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VOL. LXXXVI

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JUNE, 1972

CITY OF GIBRALTAR

Whereas at the Meeting of the House of Assembly held on Thursday the 18th November, 1971, it was

RESOLVED UNANIMOUSLY

That the Honorary Freedom of the City should be conferred upon the Corps of Royal Engineers on the occasion of the 200th Anniversary of the raising in Gibraltar of the first Soldier Artificer Company as a Regimental Unit in the British Army; in recognition of the long and close association between the Corps of Royal Engineers and Gibraltar; and as an expression of the gratitude of the people of Gibraltar for the valuable assistance which the Corps of Royal Engineers have at all times rendered to the City of Gibraltar.

NOW THEREFORE, by way of civic honour the Freedom of the City and therefore the right, privilege and honour of marching through the streets of the City on ceremonial occasions with swords drawn, bayonets fixed and bands playing, is

HEREBY CONFERRED UPON

THE CORPS OF
ROYAL ENGINEERS

IN WITNESS hereof the Seal of the City of Gibraltar was hereunto affixed this [illegible] day of [illegible] 1972

Mayor

To General Sir Charles P. Jones, GCB, CBE, MC, Chief Royal Engineer and all Ranks of the Corps of Royal Engineers.

The Freedom of Gibraltar

BRIGADIER J. H. S. LACEY, CBE, BA

THE Honorary Freedom of the City of Gibraltar was bestowed upon the Corps of Royal Engineers at a ceremony held on Casemates Square on 6 March 1972, a date marking the two hundredth anniversary of the raising in Gibraltar of a Company of Soldier Artificers, the first regular unit of skilled tradesmen in the British Army. The Corps of Engineers, later to become Royal Engineers in 1787, provided officers for the Company.

The Rock and Fortress of Gibraltar has had a long and varied history. It was known to the ancients as one of the two Pillars of Hercules, marking the boundary between the known world and the grim, terrifying and forbidding ocean beyond. The Romans called the Rock Mons Calpé. It was seized by the Moors in 711. They used it as a springboard for the Moslem invasion of the Iberian Peninsula and later as a fortress and link with Morocco during the next seven hundred and fifty year struggle between Cross and Crescent. This stronghold of Moorish pride was finally captured by the Spaniards in 1462. Many Moors took away with them the keys of their houses in the certain hope that one day they would return. The Moors, however, were finally expelled from Spain with the capitulation on 25 November 1491 by Abdallah, the last Moslem King of Granada, to the Spanish King Ferdinand the Catholic. In 1502 his wife, Queen Isabella, mother of the ill-fated wife of our Henry VIII Catherine of Aragón, formally incorporated Gibraltar into the territories of the four Kingdoms of Spain, Castille, Leon, Aragon and Navarra, and gave the town a coat of arms: a Castle with a Golden Key and the inscription, "The Key of these Kingdoms and the Guardian and Defender of the Straights". The Castle and Key have been retained to this day as the emblem of Gibraltar. The Rock and Fortress still proudly stands guard at the Western gate of the Mediterranean and above it flies the Union Jack.

The colonization of the New World following the voyages of Columbus, sponsored by Queen Isabella, tended to turn Spanish eyes away from Gibraltar. Its defences fell into disrepair and its population shrunk—finding a living on the barren rock was no easy matter. Nevertheless, in the Spanish mind, Gibraltar remained, and still is, a monument to the eviction of the Moors from their beloved native land and the final victory of Christendom over Islam on their soil.

The war of the Spanish Succession (1701–1713), caused by the death of King Charles II of Spain, saw the Grand Alliance of England, Holland and Austria, which favoured the Austrian claimant to the throne, Archduke Charles, ranged against the French claimant Philip, grandson of Louis XIV of France, to prevent a unification of Spain, France, Flanders, Italy and the Spanish Americas into one vast, all-powerful Empire.

Emboldened by Marlborough's victories in the Low Countries, the forces of the Grand Alliance, making use of their sea power, started to operate further afield. Troops were landed on the Iberian Peninsula and their fleets entered the Mediterranean. Gibraltar fell to a combined British and Dutch fleet more by chance than by any premeditated plot. Thwarted in the mission he had been sent to achieve in the Mediterranean, Admiral Sir George Rooke in command of a combined British and Dutch fleet, reinforced by a large squadron under Admiral Sir Cloudesley Shovel, arrived off Gibraltar on 24 July 1704. Perceiving its strategic importance he called upon the Spanish Governor, the Marquis de Salinas, to surrender the fortress in the name of the rightful and legitimate King of Spain the Archduke Charles. Salinas, a faithful servant of Philip, refused. The fortress was bombarded and Marines were put ashore. The resistance of the small garrison lasted but two days before surrendering. The Marquis, his troops and the civilian population were allowed to leave Gibraltar. They took with them the Great Seal and documents of the town and their

belongings to the nearby village of San Roque and, like the Moors 342 years before them, they also went in the sure and certain belief that they too would one day return. Neither wishes have materialized.

It is one thing to capture a fortress, but quite another to hold it against counter-attack. Although it was customary in those days to have Engineer Officers serving with the Fleet, Admiral Rooke's squadrons had none. When a Franco-Spanish force later closed in on Gibraltar and set up a blockade by land and sea the garrison left behind by Rooke under the Prince of Hess found itself without any Engineer Officer and the fortifications in a deplorable state. It was, therefore, not surprising that a clique of defeatist officers were eager to compel the Governor to surrender on the highly favourable terms it could count on the Spaniards being happy to concede. Fortunately, for otherwise the history of Gibraltar if not of Europe could have been very different, a small squadron was sent from Portugal to run the blockade and bring supplies and an Engineer officer to the beleaguered fortress. In this way Captain (later Lieut-Colonel) Joseph Bennett had the distinction of being the first of many hundred Sapper officers who have served on the Rock. He quickly set about strengthening the defences and, although the defeatist junta looked on savagely, his work and the inspiration of Hess triumphed against all that the investing force could throw against the fortress until the siege was eventually raised and the French and Spaniards abandoned for the time their attempts to regain Gibraltar.

The 1713 Treaty of Utrecht brought the War of the Spanish Succession to an end. The claim of the Archduke Charles to the crown of Spain was abandoned, but the map of Europe was redrawn. Most important for the future status of Gibraltar a Treaty of Peace and Friendship was signed in July 1713 between Spain and Great Britain. Article X stated that:

"*The Catholic King does hereby for himself his heirs and successors yield to the Crown of Great Britain the full and entire property of the town and castle of Gibraltar together with the port, fortifications and forts thereunto belonging; and he gives up the said property to be held and enjoyed absolutely with all manner of right for ever, without any impediment whatsoever.*"

There were, however, impediments which have kept the international lawyers busy until today on the interpretation of the Treaty on which it is not for Royal Engineers to comment. Their duty was to maintain and improve the defences of the Rock often with ridiculously little money to carry out that task. Besides lack of funds they had to rely upon contracted tradesmen imported from England and the Continent, mostly from Italy and Malta. They were not subject to military discipline and, despite the high wages paid to tempt them to work on the inhospitable Rock, they were frequently indolent and unruly and, should war come, thoroughly unreliable. Lieut-Colonel (later General Sir William) Green, who had been Chief Engineer of Gibraltar since 1761, constantly pressed for the establishment of a permanent body of Soldier Artificers, subject to Military Law, on whom reliance could be placed both in peace and war. He had the full support of the Governor and, on 6 March 1772, Royal consent was given to the establishment of a Military Company of Artificers to serve in the Garrison and Fortress of Gibraltar. The title of the unit was almost at once changed to that of Soldier Artificer Company. It comprised 1 Sergeant Major, 3 Sergeants, 3 Corporals, 60 Privates—working men skilled in the following trades: Stonecutters, Masons, Miners, Lime burners, Carpenters, Smiths, Gardeners and Wheelers and 1 Drummer.

Although King George III placed his seal on the Warrant on 6 March 1772, it took some little time to form the Company of Soldier Artificers in Gibraltar. Official communications to overseas garrisons were slow in those days. The following officers were supplied by the Corps of Engineers for the Company under the command of the Chief Engineer of Gibraltar: One captain, one captain-lieutenant and two subalterns one of whom was to act as Adjutant. Thomas Bridges, a sergeant in the 30th Regiment of Foot, was transferred as sergeant-major of the Company, being a man well qualified, "not only to oversee the working duties of the Company, but also to drill

the personnel in the exercise of small arms as may in the most effectual manner enable them to assist in defending the work they might be repairing." From the outset, therefore, the first Soldier Engineers were expected to be both skilled tradesmen and trained fighting men. Two artificers were enlisted in England, others came from Line Regiments serving on, or about to leave, the Rock. A few British civilian contracted artificers were also locally enlisted as were four Gibraltarians—Antonio Francis, who became a corporal in the Company, and Francis his brother, Nicolas Garcia and Alexander Fullerton. The first major task of the newly-formed Soldier Artificers was the construction of the King's Bastion on the site of a previous Moorish fortification called the Algeciras Gate. The Bastion covered the Line Wall from the Old and New Mole heads. It mounted twelve 32 pounder guns and four 10 inch howitzers in front with ten more guns and howitzers on its flanks. Its casemates provided accommodation for 800 men in bombproof shelter. The foundation stone was laid in 1773 and the work was completed three years later. It was fully operational by the time the great siege started in 1779 when the Soldier Artificers were to receive their baptism of fire and prove their sterling worth.

After the revolt of the North American Colonies France, Spain and Holland declared war against Great Britain and Spanish troops besieged Gibraltar. At first batteries were established on the isthmus connecting the Rock with the mainland of Spain and saps were dug forward in the traditional siege-warfare manner employed in those days. Believing that the Gibraltar garrison could be starved into submission and, not wishing to risk heavy casualties by assaulting such a formidable place, the Spaniards did not press operations with any sense of urgency. However they miscalculated the fighting spirit of the Gibraltar garrison under their Governor, General Eliott, and also the strength of British sea-power to keep the fortress reinforced and provisioned. Although throughout the siege the soldiers and civilians on the Rock often suffered great privations and were debilitated by hunger and disease, surrender through starvation was never considered for one moment. General Eliott, later Lord Heathfield, had started his military career as an Engineer officer and he knew full well how important to the defence of the Rock were Colonel Green, his Chief Engineer, and his Soldier Artificers. Seeing the continual build up of the Spanish siege works General Eliott made a bold sortie from Gibraltar with over half his garrison and almost all his Soldier Artificers, reinforced by a hundred sailors, at 3 am of the morning of 26 November 1781. Complete surprise was obtained and the Spanish lines were quickly over-run. General Eliott then hurriedly called for all his remaining Soldier Artificers to help complete the task of destroying the Spanish works. They were supplied with hammers, axes, crowbars, fire faggots and other burning material. General Eliott wrote in his despatches that: "They made wonderful exertions and spread their fire with such amazing rapidity that in half an hour two mortar batteries of ten 13 inch mortars and three batteries of six guns, each with all their lines of approach, communication, traverses, etc, were in flames and reduced to ashes. Their mortars and cannons were spiked and their beds, carriages and platforms destroyed. Their magazines blew up one after another as the fire approached them." Quite a good morning's work and a splendid example of how a unit of tradesmen, versed primarily in the art of fortifications and works, could when the occasion arose turn themselves rapidly and successfully into efficient combat engineers. Later the establishment of the Company was increased and in addition Boy Artificers, the forerunners of the RE Junior Leaders and Apprentice Tradesmen, were enlisted.

Reinforced and egged on by their French allies, the Spaniards repaired their shattered lines and constructed more batteries of heavy long-range guns on the mainland which could not easily be engaged by the artillery of the Fortress and were able to create havoc on its defences. On a May day of 1782 the Governor, accompanied by his Chief Engineer and staff, inspected some North Front Batteries which had recently been demolished by Spanish guns and was being repaired by Soldier Artificers. General Eliott is reported to have said: "I'll give a thousand dollars to

anyone who can suggest a way to get flanking fire upon the enemy's works". Sergeant-Major Ince of the Soldier Artificers Company, who at the time was in attendance upon Colonel Green, suggested driving a gallery, or tunnel, within the North face of the Rock leading to a "notch" projecting from its almost vertical face some 600ft up from its base in which guns could be placed. The delighted General ordered work to begin forthwith and Sergeant-Major Ince, who had acquired some experience as a miner, was placed in charge of the project. Work proceeded at once on a gallery eight feet square. By 15 July the first embrasure was opened and the gallery there was widened to admit the emplacement of a 24 pdr gun and its platform with sufficient room for the gun's recoil. By the beginning of September five more guns had been placed in the ever-extending gallery. It was an outstanding tunnelling achievement carried out by men debilitated by the privations of almost three years of siege who had no special mine survey equipment nor any mechanical aids whatsoever. The five guns of the gallery were fully operational by the time the combined "Grand Assault" by the Spanish and French forces was launched by land and sea on 13 September 1782.

History does not relate whether Ince ever received his thousand dollars, but he was given a farm on the Upper Rock that bears his name to this day. He is without doubt the best remembered Sapper soldier ever to have served in Gibraltar. Perhaps the best known present day reminder of his name is Ince's Hall a civic centre where, among other festivities, the Annual Gibraltar Drama Festival is held. After the siege had been lifted Ince extended his gallery to the notch where a battery to hold six guns, their cannon balls and powder magazines, known as St George's Hall, was excavated. In 1878 Field-Marshall Lord Napier of Magdala, the victor of the Abyssinian War of 1867–68 and the only Royal Engineer officer to be appointed Governor of Gibraltar, gave a banquet in this large vaulted battery for General Ulysses S. Grant, victor of the American Civil War 1861–65. St George's Hall and the Galleries, now called the Upper Galleries, are a show piece of Gibraltar. During this year's Freedom Ceremonies the North Front of the Rock was flood-lit and the gallery embrasures spotlighted to show the position from where cannons once defiantly roared during the Great Siege of the City and Fortress. Tunnelling, however, was not the only activity of the Soldier Artificers. Their constant daily task, often under fire, was the extension and strengthening of other defences of the Fortress and the repair of damage caused by constant enemy bombardment. When engaged on these duties Boys of the Company, possessing very keen eyesight, were often employed as look-outs to warn working parties to take cover on spotting the approach of enemy missiles. The two best known of these Boys were John Brand and Thomas Richmond, both were sons of Sergeants of the Soldier Artificer Company and they were held in high esteem by the soldiers who nicknamed them Shot and Shell.

After the siege they caught up on their schooling and were trained as modellers. Between them they produced a twenty five foot to the inch scale model of the Rock of Gibraltar and a scale model in polished stone of the King's Bastion—the latter and a plaster cast of the former are now historic exhibits in the Royal Engineers Museum at Chatham. Recommended for commissions in the Royal Engineers, they entered the Royal Military Academy, Woolwich, and were commissioned on 17 January 1793. They were posted as subalterns to the West Indies where sadly these two promising young officers died of the Yellow Fever.

Boys, who were training to become masons, were employed in the Europa quarry rounding stones for use as projectiles for 13 inch mortars. In cooperation with the Gunners of the Fortress successful experiments were carried out in the use of red-hot shot against enemy fortifications and the Artificers erected kilns in various battery positions, each capable of heating 100 shot in little less than an hour. This red-hot shot proved to be a most successful weapon when used against the ships and floating batteries employed soon afterwards during the "Grand Assault" against the Fortress. As anti-personnel weapons against investing land forces the Artificers constructed large fougasses, shaped like giant mortars, capable of discharging showers of stones and scrap metal against assaulting infantry.

The build-up of the investing forces however continued remorselessly. The land forces were strengthened by French troops released by the capture of Minorca and the combined Spanish and French fleets assembled in the Bay of Algeciras. It included over forty ships of the line, twelve floating batteries, a host of frigates and three hundred miscellaneous troop transports and landing craft for a final assault. The floating batteries consisted of cut down men-of-war designed to present only one side to the artillery of the Rock. Their fighting side had three successive layers of timber, the gaps between them being filled with wet sand, and behind that again a thick lining of cork constantly soaked with water. Overhead cover was provided by a hanging roof composed of a stout cordage net covered with heavy wet hides. They were considered by D'Arçon, their French engineer designer, to be both impregnable and incombustible and of such prodigious power as to ensure the annihilation of the garrison. In addition the land batteries facing the Rock had among them over 200 heavy guns, and 40,000 men stood ready to assault the fortress from the Spanish lines. The Supreme Command of the Franco-Spanish naval and land forces was placed in the hands of the Duc de Crillon who had recently captured Minorca from the British.

The situation was indeed menacing. British troops had surrendered at Yorktown in 1781 and had been driven out of Minorca. Britain had no friends nor allies and to many it seemed that she was now finally to be humiliated by the loss of Gibraltar. Throughout the long hot summer of 1782 the garrison of the Rock watched the ever-increasing strength of the investing forces and were subjected to a continuous softening-up bombardment and blockade. Their effective fighting strength, due to casualties and disease, was no more than seven thousand almost exhausted men who had been for years living under siege conditions.

After two days of particularly heavy cannonade the Duc de Crillon launched his Grand Assault on the morning of 13 September. Ten floating batteries, mounting between them 212 guns, escorted by ships of the Franco-Spanish Fleet, set sail in a light NW wind across the Bay of Algeciras. Watched by a crowd of nobility and other French and Spanish VIPs from pavilions set up on the hill facing Gibraltar, known as the Queen of Spain's Chair, the floating batteries anchored in line some 1000 yards off the town area of Gibraltar. The spectators eagerly awaited the decimation of the fortress. The guns of Gibraltar opened up on the floating batteries and simultaneously a barrage of fire was brought down on the fortress from the Bay and from the land. Nothing quite like this weight of artillery fire had ever been witnessed before, and indeed never again until the trench-warfare battles on the Western Front during the First World War. Initially the floating batteries caused extensive damage and opened breaches in the Line Wall. They truly appeared to be both impregnable and incombustible. However, the red hot shot from the guns of the Fortress began eventually to make their effect felt. One by one the battery ships caught fire, their magazines blew up and their smouldering hulls sank. By the next day the last had been burnt out. The Grand Assault had ended in complete disaster. Some two thousand men were lost in the Bay and some three hundred and fifty were picked up by boats manned by Royal Marines and made prisoner.

The failure of the seaborne attack on Gibraltar however did not end the seige and the investing forces increased their bombardment of the Rock from their land batteries. The Artificers, with every able-bodied man who could be spared to work under them, were employed on hastily repairing the shattered defences.

As a last attempt to force an entry into the Fortress the Spaniards started to construct a mine in a natural cave at the top of a scree in dead ground below Princess Caroline's Battery on the north face of the Rock. News of this was brought in by a deserter but discountenanced. Sergeant Jackson of the Artificers however, with the aid of ropes and ladders, climbed down from the Battery and discovered that the information was true whereupon steps were taken to harass, and eventually to put an end to, these mining operations. His was one of the few rock climbing expeditions on the north face of Gibraltar. Two deserters from the fortress had previously tried

to climb down using ropes but fell to their deaths. Some two hundred years later, in August 1971, a party of three of the foremost rock climbers in the world, led by Captain M. W. H. Day RE, climbed to the 1300 feet high summit of the north face in two days, spending the night in Ince's galleries on the way up.

