INSTITUTION OF ROYAL ENGINEERS

Established 1875
Incorporated by Royal Charter 1923

Patron: HER MAJESTY THE QUEEN
Chief Royal Engineer: General Sir Kevin O'Donoghue *KCB CBE*

COUNCIL

PRESIDENT

Major General C L Elliott *CB MBE* ... 2002

VICE PRESIDENTS

Major General K H Cima ... 2004
Brigadier C M Sexton *ADC* ... 2005
Colonel C P R Bates ... 2002

MEMBERS

Ex Officio	*CRE HQ 8 Force Engr Bde*	Brigadier C J Boag	
	Comdt RSME	Brigadier J D Wootton *MBE*	
	Comd Geo Engr Gp	Colonel D H E Attwater	
	Regt Col	Colonel A P Cross	
	Col RE MCM Div	Colonel I J Blanks *MBE*	
	CRE 3 (UK) Div	Colonel I G Hitchcok *OBE*	
Elected Members		Colonel M R Cooper	2002
		Colonel I M Tait	2004
		Lieutenant Colonel M R Bassett *BEM*	2004
		Lieutenant Colonel T F S Smith *TD*	2004
		Warrant Officer Class 1 N Cooke	2004
	Coopted	Colonel I A Ogden	2005
	Corps RSM	Warrant Officer Class 1 C Maxwell	2004
	Treasurer	Lieutenant Colonel J M H Townsley	2001
	Secretary	Lieutenant Colonel D N Hamilton *MBE*	2000
Corresponding Members		Lieutenant Colonel D N Wilkinson, BLO Pionierschule, Munich	
		Major G M L Coutts, BLO Engineer School, Angers	
		Major W T R Thackwell, Exchange Appointment, Australian SME	
		Colonel P M Davies *MBE*, Engineer School, USA	
		Major M R Watson, Exchange Officer, Construction Engineering Unit, Canada	

BUDGET, INVESTMENTS, MEMBERSHIP, SCHOLARSHIP, MEMORIAL AND PUBLICATIONS COMMITTEE

Chairman	Colonel C P R Bates
Vice-Chairman	Colonel A P Cross
Members	Colonel I A Ogden
	Colonel T P Grimshaw
	Colonel A M Mills
	Colonel I M Tait
	Lieutenant Colonel M R Bassett *BEM*
	Warrant Officer Class 1 C Maxwell
Treasurer	Lieutenant Colonel J M H Townsley
Secretary	Lieutenant Colonel D N Hamilton *MBE*

INSTITUTION OF ROYAL ENGINEERS' STAFF

Secretary & Editor RE Journal	Lieutenant Colonel D N Hamilton *MBE*	Tel: ATN (9) 4661 (BT 01634 82) 2298
Assistant Sec, Publications:	Captain J E Borer	Tel: ATN (9) 4661 (BT 01634 842669/82) 2299
Database Manager:	Mrs J Thorndick	Tel: ATN (9) 4661 (BT 01634 82) 2309
Clerks:		Tel: ATN (9) 4661 (BT 01634 82) 2298
Fax:		ATN (9) 4661 (BT 01634 82) 2397

All correspondence in connection with editorial matters should be addressed to the Secretary, Publications, Institution of Royal Engineers, Ravelin Building, Brompton Barracks, Chatham, Kent ME4 4UG.

The Institution of Royal Engineers is Registered as a Charity Number 249882.

Editorial

In line with our policy of taking *The Journal* forward in keeping with the huge strides The Institution itself is taking almost daily, this edition contains two changes. The first and probably the most obvious is the cover and as always, comment on the change will be welcome, as indeed it is with any aspect of Institution publications. The second is concerned with our remit to promote debate. In recent months however, the majority of comments we have received, and I include *Sapper Magazine* in this, have concerned the proliferation of abbreviations and acronyms in articles and reports. We have for many years incorporated a page explaining any not covered by authors, but for this issue it was decided to try and make the page obsolete. With the assistance of the authors, this issue is "an abbreviation and acronym – free zone", although some that are so common (eg EOD and NATO which are almost words in their own right, and in any case ought to be known by everyone) still appear. It has been done by expansion, deletion and more use of footnotes but once again, please tell us what you think – our aim is to produce an interesting and readable publication that appeals to all sections of our membership.

Guidelines for Authors

The Editor is always pleased to consider articles for publication in the *Journal*.

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

Length. Articles of any length are considered but should normally be between 1500 to 5000 words. About 1200 words covers one page less photographs.

Copy. One copy of the text should be submitted, together with a head and shoulders photograph of the author plus a short pen picture and any other illustrations.

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

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

Photographs should, if possible, be of good quality with sharp definition, and have appropriate captions. Files from digital cameras can be used providing they are taken with a camera capable of producing high quality images. The files should not be altered in any way prior to submission and they MUST NOT be embedded in the document. Digital images can be sent via email to assist.sec@inst-royal-engrs.co.uk or on a CD.

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

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

Contributions should reach the Editor by:

7 October for the December 2005 issue.
10 February for the April 2006 issue.

Submissions before the deadline are particularly welcome.

ISSN 0035-8878

THE ROYAL ENGINEERS JOURNAL

© Published in April, August and December by the Institution of Royal Engineers, Chatham, Kent, ME4 4UG.
Printed by Stephens & George Magazines, Goat Mill Road, Dowlais, Merthyr Tydfil, Mid Glamorgan, CF48 3TD.

Volume 119 AUGUST 2005 No 2

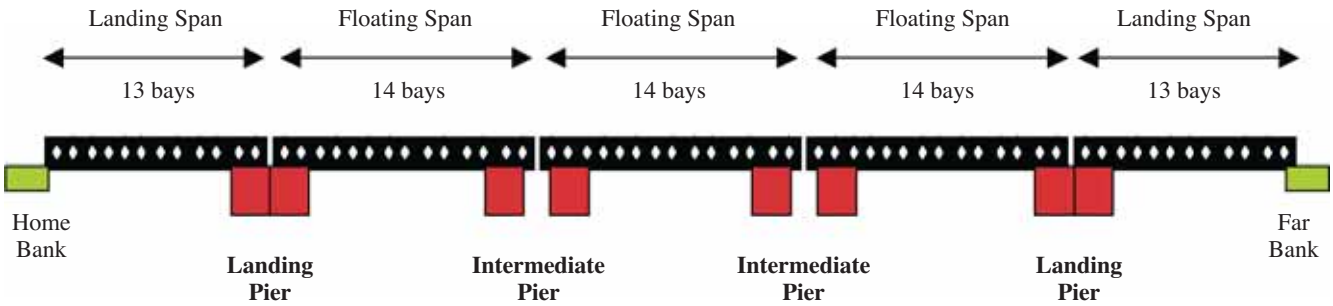
Contents

3500

Bridge Building in Basrah

MAJOR R S HOURAHANE BEng MA

Major Hourahane's initial regimental duty was fairly varied including amphibious, field (Gurkha), armoured and EOD engineering. After a year as an SO3 at 3 (UK) Div he became a Group Leader at the Regular Commissions Board. Staff College followed and then something completely different in the form of Deputy Project Manager for the Heavy Equipment Transporter Private Finance Initiative. He currently has the honour of commanding 1st Armoured Engineer Squadron. Over the last two years the Squadron has completed a compressed training year including Exercise Medman 2 *at BATUS and then deployed to Iraq for Operation* Telic V.



The new Al Fayhah bridge

Introduction

Basrah has two crossing points over the Shatt Al Arab Waterway, the Al Tannumah bridge in the south and the Al Fayhah bridge in the north. Both are pontoon bridges, Mabey & Johnson Compact 100 at Al Tannumah and Bailey at Al Fayhah (the Cullingworth Bridge). Both bridges are highly used and only wide enough to support one way traffic. Police control is essential and queues can be large particularly at rush hour. Both bridges have a load class of around 30 tonnes but since they are the only routes across the Shatt Al Arab waterway, both bridges are routinely overloaded and in the past have suffered catastrophic failure. To alleviate the problem, the Commander's Emergency Response Fund provided almost $4million for an additional bridge to be built at Al Fayhah.

The demolished Kalid bin Wahid Bridge with the Cullingworth Bridge on the right. The black line shows the centre line of the new bridge.

Built by "Iraqis for Iraqis".

1st Armd Engr Sqn was tasked with "enabling" the construction of the new Al Fayhah bridge. Rather than building the bridge with squadron manpower, the mission was summed up by the CO as; "ensure that it is a success without any cock-ups". Thus directed, an estimate identified the following implied tasks:

- Control the construction of the approach roads.
- Control the shrinking of the gap and construction of abutments.
- Set up a bridge yard at the Shatt Al Arab Hotel (home to 1 DWR BG and only 10 minutes drive from the site).
- Receive and account for the bridge components.
- Pre-fabricate as many components as possible in order to reduce time on site.
- Conduct own rehearsals.
- Instruct Basrah Engineering Company in Mabey and Johnson bridge construction.
- Set up the site.
- Ensure adequate force protection.
- Construct the bridge.
- Hold a high profile opening ceremony!

Iraqi-isation

Following the Brigade Commander's intent for Iraqi-isation: "Built by Iraqis for Iraqis" was the underpinning operational concept for the new bridge. With it being largely a consent building activity, it was also essential that it was readily apparent that it was facilitated by the British Army. Mabey & Johnson had been contracted to provide the bridge as well as on site supervision during the build. A local company, the Basrah Engineering Company had won the contract to build the bridge. This contract was essentially for the provision of manpower and plant. The Basrah Engineering Company were also contracted to construct the abutments and approach roads.

The Recce

On the *Telic V* recce in September 2004, I was made aware that there was an issue with the size of the gap. It was explained that the gap was too big for the bridge that had been bought and the gap required shrinking by some 40 metres. How exactly this happened or when it was first noticed I am not sure but in the event it was to prove significantly easier and cheaper to shrink the gap rather than buy more bridge. An extra 40 metres of bridge would require an additional span, probably in the order of $700K. The approvals process for large sums of money can be somewhat torturous and with a causeway option costing under $200K it was easy to see why this was the preferred option.

Bearing in mind that the Basrah Engineering Company had little if no equipment bridging experience,

Training and Publications

Of immediate concern was the lack of floating bridge experience within the Corps and certainly within the Squadron. My field troop staff sergeant had only just left following premature voluntary release and a new staff sergeant had to be found from within the Regiment. This had to happen relatively quickly as he had to receive some training on Mabey

Overt British Army presence was important for consent building.

and Johnson floating bridging as well as taking the troop through their pre-deployment training. Sergeant Raine, an armoured engineer employed as the Regimental Intelligence Sergeant was fired into the job with acting rank to fill the post of Field Troop Staff Sergeant. In order to ensure some redundancy, two SNCOs were to attend the Mabey & Johnson training and so Staff Raine together with Staff Williams flew from Germany to UK.

The course lasted a whole day and was held in a conference room at the Trusthouse Forte Hotel in Plymouth. Although feeling that this could have been slightly more on the practical side rather than powerpoint slides, I was somewhat reassured by the fact that Mabey and Johnson were contracted to provide an expert as the build supervisor. Once back in Germany, Staff Raine built a standard LSB as refresher training. As far as publications were concerned, we had the standard LSB Army Equipment Support Publication (AESP) which does include fixed piers but essentially covers only the construction of simply supported bridges. Mabey & Johnson had provided a generic guide to floating logistic support bridges, but this was very much a guide rather than the detail contained in an AESP.

Preparation

By the time we arrived in Iraq at the end of October 2004, the gap had shrunk to the size required for the bridge. A large amount of desert had been imported and compacted on the bank of the river. Erosion then became a problem as the river attempted to remove its new "beach". A solution was planned in the form of an "H-pile" causeway, effectively a "pier" build on the new earth causeway with piled foundations down to 18 metres. The Basrah Engineering Company had the contract and promised to have it finished by mid November.

Mabey & Johnson had a sub-contractor deliver the bridge components to the Shatt Al Arab Hotel. Being either 20 foot or 40 foot ISO container size, the pontoons were not going to be stolen and so were delivered straight to the site. The bridge arrived in twenty two 40 foot ISO containers which took some time to unpack. The resources specialists and crane operators worked hard going through literally hundreds of components and ensuring things like the 60mm bolts were clearly distinguishable from the 65mm bolts.

With construction due to start in a few weeks, a phone call from Staff Raine caused some concern. All the launching equipment was missing! After some initial ranting about civilians, a check of the container loading list revealed that there was not supposed to be any launching equipment. None had been bought! This issue ran for a few hours until it was remembered that there was a reserve LSB on 65 Field Support Squadron's resources yard at Shaibah Logistic Base. Somewhat reluctantly, the Divisional Engineer Group accepted that their predecessors must have assumed that no one would mind committing the launching equipment from the reserve bridge. With assurances such as "no we definitely won't break the rollers" we were back in action.

Very keen to reduce the time on site and therefore the force protection burden, we decided to pre-fabricate as much of the bridge as possible. These components would then be moved to the site by DROPS as they were required. The bridge being "single-double" construction, this involved assembling two panels, bracing frames and their reinforcing chords into a double truss bridge box.

As always, rehearsals were essential particularly since the Basrah Engineering Company had not built such a bridge before. Keen to appear completely confident, Staff Raine held his own rehearsals with the section that would "assist" the Basrah Engineering Company with the build. A number of mini bridges practicing span junction sets, end posts and tails were built on the hard standing at the Shatt Al Arab Hotel. Working with some of these components for the first time and without detailed drawings, Staff Raine and his men made full use of "trial and error". The drawings or more likely the knowledge was coming out to Iraq with the Mabey & Johnson representative. Regular and detailed examination of photographs of other floating bridges assisted in determining exactly which part went where. Now armed with suitable experience, Staff Raine brought the Basrah Engineering Company foremen into the Shatt Al Arab Hotel and rehearsals were repeated.

Pile driving on the earth causeway to form the H-pile causeway. Note the chairs for the supervisors!

There was still no sign of the Mabey & Johnson representative. I was becoming a little concerned as the build was due to start in a few days and with our inexperience I had been hoping for his assistance. A phone call from the representative himself two days prior to the start of the build indicated that there might be a problem with insurance and that there would be a delay in his arrival in Iraq. As the initial week would be

"That must be on upside down"!

floating pier construction and we had these particular drawings, we pushed on.

The Build

By now the H-pile causeway was nearing completion. It was clearly apparent that construction materials and working practices were not quite what we might expect in Europe, however, the finished product was excellent. None of the steelwork was new and most of the beams were made up of a number of smaller beams joined together, often not the same cross-section. Despite using only a tape measure, spirit level and a very basic level, positional control was to high tolerances and the quality of welding quite outstanding. Although not having started on time, the far bank abutment would at least be finished before it was required. The Basrah Engineering Company and their subcontractors were very resourceful and produced excellent work.

Still with no Mabey & Johnson representative, the day came to start on site. Security was an obvious concern and the responsibility of 1 DWR BG within whose patch we were operating. In addition to their normal framework patrolling and covering the Quick Reaction Force, they could only dedicate a single multiple to form the "outer cordon". The inner cordon and escorting bridge loads to site was covered by the Squadron. The other consideration was the extraction of the military construction force in the event of attack. This was covered by Boat Troop with Combat Support Boats which doubled as water borne fire support.

On 2nd December, the Basrah Engineering Company arrived with their workforce. The first thing to be done was to launch the pontoons and join them together to construct the floating piers. As already mentioned the pontoons were effectively 20 foot and 40 foot ISO containers. They were joined up to form two landing piers 100 foot x 20 foot and four intermediate piers 100 foot x 10 foot. Having seen the cranes that the Basrah Engineering Company were using, it seemed prudent to insist that squadron personnel stayed well away from them. Through Staff Raine, I clearly held Health and Safety responsibility for our personnel but the risk for local labour definitely lay with the Basrah Engineering Company. A site safety supervisor might have had a few things to say about their working practises but insisting on European standards would have been futile.

Once the pontoons were joined together, distribution beams were welded across the top to spread the load of the bridge. The distribution beams had pre-drilled holes where reinforcement chords would be bolted. These reinforcement chords provided the method of connection to the bridge panels. The holes only allowed for a tolerance of about +/- 5mm. This meant that positional control was extremely important, more of this later. The Basrah Engineering Company, working from the drawings, welded on the distribution beams. Their precision engineering experience was much better than ours and very rapidly the piers took shape. Once complete they were moved by CSB and moored downstream.

This was the first point at which we really started noticing the

The H-Pile causeway (less deck) on the new "beach". The original river bank can be seen in the background.

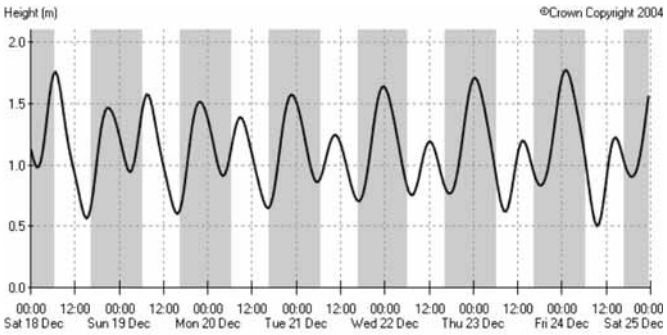
Pontoons being launched. Note the effective use of the crane hooks to retrieve the slingers from the launched pontoon.

The bridge was to be a five span Mabey & Johnson Floating Logistic Support Bridge. There would be two landing spans each of 13 bays (either end of bridge) and three floating spans each of 14 bays (see diagram at start of article). The overall bridge length was 210metres. For those Mabey & Johnson experts, all spans were to be DSHR2H+++. Next was the build of the first floating span on a roller plane that was configured for a down-hill launch. This went well albeit a little slow as the Basrah Engineering Company workers came to grips with the large "Mechano" set.

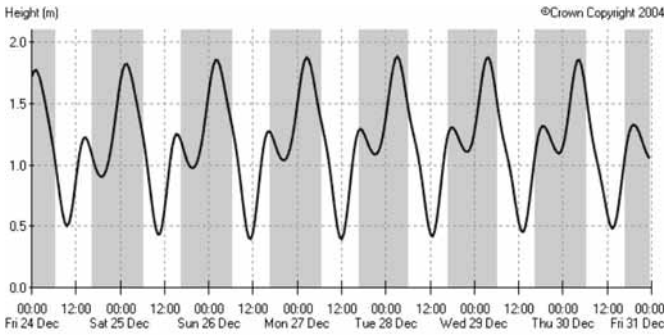
The night before booming the first floating span, as much as possible was prepared. The bridge was boomed out five bays and the floating piers were brought into position under the bridge by Combat Support Boat. On arrival the following morning a valuable lesson was learnt. Both floating piers that had been so carefully positioned were no longer

effects of the river and tide. The flow rate of the river was not excessive but did vary with the tide which had a range of 1.5 metres at Springs and about 0.8 of a metre at Neaps. The most reliable form of tidal information was available free on the internet from the Hydrographic Office. One of the interpreters offered to sell me a tide table, which had one week of data for US$50. To his amazement, his "kind" offer was declined. Prior to discovering the Hydrographic Office web site, there had been a few head scratching moments as the tide was not doing what was expected. All was revealed when the curves were downloaded. At Springs, there was effectively a 24 hour period from high water to high water with a mini tide cycle in between. At Neaps, the situation was more like the normal 6 hours from high water to low water. This added complication would catch us out on a few occasions.

Welding the distribution beams on the floating piers. The reinforcement chords are then bolted to the distribution beams. The bridge panels connect to the chords.



Basrah tide at Neaps.



Basrah tide at Spring.

floating! The tide had gone out and with 24 hours between proper high waters, it was not due in until the end of the day. The piers were not moored so close to the bank again!

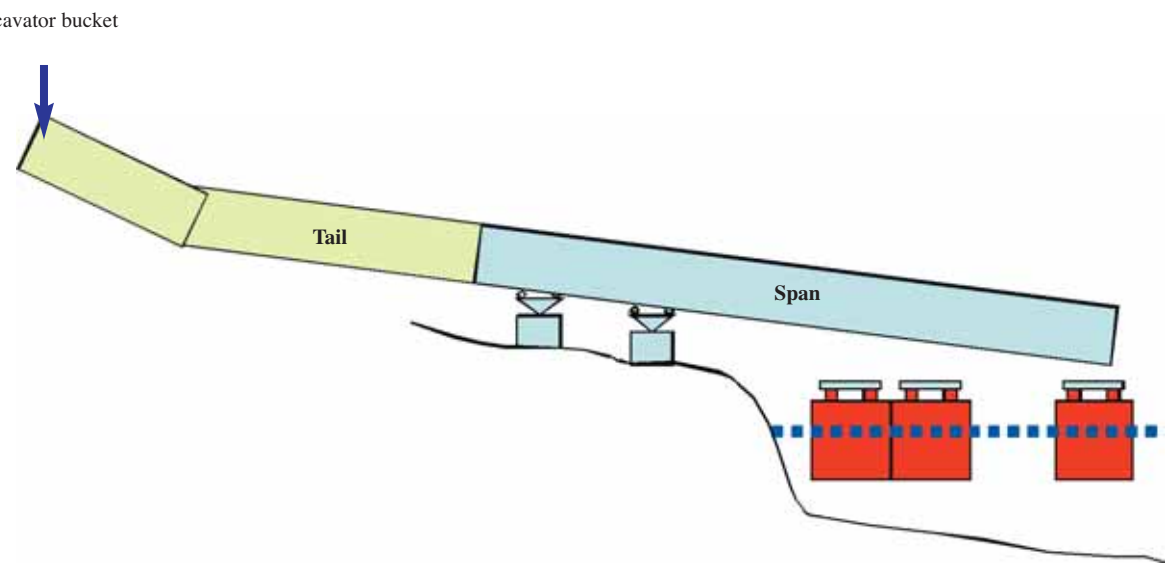
Visits were a recurring theme and we had just about everyone from GOC 1 (UK) Armd Div, MND(SE) Commanding General and many press to the House of Commons Defence Select Committee. In fact it was on the day that The Rt Hon Bruce George and his Committee visited the bridge, news was received that Mabey and Johnson's insurance company considered Basrah too dangerous and their representative would not be coming. On our behalf RHQ and the Divisional Engineer Group arranged additional consultancy support in the form of WO2 (SSM) Woodings from 65 Field Support Squadron and Staff Sergeant Jones from 22 Engineer Regiment. It was now time to "drive-on" and build the bridge.

A double truss box section being fitted.

Returning to the booming of the first floating span, each is built with a tail. The completed span is then boomed out over the pier to which it will be attached. A tracked excavator is used as the booming vehicle with its bucket chained to the rear transom of the tail. This acts to push and more importantly pull when beyond the centre of gravity and the bridge is heading into the river. The advantage of the excavator is that once beyond the centre of gravity the excavator can be used to push down on the end of the tail to adjust the height of the front end of the span as it comes into contact with the floating pier.

The excavator bucket being fixed to the rear transom on the tail.

When connecting the first pier, the importance of accurate welding came into sharp focus. As the end of 14 bays of bridge is being lowered gradually onto reinforcement chords that are now bolted to the distribution beams 5mm of tolerance is not a great deal. To remind me of this fact I could hear sledge hammers going to action to encourage the com-



Landing the front end of a span onto a landing pontoon. The landing pier is in position waiting to be connected to the back end on the span.

The end of the span is connected to the outside pier before the back of the span is landed on the inside pier.

ponents into compliance. Luckily positional control of the distribution beams was good and the first end was connected relatively quickly to the floating pier.

The remainder of the span is then boomed out and as the articulated final two bays of tail run down the rollers, the back end of the span lands on the rear floating pier. Another valuable lesson was learnt at this point. As the articulated part of the tail is passing over the rollers and the back end of the span comes into contact with the floating pier the load on the rollers is progressively decreasing. Well that was what we thought. Having not done this before, it was assumed that the tail would just run off the end of the rollers. Well this did happen, however, probably as a result of a fall in water level over the hour or so of the span boom, the rollers were still bearing considerable load when the tail ran off. Rather unexpectedly, the two forward rollers were fired backwards into the forward edge of the concrete abutment. No one was hurt, the rollers were welded back together and in future this was controlled by lifting the tail clear of the rollers with a crane just prior to run off.

An amendment to recommended practise was required for the tail. When booming onto a floating pier the critical dimension is the distance from the front roller to the point at which the water depth is 0.6 of a metre. The pontoon must float in that depth when the span is landed otherwise grounding will occur which on a falling tide would cause considerable problems. With a pre-constructed and therefore immovable abutment this distance was far larger than the recommended maximum. Nine bays of tail were necessary instead of the normal five.

Much relief followed the successful launch of the first landing span which was then taken away by the boats to be moored downstream. This is probably the point to emphasise how critical the combat support boats were to the task. The operators had been trained in moving the boats from A to B but acting as tugs was something new and the learning curve was fairly steep. When moving pontoons, floating piers or floating spans, careful synchronisation is required between 4 boats which were usually out of sight of each other. Personal Role Radio and a fair amount of practice proved vital to achieving the level of synchronisation required.

After the first floating span, the next two were built and moored down stream while the home bank landing span was assembled on the roller plane. We had worked out that the first landing span boom would be very “interesting”. To summarise the challenge faced by Staff Raine: an excavator driven by someone who didn’t speak English controlled 13 bays of span booming past its centre of gravity over the water. At the same time this had to be connected to a floating span held in position by four boats with the river and tide working against them. Mabey & Johnson referred to it as being a rather exciting event to coordinate! Anyway, as with everything else Staff Raine ably assisted by Staff Williams managed to launch the home bank landing span and connect it to the first floating span without any undue fuss or bother. Once done, the pier anchors were deployed to fix the floating span in position. Next the second floating span was brought into bridge giving us three spans.

The back end of the span has landed on the inside floating pier and the articulated section of the tail is on the verge of running off the inside rollers.

Concurrent activity saw the roller plane moved to the far bank in preparation for the construction of the far bank landing span. The H-pile causeway was a perfect size for

The home bank landing span and 2 floating spans complete.

the bridge bearing pads but not quite wide enough for the rollers! A quick spot of welding provided a combat engineer solution. Before long the far bank landing span was boomed onto the final floating span.

Finally it was time to complete the bridge. I liken this to fitting the bank-seat beam on a Medium Girder Bridge where pressure must be applied at exactly the right points to get the shoot bolts to engage. Getting the pins in on the span junction sets proved to be a rather boat intensive activity with all sorts of push and pull combinations before the pins went in and the five spans were joined.

All that remained now was to lower the far bank landing span, complete the decking, put in the anchorages and finalise the bearings. The home bank was mounted on a sliding bearing with the far bank being a fixed bearing welded to the H-pile causeway. The main purpose of the sliding bearing was to take account of the rise and fall of the tide. Staff Raine very prudently decided to leave the bridge to move through a few cycles of the tide before fixing the bearings to allow the bridge to find its own equilibrium position at mid tide.

Commander 4th Armoured Brigade was keen to capitalise on the opening of the bridge. It was decided to postpone opening for a few days in order to ensure that the Governor of Basrah could open the bridge in the run up to the elections. This was just as well since the Basrah Engineering Company had still to complete the wearing course on the approach roads. Having had about three months to do the job, they only swung into action when told that the Governor would be opening the bridge in three days time. On the day they were still laying blacktop an hour before the Governor arrived. The culminating event of the opening ceremony was for the Governor and his "motorcade" to drive over the bridge. I had visions of the Governor's heavily armoured car ending up stuck axle deep in soft and still hot black top. To my huge relief this did not happen and the Governor drove away.

Observations

By means of summary, I intend to make a few observations. Firstly I would like to emphasise that although we were not specifically trained for floating bridging, it was well within our capabilities as combat engineers, albeit with some trial and error. If called upon to do this again, life would be much easier if the detail was covered in the Army Equipment Support Publication and some practical training was possible.

It is unwise to rely entirely on contractors to perform essential operational functions. There was a contract in place for an expert site supervisor. However, come the day the Contractor was not prepared to deploy his representative to an area deemed too dangerous for their insurance company to cover the risk. The potential for this to happen again should not be forgotten.

Applying pressure to join the bridge. Note the anchor has been deployed on the right hand pier, the left hand anchor is on the pier awaiting deployment.

The complete bridge.

When the bridge was ordered, no allowance was made for damage to components during construction. Only the exact quantity of bridge components were bought. In the event, a couple of rollers, one panel and a transom were damaged and required replacement. Fortunately this could be done from theatre stock but this might not have been the case.

The final point that I would wish to make is that as demonstrated by the Basrah Engineering Company, the Iraqis are excellent engineers. They achieve most impressive results with equipment that can best be described as lethal, and raw materials that have already had a number of former lives. Project management and quality control is also strong. Amongst the engineers there is discernable pride in their profession and those that have been to university are correctly addressed as "Engineer" rather than "Mister".

The story does not end here. About a week before completion, an Egyptian engineering company arrived to set up their site yard for the repair of the Kalid bin Wahid concrete bridge (see initial photograph). With them came the final surprise. Their main concern was how they would be able to get their barges with lifting jacks past our bridge for the repair as we had effectively sealed this part of the river for all but rowing boats. The next day the Iraqi Director of Roads and Bridges appeared on the scene to inform us that in about four months the centre span of our bridge would have to come out to get the barges through. That puts this job at around May 2005 or probably July with a bit of Insh'allah added. The Director was informed that if he had to do this it would be advisable to talk to the British Army. Stand by 26 Engineer Regiment for a bridging task on *Telic VI*.

The Governor of Basrah opens the bridge.

Communication was often a challenge; Staff Sergeant Raine trying out his Arabic.

Major General Sir John Ardagh KCMG KCIE CB 1840 – 1907

GENERAL SIR GEORGE COOPER GCB MC DL

Michael Ardagh, the General's great-nephew, has recently donated ten of his paintings, some silver vases and two very nice silver goblets to the Headquarter Officers Mess. They were formally accepted by the Chief Royal at a Corps Guest Night on 9 June 2005 when General Cooper presented them on behalf of his brother-in-law who was too ill to attend. But who was General Ardagh? His portrait hangs just inside the lower anteroom, on the left as you come in from the front door: an austere, ascetic looking man, covered in medals. People often ask who he is and why his portrait is so prominently displayed. Well, this article tells a little about one of the most talented and unusual officers the Corps has ever produced a soldier-diplomat, an international lawyer, a financier, an astronomer and an artist. He was also Commandant at Chatham 110 years ago.

JOHN Ardagh was born in County Waterford, the son of a sporting parson who hunted a pack of hounds in friendly conjunction with the local Roman Catholic priest. At school, he became the head of the big boys' dormitory and a schoolfellow wrote that "whenever we small boys had a fight with pillows he always took care that things did not get out of hand. He was an honourable boy, imposed his own justice, and saved many a boy from a good caning. No one could touch him at mathematics but, with all his cleverness, he was as modest as he was generous".

He soon rose to be the top of the school and at the age of seventeen he entered Trinity College, Dublin, taking a prize in Hebrew. He passed high into Woolwich where he was either first or second in every examination, passing out first in April 1858 and joining the Corps. After the usual Young Officers' courses and an initial posting, he was ordered to join an expedition to Canada where he was involved with the construction of a telegraph line in New Brunswick. The voyage though was not without incident: setting sail, with six hundred men on board, in a boat totally unfit for the Atlantic, the engines could not cope with the heavy seas, the rigging was rotten and they lost every sail, necessitating a return to port. While waiting for another ship, John Ardagh composed a humorous poem, of which the following lines

The portrait of Major General Sir John Ardagh KCMG KCIE CB which hangs in the lower anteroom in the HQ Mess at Chatham. It is an oil on canvas painted by Mrs A M L Merritt ARE, and was presented to the Corps by his widow.

convey an idea of what the storm was like:

"It blew so hard, it blew the buttons
Slick from off the bugler's coat;
And a comrade dear of Atkins
Had his pipe blown down his throat!

The subsequent voyage was no less hazardous, with a motley crew who sometimes had to be kept at the wheel with the point of the bayonet. Blown nearly to Iceland, then down to the Azores, the rudder-chains were continually breaking and at last they sprang a leak and lay helpless in the trough of the sea, with six feet of water in the engine-room. John Ardagh and his men mended the pumps, got the ship under way again and after three months at sea, they got to Plymouth, three hundred miles further from their destination than when they had left Cork! Lieutenant Ardagh was publicly thanked on parade by order of the C-in-C for his efforts to save the ship.

In 1868 he was appointed Secretary to the Committee on Fortifications, on the recommendation of Field Marshal Sir John Burgoyne, and subsequently to the Committee on Coast Defences, in both of which he had considerable expertise. These Committees had been appointed to enquire into the state and progress of the works initiated by the Royal Commission on National Defences some ten years earlier.

He passed in second to the Staff College in 1872 and was promoted to Captain the same year. Passing out two years later, and having also become proficient in both German and Italian, he was appointed to the Intelligence Department, probably as a result of the time he spent in France during and immediately after the Franco-Prussian War when he produced numerous reports at the instigation of the War Office. He had not been there long when he was selected to accompany the Marquess of Salisbury on his mission to Constantinople to try and settle the Eastern crisis. He was able to render valuable assistance to the British Ambassador and also spent a considerable amount of time with the Turkish Army involved in fighting Russia. At the subsequent International Conference in Berlin his knowledge of Turkey and of affairs in the Eastern Mediterranean was of great value and after the conclusion of the Congress he received the Civil CB. He also summed up the Conference in twenty-two stanzas entitled "The Lay of the Wooden Spoon", showing a humorous side to his character.

Taking two months leave in 1877, he explored Alexandria and the Nile, acquainting himself with the myriad problems of the area which provided him with valuable background knowledge when, long afterwards, he became a Government Director of the Suez Canal. During this time he took a trip up the Nile in a Khedivial steamer personally conducted by the original Mr Thomas Cook. He congratulated himself on the absence of ladies on board, contrasting the peaceful relations of the male passengers on his own boat with those which seem to have prevailed on others where there *were* ladies and where there was *not* unanimity!

His impressions of Egypt and Sudan are no less favourable and he commented that the labours of Hercules were infantile compared with the stupendous task being undertaken by General Charles Gordon, *"a task no man is more capable of performing"*. In Egypt itself, *"the country is eaten up by its rulers and by a horde of foreign adventurers who fatten on the oppressive taxes wrung from a miserable population. Costly palaces unoccupied and falling into decay; new ones under construction to gratify a whim; railways which carry no passengers; sugar factories which worked at a loss; extravagant entertainments and unbridled luxury – these are the work of a profligate ruler and a corrupt administration"*.

Apart from Egypt, he visited numerous other countries, making sketches as he travelled with the rapidity and accuracy which characterised all his work, returning to England via Italy and France before resuming his duties in the Intelligence Department where he stayed until 1882 when he was posted to Chatham. He had hardly arrived there before he was once more ordered to the East, in consequence of the crisis in Egypt. He was present at the Battle of Tel-el-Kebir and at the end of the war he was appointed DAAG at the Headquarters of the British Army of Occupation and also promoted Brevet Lieutenant Colonel.

Early in 1883 he made a tour of Palestine and spent a short period of leave in England. By now, the rebellion in the Sudan, which had started two years earlier, was assuming serious proportions and the British Government was forced to take action. It was decided to send a British force to Suakin and John Ardagh was appointed CRE and Chief of the Intelligence Department, being present at the Battle of El Teb where the Arabs were defeated with heavy loss. He was greatly in favour of following this success by advancing on the Suakin-Berber route for the relief of Khartoum, but the British Government refused to allow an advance and recalled the British troops from Suakin.

