbial wall.

Much of the spare capacity was planned to be used on a second 3km section of road named Forks Island Road, which ended at the bridge site. This section of the MSR had no access difficulties and was close to the base. A series of section tasks topped up the work load, particularly on the management who were extremely busy planning the new tasks.

Work on the bridge, now reduced to pier and abutment completion, went fairly smoothly flowing down the cascade with the odd prod from 62 CRE to keep it on the straight and narrow. Tendons were placed, grouted solid, pier blocks stacked and grouted, the pier legs stressed and the capping beam cast by August. Work was virtually as complete as we could make it for the bridge and little remained to be done except stockpile the stores for 1979 and clear up.

The two roads developed rapidly with the operators thoroughly enjoying themselves on plant ranging from very old to superb. At least field squadrons on previous "Waterleaps" had done their best to wear out much of the available plant. Some plant was therefore antique (well almost) and definitely older than its operators, with consequent lack of spares, and the remainder was brand new. The new plant had a serious defect, according to the operators, as the car radio and headphones had been removed before delivery.

Everything cannot go smoothly for too long however; the two Ingersoll Rand Air Tracked drilling rigs hired to drill the dolerite and granite on both roads were superb drills but the initial contractor was unreliable, also far more rock was found than the DRPR estimated. Extra drills were hired and the benefit of the pre-project training with Tarmac Ltd on the A9 was really proving its worth. The surrounding countryside was rocked daily by large blasts. One 8000lb blast earned the eternal gratitude of a cottage owner when a permanent skylight was installed in his verandah roof. With blasts like that the cascade was gradually put back on its proper course. In true Sapper style the opening of Survey Road in early September by the British High Commissioner, Sir John Ford KCMG, MC, was heralded by yet another bang. Forks Island Road will be completed this year when the final embankment is made to the bridge and the landscaping completed.

As with all overseas exercises a major headache can be the return of stores at close of play. To forestall this, the QM started the handback the day the main party settled in, which was three months after the exercise started. This was fortunate because now the bridge beams were not going to arrive there was no need to stay until the November snows. Our friendly UK staff arranged earlier flights at the end of

September and the handback really gained momentum. Whilst this was going on with the aid of the Canadian Ordnance computer, which kept all the ledgers, all the section tasks were nearing completion. Range Towers, children's playgrounds, Bar-B-Qs, mess patios, an Inglis bridge, a T5 bridge, and an MGB appeared around the Canadian base. These minor tasks provided very valuable training particularly for the JNCOs who often planned and executed their task with little interference from above. Although they were minor tasks compared with the Petawawa bridge, section commanders were justifiably proud. One was even heard commenting to a visiting senior officer "at least I finished my task, Sir".

All work was rapidly coming to an end by mid September but as all commanders know "all work and no play makes Jack a dull boy". If the steel bridge beams had been delivered on time very little leave and adventure training would have been possible. Double shift working would have been necessary on the bridge to keep pace with the cascade. Without the bridge beams I was given a unique opportunity to plan adventure training and to make sure the troops saw something of the beautiful country we were in. Leave was obviously going to have to be staggered so that work was not affected; but how could the leave allocation be fair when almost everyone would be in Canada for differing periods of time(three–eight months). The SSM as usual saved the situation; "give them three days for every month Sir". That was what we did with leave periods ranging from nine to twenty-four days. The advance party people departed on leave within days of the main body arriving. One of the attached subalterns, obviously an entrepeneur at heart, set up a travel bureau in the Squadron Office. In a very short time he was able to arrange free transport by bus or plane throughout Canada on the military net. Some of the soldiers did go considerable distances to the Arctic, Florida, the Pacific or the Commonwealth Games at Edmonton. The majority however, chose the 800-mile bright lights and sights circuit of Toronto, Niagara, Montreal, Quebec and Ottawa.

The facilities for adventure training were excellent with canoeing by far the most popular. To start with, however, each troop commander organised a "fun" day for the squadron when all except critical work ceased. These Fridays off were a great

Photo 2. Work in progress on the roads. In the near distance is a minor dolerite outcrop which was levelled by drilling and blasting. The difference in vegetation on either side of the alignment is due to a forest fire five years ago. A logger had cleared the road alignment which acted as a fire-break.

Success out of Faliure Ex Waterleap 1978 (2)

Photo 3. The thirty-foot high Range Tower now in use as the control tower for the main fire power demonstration range.

success and ranged from regattas, rallies, tree felling, skeeter shooting and athletics to a white water canoeing race. Spread throughout our time in Canada, they provided a welcome respite from the droves of attacking insects on site. Of course the opportunity was never missed to dunk the officers and have a Bar-B-Q. The close knit diving team, always ready to show that they were a little different from the field troops, arranged a trip to the Canadian Diving School near Vancouver. The only problem with this was the distance; 3000 miles, which was further than a trip to the UK. The reply to my inevitable question was unanimously "we'll drive", and so they did. The 6000 miles return trip took four days of non-stop driving (well almost), except for four days break spent diving in the Pacific. Not content with that they swam the 3 mile wide Ottawa river one Sunday morning and also planned an attempt on the World Underwater Submergence Record. Preparation for this was long and rigorous. Many visits to the School of Underwater Medicine, two 24-hour practices to test skin deterioration, and a no-solids diet for several weeks before the final submergence, kept the divers occupied for many weeks. The attempt to break the five day record was made by Lance Corporal S Cook in the centre of Ottawa in a heated diving tank. He finally emerged after 5 days 21 hours and 8 minutes to be greeted by the British High Commissioner and a huge crowd, an enormous steak dinner and lots of champagne. The Governor Generals' Guard mounting was taking place and the band played "Wings" in recognition of Lance Corporal Cook's achievement as they marched by.

Two days before the main party was due to leave Canada the steelwork strike was suddenly settled. There was still four weeks of fabrication to be done on the steel beams so there was little point in delaying our departure. Sad as it was that the bridge had not been completed, everything possible was done in preparation for its completion the following year. The question was, by whom?

Although the Squadron was sorry to leave after an extremely enjoyable and successful exercise, it was now time for the best trip of all; back home.

Success out of Faliure Ex Waterleap 1978 (3)

Mobilising Air Defence Great Britain (ADGB)

LIEUT-COLONEL P F WHITE OBE, BA

Educated Rugby School, RMA Woolwich and Jesus College. Commissioned into Corps June 1918. Served Gibraltar, Bengal S & M, Bagdad, Waziristan, Sierra Leone, Adj TBRE, Normandy, Far East and Longmoor. BM, GSO3, 2 and 1 with AA. OC 15 Fd Coy, CRE 24 Airfd Const Gp on D Day, Asst Comdt Longmoor, CRE Malaya and Singapore and first CO of Singapore Engr Regt. Retired 1950. Fellow of RGS after Greenland Expedition (REJ 1932) and of Society of Genealogists.

In 1938, 28 Anti-Aircraft Group, one of the four Groups (later Brigades) in 1 Anti-Aircraft Division, commanded all the TA AA (RA) units Kent and Essex. Its staff consisted of a Gunner Brigadier, a Sapper Brigade Major (myself), and a civilian clerk. Our HQ was in a building, also occupied by the Garrison Telephone Exchange, just outside the southern gate of Kitchener Barracks, Chatham.

By Monday 26 September, when Mr Chamberlain was talking to Hitler in Munich, we were on "Alert", manning telephones twenty-four hours a day. At 3.30pm—this time and the code word are the only entries in my diary on this date—the telephone rang and a female voice said "George says ....." (the code word for mobilisation). I recognized the voice as that of the wife of Captain (later Brigadier JH) "George" Boyd, then Staff Captain Searchlights at 1 AA Div at Uxbridge. I asked why George had not phoned me direct, and was told that he had been trying for half an hour but could not get through.

I took a list of the telephone numbers of our ten units to the Garrison Exchange, and told the operator to call them at once. After forty-five minutes I had a reply from Rochester! The operator told me that all the main trunk lines were blocked by people in a panic—ladies discussing what to do with their little dogs if the Germans bombed us. There was no Military Priority at that time. I asked to be connected to my home at Borough Green near Wrotham. This being off the main routes, I got through at once without difficulty.

My wife had given birth to a son the week before, so the phone was answered by her nurse. I gave her the code word and the telphone numbers of our units with instructions to tell each to acknowledge to Group HQ. Within five minutes I had the first reply, and within half an hour, the whole lot. Thus on 26 September 1938—two days before the Navy—the Air Defences of the Thames and Medway were mobilised by my wife's nurse.

But there was a silver lining in this cloud. Fate decided that, in the autumn of 1939, I should be in the AA Branch of the War Office. I was on duty on the night of 30 August. My Director came into my office and calmly said "Peter, I think we ought to mobilise ADGB. Do so." I initiated the dispatch of the code word. After about half an hour, I started ringing the Adjutants of units who I knew personally. All had got the message. Priority had worked. Lessons had been learnt.

On this occasion the Navy beat us by a few days!

Mobilising Air Defence Great Britain
Lieut-Colonel P F White OBE BA

The Qualities of a Sapper Officer

LIEUT COLONEL R M STANCOMBE RE, BSc, C Eng, MICE, AMBIM

Mike Stancombe was commissioned into the Corps in 1961, after winning the Sword of Honour at Sandhurst. After graduating from Shrivenham he served with 38 Engr Regt as a troop commander, seeing active service in Sarawak. He met his future wife during an Army rugby tour in Ulster—shortly afterwards going to BAOR as 2IC of 23 Amph Engr Sqn. He then attended a Long Engineering Course before commanding two Specialist Teams. In between these commands he took over 11 Fd Sqn in Northern Ireland and subsequently went to Southern Sudan with the squadron. He has recently been the E-in-C's Recruiting Liaison Officer and is now on a civil attachment to John Howard and Co Ltd as a Project Manager (Agent) in charge of a £700,000 road construction contract.

INTRODUCTION

First and foremost, it is necessary to remind ourselves of the role of the Royal Engineers. On the battlefield, the Corps' role is clear and regularly practised in BAOR. However, it should not be forgotten that Sappers exist to provide engineer support to the defence forces. In the context of a seven-day, rapidly escalating general war situation in Europe it is easy to be mesmerized by the narrower, battlefield role. Vital as it may be, it is surely essential to remember the Corps' responsibilities elsewhere, notwithstanding its leadership role at home in the event of major conflict—a concept so unpleasant and, hopefully, unlikely, that it appears to be cast aside in favour of the more easily identifiable battlefield aim.

If it is imagined that the unexpected will not happen, it will happen. History has surely proved that the unexpected and unpleasant has had a habit of happening with monotonous regularity, especially when it is least expected. The best way to be prepared is to allow for the unexpected and plan for it. This requires imagination, surely a major requirement for all Sapper officers. Innovation is then needed to develop this imagination just as experience is required to provide realistic solutions.

Sapper officers need a wide variety of qualities, including a flair for practical engineering. Clearly an engineering degree is not always necessary. It has been proved that high quality officers can reach the rank of general without formal engineering or science qualifications. Indeed the selection system is such that a Sapper officer has every chance of reaching high rank in the Army. The danger is that the Corps could put too high a priority on getting its best officers to positions of influence in high places to the detriment of its professional standing in the Services. It is surely of paramount importance that the Sapper officer, whatever his qualifications or lack of them, is able to give the advice and leadership required of him in military engineering matters. If credibility is lost, the standing of the Corps could be seriously affected. It is therefore prudent to examine the qualities sought in future Sapper officers.

QUALITIES OF THE SAPPER OFFICER

To be a successful troop commander, it is necessary to possess an understanding of basic engineering. This is developed at the Royal School of Military Engineering,

The Qualities of a Sapper Officer
Lieut Colonel RM Stancombe RE

Chatham (RSME) during the Young Officer (YO) Course. It is hoped, however, that all Sapper officers will arrive at Chatham with a "bent" for engineering. It must be part of the selection process to ensure that the Corps is manned by officers with this quality, the definition of which should perhaps be re-examined by those who are involved in the acceptance of our officers. This engineering bent manifests itself in a variety of different ways, which suits the Corps' philosophy of attracting a wide range of officer types. Indeed the Royal Engineers has always boasted officers from the widest possible background with an enormous diversity of talents and interests. In many ways, this single factor is possibly one of our great strengths; "mad, married, methodist" or whatever others like to accuse us of being.