Relief for the garrison was at long last to come. In October 1782 a large fleet and convoy under Admiral Lord Howe, in the teeth of a gale and blinding rain, stormed into the Bay of Algeciras—the Franco-Spanish fleet being unable to offer any serious opposition. The convoy brought considerable reinforcements, including 141 Soldier Artificers recruited mostly in Scotland and the northern Counties of England who had volunteered to serve in Gibraltar, abundant food and ordnance materiel which would enable the garrison to continue the fight for many a month. The men and stores having been landed under cover of the guns of the Fortress Admiral Howe sailed away, followed at a discreet distance by the French and Spanish fleets who were unable to inflict any loss on the convoy which had so impertinently sailed into what they considered to be their territorial waters and replenished and revictualled the Fortress of Gibraltar that they had not been able either to starve into submission or take by storm.

Although the Rock continued in a state of blockade the failure of the Grand Assault, followed so closely by Howe's relief, marked the effective end of the siege. In the preliminaries to a Peace Treaty, signed in Paris on 20 January 1783, subsequently ratified by the 1783 Treaty of Versailles, Spain was offered very favourable terms. She retained Minorca and the Floridas while Great Britain kept Gibraltar. Although not popular with the Spanish people who longed for the return of the Rock, one of their eminent statesmen considered it to be the best Peace Treaty for 200 years. To the British, Gibraltar had become a symbol of defiant bravery, a crouching lion, as steady as a Rock whom none could overthrow.

Firing ceased on the evening of 2 February 1783. The siege which had lasted three years, seven months and twelve days—the longest continuous siege in military history—was at an end. An exchange of civilities immediately took place. General Eliott made a courtesy tour of the Spanish lines and a few days later the Duc de Crillon and an imposing retinue of French and Spanish nobility visited the fortifications, tunnels and arsenals of the Rock that had defied all their attempts to capture. There were parties on a lower level also. The NCOs of the Soldier Artificer Company asked the Governor and other Senior Officers of the Garrison to a ball and supper at the Three Anchors' Inn. These balls became annual events and were held each year on 13 September the Anniversary of the destruction of the floating batteries. They were known familiarly as "Junk-ship Nights". The last ball and supper was held in 1803. The great epidemic of 1804 caused the cancellation of that year's Junk-ship Night and none was held thereafter.

The fighting being over, the Soldier Artificers were at once put onto the task of rebuilding the City of Gibraltar which had taken a fearful pounding. Whilst so employed the Artificers and the civilian population, increased by many who returned to the city after the fighting had stopped, were in daily contact with each other and from this close association a great spirit of mutual friendship was established which has continued ever since. In 1786 the Company of Soldier Artificers was divided into two companies for ease of command, administration and the supervision of the many scattered works on which the Artificers were employed. However, in the annual estimates presented to Parliament, the Corps was not shown as being formed into two companies as this might have led to an outcry that a secret plot was afoot to increase its size.

The threat of invasion by the troops of Revolutionary France showed how glaringly vulnerable the defences of the Royal Naval Bases of Britain were, and on 10 December 1787, Royal Assent was given to the formation of a Corps of Royal Military Artificers to rectify this defect. There had been considerable opposition to the raising of a uniformed and disciplined military body of men skilled in civilian trades, it being argued that this was a measure "totally inexpedient and dangerous"

which might take jobs away from the honest British working man and possibly eventually lead to the nationalization of labour. However, the splendid example of the achievements of the Gibraltar Soldier Artificers convinced the Prime Minister (Mr Pitt) of the need for a similar Corps to make good the defences of our shores and the measure was adroitly shepherded through Parliament. The Corps consisted of six Companies and, as in the case of the Soldier Artificers of Gibraltar, the Corps of Royal Engineers provided the officers. The Companies were located at Woolwich, Chatham, Portsmouth, Gosport and Plymouth with one Company split between Jersey and Guernsey. Unlike the Gibraltar Artificers however, the Companies were not tied to these places and could be deployed wherever a need for engineer troops arose. With the outbreak of war with France more Companies were raised some of whom served overseas.

In June 1797, the Soldier Artificers of Gibraltar were absorbed into the Corps of Royal Military Artificers. They ceased to be "fencibles of the Rock" and they discarded their scarlet jackets for the blue of their new Corps. In their short lifetime of twenty five years these first regular engineer soldiers of the British Army covered themselves with glory. They had shown themselves to be gallant and resolute combat engineers during the Great Sortie and, throughout the long siege, skilled and equally resolute fortress engineers. The batteries, bastions and galleries they constructed remain to this day as lasting monuments to them. They set the highest standards for future generations of the "other ranks" of the Corps of Royal Engineers, to emulate. The present Anglican Cathedral of the Holy Trinity in Gibraltar, and many other civic buildings, are works of their hands. They established a bond of friendship with the people of Gibraltar which has remained and, indeed, increased over the ensuing two hundred years.

Royal Military Artificers served in Wellington's Army during the Peninsular War 1808–14. Being well trained and experienced in the art of Fortifications and Works, they were well qualified to construct the famous defensive Lines of Torres Vedras covering Lisbon in 1810. They lacked however experience in siege warfare and crippling casualties were suffered when assaulting fortified Spanish towns resolutely defended by French troops. As a result an Establishment was set up at Chatham, now the Royal School of Military Engineering, on 23 April 1812 for the instruction of young Royal Engineer officers and soldiers of the Corps of Royal Military Artificers, in the "Duties of Sapping, Mining and other Military Field Works". To stress their combat engineering role the name of the Corps of Royal Military Artificers was changed to the Corps of Royal Sappers and Miners. The uniform was once more changed from blue back to the scarlet of the Gibraltar Soldier Artificers. Wellington did not like British troops dressed in blue milling about the "front line" and being mistaken for French soldiers.

The main task of the Royal Sappers and Miners during the Crimean War (1854–1856) throughout the heat of the summer and the cruel cold and mud of winter was the construction of battery positions and a series of parallels, trenches, saps and rifle pits dug steadily forward to the walls of the Fortress of Sebastopol which was then stormed by escalade led by Royal Engineer officers and Royal Sappers and Miner soldiers with their ladders. Throughout all this time they had constantly to repair, often under fire, damage to the batteries, magazines and earthworks caused by enemy bombardment and also to be constantly on the alert to resist a sortie by the besieged garrison.

Many fundamental changes in Army organization resulted from the muddle and mismanagement of the unhappy Crimean War, and on 17 October 1856 the Corps of Royal Sappers and Miners was incorporated into the Corps of Royal Engineers, thus ending the long-standing anomaly of British military engineers belonging to separate Corps. At the same time the official designation of the rank of Private was changed to Sapper, the name by which Privates of the Royal Sappers and Miners were habitually called. Later the expression "the Sappers" was colloquially applied to the whole Corps of Royal Engineers—officers and soldiers alike.

But to return to the Sappers on the Rock.

The 1783 Peace of Versailles gave independence to the American Colonies and from then on British interests became focussed on her possessions in the Orient and the Antipodes. Gibraltar thus became a vital Naval and commercial port on the sea routes thereto. Its importance was greatly increased by the opening of the Suez Canal in 1869. The Sappers built powerful batteries to dominate the Straights and for the defence of the dockyard. These batteries had continually to be "up gunned" and new and more powerful ones built as the armour and armament of Naval ships increased. To illuminate enemy ships during a possible attack by night the Sappers installed and manned coast-defence searchlight emplacements and engine rooms. In an attempt to increase visual observation over the Straights an RE Balloon Section was sent to the Rock in 1903 and, in conjunction with the Royal Navy, balloons made experimental ascents from a destroyer for such tasks as the detection of mines or submarines. However the strong, swirling winds, so common to Gibraltar, limited the number of days when captive balloons could safely operate and the Sapper aeronauts were withdrawn from the Rock.

When the threat of air attack against the Rock developed in the 1930's the Sappers built anti-aircraft batteries and during the Second World War the Gibraltar Defence Force, now the Gibraltar Regiment, manned some of them. The Sappers also installed and manned anti-aircraft searchlights.

No serious threat however menaced Gibraltar until Italy allied herself with Germany after the fall of France in 1940. The Rock then became vulnerable to a possible threat from the Italian Navy and an attack by land by German troops whom it was feared would be allowed free passage through Spain. For good measure the Spaniards might have also joined in the fight in an attempt, at long last, to regain her longed-for Rock. With the fall of France there were no longer any French planes to give air cover to Gibraltar from airfields in Morocco. As a result all civilians, not essential for the defence of the Fortress and the operation of the Naval Dockyard, were evacuated and replaced by 30,000 troops.

Sergeant-Major Ince would have been amazed at the frenzy of tunnelling activity that followed. The aim was to provide shelter within the Rock for the complete garrison and the means for it to withstand a siege and the effects of bomb, shot and shell hurled against it. In addition to providing underground personnel accommodation, British and Canadian Sappers excavated headquarters and command posts. Chambers were also dug to hold supplies, stores and ammunition. Other chambers were dug for workshops, a water distillation plant, a laundry and a hospital. Monkey's Cave, overlooking the Mediterranean, was enlarged and a five storey convalescent hospital built within it. Storage tanks for fuel and water and ring mains for their distribution were also constructed in the tunnelled complex and electric power was provided from underground stations with a total capacity of 1200 kilowatts. Two tunnelled roads for lorries, running almost the length of the Rock, were completed and from them access roads were driven to serve the underground depots, workshops and magazines. Some of the chambers were of very considerable size. The largest had an unsupported span of 50 ft with a rise of 11 ft in the arch. The height from ground level to the crown was 32 ft and the length 380 ft. It could have swallowed up very many of Sergeant-Major Ince's St George's Halls. In all nearly two million cubic yards of spoil were excavated. However, as this only represented less than one thousandth part of its complete volume, the solidity of the Rock remained unimpaired.

St Michael's Cave, a ramification of stalactite caves, about 500 feet up the Rock overlooking the harbour, was converted for storage.

The City Council engineers also constructed tunnelled air-raid shelters for the civilian population.

The vast amount of spoil from the tunnels and stone, won by directing streams of water under high pressure on the scree leading up to the site of the old Spanish mine, were used to turn the race course on the North Front into an airfield, which was

extended by dumping rock into the Bay. Within a short space of time a 1800 yard runway had been built from which the heaviest aircraft then in service could operate. The airfield was of the greatest strategic value during the war, and today it is of immense commercial value to Gibraltar.

The cessation of hostilities witnessed the run-down of the garrison to considerably less than its pre-war size. As the troops departed however the Gibraltar evacuees returned and plans were set afoot to concentrate the military at the South end of the Rock and release accommodation held by them in the city for civilian redevelopment, particularly high-rise flats, to meet the desperate need for family homes. The Royal Engineers started work on the new Military Town, but in 1959, when they gave up their responsibility for Works Services, a civilian organization took over the project. The Sappers, however, excavated a tunnelled dual carriage-way road 25 ft by 18 ft in 1960 to ease the approach to the Military Town—known as Keightley Way—and another between 1963–65 known as Dudley Ward Way. They also carried out several other tasks, their last being the Molesend Way dug in 1965–67. The RE Tunnellers had acquired the nickname "Moles" and their final task on the Rock of Gibraltar was aptly called after them. On 1 April 1968 the Moles ceased to exist and tunnelling as a Sapper trade disappeared some 186 years after Sergeant-Major Ince started to excavate the Upper Galleries.

In 1956 Spain renewed her claim to Gibraltar at the General Assembly of the United Nations. Initially she obtained little support but she persevered. In 1966 she closed her frontier and no more Gibraltarians were allowed to enter Spain. The ferry service connecting Gibraltar with Algeciras was stopped and all telephone communications with the mainland were severed. Spanish labour, which daily entered Gibraltar and on which the Naval Dockyard and many civilian activities so heavily depended, could no longer come in to work. Gibraltar was thus in fact once more in a state of siege, and still remains so.

To ease the situation Sapper units were sent to Gibraltar on short unaccompanied tours to carry out projects that would assist in the development of tourism and provide amenities for the cooped-up Gibraltarians. Over one hundred such works have been completed. They include the beautification of old gun batteries and the construction of car parks and lay-bys on the Upper Rock and promenades and bathing beaches by the sea shore. The largest single project was the reconstruction of the Victoria Stadium which occupied two troops of 50 Field Squadron for seven months in 1970. 60, 20 and 10 Field Squadrons were also engaged on these projects as was 1 Fortress Squadron—the resident Sapper unit and the descendants of the first Company of Soldier Artificers. Although the Sappers of 1 Fortress Squadron, RE no longer dig tunnels they operate the Inter-Service Power Station, and carry out field engineering and plant tasks on the Rock.

On 18 November 1971 in the House of Assembly a motion to grant the Honorary Freedom of Gibraltar to the Corps of Royal Engineers, as a sign of gratitude and friendship, was proposed by the Chief Minister the Honorable Major Robert Peliza and seconded by the Leader of the Opposition the Honorable Sir Joshua Hassan and carried unanimously. It was agreed that the Deed of Grant would be conferred on 6 March 1972—the bicentenary of the raising of a Company of Soldier Artificers in Gibraltar. This left some time for the organization of festivities to celebrate the historic occasion, and they were extensive.

A party of "Sappers" who had served on, or been closely connected with, the Rock flew out to Gibraltar to attend the bicentenary celebrations and were accommodated in the Caleta Palace Hotel—a new hotel close to Catalan Bay on the Mediterranean side of the Rock. Among the party were two Chelsea Pensioners—Corporal Swinburne and In-Pensioner Webb, MM, aged 72 and 81 years respectively. For the conferment of the Freedom the Chief Royal Engineer, General Sir Charles Jones, and the Engineer-in-Chief, Major-General F. G. Caldwell represented the Corps, and Brigadier J. H. S. Lacey and Captain L. Thomas represented the Institution of Royal Engineers and the Royal Engineers Association. Brigadier S. C.

Chambers, MA to the Governor, and Major M. J. E. Adams RE, commanding 1 Fortress Squadron RE, were closely connected with the arrangements in Gibraltar in conjunction with the civic authorities of the City. The RE Band Chatham, under the direction of their Director of Music Captain R. A. Ridings, played at several functions over the period 25 February to 13 March and many Gibraltarians soon learned how to whistle "Wings". The Royal Engineers Soccer team played games against representative teams on the Rock. The co-ordinating officer for all events was Major J. J. Brown RE.

On Monday 28 February HE The Governor of Gibraltar, Admiral of the Fleet Sir Varyl Begg, opened an exhibition depicting the close relationship between the Corps and the people of Gibraltar over the past 200 years. It contained pictures and silver from the RE HQ Mess and items from the RE Museum and also photographs, models and historical records from the archives of the Gibraltar Government. There was a one-hour film show each evening during the run of the exhibition depicting the varied activities of the Royal Engineers.

On Friday 3 March HE The Governor gave a dinner party for the dignitaries of Gibraltar to which General Sir Charles and Lady Jones, Major-General Caldwell and Brigadier and Mrs Lacey were invited. On the same evening the Royal Engineers Association held a Dance in South Barracks Hall.

On Saturday 4 March His Worship the Mayor of Gibraltar and Mrs Vasquez gave an official lunch party for the Chief Royal Engineer and others who had come to Gibraltar for the Freedom ceremonies.

In the afternoon a Royal Engineers Soccer team played a Gibraltar Football Association team on the recently rebuilt Victoria Stadium. Both teams were presented to HE the Governor and the Royal Engineers Band played selections before the match and at half time. The Sapper team, composed mostly of players unaccustomed to football on the Rock, found the conditions very strange to them. The ground was hard baked clay and one of those strong, whirling winds, that so troubled the RE aeronauts in 1903, was blowing with great abandon. Ball control on the ground was very difficult and the flight of the ball in the air quite unpredictable. At half time the Sappers were a goal down, however honour was satisfied when they equalized in the second half to draw the game.

On behalf of all the people of Gibraltar the Chief Minister gave a dinner at the Rock Hotel for the Chief Royal Engineer and Sapper visitors and their wives. After the toasts he presented to the Corps of Royal Engineers a model of Gibraltar made by Mr Charles Anes. The rock from which the model was made was quarried from Sergeant-Major Ince's galleries. On the base of the model are the Castle and Key Arms of Gibraltar and the RE Cap Badge and carvings representing significant happenings in the 200 year history of the Sappers on the Rock. In thanking the people of Gibraltar for their splendid gift the Chief Royal Engineer assured them that it would always be cherished by the Corps. It now holds pride of place in the exhibition of silver in the Royal Engineers Headquarters Mess at Chatham.

A Service of Thanksgiving was held in the Anglican Cathedral of the Holy Trinity on the morning of Sunday 5 March. The Clergy comprised The Bishop to the Forces the Right Reverend J. T. Hughes, the Dean of Gibraltar The Very Reverend G. K. Giggall, the Senior Chaplain to the Forces The Reverend L. Lloyd Hughes and the Methodist Officiating Chaplain to the Forces The Reverend K. R. Jefferies. The Band of the Corps of Royal Engineers Chatham provided the music for the Service. The First Lesson was read by the Chief Royal Engineer and the Second by HE The Governor. The Sermon was given by the Bishop to the Forces.

After the service Brigadier and Mrs Sam Chambers kindly gave a drinks party for the Chief Royal Engineer and Lady Jones, the Engineer-in-Chief and other Sapper visitors to the Rock and their wives.

In the evening the Chief Royal Engineer and RE visitors to the Rock entertained HE The Governor, the Chief Minister, the Mayor and other prominent Gibraltar people to a dinner dance at the Caleta Palace Hotel. The model of the Rock presented

Plate 1. Mr Charles Anes with model of the Rock which was presented to the Chief Royal Engineer by the Chief Minister of Gibraltar, Major R. J. Peliza

The Freedom Of Gibraltar 1

Plate 2. The Chief Royal Engineer handing over the gates to the Chief Minister

The Freedom Of Gibraltar 2

to the Corps was on show for all to see and the Royal Engineers Band was there to provide the music once more. Indeed there was no official occasion at which the Band did not assist.

Monday 6 March 1972 was Freedom Day.

In the morning the Chief Royal Engineer unveiled a commemorative plaque at new gates to the Alameda Gardens just below the statue of General Eliott, the Governor of Gibraltar during the Great Siege. The gates were a gift from the Corps to the people of Gibraltar. The metal work of the gates and the Arms of Gibraltar and the RE Badge affixed to them had been made by Royal Engineers in this country and shipped out to Gibraltar. The stone pillars on which the gates are hung were built by a Troop from 60 Field Squadron RE serving temporarily on the Rock and incorporated two pieces of stonework by Mr Anes. In accepting the gift on behalf of the people of Gibraltar the Chief Minister spoke of the bond of friendship that had developed over the past two centuries between the people of Gibraltar and the Sappers which he hoped would continue for many long years to come.