In July 1884, it was decided at last to send a force up the Nile under Lord Wolseley for the relief of Khartoum, and John Ardagh

was put in charge of the vast amount of work involved in supplying the expedition. At the conclusion ofthe campaign, he was mentioned in despatches, promoted to Brevet Colonel and received the CB of the military division of the Order. He thus had the unusual distinction of wearing both civil and military CBs. He also received the Order of the Medjidieh, having previously received the Order of the Osmanieh.

On returning to Cairo, he was involved in the settlement of the financial negotiations between England and Egypt arising from the Nile Campaign, for which he received the thanks of the Treasury. In January 1887 he was promoted to Colonel and later in the year he was recalled to London to take up the appointment of AAG in the War Office. Only a year later, he was asked by the Marquess of Lansdowne, who had been appointed Governor General of India, to accompany him as Private Secretary. He remained in India for the next six years, finally returning to England in May 1884. In recognition of his service he was made a Companion of the Order of the Indian Empire in 1892, being promoted to Knight Commander in the order two years later. Amongst the items presented recently to the Corps are two silver vases which carry the inscription *"JCA from L, India 1888-1894"*, not some loving inscription from a lady, but a token of appreciation from Lord Lansdowne!

After only a year as Commandant of the School of Military Engineering at Chatham, an important appointment even in those days, he was promoted to Major General and became Director of Military Intelligence in London, holding that post for five years and covering the period of the South African War. During this time, he was nominated as the British representative on the International Commission delineating the boundary between Argentina and Chile and, in the same year, was appointed British Military Delegate at the first Peace Conference at the Hague. It was there that he took a leading part in drawing up the "Rules respecting the Laws and Customs of War on Land" which formed an important advance in international military law.

Though he retired from the Army in 1902, such was his knowledge of international law that he continued to be employed by the Foreign Office, being selected that year as a

member of the Permanent Court of Arbitration at the Hague. He was also appointed one of the British Government Directors of the Suez Canal and, in June 1906 he was appointed senior British Plenipotentiary at the Conference for the revision of the Geneva Convention, respecting the treatment of wounded in time of war. His last public duty, in June, 1907, was as one of the representatives of the British Red Cross Society at the International Red Cross Conference. Working to the end, he died only three months later.

This astonishing man served his country from the age of eighteen to the day of his death, remaining on active service for forty-three years, thirteen of which were spent abroad in Turkey, Egypt and India. During thirty-one of those years he was employed by the Foreign Office, the Colonial Office and the Treasury, to whom he acted on many occasions as confidential expert adviser. He had a facile pen and wrote without alteration or erasure and his papers show that he had studied numerous languages, both ancient and modern. In the course of arbitrations, settlements of claims and demarcations of boundaries, not to mention numerous congresses, conferences and conventions, he was able to devote a good deal of time to legal studies, particularly to international law. Despite his formidable intellect and an immense capacity for work – his contemporaries often referred to him as "Ardour" – he was a prolific painter in his leisure moments, leaving over seven hundred paintings and sketches, made with great rapidity and accuracy in almost all quarters of the globe. Family life eluded him for a long time and he was into his fifties before he married Susan, Countess of Malmesbury, who he had known since childhood.

As his portrait implies, he was reserved and silent, cold perhaps to strangers, but warm-hearted to his friends. He took immense trouble to look after the members of his staff and people felt that to serve him was not only an education but also a great privilege. His quick grip of the most complicated questions and an extraordinarily receptive brain meant that he never dropped a single point and was easy to work for. Nevertheless, a visitor entering his office would be immediately aware of a notice, printed in large capitals saying:

WHEN YOU VISIT A MAN OF	)	
TELL HIM QUICKLY YOUR	)	BUSINESS
LEAVE HIM TO HIS	)	
GO ABOUT YOUR OWN	)	

Evidently not a man to be trifled with!

The lodestar of his life and work was a saying of General Charles Gordon's: *"A man who cares for wealth or who fears death is the slave of others. A man who is indifferent to them is free and their master."* A very suitable epitaph.

Note: The paintings by Major General Ardagh on the previous page are the only two currently held by The RE Museum. although not on show. They are not captioned and while the location of the bottom one is clearly Egypt, that of the top one is less obvious. Others of his paintings are in Pasley House, Brompton Barracks, and in various officers' messes of the Corps, on loan from the Museum.

Boys Blong Jon Make Jungle Go Bang
Twenty Five Years on From Op *Titan* in the New Hebrides

LIEUTENANT COLONEL J M GUNNS MBE BSc

Lieutenant Colonel Jon Gunns was commissioned into the Corps in 1977 and served as a troop commander in 32 Field Squadron in Ripon, from where he was detached to serve in the New Hebrides on Operation Titan *in 1980. He has spent the last 25 years of his career attempting to find another operational tour that would allow so much variety, freedom of action and time off for adventure training. He is still searching.*

THE Anglo-French condominium of The New Hebrides is an archipelago of 82 islands stretching 1,300 km between the Solomon Islands and New Caledonia. Independence for the islands was set for 30 July 1980 and elections in November 1979 saw a clear winner with Walter Lini's Vanua'aku Party establishing a government in waiting.

However, all was not well and in May 1980 an insurrection on the island of Tanna split the island in two. On the island of Espiritu Santo, Jimmy Stevens, leader of the separatist Nagriamel movement, seized the opportunity to blockade the airport, run the police from their small station and declare Santo independent, raising the flag of the independent country of Venerama.

The curious administrative arrangements resulting from the status as a condominium meant that any decision on action required political agreement between the two colonial powers; a consensus proved difficult to achieve. Thoughts of delaying independence were discounted when Walter Lini stated that he would unilaterally declare independence on 30 July if the colonial powers reneged on their agreement to the original deadline and in June a joint Anglo-French military intervention was agreed. Operation *Titan* was go.

At 11 am one June morning I was in my troop office in Ripon when I was called to the OC. I was briefed on the situation and warned to prepare a small command team for deployment at 4 pm that day. Although the Squadron was earmarked to provide a field troop at short notice to support the Spearhead Infantry Battalion Group, this commitment fell to a different troop and my immediate horizons had been set on the next weekend off. Frantic activity and significant confusion ensued as we quickly packed kit, checked inoculations and tried to locate the New Hebrides on the troop route-planning globe. Eventually we hit the deadline for departure and, accompanied by Staff Sergeant Bill Price and my driver Sapper Marshall, I headed for the Air Mounting Centre at South Cerney where we met the other Spearhead units. Only the lead elements were to be deployed with the group based on HQ 42 Commando Royal Marines with M Company being the major sub-unit. There was some suggestion that a parachute assault might be required and the group was reinforced by an airborne element including the parachute trained 42 Commando Reconnaissance Troop as well as Army parachute trained signallers, medics and a section from 9 Parachute Squadron Royal Engineers under Staff Sergeant Turner and Corporal Lovely. A RAF detachment with two Hercules C130 aircraft was earmarked to support the force.

On 13 June we departed by VC10 for the flight to Port Vila, the capital of the New Hebrides on Efate Island. The flight took 32 hours, including four two-hour stops for refuelling at Gander, San Francisco, Honolulu and Fiji, with cold beer thoughtfully laid on at each stop.

We landed at midday local time on 14 June where, as part of a deception plan, the Army parachute elements were asked to remove their red berets in order to conceal the presence of an airborne capability. This order was predictably well-received, particularly as having been issued by a Royal Marine!

We were taken to Malapoa College, a commandeered school that was to be our home for the next 10 weeks. We quickly made ourselves comfortable and settled into a routine of training and acclimatisation. Training included internal security measures, which were demonstrated by the local Police Mobile Unit and reflected traditional colonial procedures rather than those employed in Northern Ireland. Having recently returned from a four month tour in Crossmaglen it seemed strange to train in public order drills with banners and infantry box formations. Weapons were zeroed and pre-parachute drills were practiced. Jungle training was also undertaken with guides/instructors again provided by the Police. On a lighter note, one of the 9 Squadron sappers delivered a lesson on hot-wiring cars in case we had

Jungle Training.

to commandeer any vehicles in Espiritu Santo!

It was at this stage that someone discovered that the constitution of the condominium granted all Royal Naval officers the powers of police constable; a very useful hangover from colonial days for our largely Royal Marine force.

We had deployed with very limited engineer tools and resources but were blessed with 800 lbs of explosives plus accessories which, in the absence of any better solution, were stored in a shallow pit in the middle of the accommodation. The lack of tools was to prove a problem throughout the deployment.

As a thank you to Malapoa College the 9 Squadron section constructed an assault course for the benefit of the students. This consisted of obstacles constructed from huge timbers and thick rope and proved to be a great success. The official opening saw the Commanding Officer and Headmaster run the course, the Commanding Officer sportingly allow the Headmaster to win.

Operations at this stage were limited to assisting the police and a RAF Hercules was employed at one stage to deploy the Mobile Unit to another island, Malakulu, to demonstrate determination and limit the risk of the rebellion spreading.

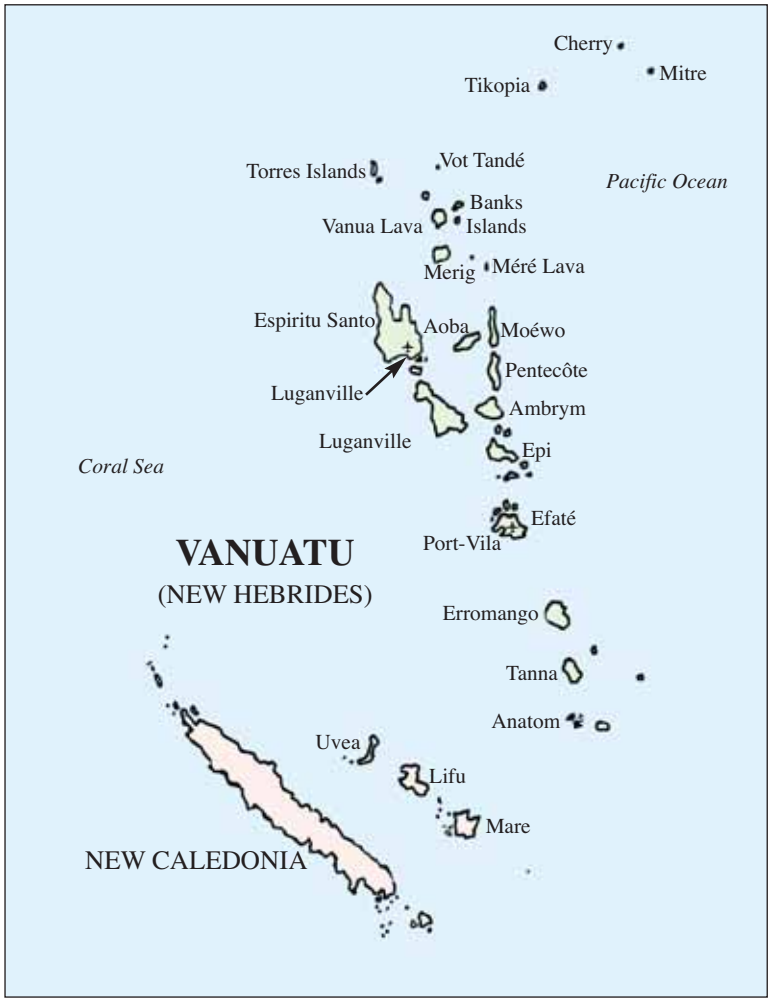
The New Hebrides had been heavily garrisoned by US forces during the Second World War and many airstrips had been built to support operations in the Pacific. In early July, the Royal Engineer detachment deployed to Quoin Hill at the north of Efate to clear, lengthen and widen one of these airstrips. The cover story was that this was a task in support of the civil community to assist in developing tourism. In fact, this was the preparation for a deception plan in case a parachute assault was required. Empty Hercules aircraft would be seen leaving Port Vila while the airborne element would deploy in darkness by road and meet up with the aircraft at Quoin Hill.

The task was undertaken using a "borrowed" bulldozer to clear low lying scrub that had encroached onto the runway and explosives to demolish large trees that interfered with the approach flight path. Arrangements were also made to illuminate the edges of the strip with flares to assist in night landings. All went well with the task although navigation through the jungle to demolish the trees that were so obvious from the air proved difficult at times. For one demolition we tried an experiment by following the exact procedures and explosive quantities laid down by the official publications. As the dust cleared after a satisfying explosion we were disappointed to see the tree still standing. Following the mandatory soak period I moved forward to investigate the situation. Only two paces into my reconnaissance the tree gave a loud groan and slowly toppled over thus restoring faith in the RE pocket book.

Possibly unaware that the civil community element of the task was a deception, the New Hebrides Director of Civil Aviation arrived to open the airstrip and expressed his delight with the project. Back at Port Vila, the Quartermaster raised an eyebrow at the quantity of lobster procured on our messing account.

Throughout the operation we enjoyed great hospitality from the islanders and many officers had been invited to dinner at the homes of expatriate businessmen. It was therefore agreed that we should respond with a dinner party in the Mess. Having deployed with what we stood up in and having no mess silver,

Opening of Malapoa College Assault Course.
Left to Right: OC M Coy, Lt Gunns, Headmaster, CO 42 Cdo.



Map of Vanuatu.

the procurement of crockery and cutlery became a critical issue. To limit the expenditure, it was agreed that officers would place their own utensils in advance at their place setting and that six cutlery settings for guests plus plates for all would be bought. On the due evening we all placed our cutlery and I wondered what the guests would make of the rather unique combination of cutlery that reflected personal preference for exercise and operations rather than for a formal dinner. Still, the drinks started flowing and all proceeded well as we were called for dinner. At this stage it became apparent that the person preparing the menu had not communicated with the procurer of crockery as we were treated to a starter comprising a quarter of an inch of soup on a small dinner plate. Things improved with a substantial and well-cooked main course before the ice-cream dessert arrived to the realisation that the spoons we had used for the starter had been cleared away. Fingers would have to be the order of the day. The guests agreed that this made for a memorable occasion.

One afternoon I was summoned to Battalion HQ and asked if I had any Ammunition Technical Officer (ATO) experience. (ATOs are responsible for examining our own ammunition and storage measures as well as having the more dangerous task of disposing of terrorist improvised explosive devices in Northern Ireland.) Anyone seeing our explosive storage arrangements would probably have been able to answer this question; as it was, I was able to assure the questioner that I had none. Unfortunately, it appeared that no-one else in the group had any experience either and so I was asked to attend the Police Station to assist in a small problem with some evidence.

Intrigued, I drove to Port Vila where I was escorted to the Police evidence room. The evidence safe was opened and I was invited to examine a soggy mass of leaves and newspaper. Questioning the Police officers revealed that this was an improvised explosive device that had been placed on the runway of one of the outlying islands but had failed to explode. Lacking any experience of counter-insurgency operations, the Police had simply treated the device as evidence and brought it back to Port Vila. Unwrapping the bundle I was confronted with a number of detonators and a quantity of very sweaty explosive which, to my untrained eye, looked distinctly dodgy. Although I lacked experience, my mind was suddenly filled with the unbidden thought: “Blow in situ”. Looking around at the new and rather well-appointed Police station suggested that this might not improve Army/Police relations and an alternative plan would be required. Ultimately, the Police cleared the building while I carried the device outside, placed it in a sandbag

Boys Blong Jon Make Jungle Go Bang!
Quoin Hill Airstrip.

Opening of Quoin Hill Airstrip.
Left to Right: Lt Gunns, two unknown officials, Director of Civil Aviation, OC M Coy, CO 42 Cdo, RAF Commander

filled with stones and took it to sea in a small boat before disposing of it in deep water.

With Independence Day looming there was pressure to finalize plans for the celebrations. A task was identified that would, apparently, be right up the Sappers' street and on 16 July I was despatched to the Residency to obtain more details. I discovered that a jetty or floating pontoon was required at the Solwater Club to allow VIPs to travel there by boat rather than endure the bumpy Port Vila roads. With very limited time to complete the task I roughed out a couple of options and returned to examine the thorny issue of resources. After some debate I was given the grid reference of a couple of acres of jungle and invited to take as much as I needed. Regrettably I was forced to decline the task.

Rumours abounded at this stage about what would happen next. One minute we believed that talks in Paris would ease the tension and we would be returning home; the next we understood that the force would be redeployed to Fiji to await events. Eventually, on the evening of 24 July, we were gathered by the Commanding Officer and briefed that a joint British/French force would deploy to Espiritu Santo on the next day with the aim of restoring New Hebrides' Government control to the airfield and Luganville, capital of the island. The force would consist of 100 British and 100 French troops under the command of a French Lieutenant Colonel while Commanding Officer 42 Commando would remain in command of joint forces on Efate. Deployment was to be by French Puma helicopter; my airstrip was not to figure in the plan.

The deployment went ahead early next day, effectively unopposed. Three members of the 9 Parachute Squadron section deployed with the force, in the absence of any engineer tasks they were employed as infantrymen.

On 27 July, I deployed to Espiritu Santo with a mixed collection of Army, RAF and RN personnel in order to relieve sufficient Royal Marines to return to Efate and mount a parade as part of the independence celebrations. Training with this disparate group had been difficult as they had a wide variety of backgrounds. When wearing berets on patrol we also had a more than passing resemblance to a tube of Smarties. On arrival at Luganville, my reinforcements were split up and distributed between the three troops deployed across the island. I assumed command of a troop billeted at Relais Bougainville, a requisitioned hotel on the outskirts of Luganville. In hindsight, requisitioned may not be the most appropriate word to use in this context as the hotel staff simply melted away when they saw a military force approaching the check-in desk.

Quoin Hill Airstrip from the air.

Hercules and locals, Quoin Hill Airstrip.

The operation on Espiritu Santo was painfully joint. I was placed under the command of a French company commander and we shared our hotel with a French platoon. The rather attractive hut occupied as my troop HQ was shared with the French platoon HQ. We were tasked to guard three key points, each of which had a guard of a half section of British and a half section of French troops. These guards rotated every 12 hours, the off-duty half sections providing the reserve. The three key points included the local supermarket, a fuel depot and a pumping station.

I was not allowed to leave the hotel, even for an orders group with M Company commander, unless I was accompanied by the French platoon commander. Despite these restrictions, relations with the French company were very good. My schoolboy French generally saw me through although I did have one sticky moment when I had been explaining my background to a visiting senior French officer only for him to turn to his colleague and say: "I see that Lieutenant Gunns works on a nuclear submarine".

There was some concern that Independence Day would see public disorder in Luganville. The troops stationed in the town itself were tasked to control any disturbance with my platoon earmarked as a reserve. I was issued with a baton gun and more rounds than I could comfortably carry and we were all set. Come the day there was a large but orderly demonstration with some stones thrown at the troops but this seemed to be for form's sake rather than with serious intent and my reserve was not called on. In fact, the most dangerous threat I faced while on the island was from falling coconuts that descended with quite incredible velocity at odd times of day and night.

In Port Vila, the Independence Day celebrations went very well with the condominium of the New Hebrides becoming the Republic of Vanuatu or, more colourfully, Ripablik Blong Vanuatu. The Royal Marines' band was flown in for the occasion and I very much regret not being able to attend the Beating Retreat ceremony at the Residency as the Union Jack was lowered for the final time.

Shortly after Independence Day, I was relieved by a Royal Marine officer and returned to Efate where I assisted in watch keeping in Battalion HQ and spent an inordinate amount of time in sport and adventure training. In mid August, the joint Anglo/French force was withdrawn from Espiritu Santo, having completed its mission, a Pacific peace-keeping force filling the vacuum.

I returned to UK with the bulk of the Royal Engineer element on 18/19 August, thus ending an interesting and eventful chapter in my career.

The story does not of course end there. The Papua New Guinean force that relieved us in Espiritu Santo proved to be as tough as they looked and were not constrained by the same rules of engagement or bureaucracy that affected the condominium forces. Jimmy Steven's son was killed in a vehicle that failed to stop at a road block and this caused Jimmy Stevens to lose heart and surrender. He was sentenced to 14 years imprisonment, effectively ending the rebellion.

Next Time make sure that Penguin has a Helmet On!

LIEUTENANT P M HOPKINS MENG
WARRANT OFFICER CLASS ONE I M CRESSWELL IENG DIPMGT MIIE MCMI

Lieutenant Pippa Hopkins was commissioned into the Royal Engineers in April 2004. After graduating from Fitzwilliam College, Cambridge with a Masters degree in Civil Engineering in 2001, she worked as a site engineer for a major civil engineering contractor before deciding to embark on a career with the Royal Engineers. On completion of 139 RE Troop Commander's Course in November 2004, she was posted to 39 Engineer Regiment to take command of a Field Troop of 10 Field Squadron (Air Support). In January 2005 she deployed with her Troop to the Falkland Islands to provide the Military Construction Force for the Hill Cove Helicopter Refuelling Site Refurbishment Project. She is now continuing her first command position with 10 Field Squadron (Air Support) at RAF Leeming.

Warrant Officer Class One Iain Cresswell joined the Corps as a Junior Leader in 1984. He served with 21 Engineer Regiment at Nienburg, moving to 38 Engineer Regiment after his Draughtsman Electrical & Mechanical Class 2 course. After being heavily involved in Harrier support for two years he was posted to 33 Independent Field Squadron, Antrim, which upon loss of independence was amalgamated into the DCRE (Works) where he was the Chief Draughtsman. Following a very busy eighteen months he arrived in Chatham for No 47 Clerk of Works (Mechanical) Course, after which he was posted to 34 Field Squadron, completing tours in the Falklands, Belize and Kuwait (Op Bolton*). In 1998 he moved to Rheindahlen Garrison as the Works Services Manager, then the Establishment Works Consultant Audits. In 2002 he was posted to 524 STRE (Wks), being involved in various design tasks in Jordan and Kuwait then Iraq in the build-up to, and during Op* Telic*. His current position is the Team Warrant Officer of 517 STRE (Bulk Petroleum) where he recently took part in the Hill Cove Helicopter Refuelling Site Refurbishment of the Defence Estates Pathfinder Project.*

INTRODUCTION

HILL Cove and Fox Bay on West Falkland are home to the two British Forces South Atlantic Islands helicopter-refuelling sites which are strategically essential to helicopter operations across the Falkland Islands. In particular they are critical to the provision of life support to the hilltop sites and to supporting Air/Sea Rescue missions. Both sites are permanent installations and are each manned by three RAF fuels personnel.

The sites were built in 1993 with a design life of 10 to 15 years and were originally constructed using Tactical Fuel Handling Equipment. The on-site fuel storage consisted of two 140m^3 aviation fuel tanks, a 100m^3 diesel tank and an 18m^3 slops tank. The tanks were not custom made but were modified Braithwaite water tanks, internally welded and epoxy lined. These were fuelled by connection to a shore receipt point and fuel was circulated by pumps through filtration equipment via six inch and four inch pipework to dispensing points at the helicopter-landing pad. The site also contained a laboratory and a crew room from which the fuels personnel could operate. The crew room also provided shelter for passengers during refuelling. Two containerised generators provided power for the site. In recent years the sites had deteriorated to the extent that they had become unfit for use for both safety and environmental reasons. The latter was particularly important given the Falklands international reputation as the home for rare wildlife and as an area of outstanding natural beauty. There was therefore an urgent requirement for both sites to be refurbished; this was to include the renewal of the fuel storage systems, distribution facilities, power generation and site accommodation all to meet current standards of efficiency, safety and pollution control. This resulted in HQ LAND Command tasking the Military Works Force (now 170 (Infrastructure Support) Engineer Group) in July 2003 to conduct an option study for the refurbishment of both sites.

The new design

The principal requirements of the new design were to provide a fuel site with a 25-year life span, requiring minimum maintenance. Constraints on the project included removing all waste, keeping the sites operational during the works, and

A visitor to site – where's his hard hat!

a budget of £2M from Headquarters British Forces South Atlantic Islands (J4 Estates). A deadline for the Hill Cove site to be fully operational was set at May 2005. Following the options study 517 STRE (Bulk Petroleum) was tasked with the detailed design and in December 2004 HQRE Theatre Troops (now 8 Force Engineer Brigade) ordered 39 Engineer Regiment to provide the Military Construction Force for the project. 10 Field Squadron (Air Support) was given the task and the refurbishment was undertaken between 18 January 2005 and 15 May 2005. 517 STRE as the Prime Contractor, led with the design, tender processes, material procurement/transportation and overall project management. Captain Steve Nicholls (Garrison Engineer and Designated Task Officer) was assigned the role of "Defence Estates Representative" and held a £2 million financial delegation, for both sites. 2 Troop of 10 Squadron as the actual Military Construction Force, was fully integrated into the Project Management Team from January 2005. It is currently planned for 516 STRE (Bulk Petroleum) to take the lead on the Fox Bay helicopter-refuelling site refurbishment from early 2006.

A First for the Defence Estates Overseas Business Unit

The Hill Cove refurbishment project was unique in that it represented the first time that the Defence Estates Overseas Business Unit had used a Military Design Authority, Military Project Manager and a Military Construction Force rather than contracting the project to a civilian company. The cost of using a commercial contractor to complete the task had been estimated at £1,350,000; hence by using the Corps to design, project manage and construct, Defence Estates made a saving of over £400,000. In addition, the timescale for the project was greatly reduced due to the immediate availability of the labour force and elimination of the requirement to let a contract via the laborious tender process.

Logistics

The Supply Chain

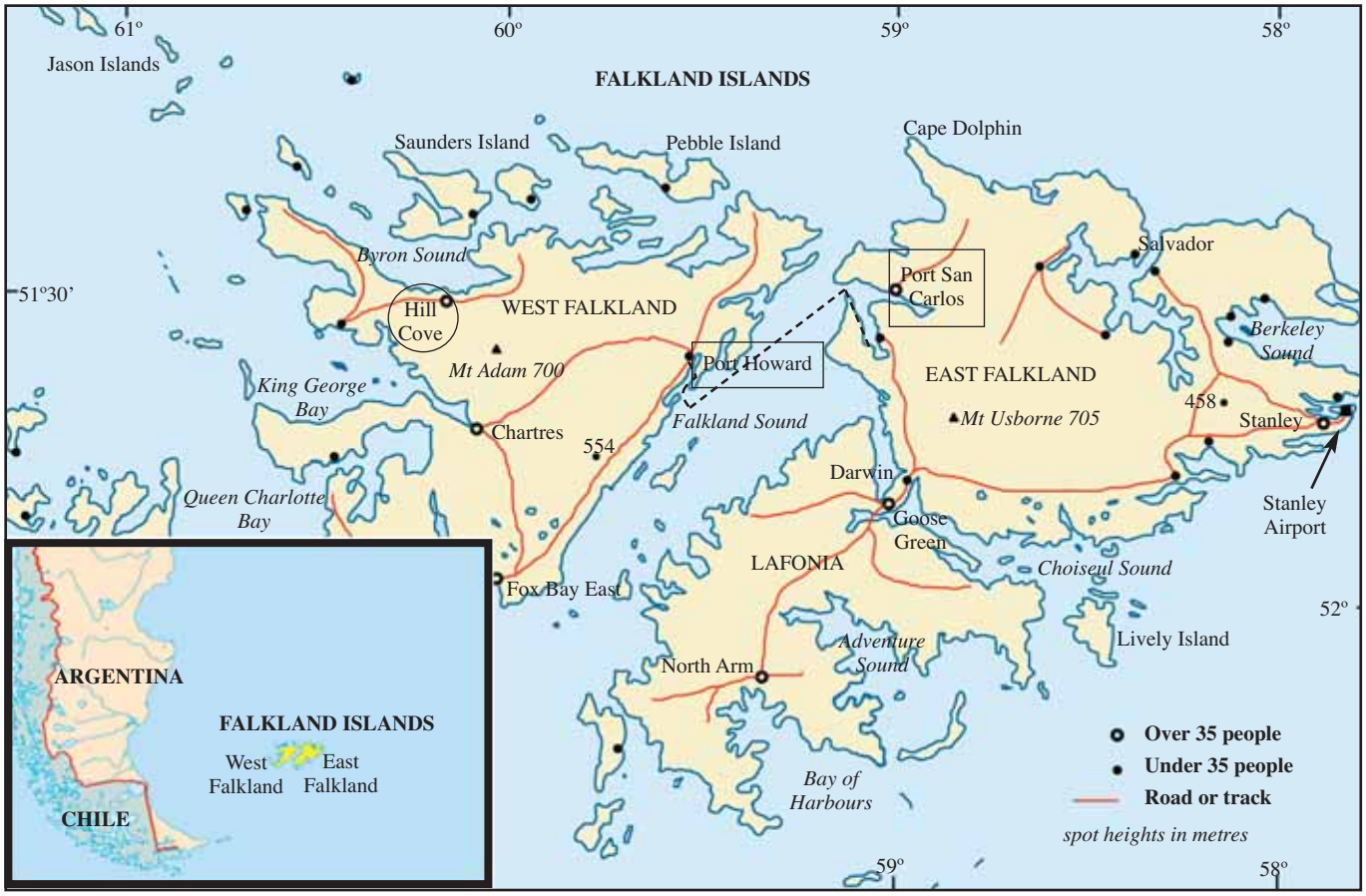
A significant construction task on the remote West Falklands was always going to result in significant logistical challenges, not least the long logistics chain for supplies from the UK. Timings were critical from the early stages of the project, with pressure on the procurement strategy and the equipment makers. Very tight deadlines had been placed on the manufacturers of the crew shelter, pump/filter/laboratory container, generator house and fuel tanks in order for the equipment to meet timetabled sailings of the Falkland Islands Re-supply Ship. Materials and equipment were loaded into weight specific/trim sensitive ISO Containers (the weight and trim specifications were Chinook lift requirements). These were transported to the Sea Mounting Centre at Marchwood where they were loaded onto the re-supply ship. What was immediately apparent was that any items not loaded on time and to the correct specification would have a considerable impact on the project programme. The deployment of a project representative to Marchwood later in the project to assist in coordinating the out load proved very valuable.

Reliance on the Chinook

On arrival in the Falklands, the stores were off-loaded at Mare Harbour and then loaded onto the MV *St Brandan*, the Falkland Islands out-stations supply vessel. This was where the real fun started. The *St Brandan* sailed to Hill Cove where it had to be off loaded onto site by a Chinook from 78 Squadron RAF. This was the only means of off loading them as there are no docks or jetties on West Falkland capable of supporting loads of this size. This process was also used to recover all waste material from the site and, in the unpredictable weather, proved to be one of the most critical aspects of the project. The reliance on the Chinook for all stores deliveries added considerable risk to the programme. Any Chinook downtime would have considerable impact, particularly because all spares had to be delivered from the UK. This required very close liaison between the project team and 78 Squadron. It also necessitated the Commander, British Forces South Atlantic Islands to declare the Hill Cove task his number one priority to ensure that stores were delivered in a timely manner. The Chinook pilots were, however outstanding, and played a crucial role in the successful outcome of the project. Placing the fuel tanks accurately on their supports is just one example of the pilots testing their limits.

Crane Delivery by MEXE-float

One of the key equipments required for the project was a Coles 315 crane. At 23 tonnes this was clearly going to be too heavy for even the mighty Chinook. A MEXE-float and its RLC crew was therefore the only solution and became a vital and interesting part of the initial logistical in-load to the site. The crane was loaded onto the MEXE-float and towed by the *St Brandan*



Map showing the route taken by the Coles 315 crane across Falkland Sound.

across Falkland Sound from Port San Carlos to Port Howard. It then had to be driven at tortuously slow speed across the full width of the Island. The delivery of the crane and the reliance on the Chinook highlighted the fundamental importance that logistical planning has on any project of this nature.

Technical Aspects

The Temporary Installation Construction Phase, 10 Jan – 17 Jan 05

The importance of the site meant that it had to remain operational throughout the project. This meant it was necessary for a temporary installation to be constructed in order that helicopter refuelling could still take place during the refurbishment and this was completed by a civilian contractor prior to the deployment of the military construction force. Once the fuel was transferred to the new installation, the empty tanks and pipework had to be de-commissioned, de-gassed, vented and certified gas free. The site was then handed over to the authorised persons of 517 STRE (Bulk Petroleum) to ensure a safe system of works regime. Operating within the very strict legislation associated with live fuel handling was a fundamental element of the overall project and was clearly evident as a key risk from day one.

The crane arriving at Port Howard on the MEXE-float.

Demolition Phase, 19 Jan – 13 Mar 05

The first task of the demolition phase was to remove the storage tanks. The smaller slops tank was lifted by the crane in one piece. The other tanks however, had to be cut into sections by hand while the crane supported the weight. The sections were then lifted to the ground where they could be reduced further before being removed from site; often by the local inhabitants. This required extensive scaffolding and a good smattering of combat engineering skills. Once the tanks were removed the 35m^2 of concrete supporting walls had to be broken out. After trying various methods of removing these seemingly over-reinforced walls using all the available tools and rather too many saw blades it was back to basic combat engineering

Braithwaite Aviation Turbine Fuel tanks being demolished.

A highly technical project, but it still required basic combat engineering skills.

and what the Corps is renowned for; initiative and ingenuity. The first wall, painstakingly removed by the prescribed method, was suspended horizontally from the crane in a sling and used as a battering ram to knock down the remaining walls. This worked perfectly and even impressed the Commander British Forces South Atlantic Islands on one of his visits. Concurrently, 350 metres of pipework was reduced and removed from site, along with the generator ISO housing, crew shelter, pumps, pump house, laboratory, pathways and fencing. The two generators were flown back to East Falkland for reconditioning and use elsewhere. Project constraints included the removal of all scrap from site, so it was with pleasure that we gave the majority to the local farmers to use for improvised bridges, fences and even accommodation. Methods used for transporting scrap from site certainly demonstrated the ingenuity of the Islanders, and it was paramount to ensure the disclaimer was signed prior to any movement of material!

New Works Phase, 14 Mar – 17 May 05

After preliminary works, involving over 25m^3 of hand-batched concrete, the tank supporting walls and foundation pad for the generator house were poured. The new fuel storage tanks consisted of two 40m^3 horizontal double skinned aviation turbine fuel tanks for the helicopter fuel supply, and a 10m^3 horizontal double skinned aviation fuel tank to supply the generators. These tanks, the containerised pump and the filter house (with an integral laboratory annexe) were underslung and lifted into place onto the supporting walls with some careful manoeuvring by the Chinook. Approximately 200m of 3 inch stainless steel pipework was welded by specialist welders who hold the American Society of Mechanical Engineers 'ASME IX' qualification, and 50m of ¾ inch stainless steel pipework was screwed into place to provide the fuel feed to the generators. Various ancillaries including pipe supports, the receipt point, back pressure relief, bulk meters and dispensing points were installed and after many hours of pressure testing, the first receipt of fuel was possible. The new electrical works also greatly improved the site, providing weatherproof helicopter landing pad flood lighting and walkway lighting both inside and outside the hazardous area. Three 60 kVA generators and associated control gear were installed inside a prefabricated "miracle span" steel structure generator house, providing the potential for 24 hour power throughout the site. This was a first for the section given the task but after a

The locals pushed their vehicles to the limit to remove scrap from site.