An Army officer should show imagination in what he does; a Sapper officer even more so. Once he has an understanding of basic engineering principles, together with the necessary flair, he is in a good position to produce the type of imaginative solutions to problems so vitally needed for success in battle. We can be proud of our past record in this respect, but must ensure that this quality is not submerged beneath the pressures of the modern Army. It will be a vital quality in war when improvisation will be the order of the day.

Following on closely is the ability to innovate. A combination of an engineering bent and imagination should produce the quality of innovation. Much of any future conflict is unpredictable; plans will certainly go awry; new problems will arise and apparently insurmountable obstacles will confront us. It is the Sapper officer who is best placed to influence the course of events by deft and timely innovation which can turn the course of battle. But there is a missing link, without which the result may not be successful—experience.

One of the most valuable assets the Sapper officer should have will be his experience of solving seemingly impossible problems of a practical nature. Perhaps not so noticeable during training in BAOR, but anyone who has been involved in construction projects undertaken by the Corps over the past fifteen years or so will testify to the fact that those involved have been required to surmount such problems. The pressure is often caused by the strict time scale of the project, but also by unforeseeable problems which arise during the course of the job. On many occasions, the Sapper officer has had to use his flair for engineering, imagination and innovation in order to achieve the aim. This will surely be so again in any future war.

THE PRESENT SITUATION

Having selected the appropriate qualities, we must now see how the Corps' current officers measure up. It will come as no surprise to many to hear that we do currently possess a large quantity of officers with afore-mentioned qualities. However, the trend recently has been towards gaining too many officers with insufficient of these "essential" attributes. And if one looks at the method of selection this is bound to be so. Although quite how we achieved the correct balance in the past, if indeed we ever did, is beyond comprehension.

In a period when recruitment is difficult you might believe that the Corps takes every officer it can get. Those who enter Sandhurst after school (before university) are selected by a panel of senior Sapper officers who use the Sandhurst report and an interview as their main tools. The remainder are inspected during a pre-RCB (Regular Commissions Board) briefing at the RSME and accepted, or not, as a result. Clearly this acceptance is subject to the candidate successfully completing the RCB itself and the subsequent Sandhurst course. Sapper officers are selected, in both cases, by attempting to evaluate the essential qualities during the Sandhurst Selection Board or the pre-RCB briefing. Most have scientific "A" levels or degrees and are therefore deemed to have the right qualities, but all have to prove they are practical, imaginative, innovative, etc. So we have a system for selection and are hopefully finding the officer of the right quality.

The recruiting climate is improving for the Corps, more graduates are coming forward and the better quality school leaver is entering the Army through university

cadetship and bursary schemes. Efforts to attract the better quality potential officer are beginning to pay off and it seems that the Corps will, in the future, be in a position to be more selective and choose applicants with both engineering AND soldierly aptitude. Clearly this type of officer is necessary to uphold the traditional good name of the Sappers and is far preferable to the officer with simply an engineering or just a literary background. The Royal Engineers as we have known it will surely become extinct if it fails to recruit high quality officers who are both soldiers and engineers.

RECRUITING SPECIALIST OFFICERS

It follows that the Corps cannot recruit officers purely to fill specialist appointments. It is not a large enough organization to have this dichotomy within—indeed it would defeat the current aim of ensuring that all specialist officers have a sound regimental background. Any supplementary specialists should be sought from the Reserve or civilian life. Indeed, on mobilization this is precisely what would happen.

Rather than recuit more officers with a literary background in order to attempt to place more Sapper officers in positions of influence within the Army, it is suggested that more high quality men with an engineering background who can also communicate should be recruited. In fact, the more one examines the likely tasks of the Royal Engineers in defending the United Kingdom from an aggressor, the more one concludes that it is the officers with the sound engineering background who will be in the position of real influence.

CONCLUSION

The balance of officers with engineering and literary backgrounds in the Corps at present is about right. The number of officers with engineering backgrounds is likely to increase in the future. As long as the vigorous efforts to attract the high quality school leaver who has not only a flair for engineering but also the ability to express himself orally and verbally continue, the Corps should be able to maintain the best balance in the future. As the quality field from which the Corps can chose its officers improves, it will be necessary for steps to be taken to improve our ability to recognize the officer who has a genuine flair for engineering together with the necessary qualities of imagination and innovation which we require. Finally, it is not considered to be wise or necessary to recruit specialist engineers for specialist jobs within the Corps. It is important that all officers who specialize in mid-career have wide experience of regimental duty beforehand.

Military Aspects of Water Supply

REPORT ON A JOINT PROFESSIONAL MEETING WITH IWES

A JOINT Professional Meeting with the SE Section of the Institution of Water Engineers & Scientists was held at Colchester on 21 February 1979. Mr R Armstrong B Sc, C Eng, MICE, FIWES, Chief Engineer in the Directorate of Resource Planning, Southern Water Authority, and Chairman SE Section of IWES, was in the Chair.

The paper "Military Aspects of Water Supply" was presented for the Institution of Royal Engineers by Lieut-Colonel D L Mackay RE, C Eng, MI Mech E, Lieut-Colonel E P F Rose TD, RE(V), MA, D Phil, FGS, MIWES and Major L A Bearder RE, MA.

Although the Meeting took place during a lull in the industrial action being taken by employees of the Water and Sewage Authorities, many present had been involved in contingency planning to cope with possible emergencies should the Government have decided to call in troops. The Meeting presented an excellent opportunity for those present to understand the capabilities of the Corps.

Lieut-Colonel Mackay, CI E&M Wing RSME, who, some time ago, had spent a

year as a Senior Engineer working with the Anglian Water Authority, described the training and capabilities of the RE tradesmen, Clerks of Works, E&MO's and Professionally Qualified Engineers, as well as the main characteristics and performance of the equipments presently in service. He related them to tasks carried out by the Corps ranging from jungle forts to sophisticated desalination installations in various parts of the world.

Lieut-Colonel Rose, a member of the Engineer Specialist Pool (Geologists) TAVR and a Lecturer at University of London, spoke of the need for military hydrogeologists in two World Wars and the subsequent peace. He referred to work in many countries and illustrated both the problems met and the solutions.

Major Bearder, ACRE 64 CRE (E&M) introduced their organization and role in contingency planning, projects and training/liaison. He referred to the well drilling capability of the Corps, our work in St Helena in particular and disaster relief in general. He made the point that we are neither organized nor equipped for disaster relief but we did have a capability if called upon but this was only a by-product of our main role in support of NATO.

The lively discussion was wide ranging, from the morality of using troops in civil emergency, the capabilities of various trades and equipment, and the importance of liaison between the Institutions. It was emphasized that contingency planning can only form the basis of an actual plan which must always depend on the actual circumstances of any particular situation.

After the formal proceedings, and votes of thanks to the speakers, the discussion continued on private topics of specialized and particular interest.

A French Stag Hunt

BRIGADIER E E READ CBE, MC C St J

Brigadier Read enlisted in the French Army on 2 Aug 1914 whilst a Gentleman Cadet at the "Shop" on holiday in France. Britain declared war on 4 Aug. He was eventually recalled to the "Shop" and managed with his Mother's help, to run away from France 14 days later. He rejoined his Batch and was commissioned normally in Nov 1914. He was, as far as he knows, the youngest officer on Gallipoli and was for a time an assistant to the Liaison Officer with the French. He is an interpreter in French and Swedish and a Commander in the Dutch order of Oranje-Nassau.

SEEING the recent admirable pictures in the *Sunday Telegraph* of French Stag Hunting I venture to describe such a hunt, at a different venue, more than half a century ago.

At the time, 1923, I was Professeur d'Anglais at the École Militaire du Génie, at Versailles. There was no mess life, or corporate private life at that time, but I quickly found that an interest in the horse soon broke through an infinity of barriers and opened up a great field of friendships.

At this time there was a central equitation establishment for all the schools at Versailles. It was headed, and largely staffed, by the celebrated *cadre noir* of Saumur. These had considerable snob value, and a member, of whatever rank, was entitled to wear gilt spurs for the whole of his service. This privilege, much to the annoyance of

A French Stag Hunt - Brigadier EE Read CBE MC C St J

some CO's, was also shared by the Knights of Malta, who are also entitled to ride up to the altar of any church mounted. I have never actually heard of anyone who has done it.

The horses, some 300–400 or so, were stabled in the Grandes Écuries of Louis XIV. This is a magnificent complex, just outside the Palace, shaped like a wheel. The four spokes each held about ninety horses and the centre hub had a big tan lungeing ring, in which I have seen two horses lunged simultaneously. When they blew "Feed away" you could hear the whinny miles away! There were several riding schools, apart from an outdoor manège, and the jumping courses, including a (to me) terrifying quarry with a six foot vertical jump down and a one-in-one slope to infinity. I was greatly privileged to be allowed to join in the classes under the Cadre Noir.

Acquiring military horses, for my own use, soon resolved itself.

When hacking in the park, all the old courtesies were meticulously observed. If some doddery old senior officer were walking along a wide ride you either walked too, or else rode gently up alongside, walked, saluted, asked permission to pass, and moved gently forward, accelerating in due course.

Through these equitational friendships the great day eventually arrived when I was invited to the Duchesse d'Uzès stag hunt in the Presidential Forest of Rambouillet. An old friend advised me, "*Vous savez, mon vieux, pour finir la journée il faut savoir conserver votre cheval.*" How right he was; I had already embarked on a course of training to *conserver mon cheval*, and also myself.

I was much helped and guided by a very good friend and excellent horseman, Capitaine Michel Buot de l'Épine of the Chasseurs Alpins. The day before our horses were sent down and cared for. There was no possibility of a second horse, as no horseman would have a clue as to where to find you long enough to catch you.

On advice I wore blue undress and blue striped breeches and black boots, all of which I fortunately had. On arrival at the meet the most glorious sights met the eye. The master and owner, by long tradition, the Duchesse d'Uzès, was already *une dame d'une certaine* age, but very much the boss. She was in black with the hunt collar of black velvet with one inch gold lace edging. She wore a *chapeau tricorne*, edged with gold, very striking indeed, had a broad gold belt with a jewelled poiniard. She rode side saddle. I was presented mounted and had to put my uniform cap under my arm and bow from the waist. This had to be repeated every time we passed or crossed during the hunt, even at full gallop. She was followed faithfully by an English groom in a bowler. Next came the Baronne de Rothschild, not the present Baronne Monique. She was similarly dressed but in pink with miniature medals on one lapel and a carnation in the other. Also with a smaller belt and dagger. *Chapeau tricorne* and side saddle. All *grand chic*.

The members of the hunt were all in pink with gold and black velvet hunt collars—velvet caps,—thigh boots, which were very useful forcing one's way through brushwood. All carried a *cor de chasse*. This is essential. In the forest you seldom get a view except down a ride or a crossride. Whoever starts a stag toots a note to say what sort of a one, a royal, or a hind, or a young one. Then at full speed everyone converges on the sound and more toots indicate to the initiated gone left or right etc.

The next hero was the *premier piqueur*, the huntsman; he had large gold Austrian knots on his cuffs and whorls of gold on his shoulder blades. He had a wide gold belt and a long elaborate broadsword. The *deuxième piqueur*, the first whip, was much the same but in silver and a smaller sword. The *troisième piqueur* the same, but with fewer whorls and knots.

First in the field was the Duchesse's son, the Comte. He was followed by his son, the Vicomte.

Finally there were the immense light coloured staghounds, all branded on one rump with a large U.

Presently we were off down a Ride. Various people spread out and soon we heard a toot which meant someone had started a ten point stag. From then onwards for five hours various toots sounded and one dashed in various directions which you hoped

(in vain) would bring you in view. You had to "*conserver votre cheval*". At one point I had run out of toots and was halted alertly in a glade to listen. The Duchesse, equally tootless, drew up alongside me. As soon as I had taken off my hat and bowed, she tore a strip off me because my horse, tossing his head, jingled my double bridle and I had to get off and muffle it. There was one glorious moment when two of us emerged into a big open clearing with a broad stream. I put my dobbin at it, cleared in fine style; the Frenchman when he came up shouted, "*Ça c'était un cheval honorable*." What finer compliment!