At a simple ceremony in the Chief Minister's office Mr E. J. Campello the Editor of the Gibraltar newspaper Vox, presented the Chief Minister with a set of nine volumes of the History of the Corps of Royal Engineers on behalf of Lieut-Colonel J. A. Hartley, who had been OC RE Troops Gibraltar 1968–70. In a book-plate inserted in each volume Lieut-Colonel Hartley had written that the presentation on the Bicentenary Celebrations was made with the fondest memories of his tour on the Rock and with the pride and pleasure that the histories of Gibraltar and the Corps of Royal Engineers had been so closely intertwined for the past 200 years. In accepting the volumes the Chief Minister voiced his thanks to Lieut-Colonel Hartley and said that the set of Histories would be kept in the John Mackintosh Hall where they would be readily available for the people of Gibraltar to consult.

The official presentation of the Freedom took place during the afternoon on Casemates Square where for many years the historic Ceremony of the Keys used regularly to take place. The massive doors of the Landport gates, once the only land entrance to the Fortress, were locked at sun down and the heavy keys were escorted through the Main Street of the City by an armed guard and delivered on a velvet cushion to the Governor for safe keeping over night. It was, therefore, an historic spot for the Ceremony of Conferment.

The ceremony was watched by a large crowd among which were the two scarlet-coated Chelsea Pensioners who readily caught the eye. Their thunder however was soon stolen when two Sappers, clothed in (reconstructed) scarlet coats of the 1772 Soldier Artificers, one in parade order and the other in working dress, marched out from the gloom of Landport Tunnel to the sunlit Casemates Square and stationed themselves one on each side of the dais. The scarlet jackets of the Band as they marched onto the Square gave a further splash of colour to the scene. An RE contingent, under the command of Major M. J. E. Adams, RE, OC Troops Gibraltar took up their position. The Chief Royal Engineer and the Engineer-in-Chief arrived followed by His Worship the Mayor of Gibraltar, Mr Alfred Vasquez, who was received with a General Salute.

The Clerk to the House of Assembly read the Deed granting the Freedom of the City of Gibraltar to the Corps of Royal Engineers. His Worship the Mayor then formally conferred the Freedom after which he, the Chief Royal Engineer and the Clerk to the House of Assembly signed the Roll of Honorary Freemen of the City of Gibraltar.

The Mayor then, addressing the Chief Royal Engineer, said:

General Sir Charles Jones, All Ranks of the Corps of Royal Engineers, I have just conferred upon you on behalf of the people of Gibraltar, the Freedom of our City. It is now my further pleasant task to present to you and the Corps of Royal Engineers a Casket containing the Deed of Grant.

This Casket has been designed and made with great care and skill by Gibraltarians from materials found in Gibraltar.

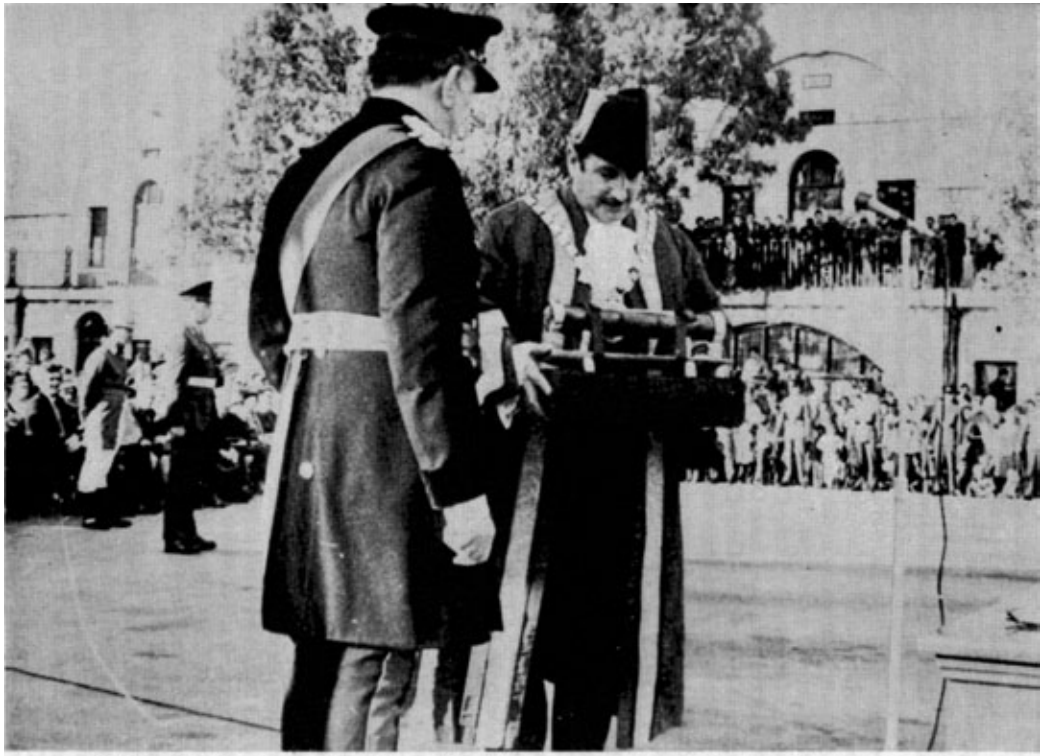

Plate 3. His Worship the Mayor, Mr Alfred Vasquez presenting the Freedom Scroll and Casket to the Chief Royal Engineer

The Freedom Of Gibraltar 3

Please accept it Sir Charles as tangible evidence of the great admiration, respect and affection the people of Gibraltar have for the Corps of Royal Engineers."

The Chief Royal Engineer replied:

"Your Worship: It is with intense pleasure, but also with deep humility, that on behalf of the Corps of Royal Engineers I accept the Freedom of your ancient City, this handsome Casket and this Deed of Grant which it contains. These are splendid gifts which will be treasured for all time by the Corps but it is the affection and spirit which lie behind them that mean even more to us than the gifts themselves.

The life lines of the Rock and the Corps have been closely interwoven throughout the past two centuries, and this interlock has been of great benefit to us both. It is my deepest hope and wish that they will continue for all time. The beautiful Casket which you have given us today means more to us because it has been designed by a Gibraltarian artist, fashioned from pieces of the very heart of the Rock, and executed by skilled Gibraltarian hands. It will inspire future generations of Royal Engineers.

On behalf of the Corps, your Worship, I accept these splendid gifts and thank you and the people of your ancient City. I now entrust the Casket to the safe-keeping of the 1st Fortress Squadron Royal Engineers."

The Casket was designed by Mr Natalio Langdon, and was made exclusively by Gibraltar craftsmen, with all materials, with the exception of the silver, coming from Gibraltar. It consists of a varnished hollowed branch of an olive tree from the Upper Rock, with silver stoppers and engraved plaque. The stoppers bear badges of Gibraltar and the Corps of Royal Engineers.

The Freedom Scroll on parchment was prepared by Mr George Palao and bears the two badges in colour.

The base of the casket is a piece of stalactite from St Michael's Cave, which Mr Charles Anes managed to retain in its natural form.

The Chief Royal Engineer then handed the Casket and Scroll to the Escort and presented to the Mayor a centrepiece for the people of Gibraltar. This consisted of a piece of blue granite with at the left silver figures of Sergeant-Major Ince's Soldier Artificers tunnelling into the Rock with the primitive hand tools of their time, and at the right a silver figure of Corporal Parry, the last of the Royal Engineer tunnellers, going about his task using the most up to date equipment. On top of the granite block is a silver figure of a Soldier Artificer of 1772 and the block is mounted on a silver plinth.

In formally presenting the centrepiece to the Mayor the Chief Royal Engineer said:

"Your Worship: You have presented to the Corps something which is beyond price—the Freedom of your City.

We in the Corps cannot reciprocate in kind because we cannot match the Freedom except by offering ourselves and our Service. However we do wish to mark the occasion by giving you something which will be a lasting and visible sign of the affection and respect which we have for the City of Gibraltar and its people.

I ask you to accept this centrepiece which I hope will be seen by succeeding generations of Gibraltarians and be a sign to them of the feelings of all members of the Corps of Royal Engineers."

In accepting the centrepiece on behalf of the people of Gibraltar the Mayor referred to it as a magnificent memento of a very great occasion and assured the Chief Royal Engineer that it would take a place of pride in the City Hall.

The Casket Bearer and Escort having taken post, the parade advanced in review order and gave a General Salute. Major Adams then obtained permission from the Mayor to move off and exercise the privilege and honour of marching through the streets of the City with swords drawn, bayonets fixed and bands playing. Led by Captain E. C. Prosser, carrying the Casket and Scroll, escorted by WOII S. Murrell and WOII L. Hoyle, the parade marched along the traditional route up Main Street taken during the Ceremony of the Keys—the officers with their swords drawn, the soldiers with fixed bayonets and the Royal Engineer Band playing. The Conferment Ceremony was over.

Plate 4. The Mayor holding the centre piece after receiving it from the Chief Royal Engineer

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Later a reception was given at the City Hall by the Mayor at which the Chief Minister presented to the Chief Royal Engineer a richly illuminated bound volume containing photocopies of documents held in the Archives of Gibraltar relating to the formation of the First Soldier Artificer Company in 1772. It was, he said, a gift to the Royal Engineers in commemoration of two centuries of fruitful co-operation. The volume is contained in an oak case made from beams of the Grand Magazine near the Moorish Castle constructed by Soldier Artificers shortly after the Great Siege. These historic documents are now on display in the Royal Engineers Museum, Chatham. He also presented Commemorative Medallions to the Chief Royal Engineer, the Engineer-in-Chief, the Officer Commanding and the Squadron Sergeant-Major of 1 Fortress Squadron RE, Corporal Bush of 60 Field Squadron RE the smartest "Sapper" on the Freedom Presentation Parade, to the two Chelsea Pensioners and to the Mayor. Further presentations were made later, one presented to the Institution of Royal Engineers is now displayed in the Gibraltar section of the RE Museum at Chatham.

During the evening the Engineer-in-Chief was interviewed on Gibraltar Television and spoke about the tasks of the Corps in today's world and its possible future role.

In the best tradition of their forbears, the NCOs of the Soldier Artificer Company who gave a ball and supper at the Three Anchor's Inn to celebrate the destruction of the floating batteries during the Great Siege, the Royal Engineer Warrant Officers and Sergeants ended the festivities of Freedom Day by asking HE The Governor, the Chief Minister, the Mayor, the Chief Royal Engineer, the Engineer-in-Chief and a host of others to a ball and supper in the Garrison WO and Sergeants' Mess. Feasting, dancing and revelry lasted well into the early hours of F+1 Day.

Before the RE visitors flew back home Mr Cecil E. Prescott, Vice-Patron of the Gibraltar Football Association, who is also highly knowledgeable on Corps history, traditions and dress, kindly invited the Chief Royal Engineer and Lady Jones and a large number of Sappers of all ranks with their wives to his house to drinks and to see his quite fabulous collection of medals and other militaria. Some of his collection of Sapper badges, going back to the days of the Soldier Artificers, was displayed in the Exhibition opened by HE The Governor on 28 February depicting the two hundred years close association between the Corps and the people of Gibraltar.

One of the last engagements of the Royal Engineers Band (Chatham) was an Orchestral Concert with Mr Gomez, the well known Gibraltarian guitarist, given in St Michael's Cave on 12 March 1972. Even in music, to quote the words spoken by the Chief Royal Engineer at the Freedom Conferment Ceremony, the life lines of the Rock and the Corps are closely interwoven. May they long remain so.

Branch Meeting of the Institution of Royal Engineers at Newcastle Upon Tyne

BRIGADIER G. T. E. WESTBROOK, OBE

A BRANCH Meeting of the Institution was held at the University of Newcastle on 24 March 1972. It was one of the first meetings to be held outside London and Chatham in accordance with a policy to foster local interest in the activities of the Corps and the Institution throughout the Country.

The Meeting was addressed by the Engineer-in-Chief, Major-General F. G. Caldwell, OBE, MC, on matters of general interest relating to the current organization and work of the Corps and Institution. In his address the Engineer-in-Chief covered the operational tasks being carried out by Royal Engineer units in Northern Ireland, and explained the new organization and command structure of the Corps in BAOR. General Caldwell then examined the deployment and work of the Corps on tasks throughout the World and went on to discuss the present situation in regard to recruiting and technical training. Finally he examined the status of the Institution both in the professional field and in its relation to the Corps. The address was illustrated by a large number of interesting slides and vufoils.

Arrangements for the meeting were made by Headquarters 29 Engineer Brigade (V) based in Newcastle. The Meeting was held in the Merz Court of the University, and the excellent facilities provided undoubtedly contributed greatly to the success of the evening. Over 120 persons attended the Meeting and there was strong representation from: The Northern Counties Association of The Institution of Civil Engineers. The Institution of Structural Engineers. The Federation of Civil Engineering Contractors. The Department of the Environment, including the Regional Controller of Roads and Transportation Department; Members of the Regional Planning Board; and the Northern Command Works Adviser. Departments from the Local Authorities of the County of Northumberland, the Cities of Newcastle, Tynemouth, and South Shields. The Washington Development Corporation. The Universities of Newcastle and Durham. The National Coal Board. Numerous organizations and Engineering Firms of local Industry.

General Caldwell concluded his address by saying that the Meeting in Newcastle was one of a series which it was intended to hold throughout the country, and he hoped that in future it would be possible to hold such Meetings regularly every year on subjects of mutual interest.

Replying for the audience, J. S. Raine Esq BSc, MICE, Chairman of the Northern Counties Association of the Institution of Civil Engineers, thanked General Caldwell for his interesting address and stated that he was sure that all Organizations and Associations represented at the Meeting would welcome further Meetings of the Institution of Royal Engineers in the Newcastle Area.

Following the Meeting, those present were entertained to a Curry Supper provided by 72 Engineer Regiment (V) (Tyne Electrical Engineers) in the nearby Drill Hall of the Northumbrian University Officers Training Corps. During the meal, pipe music was played by the Pipers of the Regiment. The opportunity provided by this function for the exchange of views on matters of mutual interest, and for discussion on many of the points made by the Engineer-in-Chief, was much appreciated by those present. It is clear that there is considerable interest in the work of the Corps amongst members of the Engineering profession which augurs well for future meetings.

Ethics and the Engineer

RALPH L. CLARKE
President, The United Kingdom Association of Professional Engineers

WHEN I was at Chatham I knew and cared very little about the profession of engineering. Engineering to me was just an accessory to the real business of life, combat. The strange thing was that when I retired to take up the appointment of Research and Development Manager to a large engineering company, I found I was right after all—combat still took precedence over engineering.

The first thing that happened was that my Chairman gave me a stiff drink and said that there was one small difficulty about my appointment; there was a chap doing the job already and it was up to me to get him out of it. Having been strictly brought up this put me in something of an ethical quandary. I recalled Abraham's dilemma when called upon to sacrifice Isaac and decided that orders, however strange, were still orders. Without much difficulty (because my adversary was naturally in a state of panic) I brought the Chairman clear-cut evidence of his acting against the interests of the company. By a stroke of genius, however, he managed to convince the Chairman that anybody as adept at in-fighting as myself would make short work of the Chairman's son who was destined to follow him in the business. I lost trick, game and rubber and had to lie low until such time as my adversary, worn out by the strain, retired to hospital and died of cancer. Then I could start on the engineering problems.

Such happenings are not unusual in industry because there is no accepted code of behaviour like that which permeates every aspect of Army life. An employer's job is to employ and to make a profit, not to worry about the welfare of his staff. Tensions between them may cause stomach ulcers but may also improve the tempo of work in the short term. A director's eye rests upon the next shareholders' meeting.

The employer in his own environment is as powerful as a Tudor monarch. He can easily build up tension by giving conflicting instructions and creating competitive situations. In the Army every effort is made to avoid conflicting responsibilities, but in civil life they are accepted as part of the game. The rules of play are judged on their success rather than on their moral uplift.

The lower the level in the hierarchy, the less easily are such tensions imposed. Work people had to play this game through the last century and have had enough of it. They have set up a rival source of power with a different set of standards. Whatever the shortcomings of some trade unions there is no doubt that they have achieved a balance of power inside firms that makes possible the continuance of human life in its broadest sense. But shop floor standards have too much emphasis on disruption, self-interest, and "the two sides of industry" to make much appeal to the officer grade of employee. What is needed is yet another standard, a professional standard of behaviour, held by a body of people large enough to defend those of their number who suffer for maintaining it.

This is what *professions* are all about.

The medical profession, starting with Hippocrates, established a code of responsible behaviour to society in return for which status and privileges were successfully claimed. No doctor will denigrate another in public; an attack upon one is an attack upon all. He can exercise his art without interference, expecting wherever he may be much the same facilities and rewards.

Engineers have never built a profession like this because they have not seen the need for it. The keepers of their conscience have been the engineering institutions which are learned societies and whose articles contain some such phrase as: "The Institution shall not engage in any transaction or activity with a view to the gain or benefit of its members".

Their ethical code is narrowly geared to the business needs of the client or the

employer, and the Institutions own interests: "Every member shall . . . uphold the reputation of the Institution and the dignity of the profession of mechanical engineer, and shall act in a strictly fiduciary manner . . .' (IMechE By-law 34). There is insufficient here to guide and assist the member in his day-to-day problems, or to make him feel part of a community to which he could turn in confidence for support.

How this came about is a matter of history. In November 1970 when the Engineer-in-Chief addressed the Institution of Civil Engineers about the contrast between military and civilian engineers in their success in personal matters, another speaker pointed out that armies were the foundation of engineering—they had invented it. Not so many centuries ago the name "engineer" had been exclusively a military term. Civil engineering on the other hand had been invented twice, first by the French in the mid-eighteenth century and again by the British some fifty years later. The French version had been exclusively a para-military affair as a result of which engineering in France had always enjoyed great prestige. French engineers had proved themselves perfectly capable of holding high office in the state and had risen to the ranks of Premier and President of the Republic. The later British version, however, was the product of tradesmen on the make which undoubtedly accounted for the current popular image of grimy hands and a spanner in the hip pocket.

An even bolder speaker added that "tradesmen on the make" was precisely what top businessmen were today.

When the Society of Civil Engineers became an institution in 1820 the greatest engineer of the day, Telford, was invited to become its first President. He accepted on condition that the Institution should exist for the benefit of engineering and not the engineer. Other institutions followed the example. There was benefit to be gained by keeping learned activities separate from the hurly-burly of personal problems. Members could meet in marble halls and discuss their art on equal terms whatever their status. But the Army know well the importance of looking after one's men, and no civil organization was set up alongside the institutions to look after the interests of the engineer. Other professions, seeing the need, established themselves. But the leaders of engineering were crusty individualists, business men, innovators, engaged in an absorbing occupation rather than a vocation. They had no interest in passing the torch to those who came after them; Nasmyth retired at 48 to study astronomy because he could by then afford to do so.

It is natural that bodies concerned only with engineering should produce leaders with the same limitation of interest. Their councils were drawn from the academic world, free from the practical strains of engineering employment, and from among industrial directors who having survived the struggle had little sympathy for those who had not. Inward-looking, self-sustaining, prestigious bodies are an asset. Every profession has them. Engineering, unfortunately, has had nothing else.