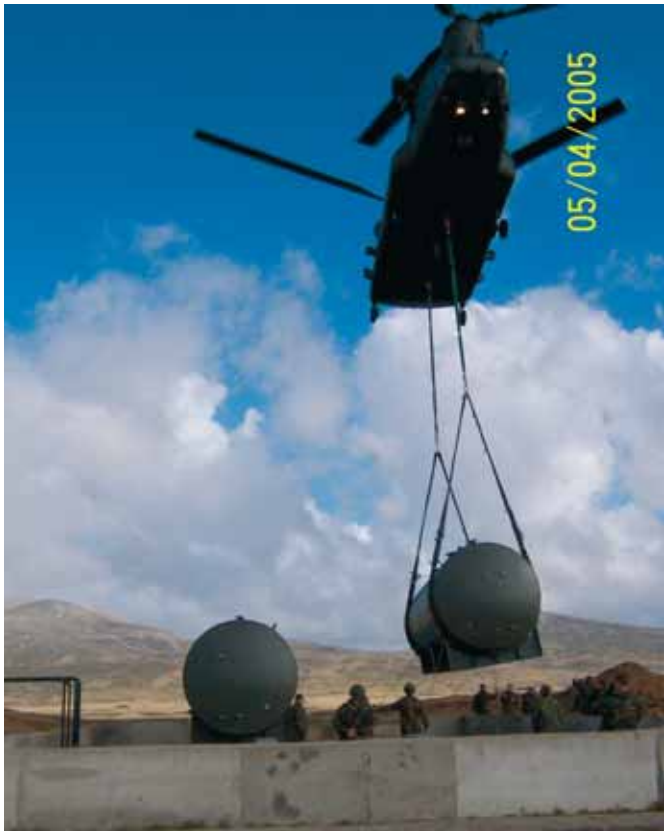
Welding a flange on the 3 inch stainless steel pipe

The generator shelter being constructed.

couple of days reading the instructions provided by the manufacturer and a couple of test runs the building was erected without incident and proved to be an excellent design. Two catchment pits and associated pipework were constructed, directing any fuel spillages to the interceptor to control the effects of any pollution. The final works to site included various raised concrete pathways, steel access ladders, safety fencing, painting and site landscaping. All elements of the construction posed considerable challenges for the construction force. All tasks were however well within the combined capabilities of an Air Support Field Troop and the specialists of 517 STRE. The technical challenges faced during the task tested all our tradesmen but did not find them wanting. Equally, the experience and confidence they gained will be invaluable in the future.

Future Partnerships

THE successful completion of this project proved the capabilities of combining the technical expertise of 170 (Infrastructure Support) Engineer Group with the professionalism, versatility and determination of a Royal Engineers Military Construction Force, particularly one from a Construction/Air Support Squadron. The execution of all of the various tasks undertaken throughout the project not only provided cost-effective infrastructure provision, but also provided invaluable artisan and project management experience



The second 40m^3 fuel tank being heli-lifted into position.

for members of the Corps in an austere and logistically challenging environment. The lessons learnt by all involved will no doubt be put into practice on operations in the future.

Clearly without the support of Defence Estates who hosted and supported the project, Helicopter Operations, Port Operations, the Engineer Resources Management Cell (Bicester), the Engineer Systems Support Integrated Project Team (Andover), Battlefield Support 7 and the various departments within Headquarters British Forces South Atlantic Islands, the task would not have been possible. It is however hoped that the successful outcome of the project has proved that the Corps is more than capable of undertaking complex construction tasks for Defence Estates on time and to budget and that this will pave the way for future partnerships . . .roll on Fox Bay 2006!

Doing a Bismarck

LIEUTENANT COLONEL M W WHITCHURCH MBE

This article offers methods and tips on leadership gathered from observing others over the years and takes the form of a letter to a Commander who seeks to improve powers of leadership in his command.
***Readers are cordially invited to offer their tips and methods too -** Editor.*

"Fools learn from experience I prefer to learn from the experience of others" - Bismarck

From Lieutenant Colonel MW Whitchurch MBE RE

DEFENCE ACADEMY
OF THE UNITED KINGDOM

Joint Services Command and Staff College
Faringdon Road, Watchfield
Swindon, Wiltshire SN6 8TS

Telephone	01793 788202	Military	(96161) 8202
Residence	01225 463044		
Facsimile	01793 788847	Military	(96161) 8847
E-Mail	mwhitchuch@jscsc.org	Military	DEFAC-JSCSC JSWOC DS(L) SO1
Private E-Mail	matthewwhitchurch@hotmail.com		

Colonel MY Cardigan-Fitzbaddely LVO OBE
Commander Royal Engineers
Headquarters 7 Armoured Division
British Forces Post Office 38

27 May 2005

Dear Colonel Myles,

LEARNING LEADERSHIP FROM OTHERS

At the Bulgarian Bear shoot you enthused about the article *Reflections on Leadership*[1] and sought examples of leadership practice for Major General Seethrough-Spiffing's study day in July. By the way I am sorry that the forest burnt down at the shoot but that Green Jackets chap's (Giles Tubes-Foxhound?) idea of firing 81 millimetre illumination rounds to get better shoots at dusk was not quite the thing.

Sorry, I digress. Gathered from observation of others, adopted and adapted for use, these examples of leadership are very effective. I will present on them as requested at the study day.

Perhaps we can go on the Burgermeister's cocktail party (held that evening) and repair some of the damage from the shoot. Call me sensitive but when Tubes-Foxhound reminded the Forstmeister (as the fire was getting out of control) "to mind his bloody place asking who came second in two world wars " was not exactly a feat of defence diplomacy.

Whoops, digressed again. These leadership ideas have all been around but some may have been forgotten or not used yet should be.

BISMARCK APPLIED – THE APPROACH

You stressed practical ideas so all officers can apply them throughout their service. My consequent approach is:

- **Explain** basic ideas
- **Demonstrate** their application

---

[1] See pages 34-38 of *RE Journal* April 2005

Under his leadership the team strives to meet the task.

LEADERSHIP ACTION CHECKLIST

Functions/Needs			Achieve Task	Build/maintain Team	Inspire/Develop Individual
COMMUNICATIONS	**Planning** (Note **Monitoring** Activities take place during this function)	PRELIM	Anticipate. Understand Task & Constraints. Define Aim & Priorities. Obtain info resources. Do estimate.	Issue notice or warning of task. Involve team in planning. Ensure their understanding of the task.	Learn all you can about individuals to assess their skills and potential.
		NOTE	Decide on Course to be adopted. Provide for contingencies.	Training. Positioning and Rehearsals for task. Regrouping as required	Use Knowledge and Expertise of Individuals in making plan. Plan individual administration. Food, rest, and equipment etc
	Briefing		State Mission and Explain Plan. Issue instructions.	Inspire team spirit. Explain reason for task. Set standards and priorities.	Delegate. Check that individuals understand the Plan.
	MONITORING **Controlling**		Stand back (help view). Ensure that all activity is directed to achieving the aim. Monitor progress. React to emergencies. Replan (if necessary).	Co-ordinate. Visit to observe team in action. Maintain standards. Reconcile control.	Maintain standards by example if necessary. Persuade. Discipline.
	MONITORING **Supporting**		Provide resources	Maintain Team Spirit. Support Decisions of Subordinates. Organize resupply.	Encourage Individuals. Coach. Criticise constructively. Listen. Develop buddy system.
	MONITORING **Informing**		Keep team in picture. Enthuse. Thank and praise team.	Keep team in picture. Enthuse. Thank and praise team.	Ensure individuals have relevant information. Thank and praise.
	Evaluating		Review tasking. Has aim been achieved? Re-plan as necessary.	Recognise Success. Learn from failure. Assess Team Training. Train Team.	Assess future training needs. Discuss and assess performance. Discuss future tasks.

Right, orders are given, now I must meet the function of monitoring.

- **Imitate and practice** the ideas by application. Reviewed throughout the year the immediate commander serves as instructor or coach[2].

BALLS TO (FUNCTIONAL) LEADERSHIP

We were all taught the three balls or circles of need and functional leadership. For revision these ideas are in the annex with suggested exercises. Yet how do they relate to each other? The answer came in 1985 from an article in the *British Army Review*. Called *Where does leadership end?* by Colonel MG Cawse OBE, this article[3] had a very useful table (reproduced on the previous page) applying these two ideas. They were adopted by the RSME and put on the back of their leadership *Aide Memoire*. I have used this table throughout my service with success.

Suggested Exercises

- Identify a task or project that you have done recently. Then list evidence of how you have met each box. Be honest and list success and failure.
- Have this table photocopied and use it as a checklist on a task in your current job.
- Repeat this task with your orders group (O Gp) where you hold controlled discussions on how well the O Gp lead. Hint: strive to make time for exercise, as it will pay well.
- Get the O Gp to assess a superior headquarters O Gp in the same way - this can lead to much amusement and satire!
- Insist that your officers carry this *aide-memoire* and plan to use it on all tasks - I swear by its value. Hold snap inspections to check it is carried and used.

LOOK AND LEARN

Observation of other leaders above, alongside and below you is highly instructive. Watch for good and bad leadership. Asking others why did he do well (or otherwise) is also helpful. Try the table as a checklist and list one method or touch that each leader used and why you would or would not use it. I have learnt more from bad leadership – it screams out at you. Good leadership is less obvious.

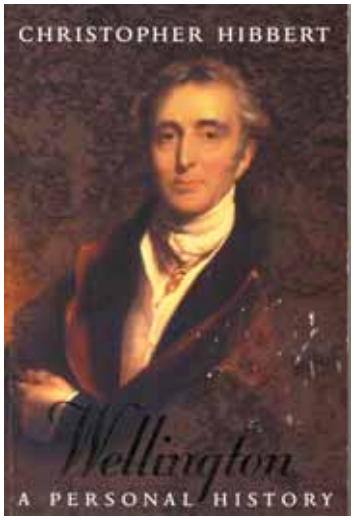
The Duke of Wellington did just this through his service. The disastrous campaign in the Lowlands[4] where he had commanded his Regiment was assessed ***"as a lesson in not what to do and that is no bad thing."***

---

[2] The art of coaching is to give advice when needed, endeavouring to spot and correct faults as early as possible and encourage the student.

[3] This is worth reading as it shows how leadership can be developed. I have compiled these leadership gems onto a Compact Disk (CD) and can post them to students. See below under Précis.

[4] See page 14 of Christopher Hibbert's *Wellington – A Personal History*. An easy read on Wellington. Obtainable by Harper Collins paperback edition 1998 contact www.fireandwater.com. The ISBN is 0586 09109 2. (This is the unique number for the book.).



He studied others and look how successful he was.

Suggested Exercises

- List three leaders that you know and study them for leadership methods over some task: the next operational tour, an exercise, a guest night and so on. What do you learn? What methods would you adopt or otherwise?

- Try the same exercise with three leaders that are famous. Suggested names follow under books to know about.

LEADERSHIP EXAMPLES FROM FILMS AND VIDEO TAPES.....

When using film (or video tape or DVD) it is important to use the right method of instruction. The German Army film technique is spot on: watch the whole film beforehand, identify examples of leadership; repeat with the class, pausing the film and discussing what is good or bad leadership. Run the discussion in a relaxed setting like the NAAFI or mess with light refreshments to create the right mood.

Now remember in 12 O'Clock High how General Savage (Gregory Peck) evaluated the balance between the needs of the task, team and individual when he gripped Lt Pettigrew? The same holds for casualty evacuation in the attack.

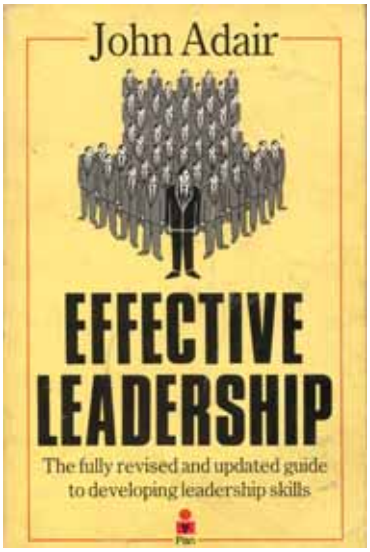
Suggested films:

- ***Twelve O'Clock High.*** Set in the bombing campaign of World War Two the film looks at how a new leader takes over an American Air Force bomber formation that is failing. It brings out functional leadership and circles very well but the last 40 minutes can be disregarded as it covers shock from battle.
- ***Master and Commander.*** Studied through the eyes of functional leadership, this film is brimming with good examples. It is available on DVD giving the advantage of being able to select scenes thus saving time when compared to editing videotape.
- ***Decisions Decisions.*** The comedian John Cleese leads this story of a manager who is responsible for an office move. Entertaining and instructive
- ***The Unorganised Manager.*** An effective leader is organized. This is not covered well by the Army in my experience. Also features John Cleese and laced with humour.
- ***The Challenge of Leadership.*** Useful food for thought on leadership. The sound track is very good – listen to it twice.

How to obtain the films? For *12 O' Clock High* and *Master and Commander* go to any Virgin Mega Store or His Master's Voice (HMV) shop on the high street and order it. For *Decisions Decisions, The Unorganised Manager* (LQO 26, 27, 30 and 31) and the *Challenge of Leadership* (C1394) please contact the British Defence Film Library[5].

LEADERSHIP EXAMPLES FROM BOOKS

Is there one book that all leadership students must have? Yes it is John Adair's Effective Leadership. **I recommend that you buy one copy for each officer (just £6.99 to you Guv), and insist this is used as the handbook throughout the year and diligent application will be reflected accordingly in annual reports. This book is a treasury of theory and practice combined with several exercises. Study of one chapter a week with the exercises will do more than anything else for your Division**. The book[6] was first published in 1983 and is still in print having sold over 400,000 copies.



Are we making time so they can read books on the application of leadership?

The other books can be obtained from any service library[7]. They are stories from war and enjoyed very good reviews in BAR. They all consider the application of leadership in battle. ***Readers are invited to offer titles especially those with an RE content - Editor***.

- *Charlie Company* by Peter Cochrane
- *Men at Arnhem* by Tom Angus or Geoffrey Powell
- *Even the Brave Falter* by ED Smith
- *Battalion* by Alistair Borthwick[8]
- *So Few Got Through* by Sir Martin Lindsay
- *Gen Jack's Diary* edited by John Terraine
- *Serve to lead*-new edition issued at Sandhurst (Look out - this is also on the new Electronic Battle Box).

---

[5] BDFL Customer Services can be contacted on: Tel: 01494 878252 Military 95 298 2252. Fax: 01494 878007 Military 95 298 2007. E-mail: BDFL.Customerservices@ssvc.com CASH, CHOTS and Army Mail BDFL – CUSTOMER SERVICE.

[6] Obtainable through Pan Macmillan, 20 New Wharf Road, London N1 9RR. The ISBN. (This is the unique number for the book.) is 0330 30230 2. Or visit web site www.panmacmillan.com

[7] Look up www.armylibraries.mod.uk

[8] Part of this book is featured in a film made by BDFL. It is called *Battalion in Battle-C* 1902

QUOTABLE QUOTES ON LEADERSHIP

Here are some quotations that help.

- Field Marshal W Slim – ***"Leadership is that combination of example, persuasion and compulsion that gets men to do as you want."***

Leadership by persuasion?

- Field Marshal E Bramall – ***"Do as I do and I shall do it first."***
- Field Marshal J Harding – ***"Never give up and never make friction[9]."***
- Field Marshal G Templar – ***"Get the priorities right, get the organization right, get the right people in, get the instructions right, get the right spirit into the people and then let them get on with it."***
- Field Marshal B Montgomery – ***"Leaders create atmosphere."*** Comment. This relates to Napoleon's point ***"that it is not the men but the man who counts"*** *viz*: the effect of personality on a team. A lesser known FM Montgomery quote is: ***"the first battle that any officer must win is the hearts and minds of his men."***
- Franklin D Roosevelt – ***"The best leader is the one who has sense enough to pick good men to do what he wants done, and the self restraint to keep from meddling with them while they do it."***

GOOD TO KNOW ARTICLES (ON A DISK AND YOURS IF REQUESTED)

I have come across several good short précis' on leadership. Some come from non-British campaigns such as Vietnam (1963-71) to Africa (1960-64) as well as the British Army. You will see that some border between leadership and the conditions in which it is applied *viz*: the realities of war and command. Space prevents discussion of these areas (they may make for good study days later in the year) and certainly your next battlefield tour. The gist of each follows.

---

9 Field Marshal Harding's address to Sandhurst in 1953 remains one of the best. His point was that leadership is easy enough but it is the context in which it has to be exercised that makes it such a challenge. See the précis part and the videotape *Realities of War* C 1782 Part 2 where FM Harding's leadership style is examined. He also appears as the man who commanded the British Forces in *Cyprus-the Emergency* C1425 to C1439 (four parts). These tapes can be obtained from BDFL. See footnote 5.

- **Vietnam Platoon leaders guide.** Advice for new Lieutenants to fighting in Vietnam. Its style of writing and many ideas are novel- you can feel the grit and sweat. Good food for thought. Here is an extract:

  "One of the biggest problems you're going to have is in the area of communications. I'm not talking about radio failure; I am talking about human failure-about people not understanding people. Miscommunication can be a problem between two brilliant scholars in an academic atmosphere. Imagine the confusion on the battlefield with forty men from different communities and with varying degrees of education, all scared to death and preoccupied with staying alive. The roots of misunderstanding at the rifle company level are haste and a colloquial style of speaking in double meanings, exhaustion and stress. Misunderstanding can be reduced by deliberately thinking out the simplest way to issue the order. Then issue the order slowly and methodically. Use sketches or draw on the ground. Even better, if possible, point out on the ground where you want the element to go. Have each leader back brief you, a technique used in airborne units, where the briefer explains to his commander exactly what his unit will do"

- ***Leadership talk from a Mercenary in The Congo.*** A first class talk by Colonel Mike Hoare who led a battalion in The Congo in 1960-64. Cogent and convincing

- ***Officers, But No Longer Committed.*** Our society breeds selfishness. This article is part of educating officers is how to defeat that weakness.

- ***Where does Leadership development end?*** Introduced earlier. Describes how training for leadership should be organised. The question is how well does each part of the division develop leaders?

- ***Thoughts on command in battle.*** Several successful commanders describe the secrets for successful leadership at Commanding Officer level. All officers who wish to command must study this précis.

- ***The role of the Sergeant Major in battle.*** In the last ten years there has been discussion on the role of the Warrant Officer. This explains in leadership terms where he fits in

- ***The Will To Win.*** This précis explains how to create the conditions for effective battlefield leadership[10]. If these conditions are the foundations of the house then leadership is the bricks and mortar that are laid on top.

- ***Stress In Battle.*** This links with *The Will To Win* précis. Describes stress on leaders and how to cope with it[11]

The Bulgarian Bears plan revenge.

[10] This précis was also made into a film called *Stress in Battle* C1410 and C1411 and can be obtained from the BDFL. See footnote 5.
[11] This précis can be related to the video tapes C 1234 and C 1235 *Realities of War*. The same author wrote both précis and film.

CURRENT CHALLENGES

What then are the current challenges to the application of leadership? Without doubt the biggest is liberal thinking. The individual needs circle has grown too large (in the form of rights of the individual) at the expense of the task and the team circles. If individual rights are not met then the threat of litigation follows in many cases in current society. Responsibilities (to the team and task) are insufficient effort in society. are rarely given insufficient effort in society. To paraphrase John F Kennedy *"ask not only about your rights but also your responsibilities to the task and team"*. I recommend the student body consider this article linked to the précis *Officers, but no longer committed* - (see previous page) - asking what can be done about it?

Prevention. Emphasis of the doctrine of standards and values. That discipline means doing your job so others will not be in a jam. That we have duties to the task and the team-to the point of death if required. The leaflet on values and standards combined with a number of controlled discussions looking at actual problems will help enormously.

Cure. That suitable sanction is used if these standards are not met. The new rules for imposing discipline (described in Army General Administration Instruction 67) are encouraging and successful. My Warrant Officer students swear by it. Equally I am impressed at how this issue is being taught to recruits by Lt Col Jon Welch and his Regiment at Lichfield. I understand that Sandbags is doing the same with our officer cadets. Yippee. I would add one offering: to be quite ruthless when standards are not met and if the Army lacks the stomach to remove an officer (often the case) then move him sideways by attachment elsewhere. I can speak on this at the study day as well as how to think about litigation but that is outside the scope of this letter.

One other common current failing is familiarity- it is a curse. We live in a society where it is felt that the boss must be a friend with his subordinates: he can't. John Adair's book described above offers some very good advice on this matter at pages 45-47. An old boss of mine summed it up when he said: " your boss is not your friend". To understand the effects of familiarity try teaching your wife to drive or ski or a language - it just does not work. To convince the sceptical and young graduate officers who are the worst offenders let me quote from Colonel Mike Hoare's précis on leadership (see previous page):

"I do not think, however, that an occasion can ever arise where your juniors should address you by your Christian name. And whilst on the subject make no favourites. This leads to endless discontent and can be as a hard on the man favoured, as it is on the others. Keep your relationship formal.

Leadership is a lonely task. It has to be so. It is impossible for a good leader to be chummy with his men and yet subject them to orders; many of them will be unpopular and even harsh. The best you can hope for is the respect of your men and this can be a considerable reward in itself…"

In sum there is a border between conforming with (and reflecting society) and the ability to do our task: to fight and win. If leaders are to be effective there must be a supporting foundation of strict rules and practices. A suitable slogan is: We defend society and do not necessarily reflect it.

AND FINALLY

Colonel Myles, there you have it - getting better by doing a Bismarck. Command and realities of war although related are separate issues and require separate days. If the above is used with thought and practice, then leadership will improve. I will be very pleased to amplify at the study day. Better still you and your officers (but please, not Tubes-Foxhound - odd fellow) and warrant officers are most welcome to lunch with us if passing Watchfield, but look out for the bears…….

Your Obedient Sapper

Sticky

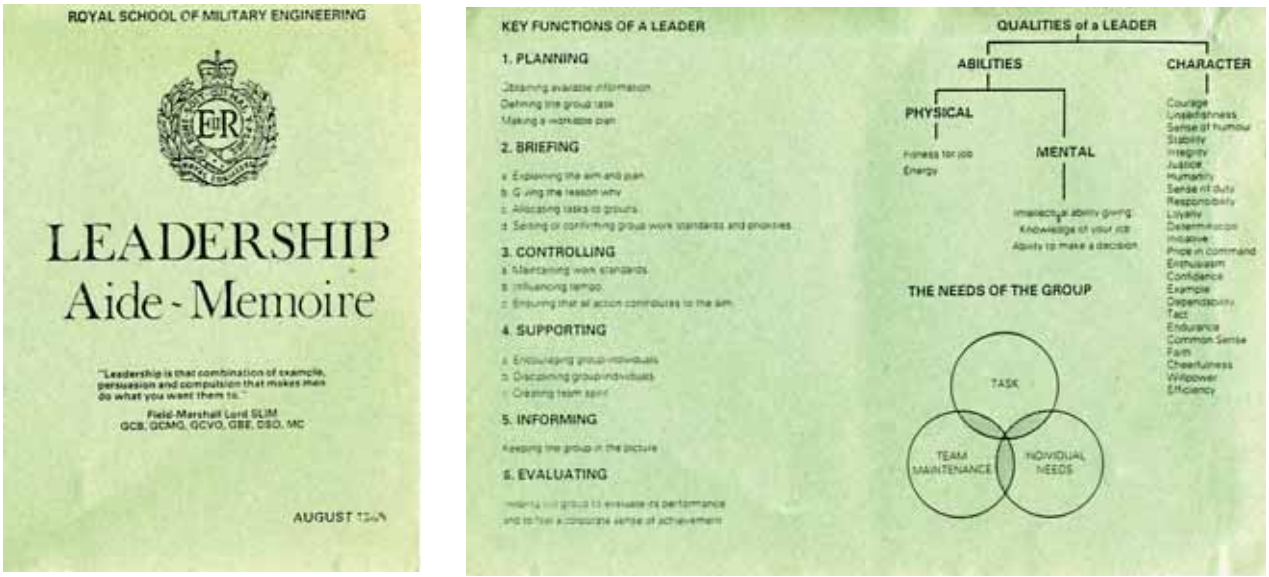
matthewwhitchurch@hotmail.com

ANNEX

SOME OLD FRIENDS - REVISION

FUNCTIONAL LEADERSHIP

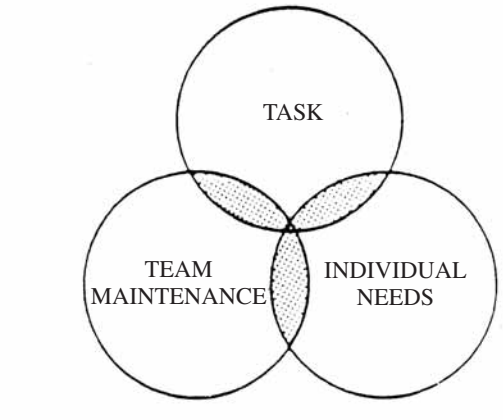
Created by John Adair this is leading (= or drawing :) by numbers: try to apply each function and you get a picture: not a Van Gogh but it will be a picture. Like art, by thought and practice, your picture painting will improve.



RSME Leadership Aide Memoire 1985.

IT'S NOT BALLS EITHER - THE THREE CIRCLES APPLIED

John Adair's second important theory was the three areas or circles of need: those of the task, the group and the individual. Generally there is a balance to be struck between these needs *viz*: allowing the entire squadron to be on leave and courses all years suits the individual need but will not get the job done or bond the team. On the other hand obsession with getting the task done at the expense of the other needs will do damage in the long term-the unit will become ineffective quite soon: both on and off the battlefield. Below is an applied example that all readers can use in taking over or reviewing any unit, sub unit or branch or team[12].



The method is to answer a list of questions that are grouped under each need.

---

[12] This applied example is based on John Adair's chapter called *Organising*. See pages 166 and 167 of Effective Leadership. See footnote 5 for more detail.

REVIEW OF YOUR ORGANISATION	
Circle and Question	**Notes**
1. Task. What is the common aim?	This is a standard question to ask. Then seek to identify how the aim is met. Is all the effort available actually used to meet this aim?
2. Task. How is the aim made known to all and broken down into objectives?	Look to see how passage of information and orders is conducted up and down the unit.
3 Team. How is the team organised and is it practical?	Does everyone have a fair loading? Do the different bits work?
4. Team. How does each part of the team contribute to the common aim?	Is there any part that does not or could do it better?
5 Team. How do they work together as a team?	Are there any turf wars? Do all the parts co-operate correctly? How is co-operation improved?
6. Individual. Is the individual allowed best possible freedom of decision and action?	Is mission command understood and applied? Does the unit have the atmosphere that promotes a realistic approach in peace and war?
7. Individual. Are individual needs actually met?	Is there a plan for developing each man and woman? Is this actually applied at all levels? Many are usually missed.
8 General. Do the three circles actually overlap? Is there a happy medium?	Listen and look to see how well this is done-soldiers will make it known very quickly.

Napoleon Bonaparte's Invasion of Egypt 1798-1801 – The First Military Operation assisted by both Geographers and Geologists – and its Defeat by the British

COLONEL E P F ROSE TD MA DPHIL CGEOL FGS

Ted Rose, now an Honorary Research Fellow in the Department of Geology at Royal Holloway, University of London, has contributed nineteen articles on various aspects of military geology to the RE Journal *over the last twenty-five years. Here he demonstrates how Napoleon Bonaparte was the first general to make military use of geologists as such.*

AT THE end of the First World War, Lieutenant-Colonel Alfred Brooks returned to a career with the United States Geological Survey from commanding American military geologists in Europe, on the Western Front. He quickly generated a memoir on military applications of geology – now widely regarded as a benchmark publication in its field. In it he noted that the earliest record of geologists participating in a military campaign apparently dated from Napoleonic times: "When Napoleon invaded Egypt in 1798 he included in his expeditionary force a commission of scientists, among whom were two geologists" (Brooks, 1920, p. 91). Although Betz (1984) later named one of these geologists as Déodat de Dolomieu, Brooks' record, unsubstantiated by bibliographic references, has been cited authoritatively even by recent authors, notably by Kiersch & Underwood (1998, p. 5) and Kiersch (1998, p. 126) plus Hatheway (1996, p. 246), and following Kiersch & Underwood (1998), by Leith (2002, p. 24). But they all leave some fundamental questions unanswered. Were there two geologists? If so, can both be named? Why were they chosen to accompany the French army? What did they do when they reached Egypt? How did their work relate to that of military geographers (= surveyors), a discipline by then long established in the French army? How and why did it all end? It is such questions that this article is intended to address.

THE EGYPTIAN CAMPAIGN

ON 19 May 1798, a fleet of 13 battleships, 42 smaller warships, and 130 transport vessels set sail from the port of Toulon in southern France (Herold, 1963) (Figure 1). It carried some 17,000 troops, as many sailors and marines, 700 horses, and mounted over a thousand cannon. Three lesser convoys were to join it en route – one from Ajaccio on the island of Corsica, the others from Genoa and Civitavecchia in north-western "Italy" – bringing the total of ships to almost 400, and of men to about 55,000. At their head was the French republic's ambitious 29-year-old general Napoleon Bonaparte, supreme commander of the military and naval forces which constituted the "Left Wing of the Army of England" – soon to become the Army of the "Orient". After a victorious campaign in Italy, Napoleon had returned to France in December 1797 to take command of an army forming to invade the United Kingdom – but within three months he had reported his resources as inadequate for the task, and consequently gained government approval for military action elsewhere.

On 9 June the fleet anchored off the Maltese islands in the central Mediterranean, ostensibly to take on supplies of fresh water. The archipelago (Malta, Gozo, Comino, plus smaller uninhabited islands) had been ruled and fortified since 1530 by the Sovereign Military Order of the Knights Hospitaller of St John of Jerusalem, of Rhodes, and of Malta, an Order commonly and more concisely known as the Knights of Malta. On 10 June French troops mounted a four-pronged attack, seizing much of the islands with but little resistance – for the Order's garrison comprised only some 332 knights (more than half French by birth), 3,600 troops concentrated in the vicinity of Malta's "Grand Harbour", and a militia of 13,000 men drawn from the surrounding countryside. After a two-day siege of the harbour fortress of Valetta, the Grand Master of the Order agreed to surrender his remaining forces, on 12 June. The knights evacuated Malta for mainland Europe, their rule ended for ever. Napoleon swiftly restruc-

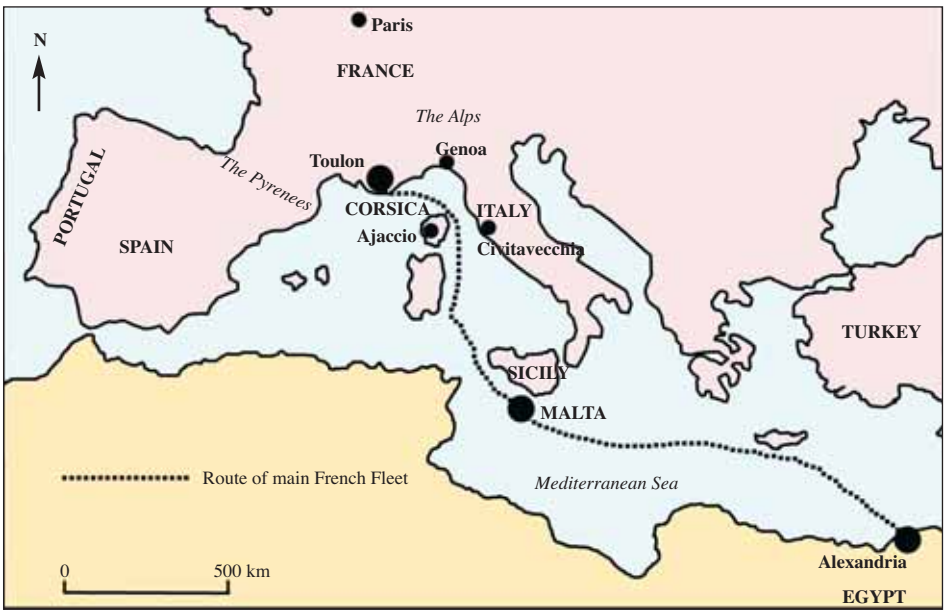


Figure 1 – The Mediterranean Sea, with main route taken by Napoleon's expeditionary force in 1798, from Toulon via Malta to Egypt, and main localities cited in the text.

tured the governance of the islands on French republican principles, appropriated much of the Order's silver and gold, and six days later sailed on with most of his troops.

On 1 July the army reached its final destination: Egypt. From about noon small boats began ferrying troops to the shore, 8 km west of Alexandria (Figure 2). Ostensibly the revolutionary army had come to free the Egyptian people from their Mameluke overlords, who ruled largely in defiance of their Ottoman Turk superiors. In fact, its objective was to found a French colony, thereby making France a power in the Levant, and so able to challenge British domination of India. Meeting little resistance, the army seized Alexandria on 2 July, and soon marched inland. The main Mameluke forces were defeated west of Cairo on 21 July, at the so-called Battle of the Pyramids. Yet only some ten days later, on 1 August, the fourteen British battleships commanded by Rear Admiral Horatio Nelson almost annihilated the French fleet of thirteen battleships and four frigates remaining off Alexandria, at the Battle of the Nile (Lavery, 1998). The French expeditionary force was isolated in the land it was to control and explore until evacuation in mid to late 1801.

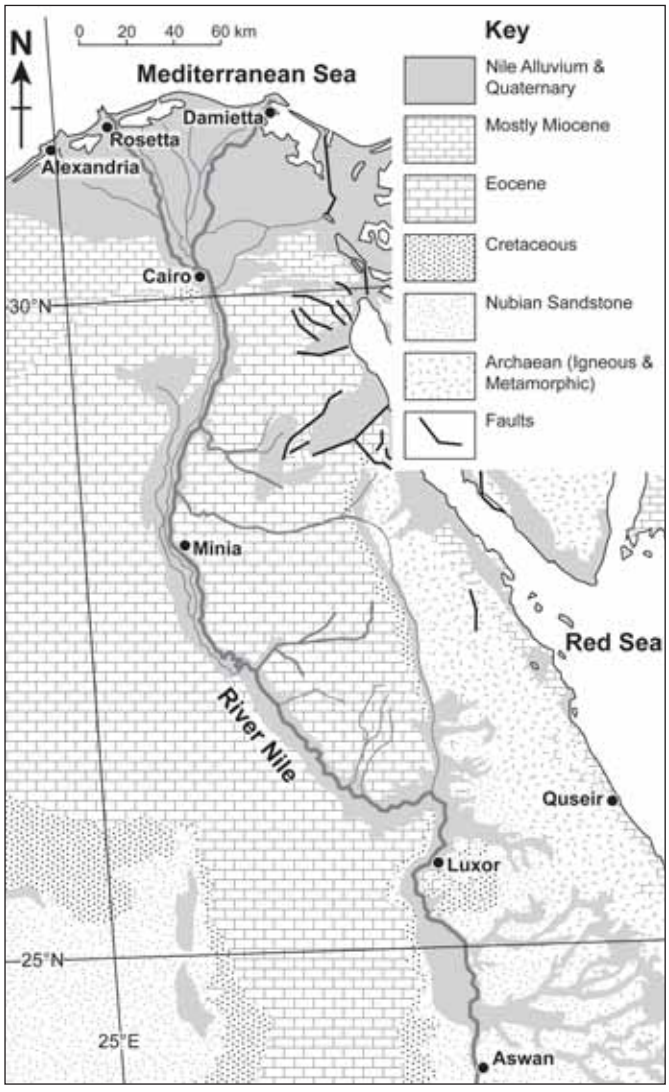


Figure 2 – Map of central northern Egypt, with outline of geology as currently known and localities cited in the text. After Rose (2004a), courtesy of Blackwell Publications; also after Said (1990), and earlier maps.