Eventually in late afternoon, I heard so much tooting that even I couldn't go wrong and suddenly emerged on a clearing with a lake about half a mile long surrounded by reeds. No quarry was in sight and the duchesse ordered the debased peasantry and anyone else to beat the reeds. Suddenly the quarry was seen swimming—a hind—with the hounds in pursuit. The *piqueurs* galloped like mad round both sides of the lake to cut off the hounds, which they just managed to do.

The duchesse was furious, tore three strips off the young Vicomte, who had started the whole day with a ten point stag. She would speak to no one. She called for her carriage, a two-horsed, two-wheeled curricle, threw on a sable cape and was driven off the field at a hand canter.

Meanwhile the rest of us got our breath. All the noise had attracted our camp followers. The young Vicomte was not necessarily to blame, as a stag will often even cross its own dam's scent to escape. I was invited by the de Rothschilds to a modest *repas champêtre*. Their footman had arrived, spread rugs on the ground, got out pâté sandwiches, fresh cape gooseberries and champagne etc. Everyone had been most kind to me, I had ridden hundreds of miles, it seemed, I had never seen a stag and I was immensely happy. Michel de l'Épine and I then hacked and walked some five or six miles back to Rambouillet where our horses had a night's rest.

Escape from Singapore—Part III

MAJOR FRANCIS L ANGELL RE

Parts I and II related the story of the departure from Singapore to the arrival at Tembilahan on the Indragirrie River, the trek across Sumatra to Padang, and embarkation on HMS *Danae* for the next stage of the escape. *The story continues:*

CHAPTER FOUR

The aft control tower in HMS *Danae* is quite small, there are wheels and gadgets around the walls; the centre parts of the steel decking had the least rivets or bolts and was accordingly selected as our "sleeping quarters" for the night. It's so very simple when you literally have no baggage, all I had to do was to put my tin hat on the deck as my pillow and lie down. My shirt and slacks were my pyjamas and bedding in one. No one came near us for a while and we just lay about and smoked and thanked God we had got out of Padang before the Japs arrived. A Naval rating arrived in due course with a tray on which were hunks of bread and jam and cups of tea. This proved to be our diet whilst on the ship and we had it three times a day and it went down jolly well; I liked to stand at one of the openings in the walls of our "compartment" and look over the ship. It looked grand. Everything was most tidy and seemed terribly efficient. Things seemed to happen with precision and there were never any stray bodies littering up the place. We stayed in our "quarters" as we all felt that if we invaded the deck we would be shot for making the place look untidy! I did go down to find my brother officers and to inquire about the men. As regards the men I was told that the Navy had them well in hand and not to worry. As regards the officers, well, all I can say is I was very pleased I had some troops because they all were crammed into the Wardroom and all looked most uncomfortable. Agreed, the lucky ones had armchairs to sleep in but it was so crowded that I much preferred my bit of decking and some fresh air. I think we had all taken it for granted that we were making for Colombo and the conversation was mainly as to how long it would take and would we all be fixed up with jobs in Ceylon?

If you look at a map of the Far East you will see that there is a string of islands running down the West coast of Sumatra. We naturally assumed that having passed through these we would turn to the North but not a bit of it, we headed South East. Where the deuce were we heading for? The answer was soon forthcoming—Java. Well, we had originally set out for Batavia but the Japanese were moving so fast that we imagined our usefulness in Java was a thing of the past. This gave us something else to think about. What sort of work were we wanted for, it could only be the same as in Singapore, anything to assist the troops in the forward areas. As I have said before, I don't worry about these things very much and if we were heading for Java, well Java it would be. But I did sincerely hope that after having got away from Singapore, getting picked up by the *Tanjong Pinang* and managing to leave Padang before the Japs came in, I was not going to be boxed up in Java. With these things running through my mind and with the ever present worry of whether my wife and kiddies were safely away, I fell asleep.

The whole of the next day, 21 February, we headed South East and were cracking along at, I believe, 28 knots. It really was all very pleasant. Of course we wondered whether the Japs might come out and bomb us or whether a torpedo would come crashing into us. But these were things we couldn't control and if anything did happen I had tremendous faith in these sailor chaps. We lay about or watched the ship and had bread and jam and tea at regular intervals and with the dusk, settled down for the night.

I cannot say at what time I was awakened, but it was pitch dark. Men were running up the steel cat ladder into our control tower and we had to squat under the little steel table or they would have fallen over us. Each man took up his station and one of them

was at the speaking tube. In the darkness the men were just darker patches against a dark night. Orders came through the tube and were repeated and it seemed as though we were expecting trouble. Well, I hadn't been in a Naval action so I supposed this would be another experience. Quite a lot seemed to have happened to me in the last few days. Then I heard "Stand by For Action" repeated over the tube and thought this is where the sparks fly, but nothing happened. We wait for hours expecting some excitement, however at last further instructions were received and the men filed out and we lay down once more. Subsequently we learned that whilst we were passing the Southern end of the Sunda Straits (between Sumatra and Java) a Naval battle was in progress at the Northern end and our ship was made ready for action to deal with any Japanese craft which might have been around. During this little excitement I again had that rotten feeling of complete uselessness. To be able to do something helps an awful lot but all we landlubbers could do was to keep right out of the way and leave everything to those whose job it was.

The whole of the next day passed without incident and at 4.00 pm we came alongside at the little Java port of Tjilatjap. This little port is to be found on the South Coast at the Western end of the Island. We disembarked at 6.00 pm and for the next thirty minutes the band of the Royal Marines played selections on the deck of the cruiser whilst we stood around on the quayside awaiting further orders. I really believe that the Marines thought we had "had it" and did their best to cheer us up, because it certainly was a bad time to be landing in Java. General Wavell's staff had gone, Batavia and Sourabaya had fallen and here we were at Tjilatjap, the only open port, with the Japs gradually closing in. It wasn't exactly a pleasant situation.

CHAPTER FIVE

It seemed that Tjilatjap was seething with malarial mosquitoes but there was a very large school about forty miles up country on high ground which was being used as a collecting station for British Services. As this area was free from malaria we entrained at 6.30 pm for a little place called Poerwokerto. The train took hours to cover this forty miles, in fact we didn't arrive until midnight, and a most uncomfortable journey it proved to be. The coaches had wooden seats running lengthwise on each side and an additional seat running down the centre. We were very crowded and only with difficulty could one stand up and stretch one's legs. The seats were very hard, the temperature very high, complete blackout and, although they may have been harmless, millions of mosquitoes. As can be imagined we chugged along at a snails pace and occasionally were shunted back along the line. On reaching Poerwokerto we set out on a fairly lengthy march to the school which proved to be a series of bungalow type buildings connected by covered ways, the whole covering a considerable area.

With my tongue in my cheek I asked my CRE when we were to start work. He looked a bit old fashioned and said that the only work we had to do was to get out of Java as soon as possible. The cruiser had been a means of getting us out of Sumatra and so long as we got out it couldn't be helped where she was going. That we had been dropped in Java was unfortunate when thinking in terms of Colombo but was a good jumping off spot for Australia. I did not want to go to Australia. How I wished that I knew where my family were heading. When they left Singapore their destination was unknown. The ships which had left in December 1941 had gone to Australia but somehow I thought that they had gone to England. It was all very worrying because should I be given the option of either UK or Australia I shouldn't know which to select and felt that whichever I chose I would find my family had gone to the other. Having thought things over from every angle and getting precisely nowhere, I settled down on the concrete floor and was soon asleep.

The next morning, 23 February, things began to get organized. The school was full of Army and RAF, Lieut Colonel Phillips, (GSO1 Malaya Command) had arrived and was OC Troops, and he wasted no time in sorting things out. He formed us into platoons for ease of movement and I was given another party of Sappers which had

been working in Java, and a party of Signals. Incidentally on our way back to Tjilatjap I collected another party of Sappers who had got through by road from Batavia and this had brought my platoon up to fourteen officers and forty seven other ranks.

As soon as everything was ship-shape I left a few men at the school to act as runners in case we were wanted, and the rest of us pushed off down to the bazaar to buy a few essentials. There were no air raid sirens in Poerwokerto but at various points in the town huge gongs were erected on scaffolds which a coolie hit with monotonous regularity. We had no raids here but Japanese planes must have been round about as I don't think the gongs stopped once! It really was the most dismal, depressing noise I have ever heard. About every thirty seconds the gong was struck and this went on hour after hour. I could have screamed. But we had some amusement. We were all after underpants and vests of which there seemed remarkably few in the bazaar. One Sapper officer arrived when the underpants were completely sold out, but he would not be beaten. He purchased two pairs of ladies silk knickers with lace trimmings and religiously wore them until we reached Colombo. It was most amusing to see him wandering around first thing in the morning clad only in his lace trimmed knickers. Some purchased shirts and shorts but I stuck to slacks and had a pair made in three hours. To my mind shorts are ridiculous things in the tropics and especially so for the conditions under which we were living. Slacks do at least help keep off the mosquitoes and keep in a little warmth at night. It can be quite chilly on the deck of a ship after sundown.

On the second night one of my men unearthed from somewhere in the school buildings some mattresses and presented one to me. I think some of the officers would have given pounds for that mattress. My bones were hardening off quite nicely but were still pretty sore.

We spent most of our spare time at the local hotel, known as the "Tram" and usually fed there. We chatted with the Dutch but they were a very worried people and would not "open up". No one could blame them for being worried, the Japs were taking everything in their stride and were approaching Poerwokerto. They also seemed to think that the British had let them down and not given the help promised, whatever that might have been, and this did not make things any easier. And of course, we were only there until we could get out, whereas the Dutch, as in Padang, had their orders to carry on and await the Japanese.

I rather feel that from what I have written you must think that the officers, and possibly myself in particular, just did nothing to assist in making arrangements for getting away. This is perfectly correct and on the face of it may seem bad but in actual fact there was nothing to do. OC Troops was working hard in this direction and his instructions were to look after the men, keep out of mischief and always be ready to leave at short notice should he give the order. I remember that he had all officers and men assembled round noon, I believe, on our first morning at the school and he said something like this; "I will do my very best to get you all out. How long that will take I cannot say. I will stand no nonsense from any of you and the people of Poerwokerto are to be respected in every way. Certain gentlemen have apparently passed through here and made themselves a bloody nuisance. If any officer or man goes down with VD I shall refuse point blank to take him out when the time comes and he will be left to the Japs." I liked Lieut Colonel Phillips and trusted him implicity. He inspired confidence all round and in the subsequent rather alarming voyage from Java he was magnificent.

On the morning of 26 February, I paraded my platoon at 5.30 am and made the journey back to Tjilatjap. At a small wayside station a Sapper officer came up and asked where we were heading. He was the fellow I have previously mentioned who had managed to get his men away from Batavia and the CRE told him to join up with us. He had got away by truck and didn't know where to go next, it was lucky for them that he found us. Having arrived at the docks we were compelled to stick around under cover until 4.00 pm before anything happened. There seemed to be dozens of

small ships, probably coastal craft, tied up two deep along the quay and we could only assume that one of them was ours.

OC Troops called all officers around him and said that he had some rather important news to impart and that when he had finished we were to convey what he said to the men. It seemed that he had tried to get a small ship to take us to Colombo but all he could get was the *Wu Chang*. All the other vessels were to try and make Australia and were already terribly overcrowded. The *Wu Chang* was a China river boat of eight foot draft and was never intended for the ocean. One storm and she would turn turtle. The authorities had said, "Take it or leave it, there's nothing else." The boat had been sailed from Singapore to Batavia and from there to Tjilatjap by a crew of RAF personnel. The RAF were all heading for Australia but he had been along and asked these particular lads to volunteer to sail her to Colombo. They had volunteered to a man. He had also found a Naval officer to captain the craft. For food there would be bully beef and tinned fish with army biscuits, all in short supply, and very little water. The officers could sleep in the few cabins there were and about the deck but the men would have to sleep in the hold and in the coal bunkers. There was no armament of any description, there were three lifeboats and our strength would be roughly five hundred. The voyage would take a minimum of ten days and the boat would roll about like a cork. That was all. Would we now go to our men and explain the position. Any officer or man who couldn't face it could stay behind, there would be no question of desertion but of course they would become prisoners of war.

From the mere fact that we were not ordered to embark but given the option it was obvious that our chances of getting through were very slim.