In 1938 some institution members saw the danger and came together to form the Engineers Guild, a limited company which complemented institution activities by offering personal career advice and an appointment service, all the things which *AG7* provide so efficiently entirely free of charge. It has since published the following recommended code of ethics for all engineering institutions:

Every member shall so order his conduct as to uphold the dignity and reputation of the profession of engineering.

He shall conduct all his affairs faithfully and honourably.

He shall take all reasonable care to ensure the safety of all engineering work with which he is concerned.

He shall take account of the responsibility of the chartered engineer towards the general public.

He shall ensure that his salary or fees shall be his only remuneration for the work in question and shall accept nothing more without disclosing the fact to his employer or client.

He shall not in any way maliciously injure the professional reputation, prospects or business of any other professional engineer.

He shall accept the obligation to guide and encourage younger professional engineers to observe this code of ethics.

The Engineers Guild also campaigned for a united engineering profession, and the success of this campaign made a code more urgent. In 1965 the Council of Engineering Institutions was set up to include the Institutions of Civil, Mechanical, Electrical, Chemical, Gas, Marine, Mining, Municipal, Production and Structural Engineers, the Institution of Electronic and Radio Engineers, the Institute of Mining and Metallurgy, the Royal Aeronautical Society, the Royal Institution of Naval Architects and (later) the Institute of Fuel.

The Council of Engineering Institutions had considerably wider powers than the institutions. They included "to advance the standards of conduct of professional engineers". But CEI could only speak for its members, and these were learned societies concerned with engineering and not the engineer. There was still no channel by which the needs of the engineer could be discovered. CEI was hailed as the keystone of the new engineering profession. The challenge to this claim was not long in coming, and this time it came from the other power source.

Eight professional engineers, employed by the Corporation of Kingston upon Hull, were instructed by the staff union to which they belonged to stop the sewage pumps in support of a manual workers strike. This action would have resulted in the low-lying parts of the city being flooded. They refused to comply and were ejected from their union. If the Corporation had happened to have had a closed shop agreement they would have lost their jobs for following a professional code of conduct in the interests of the community. CEI and the Institutions could take no action.

The next challenge was more serious. A Newcastle upon Tyne firm was forced by a series of strikes to sign a closed shop agreement with a shop floor union which covered all grades of engineering employee up to exclusive deputy head of department (equivalent perhaps to field rank). This meant thirty-eight professional engineers having to join a union where they would have been in a voting minority, which could offer them nothing in the way of career advice and whose objects included the furtherance of political objects of any kind and the calling of strikes in any works or on any contract. They refused, and dismissal notices were issued.

But by now professional engineers had taken matters into their own hands. In May 1969 an independent union had been formed called the United Kingdom Association of Professional Engineers. It found a flaw in the dismissal notices, took the firm to court and won the case on appeal. Dismissal notices were re-issued, but by that time the new Industrial Relations Act was so imminent that the period of notice laid down by the Appeal Court as appropriate would not have run out before closed shops became illegal. The firm conceded costs and the dismissals were cancelled. A major injustice had been avoided which if not challenged would have proved a precedent for the whole engineering industry.

What UKAPE did could only be done by a union. Only a body formed under the trade union acts can intervene between employer and employee without being sued for damages. If a profession is going to act in support of its employee members, it must therefore have a union to do so. The medical profession have known this for a long time, making use of an organization called the British Medical Guild which has been (until the new act ruled it out) based on the British Medical Association. The new act, under which both the BMA and UKAPE are registered, makes special provisions for professional associations.

The founding of UKAPE relieved the professional engineer of an agonizing decision. He needed the help of an association, but if he was to retain his professional standards he could not accept the obligations which existing unions thrust upon him. UKAPE guarantees in all its actions to conform to professional standards and if

possible improve them, remembering that in every UKAPE members knapsack there is a managing director's baton.

UKAPE aims to fill the gap by doing for the engineer what the learned societies do for engineering, and by providing CEI with the information it needs to lead the profession and develop a strong voice in national affairs. It will see that the new environment of the Industrial Relations Act is used to consolidate the profession instead of breaking it up. It will see that bargaining units are set up if not for engineers alone at least for professional men. It has formed a close relationship with the equivalent association set up by the science institutes, the Association of Professional Scientists and Technologists. Those engineers who through the untidy state of the engineering profession have never seen the advantage in joining an institution can obtain similar services by joining the Association of Supervisory and Executive Engineers with whom UKAPE has formed several joint groups in industry. A Confederation of Professional Associations is shortly to be founded by these three associations to which other associations will be admitted if their ethical code is satisfactory. The professions are reacting rapidly to the challenge and are building a third source of power to bring the two sides of industry together, to exert a stabilizing influence in the public sector and to preserve the integrity, freedom of choice, and sense of social obligation of their members.

This means that when the sapper officer retires he can enter a world no less wholesome than the one he has left, and will find a larger family to which he can turn in confidence for help. He can obtain advice on his contract and terms of service, useful contacts, lists of appointments vacant, and confidential information about specific employers. He will find that pennies come not from Heaven but from negotiations by a skilful union on his behalf; he may have forgotten that his Army pay, being geared to Civil Service rates, was negotiated by the appropriate Civil Service union.

It is not only the retiring officer who benefits from UKAPE. Any move to raise the prestige of the engineering profession benefits engineers everywhere. Is it right that to claim the respect of other arms one should have to be a soldier first and an engineer only second? This reflects the image of engineering held in this country, the spanner and the oilcan or the tradesman-on-the-make. The European Economic Community will bring us closer to countries like France where engineers are held in very high regard. In the words of Dr Gregory Ljungberg, director of the Royal Swedish Academy of Engineering Sciences: "Those occupations looked up to by clever students can count on the best progress, getting good spokesmen, and forming a strong and dominating position in society."

The quarter of a million professional engineers in this country could have a decisive influence on its prosperity. If it is to maintain its position in the world we do not have long to put our affairs in order.

* * * * *

Airbridge to the Misty Isle (The Broadford Airstrip Project)

MAJOR A. S. HOGBEN, RE, MI PLANT E, AF INST PET

INTRODUCTION

ON 15 September 1971 a small informal ceremony was held on the Isle of Skye. It was the handover of the newly constructed Broadford Airstrip from the Royal Engineers to the County Engineer and Surveyor of the Inverness County Council (ICC). Thus ended 66 Plant Squadron's three years close connection with the Isle of Skye. A troop from the Squadron reinforced by men from other units of 12 Engineer Brigade and a detachment from the Royal Pioneer Corps had completed, as an OP MACC project, the construction of a 2,600 feet black topped airstrip complete with taxi-way, 'plane park, car park and access road. The men of the Squadron were to return to the rigours of soldiering in Longmoor with the satisfaction of a job well done and in four cases an Island wife.

It all began in 1965, when as a result of local pressure the ICC proposed that an airstrip should be built on Skye to make possible a regular air service between Glasgow/Inverness and Skye. However due to local political difficulties over the exact location for the airstrip the allotted engineer effort was deployed to Plockton on the nearby mainland where an airstrip was constructed in 1966.

By the summer of 1967 the area of Ashaig near Broadford was agreed by all as a suitable area for an airstrip and during November 1967 a reconnaissance of the proposed site was carried out by an officer from 62 CRE (Construction). His report was published in early 1968, but at that time no engineer effort was available to construct the airstrip. In January 1969 a conference held at HQ Scotland decided financial policy and agreed the specifications. A feasible OP MACC project was now a real possibility.

A detailed reconnaissance report and revised plans were published in May 1969 by which time final clearance for the project to be undertaken under the auspices of OP MACC had been obtained. On 15 May 1969, 37 Engineer Regiment was formally tasked with the project and on 1 July 1969 a troop of 66 Plant Squadron started work on the site. The purpose of this article is to describe some of the more interesting features of the project and to record the many valuable lessons which were learned.

PLANNING

The executive order issued by the Regiment said that 66 Plant Squadron was to carry out the project under the technical direction of 62 CRE (Construction). Once the Squadron had been given the job, all planning was based on the closest possible co-operation and consultation between 62 CRE (Construction) as the consultant and 66 Plant Squadron as the contractor. The initial plan had however been prepared before a unit had been tasked with the project and therefore without consultation. This resulted in some practical difficulties in applying the proposed earth moving plan. Consequently work started without a workable long term plan.

At the end of the first plant season, as a result of site experience and knowledge of the plant and manpower actually available, a new plan was jointly prepared by 62 CRE (Construction) and 66 Plant Squadron. This clearly showed that with the resources available the project would require two more plant seasons, ie three in all, whereas the initial plan had allowed only two. Work was therefore scheduled to be completed by 31 July 1971.

The revised plan was the basis for all future work, although changes were of course made to counter difficulties as they arose and new Critical Path and Cascade Diagrams were produced to implement these changes. They were, however, all within the

overall plan and made only after consultation between the consultant and the contractor. There is no doubt that without this very close co-operation the project could not have been completed within the planned time.

MOUNTING

Although Skye is, by the shortest sea route, less than a mile from the mainland of Scotland, the major mounting problem was the isolation of the Island from both Squadron Headquarters at Longmoor and the main centres of plant supply; Longmoor (66 Plant Squadron), Long Marston (Central Engineer Park) and Livingston (61 Engineer Park). The movement agencies available were road, rail and sea or combinations of the three. The journey by road from Longmoor to Skye by a Movements approved route is approximately 700 miles. This made for a slow turnround and to the detriment of other tasks called for the deployment of all the Squadron's transporters. Rail is more convenient, although certain items needed to be partially stripped to be "in gauge". Both the rail and road routes however converge at Kyle of Lockalsh where a small vehicle ferry provides the only convenient access to the Island. The limitations of this ferry, until 1971, when it was replaced by a larger one, were that no load could exceed 44 feet in length or 12 tons in weight. Consequently a loaded Scammel and trailer could not cross as a single unit. These limitations when linked with the long haul by road and gauge problems on the railway made a sea route using LCTs much the most attractive. However the two logical ports of loading, Marchwood in the South and Rhu the military port on the Clyde, both necessitated the initial movement of plant by road or rail and so involved double or in some cases treble handling.

In fact the build up of plant, vehicles and equipment over the three years was carried out mainly by the use of RCT LCTs. The plant and equipment being prepositioned by road and rail at both Marchwood and Rhu and the LCTs beaching on Skye within 2 miles of the site. The build up of equipment and vehicles during each season was:

By the end of 1969—27 of which 8 remained on Skye during the winter 1969/70.
By the end of 1970—66 of which 51 remained on Skye during the winter 1970/71.
By the end of 1971—67 all of which were evacuated during October 1971.

Of the equipment and vehicles used approximately 40% were from Squadron AF G1098 holdings. The equipment and vehicles deployed on the Island during 1971 are shown at Figure 1.

CONSTRUCTION

The lay-out and dimensions of the project are shown at Figure 2. The runway was constructed of 5 inches compacted 2½ inch stone and dust, sealed and covered with 2½ inches of bitmac which in turn was coated with bitgrit.

The general principle of construction was to remove the peat/top-soil then build to formation level by cut and fill and the importation of limited fill from a near-by quarry, this to be done over the full 250 feet width of the runway and shoulders. Once formation level was reached a slot 75 feet wide representing the actual runway was to be cut and this slot backfilled with the imported stone (marble), compacted and finally black topped leaving the surface flush with the shoulders.

This was the plan but in practice a large area of deep peat was discovered and the area of rock which it was proposed to rip and use as fill was found to consist of very hard sections interspersed with silt. Apart from the technical difficulties these discoveries caused, they also meant that large quantities of additional fill were required to replace both the peat and the unusable rock/silt mixture. So instead of the 3,450 cu yds of imported fill called for in the original plan, a total of 100,715 cu yds were finally brought onto site. The achievement of this greatly increased haulage requirement was only possible, within the planned time scale, by the fortuitious availability in the middle of 1970 of two Cat 621 Motorized Scrapers, of which the Corps had just taken delivery. These two machines were capable of bringing onto site from a

BROADFORD AIRSTRIP

Equipment Deployed to Skye 1971

Serial	Item	Quantity
1	Tractor F/T Heavy D8H	2
2	Tractor F/T Heavy Vickers	1
3	Tractor F/T Medium D6C	3
4	Tractor F/T Light TM70	3
5	Tractor F/T Light Drott	1
6	Tractor Wheeled Medium A/C	1
7	Tractor Wheeled Light	1
8	Grader 12 ft Mouldboard	2
9	Excavator C/M ¾ cu yd Hymac	2
10	Excavator C/M ¾ cu yd 19RB	2
11	Scraper Motorized 18/20 cu yd 621	2
12	Scraper Towed 8 cu yd	1
13	Paver S/P PF90	2
14	Dump Truck 6–8 cu yd	1
15	Dumper 6 cu yd	3
16	Dumper ¾ cu yd	2
17	Vibroll 4½ ton	4
18	Roller Smooth Wheeled 8½ ton	2
19	Roller Vib Ped Bomag	2
20	Spreader S/P Phoenix	1
21	Waggon Drills 3½" Holman	2
22	Distributor Water 1,000 gal	1
23	Compressor 315 cfm	2
24	Steam Cleaner	1
25	Servicing Tlr 2 ton	1
26	Fuel Bowser 1,000 gal	2
27	Concrete Mixer 7NT	1
28	Scammel and Tlr 20 ton	1
29	Truck 4 ton GS	3
30	Truck 4 ton tipper (Commer)	12
31	Truck ½ ton GS	1
32	Truck ¾ ton GS	2
	Total	67

Figure 1

quarry approximately 1,000 yds distant 1,500 cu yds of fill a day and on some occasions their daily haul reached 1,700 cu yds. Their presence certainly saved the project from a massive delay but their rate of delivery had to be matched by an increased compaction effort to ensure that the fill was correctly laid.

The discovery of the additional peat clearly indicated that the original site investigation had been inadequate. Before revised plans could be made a new and detailed survey of the peat was required to determine its exact volume. No suitable reconnaissance equipment had earlier been available but at this stage a Craelius Auger had been purchased as a planned Lindsell buy. This enabled the exact depth of the peat to be determined, and to our horror it was found in places to exceed 18 feet, all of which would have to be removed and replaced with good fill. As a result of this discovery the final grade line of the airstrip was lowered by 2 feet to reduce the amount of fill required and the critical path amended to show the increased effort required. The revised plan showed that the original completion date of July 1971 would no longer be possible and allowed for completion by September 1971, a date which subsequently proved to be accurate.

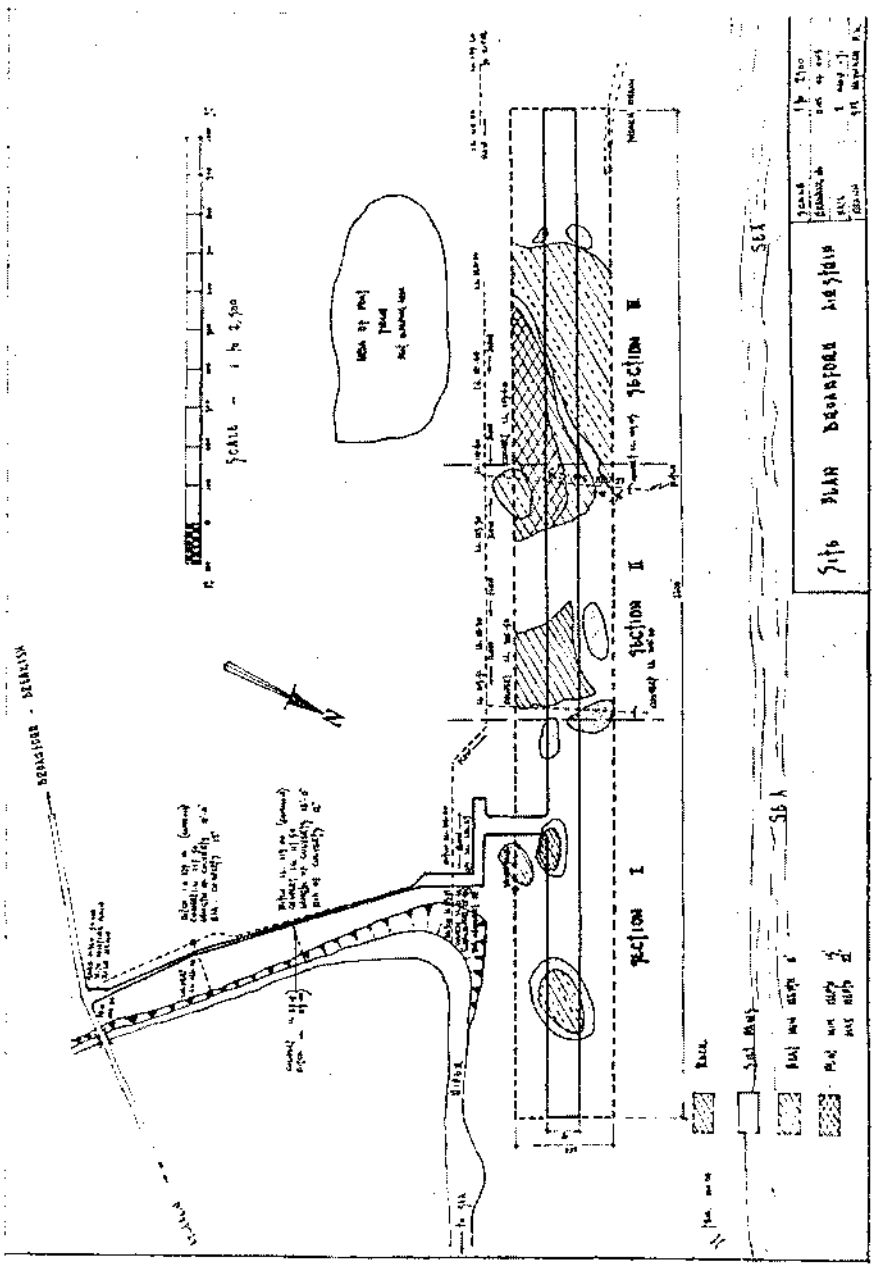


Figure 2

The overall quantities moved not counting cut and fill within the site were:
Peat removed: 73,584 cu yds.
Rock blasted and dozed to waste: 18,637 cu yds.
Waste material (silt and organic gravel) removed: 13,055 cu yds.
Fill quarried and brought on site: 100,715 cu yds.

TECHNICAL FEATURES

The major technical features worthy of comment were:
Problems of peat removal.
Sub surface silt.
Drainage.

Peat on site varied in depth from a few inches to in excess of 18 feet and it was found that each depth required a different handling technique. These were only found by trial and error since no plant manual could be found which covered the problem. In addition to the cutting of the peat from the actual working area there was also the problem of peat removal. Peat cutting and peat removal were therefore tackled as one problem.