Military Engineer-Geographers

Military engineer-geographers (Figure 3) were by that time well established in both German and French armies. By 1798 the Prussians included 14 in their Quartermaster General's Staff (Hofschröer, 2003), and the French not surprisingly included a contingent in their invasion force. The discipline of military geography had a long pedigree in the French army. It shared a common origin with the Corps of Engineers, before skills of military survey were distinguished from those of construction. Berthaut (1902) has described how French military engineering geography developed in four phases to the time of the French Revolution: 1624 to 1715, 1715 to 1756, 1756 to 1777, and 1777 to 1791. Between the Revolution of 1789 and the Egyptian campaign of 1798 changes were frequent. First, the geographers were reunited with the Corps of Engineers. Later, they were once more separated – but reduced to civilian status. Then on 23 April 1798, as the Egyptian expeditionary force was assembling, engineer-geographers were appointed to French armies as *"artistes employés à la partie topographie",* with *"chefs de section"* assimilated as captains, *"adjoints"* as lieutenants, and *"aides"* as second lieutenants. The military engineering-geography unit that landed in Egypt with Napoleon was the "3[rd] *section du Dépôt de la Guerre": chef* – Moynet, *adjoint* – Schouany, *aides* – Lathuille and Pinault, together with the astronomer Nicholas-Antoine Nouet and his young assistant Jean-Baptiste Coraboeuf as specialists in trigonometric survey.

A group of civilian topographers also accompanied the army, drawn from the land registry survey organizations of Corsica and of France. Following the early death of their leader, Pierre-Dominique Testevuide, these were eventually united with the engineer-geographers, under military command. In total the French topographic service in Egypt thus comprised:

Figure 3 – French engineers of the military geography corps, in Europe. Plane table, measuring chains, and graphometer were used for 40 per cent of the area mapped in Egypt: the remaining 60 per cent was mapped merely by means of compass for direction and pacing for distance. From Berthaut (1902). Reproduced by permission of the British Library, from shelfmark 8825.ee.18.

three land surveyors from the Corsican survey (Testevuide, Jacotin, Simonel); four military veterans who had recently served with Napoleon's Army of Italy (Moynet, Schouany, Lathuille, Pinault); four land surveyors from the survey of France (Levesque, Leduc, Bourgeois, Faurie); and seven engineers recruited directly from their basic training college, the *École polytechnique* (Dulion, Coraboeuf, Lecesne, Jomard, Bertre, Pottier, Laroche). By the end of the campaign, of these 18, four were dead and three had left the service.

In the field each surveyor was provided with four soldiers "of intelligence and good character" to help with measurements and to carry equipment. Despite casualties, illness, and operational difficulties, much was achieved: primary triangulation and topographic mapping of much of Egypt, and detailed plans of major towns, historical sites, and battlefield areas. Illness forced the repatriation of Moynet after only a few months in command, and most of the work came to be directed by Pierre Jacotin (Figure 4), who had arrived as a civilian and as deputy to Testevuide. But military appointment did his career no harm. It was Jacotin (1822) who was to write the definitive account of cartographic survey work in Egypt – work that generated a massive atlas in the 20-volume *Description de l'Égypte* (Jomard *et al*.,1809-28) that documented the achievements of French science and scholarship during the Egyptian campaign (Alleaume, 1999). The atlas (Jacotin, 1818) contained a "*topographique*" map of Egypt and adjacent regions at a scale of 1:1,000,000, in three sheets, plus a "*géographique*" map of the Nile valley and other key areas at a scale of 1:100,000, in 47 sheets. By the time the first volumes of the *Description* appeared, the list of authors indicates that Jacotin had achieved the rank of colonel in the then Imperial Corps of Engineer-Geographers, and Pierre Simonel, his surviving colleague from the Corsican survey, the rank of "*chef de bataillon*" in the Corps.

Figure 5 – The Sphinx, quarried from horizontally-bedded limestones of Eocene age, with nearby pyramid, built from blocks of similar limestone (see Figure 2). These wonders of the ancient world sited close to southern Cairo were amongst the monuments studied by members of Napoleon's Commission. Damage to the nose of the Sphinx has been variously credited to French or Islamic gunfire.

Figure 4 – Pierre Jacotin (1765-1829). Portrait by André Dutertre; from Reybaud (1830-1836). Reproduced by permission of the British Library, from shelfmark 1311.h.2.

The Commission of Sciences and Arts

The French expeditionary force was also accompanied by a Commission of Sciences and Arts – the "savants": about 150 engineers, technicians, astronomers, mathematicians, chemists, doctors, pharmacists, naturalists, architects, draughtsmen, musicians, literary men, orientalists, printers and others (notably Testevuide's geographers) (Gillispie, 1989, 1994; Masson, 1997; Bret, 1999). They had been recruited on Napoleon's behalf by General Louis Caffarelli du Falga, commander of the Corps of Engineers, and Claude-Louis Berthollet, an eminent chemist who was a leading member of the Academy of Sciences of Paris and, from 1795, its successor organization: the Institute of France. When recruited, their destination was still secret. In fact, their task was to examine almost every aspect of contemporary and ancient Egyptian civilization (Figure 5). Europeans then knew little about Egypt, so the French sought comprehensive information about Egyptian society and the country's physical environment and natural resources that would enable them to govern it effectively. The elite among the Commission were soon elected to the Institute of Egypt, founded in August 1798 on Bonaparte's initiative as a colonial adaptation of the Institute of France. However, most of the "savants" were young, only 25 years old on average. Over eighty were engineers or engineering-related "technicians". Typically they were recent graduates, a few even undergraduates. The largest group derived from the *École polytechnique*: a college founded in 1794 to provide a basic scientific training for men seeking a career in the armed forces primarily as artillery or engineer officers, and civilians destined for the public services where a foundation in mathematics, physics or chemistry was appropriate (Comité du Centenaire, 1895). A smaller number derived from the *École des Ponts et Chaussées*: the more specialized civil engineer-

ing school then only recently re-organized. Only five were established scientists: the father of differential geometry Gaspard Monge, chemist Claude-Louis Berthollet, mathematician Jean-Baptiste-Joseph Fourier, astronomer Nicholas-Antoine Nouet, and geologist Déodat de Dolomieu.

Geologists and the French Army

The French pioneered national use of geology at the end of the eighteenth century, an initiative derived largely from mining engineering. An Inspectorate of Mines was created in 1781, and a School of Mines (*École des Mines*) in 1783, but their activities were curtailed by the revolution of 1789 (Eyles, 1950). The Inspectorate was re-formed by the republican government as the *Agence des Mines* in 1794, and re-titled in 1796, developing into the *Corps des Mines* (Institute of Mines). The School was also re-organized in 1794, and although established to provide training for mining engineers, its curriculum included lectures on mineralogy from 1783 and on "physical geography" (= geology) from 1794. When the French invaded Egypt in July 1798, their expeditionary force was accompanied by the School's "professor'" of geology (Déodat de Dolomieu) and several of its recent graduates (Rose, 2004a).

Dolomieu (Figure 6) had led a full and adventurous life, well documented in numerous biographical accounts (e.g. Lacroix, 1921; Lacroix & Daressy, 1922; Taylor, 1971; Sarjeant, 1980; Zenger *et al*., 1994). At the age of two his father, the Marquis de Dolomieu, dedicated him to the service of the Knights of Malta. In his early life he therefore followed a military career: serving with the Order's regiment of carabiniers from 1765; promoted second lieutenant in 1766; lieutenant 1774; captain (of cavalry) 1779. Within the Order he became a knight in 1778; led a commandery from 1780; and in 1783 he was elected to an office that gave him command of the troops of Valetta, the fortress city dominating Malta's "Grand Harbour". But in 1784 he resigned both this appointment and his captaincy in the carabiniers. From that time especially he travelled widely in Europe, and published papers on aspects of geology and mineralogy. In consequence of the 1789 revolution in France, his family fortune was lost, and science and the teaching of science came to provide his income. He was nominated to teach "natural history" (i.e. earth science) at the newly-founded *Écoles centrales* in 1795; appointed to the developing *Corps des Mines* in 1796; and taught geology at the *École des Mines* from about that time, albeit without tenure of an established chair.

Figure 6 – Déodat de Dolomieu (1750-1801). From Lacroix (1921), after a portrait on wood, painted by Angelica Kauffman in Rome in 1789; given by Dolomieu to his student Louis Cordier, and given in turn by Cordier's granddaughter to the Institute of France..

Dolomieu joined Napoleon's expedition to a then undisclosed destination because, he was assured, it would have rocks, mountains, and an interesting terrain (Lacroix, 1921). But after the initial successes in Egypt the campaign advanced more slowly, confining his fieldwork to the region of the Nile Delta, without access to the geologically more interesting terrain further south. Dolomieu served on at least eight commissions that generated technical reports, although none of them was specifically geological. He gave four major papers to the newly-founded Institute of Egypt (texts subsequently published by Lacroix & Daressy [1922]), but all on topics more geographical and agricultural than geological in their focus. Moreover, illness caused him to leave Egypt after only eight months, in March 1799. Eight months later Napoleon himself was to do the same, to seize consular power in France and soon to change the republic into an empire. Dolomieu was less successful. A storm forced his ship to shelter in southern Italy. There he was imprisoned for his arguably treasonable assistance to Napoleon when, en route to Egypt, he was tasked to help negotiate the surrender of his fellow Knights Hospitaller in Malta. He was not released until March 1801. In January 1800, whilst in prison, he was appointed Professor of Mineralogy at the Natural History Museum, Paris. It was an appointment he took up only briefly. He died in November 1801.

Dolomieu had been accompanied to Egypt by three of his former pupils at the School of Mines, Louis Cordier, François-Michel de Rozière, and Victor Dupuy, who were also employed as "*minéralogistes*", i.e. geologists, according to Bret (1999). (Even William Smith [1769-1839], widely credited as the "Father of English Geology", described himself as an "engineer and mineralogist" in 1806 on the title page of his first book, an indication of how little the word geology was then being used [Torrens, 2003]).

Cordier (Figure 7) was effectively Dolomieu's research assistant, working on mineralogy, the formation of the Nile valley, and other geological phenomena. He had been admitted to studies at the *École des Mines* in January 1795 (Jaubert, 1862) and near-contemporaneously to courses at the *École polytechnique*. At the School of Mines he was taught by Dolomieu amongst others, and credited as one of the School's best graduates. He became a supernumerary engineer on 16 January 1797, and thus authorized to participate in a field course across the Alps led by Dolomieu, whose student he became. When Dolomieu became ill, he returned with him, although since he himself owed no allegiance to the Knights of Malta, he was exempted from most of his two-year captivity. His subsequent geological career was

Figure 7 – Louis Cordier (1777-1861). From Margerie (1930); also Rose (2004a), courtesy of Blackwell Publications.

Figure 8 – François-Michel de Rozière (1775-1842). Portrait by André Dutertre; from Reybaud (1830-1836). Reproduced by permission of the British Library, from shelfmark 1311.h.2, and from Rose (2004a) courtesy of Blackwell Publications.

long and distinguished, including appointment as an inspector with the *Corps des Mines* at the age of 33 (a post he retained until his death, at the age of 84), and in 1819 appointment also as Professor of Geology at the Natural History Museum, Paris. Unfortunately, Dolomieu and Cordier lost most of their notes and all of their specimens during the stormy voyage from Egypt and the privations of imprisonment in Italy, so neither was able to publish on the geology of the country.

That distinction fell to Rozière (Figure 8), a contemporary of Cordier when studying at the *École des Mines* and the *École polytechnique* (Gillispie, 1989,1994; Drouin, 1999). After Egypt, his career was primarily that of a mining engineer, later a chief mining engineer, with the *Corps des Mines*, although from 1820 to 1824 he served concurrently as professor of geology and mineralogy at the Saint-Etienne School of Mines in southern France. He contributed 15 magnificent plates (comprising more than 100 illustrations of the rocks and fossils of Egypt) (Rozière, 1812b,c), plus an extensive (275-page) monograph on the "physical geography" of the country (Rozière, 1812a), together with eleven other articles, to the monumental *Description de l'Égypte* (Jomard *et al*., 1809-28).

Dupuy shared some of Rozière's fieldwork. Moreover, according to Gillispie (1989, pp. 464, 452), Rozière was also "aided by a fellow mining engineer, Hippolyte-Victor Collet-Descostils, and a student, Jean-Nicholas Champy", and Louis Duchanoy "who later entered the *Corps des Ponts et Chaussées*" was another "*minéralogiste*". Dupuy and Descostils were both young graduates of the School of Mines and followed careers in the *Corps des Mines* on return to France, Dupuy as an engineer, Descostils as a chemist. Champy (Jacques-Pierre, commonly called Jacques-Nicholas, according to Bret [1999, p. 411) was also primarily a chemist. None of them was to use geological fieldwork in Egypt as a basis for publication or development of a geological career.

The role of these geologists in Egypt bears closer comparison with that of later European colonial explorations in Africa and the Far East than the work of recent military geologists as such. There was no need (or the means) for a geological appraisal to facilitate a beach landing (*cf*. geological preparations for the D-Day landings in Normandy of June, 1944 [Rose & Pareyn, 1996a,b, 2003] and German preparations for the invasion of England in 1940 [Rose & Willig, 2002, 2004]). Although the main responsibility for the young engineers in the expedition was to build or mend fortifications, roads, bridges, canals and public works, the geologists did little to assist them in the ways that military geology was to assist the engineers of both Allied and German forces in the two World Wars (*cf*. Rose *et al*., 2000). Moreover, the River Nile and associated waterways plus cisterns and shallow wells provided an adequate water supply, without the need or means to supplement this by deep boreholes sited with geological guidance – a skill developed largely in the 20th century (Rose, 2004b). The geologists were deployed to undertake exploration rather than military geology – there were no geological maps to guide them. They did record information on raw materials in the expeditionary force area and occasionally notes on water supply – tasks familiar to 20th century military geologists in both American and European armies. They were not, however, military geologists in the modern sense in that they did not wear military uniform, and were not involved in the planning or conduct of military operations.

The End of the Egyptian Campaign

In March 1801 the British mounted a combined naval and military operation in the Mediterranean to defeat the French army still occupying Egypt (Walsh, 1803; Daniell, 1951; Ryan, 1983). The naval force consisted of 180 ships under

Figure 9 – The Battle of Alexandria, which took place during the night of the 21 and 22 March 1801. After the landing of a British expeditionary force under the command of Lieutenant General Sir Ralph Abercromby and a stiff engagement of both forces, the French then attempted a surprise attack on the British position five miles (8 km) from Alexandria. The British had been expecting this but misjudged the timing and direction of the assault. For a while, their line seemed threatened. However, the French were repulsed with the help of reinforcements and renewed artillery fire. This decisive defeat eventually led to their expulsion from Egypt. The painting shows a number of the principal actions of the battle although they occurred at different times: the Black Watch capturing a French standard of Bonaparte's "invincibles"; General Abercromby being mortally wounded in the thigh; the heavy fighting amongst the ruins of the Roman palace; and the wounding of Major General Sir John Moore. Oil on canvas, c.1805, after Philip Jacques de Loutherbourg. Reproduced by permission of the National Army Museum, London.

Admiral Lord Keith. The military comprised some 15,000 men, of 31 regiments or battalions, under Lieutenant General Sir Ralph Abercromby.

The French army by then comprised about 25,000 men, dispersed at stations throughout Egypt. Abercromby decided to land on the beach at Aboukir Bay, with the objective of capturing the port of Alexandria 20 km to the west. Although the French had sighted the fleet long before troops disembarked, they posted less than 2,500 men at the landing site, backed by only 15 guns.

Abercromby had experienced confusion during amphibious landings earlier in his career, and planned this one carefully. As rehearsed near Turkey before the expedition sailed for Egypt, the troops landed in three waves. The first, consisting of 58 flatboats spaced at 50-foot (15-m) intervals, rowed by sailors and packed with 50 infantrymen each, seized a beachhead and held it for the next two waves – carried in or towed by ships' cutters rowed by sailors. The troops landed in the order they were scheduled to deploy and fight. The shallow water of the bay forced most of the fleet to remain offshore, some five miles (8 km) distant, so providing little fire support.

The landing went almost exactly according to plan. At 02.00 hours on 8 March, a rocket fired from the flagship signaled that the waves should form up, about 10 km from the shore. Having reached the start line soon after 08.00, the troops rowed for the beach, the first grounding at about 09.00. The French opened fire with artillery and later musketry, but the initial assault was over in minutes. Subsequent waves of troops reinforced the landing party, and by nightfall the British held strong positions ashore.

The landing was a triumphant success. The landing force reported 652 soldiers as killed, missing, or wounded, and 97 sailors, mostly whilst approaching the shore. The French lost between 300 and 400 of their troops. Once ashore, Abercromby had to fight two more battles, in the vicinity of Alexandria. At the second he was mortally wounded (Figure 9), dying a week later on 28 March. Nevertheless, the French army in Cairo was compelled to surrender on 27 June, and to evacuate from Egypt between 31 July and 7 August – the "savants" having been evacuated earlier, in May, as open warfare brought their activities to a close. The remaining French forces surrendered at Alexandria, after siege, on 2 September. Their repatriation began on 14 September, and the French invasion of Egypt thus came finally to an end. Scarcely 23,000 of the 50,000 military and naval personnel brought to Egypt by Napoleon had survived to return to France, 3,000 of them as invalids (Herold, 1963).

Conclusion

It is clear that at least three geologists worthy of that professional designation accompanied the French army to Egypt: Déodat de Dolomieu, Louis Cordier, and François-Michel de Rozière. Dolomieu was already a distinguished "professor" of "*géologie*" (Anon., 1801, p. 168); Cordier was later to become a professor of geology, and to serve three times as president of the Geological Society of France (Margerie, 1930); Rozière published the only geological work of any significance to be derived from the campaign and was also much later, briefly, a professor of geology.

Dolomieu had a background of some 18 years of youthful military service, and Cordier and Rozière had benefited from courses taken together with potential military engineers at the *École polytechnique* whilst training in Paris as "mining engineers". They thus had a background suitable for military appointments. Yet all served in Egypt only as civilians, as "savants" with Napoleon's Commission rather than finally all with military rank like the engineer-geographers. They were not military geologists analogous with those deployed by the British and German armies in the two world wars, to apply geology to operational effect on the battlefield (*cf.* Rose *et al*., 2000) – largely because geology was then at too early a stage of development as a science to be of much predictive value. Essentially, they lacked, and were not in a position to generate, a geological map. Although France was the first nation in the world to institute a national geological survey

(Eyles, 1950), its geological mapping did not begin until 1825 (with completion in 1835 and publication in 1841). In Egypt, French military geographers achieved significant new topographic mapping, notably of the Nile valley and adjacent desert areas, but the first geological map of Egypt was made under largely British auspices many years later – with publication in 1912 (Hume, 1925). In general, military geologists became of significant operational use only from 1914 onwards, in countries where the existence of good topographic and geological maps enabled them to generate specialist maps which interpreted terrain for specific military purposes (cf. Rose & Willig, 2004; Rose, 2004c).

Acknowledgements

I am grateful to James McGrow of the Geology Department at Royal Holloway, University of London, for the initial drawing of figures 1 and 2; to copyright holders as acknowledged in figure captions for permission to use other illustrations; and to librarians Wendy Cawthorne of the Geological Society, London, and Francine Masson of the *École des Mines,* Paris, for drawing my attention to some of the publications cited. A version of this paper was presented at the International Conference on Military Geology and Geography convened at the U S Military Academy, West Point, in June 2003, and is preserved on the CD-ROM which records the conference's proceedings.

References

Alleaume, G 1999. Entre l'inventaire du territoire et la construction de la mémoire: L'oeuvre cartographique de l'expédition d'Égypte. In: (Bret, P: ed.) *L'expédition d'Égypte, une enterprise des Lumières, 1798-1801*. Académie des Sciences – Technique et Documentation, Paris, 279-284.

Anon 1801. Discours prononcés par le Conseil des mines. *Journal des Mines*, **9**, 167-168.

Berthaut, H M A 1902. *Les ingénieurs de géographie militaire*. Service géographique de l'Armée, Paris, v. 1, xvi + 467p., v. 2, x + 525p.

Betz, F, Jr 1984. Military geoscience. In: (Finkl, C W: ed.) *The encyclopedia of applied geology*. Van Nostrand Reinhold, New York, 355-359.

Bret, P (ed.) 1999. *L'expédition d'Égypte, une entreprise des Lumières, 1798-1801. Actes du colloque. Paris 8-10 Juin 1998*. Académie des Sciences – Technique et Documentation, Paris, 436p.

Brooks, A H 1920. The use of geology on the Western Front. *United States Geological Survey Professional Paper*, **128**-D, 85-124.

Comité du Centenaire 1895. *École polytechnique. Livre du Centenaire, 1794-1894. Tome 1. L'École et la science*. lxv + 519p. *Tome 2. Services militaries*. 572p. *Tome 3. Services civils et carrières diverses*. 646p. École polytechnique, Paris.

Daniell, D S 1951. *Cap of honour. The story of the Gloucestershire Regiment, the 28th/61st Foot, 1694-1950*. George Harrap & Co., London, 344p.

Drouin, J-M 1999. Récolter, décrire et raconter: Delile et Rozière. In: Bret, P. (ed.). *L'expédition d'Égypte, une entreprise des Lumières, 1798-1801*. Académie des Sciences – Technique et Documentation, Paris, 261-277.

Eyles, V A 1950. The first national geological survey. *Geological Magazine,* **87,** 373-382.

Gillispie, C C 1989. Scientific aspects of the French Egyptian expedition: 1798-1801. *Proceedings of the American Philosophical Society,* **133**, 447-474.

---- 1994. The scientific importance of Napoleon's Egyptian campaign. *Scientific American,* **271**, no. 3, 64-71.

Hatheway, A E 1996. Conference report: 1994 Seattle Symposium reveals complexity and value of military geology. *Engineering Geology,* **44**, 245-253.

Herold, J C 1963. *Bonaparte in Egypt*. Hamish Hamilton, London, xii + 424p.

Hofschröer, P 2003. *Prussian Staff & Specialist Troops 1791-1815*. Osprey, Oxford, 48p.

Hume, W F 1925. *Geology of Egypt. Vol. 1*. Government Press, Cairo, 408p.

Jaubert, H F 1862. *Notice sur la vie et les travaux de M. Cordier.* L. Martinet, Paris, 28p.

Jacotin, P 1818. Carte topographique. In: (Jomard *et al*.: eds) *Description de l'Égypte ou Recueil des observations et des recherches qui ont été faites en Égypte pendent l'expédition de l'armée française*. Dépôt général de la Guerre, Paris.

---- 1822. Mémoire sur la construction de la carte de l'Égypte. In: (Jomard *et al*.: eds) *Description de l'Égypte ou Recueil des observations et des recherches qui ont été faites en Égypte pendent l'expédition de l'armée française. État moderne. Tome second. Deuxième partie*. L'Imprimerie Royale, Paris, 1-118.

Jomard, E-F *et al*. (eds) 1809-28. *Description de l'Égypte ou Recueil des observations et des recherches qui ont été faites en Égypte pendent l'expédition de l'armée française*. Paris, 20 vols.

Kiersch, G A 1998. Engineering geosciences and military operations. *Engineering Geology*, **49**, 123-176.

Kiersch, G A & Underwood, J R, Jr 1998. Geology and military operations, 1800-1960: an overview. In: (Underwood, J R, Jr & Guth, P L: eds) *Military geology in war and peace*. Reviews in Engineering Geology **13**. Geological Society of America, Boulder, Colorado, 5-27.

Lacroix, A 1921. *Déodat de Dolomieu, membre de l'Institut National (1750-1801). Sa correspondence – sa vie aventureuse – sa captivité – ses oeuvres*. Libraire Académique Perrin et Cie, Paris. v. 1, lxxx + 254 p., v. 2, 322p.

Lacroix, A & Daressy, G 1922. *Dolomieu en Égypte (30 Juin 1798 – 10 Mars 1799): Mémoires présentés à l'Institut d'Égypte 3*. L'Institut français d'Archéologie orientale, Cairo, viii + 140p.

Lavery, B 1998. Nelson: Aboukir, 1798. In: (Grove, E J: ed.) *Great battles of the Royal Navy: as commemorated in the Gunroom, Britannia Royal Naval College, Dartmouth*. Bramley Books, London, 114-120.

Leith, W 2002. Military geology in a changing world. *Geotimes*, **47**, no. 2, 24-26.

Margerie, E de 1930. La Société Géologique de France de 1880 à 1929. In: (Anon) *Centenaire de la Société Géologique de France. Livre Jubilaire 1830-1930*. Société Géologique de France, Paris, 1-82.

Masson, F 1997. L'expédition d'Égypte. *Bulletin d'Amis de la Bibliotheque et des Collections de l'École des Mines,* **12**, 31-40.

Reybaud, L *et al*. (eds) 1830-1836. *Histoire scientifique et militaire de l'expédition française en Égypte*. A J Dénain & Delamare, Paris, 10 vols., 2 atlases, 1 supplement (portraits).

Rose, E P F 2004a. Napoleon Bonaparte's Egyptian campaign of 1798: the first military operation assisted by geologists? *Geology Today,* **20,** 24-29.

---- 2004b. The contribution of geologists to the development of emergency groundwater supplies by the British army. In: (Mather, J D: ed.) *200 years of British hydrogeology*. Geological Society, London, Special Publications, **225**, 159-182.

---- 2004c. Military geology. In: (Selley, R C, Cocks, L R M & Plimer, I R: eds) *Encyclopedia of geology*. Elsevier, Oxford, v.3, 475-487.

Rose, E P F & Pareyn, C 1996a. Roles of sapper geologists in the liberation of Normandy, 1944. Part 1 Operational planning, beaches and airfields. *Royal Engineers Journal*, **110**, 36-42.

---- 1996b. Roles of sapper geologists in the liberation of Normandy, 1944. Part 2 Quarries, water supply, bombing and cross-country movement. *Royal Engineers Journal*, **110**, 138-144.

---- 2003. *Geology of the D-Day landings in Normandy, 1944*. Geologists' Association Guide **64**. Geologists' Association, London, ii + 98p.

Rose, E P F & Willig, D 2002. German military geologists and terrain evaluation for Operation *Sealion*: the invasion of England scheduled for September 1944. *Royal Engineers Journal*, **116**, 265-273.

---- 2004. Specialist maps prepared by German military geologists for Operation Sealion: the invasion of England scheduled for September 1940. *The Cartographic Journal*, **41**, 13-25.

Rose, E P F, Häusler, H & Willig, D 2000. A comparison of British and German military applications of geology in world war. In: (Rose, E P F & Nathanail, C P: eds) *Geology and warfare: examples of the influence of terrain and geologists on military operations*. Geological Society, London, 107-140.

Rozière, [F.-M.] de 1812a. De la constitution physique de l'Égypte, et de ses rapports avec les anciennes institutions de cette contrée. In: (Jomard, E-F *et al*.: eds) *Description de l'Égypte …. Histoire naturelle. Tome second*. L'Imprimerie Impériale, Paris, 407-682.

---- 1812b. Explication des planches de minéralogie – Appendice au mémoire précédent. *In:* Jomard, E.-F. *et al*. *Description de l'Égypte …. Histoire naturelle. Tome second*. L'Imprimerie Impériale, Paris, 683-732.

---- 1812c. Minéralogie, pls. 1-15. *In:* Jomard, E.-F. *et al*. *Description de l'Égypte …. Histoire naturelle, planches. Tome III*. L'Imprimerie Impériale, Paris.

Ryan, B P 1983. Aboukir Bay, 1801. (In: Bartlett, M L: ed.) *Assault from the sea: essays on the history of amphibious warfare*. Naval Institute Press, Annapolis, 69-73.

Said, R 1990. *The geology of Egypt*. Balkema, Rotterdam, 734p.

Sarjeant, W A S 1980. *Geologists and the history of geology*. Macmillan Press, London. 5 vols, 4526p.

Taylor, K L 1971. Dieudoné (callet Déodat) de Gratet de Dolomieu. In: (Gillispie, C C: ed.) *Dictionary of Scientific Biography,* **4**. Charles Scribners' Sons, New York, 149-153.

Torrens, H 2003. *Memoirs of William Smith, by his nephew and pupil John Phillips, with additional material by Hugh Torrens*. Bath Royal Literary and Scientific Institution, Bath, xxxviii + x + 230p.

Walsh, T 1803. *Journal of the late campaign in Egypt. Including descriptions of that country and of Gibraltar, Minorca, Malta and Macri*. Cadell & Davies, London, viii + 261p, appendix 145p.

Willig, D 1999. Entwicklung der Wehrgeologie: Aufgabenspektrum und Beispiele. 1. Von dem Anfängen bis 1918. *Fachliche Mitteilungen,* **225**. Amt für Wehrgeophysik, Traben-Trarbach, 1-116.

Zenger, D H, Bourrouilh-Le Jan, F G & Carozzi, A V 1994. Dolomieu and the first description of dolomite. In: (Purser, B, Tucker, M & Zenger, D: eds) *Dolomites: a volume in honour of Dolomieu*. Special Publication **21**, International Association of Sedimentologists. Blackwell Scientific Publications, Oxford, 21-28.

Post Conflict Reconstruction: A Review of the Role of 22 Engineer Regiment's Power Distribution Support Teams During Op *Telic IV*

LIEUTENANT M HAYAKAWA BA(HONS) MA

Lieutenant Marcus Hayakawa was commissioned into the Corps in 2002. Since he completed his Troop Commanders Course he has served as an Armoured Troop Commander in 3 Armoured Engineer Squadron where he has deployed to BATUS and on Op Telic IV. *He wrote this article on his return from the latter and is very conscious that much of the essay will struggle to keep pace with the rapidly changing post war Iraqi environment.*

INTRODUCTION

As newspaper photographs of a flame-clad British soldier battling rioters in Basra were put to press in the summer of 2003, it was becoming increasingly obvious that the post conflict reconstruction of Iraq would be a complex and dangerous affair. Sparked by a population's growing frustrations with essential services, similar riots were predicted for Op *Telic IV*. To counter this threat to public order, 22 Engineer Regiment was tasked with monitoring and improving local essential services.

The riots demonstrated that essential services were crucial to the successful development of a new democratic nation. Electrical generation, transmission and distribution, water, refuse, fuels and sewage were identified as the foundations to stability and ultimately the population's continued consent to the presence of British Forces.

Operating at the tactical level, 3 Armoured Engineer Squadron was tasked to provide Power Support Teams to assist in the regeneration of an Iraqi electricity network that had suffered from decades of neglect, mismanagement and looting. These teams were created to reflect the Iraqi departments of generation, transmission and distribution. This paper will critically examine the role of the Power Distribution Support Team. It will describe some of the initial difficulties faced by them, outline some of the ideological shifts that shaped the Team's efforts as well as describe some of successes and failures encountered throughout Op *Telic IV*.

IN AT THE DEEP END: BUILD UP TO THE TRANSFER OF SOVEREIGNTY

A Slow Start

IT had always been acknowledged that the arrival of a new Brigade would disrupt the continuity and momentum that the outgoing units had developed. Nevertheless, in addition to the difficulties associated with any relief in place, the Power Distribution Support Team faced a number of other factors that had combined to create an early period of limited achievement.

One of the most obvious reasons for the Team's slow start to the tour was simply a lack of technical knowledge and the uncertainty over the role of the Power Distribution Teams. The personnel were drawn from a Squadron that had recently completed a busy training year, before quickly reorganizing to meet a myriad of Op *Telic IV* commitments. As a result, they had deployed with scant knowledge of national electricity issues, let alone a true appreciation of the Iraqi electrical network. While pre-deployment training had focused their attention on potential taskings, organized visits to British power and substations were never able to offer comparable examples to those that the teams would be working with. More importantly, pre-deployment training was unable to tap into the psyche and work ethos of the Iraqi engineers. It was the relationship with the local specialists that would prove to be crucial factor in any successes or failures encountered throughout the operation. As a result, the Team quickly discovered that it would take some time before they could confidently describe themselves as "expert" within their new field. Nevertheless, they remained confident that their lack of technical knowledge could be quickly overcome.

Despite this optimism, a second reason for a somewhat conservative start to the tour was the unanticipated deterioration in the security situation. While the increasing levels of anti-Coalition Force activities affected the freedom of movement for the Team, unexpectedly high levels of violence also brought about a sudden requirement for large force protection tasks. These placed enormous strain on the Squadron's manpower and its ability to simultaneously field a sizeable Military Construction Force as well as the Power Support

Some poor workmanship.

Teams. It was therefore, only to be expected that while the Team assets remained the main effort, the increasingly heavy burden of taskings underlined the fact that they were never going to be the only effort.

Mindful of the sporadic movement restrictions caused by security issues and commitments to other tasks, the Team was keen to press on and establish a presence throughout the Area of Operations. Unfortunately, a growing list of initiatives came to an abrupt halt with the arrival of load shedding. The exceptional summer temperatures were once again threatening to destabilize the distribution network. When the first reports of load shedding began to arrive two months before they had been predicted, the Team was caught off guard and spent much of the tour reacting to the crisis and a population whose expectation now far exceeded the capacity of the distribution network. Although unpopular, the reality of load shedding could not be ignored, not least because within such a fragile distribution system, regulated power cuts are essential to maintaining stability. Without them, the system could have expected to see province and even country-wide blackouts. Unfortunately, however, a preoccupation with load shedding and its likely implications meant that the Team was slow to engage in other distribution projects throughout the provinces.

While the affects of load shedding were to be an ongoing task, one single event still dominated the tour calendar. 30 June 2004 would mark a watershed in the post conflict environment in which the British Forces were operating. The reaction to and realities of the return of Iraqi sovereignty was something that was frequently speculated upon but never truly understood. Throughout Op *Telic III*, the Coalition Provisional Authority and its associated institutions were well resourced and financially generous to post conflict reconstruction projects. However, the return to Iraqi sovereignty meant that all projects had to be completed by the end of June. In addition, critical proposals were delayed amidst confusion over the true impact of the closure of the Coalition Provisional Authority. As a result, the hand-over of power not only represented an ideological shift in the way the British Army was to operate. As far as the Team was concerned, it also had an enormous impact on unresolved issues such as the availability of project funding and contracting.

Measurable success

DESPITE all these constraints the Power Distribution Support Team was still able to achieve a great deal before the handover of civil power. To a large extent this was due to the essential service teams left behind from 20 Armoured Brigade. These teams comprised TA officers and soldiers who were incorporated into 22 Engineer Regiment Group at the start of the tour. Their experience, dedication and specific knowledge of the intricacies of the Iraqi electricity system were critical. Within the first few months of Op *Telic IV*, the Teams had completed a number of projects. Included in these were the provisions of new switchgear for the regeneration of substations throughout Basra province as well as the procurement of health and safety equipment for the employees of the Distribution Company.

The continuation of the first Power Support Teams into Op *Telic IV* was also complemented by the arrival of SO2 Electricity Generation, and SO2 Electricity Transmission and Distribution. Their detailed technical knowledge and comprehensive understanding of national and regional electricity proved to be the catalyst for focusing the efforts of the Power Support Teams. In conjunction with the Regimental Headquarters, they were able to address operational issues across the whole country and then focus on regional issues within 1 Mechanised Brigade's Area of

Crown Jewels Substation.

Operations. As a result, the lack of direction, measurable indicators and focus that had thus far hindered the team from achieving a coordinated aim was slowly beginning to be rectified.