Having swallowed hard I passed on the information to my men and waited. The instructions then came to embark and every officer and man went on board. I was as pleased as Punch. I should have hated seeing anyone stand back. It's an awfully long way from Java to Colombo and to attempt the journey in a river boat is sheer madness, but there was always the chance that we would "get away with it" and in any event it was better than being bottled up in Java with the Japanese. It so happened that the *Wu Chang* was in the outer row of ships and it wasn't until we had crossed a small vessel tied up to the quay that we could see her. I was surprised that she was as long as she was but she was very narrow. On the deck was double row of cabins with a central corridor and, with a small dining room at one end and a small lounge at the other, the accommodation was complete. The officers piled into the cabins, three to a two-berth, and the remainder took up their positions on the deck. I was in a cabin and one of my friends and myself spent alternate nights on a bunk or on the floor. The men were put in various little compartments below deck and any odd space they could find. In all, officers and men, about five hundred were crammed into that little ship. We spent the night in the *Wu Chang* tied up alongside the quay and once again became apprehensive lest we delay too long. The RAF personnel who had sailed the boat from Batavia came along and with them was a wireless operator who had volunteered for the voyage. The Naval officer who was to skipper the boat together with several other Naval chaps were on board and, of all things, one lady passenger. It appeared that she was the wife of some official or other who had to remain in Tjilatjap and she was prepared to face the journey rather than stay for the Japs. She was given a cabin but spent each day sitting in a chair alongside the bridge. Two points which I simply must mention are that the chart for the voyage was a school atlas and that in order to help the little ship keep the right way up in the water the RAF had loaded her with one hundred tons of bombs as ballast. I confess I saw neither the Atlas nor the bombs but a very senior officer vouched for these. This journey certainly bristled with possibilities!

In the morning Major Rogan RAMC came to me and asked if I still had any money, and if I had, was I prepared to spend it on medical supplies for the trip. I had, but not very much, but whatever there was he was welcome to and we went off to find OC Troops. We explained that we wanted to go off and try and obtain medical supplies; when did he expect to sail? He didn't know but asked us to hurry as should

word come through that the *Wu Chang* must sail he might have trouble in holding up the boat. We had no idea where to go but set off in a *tonga* and after many inquiries found the Dutch Military Headquarters. From here we were directed to the Dutch Military Hospital from which in turn we were sent to the Dutch Military Dispensary. This was miles away outside the town and it seemed even further than it really was as we had no idea where we were going. All the time we were wondering whether the boat had been ordered out and hoped against hope that we would make it. To make matters worse, on arrival at the Dispensary the officer in charge was away and that meant a further delay of at least forty-five minutes.

Major Rogan had prepared a list of his requirements which I now studied. I was horrified to see that the first item, one thousand M&B tablets, would cost more money that I possessed. This rather shook me so we agreed that if supplies were forthcoming, as the various items were produced I would take them out and put them in the *tonga*. Then, if we had a row over the bill, we would try and make a dash for it. This all sounds perfectly absurd, and of course it was ridiculous, but we wanted those supplies so badly that we could think of nothing else. The Dutch officer duly arrived and we explained who we were and what we wanted. He took the list and after scanning it said "I'm sorry but I cannot possibly provide more than half of the quantity of each item". We thanked him and I'm sure I must have looked very red in the face because I felt sure it would end up in a rough house. As arranged I carried the various items to the *tonga* as they were produced and at last came to the final item. I felt most uncomfortable. Rogan muttered something about the bill, I don't think he was feeling too happy. The officer merely smiled and said, "That's something I think our Governments can settle after the war." We could have fallen on the chaps neck and kissed him but actually what we did was to grab him by the hand, pat him on the back and talk like a couple of excited schoolgirls. But we were very grateful and very relieved.

We hurried back to the docks with our precious cargo and passing through the town we again heard that terribly depressing noise, the monotonous beating of deep toned gongs. The *Wu Chang* was, thank Heaven, still there and we reported in. We fixed up the MI Room and I left the doctors to play with their bottles. Other chaps had been busy getting extra bully beef, tinned fish and army biscuits and of course the water tanks had been filled. Somebody had found and bought quantities of bamboo matting which was now stacked on the cabin roofs. Everything which could be done to help on the voyage had been done and all we could do was wait.

Correspondence

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JUBILEE REVIEW SENNELAGER JULY 1977

Sir,—Further to the article in the March 1978 issue of the *Journal*, a commemorative plaque has been fixed to the Windmill which is a feature of the area. A photograph of the plaque is enclosed for your records. It is of bronze and was manufactured by Engineer Base Workshops of 21 Army Support Squadron RE and fixed to the Windmill by the artisans of this unit which is based at Schloss Neuhaus near Sennelager. On the reverse of the plaque a small Corps cap badge was engraved during manufacture at EBW. Unfortunately it was not possible to obtain a satisfactory photograph of this prior to installation.—Yours faithfully, D P Ashton.

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SAPPERS FIT FOR WAR

Sir,—Congratulations to Lieut Colonel Mike Addison on one of the best articles to appear in the *Journal* for a long time. Provocative and hard-hitting it certainly was, but alas, so much of his criticism thoroughly well founded. As he set up his aptly described "myths" to knock them down one by one, it was every time a coconut. The short answer to most of his proposals must inevitably be cost, but that doesn't invalidate any of them.

Before offering two comments on his excellent article, may I first correct what I am sure was an inadvertent editorial error in his opening biographical note. The statement that "when Confrontation ended, he and his QMSI were replaced by 59 Cdo Sqn" is incorrect, and is unjust both to the able Sapper officer who replaced him as SO 3 RE in the Commando Brigade and to the members of 59 *Field* Squadron who so ably supported that Brigade for their last two years in the Far East. In fact the Commando Squadron was not formed until two years later; and it in no way denigrates Colonel (then Captain) Addison's colourful career to point out that it was the calibre of 59 *Field* Squadron's support in both Malaysia and the Aden withdrawal that convinced the Commandos they should have their own integral Sapper squadron.

The first point I would like to take further is "PQE Myths". Mike Addison points out correctly that engineering doesn't fall into two neat groups, one for the professionals and the other for field engineers; and goes on to add "However, this is what we've done in the Corps, or rather what has happened, because it's unlikely anyone ever intended to do it." But the truth is that we have deliberately followed that policy and have only ourselves to blame for the gulf between the staff-trained "combat" man and the PQE. As I happen to be a staff-trained PQE I claim no bias, but the very fact that I am one was no thanks to the Corps. Half-way through a Long Engineering Course I got a selection for Staff College, and the official advice I received from the Corps (I have the letter to this day) was to chuck the Long Course and hasten to acquire my *psc*. Fortunately for me I had a wise father who was a good horseman and knew all about changes in mid-stream, and on his advice I completed my Long Course before going to Camberley. I have always been grateful to him for that, and never more so than when the time came to leave the Army to start my second career. But the main point here is that only twenty-odd years ago it was accepted Corps policy to treat the PQE side as second class citizens; and with that encouragement from the top it is small wonder that the present gulf exists. At every stage the gulf was made more obvious. The staff-trained or straight "combat" man was given a field squadron; the PQE a park or support squadron. In due course the former became CRE of a division or CO of a regiment, while the latter went off to some fairly obscure job in works. I well remember a Chief Engineer's Conference in the Far East, where, during a discussion on officer training, the cynical but entirely true statement was made that if you wanted to be an engineer you must not ruin your chances by being over-promoted!

Mike Addison concludes that "We must break down these artificial, self-erected barriers between the professional and regimental engineers and work hand in hand. . . . The rift between PQEs and field engineers must be filled." I could not agree more, but I would go further and say that in more cases than not the two should be interchangeable. There is really no reason why a good PQE should not be a good commander, and there are many "combat" types who are first-class engineers although not PQ. Happily the tide has already turned. In recent years it has become

recognized Corps policy to send PQEs to Camberley, though whether it is yet officially encouraged I do not know. Moreover we currently have a non staff-trained PQE as CRE of a division in BAOR, and even higher up the ladder a non staff-trained PQE as a Director in the MOD. Such appointments would have been unheard of not many years ago. Long may this trend continue. Let all of us be professional Sappers as opposed to *either* staff/regimental *or* engineers.

My second point concerns "Training Myths". Mike Addison says, with every justification, that "Exercises are particularly dangerous to sappers because the face of the earth cannot actually be changed during them, so white tape etc. . . . even the other arms notice, and ignore even our modest attempts to play sapper factors realistically." Let me recount a true story both to emphasize Mike's point and also to show that just sometimes the sappers can win. In the first post-Confrontation divisional exercise in Malaysia, designed to test the Commonwealth Brigade and 38 Group RAF, with 99 Gurkha Brigade acting as enemy, the play hinged on the early capture of an old Japanese-built airstrip in the hills which could act as the FOB (Forward Operational Base) for subsequent operations. A heliborne assault was to secure the "damaged" airstrip, a sapper troop was to repair it overnight, and as soon as possible after first light the RAF were to start flying in stores and ammunition in their Twin Pioneers. Early afternoon on the day of the planned assault, the CRE as Engineer Controller, accompanied by the QMSI in charge of battle simulation, went up to the airstrip to inspect the "damage" prepared by the enemy sappers. He was met by an enemy troop commander who enthusiastically took him on a tour—of half a dozen tree trunks, a few bits of wire, and—you've guessed—a number of large "craters", carefully denoted by skilfully placed white tape. Without the use of a slide rule the CRE calculated that it would take the assaulting sapper troop all of 15 minutes to repair the airstrip, leaving them some 15 hours to play quietly elsewhere while the other arms got on with the battle. In a fit of absurd enthusiasm he turned to the QMSI and said "Q, for God's sake let us have two real craters for a change—and on the runway." The QMSI, one of that marvellous breed who have given all Sapper QMSIs their well-deserved reputation, smiled knowingly, and almost before you could say camouflet he and his small team had blown two large and excellent craters. In fact they were rather more excellent than either he or the CRE had intended, because unknown to anyone on the exercise the airstrip comprised only a fairly shallow raft of good soil across an underlying bog; and the explosive had punched freely through the crust to leave two quite disgusting craters, not only liberally covered with stinking mud but quite literally oozing at the bottom.

The effect of this small "change in the face of the earth" (to use Mike Addison's phraseology) was electrifying. Within minutes of the assault wave arriving, word had reached JFHQ (Joint Force Headquarters) that some irresponsible idiot had *actually* destroyed the runway. The airstrip was now largely a swamp; the RAF couldn't possibly land an aircraft on it; there were nothing like enough helicopters to use instead; the Brigade plan would have to be re-written or abandoned; there was frantic consideration of non-existent contingency plans; in fact the whole exercise had been made a complete shambles! In the meantime the field squadron commander was lifted to the airstrip to join his assault troop, quickly sized up the now real problem, made his plan and set his men to work. Due to the unforeseen bog, the task was much more than just backfilling and compacting two craters. The mud and slime all had to be removed, the underlying source of it properly plugged, and suitable fill brought in from elsewhere. Whilst I would wholly agree with Mike Addison's views about power and machines, this was an occasion where such luxuries simply did not exist. The only machine to hand was a pre-placed suitably sabotaged enemy D 4 dozer and trailer, which the sappers were allowed to find nearby. With these inefficient items, a large supply of sandbags (later described by the G 2 Training as "half the Division's annual supply"!), a great deal of muscle, sweat and curses, and the ever present incentive of knowing that the fly-in must start at first light, the sappers worked like men possessed. When the CRE visited in the early hours and

asked the OC how things were going, he was met with the reply "Fine Sir, we'll have it ready. There's only one real problem left—which of these two holes to bury you in!" By shortly before first light both craters had been cleaned out, plugged, backfilled, compacted and capped with PSP. At first light an RAF officer pronounced the runway safe, and a few minutes later the first aircraft touched down, to start the fly-in bang on schedule. The next daily issue of the Brigade's own newspaper carried the banner headline "SAPPERS SAVE THE DAY", and followed with an account of how yet again their field squadron had led the way.