Shallow peat (up to 2 feet deep) was initially cut with towed scrapers. Although this method picked up the peat it was found to be impossible to remove it from the scraper bowl as it rolled up like a Swiss roll and could not be forced out. Straight dozing was then tried and this worked well, but it could only be used in areas where the peat could be dozed into the sea or the river and did not have to be picked up. In areas where straight dozing was unsuitable a 19RB face shovel or drag line was tried. Using the face shovel it was possible to load the peat directly into 4½ cu yd dumpers or Commer tippers but this method was slow and left deposits of peat on the subgrade. The drag line left a cleaner subgrade but double handling was involved since piles of peat were produced which then had to be loaded into haulage vehicles. During 1971 Allis Chalmer Medium Wheeled Tractors (MWT) were employed and these were found to be effective although they were not able to achieve their designed output.

Medium depth peat (from 3 to 6 feet) was, under Skye conditions, found to be the most difficult to remove, since the subgrade tended to be very wet and unable to support with ease any conventional machine. Hymacs, 19RB face shovels and Allis Chalmers were all tried in turn. The most effective method evolved was for an Allis Chalmer to fill its bucket, reverse to stable ground and load tippers parked on the haul road. This was slow because it involved frequent stops to bring in fill to support the MWT, but it was faster than the use of excavators since they required a completely stable haul road to be built adjacent to the working face to support the tippers.

The deep peat (in excess of 6 feet) had a subgrade of stable silt. If this subgrade was covered with fill immediately after exposure it remained stable but if left exposed and allowed to get wet it became unstable and unable to support any machine. Once the silt became unstable it had to be removed. The technique evolved for deep peat was to excavate the peat, stopping frequently to backfill with imported fill. The excavators consequently remained on fill throughout and were able to receive tippers and dumpers at the peat face. Plant used was either 19RB or Hymac face shovels, the more effective being the Hymacs because of their faster speed of operation.

To summarize, recommended techniques for peat removal (in conditions similar to Skye) are:

Up to 2 feet deep—Doze to waste or pick up with a MWT.
From 3–6 feet deep—With stable subgrade—face shovel.
With unstable subgrade—MWT.
6 feet plus—Hymac face shovel.

Sub surface silt occurred in two forms and presented different problems in each case. One form was found under the deep peat and the method of dealing with this has already been described. Silt was also found under isolated areas of rock in silt

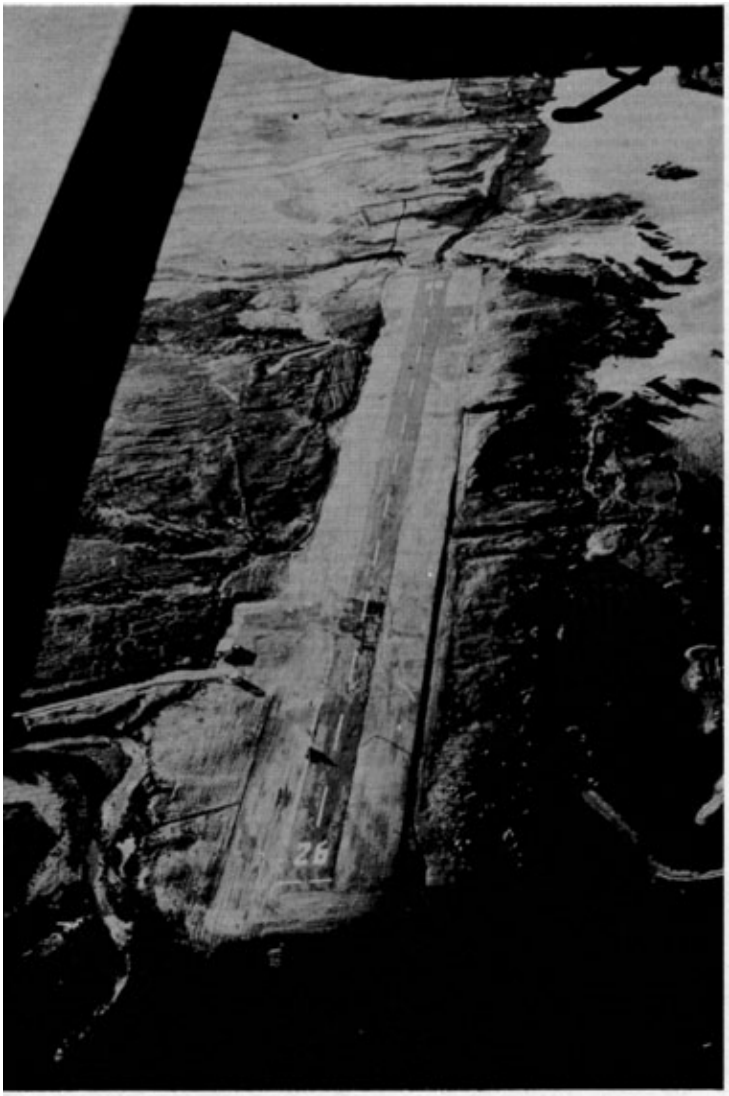


Plate 1. Completed airstrip showing terminal building and fire station

pans formed by subterranean springs fed by the percolation of water beneath the peat layer from the catchment area to the South of the runway. The silt pans were permanently unstable and not only had they to be removed but their supply of water had to be cut off or diverted. Once the South shoulder of the runway had been completed all water flowing through or under the peat was kept away from the formation by channelling it into the side drains but this work was not completed until the last few months of the project. During construction a considerable amount of work was involved in dealing with these sub rock silt pans. The best solution was found to be to dig French drains from the lowest point of each pan and channel the water to the North into the sea. The silt was then excavated and the hole backfilled.

Drainage, as on any plant site, was a critical factor and it was especially so in this case on a site which was exposed to two winters and excessive summer rainfall. Rain was such an important factor in the design and execution of this project that it is

Plate 2. Peat face 12′ high

Airbridge To The Misty Isle 2

considered separately. The drainage plan for the finished airstrip was conventional with longitudinal V ditches on each side of the cleared area and two culverts under the runway. The major problems occurred during construction and two of note were the use of interceptor drains and the clearance of water from the peat face. During 1969, an interceptor drain 4 feet deep was dug on the South (uphill) side of the site to prevent the peat on the area of the runway from becoming water-logged during the winter 1969/70. In areas where the invert level of this drain was below the peat bottom it worked well, but in areas where there was still peat below the drain it was completely ineffective because the water flowed onto the proposed runway site through the peat beneath the drain. It is clear that when constructing interceptor drains in peat they must be of sufficient depth to be below the peat bottom.

As described earlier, as the deep peat was excavated the area had to be backfilled with imported fill. This fill could not be brought in right up to the peat face because a working space had to be left for the excavator bucket. Thus in effect a ditch was formed at the base of the peat face and since water was continually draining through the peat this ditch was always filled. The disposal of this water was a constant requirement since to have left it would have resulted in the sub peat silt becoming unstable and in this form would have undermined the fill. Consequently, while the deep peat was being removed, a constantly changing system of temporary drains and culverts was employed to drain the peat face into the main culvert outfalls. The temporary drainage plan was complicated by the requirement to keep open the haul roads so that fill could come in from one direction and peat be removed in the other. The requirement to drain the peat face resulted in many weird and wonderful arrangements which tested to the full the ingenuity of both the Project Officer and the Author, but forcibly demonstrated the need for flexibility of thought and a willingness to try *ad hoc* and unconventional methods. At one stage a temporary culvert flowed under an existing main culvert and although this meant the subsequent relaying of a short

Plate 3. Pusher plate in use on a D8H

section of the main culvert this was preferable to the only alternative which was to blast a water course through solid rock.

RAINFALL

The most significant factor affecting the planning and speed of completion of the airstrip was the heavy rainfall experienced on Skye.

The average annual rainfall measured at sea level is 71·36 inches. Statistically the driest months are March, April, May and June which have average rainfall figures of 4·58, 4·55, 3·71 and 4·04 inches respectively. August has 5·43 inches and September 6·70 inches. Needless to say 1970 was the wettest summer recorded and during a period when it was planned to lay and compact fines, 2·23 inches of rain fell in 24 hours. These general statistics however were all known before the project started and therefore the rain was no surprise, although the ability of the peat to absorb and retain moisture was a surprise to many. The initial plans made an allowance of 50% for bad weather. This however was quickly proved to be inadequate and revised plans made an allowance of 100%. This figure during late 1970 and throughout 1971 proved to be reasonably accurate.

Although an overall plan exists for all projects there is always a flexibility in day to day planning. Initially on Skye this flexibility was overstretched due to the frequent need to change the prepared daily programme because of unexpected rain or other adverse weather conditions. Similarly specialized tasks requiring three or four days dry weather were started and then abandoned because of rain on perhaps the second day. During 1970 and 1971 these problems were eased by having and using a weather forecast specially prepared for the Skye area by RAF Leuchars. This in conjunction with the general BBC weather forecast proved to be a great asset and considerably helped the day to day site planning.

COMMENTS ON MAINTENANCE, SERVICING AND MACHINES

The requirement for a high plant utilization rate meant that serviceability had to remain good. This was achieved, but only because of the hard work of the Forward Repair Team and the close co-operation which existed between the unit, COD Chilwell and the REME Contract Repair Organisation in Aberdeen. Throughout the project daily servicing was carried out by the operator/driver at the end of each day's work. During 1970 periodic servicing was carried out by a servicing team taking machines out of work as servicing became due. Despite switching of machines it was impossible to prevent the removal of one machine disrupting the work of others. Consequently in 1971 the system was changed and all periodic servicing was carried out on one day each week. Machines received their servicing in the week nearest to their due date. On the weekly servicing day 25% of all machines also received their unit monthly inspection. It was found that in this way disruption of the project was reduced to a minimum and, coincidental or not, serviceability improved. During 1970 serviceability fluctuated between 65% and 85% whereas during 1971 it was better, in that fluctuations were reduced and serviceability remained constant at between 80% and 90%. These figures are slightly lower than would have been achieved on a less isolated site because machines requiring major overhauls or even those declared BLR had to remain on site and be counted as part of the held equipment until they could be evacuated at the end of the season. (For the purists it should be noted that serviceable meant task worthy and not serviceable by CIV standards.)

The overall effectiveness of machines was good and many loan machines worked more hours on Skye than they had during their previous eight or twelve years service life. The Hymac excavators gave sterling service during the peat removal stage, two of them working with up to six 3-ton tippers cut and loaded a daily average in excess of 500 cu yds. Some initial difficulties were experienced with these machines as it was found that when working as a face shovel they were incapable of lifting a full bucket of wet peat and with a three-quarter full bucket were incapable of swinging uphill when the base machine was canted at more than about ten degrees. This failing was

rectified by boosting the hydraulic fluid pressure to that used on civilian machines. The use of the Cat 621 motorized scrapers brought to light one interesting fact concerning the supply of pusher plates for the pusher dozer. The two machines on site were used to bring in fill from the quarry and were push loaded with a Cat D8H. Initially the D8H was used without a pusher plate and as a result the pusher beams of the scrapers punched a hole through the blade of the D8H. The Caterpillar organization was therefore asked to produce a pusher plate but none to fit an angle dozer blade were held in stock in either their UK or European depots. Civilian contractors apparently fit pusher plates only to dozer blades. The difficulty was overcome with the help of REME Contract Repair Branch who arranged for Glasgow Dockyard to manufacture a pusher plate within four days with the aid of a wooden template made by the unit. Caterpillar subsequently manufactured a pusher plate to fit the angle dozer but it was not required because the temporary plate proved completely satisfactory.

EXTRA-MURAL ACTIVITIES

The men of the detachment fitted in very well with the local community and made an effort to adapt to local customs. A local historian gave lectures on the customs and history of Skye, while the Squadron ran regular whist drives and operated the only cinema and "Night Club" on the island. These activities helped to improve community relations and at the same time provided interests for the men. A full length SKC feature film was shown each week which was attended by invited guests (in the main girl friends). An invitation to these shows became a much sought after privilege. The troop club was also open to guests on one night a week. This enabled the men to return, at least in part, the hospitality offered by the Islanders whose disregard for the licensing laws had to be seen to be believed, However it was not all wine, women and song. On four occasions the troop were turned out at the request of the police to help in mountain rescues, and on two occasions it was the soldiers who found the missing persons.

There is no doubt that the Sappers made an impression upon the Islanders and certainly some of the magic of the "Misty Isle" rubbed off on to the Sappers who still return to Skye for their leaves despite memories of twelve-hour working days and six-day working weeks, often in appalling weather conditions.

LESSONS LEARNED

A great many lessons were learnt on this project and inevitably a number of old lessons were forcibly relearnt. The lessons fall into three classes—planning, technical and administrative/manpower. Under planning two old lessons were relearnt, firstly the need for an accurate and detailed reconnaissance. Had the full extent of the peat and the quality of the rock been known, prior planning could have been made to cope with the problems rather than depending upon a reassessment using new equipment and the subsequent last minute requirement for motorized scrapers and additional manpower. Secondly was the proven need for consultation between the designer and the builder during the planning stages. We were lucky in this respect and the closest possible consultation and co-operation existed between 62 CRE (Construction) and 66 Plant Squadron throughout the project, but during the initial planning stage before we were tasked for the project the unavoidable lack of this consultation was reflected in the initial plan. The many technical lessons learnt may be read in detail by those who are interested in the Project Report which is held at the RSME and the RE Bureau of Archives. They may be summarized as:

The various methods found to be the most effective to remove varying depths of peat.

The importance of accurate weather forecasts from both civilian and service sources, to avoid as far as possible last minute changes in the day to day plan.

The equipment servicing plan must be flexible enough to adjust to site conditions and must not be bound by hard-and-fast text-book limitations.

Full use must be made of trial and error techniques where conventional methods have failed or proved inadequate. Flexibility of thought in using *ad hoc* and improvised methods

Plate 4. CO 37 Engr Regt arriving in first aircraft
Note marble surface prior to black top

should be encouraged. MPFs as well as Project Officers should be encouraged in this respect. The four main lessons learnt in the manpower and administrative group were:

Firstly the need for sound administrative backing both on and off the site. There is no question that a project of this size is too large for a troop commander if he is to be responsible for both the technical and administrative control. A second officer had he been available would have been invaluable to run the day to day administration such as pay, PRI, welfare, accommodation and messing. He could also have done much of the very necessary and time consuming stores chasing.

Secondly the misemployment of JNCOs can be disastrous. During the latter part of the project we were desperately short of operators and put JNCOs on to the machines to make numbers up. This was a bad mistake and resulted in the lowering of standards of both site supervision and minor unit administration. It also prevented the JNCOs concerned from gaining the maximum training value from the project.

Thirdly the training value of a project to individual tradesmen is reduced when maximum output is required to meet a tight planning dead-line. During 1970 the policy was to change men from machine to machine about every three months, thus enabling them to gain a wide range of experience. An attempt was also made to improve their skills by putting them on the machines at which they were least proficient. During 1971 when maximum output was required the men were, of necessity, kept on the machines at which they were most proficient, thus improving their already high standards but neglecting their weaker skills.

Fourthly every plant site must have a labour force. Combat Engineers were in short supply throughout the project and the Plant Squadron holds none on its establishment. This shortage was overcome by the use of Royal Pioneer Corps men who made an excellent substitute for at least 50% of the total requirement.

CONCLUSION

The major conclusion is that a project of this size extending as it did over three years, is too large for a troop with only one officer but despite this, projects of this nature provide excellent training value for both management and tradesmen. However training limitations do exist and must be fully taken into account by both tasking and planning authorities. If given another task of comparable size I, as a Plant Squadron Commander, would unreservedly welcome it but would seriously heed the lessons learnt on the Misty (Sodden!) Isle.

"Equipping the Man" or "Manning Equipment"

MAJOR J. P. M. WILSON, RE

THE war for which our forces in Germany have been prepared has not really altered in the last decade or so. The main threat appears to be a conventional battle which could suddenly extend to the use of both chemical and nuclear weapons at any time.

The army in BAOR has been organized to meet this threat by the formation of battle groups and combat teams of all arms, equipped and armed to fight in both a conventional and NBC environment.

The role of the Sappers in the BAOR battle is still to maintain the mobility of our own battle groups while impeding that of the enemy. Because of the overall superiority of the enemy forces facing Western Europe, the role of the Sappers is a vital factor in the war.

In broad terms the priorities for engineer work dictate that when aggression is imminent all engineer resources are committed to the corps defence plan, and only when work on this has ceased can engineer units revert to supporting their own formations. First priority therefore in the BAOR battle is to impede the enemy's mobility, and only after this phase can the battle group have its affiliated engineer support to maintain its own mobility.

Once battle is joined the battle group commander will be very concerned to ensure his own freedom of movement. The main dangers to this freedom are from blowdown, minefields, ditches and streams, and from marsh and soft ground. It must follow therefore that these will be the main tasks facing the engineer troop commander in close support, and not only must he be capable of coping with these tasks but he must be capable of doing them quickly. With the excellent cross-country mobility of the battle group, and the need to move swiftly when out of hide positions no commander can afford to be halted by an obstacle for more than a matter of minutes. If pressed to quote a figure it would be reasonable to say that no combat team commander would risk being deployed in the vicinity of an obstacle for more than 20 minutes without radically changing his axis of movement or deploying to a hide position. Therefore the engineer troop giving close support must be capable of finishing its task within 20 minutes from the first reporting of the obstacle to the first vehicle moving over it.

It is the inability of the engineer troop to give this type of effective close support to the battle group which is the main burden of this article, and it is important to analyse the reasons for failure so that solutions can be found.

At present the new organization of engineers introduced three years ago in BAOR is working well, and from both the divisional and brigade commanders point of view it represents an established increase in Sapper manpower of over 50 per cent, which will normally be available to support his formation. However, this manpower increase is being squandered because the engineer troop does not have the right equipment to provide the support required. Its dozers do not have protection against conventional or NBC attack, they are relatively slow and do not have radio. The troop possesses no rapid mineclearing device, nor does it have any rapid short gap bridging potential. It has no rapid means of improving approaches and exits to bridge sites or to provide a way across soft ground for battle group vehicles. The engineer section FV 432 is in fact no more than an armoured transport vehicle capable of carrying a section around the battlefield ready to tackle dismounted tasks which in battle will neither be possible because of vulnerability nor required because the completion time will be too long.

Ever since the introduction of NBC weapons into the war the requirement for engineer equipment has changed from "equipping the man" to "manning equip-

ment". The need for dispersion, protection and mobility on the NBC battlefield has brought with it changing characteristics for engineer support equipment which must now incorporate protection, mobility, communications, increased mechanization and speed of operation. Protection must cover both crew and vulnerable equipment. Mobility involves physical size and weight as well as load class, speed and cross-country agility, as all engineer equipment must be compatible with battle group vehicles. Communications within the battle group dictate that essential equipments have the flexible radio potential to meet *ad hoc* grouping and command systems. Increased mechanization of engineer equipment ties in with protection in that it is required to prevent having to dismount men to carry out essential engineer support tasks as is necessary with present equipment. Lastly there is speed of operation which is linked to mechanization. The requirement here is for good mobility and communications as well as a rapid cycle of operations so that the particular task can be completed in say twenty minutes allowing time for reconnaissance and deployment.

Now to be constructive by considering what aid the battle group commander needs to ensure his mobility. The impediments have already been mentioned and now it is necessary to see how best to cope with them.