Adapting to Change: Working in a Sovereign Iraq

As previously mentioned, the hand over of authority represented a seismic shift in the psyche of the Power Distribution Support Team. In many ways, the handover of power presented a timely opportunity for all those involved to re-evaluate their role, not only in their dealings with the Iraqi electrical engineers, but also within the context of a period of uncertain funding and the increasing potential for civil disobedience.

The outcome of this re-evaluation resulted in the Team concentrating on three inter-related strands of policy. Firstly, they were to focus more attention on direct support to 1 Mechanised Brigade. Secondly, they were to continue to provide targeted, measured and appropriate support to the Iraqi engineers. Finally, they were to maintain the ability to react to emergencies in power distribution.

Supporting 1 Mechanised Brigade

With limited project funding, the Power Support Teams were unlikely to seriously affect the load shedding cycles within the Area of Operations. Therefore, conscious that public disorder linked to load shedding remained a serious possibility, the Team sought to channel their efforts towards support for individual battlegroups. Initially this began with liaison with various G5 representatives. While at first this led to a bombardment of funding requests, it soon became apparent that assistance would be limited to electricity related information collection, interpretation and dissemination.

One such example of this was a drive to collate detailed mapping and electrical diagrams. This was done in order to provide Battlegroup decision makers with a greater understanding of the electricity networks within their Areas of Operations, with special attention given to the geographical locations of load shedding groups. To date, the Power Support Teams have completed mapping of Basra, Umm Qsar and Az Zubayr.

While the maps proved useful for creating a tautology of geographical load shedding areas, they could not of course describe the individual sensitivities that were stimulated by frequent power cuts. As a result, like many sub-unit groupings within the Brigade, the Team attempted to gauge the opinion of a population prone to taking their problems out onto the streets. This information was passed up through the chain of command. On occasion, specific information was offered to the Distribution Company. One such example of this was after frequent complaints were lodged with us concerning the bias nature of load shedding within northern Basra. This matter was taken up with representatives from the Basra Distribution Company and the situation was rectified within 24 hours. Although this individual case ended positively, it demonstrated the Team's growing understanding and influence on the geographical impact of electricity failures. Such information was continuously offered to the SO2s for wider distribution.

Supporting the Distribution Companies

The relationship between the various electrical departments within Basra Governorate is complicated and often fraught with infighting and resentment built up over decades. For the Power Distribution Support Teams, the Ministry of Electrical Distribution for the South and the Basra Distribution Company were the two crucial organizations. The former was responsible for all electrical distribution throughout the four southern provinces of Basra, Dhi Qar, Al Muthanna and Maysan. The latter, had a sole interest in Basra Governorate.

As described earlier, the Team sought a conscious re-definition of its relationship with the Distribution Companies. It was intended that this new relationship would empower the Iraqi electrical engineers to identify their priorities, source contractors and where possible fund their own initiatives. Positive encouragement was given by the promotion of a simple three-stage project proposal system. Firstly, the Iraqi engineers would have to identify specific projects and complete the scope of works. Secondly, we insisted that the Distribution Company source the three contractors required to tender for project proposals. Thirdly, and in conjunction with the Power Distribution Support Team, the Iraqi authorities would be expected to project manage Multi National Force funded projects. This would be done to ensure correct accountability as well as to improve the management norms and values of the distribution companies. The best example of this was the funding and implementation of a 33KV underground cable. When project approval was eventually granted for this crucial cable, regular meeting, enforced deadlines and the use of works tables meant that as the project developed the local contractor and the South East Distribution Company were able to take a greater lead in the process. This was a sea change from the early days of planning where all meetings and contracts

CERP funded electrical spares.

Lt Tim Williams and SSgt Alan Birchmore receiving local knowledge.

were led by us. In the end it was pleasing to note that the project was finished nearly two months ahead of schedule.

It would be incorrect to assume that each project proposal conformed to these three desired criteria. Nevertheless, while a great deal of our time and effort continues to be spent tendering and negotiating contracts, there has been a significant improvement in levels of local participation, project management and good governance.

Monitoring the Distribution Companies through project management was not the only way the Power Distribution Support Team assisted in affecting organizational culture and building management capacity. From the outset of the tour it became evident that the redevelopment of the distribution network was in part hindered by poor decision-making, a lack of accountability and scant documentation. As a result, the Team continuously sought methods of improving management practices and resources. One such example was the assistance in updating the South East Distribution Company's mapping data. The Team donated an array of mapping equipment designed to empower the Iraqi planning engineers to produce their own up to date maps.

Responding to Emergencies

WHILE load shedding was unpopular, it was more likely that a sudden electrical failure would spark a violent deterioration in the security situation. In addition, on a humanitarian level, unforeseen electrical emergencies had the potential for catastrophic effects on basic services such as hospitals and water treatment plants.

As reports of protests outside substations began to arrive with increasing regularity, emergency response was developing into somewhat of an art form. Despite a great deal of brain-storming, there was still no definitive Team strategy in place for responding to the first signs of a much predicted break down in law and order. Nevertheless, as the tour developed the Power Support Teams began to find themselves in a position to make more considered reactions to electrical crises. This was made possible by three broad factors. Firstly, the teams were continuing to grow in confidence as well as competence. Secondly, the Power Distribution Support Team was able to make more considered responses because it had become apparent that the teams were extremely limited in their ability to actually affect a crisis. Finally, and most significantly, the Iraqi authorities had begun to demonstrate a greater ability to identify and respond to local failures. This, however, did not make the Power Support Teams obsolete. It simply demanded that they change their approach and combine a proactive monitoring role with the ability to provide targeted reactions to electrical emergencies.

This new relationship was demonstrated in July when reports from Umm Qsar suggested that the failure of one of the town's two substations had caused a black out across half the town. More importantly, a lack of electrical power had closed the town's water treatment plant and the population was rapidly running out of potable water. In conjunction with the Brigade Essential Service Teams, we were dispatched to investigate the root cause of the problem and to identify cost-effective ways to rectify the fault and stabilize the network.

Once the assessments had been completed, it became apparent that the Iraqi engineers had already devised a solution to the problem. As far as they were concerned, they had located the fault and were simply awaiting a number of replacement parts from the South East Distribution Company. On the face of it, this offered a superb example of Iraqi identification and response to local failures. However, it also highlighted the need for the Power Distribution Support Team, who at the request of the local council sought Brigade funding for two transformers and a substantial amount of electrical cable. This equipment was designed to complement the Distribution Company's repairs by stabilizing other areas of the Town's distribution network.

By securing a stable supply of electricity to the town and in particular the water treatment plant, we established a potential niche. While the various electricity departments continued to grow in competence and effectiveness, there would always remain critical projects that they could not fund. Umm Qsar was one such example. Within three weeks and for only 49,000 USD, the Brigade had provided funding that would certainly not have become available from the Transmission Directorate whose financial commitment to the substation's failure was limited to reactive engineering and quick-fix solutions.

In addition to funding, the Teams were also able to disseminate information regarding cause and effect of the electrical failure to the Royal Welch Fusiliers Battlegroup. The Brigade Essential Service Teams had proved their ability to respond to significant electrical failures. Umm Qsar had demonstrated that the Power Distribution Support Team was able to identify an emergency, react promptly, make an informed assessment, monitor the local authorities, fund a critical project,

and continuously maintain a flow of information throughout the Brigade Area of Operations.

Established Practices: Working Towards an Uncertain Future

As Op *Telic IV* draws to an end it remains difficult for the Power Distribution Support Team to make firm plans and almost impossible to assess the future of the Distribution Network. Since the middle of August there has been a noticeable deterioration in the security situation. Continued resistance to the presence of Coalition Forces, threats to perceived collaborators and movement restrictions are a persistent hindrance to the role of the Power Distribution Support Team.

Fortunately, there have been two welcomed developments that have coincided with the upsurge in anti-Coalition Forces activities. Firstly, there has been a sudden influx of available project funding. These funds have been allocated to the purchase and installation of a 33KV cable that will provide stability and improved electricity to over 150,000 inhabitants of Basra, including a sizeable proportion of the impoverished Shia Flatts area of the city. Funds have also been allocated to purchase spare parts for the Distribution Company. Secondly, funding for low cost, high impact projects has been authorized throughout the Province.

Besides accessing new funding opportunities, the second development was the seasonal reduction in electricity demand. September witnessed a steady decline in peak loads throughout the Area of Operations. This can be attributed to the slight reduction in temperatures. Nevertheless, the positive impact cannot be ignored. Levels of load shedding are being reduced and greater flexibility within the network has allowed for critical winter maintenance programmes to begin. Importantly, there has so far not been a repeat of the riots of 2003.

Conclusion

Within an increasingly fragile post war environment, the Power Distribution Support Team made a tentative start to Op *Telic IV*. Reasons for this ranged from inexperience, a lack of preparation, and uncertainty over the stability of the distribution network to the return to Iraqi sovereignty. Although a number of projects were completed within this period, the Team spent the first few months of the tour developing a sense of identity and trying to establish what their role would be within a post-Coalition Provisonal Authority Iraq.

After the hand-over of civil power, the Team set out to redefine its raison d'etre. This was made possible by the direct support given by the Brigade Essential Service Teams as well as a growing realization of the Team's capabilities. We were directed to support 1 Mechanised Brigade, assist the distribution companies and be on hand to respond to electricity related emergencies. Once these three broad policy areas had been defined, the Team's work began to build momentum and credibility. This was accompanied by the noticeable improvement of the Iraqi authorities' ability to deal with local failures and command their own affairs.

Despite the unpredictable security situation, the Power Distribution Support Team has contributed to a number of successes. Detailed mapping has improved our knowledge of the Iraqi electrical system. In addition, new substations have enhanced stability and reduced load shedding within the distribution network. Funds have also been made available for distribution spare parts as well as the equipment required to promote safe working practices.

The reconstruction of Iraq will be a slow and difficult process. Future Power Distribution Support Teams must continue to adapt to the changing environment as well as receive the top-down support that was provided throughout Op *Telic IV*. Although the summer months have now passed without the predicted riots, the population of Basra must learn to accept that the regeneration of the electricity network will take a number of years. As long as British Troops remain on the ground, there will be large elements of the population, some of whom may be violent, that hold Her Majesty's forces accountable for the rehabilitation of all aspects of electrical power.

Supporting Counter Insurgency Operations in Al Majarr Al Kabir – Op *Trojan* – 12 June 2005

CAPTAIN D J BICKERS BEng(H)

Capt David Bickers is the Operations Officer for 30 Field Squadron, which deployed under 26 Engineer Regiment as the UK Close Support Engineer Regiment on Operation Telic 6. *During the tour he served as the Battle Group Engineer to Task Force Maysaan, based on the 1 STAFFORDS Battle Group in Al Amarah. After studying civil engineering at the University of Manchester Institute of Science and Technology he commanded Troops in both 25 and 32 Engineer Regiments. He will take post as Adjutant 22 Engineer Regiment in September 2005.*

Introduction

Situated in the central marshlands of Maysaan Province, Al Majarr Al Kabir has a reputation as a hard and lawless town that even the Saddam regime was unable to tame. This reputation was only enhanced on the 23 June 2003 when, amidst the backdrop of a contact battle between Anti Iraqi Forces insurgents and 1 PARA, six Royal Military Police soldiers were brutally executed whilst visiting the Iraqi Police Service Station within the town.

Located twenty-five kilometres south of the provincial capital, Al Amarah, and bisected by the River Majarr Al Kabir, the town is highly impoverished and underdeveloped. The volatile security situation of the last two years has not allowed any J9 reconstruction projects to flourish there as they have done across the rest of the province.

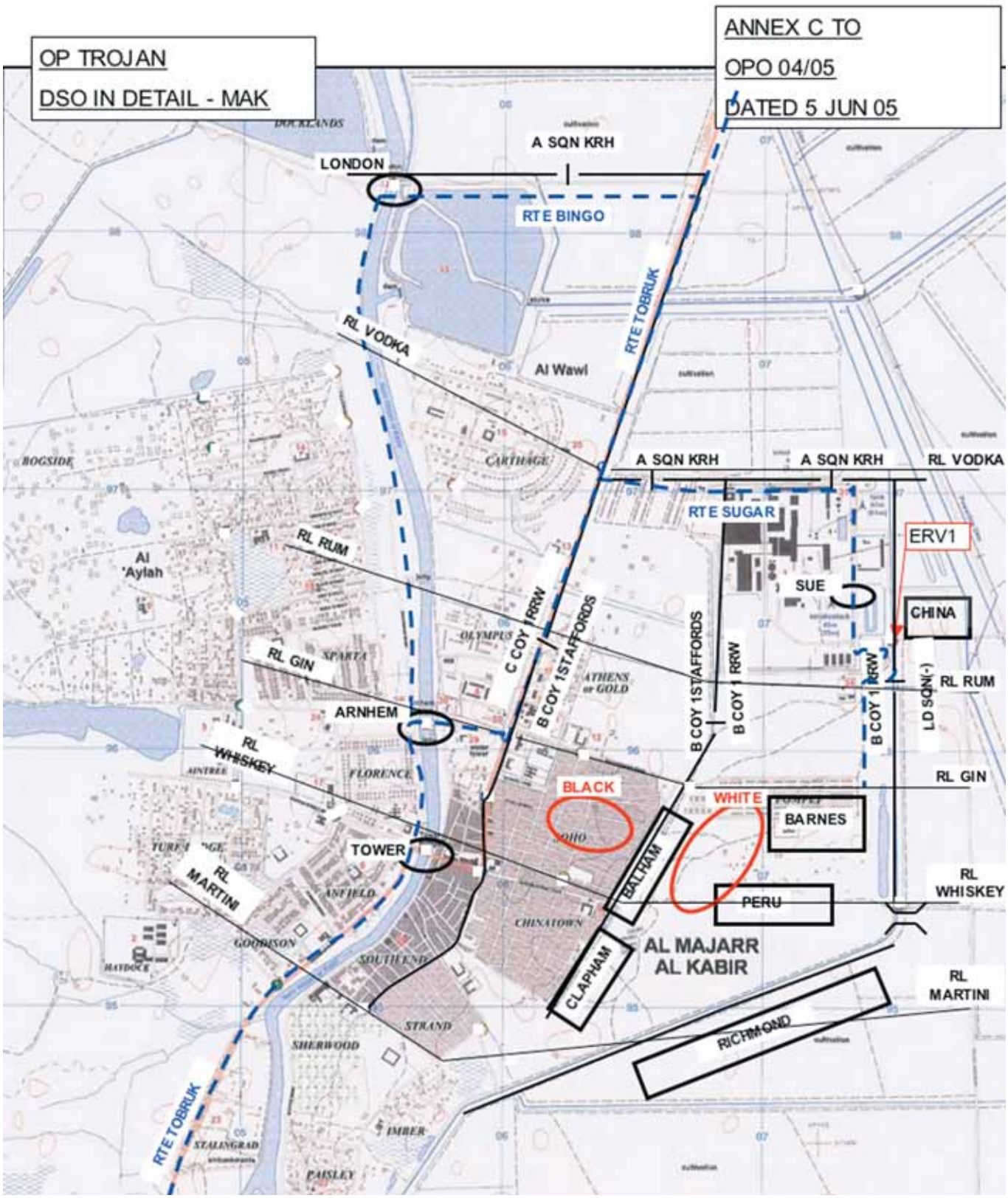
On the 21 April 2005, the 1 STAFFORDS Battle Group took over authority for the Maysaan Province area of operations from the Welsh Guards Battle Group, whilst simultaneously re-roling as a Task Force under the direct command of Multi National Division South East. It was a hectic opening period for the Task Force, with twenty-five serious incidents in the first six weeks. Amongst the indirect fire attacks and rocket propelled grenade engagements that are almost common place in Maysaan began a concerted and serious improvised explosive device campaign that claimed the lives of two Task Force soldiers in a four week period; Guardsman Wakefield on 1 May 05 and Lance Corporal Brackenbury on 29 May 05.

Compelling military intelligence linked these attacks and others to a group of insurgents based in Majarr Al Kabir, with known links to the Jaish Al Mahdi Militia, Office Martyr Sadr and Baghdad based insurgents. In order to defeat the threat posed by this group the Commanding Officer of Task Force Maysaan tasked his J5 planning team to formulate a plan to detain members of this Majarr Al Kabir based insurgent group. Hence Op *Trojan*, which was to become the largest Multi National Force operation conducted in the divisional area of operations for over a year, was conceived. 30 Field Squadron had just completed a training year with the Battle Group and were tasked with providing the Division's close support engineer reserve. The Squadron was placed under operational control of Task Force Maysaan until the completion of the operation.

The Plan

Preliminary Operations. A preliminary operation was launched one week before the main strike. This included continuing the find function on the target locations as well as engineer recces which were required to confirm the bridge classifications of the three crossings within Majarr Al Kabir, codenamed LONDON, ARNHEM and TOWER. The key aspect of the preliminary operation was to condition the enemy into seeing armour operating in Majarr Al Kabir. The targets were all highly surveillance aware and military intelligence reporting had suggested that they viewed armour operating in and around the town as a combat indicator for a future Multi National Force strike. Therefore, to give a reason for a regular presence of armour on the outskirts of the town, a programme of engineer upgrade to the permanent vehicle check-point was instigated. This saw a small plant team headed by Cpl Stanley of 30 Field Squadron begin nightly improvements to the force protection measures under the protection of C Company of 1 STAFFORDS in their Warriors. This continued up to the night of the strike itself, where the engineer work allowed a forward main headquarters to set up undetected at the rear of the check-point and gave cover for the formation of a Warrior mounted reaction force on the edge of the town.

The final strand of the operation was to "sweeten" (as described by the CO in his intent schematic) the local population through J9 Reconstruction. Consent of the general



Op *Trojan* Divisional Support Overlay.

population for Multi National Force operations was assessed to be on a knife edge. Previously, the Jaish Al Mahdi Militia had been able to mobilise large numbers of men into taking up arms. The Task Force succeeded in employing large numbers of young men in the days leading up to the strike, including 300 alone in one of the streets where three houses were to be searched. It is assessed that by effectively buying the consent of the town the Task Force was able to avert a large scale public order situation erupting during the operation.

Execution. Five target houses had been identified, codenamed

The Mob Teams enter Majarr Al Kabir as part of the Infantry Strike half-companies.

The Infantry Strike half-companies gain access to the roofs of the target houses immediately prior to H-hour.

VICTOR, WHISKEY, X-RAY, YANKEE and ZULU, situated in the two target areas, BLACK and WHITE. On H-hour, the Task Force strike echelon, comprising two half-companies from B Company 1 STAFFORDS and B Company 1 RRW in SNATCH vehicles, converged onto each target area. Integral to each of these companies was a four-man team (both from 30 Field Squadron), also in SNATCH, and equipped to carry out urban mobility tasks. These teams were tasked to aid initial entry where required, provide assistance to the search by gaining access into safes and strong rooms and to carry out basic non-explosive denial of weapons that could not be recovered from the target area due to either time or lift constraints. The teams were commanded by Lieutenant Guy Cheesman who deployed on the Main Effort and maintained a command node back to the OC, Major Andy Noble, who was in Forward Main HQ. The Battle Group Engineer remained with Tac HQ and this gave a robust C2 architecture with redundancy.

Simultaneously on H-hour, the remaining half company from each target area flew in and from a holding position on the limit of audio perception, they dropped into the helicopter landing site PERU to secure each target area. Accompanying each half-company was a Royal Engineer Search Advisor, Sgts Craddock and Tait, both of 38 Headquarters Squadron, and a Royal Engineer Search Team commanded by Cpl Hall of 30 Field Squadron and Cpl Thurlow of 38 Headquarters Squadron, tasked with carrying out searches of the principal target house in each area. Concurrently, C Company of 1 RRW moved south in their Warriors to hold the three bridges in order to isolate the target areas from the west. A Squadron (-) of the Light Dragoons was inserted by SCIMITAR in to the south and east in order to screen and secure the pick-up helicopter landing site, CHINA, and a Squadron/Company Group based on A Squadron of the King's Royal Hussars stood-off to the north in order to threaten and provide a reaction force as required.

The Royal Engineer contribution to the operation, as well as the individual commitment of each sapper, cannot be underestimated. Majarr Al Kabir is a hostile and intimidating town and each soldier was aware of the assessment that some of the targets were likely to fight rather than be detained with ease. The mobility teams were subjected to the same substantial risks as the remainder of the strike companies. The Search Teams and Search Advisors knew

RE Search Team and RE Search Advisor (Sgt Craddock) in Target House BLACK VICTOR.

The RE Search Team in Target House BLACK VICTOR catalogues the finds.

Example of the RE Search Team finds in Target House BLACK VICTOR.

that the target houses were unlikely be secure by the time their aviation link-up was complete. The inherent risks were shown when, minutes before H-hour, a Sea King crashed within Camp Abu Nadj. Miraculously no one was seriously injured.

Six detainees were extracted by air back to Abu Nadj and, after approximately ninety minutes on the target, and shortly before first light, the Commanding Officer ordered the extraction. All air delivered troops (including the two Search Teams and Search Advisors) moved to the pick-up point by foot where they were extracted in two airlifts back to Abu Nadj. The remaining half companies in SNATCH were then extracted from the target areas.

Exploitation. The original intent was that B Company of 1 STAFFORDS would move immediately into a Forward Operating Base located at the Iraqi Police Service Station. Their integral RE Mobility Team moved straight back to Abu Nadj where they re-roled to a force protection team, loaded the FL12 from the plant team with defence stores and prepared to move with the second half of B Company who had themselves returned by air and re-roled into SNATCH. At this stage it became clear that the purpose of having Multi National Force soldiers forward based had already been achieved. The peoples' immediate complaints came to those elements of the Task Force still in Majarr Al Kabir rather than the Office Martyr Sadr, thus denying the latter the opportunity to gain political mileage.

Instead, regular day and night patrolling was carried out within Majarr Al Kabir over the following days. This was tied into an aggressive Information Operations campaign to explain the actions of the Task Force and counter the highly effective info ops campaign launched by the Office Martyr Sadr. In addition, J9 Reconstruction projects were triggered to further sweeten the residents. The end state was that of the six persons detained from the target areas, three were sent to the Divisional Temporary Detention Facility in Shaibah Logistic Base. Rocket propelled grenades, mortars, small arms and improvised explosive device component parts, included hundreds of detonators, were recovered.

Key Observations and Recommendations

We must look carefully at how best we resource and train ourselves to carry out mobility support in counter- insurgency operations.

Extensive thought was put into equipping the two RE Mobility Teams. Each deployed with a bespoke door thumper (self-fabricated from an HGV axle and able to smash through a masonry wall), *Makita* saws with metal cutting discs (masonry discs were also deployed), bolt croppers with torque extenders, wrecking bars, oxy-acetylene cutting equipment (small civilian cylinders were procured to reduce weight and space), cordless drills and saws. They would have also deployed with an explosive means of entry if authorized (see below).

We must retain explosive means of entry as a RE capability.

The Task Force was denied permission by the Senior Ammunition Technical Officer to carry out explosive means of entry, describing it as a *"highly specialised skill using very specific equipment and charges"*. Their recommendation was that only an Ammunition Technical Officer should be used to carry out this task. That RE personnel within the Division were aware that this advice was being given by a Royal Logistic Corps officer, stripping a core function (use of in-service demolitions on operations) from the Corps, was highly disappointing. We must fight as a Corps to ensure that this capability is not withdrawn from us and ensure that we are properly trained and resourced to carry out the task when asked to do so. Key to this is to classify GATECRASHER as in-service explosive and incorporate it into our training establishments.

We should be able to provide an obstacle breaching and crossing capability wherever the British Army retains an armoured capability.

The Company/Squadron Group that threatened to the north were hugely constrained by lack of mobility. They only had one highly canalised class 70 crossing of the River Majarr Al Kabir at their disposal, (LONDON Bridge), which effectively restricted them to operating exclusively in the east. Had AVLB been in theatre it would have been requested by the Task Force. That no assault bridging was available within the Corps area of operations despite the tempo of counter insurgency operations being conducted and the amount of armour deployed within, it would seem a little short sighted.

In addition there was no effective obstacle breaching capability available to the Task Force. Route SUGAR had a concrete bollard obstacle that had to be breached in order to open up the route. This was carried out with Warrior as there was no Combat Engineer Tractor in theatre and the Armoured CASE brought over from Northern Ireland had insufficient endurance in the high temperatures to make its use viable. The result was that the Warrior damaged its enhanced armour and was therefore significantly vulnerable throughout the remainder of the operation.

We should look to resource Task Force/Battle Group level engineers with geographic capability.

With six manoeuvre sub-units in total, plus the entire Divisional aviation lift capacity, national level intelligence,

surveillance, target acquisition and reconnaisance assets and Corps level close air support, Op Trojan was little short of a Brigade level operation. Clear schematics and Divisional Support Overlays are essential to co-ordinate all of these moving parts. Geographic Branch at Division were helpful in producing products but the geographical distance and speed of change of the plan meant that ultimately the overlay was produced by the Battle Group Engineer on PowerPoint. The Corps could look to provide Battle Group Engineer's with deployable information technology and suitable software to produce more professional products and fill the capability gap at Battle Group/Task Force level.

Training year affiliations are valuable and can add significant value to military effectiveness on operations.

The trust and integration built up over the training year between the Battle Group, Squadron and Battle Group Engineer aided both the planning and the execution of the operation as well as providing the stretch to take on other roles. As well as general Battle Group Engineer duties I was responsible for intelligence, surveillance, target acquisition and reconnaisance targeting within the Task Force. This meant I worked closely with the Intelligence Officer and allowed me to task assets such as PREDATOR and MR2 Nimrod to answer both my ground, and his enemy, requests for information. Consequently, our ground/enemy threat integration during question one of the seven questions planning process was comprehensive and laid the foundations for a sound plan.

G7 SSR and G9 Reconstruction can provide effects that can be utilized within effects based planning for counter-insurgency operations.

The force protection upgrade of the Majarr Al Kabir permanent vehicle check-point was essential in setting the conditions for the successful strike. Equally, the sweetening of the local community both prior and post the strike were key effects that added to mission success. The fact that nearly every native man in Target Area BLACK had been employed by the Multi National Force three days prior to the strike is assessed to have contributed to none of them taking up arms. Commanders should realise the potential of these effects and ensure that G7 and G9 departments are involved in the planning process where required.

Sappers must train thoroughly in weapon handling and low level tactics in order to be able to integrate into an All Arms environment.

Key to the integration of the 30 Field Squadron Mobility Teams into the strike companies was the high level of tactics and weapon handling they had carried out prior to deploying. Several of those that deployed on Op *Trojan* had conducted two weeks of live firing training with 1 STAFFORDS at Castlemartin and all had completed extensive contact drills, both from vehicles and whilst dismounted, during pre-deployment cascade training at Caerwent Training Area in Wales. This was a two-way process which gave our soldiers the confidence to operate within an infantry-centric environment and it also gave the infantry confidence in the ability of our sappers.

The effect of carrying out offensive operations on morale cannot be underestimated.

Finally, the operation was a key example of how morale can be maintained through offensive operations. Any force will be sapped through repeated indirect and direct fire attacks and fatal or near fatal improvised explosive device attacks. To give our soldiers the chance to strike back at an identified aggressor was essential, and one which was taken with the enthusiasm and professionalism that you would expect of a British Soldier.

The 30 Field Squadron RE Mobility Teams post Op *Trojan*, including Lt G Cheesman (6th from left).

VULCAN – Best Explosive Engineering Tool in the World – Probably

(With apologies, or should that be thanks to Carlsberg Lager)

MAJOR J Q KILLIP MA BSc (Hons)

John Killip's military career reached its premature apogee while serving as a Sapper in the Royal Monmouthshire Royal Engineers (Militia); at the time he led a double life as a Chemistry student at Birmingham University. Following little more than attendance on 88 YO Course, he spent almost five years with 26 Engineer Regiment in Iserlohn, including a tour of Northern Ireland as a Squadron Operations Officer. Next, despite lacking the requisite genealogical credentials, he spent two sublime years out of mainstream military life as an SO3 in HQ 51 Highland Brigade in Perth. He then took post as the first Operations Major of the newly re-formed 25 Engineer Regiment in Antrim, where he also commanded the Headquarters Squadron to avoid the inconvenience of having any spare time. A nomadic three years, first as Training Major of the late 78 (Fortress) Engineer Regiment (Volunteers); then a year as Chief Mines/EOD in HQ Stabilization Force in Sarajevo before it became an SO1 job (!) and finally a year doing a Master's degree at Shrivenham preceded squadron command in 32 Regiment, Royal Horse Engineers in Hohne. That tour included a 5-month sojourn as Regimental Second-in-Command and a stint as SO2 Engineers in Multi-National Division (South West) in Banja Luka, by then the de facto *Divisional Chief Engineer appointment, or so he likes to think. After just over three years as desk officer for EOD and Demolitions acquisition in the Defence Procurement Agency, the Civil Service declared him incorrigible, having proved unwilling and unable to count beans in the orthodox manner. He was released back to the Corps to be Second-in-Command of 22 Engineer Regiment in Perham Down, with whom he has just returned from operations in Iraq. This particular boy is about to be posted to a sweet shop; his next appointment is Officer Commanding the Royal Engineers Trials and Development Unit.*

Background

A first act as a non-Explosive Ordnance Disposal qualified EOD acquisition staff officer was the examination of the chaotic Conventional Munitions Disposal Equipment Programme funding lines. One project in particular caught the eye; entitled "Render Safe Procedure: Detonation Acceptable". Despite the lack of formal military qualifications, a degree in Chemistry and a childlike fascination with and enthusiasm for explosives, pyrotechnics, bombs and rockets prompted some research. The project requirement was poorly understood and had not been articulated formally. However, it was concluded that were this to be developed, capable solutions might readily be provided by commercial, off-the-shelf tools and those developed by the [then] Defence Evaluation and Research Agency. Further research, including witnessing some practical demonstrations and poring over manufacturers' literature, and a developing technical comprehension, confirmed that there was a justifiable need for a system to provide the capability that the nascent requirement envisioned. However, there were then no adequate criteria either to drive Ministry of Defence funded applied research and development or against which to identify, assess and select commercial, off-the-shelf products.

In acquisition terms, broadly, user requirements articulate formally the required effects or characteristics of a system: *what* it is required to do. The system requirements derived directly from them articulate the means, methods or characteristics by which the tool or system is to meet the user requirements: *how* it is to do what is required. Key user and system requirements are those which must be met and where there is no scope for trade-off of system performance against project cost and time. Understanding the specific definitions and requirements set out in this document is the essential prerequisite to getting the solution that best meets the system and thus the user requirements. Project success requires the customer to set informed questions and the supplier both to understand and to answer these questions.

The research revealed, in summary, that there was a capability gap in the ability of EOD operators to bring about a variety of more predictable 'low order' reactions. Low order may be defined loosely as an energetic event or response to stimulus where the full [potential] energy of an explosive device is not released. Particularly where collateral damage, especially to one's own infrastructure, is not desirable and may not be acceptable, it is preferable to be able to bring about such a reaction rather than a much easier to achieve but potentially damage-causing detonation. Applying the concept of "nominative pre-determinism"[1], the project was re-named "Short Range, Low Order Techniques Capability" and a comprehensive set of user and system requirements articulated. The project aimed to furnish a capability that would be: " . . . effective in bringing about a variety of low order reactions when used against a broad spectrum of explosive ord-

[1] The principle of applying a name or title to a subject which, thereafter, prescribes or obliges its performance or role or of using an extant name or title as the authority for performance or role, regardless of its appropriateness.

nance . . . [being] . . . a tri-service requirement, seeking a capability for use on land and under water".

The system requirement document required of potential suppliers a developed understanding of the low order techniques brought about by their product(s) and the articulation of the design philosophy underpinning their configuration and performance in terms of explosive theory and of EOD applications. The two most searching requirements were:

- [Short Range, Low Order should be a system that would be] ' . . . *effective against the broadest possible spectrum of Explosive Ordnance*[2]'. The best candidate system would offer different components of capability or, better, variations in configuration of an ideally modular, core element. It was anticipated that most responses would address only Unexploded Ordnance[3], focusing on effectiveness against a narrow selection of types, thus both failing to recognize the breadth of utility required and demonstrating shortcomings in technical comprehension and design philosophy.
- *'Render safe mechanisms must employ low order techniques and be capable of employing a variety of low order techniques and mechanisms, as appropriate to each target'*. A technical discussion paper was required, in order to quantify potential suppliers' comprehension of low order theory and mechanisms and to demonstrate how this understanding underpinned the design, configuration and performance of the system.

The Theory and Application of Low-Order Techniques

Of the variety of low order techniques that the Short Range, Low Order Requirement sought, the most broadly applicable is 'deflagration' brought about by a shaped charge attack. Strictly, deflagration means rapid, vigorous burning. In EOD vernacular, it means the ignition of the explosive fill, usually causing the target's case to burst. Most low order tools penetrate the target's case using fixed configuration, copper-lined shaped charges. Most commercial, off-the-shelf low order tools are produced by the manufacturers of devices generally optimised for maximum penetration but which do not address the physical and chemical responsiveness of explosives confined in steel cases. Striking a target with a dense, very high velocity inert metal projectile, albeit at very high temperature, is not the most appropriate way of bringing about simply ignition of the explosive fill; it is potentially a reasonable means of initiating detonation. So-called "pyrophoric[4]" shaped charge liners had been shown to increase significantly the likelihood of initiating deflagration. Mechanical break-up or "disruption" is the other principal projectile attack low order technique. This can be brought about by inducing physical shock in the explosive which falls short of detonation but which is energetic enough to tear open the case and shatter and eject a proportion of the explosive fill and this is best brought about by a low energy, inert projectile.

Where a render safe procedure employs explosively generated projectile impact, the possibility of accidental initiation of detonation must be considered. Indeed, this assumption is incorporated into the operational procedures for the use of low order techniques, which require the precautions and mitigation measures appropriate to a detonation to be applied to all low order interventions. An understanding of the mechanisms likely to bring about unwanted detonation should help to avoid, or at least to reduce significantly by design, the probability of it happening. The following concepts are fundamental to this overall understanding:

- According to Vielle's Law[5], the rate at which an explosive burns is a function of the pressure at the burning zone. When explosive burns, gas is generated and if confined in a rigid container and ignited at a single point, pressure rises rapidly unless the case is vented: increased pressure increasing the rate of burning. The rate of burning can rise very rapidly to that of detonation; a phenomenon known as "Deflagration to Detonation Transition". Venting of the case tends to slow the rate of pressure rise and delay incipient deflagration to detonation transition. If venting is adequate, all the explosive will be consumed by burning before detonation can occur. To render safe a target by burning, the case must be sufficiently vented to prevent occurrence of the phenomenon.

- The transfer of energy from an impact on the surface of a mass of explosive has been termed the "energy fluence". Each explosive has a specific range of energy fluence, above which immediate detonation will always occur and below which it will not. The average of this range is known as the "critical energy fluence". If unwanted detonation is not to occur, the applied shock must, at its greatest, be within and preferably below this range.

- The "run distance" is defined as the minimum distance over which a shock wave above the critical energy fluence must be sustained through a receptor charge for it to become a self-sustaining detonation wave. Pressure dissipates from the edges of a [flat] shock front, reducing the diameter of the peak pressure shock front continuously: there is a conical zone immediately opposite the area of impact in which peak pressure is maintained. The greater the diameter of the impact area, the greater the theoretical run distance and hence the probability of detonation. To avoid detonation, this [impact] area should be minimized, see Figure 1. Shock can lead to ignition of the explosive. In an un-vented case, prompt detonation is likely through deflagration to detonation transition. If the violence of the impact is already close to causing shock-induced detonation and ignition, yet is not violent enough to cause reliable case weakening or venting, the method is inherently risky.