The story doesn't quite end there. At that evening's daily umpire conference there was an unprecedented inter-service row. At the invitation of the GOC, clearly unaware of what was to follow, the AOC opened the batting by launching into a blistering attack on the Army in general and the Royal Engineers in particular. The gist of his message was unmistakable: when the RAF took part in exercises they treated them seriously and played by the rules; they were neither accustomed to nor appreciated damn fool pranks; aircraft were expensive, pilots' lives were precious and airfield runways were sacrosanct; if the brown jobs wanted to dig useless holes to fill them up again they could easily do that anywhere, but not on RAF territory; in sum, if this was the sort of inter-service cooperation practised by the Army, the RAF would not be happy to exercise with them again! The Air Marshal then sat down, and there followed a protracted and deafening silence. It was painfully clear that neither the GOC, nor any of his staff, was prepared for this onslaught, and equally clear that a head was needed for the block—and fast. Realizing that he had suddenly become the obvious candidate, not only for block but for advanced retirement, the CRE suggested that perhaps he should attempt to reply to the charge—to which a grateful GOC muttered "Yes, I think you'd better!" With all boats burned, his back to the wall, in for a penny, etc, etc, the CRE then let rip with a totally unrehearsed and far less well-phrased mini-version of Mike Addison's current views. He said, *inter alia*, that exercises were meant to exercise all arms, not just the chosen few; every arm had a right and a duty to demonstrate its function and capability to the other participants; maximum realism was an essential ingredient of any respectable exercise; as for making holes quite unconnected with the exercise, no one in his right mind would contemplate such absurdity, let alone the stupidity of filling them up again; it was the Sappers' job to prepare and maintain landing facilities for the RAF and this was precisely what they had done; moreover they had done it commendably well, the airstrip was still in perfectly good condition, and accepted as such by the RAF themselves, the fly-in had started bang on time and continued perfectly smoothly—so what the hell was all the fuss about anyway! Convinced that he'd never see the inside of another RAF aircraft, the CRE sat down to await his more immediate fate. But his luck was in. The GOC very tactfully declared a draw and the conference passed on to less exciting routine. When the assembled company finally adjourned to the bar tent, the CRE was not surprised when the ADC invited him to join the General "for a few words"! But his luck held firm. "Well" said the GOC, with a grimace resembling a twinkle, "we just got away with it, but it was a damn close thing. What neither you nor I had realized is that what you did was tantamount to blowing two holes in the deck of the Ark Royal!"

And the moral of this tale? There are probably several but I would choose one to fit Mike Addison's wise words: given the right exercise situation, the means and the sappers, and of course that essential element of "irresponsibility", never miss an opportunity to "change the face of the earth"—not only with the ultimate intention "to suit the tactical commander's aim", but also to cause the maximum imagined chaos in the minds of the other arms while you're getting them out of the mess and showing them how vital you are!

To add a final authentic touch to this little drama of not so long ago, may I conclude by introducing the players. The "irresponsible idiot" who ordered the holes was the writer of this letter, now retired but not let it be said as a matter of cause and effect; the man who made the holes was none other than Mike Addison's own

(obviously well trained!) QMSI, now Captain Alan Wallace of 9 Parachute Squadron; and the squadron commander who so expeditiously filled them in to save the day is currently the Commandant of the RSME. And there must be another moral in there somewhere!—Yours sincerely, P F Aylwin-Foster

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CROSSING OF THE IRRAWADDY

Sir,—Two items have recently appeared in the *Journal*, both dealing with the David Cobb painting of the "Crossing of the Irrawaddy". There has been some criticism of this painting from time to time and as I had some influence on its production, and like it, may I explain a little of the less well known background?

As far as I am concerned it all started just after I had been involved in 20 Indian Division's crossing of the Irrawaddy. My company (365 Ind Fd Coy RIE, a Madras Sapper company) was in readiness to build a supply airstrip in the bridgehead but could not do so until a suitable piece of ground had been captured. Although the actual crossing was peaceful a very lively situation developed resulting in one of the heaviest Japanese death rolls of the campaign. Obviously we could not sit around doing nothing so we took over some of the ferries from the Divisional RIE. My concern was a ferry consisting of two or three FBE rafts and their associated landing bays. The rafts were towed by DUKWS operated by RN/RM crews. At this point the river was about 1,000 yards wide with a good steady current and so the turn-round time was not very fast. Our main traffic forwards was 6-pdr guns, hardcore for the exit ramp, 30-cwt Dodge 6×6 ammunition trucks and infantry mules. The return loads were usually bullet scarred jeeps of the Friends Ambulance Unit carrying Gurkha wounded.

When a steady routine had been established I hunted around and built a floating contraption from two damaged FBE boats, an 8-hp Petters propulsion unit and odd bits of wood and rope. This became known as "Houghs Abortion" but it gave us another ferry for those, fit or wounded, who could walk.

Meanwhile, back near the once pleasant town of Monywa, a Spitfire squadron was in residence on a strip which we had rehabilitated by filling in trenches dug by the enemy and then cutting the grass. We had rolled the backfill by winching derelict PWD steam-rollers back and forth using the winches on our 3-tonners and we had cut 1500 yards of grass by lining up the company and getting busy with our jack-knives. The Spitfire squadron was looking for trouble but not finding much. The OC was an ex-Battle of Britain pilot named Lacey whose aircraft bore twenty-seven swastikas and nine parachutes. This was generally accepted as proof that he had a personal superiority ratio over the Luftwaffe of 3–1! His tour was nearly over and he had not encountered the Japanese.

I was in mid-river with my home-made ferry laden with wounded when six Japanese aircraft appeared and circled overhead. This was very unpleasant but at the critical moment Lacey and another of his pilots appeared coming up-river almost at bank height. They almost stood on their tails under the Japanese formation and everything was over in seconds. To round off the event the Gunners also bagged one that was escaping.

Next day I was posted to 430 Ind Fd Coy (also Madras Sappers) to replace a casualty. This company was waiting to cross the river with 2 Division (British) to build them a supply airstrip. I crossed the river the morning after 2 Div's night assault and had a chance to see what they had done and were doing. I then went inland and found 430 Coy starting on their task with the Japanese shelling the dozers and 2 Div

clearing a village embarrassingly near to the proposed end of the runway.

The story now jumps many years to when, by sheer chance, Colonel Tony Crouch, Major Euan Phillips and I had met in the Waterbeach Mess and I was relating the authentic version of a once well known story relating to the Irrawaddy crossing. The upshot was that a few days later I was asked to attend a meeting concerned with providing help to David Cobb who was to paint the picture that would commemorate the work of the Royal Engineers in the Burma campaign. I think that Euan Phillips and I visited David Cobb together on one occasion, I visited him alone two or three times.

David Cobb had received a collection of documents such as Operation Orders, War Diaries, maps and photographs and my job seemed to be to help him to interpret these and to obtain confirmation of detail, extra photographs and so on.

Of our three other World War II paintings one is depicted from the enemy's view (El Alamein) and two from the home bank (the Rhine and the Rapido). The decision had been taken, I think by David Cobb, to do this one as from the enemy bank. I am sure that this was right. From the sapper viewpoint there was nothing like the dramatic building of the Rapido Bailey under the intense and murderous short-range fire shown in Cuneo's picture. There were no enormous dumps of engineer stores on the home bank as on the Rhine. The overwhelming characteristics of the Irrawaddy crossings were the immensity of the river, the incredible paucity (and antiquity) of the equipment and the existence of a homogenous, multi-racial breed known as 14th Army. Moreover this picture had to depict Royal Engineers (as opposed to the much more numerous Indian Sappers and Miners) at work.

The immensity of the river and the shortage of equipment led inevitably to some events having more significance than a stranger might have expected. The problems arising from some of the assaulting infantry grounding on a sandbank, the work of a very skilful Japanese machine gunner and the effects of some mortaring were all out of proportion to what might have been expected if we could have had the numbers of men afloat, and the supporting equipment, that the job merited. I think the picture brings out this situation very well when seen through thoughtful eyes.

In the finished picture there are some details of which the significance may not be apparent to all.

In the foreground a little group is huddled round a wireless set. This could have been a No 19 set but it is equally likely to have been a No 22. In 430 Coy our one and only set was a No 22 but there were some No 19s around. The set in the picture represents the Beachmaster's rear (and possibly only) link. The other foreground figure is an officer leaning on a sturdy stick. He was to be found everywhere in Burma and was usually a Gunner making sure that his ammunition waggons were getting through yet another obstacle. I am told that in the Italy campaign he was always there too, but usually wet through.

The river bank was a varying mixture of sand, silt and clay and the sappers were working flat out to make it passable for wheels. During the night they had broken the bank down by brute force and had then, around dawn, got a D4 into action. I had difficulty in obtaining an authentic picture of the D4 as 14th Army's plant came from strange sources and had unusual fittings. The one illustrated has a PCU and not a Hyster winch. This may seem odd but is probably right. Not only had D4s been used to pull scrapers but a D2 and scraper were used at least once for a Dakota strip! The roll of Somerfeld tracking the sappers are manhandling up the ramp must have been almost an heirloom; we often had to use palm fronds to make dried up stream beds passable to vehicles!

One young man was vastly amused by the tank shown on the Bailey raft. If he has checked with "Defeat into Victory" and the Bovington tank museum he will now know that the US Army had supplied many tanks that pre-dated the Sherman and that did have the main armament in a limited traverse sponson with subsidiary armament in a small turret.

Artists are naturally concerned with colour and light and one of my strongest

memories of that early morning is of a sort of pinky-grey light with the sun picking out the warm colours of the bare earth in the foreground. The home bank seemed far, far, away. David Cobb and I struggled for a long time trying to get the colour right and even so it is possible that a witness of the events ten minutes earlier or later would have a different impression.

In all honesty I am not sure whether a DUKW really did wander over the sandbank though it is very likely. Attention had to be drawn to it because of its significance and a pattern of footprints would not have been visible at that distance.

What about the "Green Hell"? I am glad to say that it was nowhere near the area of the Irrawaddy crossings. Geographically the jungles and mountains of Tamu, Kalewa, Kohima and so on are in a different land. The Irrawaddy crossings were in a pleasant, civilized land of open fields, palm trees, rice, cotton, mangoes, villages and tracks dusty beyond belief; but no Green Hell.

Lastly the two Spitfires in the far background. Well the Dakotas couldn't do much until a DZ or a strip was ready and the Hurri-bombers weren't around until a dust-up a little later in the day; but we were in range of Lacey's Spitfires!—Yours sincerely, Dick Hough

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A PROPHETIC VISION OF NEW TECHNIQUES

Sir—Colonel A J Harris's article on New Techniques for the Corps (Volume 93 No 1 March 79) posed a number of questions to "They". Although not aspiring to this omnipotent title the Field Engineer Branch of Military Vehicles and Engineering Establishment (Christchurch) thought that readers might be interested that most of the points mentioned under the heading of field works have or are being covered.

In October 1977 the Royal Military College of Science completed a 3-year contract which had been commissioned by MVEE(C) on de-stabilization of soil. The reports are unclassified (Contract AT/2160/022MV) and can be obtained by anyone who is interested. The Report concluded that clay soils can have their cohesive strength substantially reduced by additives of low dielectric constant. It must be left to the field commander to decide whether the logistic and manpower effort to exploit this is worthwhile.

MVEE(C) did a considerable amount of work on unstable filling agents in 1972/3. This work is published as Report No 73503 which is still classified, however, anyone who has a rightful need can obtain it.

Work has also been done on surface agents, namely a "tacky barrier", "slippery bentonite" and "instant banana peel". Again some of these subjects are still classified. The effectiveness of these surface agents against the modern tracked vehicle on normal cross country going is very questionable.

There is at present a collaborative project on reinforced earth, between a University, RSME, MVEE(C) and field units. In the rotary drum excavator there is the potential to move the great quantities of earth needed to construct the vertical walls. In this project fabric reinforcement is being investigated as a means of reducing the logistic load in terms of weight and volume. In addition MVEE(C) have sponsored and conducted a full scale comprehensive trial on the use of fabrics and meshes in the construction of roadways and pavements. Work on this is still continuing and has been reported through TRRL and CIRIA.

The rapid repair of airfields is a very on-going subject. Surfacing for scab and crater repairs is receiving a great deal of attention. Long standing investigations into the use of many additives for ordinary Portland cement, including calcium chloride

and lithium chloride have revealed that there is an inherent unreliability in varying environmental conditions. A range of organic and inorganic materials is being investigated, some show promise but at a cost.

The Christchurch Block System and the Rapid Assembly Protective Wall both of which utilize the ballistic properties of concrete are now in service. MVEE(C) are currently examining sprayed concrete with fibrous reinforcing as an additional protection which can be applied to existing buildings.