First, there is the need to deal with tree and building blowdown. Although this may be on a large scale, it may be assumed that combat team hide areas and prepared positions will have been sited with this hazard in view. To clear a passage through blowdown for combat team vehicles requires a heavy and powerful dozer which will afford protection to the crew from nuclear blast and radiation as well as falling trees and buildings. It is also essential that this dozer has radio communications both to receive orders when closed down in an NBC environment, and also to report progress and results on the task. The only machines providing the necessary tractive effort, protection and communications are tanks or large tracked APCs.

Secondly, the battle group commander may be faced by minefields. In the withdrawal these will probably be our own, while in the counter attack they could be both our own and those of the enemy. In dealing with our own minefields, equipment is less likely to be needed than sensible siting of minefields, an efficient system for providing minefield gaps, and rapid reporting of our own minefield laying. However, in overcoming enemy minefields (and perhaps our own in emergency) rapid mine clearing devices are needed. Although it is apparent that no one system will be effective against all types of mine, the field troop must have some ability to breach a minefield rapidly. At present instead of going for a variety of different methods of rapid breaching, the whole subject is in the "too difficult" category until a break through can be found.

Thirdly, there is the ditch or small stream obstacle to movement. It only takes a gap of 2½ metres to prevent an FV 432 vehicle from crossing, and about 3½ metres will stop most tanks. The shortest mechanical bridge in the future will cope with gaps up to about twelve metres. Not only will this be too unwieldy for the short gaps, but also the number readily available within the division will be too few to allow permanent allocation to the combat team. For over a quarter of a century the fascine has been successfully used to bridge this type of obstacle but in modern war it is too cumbersome to be carried about mounted and it takes too long to mount to be of significant value today. What is required is a short 6-metre span Class 60 bridge which can be speedily launched from one of the battle group vehicles.

Lastly, there is the problem of bad going. This is usually waterlogged ground such as marsh or water meadow. The only real answer to this type of going if a crossing is required is to use some tracking aid. The most successful of these is Class 60 trackway, which can be conveniently rolled up for carriage and if adaptations to a suitable vehicle are made, short lengths can be quickly dispensed where required.

CONCLUSION

While engineers in BAOR can efficiently cope with the first priority tasks at the outset of any hostilities in North West Europe they are not able to provide useful

close support to battle groups and combat teams on the nuclear and chemical battlefield with their present equipment.

There are now more field troops within the brigade than at any other time in recent history, but this potential is being wasted by a deficiency in equipment which centres round the need to provide the field troop with devices and equipment from which a protected crew can give the necessary engineer support in a matter of minutes. At present all support by the field troop to the battle group is either given by dismounted Sappers or by unprotected equipment. This is unnecessary when relatively simple equipment can be designed to do the majority of engineer support tasks required by the battle group.

The main specific requirements are for the field troop to be equipped with:

a. A heavy armoured dozer with radio and mobility at least as good as the main battle tank.

b. Rapid mine clearing device(s).

c. A 6-metre bridge which can be launched from a troop vehicle.

d. A Class 60 trackway dispenser which can be launched from a troop vehicle.

e. A troop vehicle with good communications which while possibly carrying fewer men is adapted to the engineer role (eg, with winch, simple dozer blade and a launching platform for engineer devices).

If these deficiencies are to be made good by the late 1970s it is essential that steps are taken now to look at equipment due in service in the next few years to see how best it can be adapted to fit the engineer support role in BAOR.

* * * * *

The Adoption of Colonel By Lake, Harriet Point and Esther Head as Official Geographical Names

MICHAEL B. SMART

In recent months the name and engineering achievements of Lieutenant Colonel John By (1781–1836), RE, Supervising Engineer, Rideau Canal (1826–1832), have become the focus of considerable national interest and publicity in Canada.

This has brought with it a renewed awareness and appreciation of the not insignificant role played in Canada's early political-geographical development by him and his Corps of Engineers. His contribution to Upper Canadian history, it is generally agreed, certainly deserves more than the passing references usually given to it in most Canadian (or American) history textbooks.

Furthermore, in the light of the treatment subsequently meted out to him in his own country following completion of the project in Canada, we thought it only fair that something more be done towards reinstating his name—at least over here—in a form which would lend itself to easy communication to the public in general.

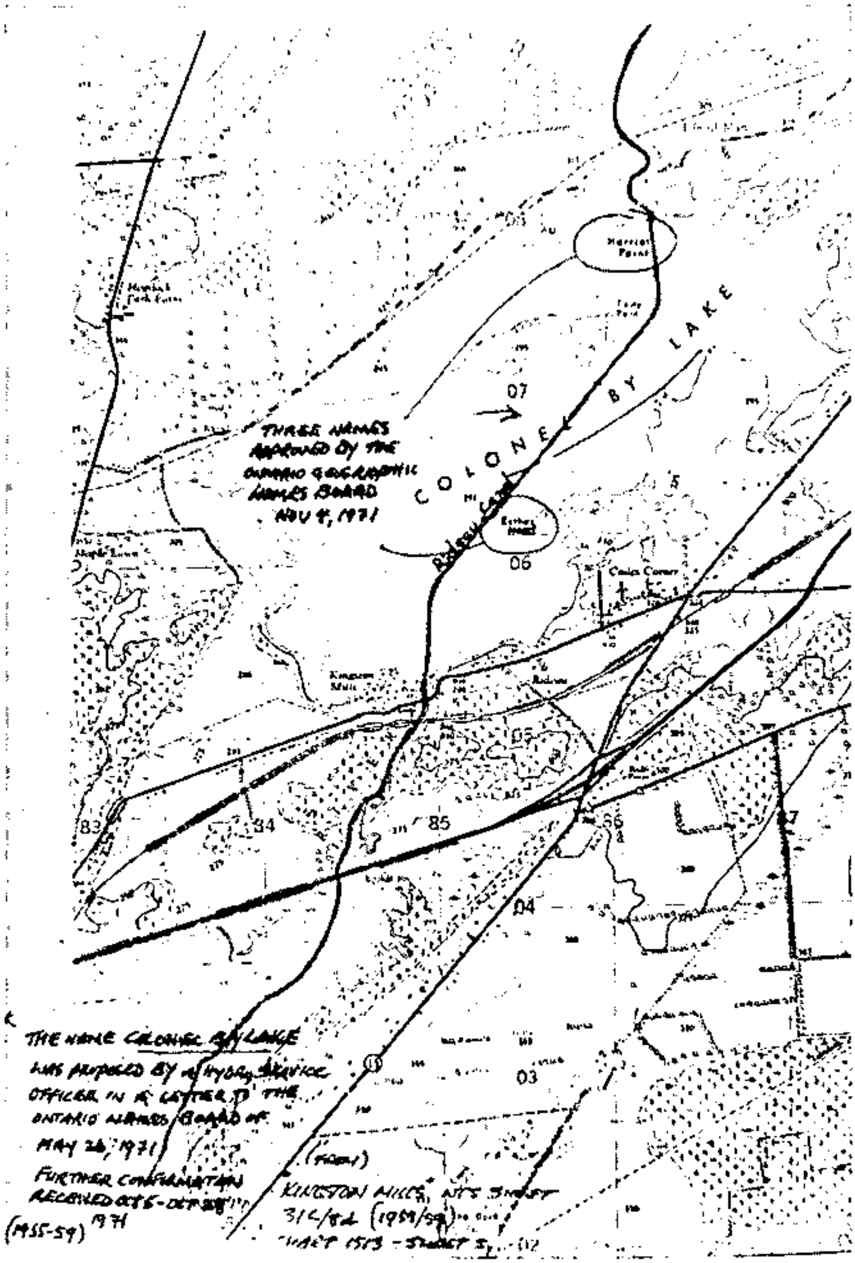
As a nomenclature board, we were equipped to do this, Our function and purpose is essentially to provide and to maintain for the Province of Ontario an accurate and systematic geographical nomenclature for its topographical maps. The provision has also been made, in the principles and procedures which guide our decisions, that in settled areas local usage is accorded prime consideration in all matters concerned with the determination of names of natural geographical and topographical features. In unsettled areas historical usage is called into play. In accord with this principle we have implemented, in commemorating Colonel By, the procedure of naming a prominent, and at the same time, appropriate, geographical feature in Southern Ontario.

In this part of Canada, formerly known as Upper Canada and still earlier as Quebec, the building of the Rideau Canal represented—in mid 19th century terms—one of the most revolutionary geopolitical rearrangements of vital communications in colonial North America. The scheme to establish a more secure link between Montreal and Kingston—and especially the Great Lakes—well behind the vulnerable Upper St Lawrence frontier, was successfully executed by By in spite of formidable obstacles. His canal effectively transformed the strategic geography of the young nation and shifted the political centre of gravity to the Ottawa. We are of the opinion, therefore, that the time for giving full credit and recognition to By for this prodigious accomplishment is long overdue.

Accordingly, we have, as the statutory authority in such matters, implemented the selection and naming of one of the above mentioned (and in this instance unnamed) bodies of water making up the Ridea Waterway which By constructed 140 years ago. The name Colonel By Lake was proposed early last year—met with local approval, and adopted as an official geographical name on 4 November 1971. As such, it will appear in the next series of maps to be published of Southeastern Ontario. The map enclosed is from a 1955–59 edition.

The adoption of the name followed a recommendation (together with others mentioned below) to the Minister of Lands and Forests of Ontario that the name Colonel By Lake (as indicated on map) be adopted and applied to a lake within the system of lakes and waterways making up the Rideau Canal.

Other tributes and memorials have taken on different forms. On 14 August 1971, a statue of By was unveiled in Ottawa—at the north entrance of the canal—by the Governor-General. The name of Ottawa itself, as you probably well know, was the name given in 1854 to the town which was then known as Bytown.



THREE NAMES APPROVED BY THE ONTARIO GEOGRAPHIC NAMES BOARD NOV 4, 1971
COLONEL BY LAKE
07
06
05
04
03
83
84
85
THE NAME COLONEL BY LAKE WAS PROPOSED BY A HYDRO SERVICE OFFICER IN A LETTER TO THE ONTARIO NAMES BOARD OF MAY 26, 1971
FURTHER CONFIRMATION RECEIVED OCT 6 - OCT 28 1971
(1955-59)
KINGSTON MILLS, NTS SHEET 31C/8d (1959/59)

We are confident that it will be of some interest to the RE Historical Society and the Corps of Royal Engineers to know, that, with the above Board decision, the name of By has been elevated to a permanent position on the official map of this country.

As it is now organized, the Ontario Board is a very new authority within the Provincial Government, having only come into force by proclamation on 1 April 1969. Prior to its establishment and the formal appointment of its members in July of last year, nomenclature decisions were made through the office of the Surveyor-General. The present holder of that office is one of the seven members of the current Board.

As shown on the enclosed map, Colonel By Lake is now the official name for that part of the Cataraqui River which was widened with the construction of the dam at Kingston Mills. This resulted in the creation of two lakes which make up the southern portion of the canal system. The newly named lake lies six miles northeast of Kingston, Ontario, and occupies that part of the waterway between the peninsula called Isle of Man and the Settlement of Kingston Mills.

The enclosed map is a portion of the National Topographic Series sheet Kingston Mills, 31C/8d, 1:25,000. The geographical limits of the lake are clear.

At the time of the above decision, the Board also processed, and recommended for approval, two other names intimately associated with the first. These are: Harriet Point and Esther Head—in commemoration of Colonel By's two daughters. They were, together with Colonel By Lake, officially approved on 4 November 1971.

The name Harriet Point replaces High Banks Point (a provisional description never formally approved and whose use was restricted to hydrographic charts), and Esther Head, which supersedes the local—and formerly official—name Niggerhead. The latter name, unfortunately, was no longer understood (at least not by the vast majority of people who now live in cities) in its original geomorphological context. It had to go—at least as an official name. Niggerhead has been rescinded, Esther head adopted.

The idea of communicating this information to you was first suggested to me by Brigadier L. J. Harris, RE, Surveys and Mapping Branch, Department of Energy, Mines and Resources, Ottawa, at the Annual Meeting of the Canadian Permanent Committee on Geographical Names in Regina last September.

I trust that this information does prove to be of some interest to your Institution and to the RE Historical Society in particular.

* * * * *

Souterrains at Hulloch

ALEX AIKEN, BSc, MICE, MIStruct E

In September 1939, after a 21-year truce, the Great War started again. As far as possible the French and British acted as if nothing had happened in the interval, but a few changes had to be accepted. As before, the British Expeditionary Force was deployed on the left of the main body of French troops; but Belgium, being neutral, now separated the British from the Germans.

In the Lille area the border defences were about 20 miles east of where the battle-front had been fixed between 1914 and 1918. It was decided to organize these defences in depth in the form of three lines, with a reserve position across the base of the salient formed by the frontier east of Lille. Twelve field companies of Royal Engineers were, in November 1939, drawn from Territorial divisions at home to be employed in digging anti-tanks ditches, constructing breastworks, and other works.[1]

Aerial bombing was taken as a serious threat, and the construction of deep underground headquarters for the major formations of the BEF was decided upon. For 2 Corps HQ, located at Phalempin, it was thought that the old workings ten miles to the west, opposite Hulloch, could be adapted for the purpose, and accordingly a Lanarkshire unit, 240 Army Field Company RE, was ordered to Annay sous Lens in the 2 Corps area.

Major Ness, the OC, visited the site on the 11 January 1940, with a view to breaking into the old workings.[2] These were not difficult to locate, since the spoil-heaps were still in existence and the entrances at the side of the Vermelles-Hulloch road had merely been filled in with lumps of chalk; presumably to prevent cattle falling down the steps.[3] The souterrains were not in fact opened until the 24th—the company having been away for a week on other tasks[2]—when Lieutenant Widdowson had the unpleasant duty of crawling down through the narrow opening first made. This officer was from the staff of the CRE 2 Corps Troops Engineers, to which 240 Company belonged. He, assisted by a Staff Sergeant, carried out the initial surface reconnaissance.

Most of the timbering had been removed—probably by the French farmers returning immediately after the Armistice—resulting in local falls of chalk. Signs of the previous occupants were fairly limited; regimental crests cut in the walls of the chambers, a few boxes of grenades and ammunition, an occasional rusted rifle. The workings were shallower than expected, having about 25 feet of cover, and doubts were expressed about their resistance to bombs; although what was sufficient for the large calibre shells fired in 1918 should have been enough for the size of bombs dropped in 1940. On the assumption that the German defences would have been better than the British, an entry was made about 600 yards to the east. The first thing that came to light was a German corpse; the equipment rotten, but still recognizable. Nothing more was heard of the proposal to use the German workings,[3] however, probably because the headroom was insufficient.[4]

Mining was interrupted twice; in the second fortnight of February, with the company away on bridging training, and again during the first week of March, when the unit was engaged in other ways. Underground working began again in earnest on 9 March when No. 3 Section, under Lieutenant Motherwell, set about extending the existing system.[2]

240 Company was not equipped for mining. Lighting at first was by hand-lamps, then by electricity from a lighting set with a Petters-type engine in a Nisson hut above ground.[3] Round-the-clock working began in the middle of March with the Field Company supplying two shifts, and 171 Tunnelling Company supplying one.[2] The latter unit had been specially formed—mining having ceased even before the end of the Great War—and given the number of the first Tunnelling Company to mine and blow the enemy's trench, in February 1915.[5] One of their officers was an older man

who had been responsible for some of the original excavations, and he was able to recall the positions of various chambers. A small book or pamphlet describing the Hulloch Souterrains was also traced, and this helped too.[3]

More than a mile of passageway was fully explored, and two dozen chambers inspected, of which more than half were useable. Twenty or more additional dugouts were planned, to house electric light plants and latrines; five new entries to the system were proposed.[6] 190 Electrical and Well Boring Company RE put down bore-holes for ventilation purposes;[3] all of which were found to be in the right places when the new chambers were subsequently excavated. Surveying by 240 Company was mainly limited to the use of prismatic compasses, although 171 Company was better appointed in this respect.

All the spoil from the new workings had to be disposed of underground, to maintain secrecy from aerial observation; although the Germans probably knew through spies anyway. Unuseable chambers were available to accommodate the excavated chalk, but as the work progressed this material had to be barrowed up to ¼ mile away. Latterly a narrow gauge track was used.[3]

So the work continued. Progress in excavating new 6′ 6″ by 3′ 6″ roads was about 6 feet in 24 hours. On the 24 March tradesmen were withdrawn from mining to work on RE Services, but as compensation 15 infantrymen with civil mining experience arrived the following day.[2] Some of those were Guardsmen, very tall and regimental, but keen to qualify for extra pay while attached to the Royal Engineers.[3] The work was mainly on each side of a subway known as Dudley Tunnel, one of three in the Hulloch area, used for passing men in safety to and from the front line.[5]

A considerable time was spent by the Company Commander surveying the existing underground workings, with Lieutenant Widdowson, and later alone, with the intention of opening up a new entrance.[2] Unofficial exploring was not easy; partly because the Section Officers were on duty all the time they were underground; partly because some of the chambers were waterlogged. Even wetter were the galleries where they dipped or were low-lying; with the added complication of being festooned with old signal cable—great numbers of wires fastened to the roof, but broken and hanging down to the floor in places.[3]

One officer[7] claims to have followed the main forward lateral—which by June 1916 was continuous from the vicinity of Hulloch northwards to the La Bassée Canal, a distance of four miles[5]—as far as the Hohenzollern Redoubt one and a half miles away. How this could have been done underground, past roof falls and through ponded water[3]—the ground level falls about 30 metres[8]—is not clear.

Early on the 10 May 1940 the German armies attacked Holland, Belgium and Luxembourg; the same day Major Ness received orders for his Company to move into Belgium.[2] The First World War had ended; the Second had begun. After the departure of the British troops the French civilians removed the revetting from the entrances which then fell in,[4] until eventually the sites became indistinguishable from the traces of the earlier war. The Souterrains at Hulloch were never used.

SOURCES

1. THE WAR IN FRANCE AND FLANDERS 1939-40 by Major L. F. Ellis (H.M.S.O. 1953).
2. WAR DIARY 240 Army Field Company RE.
3. MOTHERWELL, A. C. Late Major RE.
4. STANISLAS, ANDRZEJENSKI. Hulloch.
5. TUNNELLERS by Captain W. G. Grieve and Bernard Newman. (Herbert Jenkins, Ltd. 1936.)
6. CHASSELLS, MIRRLEES (deceased). Late Major RE.
7. HINDMARCH, E. Late Major RE.
8. 1:10,000 TRENCH MAPS. Edition 7A. Sheet 36c N.W.3. Loos. Trenches corrected to 11.6.16.

Early Days

M.L.C.

In the *Journal* for April 1872 is reprinted the "Royal Warrant Regulating the Employment of Engineer Officers in Civil Situations under the Crown". In it we discover that "Officers lent for civil employment shall be placed temporarily on the Reserve List and shall have a right to return to their Corps provided they elect to do so before 10 years of continuous civil employment". Such Officers, "so long as they continue in the Civil Service and keep themselves efficient as Military Engineers, shall be promoted in their Corps as vacancies occur for the Officers on the Establishment next in seniority below them." Further, for those Officers on the temporary Reserve List, the Civil Service only paid "extra costs"—to use the present jargon.