---

[2] Explosive Ordnance is defined in NATO AAP-6 as: "All munitions containing explosives, nuclear fission or fusion materials and biological and chemical agents. This includes bombs and warheads; guided and ballistic missiles; artillery, mortar, rocket and small arms ammunition; all mines, torpedoes and depth charges, demolition charges; pyrotechnics; clusters and dispensers; cartridge and propellant actuated devices; electro-explosive devices; clandestine and improvised explosive devices; and all similar or related items or components explosive in nature."

[3] Unexploded Ordnance is defined in NATO AAP-6 as: "Explosive ordnance which has been primed, fused, armed or otherwise prepared for action, and which has been fired, dropped, launched, projected or placed in such a manner as to constitute a hazard to operations, installations, personnel or material and remains unexploded either by malfunction or design or for any other cause."

[4] In this context, the pyrophoricity of materials refers to their propensity to burn extremely vigorously in air once the explosive charge is initiated, rather than their igniting spontaneously on contact with atmospheric oxygen. Zirconium is an example.

[5] Vielle's Law is expressed by the equation: $r = \beta P^a$

where r = rate of regression of flame front; P = pressure; ß = coefficient of the burning rate; a = burning rate index

If the value of ^{a} exceeds 1, and there is enough explosive present, then the rate of burning will accelerate to the sonic velocity of the explosive and detonation occurs.

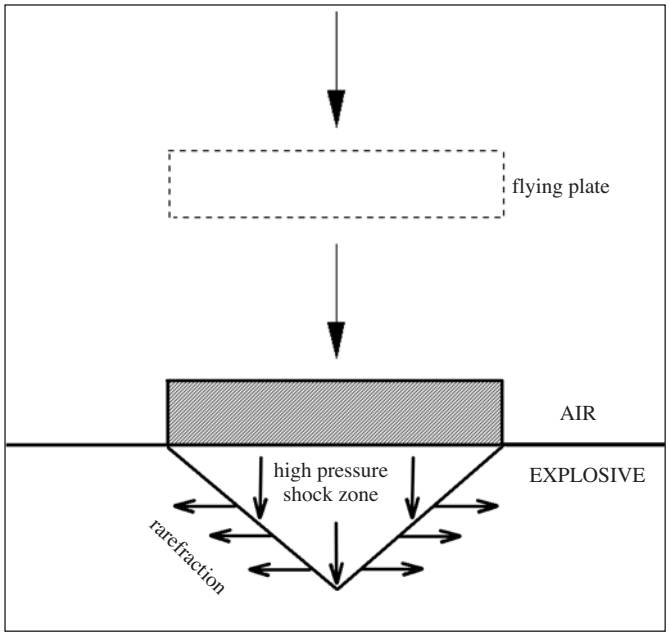


Figure 1.

Acquisition Strategy and Selection of the Short Range Low Order System

The Short Range, Low Order acquisition strategy was particularly carefully crafted, in order to enable a modular or generic system to be developed further under the aegis of the project should, for example, additional components of capability, such as larger analogues and additional ancillaries be required. It also allowed for progressive or incremental introduction into service and for continuous assessment and development, allowing a system or family of systems to be introduced and subsequently developed in service.

Only one of a number of candidate commercial off-the-shelf systems submitted for assessment met all the necessary key criteria at the down-selection stage, including having a convincing body of evidence to corroborate the supporting low order theory paper. In the event, only one paper was provided and the project selected the "Jet" family of systems, of which "VULCAN" was to be the principal component of capability.

VULCAN – System Description

VULCAN is an inert charge container system: essentially a kit of plastic parts comprising the charge container body and a range of user-fitted shaped charge liners (projectiles) as the core elements, with a number of ancillaries. See Figure 2. The charge container body is filled with an explosive load of PE4 or other service plastic explosive: loads may vary from a minimum of ~10g to a maximum of ~55g. The projectile and load, the stand- off distance and any ancillaries are selected according to the intended application. A range of tools is provided for measuring explosive quantities and for stemming, shaping and consolidating the explosive load. The charge container is configured to ensure axial and radial symmetry, which are essential for efficient projectile formation. The detonator holding screw allows the system to be used with service electric and non-electric detonators, detonating cord boosters and shock tube initiators. There are a number of ancillaries:

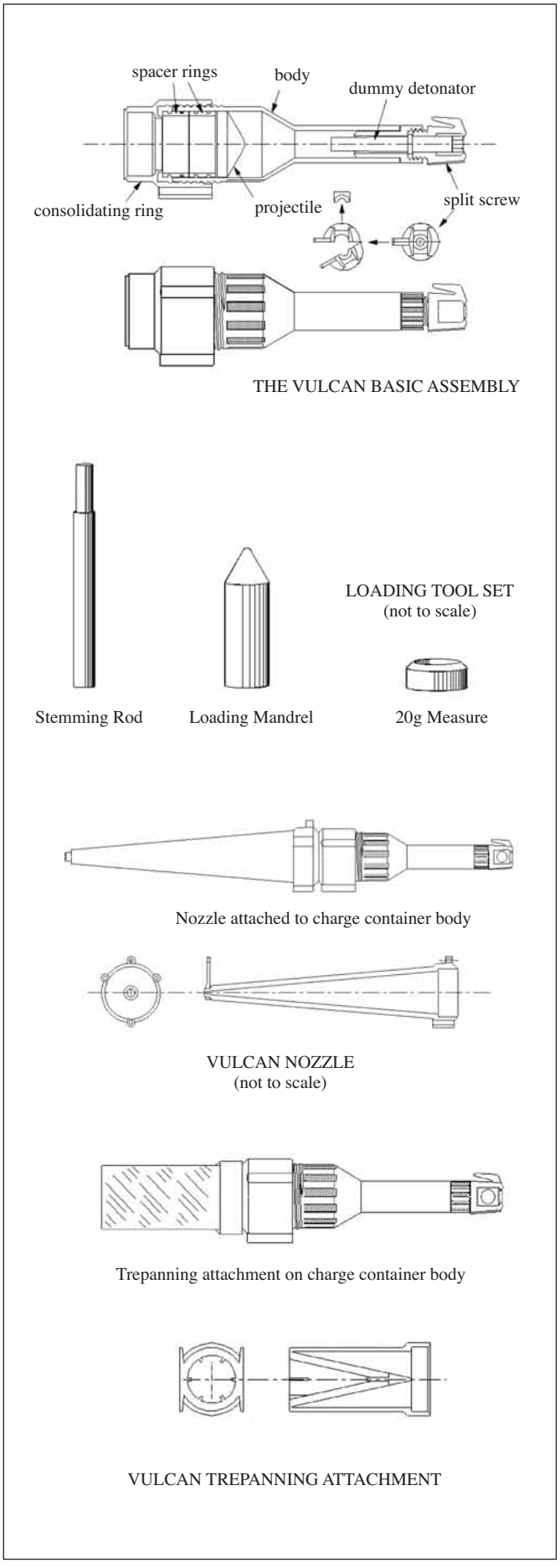


Figure 2.

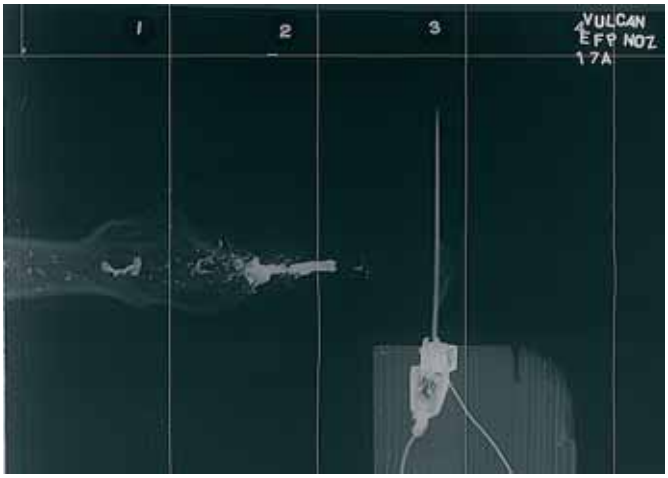


Plate 1 – Flash X ray – copper Explosively Formed Projectile emerging from jet-focussing nozzle.

- The jet-focussing nozzle fits on to the consolidating ring to enable disc-like projectiles and even jet-forming cones to be collimated to 2-3mm in diameter, allowing projectiles, which may include metal, plastic and water to be aimed very precisely. The flash X-ray photograph at Plate 1 shows the mass of copper from a 30mm diameter, 2mm thick Explosively-Formed Projectile bursting out of the nozzle with an effective diameter of ~4mm. This has particular utility in Improvized Explosive Device Disposal. The discovery of the so-called "Alford Effect" by the developer ranks in significance with the discovery of the Monroe and Misznay-Schardin Effects, which describe shaped charge jets and Explosively-Formed Projectiles.
- The corollary to the focussing component of the Alford Effect is trepanning. The trepanning attachment, also fitted to the consolidating ring, is a cylindrical capsule containing an integral cone with its apex towards the centre of the projectile, usually a flat plate or an explosively-formed projectile. This forges the projectile into an annulus, capable of cutting wide holes (~37mm in diameter) in metal targets several millimetres thick. This is potentially useful for case venting, particularly for the exploitation of naval munitions. An example of the effect, shown at varying explosive loads building up to that load required to defeat the target, a 5mm steel plate, is at Plate 2. Both focussing and trepanning effects are scaleable and could be applied to larger analogues of VULCAN.
- A pressure resisting Underwater Stand-off Capsule gives the projectiles sufficient air-filled space in which to form and accelerate under water. A thin rubber sleeve provides waterproofing that was demonstrated in trials at Fort William by the Defence Scientific and Technical Laboratories, (the MOD-retained successor to the Defence Evaluation and Research Agency), to be effective to over 100m depth. As an illustration of the continuous development potential of VULCAN, this is currently undergoing improvement and simplification.

VULCAN – The Application by Design of Low Order Theory

The hypothesis put forward to support the case for VULCAN assumed that the best method of bringing about deflagration reliably is to attack with a low density, chemically reactive, pyrophoric, small diameter shaped charge jet projectile. Uniquely, the system uses a magnesium shaped charge liner. The low density of magnesium (1.74 g/cm^3 compared with [pyrophoric] zirconium at 6.5 g/cm^3 and [inert] copper at 8.95 g/cm^3), less than twice that of water, minimises the likelihood of shock-induced detonation. The hypothesis assumed that the explosive is ignited by the projectile impact, based on the particular suitability of magnesium: *viz*. its low melting point (650°C, compared to 1852°C for zirconium), which facilitates its ignition on firing and its moderate but adequate exothermicity on combustion (10 kcal/cm^3 compared with 18 kcal/cm^3 for zirconium) which is sufficient to ignite even highly aluminised, slow-burning insensitive explosive. Its high chemical reactivity is also a significant advantage: it might reasonably be assumed to react with the oxygen in the nitro groups in the explosive. Plate 3 shows an open shutter image of a magnesium projectile being fired in air, which illustrates clearly that the magnesium ignites. It is most surprising that the jet remains so highly collimated over 15m, whereas shaped charge jets, even those formed from ductile metals such as copper, tend to break up after a few charge diameters. In characterisation tests, a magnesium shaped charge jet fired at a 5mm mild steel plate made a hole ~12mm in diameter at a range of 2.4m, which equates to about 65 charge diameters. This compares with holes of 7-8mm for attack from 75mm or 2.5 charge diameters, highlighting extraordinary collimation. Flash x-ray characterization shows that the magnesium, which is very brittle, actually shatters into small particles on firing the charge, shown at Plate 4. It is presumed that any particles that move to the periphery of the jet will tend to decelerate and to burn up rapidly, leaving a continuously reducing, highly collimated jet. Very high-speed video confirms this clearly, showing

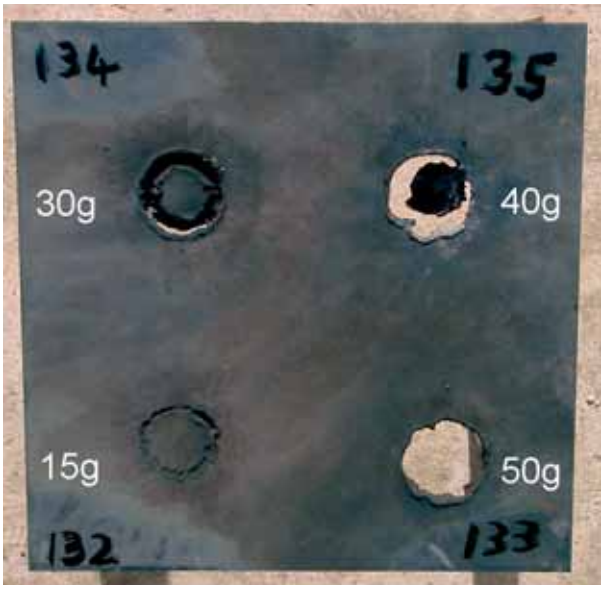


Plate 2 – Formation of trepanning cuts.

Plate 3 – Magnesium Jet fired in Air (Time lapse image).

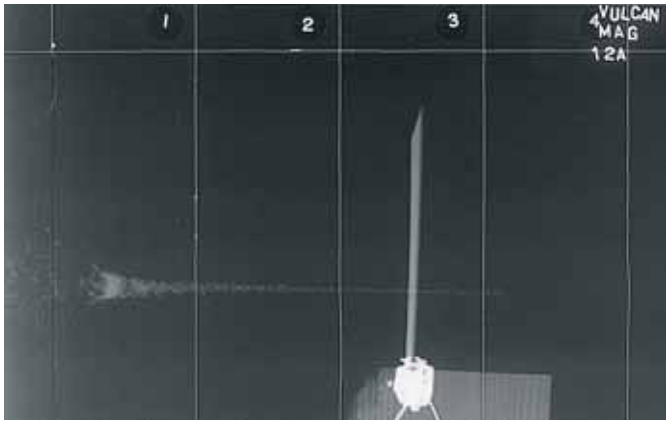


Plate 4 – Flash x-ray – formation of magnesium shaped charge jet

Plate 6 – Deflagration of 1000lb bomb – Pendine 2001

a large cloud of burning magnesium micro-particles surrounding the jet. Plate 5 shows this as the jet emerges from a stack of mild steel plates 37mm thick.

Most conventional explosives for bombs, typified by RDX/TNT-based compositions, are brittle. Not only does the reactive, burning jet punch a narrow hole several centimetres deep into the explosive but it also causes it to shatter locally. Thus, a large surface area of explosive will be ignited at once, causing a considerable, rapid pressure rise. The entry point and weakening of the case resulting from the sudden, intense increase in internal pressure around the burning area create a specific weak point and a weakened zone, through which the line of fracture should naturally pass. Explosive compositions modified with a considerable amount of wax, plasticiser and reinforcing filaments which do not shatter in the vicinity of the impact zone may ignite but burn over a limited surface area, with decomposition gases vented adequately through the relatively small entry hole. As the explosive continues to burn and the cavity becomes larger, the burning surface area grows steadily larger until venting becomes inadequate to prevent pressure rise. Once this commences, the rate of burning increases rapidly and the pressure reaches a level at which the case bursts. Overall, immediate bursting of large munitions is likely to occur when the explosive fill shatters: less friable explosives, such as those incorporating plasticisers and insensitive explosives do not shatter, so a delayed reaction may occur.

VULCAN – in Service and in Use

Although 'Small Jet', the evolutionary predecessor of VULCAN, had been in existence for some years prior to the Short Range Low Order project, the first firing of VULCAN was in October 2001 at Pendine Ranges in South Wales, as an adjunct to activity being undertaken by the RAF Airfield EOD Development Team. The available targets were two Marks of British 1000lb bombs: the Mk 10 containing a brittle and relatively insensitive explosive and the Mk 13 containing a highly plasticised, fibre-reinforced composition. Two Mk 10s were deflagrated successfully by VULCAN. The attack of two Mk 13s resulted in surprisingly consistent delay of some minutes before deflagration occurred. Both sets of tests provided exemplary corroboration of the developer's low order theory and understanding of the mechanism. Plate 6 shows one of the Mk 10 bombs, recovered after the tide had come in and receded, demonstrating a classic shear fracture along its length, running through the case entry hole and an area of bulging around where burning had taken place, evidenced by the presence of carbon deposits. The following month, a demonstration was provided on the range phase of Exercise *HIGH IMPACT*; 33 Engineer Regiment (EOD)'s annual Regimental exercise. This demonstrated the deflagration of 81mm mortar bombs, 105mm artillery shells and the ejection of the fuze from mortar bombs by firing water into the case. Note that this required two simultaneous shots: US 81mm mortars tend to require only one.

In early 2002, elements of 33 Engineer Regiment (EOD) deployed to Afghanistan. An urgent operational requirement was raised for a low order tool, which was furnished by a batch of 200 VULCAN. Perversely, the EOD staff advisor to the Permanent Joint Headquarters in Northwood conceded that the hardware could be furnished but prevented training being provided in theatre. A detailed pictorial user guide incorporating technical notes was produced hastily, jointly by the Author and the developer, to accompany the batch of tools. Although it was reasonably widely used, in some cases with considerable albeit expected

Plate 5 – High speed video of jet of burning magnesium emerging from a 37mm thick steel target

Plate 7 – UK 81mm Mortar Bomb: fuze ejected by firing water into the body.

success, performance reports from the field were generally not forthcoming. However, those who did use VULCAN successfully established a small caucus of users able to see first hand, and in due course proselytise the utility and effectiveness of the system. Concurrently, the developer gifted a number of systems to TFL Defence UK Ltd, a commercial mine clearance company conducting a reconnaissance in Afghanistan, whose performance report, their *quid pro quo*, was very favourable although it did demonstrate a lack of full understanding of the system and its applications. In addition to some very favourable data being gathered, the requirement for proper training and for continuous feedback from operations emerged as being key to success.

Ad hoc data gathering was carried out continuously over the next year in the UK and in the US, both on land and under water. By May 2003, VULCAN had been introduced into service and training was provided to the Defence Explosive Ordnance Disposal School instructors: a practice known as 'Train the Trainer'. This included a detailed presentation by the developer on theory, practice and applications and a day of practical use at Shoeburyness Ranges in Essex. Although targetry was limited to small munitions, a number of firings were carried out, including some experimental shots, which clearly illustrated the application of low order theory and the broad utility of VULCAN. These included the deflagration and disruption of artillery shells; anti tank mines; shaped charge [anti tank and anti-aircraft] warheads and the deflagration of rocket motors on small air-to-ground free-flight rockets. Collectively, these latter demonstrations suggested that it would be possible to attack simultaneously the warhead, motor and other components of rockets and missiles to give a low order render safe procedure for the whole system.

Perhaps the best example of innovative collaborative testing, evaluation and evidence gathering is the ongoing tripartite arrangement between the MOD and the developer and the developer and the Mines Advisory Group, a Non Governmental Organization that carries out some truly excellent work in a number of countries suffering a mine and unexpolded ordnance problem. Laos was very heavily bombed during the Vietnam War and in their area of operations in that country, the Mines Advisory Group has collated data on several hundred large bombs requiring to be rendered safe. They had suggested that low ordering in situ could be preferable to high ordering, as it minimizes collateral damage to infrastructure, enhances operational flexibility and reduces the impact of their operations on the local population. Coincidentally, it provides the locals with a source of quality scrap steel! This is a noteworthy point, as it is suspected that there is a reluctance to report the presence of unexploded ordnance because the locals prefer to attempt to salvage the steel for their own use by sawing open bomb cases and attempting to remove the explosive manually. The developer furnished the Mines Advisory Group with several hundred VULCAN *gratis* and in return, they undertook to report the results of each intervention in the format used by the Trials and Data Validation section, which maintains the 'ASH' EOD technical database (named for the doyen of EOD, Major Arthur Stanley Hogben QGM). The MOD then pay the developer the equivalent cost of the VULCANs he had furnished for each batch of fifty reports received. He is privy to these reports and was contracted to pass objective comment on the results and any technical interpretation therein. Some one hundred and fifty or so interventions have been undertaken to date. This has enabled bona fide operational data to feed the performance database in a recognized format, at the cost only of the tools used, representing a massive saving to the MOD in test and evaluation effort and cost. Video evidence taken in Laos confirms the benign nature of these low order interventions. Plate 8 is a still photograph extracted from a video of the deflagration of a 250lb bomb taken from 20m away. The diffuse fireball is estimated at ~4m in diameter, probably representing the consumption by burning of less than 5 per cent of the explosive fill. The camera was set up on the ground and triggered remotely: there was no evidence of ground shake.

Plate 8 – Fireball from deflagration of US 250lb bomb – filmed from 20m away!

Plate 9 – RN diver placing VULCAN against fuzed 1000lb bomb

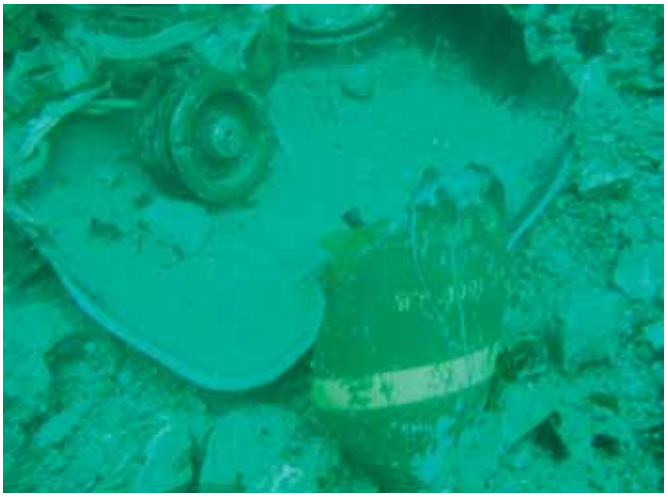


Plate 10 – Successful deflagration of Mk20 1000lb bomb under 20m of water.

The Fleet Diving Squadron supported a series of generic underwater utility tests conducted in 2002 by the Defence Scientific and Technical Laboratories. In 2003, they conducted some preliminary underwater deflagration tests at the Cape Wrath bombardment range, off the far north of Scotland. These were on two live Mk 20 1000lb bombs fitted with armed anti handling fuzes. An example of a charge being placed by a Royal Navy clearance diver against one of these bombs under 20m of water is at Plate 9. Both attacks resulted in a successful deflagration; the result of the intervention shown being set up is at Plate 10 (note the similarity to the result shown at Plate 6). Training and guidance was provided on site by the developer; the Author also attended these tests. It is planned to conduct further such activity in summer 2005.

During Operation *Telic 4* in Iraq, the Author attended two Joint Force EOD Troop range days. These aimed to provide instruction on the use of VULCAN to those who had not yet been trained at the Defence Explosive Ordnance Disposal School or within 33 Engineer Regiment (EOD) and to mentor and guide test and evaluation, with a view to developing approved Render Safe Procedures. This particular activity comprised a number of qualifying shots, to determine the most appropriate configuration and then a minimum of 10 successful interventions with no high order reactions to be reported. This was achieved with a number of the most commonly encountered unexploded ordnance, such as 82mm and 120mm mortar rounds. Other firings reaffirmed the system's utility against land service ammunition and shaped charge warheads, the most relevant being the RPG-7. The firings against the Chinese-made 107mm free-flight rocket were particularly pertinent, as these were being fired regularly at British military bases. These tests included attacks against the warheads, essentially the same as small calibre artillery rounds, and the rocket motors. This confirmed the practicability of low ordering both blind rocket warheads and fully constituted rocket systems using only 50g of explosive. See Plate 11. A successful

Plate 11

107mm rocket warhead and motor set up for attack.

After attack, showing remains of rocket motor case.

Plate 12 – SA-9 GASKIN after VULCAN attack.

low order was also carried out on a SA-9 GASKIN soviet-made anti-aircraft missile, attacking the warhead, rocket motor and guidance unit. See Plate 12. This was the first occasion on which a large, complete rocket or missile had been low ordered in this manner successfully. These two days' activity took low order techniques several steps forward, highlighting also the utility of training, properly conceived test and evaluation and proper, objective reporting.

Clouds around a Sterling Silver Lining

VULCAN is a broadly effective tool with considerable development potential across the spectrum of EOD applications and, in the case of larger analogues, more widely for battlefield explosive engineering. It was acquired as a commercial off-the-shelf product, requiring no MOD-funded research and development. It is supported fully by a broad range of operational evaluation data, much of it gathered at minimal cost. It was procured and introduced expending only 10-15 per cent of the funding provided for the original, un-defined project. Thus, its introduction might seem at first glance to have been an exemplar of the concept of 'Smart Acquisition', which aims to acquire capability, 'cheaper, faster, better'. Whilst VULCAN is supported by a developed theoretical understanding and incorporates novel and profoundly well considered design characteristics, it is at its simplest an empty plastic tube. That this project required considerable staff effort over two and a half years against considerable internal resistance to introduce it into service must be a concern.

Acknowledging that low ordering represents only a small fraction of current operational EOD activity it does, nonetheless, have a place and should, as a matter of policy, be practised more widely. The poor definition of the project originally was indicative of the temptation simply to stick with or upgrade tools already in the inventory, regardless of their utility and effectiveness, rather than to question received wisdom and to look more widely at doctrine and capability. A report prepared in 1996 by the office of the Principal Ammunition Technical Officer, Headquarters Land Command on the performance of the original variant of 'Small Jet' concluded that it had no applications for render safe procedures. This attitude was replicated by an unjustifiable degree of scepticism initially and, later, resistance from some elements of the EOD community to the introduction of VULCAN. Experienced EOD operators, more than capable of using the system but without a developed understanding of the underlying theory have conducted firings whose results are predictable with even a low level of understanding, reporting them as failures of the tool and even question its effectiveness and continued utility. Unhelpful at best, this demonstrates a craven lack of technical comprehension, particularly of the nature of the system, the strategy for its acquisition and of the continuous imperative to develop tools and techniques.

The deliberate prevention by the EOD staff officer advisor at the Permanent Joint Headquarters of training to be provided in Afghanistan and expression of the opinion that operations are not an appropriate environment in which to introduce new capabilities led to a loss of momentum and wasted opportunity. It is fortunate that such opinions did not characterise the allies' conduct of the first and second world wars! There was un-justifiable, widespread resistance from some quarters of the EOD staff to the proposal to set up the test and evaluation programme with Mines Advisory Group in Laos, which has proved to be a highly successful and mutually beneficial arrangement. To date, the Army School of Ammunition, unlike the Defence Explosive Ordnance Disposal School, has not yet hosted its 'Train the Trainer' package two years after the introduction of the system into service. So, although in service with the Royal Engineers and the Royal Navy and available to the Royal Air Force, which institutionally prefers other systems, VULCAN is not yet being used in service with the Royal Logistic Corps. There are experienced and well qualified Bomb Disposal Officers of all arms and services who have not yet been instructed on the use of the system, who continue to use less suitable tools and techniques, even where render safe procedures using VULCAN have been validated. Opportunities to develop techniques in a controlled and regulated manner on operations continue to go begging. Operational use may be more widespread than hitherto but reporting remains at best sporadic, meaning that formal approval of render safe procedures that have effectively been validated is delayed or does not happen.

Finally, there has been widespread reluctance and in some cases resistance from users to engage with the developer over matters of training, theoretical understanding, application, interpretation of results and continuous development. Some of this is based on a misunderstanding of what constitutes commercial propriety. There is a mistaken belief that it is somehow inappropriate to conduct such liaison: this is emphatically not the case. Some is based on the institutionalized unwillingness of service personnel to disclose information, regardless of its classification or otherwise and regardless of the benefits to be derived from doing so. Some is, regrettably, based on hubris and on antipathy. Overall, this has contributed to imposing delay; in restricting the growth and promulgation of knowledge and experience and in preventing more rapid continuous development.

Final Thoughts

The possibilities offered by VULCAN across the full range of EOD operations are considerable and the acquisition strategy allows for continuous development to realize this. The strength of the system lies with its modularity and development potential. VULCAN is, in effect, a multitude of tools in one and is itself one of several possible components of capability within a family of systems. Further components of capability and ancillaries can be developed according to need, as shortcomings in performance emerge. A very large analogue, having a 90mm charge diameter is presently being developed. KRAKATOA is a development of and maintenance replacement for an existing tool: it has potential applications for the attack of thick, hard and tough cased munitions as well as general battlefield explosive engineering. Preliminary test firings have recently been undertaken. A concept demonstrator is shown at Plate 13.

VULCAN provides, for the first time, a tool designed to bring about predictable low order events with minimum probability of causing detonation. It is simple and intuitive to use, although it is most effective given an understanding of the underlying technical theory, application of which enables it to be employed to best effect. Its possibilities were appreciated early on by a few individuals, some of whom have been played a crucial role in progressing the promulgation of understanding and in championing acceptance by elements of the EOD community. Other elements of this community, both in service units and on the staff, have been at best ambivalent and unhelpful through their resistance to its introduction. It is in stark contrast to this position that Alford Technologies (the developer) was granted the Queen's Award for Innovation 2004 for VULCAN.

Plate 13 – KRAKATOA concept demonstrator model.

As user familiarity and confidence in VULCAN grow with increased, properly reported use, it may be appropriate to bring low order render safe procedures more centrally into EOD tactical doctrine and tactics, techniques and procedures. It is extraordinary to think that tactical doctrine might be influenced by a plastic tube!

Memoirs

COLONEL A J I POYNDER MC

Born on 10 February 1920, died 28 November 2004, aged 84.

ANTHONY John Irvine Poynder, known as Tony, was born in Bangalore to a lively and very social Scottish mother and a world-class Irish polo player, Captain C T I Roark. Soon divorced, his mother remarried to a brave and distinguished officer of the 9th Gurkha Rifles, Freddie Poynder. From such an extended heritage came much of Tony's charming manner, his determination and his strength of mind. The Irish blood undoubtedly played a large part in his sense of, and love for adventure and also what made him such an attractive companion to so many. From 1933 he was educated at Wellington College (as a Poynder, although at that time he had not yet offically changed his name). He did well; academically by passing high into RMA Woolwich in 1938, in the sporting field where he was Captain of Boxing and by showing his leadership qualities in various senior positions in the management structure.

He was commissioned into the Corps in No 43 Batch on 3rd July 1939, his name being entered in The Gauge Book of the REHQ Mess on 31st August, four days before the declaration of war. Due to this, the Batch Course was reduced to two terms and after a short time in a Training Battalion, he was posted in April 1940 to Forges-les-Gaux in Normandy. There he joined a scratch unit, Perownes Rifles formed and commanded by Lt Col LECM Perowne, who later became the first Colonel of the Gurkha Engineers. The unit was formed as a four-company battalion with the combined sapper/infantry role of preparing bridges for demolition and building defence works along the River Bethune. Tony was 2IC of the Neufchatel-en-Braye company and somehow acquired a 2.5 litre Bugatti as his personal vehicle! One day he was driving to Perowne's HQ not knowing that his old school-mate and twin-by-birthday John Cowtan had constructed a formidable road block of sunken tree stumps on the approaches! The road block won, with Tony ending up in an apple tree with a branch through his lung. He was taken in a coma to the Base Hospital at Rouen and his language in the ambulance was apparently so fluent and remarkable, that the RAMC doctor reckoned he was worth saving! The doctors' skill and his own determination saw him through all this and he lived to fight the next part of his war with the 1st Army in North Africa, being wounded followed by repatriation.

Back in England he recuperated, spending part of the time teaching at Wellington College. He joined the Assault Engineers when they were first being formed in August 1943 and was appointed second-in-command of 81 Assault Squadron which landed on the beaches of Normandy on D-Day, 6th June 1944. They were amongst the first ashore and were very largely responsible for getting the other armour on that sector over the beaches and into the beachhead. Tony Poynder was largely responsible in turn for the detailed organization of his squadron for the operation which was so thorough and outstandingly successful, that he was Mentioned in Despatches.

As a result of the casualties sustained by their sister 82 Assault Squadron, he took over command of it, remaining at its head throughout the campaign; first as an AVRE squadron in Normandy and later as an LVT (Terrapin and Buffalo) Squadron in all the amphibious operations around the mouth of the Scheldt, including the landings at Breskens, South Beveland and Walcheren. They later reverted to AVREs for Operation *Veritable* in the crossing of the Rhine between Nijmegen and Xanten, when, it is believed, an AVRE of 82 Squadron was the first tank across the river in the pursuit through Bocholt and in the fighting in Bremen and Bremervoorde.

For his services, the CRE of 6 Armoured Engineer Regiment, Lt Col J K Shepheard, recommended Tony for a DSO, but this was downgraded to the Military Cross. Part of the citation reads: *"Throughout all these operations, Major Poynder showed a flair for leadership of the very highest order. His cool courage and determination to overcome all obstacles, and his cheerfulness and expert man-management, however dangerous and unpleasant the conditions, was outstanding. In all the operations in which his squadron took part, the landings on the islands of the Scheldt Estuary were widely held to be probably the most difficult, bloody and courageous operations of the campaign. Major Poynder was always well forward in his Command AVRE, Command Buffalo or leading Scout Car, inspiring his troops, immediately making wise decisions where things were sticky or not going according to plan, and taking the initiative and a lead, determined to overcome all obstacles and achieve the objec-*

tive. He was an inspiration to his men whose morale, largely as a result of his personal example and leadership, was outstandingly high".

No wonder his soldiers loved him and he loved them, making a particular point in post-war years of keeping the squadron together as much and as often as possible by reunions of one sort or another. It was only right and proper that he should have taken part in his tank in the London VE Day Parade.

After the war, Tony was fortunate enough to be able to take up his place at Cambridge which had been deferred in 1939, and after obtaining his degree, he resumed regimental duties. After Staff College, he was posted to the then Free Territory of Trieste where he developed his love of sailing by building his own boat and teaching his young family to sail. He was a very active member of the REYC for the rest of his life – some forty years. It must have given him great satisfaction that his final yacht, a French *Arpege*, was left by him in such good and capable hands. He continued his career and later commanded 9 Independent Airborne Squadron including the building of Pegasus Village on the banks of the Suez Canal at Ismailia. He was extremely proud of this unit and did much to foster continued comradeship between all ranks for many years. After that, he had a very important and busy tour as MA to General Sir Cameron Nicholson GCB KBE DSO MC, the Adjutant General and Master Gunner, St James's Park. This was followed by regimental duty again as CRE 4th Division and Chief Instructor of the Field Engineer School at the RSME, appropriately being housed in Upnor Castle.

He resigned at his own request in 1966 to join British Hovercraft on the Isle of Wight, travelling extensively to advertise their machines, and subsequently Westland Helicopters, their parent company. These jobs and his very active twenty-seven years in the Sappers made him a natural selection for various appointments in Sea Containers Ltd, culminating in a directorship in organizing and launching the Orient Express Train Service.

What with AVREs, Buffaloes, Terrapins, Parachutes, Hovercraft, Helicopters, Container Ships and Express Trains, there cannot be many to have had such an extraordinary knowledge of strange means of transport!

On his final retirement in 1986, he moved to Slindon in West Sussex, not far from where he could moor his *Arpege* in Chichester Harbour. He threw himself into village life with all the vim and vigour that had characterized his life and he was much respected. Retirement also provided more time to give encouragement to his grandchildren, great-grandchildren and their friends to be adventurous and get the very best out of life.