We apologize if this sounds somewhat like a project progress review. Most of the information has been disseminated through the appropriate channels but if any reader requires more information we will do our best to provide it.—Yours faithfully, W J Port

Colonel A J Harris CBE
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A PROPHETIC VISION

Sir,—Seldom can a prophet have been proved right so soon. It all happened as he said, only, it would seem, a couple of years ago. It is just that he had not been told about it.

Others among your readers in like state will, like him, be grateful to Major Port for his letter.—Yours faithfully, A J Harris

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MERRY-GO-ROUND

Sir,—I read with interest Brigadier John Notley's parting shots (printed in the March Edition), as he gently sailed into retirement.

Without going into the specifics of the MGB Pier, mentioned in his article, I would like to think that the Brigadier intended to exclude MVEE (C) from his remarks regarding "a definite reluctance in R&D Establishments to explain problems and solutions to engineer commanders of all levels prior to prototype production". At Christchurch we have always tried to maintain close liaison with the User and engineer commanders at all stages of development; in this respect we are frequently visited by Sapper Officers both prior to taking up, and during, appointments in key roles. Indeed only last week two Sapper Lieut-Colonels spent a very useful day here being briefed, one on his posting to BAOR, and the other to a post on the staff of Chief Scientist (Army).

In the present financial climate it is impossible in these days to hold Open Days of the type once held by MEXE; however we *always* welcome visits by Sapper Officers to see exactly what we do, and to meet and exchange views with our staff. In many cases these visits are initiated by us when changes in particular appointments are noted, but we cannot make an individual approach in all cases, and therefore extend a formal invitation to all Sapper Officers who feel that there is a need for such a visit, to get in touch either with myself or our Staff Officer (Lieut-Colonel Jerry Hills), and we will be delighted to make arrangements.

I have strong views regarding the Brigadier's comments on the Corps developing equipment outside the R&D system on a "DIY" basis, but prefer not to go to print in

case I be accused of the "NIH" syndrome. I look forward with interest to hearing other views on this aspect of his article, hopefully expressed through your correspondence column.—Yours sincerely, J H Joiner

Brigadier J A Notley MBE
12 Strathfield Road
Andover
Hants

MERRY-GO-ROUND

Sir,—In reply to Jim Joiner's letter, I believe that MVEE(C) is as guilty as other R&D establishments in not fully consulting their customers.

To give you a typical example, I was visiting Christchurch about two years ago and saw a new piece of demolition equipment being trialled. It worked very efficiently but when I asked the designer how it was to be carried in a field squadron, he said that was not his problem—he was producing a piece of equipment to a GSR.

In principle he was right, but my point is that I believe that when a R&D establishment has thought through a design, they should go out to units and talk to Engineer Commanders at all levels before making a prototype. We would then be more likely to get equipment which we really want and not something a staff officer thinks we should have.

As for the Corps' ability to produce some of its own requirements, I suggest Jim Joiner visits Long Marston, Willich, 325 Engineer Park or any field support squadron to see what can and is being done.

I would also suggest that Colonel Field, in his letter in the June *Journal*, is underestimating the ability of the Corps to design and produce reasonably simple equipment as efficiently, more cheaply and in a shorter time frame than the so-called existing procedures.—Yours sincerely, John Notley

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E-IN-C'S CONFERENCE—THE SIMS PAPER

Sir,—Major Sims, in his paper "Sapper Influence in the Army", (June *Journal* page 75), did less than justice to two whole generations of us when he implied in his introduction that the Royal Corps of Signals was our last major offspring.

I am not sure of the background to the formation of the Royal Electrical and Mechanical Engineers, but I feel certain that it was RE-inspired and I know that a fair proportion was RE-manned. The next generation finds me on much firmer ground, for I well remember how we, through the 1950s, used to advocate the formation of a Transportation Corps and how this resulted in the founding of the Royal Corps of Transport in 1965, to be followed a few years later by the Royal Australian Corps of Transport.

True, no major war has yet tested the RCT, but Aden and Northern Ireland, at least, need give us no cause to doubt its worth. And the inevitable, and not always welcomed, re-badging of so many of our Sappers of all ranks has leavened large parts of the Army, in both 1942 and 1965, to, I think our mutual advantage.

Perhaps the 1980s-generation will find their fulfilment in Lasers, or Space. . . .—Yours sincerely, R J Wade

Colonel T Burrowes OBE MA
25 New Street
Henley-on-Thames, Oxon.

94TH BIRTHDAY CELEBRATIONS OF LIEUT-GENERAL SIR CLARENCE A BIRD KCIE, CB, DSO

Sir,—This photograph records a memorable occasion when, on 11 February last, General Sir Charles and Lady Richardson gave a luncheon party at their home to celebrate the 94th birthday of Lieut-General Sir Clarence Bird, senior retired Colonel Commandant in the Corps. In the photograph, he and Lady Bird are seated in the centre with their hosts on either side. General Sir Ouvry Roberts is standing behind them.

General "Chiriya" Bird's service in the Army Active List totalled forty years, which stretches to forty-eight years when the balance of his service as an active Colonel Commandant RE is included. The year 1979 marks the 75th Anniversary of his commissioning from "The Shop": it also coincides with his and Lady Bird's Diamond Wedding.—Yours faithfully, Terence Burrowes (Hon Sec, KGV's O Bengal S&M Officers Association)

Major P J Russell-Jones RE
ASC 14 RMCS
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DISTINGUISHING MARKS

Sir,—Am I alone in being fed up with being taken for a member of the various other Corps who, like us, wear no distinguishing marks on their uniforms when in barrack or combat dress? Can we not have a small RE shoulder title, on the lines of that worn by the Royal Regiment of Artillery, to distinguish us from other mortals?—Yours faithfully, P J Russell-Jones

94th Birthday Celebrations of
Lieut General Sir Clarence A Bird KCIE CB DSO

Major A J Loch RE, FI Plant E
c/o D Engr Svcs, HQ E-in-C(A)
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REMOTE CONTROL OF EARTHMOVING EQUIPMENT

Sir,—While there is no doubt that the system proposed by Captain Sloan for the remote control of earthmoving plant will work, he seems to have forgotten that there is more to operating a dozer than just driving. The operator must be able to react to the effect of the task on his machine. He has to use not only his hands and feet but his eyes, his ears, possibly his nose and certainly the seat of his pants. Although Captain Sloan says that remote-controlled machines are being used it is a pity that he has not given any performance figures compared with normally controlled machines. I believe the output of the remote controlled machine would be very low.

Remote control of a dozer was considered seriously in the early 1960s for EOD beach clearance when systems were available for schnorkelling tanks and agricultural tractors. But because of the reasons given above it was decided to continue with the conventional armoured dozer.

Captain Sloan justifies remote control of plant on what might be called environmental reasons and on military needs. Most of the former have been overcome by the cabs on modern machines, with protection against falling objects and rolling over, sound suppression, spring seat, heaters and air conditioning as in the new service heavy crawler tractor. The operator would be more comfortable, and hence more productive, in his cab than outside using a remote control. The logic of suggesting that the boredom of repetitive work would be reduced by remote control is difficult to understand.

The only military requirement that might justify, at the present time, the remote control of plant would seem to be that of removal of radio-active soil after an accident. Rather than develop our own system it would be more economical to buy commercially available machines such as Swedish Volvo Minotaur mentioned by Captain Sloan, if it does what he says it will.

While I believe that there is no requirement for remote control on the lines previously suggested, I wonder if the Army, or the services as a whole, should investigate the need for a remote-controlled "man". Mechanical arms and hands have been developed for some years now that reproduce all the movements of the human limb. A remote-controlled "man" could therefore be made to use a wide variety of equipments with little, if any, modification required to the equipment. However there would still be the problem that the "man" would not be capable of thinking and reacting in the same way as a human. In some applications the relay would have to carry information for a number of senses and in a form to which the operator could react.—Yours faithfully, A J Loch

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REMOTE CONTROL OF EARTHMOVING EQUIPMENT

Sir,—I am most grateful for Major Loch's interest in my article and the trouble he has taken in preparing his comments on it. As he rightly says, there is little doubt that a remoted machine would be less efficient than a manually-operated equipment in the primary role of earthmoving.

However, a major aim of the article was to suggest how remote-controlled plant might also be employed on less usual and more dangerous tasks, in order to promote thought and discussion on such unconventional usage. Evidently it has succeeded in this aim.—Yours sincerely, C E E Sloan

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COMMENTS ON ARTICLES IN JUNE ISSUE OF THE JOURNAL

Sir,—I would like to comment on the interesting juxtaposition of ideas in the June edition of the *Journal*. The Chief Royal Engineer called for forward thinking based on research, Colonel Jukes-Hughes gave eloquent testimony to the potential of the Wavell ADP system used in 2nd Armoured Division and Colonel Newth pleaded for a training scheme to keep us up-to-date in engineering knowledge.

I am confident that the officers of the Corps are capable of generating the ideas mentioned by the Chief Royal Engineer, particularly because so many of them showed their adaptability and willingness to use up-to-date tools with enthusiasm during the Wavell trial. To those who feel inspired by the message contained in the three articles, a ready-made solution exists for those fortunate enough to be selected for staff training—they should join Divisions 1 or 2 of the Army Staff Course at Shrivenham.

Not all officers can aspire to staff training, but many can. I will not address the needs of those others which might have to be fulfilled by the kind of in-house Corps training mentioned by Colonel Newth.

My message to those unaware of the opportunity offered, is that Divisions 1 and 2 of the Army Staff Course provide the much needed training to up-to-date engineering knowledge gained on widely based degree courses. And more, the Shrivenham part of the course provides exactly the right academic and engineering environments needed by those who wish to research and think through their ideas conceived at the sharp end.

Many civilian graduates would give much for the opportunity to up-date their knowledge and think out ideas. The Army provides us with that opportunity. To meet the challenge of fast moving technology, of the perceived military threat, and of the stimuli in the June *Journal*, we must urge those who can to make the most of Shrivenham.—Yours sincerely, E G Willmott

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"TWO INTO ONE DOESN'T GO"

Sir,—One of the disadvantages of thirty years in the Corps is the fact that the same problems keep coming around for the second time.

In 1954 I believe the then OC 2nd Field Squadron (Brigadier Tony Wheatcroft) felt the need to assert the supremacy of his squadron over the 5th. Unfortunately this pretension arose just as I was researching the 5th's history with particular reference to Lieutenant Chard's action at Rorke's Drift, and I was able to scotch this at source.

A simple study of Major General Porter's History of the Corps Vol 2 page 138

makes it quite clear that it was not until the reorganization of the Corps in 1806 that numbering was introduced and that this was done geographically starting with the 1st at Woolwich, through the 5th at Gosport and including the two Gibraltar companies as 9 and 10. However unjust this may have been, that is what happened. Subsequently there was much confusion within the Corps but the 10th battled on as a Railway Company (1885) to a Port Squadron RE in the Far East until McLeod in 1965.

Ray Bradbury is wrong therefore in asserting the supremacy of the 2nd over the 1st, but this is not his fault. Since the 1950s, when renumbering became a yearly event in the Corps, generations of 1st Field Squadron's commanders have suffered from hubris and tried to affect cavalry connotations for their command. This has resulted in the inferior status ascribed in the article. I have no remit from that squadron to champion their cause but they should look to their proper origins at Woolwich in 1787 and subsequent service in the Crimea if they are to be considered as legitimate.

In the meantime, 10 Port Squadron RCT—the true descendants of the second Gibraltar Artificer Company—send their regards from Cyprus to the two changelings in our midst, 2 Field Support and 10 Field Squadron.—Yours sincerely, P O M Chitty

Major H A Cowan RE, BSc, C Eng, MICE, MI Plant E
10 Fd Sqn RE
BFPO 43

"TWO INTO ONE DOES GO"

Sir,—I was interested to read Major Bradbury's article "Two Into One Does Go" in the March 1979 *Journal*. However I believe that the matter of the oldest squadron in the Corps is even more complex than that article suggests.

The History of the Corps of Royal Engineers states that when the companies of the then Corps of Military Artificers were first distinguished by numbers, in September 1806, the Gibraltar companies were numbered 9 and 10. If this statement is accurate, 9 Parachute Squadron would be the oldest squadron in the Corps, followed closely by 10 Field Squadron which appears to have at least as strong a claim as 2 Field Support Squadron to the pre-1806 history described in Major Bradbury's article.