In these days, when every established post is minutely scrutinized for its day to day military justification, this makes strange reading. Here there are no undertones of having laboriously to justify MACC because of its training value. The justification was that for an immense range of posts—technical and administrative—the education, training and experience offered by the Corps both attracted men of ability and prepared them in a way no other bettered.

That said, in some ways the early *Journals* made a disappointing mouthpiece for the immense diversity of operation and thought present in the Corps. Thin gruel indeed—to an extent that in June 1872 the Editor makes that familiar appeal for Officers to write "on the professional subjects in which they are interested or engaged". However, it must be remembered that the *Journal* was complementary to the "Professional Papers", which were published once per year. These contained fourteen or so technical articles of the type now published in the *Journal* itself. Indeed, the *Journal* has now almost wholely replaced the "Corps Papers" as a forum for technical discussion.

The Officer who started the Professional Papers, and who in so doing "with the single exception of the founder of our school at Chatham, has done more to increase the interest of his brother Officers in their profession" died in 1871. A long memoir, together with that of Field Marshal Burgoyne, was published in the 1872 *Professional Papers*.

Lieut-General Sir William Denison was a Captain in charge of Admiralty works at Woolwich Dockyard when he started to edit the papers in 1837. Denison's own career was immensely varied. Civil Engineering, Survey, Works, Colonial Governor; administrator, innovator, practical engineer. The judgement of Sir John Burgoyne, who recommended him to be Governor of Van Diemen's Land, when he was a Captain in a works appointment at Portsmouth, was amply justified.

Denison may have been unusually "dedicated and motivated", but he repeated in correspondence, time and again, that the background and experience of Royal Engineer Officers enabled "those, who so chose, to pick up and use a varied mass of information in the course of their professional careers". The operative words were, perhaps, "who so chose". It was Denison again, who underlined the value of the integrity of an Engineer Officer in appointments such as Colonial PWD (let alone Admiralty works) and Directors of Mints, where honesty appears to have often been lacking.

After being away from the Corps for nearly 20 years, years which had brought him a KCB and a spell as acting Viceroy of India, Denison elected to return to the Corps when offered the job of CRE Portsmouth. Although this was a less humble appointment than CRE Gravesend, to which Gordon returned after his Chinese exploits, the posting was later cancelled, much to Denison's disappointment, as being beneath his capabilities. Instead he was employed until his final retirement as Chairman of the Royal Commission inquiring into the means of preventing the pollution of rivers. This present age seems to have had no monopoly in concern for that subject!

What would Denison, and the many Officers who, like him, had distinguished careers outside the Corps, make of the present day Corps? They would, one feels sure, be sad at the lack of opportunity, but, one would guess, be correspondingly active in their search as to how present circumstances could be put to good effect. For instance, if varied careers could not be pursued within the Corps, how could they be created more satisfactorily within the present "two career" concept.

Denison, one hopes, would be reasonably pleased with the *Journal* and at the number of Officers who "so chose" to pass on to others what they had learned in their professional careers. As a winner of the Telford Medal awarded by the Institution of Civil Engineers, he might have wished that the Corps relations with the Professional Bodies could have seemed closer. He would have approved of Captain E. D. Malcolm who read a paper on "Military Telegraphy" before the Society of Telegraph Engineers, an account of which appeared in the *Journal* of June 1872.

The "100 years ago" feature of the early *Journals* took the form of various unedited extracts from earlier Army orders. We are reminded that the Corps of Engineers became the Corps of Royal Engineers in April 1787 and that the Corps should rank "with our Royal Regiment of Artillery". Further, when RE Officers paraded without troops (which would have been drawn from the Royal Military Artificers) the Royal Engineers "should be on the right with the Royal Artillery, Engineer and Artillery Officers taking precedence according to date of Commission".

At the Siege of Lille in 1708, the Duke of Marlborough was gravely critical of his Chief Engineer, Le Roches, who was accused of badly misjudging the weight of bombardment necessary to reduce the fortress. Thus the Army had to stay in the field much longer and consumed vastly greater supplies, including powder and shot, than had been anticipated. The Engineer responsibility for such advice, in which Le Roches had failed so lamentably, is very much reflected in both the *Journal* and the *Professional Papers* as a result of the Franco-Prussian war. Much rather dull detail of the exact number of guns, their range, calibre, deployment and so on at sieges such as Belfort, Strasbourg and Paris are listed. The need to forecast bridging and demolition times today is certainly no less important. It would seem that such matters are very much more interesting!

In this connection, a lively exchange developed as a result of an article "On Defensive Reform" published in the 1871 *Corps Papers* by Captain A. Parnell, at that time an instructor at the SME. Parnell's thesis was that the object of any fortification was to stop the enemy and that the most effective way to do this was to bring him under concentrated fire. Therefore, instead of building expensive fortifications with the usual extensive—and expensive—flanking defences and outworks, the money would be better spent on providing the maximum artillery with the minimum necessary earthwork etc. Furthermore, within the fortress area means—mostly a railway network and the necessary carriages—must be provided so that even the largest calibres could be quickly moved to reinforce a threatened direction. "Not an armed system of fortification but a fortified system of artillery."

A full meeting was held in the SME to discuss this paper. Giving such prominence to the massing of artillery fire did not meet with much favour. "By adopting this view we should, I think, abandon much of the business now assigned to military engineers. The designing of fortifications will no longer offer much scope for the application of engineering." Arguments such as these are possibly not the best to deploy against new ideas, although they must always be expected! In his reply in defence of his much simplified system of earthworks, the author submitted that "ingenuity is by no means an essential ingredient of engineering". This aphorism almost seems to contain the seeds of the subject for a prize essay!

No note on the events of the early 1870s would be complete without some mention of Sir John Burgoyne. He spent thirteen years in the Civil Service, notably in Ireland, before again returning to military duties. During these years he had "succeeded in adding greatly to the estimation in which his previous brilliant military career, had caused him to be held". Would he, one can again speculate, with his

immense influence both within and without things military, have seen some formal way of fashioning a truly full career for Royal Engineer Officers who showed the necessary ability, inclination and drive? If he could not, then nobody could.

Correspondence

Lieut-Colonel P. I. Manning, TD, RE (V) BSc, FGS, PAIWE
Geologist Engineer Specialist Pool
Mountain View
Ballyskeagh, Lisburn, N. Ireland.

LIEUT-COLONEL JOHN BY, RE

Sir,—I was interested to read an account of the exploits of Lieut-Colonel By RE (*RE Journal* December 1971, p 236). However, the last paragraph suggesting that his name might now be unknown is fortunately not true.

His name is perpetuated by geologists in the mineral named Bytownite (Bytown is now Ottawa as you point out). It is one of the intermediate plagioclase feldspars. Rather oddly the original Canadian occurrence has been shown to be a mixture of anorthite with quartz, etc but Bytownite does occur in certain basic plutonic and volcanic rocks. Very rarely it forms the rock called plagioclasite or anorthosite. It may also be formed by contact or regional metamorphism and can be found in some meteorites.

Currently it has been shown to be of common occurrence in the lunar basalts brought back by American astronauts.—Yours faithfully, Peter I. Manning.

Brig C. R. Mangat-Rai (Retd),
42 Cottage Street,
Hingham, Massachusetts,
26 March 72

LIEUT-GENERAL SIR HAROLD WILLIAMS

Sir,—It was with deep regret that I learnt of the death of Bill Williams whose service to India, rendered in diverse forms, has been inestimable. He gave generously as a professional soldier, as an engineer, as an educator, as a mountain climber, bird lover, Freemason and above all as a man who had a tremendous love of people which expressed itself in his genial personality wherever he went.

I first met him in Roorkee in 1935 when we were both serving in the Bengal Sappers and since then I have been in continuous touch with him either officially or as a personal friend. I had the honour and privilege of serving under him throughout his time as E-in-C, India.

The Corps of Engineers is particularly indebted to him for the sound foundation he laid after Indian independence for the training of officers, a matter with which he became concerned early in his service in India when he was appointed to supervise the education of YOs at the Thomason Engineering College, Roorkee. From that position he went on to be Commandant of the SME, India, as it was first called, and later, as E-in-C, he was the person to whom the principal credit must be given for the creation of the College of Military Engineering, Kirkee. This Institution will be a memorial to him. It is recognized as one of the premier training establishments in India.

However, his official services to India will be listed in his memoir in your journal. Here I should like to mention some of the personal qualities that endeared him to his friends in India.

He seemed completely to lack any racial pride or sense of self importance. He was naturally and unaffectedly friendly to all alike irrespective of rank or talent. As E-in-C he had to attend many official functions and social occasions. He was always at his best at these and was genuinely and patiently interested in the affairs of those he met. Though he remained a bachelor, he did much entertaining himself and was careful to include ladies in his parties. He used his powers of organization to assemble a congenial, multi-racial group graced by beautiful women in brilliant saris and elegant evening dresses, often in the setting of the Delhi Gymkhana Club.

He had a talent for bringing out the best in young men whom he encouraged in their various enterprises whether it be shikar, sailing or mountain climbing. It was largely due to him that the Corps of Engineers played a leading role in India in fostering these outdoor activities. He set an example himself of getting away from his desk in Delhi in the summer to trek and climb in the Himalayas.

He was very knowledgeable about Indian birds and when I was Commandant of the CME one of the more difficult, because unfamiliar, tasks that I undertook for him was to print *Birds About Delhi* (by H. P. W. Hutson with preface by Bill). My wife was pressed into service for doing the proof reading. I recall with pleasure the time, 1 March 1959, when my wife and I went on an afternoon's motor trip with him from Aligarh to Narora on the Ganges. He pointed out birds to us as we sped along and my wife jotted down the names. It was a list of 67 varieties ranging in type from the black ibis to the sarus crane.

It has been remarked by some of his Indian friends that he must have lived out an earlier incarnation in India, so at home was he in the country. He will be remembered with affection and respect and his passing will be mourned widely by a varied circle of persons who loved and admired him.—Yours faithfully, C. R. Mangat-Rai.

Major E. S. Straus
Hon Secretary
IEME Officers Dinner Club
10 Dorchester Court
Herne Hill
London SE24 9QX
29 January 1972

Sir,—It was indeed most kind of you to send me the galley proof of Bill's Memoir: Reading it brought back many memories to both my wife and me and surely no man could wish for a finer memorial, than to be missed as a true friend by so many of all races and creeds and differing station in life.—Yours faithfully, E. S. Straus.

Brig. M. L. Crosthwait, MBE
Darwin College,
Cambridge

BRANCH MEETINGS OF THE INSTITUTION

24 April 1972

Sir,—Some of the readers of the *Journal* may have noted that one of the subjects set this year by the RUSI for the Gold Medal Prize Essay, is as follows:—

> "Since the end of National Service the Army has increasingly drifted back into its pre-World War II position of semi-isolation as regards its relationships with the Civil Community. A very considerable sociological gap once again exists. With the Army withdrawing into Europe and becoming increasingly UK based it is clearly important that this gap should be closed. Examine the reasons for this sociological gap and recommend ways of removing it so that the Army may become more closely integrated with the Civil Community."

I hope it is not too optimistic to suggest that an energetic pursuit of Branch Meetings, as recently encouraged by the Institution, might help in their own way to keep the doings of the Corps fresh in the minds of a non-military audience. It is hoped that local civilians who are Members of Professional Engineering Institutions and retired RE Officers, will be encouraged to attend. The RSME paved the way admirably at the recent joint Meeting with the Kent Branch of the Institution of Civil Engineers. Another successful Branch Meeting has been held at Newcastle upon Tyne sponsored by HQ. 29 Engineer Brigade (V).—Yours faithfully, M. L. Crosthwait.

Major A. F. Prain, RE (Retd)
Culford School,
Bury St Edmunds,
Suffolk
11 March 1972

EARTH SATELLITES

Sir,—Having read Lieut-Colonel Crawford's article in the March 1972 *Journal* on "Geodesy by Satellite" it might be of some interest and amusement to your readers to contrast the sophistication of the techniques described with a satellite project being undertaken by one or two of our sixth formers.

The enclosed photograph shows a depression approaching Britain from the mid-Atlantic and was received from US satellite ESSA-8 using a modified cheap transistor FM radio, an elderly tape recorder, a school oscilloscope on which the picture was displayed and a pre-war folding Kodak camera.

Our budget has been limited to £15.—Yours faithfully, A. F. Prain.

Earth Satellites.

Memoirs

LIEUT-GENERAL SIR HAROLD WILLIAMS, KBE, CB

A MEMOIR of Sir Harold (Bill) Williams was published in the March 1972 issue of the *RE Journal*. The following tributes from India have since been received.

Mr Melville de Mellow of All India Radio writes:—

I met him for the first time at the Indian Military Academy, Dehradun. That was in 1933. He was Equitation Officer in addition to his other duties which largely concerned lecturing on Engineering subjects to the Gentlemen-Cadets. I was a poor horseman—starting late in life. It was, therefore, a painful experience and would have been much worse were it not for the humanity and understanding shown by this man. "Bill" Williams was very human and the smile and chuckle that accompanied every remark he made was not "phoney". He was a warm human being. It was amazing that this man, who had the proportions of a heavyweight champion had the mildest of dispositions gilded with a rare sense of humour. I never saw him lose his temper though he was the most disciplined person I have ever met. He was also meticulous. "Bill" loved India with something of the passion of a Charlie Andrews. In his own sphere of work and influence in India he set many landmarks which bear witness to his utter devotion to the task and to the country. He was one of those rare souls that belong to the world. Born in one country they can serve another, with the same intensity and zeal that they would show to the land of their birth. He gave India his "all"—his talents, his energy, his genius for construction-works, his wisdom and, in the end, his very life. I remember a conversation in a "pub" in the West Country last year, when a trout-fishing expedition took me very near to the village to which "Bill" Williams had retired. I was talking to another retired Sapper Officer who had left India in 1947. "Do you ever see 'Bill' Williams round here?", I asked "Oh, very rarely", he replied. "He's not a 'pub-wallah!' He walks a lot in the countryside bird-watching. I met him three months ago. He's gone back to India—his only 'sweetheart', as he once told me". That was "Bill" Williams; always restless to get back to the India he loved so dearly—and the India he served so well. How well? His first station in India was Roorkee where he quickly became familiar with the fascinating story of the Ganga Canal and the Solani aqueduct, which till 1903 was the longest in the world. He visited Delhi before New Delhi existed and he studied Firoz Shah Tughlak's canal system and Shah Jehan's efforts in irrigation. He made a study of the thousands of reservoirs in Mysore with their little canals scattered all over that State and the Carnatic, and when he visited Ceylon—he was told about the engineers from South India and of their fantastic irrigation works in the northern part of the island. He once told me—"From my earlier days in India I began to look upon irrigation work in India as some of the finest engineering in the world. I saw a great deal of the Thomason College, which is now the University of Roorkee, and I know it to be an institution which had sent out large numbers of Civil engineers, not only to work in Northern India but also in countries as far afield as the UAR and Iraq". And then, with a chuckle, and that famous twinkle in his eyes, he added—"I wonder how many people know that the old Aswan Dam was built by three engineers from the Roorkee College?"

But "Bill" Williams did not confine his search and thirst for knowledge, to the plains of India. As a young officer, he visited Kashmir, and was greatly intrigued by the wooden flume which ran for miles along the Jhelum Road below Baramullah.

Williams lived for some part of his life in the seaport of Hodeida in the Yemen. All water supply came from wells. Malaria was rampant and water was always short. And it was here he realized that, without engineering, life in cities would be impossible. He once told me: "We marvel that the cities of the Indus Civilization had their piped supplies and drainage, and we criticize the rulers who built these cities like Tuglakabad and Fatehpur Sikri and then had to abandon them because of the failure

of the water-supply. But the connection between buildings of distinction and civilization is obvious in India. We can learn as much from failure as from success.

The cities of the Indus Civilization—the pillars and rock edicts of Asoka's time—the Rock Temples of Ellora—the Great temples of Southern India—the Qutab—the earlier Muslim mosques and Tombs—the Taj—Fatehpur Sikri and Shahjehanabad—the great cities of Calcutta, Bombay, Madras, and New Delhi all testify to the fact that, when a civilization or a nation flourishes, the builder is busy and he has never been more so, than in the present frenzied era of construction. Some of the earlier efforts may seem crude and defective to our very sophisticated eyes, but with Isaac Newton, we acknowledge our indebtedness to all who have worked before us. We see further, because we stand on the shoulders of giants". That was Harold Williams. Ever ready to give credit to those early pioneers who had blazed the trail, and always believing that civilization and civil-engineering go hand in hand for the prosperity of man. He was a giant in his field, and for many years to come young engineers in India will be seeing farther because of his broad shoulders, unstinted sharing of knowledge, wisdom and infectious enthusiasm. His friendships transcended race and creed. His disciplined life was a living example to his "Chelas". Any assessment of "Bill" Williams, so soon after his passing will not only be difficult but unfair. A true image demands exhaustive research in those many fields of endeavour where he left his indelible mark. And these spheres are too numerous and widespread to explore at short notice. Personally, I shall remember him as a man of great warmth and compassion underneath a bubbling exterior. He was one of those rare people who could be loved, trusted and accepted by anyone, any country, any government. He gave his heart to India early on in his life and the thought he treasured most, I believe, was perhaps the fact that India retained his services as Engineer-in-Chief eight years after the country became free. This is proof of the esteem in which he was held by the nation. "Bill" Williams lies buried in his beloved Roorkee—the first station to which he was posted on reaching India as a young Subaltern. Roorkee was his "Shantiniketan" and his "Sewagram". He was drawn there, again and again, to replenish his energy—to reflect, to plan and to relax. And so, when death finally claimed "Bill" Williams in the hills of Mussoorie, it seemed appropriate and perfectly natural that he would not be far from the spot he loved most—his spiritual home—Roorkee. And it was here that his body was finally laid to rest. We shall miss his chuckle, his twinkling eyes, his sense of humour, his earnestness and above all his warmth and humanity. He has left us and, for the engineering fraternity in India, his passing is like the falling of a great cliff into the sea. However his memory and his work will live long among us and we may say of him, in the words of the English poet:—

"Lofty designs must close in like effects:
Loftily lying,
Leave him still loftier than the world suspects,
Living and dying".

* * * * *

The following tribute has been received from The College of Engineering, Poona:

The College of Military Engineering, Poona owes its present status, size and shape in a very large measure to the imagination, foresight and capacity for long term planning of Lieut-General Sir Harold Williams. Right from the small beginning of this Institution at Roorkee in September 1943, he had been actively associated with this College throughout its existence. In fact, he was responsible for the establishment of the School of Military Engineering at Roorkee, a task which was rendered easier by the proximity of the Bengal Engineer Centre and above all by the generous decision of the then United Provinces Government to place at the disposal of the School of Military Engineering the facilities of the Thomason Engineering College and throughout its stay at Roorkee kept a close watch on its development.