Tony was married to Ann Stancomb, whose husband David had been killed in Normandy. She had two sons so Tony, a stepson himself, became a step-father. Later on, they had two daughters making four in the family and Tony made sure he treated everyone the same! Ann predeceased him and after he was badly injured in a motor accident, he was looked after by Mrs "Hadders" Mackay, the widow of Major General Eric Mackay, the hero of Arnhem. He seemed to recover well from his injuries, but eventually suffered a relapse and died in Yeovil Hospital.

He will be well remembered as a fine family man, a fine friend and a fine Sapper.

CS FWJC REW MW

COLONEL J E WELLER MC

Born 24 June 1918, died 7 January 2005, aged 86.

JOHN Eric Weller, known universally and probably inevitably as "Sam", was born in Selston, Nottinghamshire to the Rev Richard and Mrs Jessie Weller. He entered Winchester House School at Brackley in 1927 where he became a School Prefect and also played cricket and rugger for the School in the 1st XI and 1st XV respectively. He won a scholarship to Haileybury College and entered Melvill House in September 1932 where he kept up with his cricket and rugger, playing for the College second teams.

He entered The Shop at Woolwich in 1936 where he learned to ride and was commissioned with No 39 Batch on 27 January 1938 and batched into the Corps on 10 February 1938. He then went to Jesus College, Cambridge, but his time at university was cut short by the war and in November 1939 he was posted to Haifa. He travelled via Cherbourg to Marseilles where he embarked on the Bibby Line troopship *HMT Devonshire* for Alexandria, where he joined 12 Field Company which was employed in building camps for cavalry units. He took the opportunity to travel whilst he could and managed to visit both Cairo and Jersualem.

In June 1940 the company was moved to Egypt where Sam received his captaincy and the post of second-in-command. The unit was part of Wavell's Libyan campaign, and for his part in capturing thousands of Italians, Sam was Mentioned-in-Despatches. In the summer of 1941, the company moved first to Syria and then to Tobruk via Alexandria. From September to December, they were besieged in Tobruk with Sam as its OC in the temporary rank of major, reverting to captain when the town was relieved. The company then moved to the Canal Zone and Baalbeck in Syria, Sam himself embarking on a French ship in Suez in March 1942 and sailing for England via South Africa.

He was an instructor in Fieldworks and Demolitions at the SME Ripon for a year before being promoted to major and moving to HQ EinC at the War Office and becoming involved with the design of equipment to defeat anti-tank mines. He did this for nine months until he was appointed officer commanding 210 Field Company. The company landed in Normandy in June 1944 and built bridges across rivers and canals during the advance. They entered Brussels in September and were later involved with the rescue of paratroops at Arnhem and in the battles in the Ardennes. On 24th March 1945 together with the 11th and 209th Field Companies, they built a bridge over the Rhine at Rees for which Sam was awarded the Military Cross. Part of the citation read: *The whole time work was in progress, Major Weller, whose unit was in the most exposed position, remained on the open bank directing the task. Wherever danger appeared greatest he was to be found encouraging his men and showing disregard for his personal safety. His calm leadership undoubtedly saved casualties, and his courageous example was reflected in the determination of his troops.*

After the surrender, Sam had various jobs ranging from building 30 Corps HQ at Nienburg, OC 4th Field Squadron and the RE Instructor at the School of Infantry, Sennelager. During this time, he revived his riding skills learned at The Shop and took up show jumping on ex-German Army horses. After a spell at the Staff College, Camberley, he returned to Germany with HQ BAOR at Bad Oeynhausen and HQ 5 Infantry Brigade at Iserlöhn. In 1955 he was appointed Chief Instructor of 4 Training Regiment at Aldershot followed by another *pot pourri* of jobs; Intelligence at the War Office, DCRE Northern Ireland, CO of 121 Army Engineer Regiment at Shepherds Bush and Staff Officer with the Military Secretary's Branch at Stanmore.

In the summer of 1963 he returned to HQ BAOR once more as Colonel E, but this time at Rheindahlen. Whilst in that post, he organized the Army Ski Championships at St Moritz for three years running. In the summer of 1966 he was appointed Chief Engineer Scotland. During his tenure, he was responsible for many MACC (Military Aid to the Civil Community) tasks; a bridge in Glencoe, airstrips at Unst and Skye to name but two, and roads to isolated places. The Skye airfield was interesting as it was actually on the mainland because the two major Clans on the island could not agree a location, north or south of the island! He returned to the Ministry of Defence in 1969 and retired from the Army in April 1970.

He then worked for the Thames Conservancy as Licensing Officer and later for the Devon Rivers Authority, retiring in 1981. He bought a house near Exeter where he kept a horse and played golf. He had always been a keen fisherman and remained so to the end. He became very involved in local affairs such as the church, the British Legion and the local gymkhana.

He is survived by his wife Barbara whom he married in 1951, and their two children, Susan and Richard.

HGWH EAH MC WAPC WEMM

BRIGADIER D J N GENET DL

Born 18 January 1926, died 24 January 2005, aged 79.

BRIGADIER David Genet had remarkably close connections with the Corps in many different ways. Both his father, Brigadier H T Genet MC, a Canadian who had been granted a commission on the British Army by virtue of passing out top from Kingston, and his father-in-law, Brigadier Colin Browning CBE MC, were also sapper brigadiers. Almost thirty of his thirty-five years' service were with the Corps, twelve of them in engineer units in widely different parts of the world, four as RSME instructor, and the remainder in key sapper staff and command appointments. His unparalleled knowledge and understanding of the Corps were invaluable in the work he undertook on retirement on behalf of the Sappers.

David Genet was born in Delhi and educated at Wellington College. He went up to Trinity Hall for the Cambridge University six-month short course in 1943, whence he went through the gruelling war-time primary, sapper and officer cadet training programmes at Colchester, and Clitheroe (1 Training Regiment) and Newark Officer Cadet Training Unit. From this he emerged as a second lieutenant destined for the Bengal Sappers and Miners. He was particularly pleased to be posted to 1 Field Company, which his father had commanded before the war, and to follow in his footsteps to the North West Frontier.

Returning to England in 1947 he was an Assistant Instructor in the Officer Cadet Squadron at Ripon for three years where one of his students was Fred Beringer, a past Corps Secretary. Fred remembers that the Chief Instructor was Lieutenant Colonel Mark Henniker, an eccentric in the best sense of the word, who once appeared in front of the YOs in a cavalry twill uniform with splendid riding breeches. He offered the students the name of his tailor but afterwards, in a great feat of diplomacy, David Genet explained that whilst the CI's offer was well intended, the YOs would be well advised to stick to Hawkes' the Corps Tailor! David was a very keen rugby player and whilst at Ripon was in the team that won a famous victory over The Duke of Wellington's Regiment in the Army Cup. He then moved on to Hameln as Adjutant of 26 Field Engineer Regiment and later as Second-in-Command of 7 Field Squadron. While at Chatham he had been observed to be spending ". . . an inordinate amount of time at Pasley House" where he was wise enough to secure the hand of the Commandant's daughter, Mary. They were married during his tour in Germany, the start of an extraordinarily happy fifty-two years of married life.

From Germany David went out to Korea as an SO3 RE in 1st Commonwealth Division in the post-war period and, after a spell as Second-in-Command of 12 Field Squadron returned to the United Kingdom as Adjutant of 53 Welsh Divisional Engineers at Swansea. Thence, after Staff College and a War Office staff job, he returned to Germany on promotion, this time to Osnabrück as Brigade Major of 11 Engineer Group. In 1960 he was posted to Hong Kong to take over 54 Independent Field Squadron. He thrived on the independence of that job, enjoyed with pride supporting 48 Gurkha Infantry Brigade and rose to the occasion of the extraordinary variety of the work, much of it resulting from the massive influx of illegal immigrants and other emergencies such a the devastation caused by Typhoon *Wanda*.

From that hugely satisfying period, David had to convert the Squadron into a field park and deploy to the Singapore Base; this was not to his liking as a field soldier . . .

Out of the blue, at the end of 1962, the Brunei Rebellion enlivened the situation and the Squadron deployed widely with a composite troop in North Borneo, field troop in Brunei and the park element in support of 17th Gurkha Infantry Division in Sarawak. There was even a detachment in Cambodia.

David was back in his element. He was very energetic and vigorous in support of the infantry and the RAF. The Squadron responded to perform an excellent job. Typical of the man: when the airfield at Kota Belud opened after a heavy monsoon period with the runway still under water in parts, David trusted the judgement of the Troop Commander on the spot. The first Beverley duly arrived, lumbering out of low cloud with the vanguard of the first infantry battalion. Out of that aircraft stepped not only infantry but the OC himself! Also typical of his forethought, out of the second aircraft, and following the infantry, stepped a very bewildered Pakistani *char wallah* – a very welcome person to bring some "comforts" to soldiers who had been deprived of NAAFI-type facilities for three months. Such was the man. Smart, quick, dedicated to soldiering in the field, steeped in the finest tradition of the Indian Army and so proud and thoughtful.

David and his family returned to England in 1963, first to the Joint Services Staff College followed by a posting to the Ministry of Defence, then back to Chatham where he was

Senior Instructor Bridging for three years.

In 1967 he was appointed to form up and command 37 Engineer Regiment at Longmoor where he once again met up with Fred Beringer as his second in command. There from the outset, David established the exacting standards to be followed. He made certain that all aspects of regimental life were rapidly established. Key posts were filled, new stores were built, messes were set up and sports teams formed together with a myriad of other activities. He was the inspiration and encouraging force. His tour was not an easy one. As the junior regiment of 12 Engineer Brigade, the Regiment was never made up to the full strength in squadrons, and he was required to train and dispatch one of those as a permanent garrison field squadron in Northern Ireland. He made light of such problems and quickly established 37 as a cheerful, effective and hard working sapper regiment and many remember their time at Longmoor as being very happy and rewarding, due entirely to the efforts of David and Mary.

Two more jobs in the Ministry of Defence followed: GSO1 at HQ EinC and Colonel (GS) in the Directorate of Operational Requirements. Then, in 1976, he went to Brighton as Officer in Charge of Royal Engineer Manning and Records and in 1979 to his last appointment as Commander Engineer Support Group at Barton Stacey.

Throughout his career David Genet took a close interest in Corps affairs. He filled a number of appointments with the RE Association culminating in Vice Chairman of the Benevolent Fund. He had been a member of the Council of the Institution and continued to support it throughout his life. An active sportsman he enjoyed rugger and hockey at regimental level, had been a keen saddle club member in Hameln, and was a member of the Corps tennis team in 1963. He was President of Corps Association Football in the last two years of his service.

On retirement from the Army David took up the duties of Schools Liaison Officer (RO1), London District until he and Mary decided to settle in Devon and move to Budleigh Salterton, his father-in-law's home town, in 1983. They were never long without a dog and the last of their four black labradors, Subedar (who died shortly before David himself), gave him great pleasure during this period, accompanying him in many of the activities in which he became immersed. David was Chairman of Devon Army Benevolent Fund from 1985 to 1993 and organized a highly successful Appeal Year in 1989. He was much involved in the Devon County Show and became Chief Steward of Showground Features. He was appointed Deputy Lieutenant of the County in 1991.

Several years ago David was diagnosed with the cancer that eventually ended his life. He never complained about it, although it necessarily curtailed his activities, and his concerns remained for others. It is this trait and his warm and generous nature by which he will be remembered by so many of his friends and colleagues.

His wife, Mary, survives him along with their two daughters and four grandchildren.

GLC CPC WMM RCP GWAN MET EGW JABC FB

MAJOR I C B DICKINSON MC TD

Born 3 June 1916, died 29 March 2005, aged 88.

IVAN Charles Barron Dickinson was born in South Africa whilst his father, an orange farmer from Pietermaritzburg, was *en-route* from the Somme to Ypres whilst serving with the 17th Transvaal Siege Battery of the South African Heavy Artillery. Ivan was educated at Michaelhouse, Natal, leaving in 1933. He commenced his engineering studies at Loughborough in 1936, returning briefly to South Africa on an assisted passage in the summer of 1939 to visit his parents. He left South Africa again on 2 September 1939 to come to England to volunteer his services, but his call-up was deferred so he could complete his course at Loughborough. He was trained at No 2 Training Battalion at Newark and subsequently served in Works Units prior to being commissioned in 1942. His first command was a platoon of 77 Chemical Warfare Company, later reorganized as 77 Assault Squadron, and Ivan, being a lieutenant, became second officer of 3 Troop, the troops being commanded by captains. His troop consisted of six AVREs, and at H-Hour on D-Day, they landed in Normandy with responsibility for clearing obstacles on Queen White Sector of Sword Beach at Lion-sur-Mer. During the work, Ivan was severely wounded by the remnants of a phosphorous tracer shell, but refused to hand over direction of the task.

For his actions he was awarded the Military Cross, the citation for which reads: *"This officer landed at H hr on 6 June 1944 and was responsible for the urgent clearance from a zone of the beach of anti-craft and anti-tank obstacles. He was severely wounded in the shoulder during this work yet refused to hand over direction of his task until its back was broken and movement on the beach made reasonably safe. At this stage he collapsed, yet the men under his command, inspired by his fine example of leadership, continued their task to its completion"*. His troop leader, Captain W Carruthers MC described his wounding in "The RE Battlefield Tour – Normandy to the Seine"; "It was reported to me that Lt Dickinson was wounded. I found him lying by an AVRE looking very sick with a nasty wound in his shoulder. He had gone out on a Sherman removing *Tellermines* from obstacles when he had been hit. He had to be brought ashore by his hair, held by the Sherman commander. However a mouthful of 'White Horse' and a sling worked wonders and he carried on".

He was hospitalised in England, enduring many skin grafts on his back, but was able to rejoin 77 Squadron, by now equipped for the Scheldt Estuary and the Rhine Crossing with Buffalo Landing Vehicles (Tracked), in time for the Elbe Crossing. He was slightly wounded again, but recovered and served with 100 Field Squadron, Royal Monmouthshire Royal Engineers until demobilization in early 1947.

He initially settled in Glasgow, but moved to Tyneside in the summer of 1949 where he remained for the rest of his life. He worked as a Chartered Civil Engineer in the North-East on many of the major reservoir and shipyard construction projects in the 1950s and early 1960s. He also found time to join 50 Division Engineers TA, where he took command of 505 Field Squadron.

Ivan's determination had showed itself earlier in the war. Whilst on a bridging course at Goole, the students were allowed out to the pubs, but to get to them, had to row across the River Ouse. One day, the boat had been left on the wrong side. Not to be outdone, Ivan stripped off all his clothes, swam across and rowed the boat back. He then redressed and rowed it back across to the pub! He was also renowned for his thirst for knowledge and was especially enthusiastic about "Hobart's Funnies".

He will also be remembered by all 105 TA Regiment officers for his forthright comments during TEWTS, his love of South Africa and his respect for his Corps. His last CO graded him "a jolly good Royal Engineer!"

Ivan was also a real family man and was devastated by the death of his wife Joie whom he had married in November 1944. He is survived by his four sons, Peter, Bruce, Clifford and Angus and his daughter Katherine, who is an Associcate Professor at the University of Otago, Dunedin, New Zealand.

PD REW AKJ

MAJOR E A HADOW

Born 7 November 1917, died 11 April 2005, aged 87.

EDWARD Arthur Hadow, "Teddy", as he was always known, was born in County Wicklow. His mother was Irish and his father was in the army and frequently abroad. Teddy was educated at Repton and on leaving, went to the Royal Military Academy at Woolwich. He also attended a degree course in engineering at Clare College Cambridge, but this was cut short by the outbreak of war in 1939.

He was batched into the Corps on 10th February 1938 and saw active service throughout WW2. His travels took him first to Palestine with 56 Field Company at Sarafan, then into Jordan at Irbid and on to Kirkuk in Iraq where he was stationed at Oil Pumping Station K1. Teddy travelled extensively in the region, through Syria and Lebanon to Haifa, Jerusalem, Cairo and Alexandria. He was then posted to the desert to join the Eighth Army at Tobruk to prepare for the battle of El Alamein, bing appointed second-in-command of the 3rd (Cheshire) Field Squadron around Tripoli and Tunis.

Teddy told many amusing anecdotes of his life in the Sappers, a favourite being that when he first arrived in Palestine at the beginning of the war he was asked whether he had brought his dinner jacket He was puzzled by the question but duly sent a telegram home, "Arrived safely, please send dinner jacket." . It was packed up and arrived before Christmas. He related with amusement that he never used it but carried it around with him for the rest of the war, wearing it only once as a joke. However, he kept it and used it in civilian life for the rest of his days!

1943 saw Teddy being posted to the Special Operations Executive. He joined the Hungarian Section where he was involved in subversive explosives, parachuting on missions into northern Yugoslavia. Towards the end of the war SOE posted him to Australia where he helped with preparations for the invasion of Japan. Their surrender curtailed that operation for which he was grateful.

At the end of the war Teddy transferred to Survey and in 1950 volunteered to take the place of an officer who had just announced his engagement to be married and could therefore not go to join the team demarcating the boundary with Ethiopia. It was serendipitous that Teddy met his future wife within two days of arrival and was married six months later! The work on the Boundary Commission was at first undertaken purely with hand labour but Teddy introduced bulldozers which speeded up the job considerably. On his return to the UK in 1953 he had a series of postings in England until he retired from the army in 1959.

Motoring and cars were his great passion. He was not a desk job man and he spent the next ten years working for Kompass Register and then for the Ministry of Transport, both jobs involving much driving around the South West, sometimes in his well maintained Alvis. He retired in 1968, throwing himself into community life in Chudleigh, Devon. He was Churchwarden there for seventeen years as well as Treasurer of the local Church, British Legion and Community Project for many years. He travelled extensively, maintaining close contact with his army friends from the Sappers and hosting several anniversary dinners at his home for 39 Young Officer Batch.

Above all, Teddy was a great enthusiast. He was the most unpretentious of men and wonderfully hospitable. His porridge and home-made mulberry wine were legendary! His interests and hobbies ranged from clock-mending, silversmithing, bell-ringing and gardening, to doing the Times crossword (and latterly Su Doku). He lived 87 well filled years, active to the end.

He married Lettice Wigram in 1951 and is survived by her, their five children, Rosemary, Juliet, Celia, John and Robert, and ten grandchildren.

RMH

COLONEL E D SMEEDEN DL

Born 16 October 1919, died 26 April 2005, aged 85.

EDWARD Douglas ("Ted") Smeeden was born in Shanghai where his father was serving in the Diplomatic Corps. After training as a mechanical draughtsman he enlisted in April 1940 joining 289 Field Park Company. He was posted to 140 OCTU in August 1943, commissioned in March 1944 and moved to France with No 4 Engineer (Base) Workshops in July 1944. Following a short period with 505 Field Company he returned to the United Kingdom in July 1945. His next posting was to India where he was attached to the Bengal Sappers and Miners. Returning to England the following year he was soon overseas again joining 7 Field Company in Greece (where he was badly injured in a road accident), in December 1946. In March 1949 he was posted to 17 Field Squadron in Tripoli. He had his first experience of the Territorial Army when he became adjutant of 101 Field Engineer Regiment TA (at that time the engineer component of 56th (London) Armoured Division) in August 1950. His arrival at Regimental Headquarters, located in the Duke of York's Headquarters Chelsea was, it has been said, noted by the debutantes of Kensington and Chelsea, as were his three sisters, by the bachelor officers of the Regiment!

In December 1952, he was posted to 36 Engineer Regiment in Ripon. It was there that he met and later married his first wife Joan Hood. A period with Works Service Eastern Command followed from March 1955 to December 1956. Promoted major in March 1955 he became SO2 RE HQ Malaya Command on the 4th of December 1956. For his services there he was awarded the Kedah Distinguished Service Star. Eighteen months with 1 Training Regiment from January 1960 to August 1962 was followed by a posting to the Strategic Reserve Movement Control Squadron RE in August 1962.

In November 1963 he was promoted to Lieutenant Colonel and selected to command the Royal Monmouthshire Royal Engineers (Militia) (the senior regiment of the Territorial Army) then, as now, based in Monmouth. With the previous Commanding Officer having been forced to resign and morale low there was considerable apprehension when he and Joan swept up to Regimental Headquarters in Great Castle House Monmouth in Ted's trade mark Mercedes, accompanied by their large alsatian Max. This apprehension was only increased when after his initial briefing he said that he had some urgent and private telephone calls to make. It was with some relief that his staff later learned that he had been calling his bookmaker!

He quickly settled in and gained the trust of his new Regiment, waging an unofficial and personal campaign at significant personal expense to raise the profile of the Regiment and to gain support for it locally. Typical of him was the support and help that he provided for a civilian employee of the Regiment, the holder of a First World War Military Medal recently widowed, homeless and about to retire for whom he went to great lengths to find a home in a new alms house.

Shortly thereafter he faced his greatest challenge as Commanding Officer when it was proposed that the four Territorial Army engineer regiments in Wales and the Midlands should be reduced to a single regiment with its headquarters and a field squadron in Smethwick, a field squadron in Cardiff and a third in Swansea. With the senior regiment in the Reserve Army about to vanish, robust action was required. By September the Chief Royal Engineer (General Sir Frank Simpson) and the Engineer in Chief (Major General J H Bowring) had been convinced, morale in the unit remained high and the Regiment headed the recruiting figures in Western Command. It only remained to convince the then General Officer Commanding 53rd Welsh Division, Major General Douglas Darling, that the Royal Monmouthshire Royal Engineers (Militia) should survive. Arranging an interview with him the day before the reorganisation was due to be announced, Ted put forward the arguments. He concluded by making it clear that he hoped that when the General met the Duke of Beaufort at a dinner to be held in Great Castle House (the Regiment's Headquarters in Monmouth) later that month to commemorate the 500th anniversary of the battle of Agincourt, he would be in a position to tell him that his old regiment (it had been commanded by the 5th and 6th Dukes of Beaufort from 1771 to 1835), had been saved.

As a result when the plan was made public with the publication of a White Paper in December 1965 the allocation of engineer units to Western Command had been altered to a regiment consisting of a headquarters in Monmouth and three squadrons in Birmingham, Newport and Swansea respectively. Further battles had to be fought however before it was finally confirmed that the regiment would keep its title and remain in Monmouth. Ted handed over command on the 31st of March 1967, the day before the Territorial Army

became the Territorial and Army Volunteer Reserve. He was due to be posted to New Zealand as the Comptroller to the newly appointed Governor General, Sir Arthur Porritt. However whilst serving at Monmouth he and Joan had purchased Dadnor Court, a commercial orchard close to Ross-on-Wye and Ted considered that being 12,000 miles away for three years would not be conducive to the effective management of such an enterprise. A year as GSO1 on Exercise *Unison* followed before he took early retirement from the Army on the 30th November 1967.

From his arrival in Monmouth he and Joan became very much involved in local activities. Great Castle House was opened to the town and to the local community and they entertained widely. Typical of their kindness was their allowing the then adjutant to remain in Little Castle House which was, traditionally occupied by the Commanding Officer. Ted had a great interest in horses, thought to stem from his grandfather, an emigrant to England from Prussia, who ran a fleet of hansom cabs. This interest, combined with his knowledge of racing and natural enthusiasm led to his involvement with racing at Chepstow where he served as a Steward, was a director of Chepstow Racecourse plc and hardly missed a day's racing until he retired in 1990. In 2003 he was appointed a Life Vice-President. His background enabled him to make a valuable contribution to the realignment of the racecourse and as a steward he was unfailingly helpful to both owners and trainers. He was also involved in both the Chepstow and the Monmouth Horse Trials only retiring from his position with them as starter when he was eighty. He and Joan regenerated the Monmouthshire Reel Club of which they both remained keen supporters, Ted being Patron of the club up to his death.

Ted was also divisional secretary of SSAFA and vice president of its local branch where he had a reputation for looking after people and for using, (strictly against the rules), his own resources to help them. Sadly his gold badge for twenty five years service to SSAFA arrived too late to be presented to him. He helped reform the Monmouthshire branch of the Royal Engineers Association of which as President he was an active member and supporter. Indeed he was on parade with them on Remembrance Sunday only last year. He was appointed a Deputy Lieutenant of Gwent in 1976.

His connections with the Royal Monmouthshire Royal Engineers (Militia) were renewed when he was appointed its Honorary Colonel in succession to Colonel Patrick Clay on the first of April 1972. It was during his tenure and through his efforts that HRH the Duke of Gloucester became the Royal Honorary Colonel of the Regiment. Ted retired as Honorary Colonel in 1987 after fifteen years in the post. During this time he helped in the relocation of the Regimental Museum. He also subsequently contributed to the publication in 1996 of a new history of the regiment *"Militiamen and Sappers"* by Dr Graham Watson.

Ted was a man of great kindness, enthusiastic and loyal to those both senior and junior to him. He was generous but never ostentatiously so. Financially astute he could occasionally be led astray. There was the day that he went to visit his tailor in Cardiff to buy a new suit. Explaining to the salesman that he had just bought a house near Ross seemed to lead to his returning with a fisherman's jacket and an expensive salmon rod! Had he ever fished it might have been understandable!

He and Joan, who died in June 2001, had no children. He married Judy Whitham in December 2002. This brought him a new family which gave him great joy. Sadly he did not live very long to enjoy them. An impeccably dressed, handsome man, calm and good humoured he always had a twinkle in his eye. He will be sadly missed by all those who had the pleasure of knowing him.

AFG

MAJOR A H BECKETT MBE

Born 4 March 1914, died 19 June 2005, aged 91.

ALLAN Harry Beckett was probably the last of the engineers involved in the Mulberry harbour project – the construction of transportable harbours to support the D day invasion in June 1944.

Allan was born in East Ham and educated locally, later serving an apprenticeship with Sanders and Forster, the steelwork and structural engineers. From an early age he showed ability as a mechanical engineer, making working miniature steam and petrol engines. His father however advised him that civil engineering offered better prospects, and he studied this at London University. He was also from boyhood an adventurous yachtsman. These enthusiasms were later to come together in the Mulberry harbour project.

In the summer of 1942 plans were being made for the invasion of France, but it was clear that all existing ports in northern France were very heavily fortified. A port would be necessary to ensure a continuous supply of both men and materials in the immediate aftermath of D-Day and to ensure that the Allied troops were equipped to withstand the inevitable counter-attack. Artificial harbours had been the subject of suggestions, but no details had been worked out. The Normandy beaches are very flat and deep draft ships cannot approach close to the shore.

At this time Beckett was commissioned into the Royal Engineers, working for Lieutenant Colonel W T Everall, a noted bridging specialist. Everall showed him a rough sketch marked *"Top Secret"* of a proposed roadway raised on stilts to bring vehicles ashore. Beckett said it seemed unnecessarily complicated and was promptly asked to suggest something better. Over a weekend he produced a tinplate model of a floating roadway consisting of a flexible bridging system carried on anchored floats. Full construction drawings were produced within a week.

A prototype was built and tested at Cairn Head in Scotland, along with several competing designs. A severe storm left the Beckett floating roadway intact but wrecked the others, thus making it easy for the Chiefs of Staff to select the best.

Ten miles of roadway were built for use in the Mulberry harbours, and Beckett designed much of the ancillary equipment, including the restraining "Kite" anchors, since no existing type had sufficient holding power. The entire Mulberry project was completed in the greatest secrecy. The enemy had no idea that it was even possible to support an invasion with an artificial harbour: indeed this was one of those projects that like the Trojan horse depends totally on surprise and can only be carried out once in the history of warfare.

On D-Day +1, 7 June 1944, all the elements of the harbours were towed to the Normandy beaches for assembly. Beckett crossed the channel in an American launch, accompanying a length of floating roadway hauled by a tug, and supervised the assembly of the roadway sections in the British Mulberry. By D-Day+5, the harbours were operational and tanks were coming ashore in quick succession. Years later he would describe the excitement he felt in watching 40-ton tanks roll along the floating roadway and onto land to join the battle to liberate Europe. A storm on 19 June 1944 destroyed much of the American Mulberry, but the British harbour, although damaged, was able to continue functioning. Some of the credit for this must lie with Beckett who personally supervised the roadway assembly in the British harbour. The Mulberry harbour was for a while the busiest harbour in the world, and continued to be operational until the capture of Antwerp in October 1944.

The Dutch island of Walcheren controlled the approaches to Antwerp and had been flooded by the RAF bombing the dykes to drive out the enemy forces. Beckett was sent by the War Office to assist the Dutch engineers. He supervised the repairs by the novel means of floating surplus Mulberry units into the holes and sinking them there.

His service in the Corps was latterly in the capacity of Deputy Assistant Director (Transportation) at the War Office, for which he was awarded the MBE. Apart from what has been described above, he was responsible for the design and supervision on site of emergency lock gates, ship conversion and in Holland, railway bridge construction. Some of the techniques he developed for repairing the Walcheren Dykes are still being used to the present day.

After the war Beckett joined the London firm of Sir Bruce White, Wolf Barry and Partners and established an international reputation as an expert in port and harbour design. Always looking for the new or unusual answer to a design problem, he was often called in to rescue projects that had run into seemingly insuperable difficulties. He enjoyed encouraging young engineers and was incapable of any kind of pretentiousness.

Allan Beckett has also been the author and joint-author of several technical papers for the Institution of Civil Engineers and other bodies, notably *'The Thames Barrier – the critical design issues for the relief from flooding of London"*, for The Royal Society.

In 1949 he was awarded £3000 for the invention of the Kite anchor which he invested in a house of his own design. In this year he also married Ida James, who provided unfailing support and encouragement. They had three children, Michael, Timothy and Sian. He continued to be a keen yachtsman, and marked the arrival of normal retirement age by designing and having built a new yacht made of copper-nickel alloy – one of a very few boats in the world made of this material. In truth however he never really believed in retirement, or in becoming old. He remained active professionally and physically until well into his eighties, always at heart the bright young engineer who could be relied on to produce a creative answer to a difficult problem.

TB

MAJOR M G WHITE RCT (late RE)

Born 30 September 1930, died 4 December 2004, aged 74.

MARTIN Gilbert White was born in Ryde on the Isle of Wight. He attended Brightlands Preparatory School and, from September 1944 until April 1948, Wellington College. Berkshire. Then, instead of as might have been expected in view of his family's Dartmouth connections joining the Royal Navy, he elected to sit the Civil Service Entrance Exam and attend a War Office Selection Board for competitive entry to the Royal Military Academy, Sandhurst; at that time recently reopened after the War. He passed and was admitted as an Officer Cadet in January 1949. He was commissioned into the Corps of Royal Engineers on 22nd July 1950. He remained a Sapper until restructuring of the Army in 1965 saw him transferred, in the rank of Major to the then newly created Royal Corps of Transport.

The winter of 1951/52 saw Martin on active service in Korea; first coming under fire in the Hook area whilst attached for orientation purposes to 55 Field Squadron. His service in that country was to make a lasting impression on him. He became a staunch supporter of the Korean Veterans Association and on the occasion of the 50th anniversary of the end of the war, he and his wife Barbara attended ceremonies in Korea as guests of the South Korean Government.

Sapper units in which he served included the Hong Kong Squadron RE, as an instructor in 1 Training Regiment, Malvern and in BAOR with 29 Field Squadron. Then, perhaps a turning point in his career, he studied all aspects of Railway and Port Construction, Repair and Operating on the Long Transportation Course. This was followed by a tour with the Middle East Port Organization and active service again, this time in South Arabia.

After transfer to the Royal Corps of Transport, he served with 32 Regiment RCT in Singapore; being responsible there for the very complex programme of School Bus movements; daily picking-up and returning from school the children of all three services and MOD Civilians. But Martin was a soldier who sought a much more active form of service life He attended a colloquial Arabic language course to add to his Parachute qualification, his earlier attendance on a Diving Course at HMS Vernon and his possession of a Heavy Goods Vehicle driving licence. In 1969 he volunteered and served for a year with the Abu Dhabi Defence Force, training them in anti terrorist operations.

From 1971 Martin served for six years as the Transport Officer in Chief's Staff Officer responsible for introducing to his new Corps the then unknown 'Black Science' of Information Technology. He studied at Southampton University, gaining an MSc in Transport Management and was elected a Member of the Institute of Management and of the Chartered Institute of Transport.

Martin's concluding years of army service before retirement were four years in command of 17 RSME Transport Squadron which had also re-badged from RE to RCT. He was a good choice for that post, maintaining the men's morale by cheekily discovering that officers who had transferred between Corps could continue to wear their old insignia until it was worn out and needed to be replaced. With the connivance of friendly storemen, Martin ensured his Sapper accoutrements far outlived his service. A highlight of that tour was, for him, the occasion when he and his squadron were on parade when the Royal Engineers received the Freedom of the City of Rochester. In his last years he served as transport adviser to the Motor Vehicle Experimental Establishment, Christchurch.

On retirement from the Army, Martin's railway training helped land the Civil Service post of Rai1way Staff Officer at the Logistic Executive Headquarters in Andover. A year later he was promoted to the Grade of Principal, and made Superintendent of the Army Railway Organisation, which soon after became responsible for railway matters of concern in all the MOD's many rail-served depots and establishments.

Martin had many interests outside of his work. He had a deep knowledge of the history and characteristics of almost every bus that had ever been made, and was a competent yachtsman and RYA Coastal Skipper. When no longer able to change sails and climb the mast be volunteered his services to the Race Committees, organising Regimental, Service and Royal Ocean Racing Club events. For a while he was owner of an ex-WW2 4-ton 4x4 Carrier truck in which he acted as Quartermaster/Head Chef to the Solent Area Military Vehicle Trust when he attended commemorative events in Normandy and elsewhere. His version of All-in-Stew, well laced with good red-wine, became legendary.

Sadly, in 1990, Martin suffered a stroke requiring him to retire on medical grounds. Most would think that to be a time to put one's feet up and sit by the fireside, but not he! Martin purchased a Personal Computer which he used as a word processor; enabling him to keep in touch with all his old

interests. He continued to attend reunion dinner events in his wheelchair, especially those with his Royal Engineer (Transportation) comrades

Perhaps his greatest memorial opportunity came in May 1994, when the D-Day Commemorations were being planned. Some years earlier he and a colleague had bought a 0-4-0, Andrew Barclay diesel locomotive as scrap, rather than see it broken up. Research revealed that the locomotive and a twin, had been considered small and versatile enough to be taken to Normandy by LCT and landed on Juno Beach. They worked as the first locomotives to haul stores from railheads adjacent to the beaches to Depots then being established, and thence over the French railway system as lines became liberated and operable. With the help of friends, the French SNCL and financial help from railway manufacturers and others, Loco WD 4, (its original army description), was displayed on Southsea Common; moved to France and for three weeks operated over a section of' preserved line in connection with the D-Day anniversary commemorations. On return to England Martin presented it to the Royal Engineers Museum at Chatham where it is presently on display to the public. None of that would have been achieved without his perseverance and dogged determination to overcome the countless obstacles placed in his path by authority. He was also a great supporter of The Friends of the RE Museum and was instrumental in retrieving the "Orton" Distinguished Conduct Medal group from Canada.