10 Field Squadron is currently researching its early history and would welcome any advice, opinion or information which readers may be able to provide.—Yours faithfully, H A Cowan

Major P J Williams RE, BSc
1 Field Squadron RE
BFPO 48

"FIRST" OFFENDER

Sir,—While accepting Major Bradbury's argument (March 1979 *RE Journal*) that 1st Field Squadron is not the "First born" of the Corps, I would dispute that 2 Field Support Squadron holds the premier position. Because of our cavalry pedigree and our "numerical superiority" we, in 1st Field, like to think that the squadron is rather special and merits the premier position. As OC 1st Field, mine is, of course, a predictable viewpoint; but don't just accept my word for it, ask any of our "old boys"!—Yours faithfully, P J Williams

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"SECOND TO NONE"

Sir,—The history of our Corps was rather complicated during the early 1800s due to the confusion brought about by a series of re-organizations and amalgamations—a phenomenon well known to us over a century and a half later! It is apparent, from some of the letters that you have received, that this turmoil is somewhat more involved than their authors appreciate. A brief resumé of 2 Company's history during that period should help to clarify matters and, at the same time, establish conclusively 2 Field Support Squadron's claim of having the oldest history in the Corps.

In 1797 the 1st and 2nd Soldier Artificers Companies, based on Gibraltar, were incorporated into the Corps of Royal Military Artificers. Initially they were simply referred to as the 1st and 2nd Gibraltar Companies, but in 1806, when the formal numbering of companies was introduced, they were allotted the numbers 9 and 10 respectively. This was only a temporary measure, however, because in 1811 the Corps was expanded to thirty-two companies, arranged in four battalions. Precisely how the companies were allocated to battalions is not certain, but the fact remains that the old 9th Company was re-designated as 2nd Company, 1st Battalion. In 1817 this Company was based on St Helena with Napoleon and in the same year they absorbed 7th Company, 4th Battalion, who had just returned from four years in the Windward and Leeward Islands (those were the days!). In 1819 the battalion system was abolished and in 1820, after Napoleon's death, the Company returned to Woolwich and was re-named 2nd Company. Thereafter its history is relatively straightforward, leading eventually to the present-day 2 Field Support Squadron.

These historical facts are recorded in several authoritative documents held in the Corp's Library. I would mention, in particular, the work carried out by the RE Historical Society in the mid-1960s when they formed a special committee to research all squadron histories. All these records confirm beyond any doubt that 2 Field Support Squadron is the only remaining descendant of the original Soldier Artificers Companies formed in 1772 (apart from 1st Fortress STRE). The Squadron is second to none, therefore—a fact that *our* old boys have always known.—Yours faithfully, R A Bradbury

Lieut Colonel J M Laing MC, RE(Retd)
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INDEPENDENCE OF FIELD SQUADRONS

Sir,—I share the astonishment expressed in the letter from Brigadier Hamilton-Baillie (*RE Journal*, March 1979) that some of the present generation of officers in the Corps apparently do not know of the independence enjoyed by field companies/squadrons in the past.

The responsibility which had to be taken by a comparatively young man as a major commanding a field squadron was surely one of the great attractions and challenges of entering the Royal Engineers. In fact the training for assumption of responsibility started even earlier when the young subaltern received his first command of a section (later a platoon, now a troop). The Field Troop with more men,

Memoir

BRIGADIER E F PARKER CBE, BA

Born 28 July 1909, died 9 February 1979, aged 69

TEDDY PARKER throughout his life was at once an individualist and a great skipper; he was a leader in the best traditions of the Corps, tough, progressive, humourous, friendly and enterprising.

Born in Belfast, he went to Campbell College, where he won prizes for poetry and literature and a gold medal for mathematics. Thus two of his principal talents, literacy and numeracy, became apparent, talents he was later to use to the full. A third talent was also developed at that time, the ability to sail a boat.

He decided to enter the Royal Navy but it was fortunate for the Corps that he was failed on eyesight and therefore went to "The Shop". It is ironic that throughout his life he appears to have had exceptionally good eyesight, not requiring spectacles until he was fifty-five. At "The Shop" his fourth and fifth talents appeared, boxing and riding. His talents for literacy, and a sometimes irreverent humour, were put to good use as the Assistant Editor of the Shop magazine and the producer of the Seniors' Concert, for which he wrote the entire script. He was commissioned on 29 August 1929.

From his earliest days Teddy's love of sailing played a major part in his life. As a Second Lieutenant in 1930, when competition to crew in *Ilex* was extremely keen, he was selected for the race to Santander for the King of Spain's Cup, which she won.

At Emmanuel College, Cambridge he enjoyed himself and settled for a third. He was a notable bantam-weight boxer. He was also something of a bon-viveur which he was to remain throughout his life. This sometimes got him into trouble. He was reported to his tutor one day by his landlady's husband, and the following conversation ensued:

"Mr Parker, I understand that you were the worse for drink last night".—"No Sir"

"Well then, Mr Parker, let us compromise and say you were the better for drink".—"Yes Sir".

After Cambridge, he set sail for India and reached the final in the all-[illegible] boxing. He joined the Madras Sappers and Miners in Bangalore and ma[illegible]se a reputation as a jockey on every course in India, breaking his collar bones fi[illegible]e times, an ankle, his back and for good measure, a few ribs. This led to a certain [illegible] amount of absence from duty which did little to endear him to the CRE, later [illegible]ne much respected Brigadier Farley. He was then sent to the North-West [illegible]rontier where his riding was surrounded in barbed-wire. His inj[illegible]uries were probably no more than par for the course for an energetic and irrepressible steeplechase jockey. We do not know how much they affected him later in life because he never referred to them, but it is probably true to say that he was somewhat handicapped. His constant activity showed very well how he lived up to his motto: "A pound in the bank is an opportunity wasted". He began his journey home by sailing an open dhow from Karachi to Aden.

He lived to the full on his leave in England in 1935 and, at the end, approached his bank for a larger overdraft, which was refused. However, when the Manager learned that the alternative was cashiering, he let Teddy have his ticket plus 2/6d. This had to last until he got to India, where he was met by a clerk who replenished his coffers. It was on this voyage that he met Bea.

Brigadier E F Parker CBE BA.

more equipment, more vehicles and more independence than the equivalent sub-unit in nearly every other Arm naturally demanded more responsibility at a younger age. With this background a sapper officer had no misgivings about assuming the onerous task of commanding a field squadron and the independent outlook had already been bred into him. This was certainly my experience during the Second World War when there was no doubt that these units were quite viable and designed to operate on their own for long periods.

In the same issue of the *RE Journal* I read Brigadier Notley's article. It seems from his remarks, and from other articles, that the one-over-one-over-one command principle which has crept in during the last few years is now being reversed. It cannot be anything but good that the pendulum is returning to a more central position and may settle nearer the type of command relationships that existed in engineer regiments two decades ago when there was still a strong feeling of squadron identity. At that time I was 2IC of a Regiment in BAOR, but when I was acting as Regimental Commander I had to be very careful of the type of orders issued to the Squadron Commanders. Even the CO found that these experienced officers were wary and jealous of anything which might have seemed to interfere with the ordered running of their own units, but there was no hint of insubordination in this. In the late fifties and early sixties squadron independence was still the naturally accepted thing.

I hope I do not sound like an advocate for operating in the eighties with the outlook of the forties, but some organizations can go on successfully for a long time and the Field Squadron as the basic unit of the Corps is well tried, well loved and it has nearly always worked.

In controlling any project too much top hamper hampers efficient execution, so it may be interesting to note what might be an analogy in civil practice. Since leaving the Army I have been playing a small role in the planning processes for a major building re-development project. Contractors move on to the job in phases after receiving all the design details and instructions. As a new phase starts those of us who have helped the professional Design Team bow out and let the selected contractor get on with the work. Indeed, if I am not invited I cross his site boundary line at my peril! He is quite capable of acting more independently than a field squadron.

It is very near to Winston Churchill's wartime rallying call: "Give us the tools and we'll finish the job", but for the contractor more like: "Give us the design and instructions; we'll carry out the work". A similar slogan could be devised for field squadrons returning to more independence.—Yours faithfully, J M Laing

In 1937 he became Second in Command of 55 Field Company at Catterick and at once acquired from a well-known trainer, a horse called Apple-a-Day; the price was a packet of "fags": Apple-a-Day was not exactly cut out to win the Grand National, but using great skill and patience, Teddy turned the horse into a very successful point-to-point winner. At the last meeting Teddy rode in every race on the card bar the ladies race. He won two, was placed in two but came to grief in the 5th breaking his neck in the process. By the time he emerged from hospital his bank manager was becoming very restive. A solution was found in changing places with an RE Officer posted to Haifa as Second in Command, building the Haifa/Bagdad Road. This was officially agreed and Teddy went happily off, £100 to the good and engaged to be married to Bea. He married her in Palestine in December 1939 and in June 1940 was sent to Mersa Matruh where he had something of a rough time. For his work he was awarded the OBE.

Later he was sent to GHQ and on arrival in a bullet-riddled Jeep and covered in blood and dust and dirt, he was immediately summoned to a meeting of immaculate staff officers. The subject under discussion was the occupation of Crete. Intelligence on Crete was minimal but Teddy had spent some time sailing there with Admiral Goldsmith and so knew much about the harbours and water resources. He therefore became the focus of the remainder of the meeting. In September 1940 he thus found himself with his Company in Crete. This Company is described in *Corps History (Vol VIII)* as a Unit which probably had one of the most varied experiences of any in the Corps. During the withdrawal after the German landing, he personally supervised the demolition of every bridge on the fifty mile route. He volunteered to command the rearguard and most of his Unit were killed or taken prisoner.

After capture, he was marched seventy miles to the POW pen. In a party of tall Commonwealth troops, he arrived a small squat figure in shirt, trousers, tattered shoes and little else, but nevertheless instilling cheer and commanding authority. There followed a circuitous train journey to Bavaria via Salonika and Lubeck in cattle trucks so cramped that there was only room for half the passengers to sit at one time. Teddy passed the time playing piquet and remained undaunted in what can only be described as abhorrent and filthy conditions. As a result of being a leader in escape plans, he was put in solitary confinement twice and moved to other camps three times. He was esteemed as a cook usually, it appears, surrounded by blue smoke, but always producing the best possible meal. He and Ken Wylie invented a yacht racing game and Teddy became editor of *Touchstone*, the camp magazine, among many other activities. There was also much bridge where Teddy's somewhat aggressive and unconventional calling combined with a poker player's grasp of his cards would certainly have incurred the displeasure of Mr. Culbertson. There were, of course, a number of exploits including the spiking of hoses when the Officers' Mess was bombed in Lubeck and a dissertation to German troops in Urdu. In 1944 Bea managed to get home from South Africa with her daughter, Veronica, and so was in England to greet Teddy. In 1946 he was posted to Austria and then Italy. This was followed by the Staff College, War Office and Berlin.

In 1952 he formed 25 Field Engineer Regiment at Maidstone. After a summer of intense activity, the Regiment was ridden very hard over a course from Thetford to Salisbury Plain to Cyprus and Benghazi, all within twenty-eight days and was quickly in fighting condition at the end. There followed a move to the Canal Zone as part of 3 Div and a number of intensely demanding exercises. Teddy found an old sapper yacht and determined to sail it out of Egypt to Cyprus. On the way up the Canal there were pot shots from both banks until a destroyer, already forewarned, arrived to give cover by training its guns on the sources of fire.

In 1953 he moved to SHAPE and it was during this time that the French element was called out for its only recorded military operation—to find Teddy's horse which, on its way from Vienna, had become separated from its groom in Strasbourg and ended up in a Paris siding without food and water over a bank holiday weekend. The operation was a success and eventually Teddy took the horse in triumph to the

French Army stables near the Eiffel Tower.

In 1957 he was sent to the States, where he continued his old love of sailing. He was elected to the Cruising Club of America and he sailed in several Miami/Nassau Races and at least one Bermuda Race with the late Henry B du Pont on *Cyane*. He was for many years a contributor to the magazine *Skipper*.

In 1959 he became Commandant of the SME. Here he re-vitalized the RE Yacht Club and was responsible for the organization of the 150th anniversary celebrations, and was instrumental in inviting Prince Philip to take the parade where the title Royal was bestowed. The only blemish appears to have been Teddy's error in taking the E-in-C's hat. When the error was discovered Teddy was barred (by his own orders) from crossing the square to swap hats. Somehow or other Teddy eventually greeted HRH wearing the correct one. In addition he was responsible for the modernizing and reorganization of the RSME and the great improvement of the training area at Upnor.

Whenever the opportunity offered Teddy would be afloat and racing: in the Hunt's *Spica*, in *Ilex*, in India, in the United States, in *Avalanche*, in *Right Royal* and *Annasona*, in *Grenade*, in *Goblet* of which he was part owner, and as skipper of *Bloodhound* when she was loaned by the Queen and Prince Philip to the RORC. He was a superb seaman and soon developed into a top class ocean racing skipper, who spared neither himself nor his crew and never gave up a race. For instance, in 1949 Teddy in charge of *Avalanche* in the Fastnet race, had to spend a long time up the mast to retrieve the main halyard, when lesser men would have waited for the weather to moderate. It took eleven days to complete the course. No wonder he became Commodore of the REYC and Vice Commodore of the RORC. But above all he was a splendid shipmate when sense of humour and fun turned the most daunting conditions into something to be enjoyed.

After he retired, Teddy was asked by Francis Chichester to reorganize his office in London, which he completed in a year; and he then became General Manager of a newly formed company, Offshore Marine. The company's purpose was to use service craft to support offshore drilling and operational bases. The company started operations in 1965 with a converted coaster, serving the ill-fated BP rig *Sea Gem* out of Great Yarmouth and in that year introduced its first two specially designed and built offshore oil rig supply vessels. By 1968 Offshore Marine had grown to a fleet of twenty-three purpose-built supply vessels, servicing rigs throughout the world. The company was then taken over by Cunard and Teddy became Managing Director. Under his leadership the company was very successful and received the "Queen's Award to Industry" in 1972 for its export achievements. In 1972 Cunard, of which Teddy was a director, was taken over by Trafalgar House and Teddy decided to leave to form a new and similar company, Star Offshore Services. In a short time this company had built up a fleet of offshore service craft directly in competition with Offshore Marine. It then looked for expansion in oil-related diving operations and absorbed the firms of Northern Divers and North Sea Diving. At this point Teddy became President. The whole of his North Sea efforts were a quite remarkable example of his entrepreneurial flair, his tremendous drive and his ability to co-operate with a whole host of other organizations, in particular in the City, where his relationship with Cazenove was a particularly important factor in the financing of his enterprises. It was a wonderful example of a Sapper Officer's wide experience being put to good use in the commercial field.

Typically, having retired from the North Sea business, Teddy set up as a sheep and pig farmer and would have made a great success of this, had he lived.

Teddy was a unique Sapper Officer in the best traditions, ingenious, determined, enthusiastic, endearing himself to an enormous circle of friends with his mischievous sense of humour and his tremendous enjoyment of life.

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Book Reviews

PARACHUTE BADGES AND INSIGNIA OF THE WORLD

R J BRAGG AND ROY TURNER

(Published by Blandford Press, Price £4.95)

THE authors have set out to do three things; to make available for the first time a reference illustrating the numerous qualification badges or "wings" worn throughout the world, to show the development of World Parachute Forces from the early experimental days in the 1930s and to encourage readers to explore the subject further. As they are arguably the leading world authorities on the subject it goes without saying that they have succeeded.

As would be expected from the Blandford Colour Series the book is very readable and the colour plates (64 of them) are outstanding. The book contains brief histories of the Airborne Forces of 102 nations and, in Appendices, a unique chronological list of WW2 and post war combat jumps.

A word of warning. The book is about Parachute Troops and does not include the other integral part of Airborne Forces, the men who flew and rode the gliders, and where deeds and actions have no less lustre than those of their Parachute comrades. Is it too much to hope that there is a further book in the pipeline?

EEP

GUNNERS, GAME AND GARDENS

ERIC HARRISON

(Published by Leo Cooper, London. Price £6.95)

IN his autobiography, Major General E G W W Harrison CB CBE MC MA DL, late RA, and now 85 years old, has tended to concentrate on the off-duty pursuits of his very varied and interesting life. He admits to having been very lucky and that he can still fish or shoot a full day without undue fatigue.

In his younger days he was an outstanding athlete and games player; Rugby for the Mother Country XV in 1919, Army in 1920; Olympic and British Empire hurdler; a very useful man in a unit team. His passions were however more directed to hunting, shooting and fishing and, after his retirement, gardening, a field in which he has won many prizes for his rhododendrons and camellias at the RHS.

The alliterative title is a little misleading. I confess that gardening did not figure sufficiently for my taste and dyed-in-the-wool Sappers need not fear, there is not too much on Gunners either! The book is a good read, particularly for those interested in field sports.

EEP

ANZIO 1944: AN UNEXPECTED FURY

PETER VERNEY

(Published by B T Batsford Ltd, London. Price £8.50)

A SMALL minority of today's Sappers know much about the operations in the Anzio Beachhead in 1944 when, having landed almost unopposed behind the enemy lines, an allied Corps just managed to hold on long enough to divert significant enemy forces from the main front and subsequently to take part in the eventual breakthrough of the Hitler Line and the capture of Rome.

This is quite a short book by an experienced and erudite Infantry officer with personal experience of the operations and firm views on their outcome. The strategical and geographical background are well described in the best Camberley style and the maps are good. However, provided one can bear a comparative silence on engineer activity, the appeal of the book lies in its superb portrayal of battalion battles fought by British Infantry at their most gallant and dogged best, regardless of

casualties, fatigue and shortage of combat supplies. Rifle companies were frequently reduced in strength to single figures and sometimes wiped out altogether. How much depended on the splendid quality of Company Commanders. Great tribute is also paid to magnificent standards of response and effectiveness in the British Artillery support without which the infantry would have been under even greater pressure. (It is well for us to know professionally how good Gunners can be, however important it is to beat them on the games field!)

Armchair strategists in 1979 must wonder why the initial intelligence assessment of the enemy forces and the terrain were so inadequate. More complete intelligence might have led to a higher proportion of armour in the orbat with significant consequences.

Nevertheless I enjoyed reading this inspiring book which I commend to all Sappers with a taste for modern military history–perhaps especially to some of those who would benefit from attention to their tactical awareness as mentioned in Colonel Ted Willmott's recent article in the *RE Journal*.

DJNG

BOOK NEWS FROM INSTITUTION OF CIVIL ENGINEERS

All books in this section are published by Thomas Telford Ltd and are obtainable from the Marketing Dept, Thomas Telford Ltd, Telford House, PO Box 101, 26–34 Old Street, London EC1P 1JH

BASIC WATER TREATMENT—FOR APPLICATION WORLD WIDE

GEORGE SMETHURST BSc, FICE, FIWES, FGS

Price UK and Eire £7·50; overseas by air £10·00

THE trouble with water is that there is so much written about it that it is virtually impossible to find the answers to relatively simple problems without a mobile library in support!

The author has had forty-six years experience as a water engineer in five continents and has worked for more than half his time in developing countries. He has attempted to write the sort of book he would have liked to have had available during his own career. In my view he has succeeded.

The book explores the areas where engineers in the field should do things for themselves and the areas where they should seek advice and, above all, it stresses simple solutions, cheap to build and easy to maintain. The book is supported by a very useful Glossary, a list of References for more detailed and specialised information and useful Conversion Factors.

This book is a must for any unit library as it has the answers to most of the water treatment problems which worry the military engineer.

THE MARINE ENVIRONMENT AND OIL FACILITIES

Price UK and Eire £10.00; overseas by air £13.00

PROCEEDINGS of a conference sponsored by the Society of Petroleum Engineers, the Institute of Petroleum, the Society for Underwater Technology and the Institution of Civil Engineers and organized by and held at the Institution of Civil Engineers, London, on 20 September 1978.

Oil pollution and spillage are phrases which have generated many emotional outbursts as well as a vast literature over the past decade. This volume brings together information from many sources on the wider and longer-term effects of the exploitation of offshore oil. Experts from oil companies, governments, research organizations and engineering contractors and consultancies, present and discuss the latest developments in the study and control of the environmental impact of offshore oil activity. The complicated value judgements involved are well presented and discussed.

CLAY FILLS

Price UK and Eire £18.00; overseas by air £23.50

PROCEEDINGS of a conference sponsored by the British Geotechnical Society, the British National Committee on Large Dams, the Institution of Highway Engineers and organized by the Institution of Civil Engineers. Held in London, 14–15 November 1978.

Compacted clay has been widely used as fill material for embankments, water-retaining structures and reclamation works. The assessment of the properties and the prediction of the behaviour of such fills have often to be based on limited information and in spite of various semi-empirical test methods developed to correlate with engineering experience, significant design and construction difficulties still remain.

This conference was designed to co-ordinate the latest knowledge on the subject by drawing together the experience of the many practising engineers and research workers engaged in this field. The twenty-seven papers deal with the engineering properties and behaviour of the material, with design, performance and monitoring, with construction, placement and methods of treatment and with the special problem of pavement subgrade assessment for roads. Many valuable case histories, information and data relating to actual works are provided. The discussions extend the papers by giving many examples from practical experience, especially of failures and their causes. The conference concentrates on clay, but compacted soft rock and similar materials are covered.

The volume provides an invaluable source of detailed information and enables engineers to operate with greater confidence in making assessments and predictions of the performance of clay fills.

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Lansing Bagnall Ltd., Europe's leading manufacturer of Lift Trucks, have a vacancy for a Technical Writer in the Technical Publications Department.

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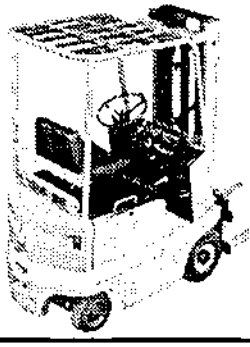

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ARTICLES AND CORRESPONDENCE FOR THE JOURNAL

YOUR Journal depends for its existence on articles and correspondence submitted for publication on historical, professional, technical and, indeed, on any subject of interest to Military Engineers.

ARTICLES

Articles may be of any length, but preferably not more than 6000 words. They should be typed in duplicate on one side of the paper only, double spaced with a one-inch margin. A third copy should be retained by the author for checking with the proofs.

Articles should be accompanied by a photograph of the author, suitable for reduction to two inches width, and a pen picture of his career to introduce the author to our readers.

Photographs to illustrate an article should be black and white prints on glossy paper. The size of the photograph does not matter as the size can be adjusted. Line drawings, maps etc must be in black ink and all lines, lettering etc must be bold and clear to allow for reduction in size when reproduced. Scales must be drawn and not worded.

The copyright of all articles published in the *RE Journal* is assigned to the Council of the Institution of Royal Engineers.

Payments for articles is at a rate decided by the Publications and Library Committee. An additional award of £20 is made at the discretion of the Committee for articles of particular merit published in each issue of the *RE Journal*. In addition two prizes, Montgomerie and Arthur ffolliott Garrett Prizes, are awarded each year for outstanding articles by RE Officers, not above the rank of Lieut-Colonel, published in the *RE Journal*.

Articles may be submitted at any time but the following dates are *normally* the latest for inclusion in the issues shewn:

MARCH ISSUE	1 DECEMBER	SEPTEMBER ISSUE	1 JUNE
JUNE ISSUE	1 MARCH	DECEMBER ISSUE	1 SEPTEMBER

For articles requiring clearance attention is drawn to Military Security Instructions Part 1 Army Code No 60723 Appendix B to Chapter 5.

CORRESPONDENCE

Correspondence is the life blood of the *RE Journal*. Correspondence on published articles is particularly interesting as it provokes further thought and widens the discussions on controversial topics. It is important however that the initial reactions to articles published should be in the NEXT Journal to maintain the interest in the subject. For this reason the submission date for correspondence *referring to articles* is five weeks later than that for articles. On average this will give correspondents about one month to react.

The submission dates for Correspondence on published articles are therefore:

MARCH ISSUE	7 JANUARY	SEPTEMBER ISSUE	7 JULY
JUNE ISSUE	7 APRIL	DECEMBER ISSUE	7 OCTOBER