Martin, who was loved and respected as Husband, Father, Stepfather, Grandfather and friend, is survived by his wife Barbara

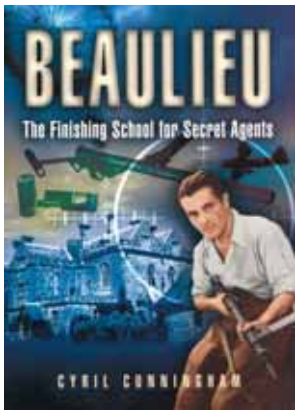
BW LC

Memoir in Brief

Major Harold William Duff, always known as Harry, died peacefully on 30 April 2005. He was born at Devonport on 9 January 1928 and commenced his military service as an Apprentice Tradesman (Fitter) at The Army Technical School, Beachley. During WW2 he was captured and spent nearly four years as a prisoner-of-war in Greece. His postings included 12 Field Company at the old Gibraltar Barracks, Aldershot, OIC Workshops at Deverill Barracks, Ripon and M Company of the Depot Battalion RE at Kitchener Barracks, Chatham. Whilst at Chatham, he was MQMS of the Training Workshop of the E&M School located in the Ravelin Building (now the RE Museum and RHQ RE). He also served in East Africa, the Canal Zone and BAOR. In December 1946, he married an ATS girl, Molly, who with their daughter Sandra survives him. With his passing, the Corps has lost another of the few pre-war mechanists.

Reviews

BEAULIEU
The Finishing School for Secret Agents
BY CYRIL CUNNINGHAM



Published by
Pen and Sword Books Ltd,
47 Church Street, Barnsley
South Yorkshire.
S70 2AS.
Price £12.99.
ISBN 1-84415-312-6

UNTIL I read this book, although I admit I had not thought very deeply about the subject, I imagined that secret agents were something to do with Bletchley Park. After all, everyone knows that that is where they broke the *Enigma* and *Lorenz* codes and it is always being mentioned in books, films and television dramas and documentaries. If you think of Beaulieu at all, it is for the Abbey or the National Motor Museum and would never dream that in the dark days of the war, even darker events were happening there. Indeed the Montagu family, whose home was in the middle of the complex, were completely unaware of what was going on around them. Lord Montagu commissioned the book for this very reason – he wanted to know more. *Journal* book reviews are normally done by someone who knows the subject in order that constructive criticism (or praise) can be given in order that readers may determine if they would like to obtain the book to learn more. In this case, the author is probably the only one who did know anything because secrecy reigned supreme and to establish the facts, he had to go to many different sources – lots of people knew a bit, but very few knew the overall picture.

During the war, over 3000 men and women of fifteen European nationalities plus some Canadians and Americans were trained in a complex of twelve country houses in the Beaulieu area at "The Finishing School" for operatives of The Special Operations Executive. The students underwent a variety of courses; Sabotage, Survival, Security, Resistance to Interrogation and Living off the Land to mention a few. These titles will be familiar to all soldiers, not necessarily just those parachute or commando trained, but the syllabii of the Beaulieu courses bore very little similarity to Army courses bearing the same names. Indeed, we are told that in some cases the training was fundamentally incompatible with what military students especially, had been taught previously to the point that once qualified and in the field, it was up to individuals to reconcile the two areas and strike their own balance. If you think back to your own training in these subjects and realize that the Beaulieu curriculum included burglary, forgery, sabotage, slander, blackmail and murder, you begin to see why that was.

You may be wondering by now who taught these subjects. There was a safebreaker on the staff, but by and large the instructors were mostly ex-intelligence officers from the First World War. Some were to achieve fame or notoriety later in life such as Captain H Amies (later Sir Hardy Amies the couturier) and Mr H A "Kim" Philby. The latter's espionage activities on behalf of the Soviets were then unknown, but we are told he was a "memorably effective instructor" and anyway, at the time the Soviet Union was our ally and as keen on the destruction of Nazism as we were.

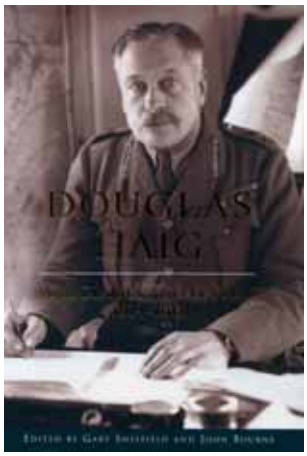
Why then was there a need for such a school? Despite what had been learned between 1914 and 1918, Britain, almost alone amongst the European nations, did not acknowledge that Intelligence was actually a profession and provided a suitable career for service officers – indeed in the Army, this attitude led to the disbandment of the Intelligence Corps in 1929. By 1938, only a few officers were working in the Intelligence Department at the War Office and nobody had been earmarked for the Field Intelligence Officer appointments that were on the establishment of all military headquarters. In 1939 of course, everything suddenly changed. Major (later Field Marshal Sir) Gerald Templer reformed the Intelligence Corps and by the time the BEF departed for France, all the Field Intelligence appointments were filled.

The military were thus catered for, but their officers were needed on the field of battle. What about behind the lines? Despite what is written above, the SIS (Secret Intelligence Service) had existed all along although no one would ever admit this. By 1939 it was almost ineffective. It did train spies and ran course in sabotage and like subjects but was against, indeed hostile to the concept of an Special Operations section. They felt those recruited would be no more than enthusiastic amateurs who would be bound to be caught by the Nazis and forced to talk. As a result, the SOE was born in July 1940. It was based on Section D of the SIS and some of the staff of the section was transferred to the SOE since the work they had been doing was what the new organisation required. One of those transferred was Guy Burgess, of the post-war Burgess and Maclean (and Philby) espionage scandal

Cyril Cunnigham's book covers just about everything to do with the school, its organization, personalities and trainees. It also covers what the Germans knew, both about Beaulieu (quite a lot as it happens) and countering the effects of an organization like the SOE (a great deal). On this latter point, although the capture, torture and deaths of many agents has been highlighted over the years, it ought to be remembered that well over 60 per cent of the agents deployed worked very successfully and came home to their families at the end of the war. This book is an excellent tribute to the staff and students and their exploits. If it is not the type of publication that would normally find a place on your bookshelf, in this case I would urge you to think again.

JEB

DOUGLAS HAIG
War Diaries and Letters 1914-18
EDITED BY GARY SHEFFIELD AND JOHN BOURNE



Published by
Wiedenfeld and Nicholson,
Orion Publishing Group,
5 Upper St Martin's Lane,
London. WC2H 9EA.
Price £25.00.
ISBN 0-297-84702-3

WHEN a book consists of a collection of diary entries and letters, the reader has to be wary and ask him or herself questions. Were the entries which appear in it selected to suppress (or even highlight), controversy? Are all the selected entries complete or have they been edited to once again suppress or highlight particular facts or stories? Are the editors sufficiently qualified to make such selections on our behalf and will their comments ensure that by the end of the book, we have all the facts?

On the latter point, both Dr Sheffield and Dr Bourne are more than qualified. The eminent historian Sir Michael Howard has described Dr Sheffield as the "acknowledged expert on the First World War" and Professor Peter Simkins, Senior Historian of the Imperial War Museum has said Dr Bourne "has an unrivalled knowledge of the British generals of the First World War".

It is a well-known fact that Haig's Diaries have caused controversy in the past. Not so much because of what they say or do not say, but because there are two versions. The first was his contemporary handwritten diary, done day by day as events unfolded. The second was still his own work in that he had it typed after the war but he included extra papers, letters (to his wife amongst others), and memoranda and also made some corrections although not, we are told, any major deletions. Some people have seen the typewritten account as an attempt by Haig to rewrite history, but if this was so, why keep the handwritten version? Both still exist in one location and can thus be compared and therein lies the reason for this book.

The editors have chosen to base their work on the contemporary handwritten account so the reader knows what Haig was thinking at the time he recorded the events. Where there are differences, the authors have included them in the text or in footnotes. Some of the changes are obviously meant to clarify a matter whilst others are more obscure and not so easily explained. I offer two examples from the entry for the 8th August 1918. This was the Battle of Amiens, held by many to be the BEF's greatest victory of the war and described by Ludendorff as the "black day of the German Army". The handwritten diary says *". . . everywhere else, the situation had developed more favourably for us than we had dared even to hope!"* The typed transcript has it as *" . . . everywhere else, the situation had developed more favourably for us than I, optimist though I am, had dared even to hope!"*

Later on that day, he visited the headquarters of the First French Army at Contay and its GOC, General Marie Eugene Debeney. Haig records (in manuscript) that *"Debeney was pleased with himself, even though 3 battalions of Colonial Infantry had bolted before a machine-gun"*. In the transcript Haig has added that Debeney was *"much distressed"* about this occurrence. Do these amendments matter? My feeling is that they do not and I think that anyone who has seriously tried to keep a diary would agree. My wife and I did keep one for a year, I cannot now remember why, but we did our notes religiously every day and when the time came to write it up properly, we found a need to express things better and comparing the two, it changed nothing.

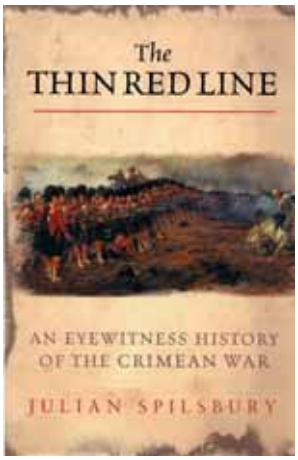
Haig was the Commander-in-Chief for the final three years of the war, but the diaries start in July 1914 when he was GOC Aldershot and GOC (designate) of I Corps. The reader thus gets a feel for his thinking and decision making processes long before he assumed the top appointment. The entries deal with, as you would expect, the key battles of the war, especially The Somme, Passchendaele and the offensives of 1918. They also illustrate his dealings with the politicians especially the two wartime Prime Ministers, Asquith and Lloyd-George. He records that the former had *"a stupendous capacity for alcohol"* and that he had *"no great opininon of L.G. as a man or leader"*. He did however have a supporter in the King and they shared a mutual trust. Haigh also shows that he was always ready to adopt new technology and appreciated the value of the 'airoplane' (sic), and later the tank, for which he always used a capital 'T' to highlight its importance.

Whilst reading the book, I had just got to Haig's entry for 6th December 1916 and on the same day had read in the papers about the campaign to obtain pardons for those 300+ soldiers "shot at dawn" Haigh had just confirmed the court martial sentence of death on an infantry officer charged with desertion – the first such case since he had become CinC – and he records *"Such a crime is more serious in the case of an officer than of a man, and also it is highly important that all ranks should realize that the law is the same for an officer as a private"*.

The common opinion of Haig is that he was the "chief donkey" of the herd of donkeys who led the lions and until I read this book, I also inclined to this view. The diary entries give a unique overview over the whole situation day-by-day and the CinC was the best placed man to see things as they were. In my view, the editors have made a fine job of presenting the facts so the reader can make up his own mind. It is a hefty tome at 550 pages but if you are seriously interested in the events in France and Flanders from 1914 – 1918, then it is required reading.

JEB

THE THIN RED LINE
An Eyewitness History of the Crimean War
JULIAN SPILSBURY



Published by Weidenfeld & Nicolson, Orion House, 5 Upper St Martin's Lane, London. WC2H 9EA. 340 pages, illustrated, 5 maps. Price £20.00. ISBN 0 297 84626 6

THE Crimean War continues to fascinate authors and here is yet another book in much the same style as that reviewed in last August's issue of the *Journal*: Alastair Massie's *The National Army Museum Book of The Crimean War*. This account, The *Thin Red Line*, is also built up round the letters and journals of the participants. The main part of the book is taken up with the stories of the three great battles of the Alma, Balaklava and Inkerman. It is the second of these that always seems to enthral with the extraordinary defiance of the 93rd Highlanders (from which the book takes its title) standing in contrast to the tragic heroics of "the Charge". Although Balaklava receives the fullest treatment, the astonishing performance of the British infantry at the other two battles is also well brought out, as are the lamentable lack of logistic back-up and the resultant stoical sufferings of the wounded. All is told with panache and the flowing narrative style that might be expected of a professional author with two novels to his name and a portfolio of writing for radio and television. There is plenty of hyperbole: "Thus began the greatest artillery battle the world had ever seen" – at Borodino, forty years earlier, both sides had had ten times the number of guns. Clichés are frequent: "defeat from the jaws of victory", "the butcher's bill", "the new reinforcements certainly cut a dash". But overall, this is a vivid and clear account of what was a painful and harrowing experience for all the participants.

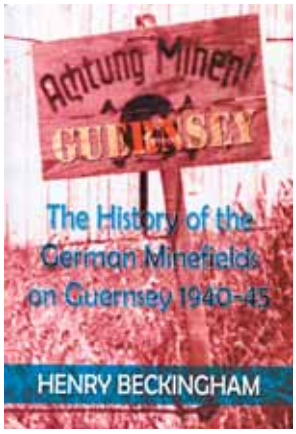
The siege itself is treated more as a background scenario than as the central focus of the war in the Crimea that it was. The engineer work is scarcely mentioned; the maps do not shown the progress of the siege or the position of the trenches in relation to the other features of the battlefield. The only sapper quoted is the unfortunate Major George Ranken, killed in a demolition accident after the shooting war was over, whose modestly-told experiences of the final assault on the Redan are well-worth attention. Sir John Burgoyne is mentioned once, albeit incorrectly referred to as the army's "Chief Engineer".

The wider issues of the war are sketched-in rather than elaborated. The naval operations in the Baltic, possibly one of the most significant factors deciding the Russians against trying to continue the war, earn only a single paragraph. The Kars campaign is not mentioned at all.

So this is not a book for those who seek a comprehensive account of the 1854-57 war against Russia, nor does it set out to be. It is a thoroughly enjoyable, clearly written narrative of the more dramatic events of the war in the Crimea that conveying a colourful picture of the British Army at a seminal stage of its development engaged in living through and fighting a difficult war.

GWAN

ACHTUNG MINEN! GUERNSEY
The History of the German Minefields on Guernsey 1940-45
BY HENRY BECKINGHAM TD



Published by
Woodfield Publishing,
Babsham Lane,
Bognor Regis,
West Sussex. PO21 5EL.
Price £10.00.
ISBN 1-903953-87-1.

HENRY Beckingham's first book, *Living With Danger*, was reviewed in the December 1998 *RE Journal* and covered his experiences as a bomb disposal officer in the Blitz and also his post-war work in the Guernsey minefields. This second book deals entirely with Guernsey and commences with the German invasion on 1st July 1940 and covers the laying of the minefields, their removal and the continuing task of clearance. It is a remarkable story and as Colonel "Archie" Archer GC OBE ERD writes in his foreword, Henry Beckingham must have either kept a very detailed diary, or has a prodigious memory, so detailed is the account.

During the occupation, on Hitler's personal instructions, all the Channel Islands were strongly fortified in order to repel the attacks by Allied forces which were anticipated. These measures involved the laying of thousands of mines and other explosive devices on the beaches to deter a seaborne invasion, and on open ground to deter airborne troops or gliders. On Guernsey, the work was carried out by No 1 Pioneer Battalion of the 319th Infantry Division. Captain Beckingham has received a lot of help in the form of documents and photographs from the son of Albin Ballauf who served in the Battalion from 1941 to 1946, which has served to make the account more personal and readable.

In the event of course, there was no invasion, the Government having concluded the islands' strategic value did not merit the bloodshed that would be involved. When liberation finally came in 1945, special units of the Royal Engineers were drafted in and with them was young Lieutenant Henry Beckingham and his unit, No 24 Bomb Disposal Platoon RE. They set to work to clear the thousands of obstacles having as a work force the young German soldiers of No 1 Pioneer Battalion (by now of course, prisoners-of-war). The work was completed with a minimal loss of life, which is a credit to the men, both British and German. At its peak, the workforce, apart from the 45 men of the platoon, numbered 1,780 prisoners-of-war and 300 civilians.

The whole tale is a very important part of Corps history and we should be indebted to people such as Captain Beckingham for keeping the records, researching the facts and then laying them out so clearly for posterity. All sappers, not just those of an EOD persuasion, will find this book readable and interesting and although crammed with information, is slim enough to find a place on any bookshelf.

JEB

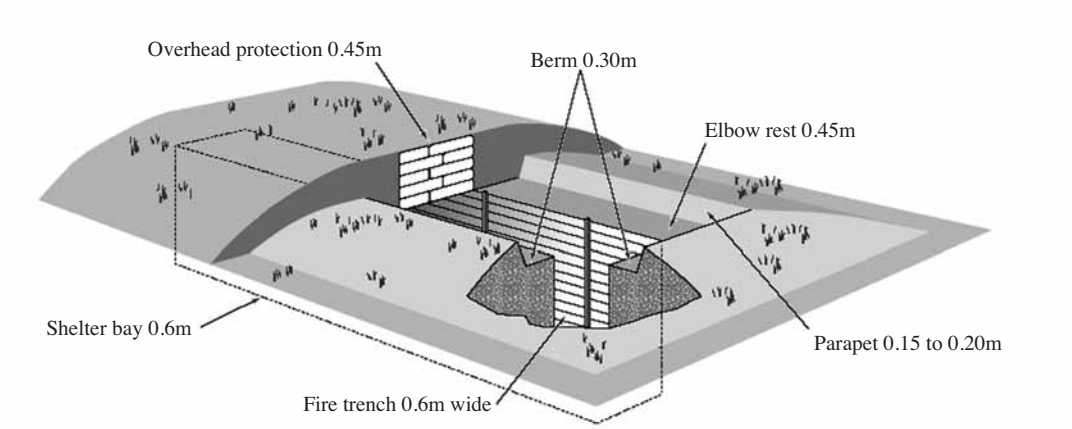
Correspondence

FRAGGING, LUCK, ABBREVIATIONS AND ACRONYMS

From Lieutenant Colonel M W Whitchurch MBE

Sir, – Major Matthew Walton-Knights' (W-K) laudable suggestion of using dry walls[1] to defeat mortar fire does not displace the essential need for suitable overhead protection[2] (OHP). Ask anyone who has taken casualties owing to poor or no fortification. A half decent opponent will use mortar ammunition fusing that allows burst on contact (bad enough), airburst and sub-surface burst (disaster if not tackled correctly) thus OHP and other methods are essential. Major W-K considered the effects of 82 and 50 mm but don't forget 120 mm bombs and 107 mm rockets. Determined insurgents will acquire these weapons sooner or later (Interpol will confirm if not convinced). Alternatively veterans of Ireland will recall the effect of home made mortars fired by the Irish Republican Army in South Armagh[3]. Therefore a shelter trench with OHP (as shown below) must be beside each tent in case of emergency. Older readers will recall Southwood Camp and the air raid shelters that were beside each accommodation spider - this is the same idea. Readers should watch for the British syndrome of "temporary" fortifications (that have little value) whereas more effort leads to proper works that are tough enough to meet the threat[4]. Other solutions include different sorts of bunker with essential OHP, that are partly or entirely below the surface. **As a general rule try to get below surface adding OHP.**

But then perhaps we need not bother and rely on being lucky . . . another thought that struck me from the article is the question of how to promote interest in fortification. It is rarely popular and attracts polite interest at best. ***Readers are invited to offer their ideas - Editor***.



Tried and tested-Dug for Victory and takes hours to build.

Good use of ground can use thousands of tons of local soil by (*viz*: well sited-reverse slopes, dug in, and or with, berms[5]). Suitably bunkered accommodation is wise and saves lives and limbs[6]. Hesco may be more expensive but what price our soldiers lives? It might take longer than dry walls but as the saying goes **sweat saves blood, and brains saves sweat and blood.**

---

[1] See April 2005 Edition *One Way of Staying Fragmentation Free*. Pages 39-42.

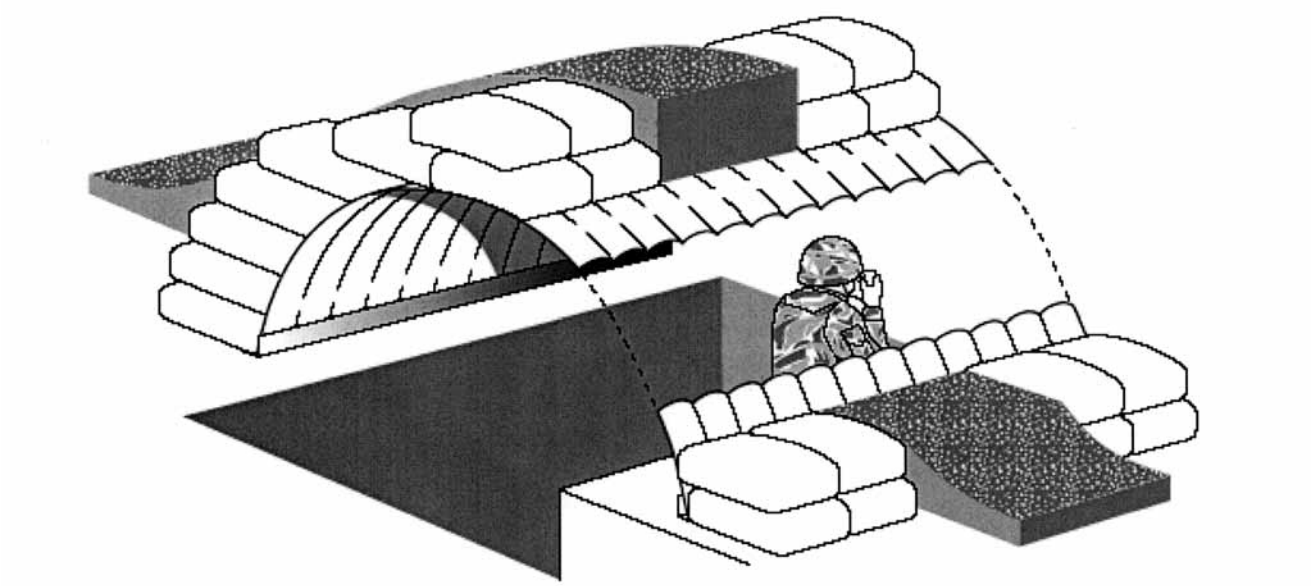
[2] *Overhead protection (OHP)*. A roof of substantial thickness, usually over earthworks, designed to provide ballistic protection . . . Taken from Military Engineering Vol 2 Pamphlet 2-*Field Fortification*.

[3] Consider our experience in Ireland to prove the point. The mortaring of Forkhill, Crossmaglen and Armagh city in 1978 are good examples.

[4] Compare the British and German approaches on the Somme in 1916-18. Germans well sited (especially reverse slopes) built for serious attack and very comfortable. The British? Forward defence gone mad, poor siting, vulnerable to flooding and very uncomfortable.

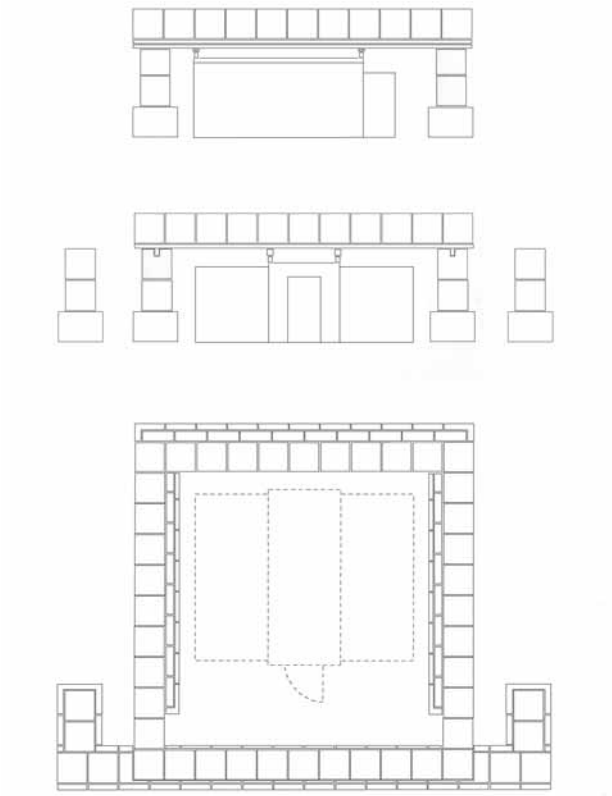
[5] Local soil or sand bulldozed into huge mounds. HQ 1 Armoured Division did this in 1991 with success in the desert.

[6] One of the best articles on fortification appeared in British Army Review Number 66 in December 1980 entitled *Don't just stand there. Do Something!"* by Lt Col RD Garnett MBE RE. Obtainable from the Tactical Doctrine Retrieval Cell. Want to read it? Then call David Porter on 01980 61 5046 or E Mail eotdrc.dgdd@gtnet.gov.uk



Even better - OHP added to the working bit.

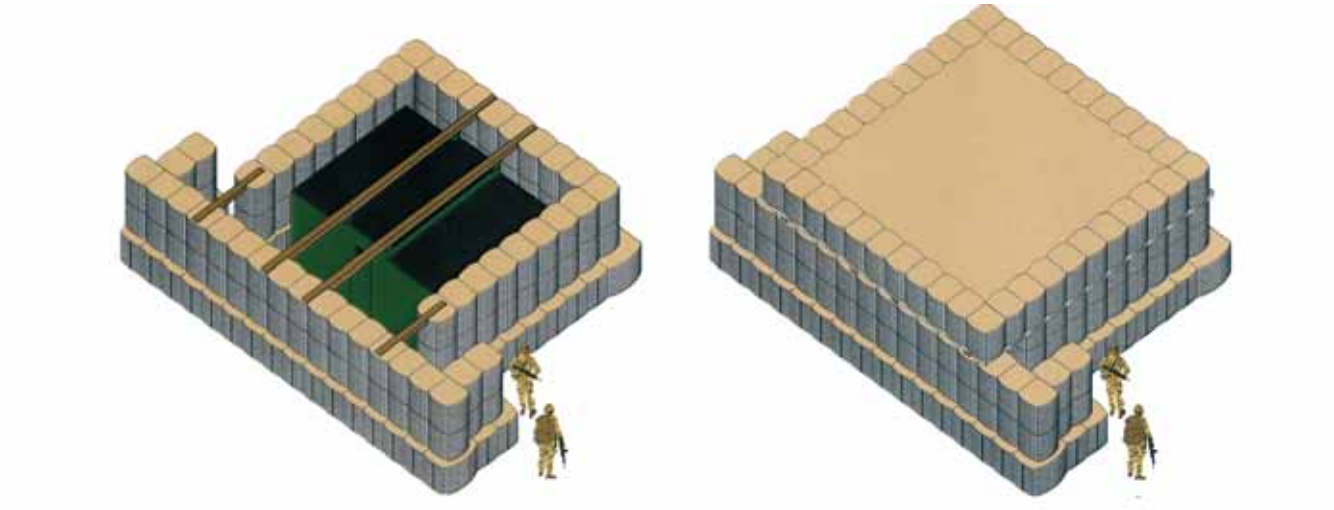
Extended OHP – can withstand all mortars, 155 shells and 120mm rockets with super quick fuse.



The Overhead Protection System covers a footprint of approx 11m x 11m, with an internal space of 8m x 8m. The walls are built from 1.5m x 1m 10m long MIL 4 units on the base, with 2 layers of 1 x 1 x 10m MIL 3 units on top.

The roof structure consists of a specially manufactured locating cup supporting two 11m long roof beams. These beams have a minimum yield strength of 170N/mm^2. Two 3m roof beams with the same grade of steel are used to bridge the access point. 11m long steel sheet piles (made of the same grade of steel as the roof beams), are used to form the base of the overhead cover.

A parapet is then formed using MIL 3 units. finally the internal roof cavity is filled with soil until it is level with the top of the MIL 3 units.



Can be several cabins under one roof.

In summary the dry wall is one solution but watch out for the opposition who may not conform to the pink and attack with something different. Sub-surface fortification is the best answer. Major W-K and his Squadron have served us well by raising the idea and article.

Finally on a separate note, acronyms and the abbreviations practice (AAP) have gone mad in many professions including ours. Therefore I suggest that all AAP is introduced (as above) with suitable footnotes[7]. It works. To not do so is NBG. For that reason please adopt into our *Journal*.

Your Obedient Sapper

Sticky
matthewwhitchurch@hotmail.com

PS Good luck with your AAP.

[7] Because this does not tire the reader as the foot note is on the same page and retains interest.

IN DEFENCE OF POINTY-HEADS AND FORCE PROTECTION POLICY

From Lieutenant Colonel N J Sealy-Thompson

Sir, – Having had a pre-publication sight of Sticky Whitchurch's letter *(Fragging, Luck, Abbreviations and Acronyms)*, I felt obliged to write in defence of Major Matthew Walton-Knight's article in the April issue of the *Journal*.

Matthew and his Squadron applied the age-old Sapper principle of improvisation in the absence of a technical solution. During Op *Telic 4*, British (and Coalition) forces in Iraq were faced with a significant spike in insurgent activity. This had not been anticipated or planned for in the aftermath of the warfighting phase of the operation, and as a consequence, protection from direct or indirect fire was not a major factor in the design and construction of field accommodation.

5 Field Squadron therefore, had to find a rapid and effective solution to protecting a large number of tented camps, where access was restricted and with only limited Sapper resources. The high-density concrete block wall, capable of being constructed by non-specialist manpower, was the solution.

In his letter Sticky expounds the need for overhead protection. While adequate side and overhead protection to defeat the full spectrum of enemy weapon systems is clearly the ideal solution, it is unlikely to be the most practical in modern expeditionary operations. Much work was done throughout 2004 to identify an engineering solution to the threat in Iraq, and a design for a fully protected and deployable accommodation model, (CITADEL), was produced. However, an in-theatre operational analysis in early 2005 indicated that more casualties would be sustained in the process of constructing the accommodation (primarily due to attacks on the numerous convoys moving stores), than were likely to be saved in the event of a direct hit on the camp.

The good news is that much effort and interest has been applied to the issue over the last year or so. Despite Sticky's belief that "It is rarely popular and attracts polite interest at best", I can assure him that the example above attracted considerable interest up to ministerial level. In the past month alone I have been present at two well attended, high level, international conferences that addressed the issue; one sponsored by EinC(A). Some excellent work has been done by Major Laurence Quinn, the SO2 Force Protection Engineering in HQ EinC(A), including his contribution to the Joint Warfare Publication 3-64.1 (Force Protection Engineering) which is due for publication shortly. This highlights the requirement for risk management by commanders, based on informed analysis. Force protection policy must take account of a wide series of potentially conflicting issues – force posture, political resolve, morale, force degradation and host nation perspective, to name but a few. The current policy is a systematic approach to integrated survivability where physical protection of structures is but one element. The difficulty currently lies with educating all arms commanders that surrounding everything with HESCO and concrete is not the panacea to their force protection problems; but we are getting there. Finally, I would suggest that while Sticky's recommendation that "…a shelter trench with overhead protection must be beside each tent in case of emergency" may still be an act of war, it is impractical for the several thousand troops located in Shaibah Logistic Base, during the post-conflict period we now face in Iraq; not to mention flooding, sidewall collapse, creepy crawlies and the danger posed to vehicles! Yours sincerely – N J Sealy-Thompson.

Editorial Note: *An unusual situation has arisen in that Lt Col Whitchurch's letter was seen and replied to by Lt Col Sealy-Thompson prior to publication. In return, Lt Col Whitchurch saw the reply and was moved to comment. We have decided to publish everything in accordance with our remit of promoting debate. This however is not the end of the story. What do readers who served in World War 2 and Korea think? What of our American friends who served in Vietnam and elsewhere? Serving Warrant Officers from the Falklands to Iraq, what is your experience? Your views will be very welcome for the December edition.*

Lieutenant Colonel Whitchurch comments.

Research in Janes Infantry Weapons (27th edition-2002 page 462) reveals that the 82 mm Iraqi *"Al-Jaleel"* mortar has a range of up to 4,900 metres and can fire up to 25 rounds in one minute. It was in Iraqi service before 2003 and is the sort of weapon that could be available. The area covered (or beaten zone) is not given but taking the characteristics of our 81 mm mortar (See Video tape C1706-The 81 mm mortar-characteristics and organisation) I judge it would be a 60-metre radius and lethal up to 40 metres, therefore consider how an insurgent would see it:

"I could drive up in my car, bring the mortar into action, fire 25 rounds in one minute from nearly 5 kilometres away and by the time the 25 rounds are on the ground I will have packed up and gone. Given the target area is so big I do not need to adjust my fire – I <u>will</u> hit something. These 82 mm rounds will go off on contact with the tents (see page 40 of REJ Apr 05 edition) *giving me an airburst effect. Thus the block walls will offer them little protection but increases my chance of killing more infidels."*

Imagine this one mortar fired against Shaibah Logistic Base. Col Garnett claims that the protection factor against indirect fire in the open is one: prone gives a factor of 40 and dug in with OHP it is 200. Shelter trench? Yes please. Consider: why not build a modified shelter trench inside the tent with revetment – rather like a cellar. Think on it.

I smile at the expression "post conflict". Looking at the casualties and daily attacks it seems to me that we are still mid- conflict (ending in 2012?) against a very determined opponent. Matthew W-K's laudable idea is better than nowt, but do not underestimate what a well-used 82 mm can do if you are unlucky…...

QUARTERMASTER – PIRATE OR PRINCE

From Captain (retd) J F Mapstone

Sir, – I was interested to read that all seven Quartermasters in Iraq were grizzled over forties, as I was appointed QM of 65 CRE (Works) in 1947, at the age of 21 years and 11 months.

Following a two year E&M course as an Engineering Cadet, six months apprenticeship in a water undertaking, followed by Officer Cadet Training Unit at Newark and a Young Officer Works course at the School of Military Engineering, I was posted to the Middle East, where I expected to be involved in water supply in that arid area.

On arrival at 65 CRE (Works), in south Palestine, the Commanding Officer informed me that the unit had been without a Quartermaster for many months, and I was to occupy the post until a career Quartermaster arrived. This was in April 1947, and I was still in post when the unit was placed in suspended animation – in other words closed down, in March 1948. I was given a further Quartermaster appointment as OC 1295 Stores and Workshops. The Corps did not recognise me as a PQE until becoming an E&MO in 57 CRE (Works) in the Emergency Reserves in 1961.

I was never treated as a Prince, although senior officers were almost invariably nice to me, and I was never accused of piracy, probably being too green to know how to start! I was told that my predecessor at 65 CRE had become a guest of the Corps of Royal Military Police with a lot of explaining to do. On my second day as OC 1295, I was ordered to arrest the previous OC, but he was out of reach in Maganah controlled territory as were the whole of the barbed wire and picket stocks of both 65 and 62 CRE. Later on, my successor at 1295 was court martialled!

Life as a Quartermaster could be dangerous – I survived one murder attempt, which killed an unfortunate artillery officer, who had changed seats with me. Also, seemingly, it could also be profitable if not caught – my predecessor as Quartermaster 65 CRE was reputed to have been in possession of £30,000 Palestine, when collared by the Royal Military Police. Was I lucky?

I doubt whether details of my experiences as a Quartermaster in Palestine, the Canal Zone and Tripolitania would be appreciated in a *Journal* article, not by the hierarchy and some of the participants, if still alive. Yours sincerely – J F Mapstone.

ACRONYMS

From Captain (retd) Orange-Bromehead

Sir, – I read with interest the letter on acronyms published in the April *Journal*.

As a retired officer I have myself written on this subject. May I offer the editor the following to reflect on when sorting out the articles and guiding those who are sending them in. After I have read my *Journal* I pass it on to the local secondary/comprehensive school – which has a science bias, along with my new Civil Engineer magazines and Cambridge Alumni magazine. I know they are appreciated and hope they are influencing young people towards the engineering profession. I suspect that an excess of acronyms are a bit of a turn off.

May I suggest that the *Journal* be also seen as a means of advertising the Corps in schools and members encouraged to pass on their copies as I have. Yours sincerely – Richard Orange-Bromehead.