General Williams served the institution as Deputy Commandant from 26 August

1944 to 24 October 1944 and as Commandant from 8 March 1945 to 30 November 1947. During this period considerable reorganization of the School took place and the scope of training was expanded. Apart from a large number of Combat Engineering courses, a variety of "package" courses in Civil, Electrical and Mechanical Engineering disciplines was started. In order to develop an academic background in engineering for officers of the Corps of Engineers who did not have the opportunity to attend a regular Engineering Degree Course during World War II, he organized the Supplementary Course for all the regular officers.

As the requirements of training increased it became obvious that the existing facilities would no longer be suitable, and a new home had to be found for the School of Military Engineering. Here again, General Williams initiated the search and located the present beautiful campus near Poona which at that time consisted of a few temporary buildings of an American transit camp. We owe to his foresight and imagination the present beautiful campus of nearly 3,600 acres skirted by the perennial River Mula. By the end of 1947, the School of Military Engineering started to move to its new location and completed its move by the middle of 1948.

Plate 1. Prime Minister's visit to CME—6 October 1949
General Williams with Prime Minister Nehru and General Cariappa. Brigadier Holloway can be seen at the wheel

General Williams was appointed Engineer in Chief on 1 January 1948 and continued to influence the further development of this Institution. It was during his tenure (1 January 1948 to 15 October 1955) that the main buildings housing the various faculties were constructed. He, along with Brigadier R. E. Holloway who was the Commandant SME from 1948 to 1953, truly laid the foundation of this College as a sound combat and technical training Institution. It was largely due to General Williams' influence and effort that the Institution of Engineers (India) recognized the Engineering Degree Courses conducted for the Corps of Engineers, Corps of Signals and Corps of EME as exempting from the Associate Membership

Lieut General Sir Harold Williams KBE CB

Examinations of the Institution of Engineers (AMIE) India. He also strove for the recognition of Military Engineers in the Engineering fraternity in this country.

Besides his various activities he snatched time to pursue the science of ornithology—the study of birds whose movements are often associated with empirical forecasting of the weather condition aspect of the monsoon in India. He had a passion for mountaineering. He led the Indian Engineers expedition to Mount Kamet (25,447 ft), the second highest peak in India. Under his leadership, the expedition climbed up to Meade's Col (23,500 ft) in 1952. It was his pioneering work that enabled the first Indian Expedition under the late Major Nandu Jayal to conquer Mount Kamet later.

Plate 2. Guest Night at Officers' Mess CME
(Speaking at the Regimental Guest Night at HQ Mess CME during one of his visits)

Large in stature, calm in manner, impressive in speech, spotless in character, General Williams stood out as a shining example for any young Sapper to follow. He was loved, respected and frequently visited by officers whose lives he influenced in a very real way. He lived a full and gratifying life of attainments and influence. He never exerted the power of his office to get things done. The force of General Williams as an individual, however, exerted pressure in itself, it made people believe in what he said and in what he wanted to do. He was skilful in getting people to arrive at their conclusions as to what ought to be done, conclusions which they found very similar to his own.

Throughout General Williams' outstanding record as a soldier, engineer, educator and subsequently as a Government official there shines his ability to get other people to share his warm enthusiasm for the work to be done. His mood, enthusiasm and at times his disappointments were easily transmitted to those who worked with him. He had the gift of a retentive memory and he stored it wisely with a sound knowledge of his profession, and much of the learning of a scholar. Indeed, General Williams' range of information was remarkable and it was not wise in his presence to lay down

Lieut General Sir Harold Williams KBE CB 2

Plate 3. Silver Jubilee Celebrations Regatta—10 October 1968
(With Shri Sardar Swaran Singh Defence Minister (present Foreign Minister))

the law on any subject, unless very sure of the facts, for he was disconcertingly likely to have read more, thought more and remembered more on the same subject.

Even after retirement from public service General Williams kept up his interest in this College. Each of his visits has been a memorable occasion for the CME, as he always radiated enthusiasm and energy to whoever came in contact with him. About 14 years ago he had his first indication of cardiac insufficiency and was hospitalized. However, this ailment never deterred him from leading a full and active life. He recognized and accepted death as inevitable and unavoidable and refused to be worried about his personal health with almost fatalistic unconcern for danger.

General Williams attended the Silver Jubilee Celebrations of the College during October 1968 which was an occasion to meet many old friends and associates. His last visit to the College was on 5 and 6 November 1970 when he went round all the faculties and wings, unreservedly giving his views on various subjects of topical interest.

Little was it realized that this would be his last visit to the CME. He has earned a permanent place among the architects of this Institution and he will always be remembered as a dedicated soldier, outstanding engineer, a top educator and above all a true friend of this country.

The following tribute has been received from the Institution of Military Engineers India:—

Very few in the Corps of Engineers of the Indian Army will be unfamiliar with the name of Lieut-General Sir Harold Williams, KBE, CB. It is sad to note that this distinguished Sapper Officer has been laid to rest. He died on 17 October 1971 at Mussoorie, India. Appropriately he breathed his last in the country which he had made his own, the country in which he spent almost all the years of his life.

Born on 1 June 1897, General Williams received his early education at Mount

Plate 4. Silver Jubilee—11 October 1968
With ex Commandants of CME
(*Left to Right*)
Brigadier S. K. Bose, Major-General P. R. Kumar, Lieut-General Sir H. Williams, Major-General M. M. Nath, Major-General Harkirat Singh and Lieut-General R. A. Loomba

Joy School Dublin, the Royal Military Academy at Woolwich and finally at Cambridge. He received his engineering education at the School of Military Engineering, Chatham.

Starting his career as a Second Lieutenant in the Royal Engineers in 1917, he was posted to the Bengal Sappers and Miners at Roorkee in 1918. He was appointed Adjutant of the Corps in 1929. From this appointment, he moved on as a Company Commander and as Instructor at the Indian Military Academy in Dehra Dun. He was promoted Brevet Major in 1934 and was posted back to Roorkee as a Professor in Civil Engineering at the Thomason College, Roorkee. He held this post from 1936 to 1938.

The Second World War found him as CRE of the First Armoured Division in France in 1940. On his return to India in 1942, he was appointed to the important appointment of Brigadier Engineer Staff at General Headquarters which he held for over two years. He was then posted as Chief Engineer IV Corps. He went back to Roorkee in 1945 as the Commandant of the then School of Military Engineering. Later he took over as Chief Engineer, Southern Command. Recognition of his merits were reflected in the shape of honours conferred upon him by Her Majesty's Government. He was made a KBE and a CB.

Soon after the partition of the country and the grant of Independence to India, he was appointed Engineer-in-Chief of the Indian Army in December 1947. He held this appointment with distinction till 1955. As a mark of the high esteem in which he was held by the Corps of Engineers, he was appointed Colonel Commandant of the Corps in 1951.

As Engineer-in-Chief, he headed the Corps of Engineers at a critical period of its

Lieut General Sir Harold Williams KBE CB 4

Plate 5. Last visit to CME—6 November 1970
At the Corps Museum

history and groomed it as it emerged with all the scars left by the partition and guided it to its development as a unified edifice. It was he who laid down the policies and overseered its programmes. It was he who laid the firm foundations for others to build on. His was the vision which foresaw the requirements of the future and picked the right men for the many jobs to be done and the many problems to be faced.

He constantly strove to put the Military Engineer in the forefront. It was his endeavour to highlight the importance of the Military Engineer in peace as well as in war. As a member of innumerable committees of several technical institutions and associations, he did his best to promote the image of the Corps of Engineers as the foremost construction organization in the country. It was due to his vision and daring that the Army engineers accepted the first major engineering project outside the country after Independence—the construction of the Tribhuvan Rajpath, the construction of a road linking land locked Nepal with the outside world over extremely difficult terrain.

General Williams was no ordinary character—here today only to be forgotten tomorrow. He was a man of many attainments and distinctions. He was as distinguished a soldier as he was a sapper. He was as distinguished a scientist as he was an educationist. He was as distinguished a naturalist as he was a humanist.

A man of multi-sided activity and tireless energy he was intimately connected with a number of engineering institutions to whose advancement he contributed immensely. He had been a President of the Institution of Engineers (I) and had similarly been the President of the Institution of Surveyors (I). He had been a Council member in the Institution of Civil Engineers (London). His interest in technical education was immense. He was intimately connected with several Universities in India and was a member of the Fortescue Committee which reported on the need for creating an engineering University at Roorkee. He was twice Chairman of the Central India

Lieut General Sir Harold Williams KBE CB 5

Centre of the Institution of Engineers. The Government of India selected him to be the first Director of the CBRI in Roorkee, one of our foremost research institutions. Later he was appointed as an Adviser to the Planning Commission of India.

Those who knew General Williams will be aware of his deep and abiding love for Roorkee starting from 1918. He kept returning there in one capacity or another throughout his career. It is truly fitting that this gallant officer has been laid to rest in this town that he had made his own. His love for Roorkee was perhaps symbolic of his love of the larger whole of which Roorkee is a part. He loved India and his friendship for Indians was steadfast and sincere. Though he left the country in 1967 after his retirement, he kept frequently returning to it and indeed visited it practically every year. It is difficult to believe that this familiar figure has left us finally to return never again. We will miss his warm personality, his keen interest, his piercing inquisitiveness, his keen wit and his military guidance. Though physically not with us, his spirit will live with us for ever. His memory will be cherished and his achievements for the Corps and the Country will remain to testify to his greatness.

The Institution of Engineers India also sent tributes of Lieut-General Sir Harold Williams. He was President of that Institution during 1953–54.

Mr A. C. Banerjee of the Central Building Research Institute, Roorkee writes:—

General Sir Harold Williams' association with the Central Building Research Institute at Roorkee (India) dates back to 1952 when, as Engineer-in-Chief of the Indian Army, he became Chairman of the Building Research Committee. After his release from the Army in 1955, he joined the CBRI as its Director, a post which he held until his retirement in 1962.

At the time of his joining, the CBRI had only a nucleus staff of about a dozen scientists supported by a modest number of administrative and other house-keeping personnel. It was largely due to his efforts that a large number of scientists and engineers belonging to various disciplines were appointed during 1955–56 which gave considerable impetus to the research efforts. He continued the drive to attract young talent and, at the time of his retirement, the strength of the scientific staff had reached about 120 and the total strength had risen from 123 in 1956 to 381 in 1962.

Besides recruiting suitable staff, General Williams devoted considerable attention towards developing facilities for conducting research in the fields of structural engineering and building physics. It was largely due to his efforts that a new Structures Laboratory was built in 1960 offering all facilities for testing to destruction full-scale building and bridge structures. The construction of the laboratory can be considered as a land-mark in engineering research as it helped in putting structural engineering research on a sound footing in this country. He also visualized the important role which Building Physics was destined to play in proper planning and designing of buildings in India. He, therefore, attached great importance to developing full facilities for conducting research in the fields of illumination, heat-transfer, climatology, ventilation and acoustics. Before laying down his office, he was able to complete the planning of the new Physics Building and was successful in obtaining adequate funds for its construction.

From the very beginning, General Williams was aware that lack of proper accommodation was a big hindrance in the way of attracting to the Institute well qualified staff. He therefore gave top priority to the construction of staff quarters and development of essential facilities in the campus. As a result of his efforts in this direction, a large percentage of the staff today enjoy the benefits of government accommodation and campus facilities.

During his tenure as Director, the Institute had carried out several important research projects which later brought credit to the Institute. To mention a few, the development of under-reamed pile foundation in blackcotton soil was largely developed during 1955–62. Today, this process has saved nearly a crore of rupees in the cost of foundations alone. A new type of roof, called the doubly-curved shell roofing unit, was evolved which economizes in the consumption of cement and steel as com-

pared to the conventional RCC roof. For the first time in the country, an experimental roofing unit using folded plates was built at Roorkee covering a large column-free space. The experience gained during this construction was put to good use in later years when several folded plate roofs were constructed in the country. In building physics, two field projects were carried out, one each in Roorkee and Delhi, to assess the effect of ceiling height on thermal comfort. These studies and later laboratory investigations provided a scientific basis for recommending nine feet as the permissible ceiling height consistent with reasonable thermal comfort. Two important research projects in building materials successfully carried out during General William's tenure related to improvement in the quality of bricks from black cotton soil and substitution of imported asbestos fibre by indigenous asbestos.

He spared no efforts in securing international recognition for the work at the Institute. It was largely through his efforts that the Institute was made known abroad and several young scientists could receive training in various fields in building research institutes in UK, USA, Canada, Australia, etc. These efforts have continued ever since and today the Institute enjoys a very high reputation both in the West and in the South-East Asian Region.

General Williams always tried to foster close coordination between the CBRI and the Army. It was largely due to his efforts that the Institute participated in the housing project for the Army at Ambala where 1700 houses were completed in seven months. One of the Institute's processes, doubly-curved shell units was used for the roofs in the project. Also, a pavilion incorporating prestressed cantilever trusses supported on prestressed columns was designed for the Bengal Engineer Group & Centre, Roorkee.

Towards the end of his tenure at the Institute, General Williams devoted considerable attention towards the setting up of facilities for conducting fire research in the country. Today, a full-fledged Fire Research Laboratory is under construction at the Institute which would be the third of its kind in the South-East Asian Region.

After his retirement, the General continued his close association with the Institute which he visited almost every winter and evinced keen interest in its work and in the welfare of its staff. His sterling qualities of head and heart had won him the esteem, love and admiration of one and all.

Mrs Afzal Friese, Principal of the Okhla Centre of the Delhi Society for the Welfare of Mentally Retarded Children paid tribute to Sir Harold William's great assistance to the Society in its early days and to the personal interest he always took in its working. He was particularly interested in helping military personnel whose children had mental retardation problems.

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LIEUT-GENERAL SIR ARTHUR EDWARD GRASETT, KBE, CB, DSO, MC, KStJ, COLONEL COMMANDANT RE (RETD)

ARTHUR EDWARD GRASETT was the fifty-fifth of the 125 Regular Officers commissioned into the Royal Engineers from the Royal Military College, Kingston, between 1880 and 1942—a breed of young men who brought with them from Canada into the Corps a robust pioneer spirit and a great warm-hearted enthusiasm. Ten became General Officers, others became outstanding administrators and engineers, many were severely wounded or killed in action and each one was a credit to the Country and College from which he came and to the Corps in which he served.

Lieut-General Sir Arthur Edward Grasett KBE CB DSO MC

Born in 1888, the son of Arthur W. Grasett of Toronto, he was educated at Upper Canada College and the Royal Military College, Kingston, where he was BSM, equivalent to Senior Under Officer, and won the Sword of Honour. He was commissioned into the Royal Engineers in June 1909. On completing his young officer training he was posted to Ireland where he served in Signal Companies RE on the Curragh and in Limerick during the 1914 Irish "Troubles".

During the First World War he served on the Western Front in 49 Signal Company RE and subsequently as Brigade Major 47 Infantry Brigade, as a GSOII in IX Corps HQ, and as GSOII in 37 Division HQ. He was awarded the MC in 1915 and the DSO in 1918.

Posted to a GSOII appointment in the War Office in 1919 he entered the Staff College, Camberley, as a student the following year. On graduating from there he was posted to India as Brigade Major, 8 Infantry Brigade which took part in the 1921–3 Waziristan operations on the North West Frontier.

He was keenly interested in rowing in the Post World War I era and became a member of the Leander Club.

Returning to the home establishment in 1924 he became an Instructor at the Staff College, Camberley. This posting was followed by a short tour in command of 59 Field Company RE, then stationed at Catterick, and later by a brief time in the Staff Duties Directorate of the War Office. In January 1931 he was selected to attend the Imperial Defence College. Returning to India again in 1932 he held the appointment of Deputy Director of Military Intelligence at Army Headquarters for three years.

He then married and, with his bride, went to Camberley where he joined the Staff College as GSOI (Colonel) of the senior year in January 1935. Grasett and his team of outstanding instructors, which included Bill Slim, brought a breath of fresh air into an over-conventional and slightly stuffy atmosphere. Ted Grasett's Canadian background, World War I and other wide general experience, combined with an inquisitive mind, gave him a broad-minded approach to military and other problems at this crucial time. He was not only most approachable, but receptive to new and unconventional ideas for examination on their merits.

In June 1937 he became Brigadier General Staff HQ Northern Command at York. Promoted Major-General in 1938, he became General Officer Commanding British Troops in China which appointment he held for almost three years. He was created CB in 1940.

Returning home before Japan entered the war in December 1941 he was given command of 48 Division and shortly afterwards of VIII Corps Home Forces with the rank of Lieut-General.

Little has been written of the aftermath of World War II in Europe except emphasis on the Black Market and other unsavoury activities by individuals. It deserves better and wider treatment. The incredibly rapid return of law, order and government to France, Italy, Belgium, Holland and Germany after the chaos of war and occupation, firstly by Allied military and later civilian governments, and finally national governments, owes much to the foresight, planning and policies determined by Lieut-General Sir Edward Grasett as Chief of Staff for Civil Affairs SHAEF in 1944–5.

The failures during this aftermath, of which so much has been written, lie with those individuals, often not too well chosen, who had to implement these policies. The extent to which they could successfully be carried out was clearly shown by Grasett himself as the first Lieut-General and Commander-in-Chief of Jersey after the German occupation. He quickly began to establish normality on the island after its long ordeal. He was one of the most popular representatives of the Sovereign to hold the office. He took a keen personal interest in all Jersey's civilian activities and those of the Ex-Service Associations. He and Lady Grasett were hosts at Government House on a number of royal visits—by The Queen, then Princess Elizabeth, with Prince Philip, the Duke and Duchess of Gloucester and the Duchess of Kent.

Another distinguished visitor was Lady Mountbatten who came in 1950 for the laying of the foundation stone of the new St John Ambulance Brigade Headquarters. General Grasett had for many years taken great interest in the Brigade and shortly before Lady Mountbatten's visit he had been created a Knight of the Order of St John of Jerusalem. His four year tenure of office as Governor was extended for a further period by public request, indeed by public insistence on the part of the Islanders.

He received his knighthood of KBE in 1945 and for his war services he was honoured by the Governments of the United States, France, Belgium and Russia. He became a Colonel Commandant Royal Engineers in August 1945 and retired, tenure expired, in July 1955.

Ted Grassett's spontaneous, unquestionable powers of leadership, coupled with moral courage to support his views, his broad-mindedness and his loyalty and integrity ensured the success of his military and civil careers. His naturalness and humility, together with a genuine lively interest in people from all walks of life, earned him a multitude of friends.

He did much towards the procurement of a silver centre piece, representing the RMC Arm and a Scroll containing the names of the 125 Regular Officers commissioned into the Royal Engineers from Kingston, presented to the RE HQ Mess at a Corps Guest Night on 18 November 1965 by Major-General G. S. Hatton, CB, DSO, OBE, on behalf of the surviving ex-Kingston Cadets. He was regrettably not able to be present at the Guest Night, as the senior surviving ex-Kingston Cadet and personally make the presentation.

In 1935 he married Mary Joan, daughter of J. K. Forster, Esq of Egton Manor, Yorkshire. They had one daughter.

He died on 4 December 1971, at home after a long illness bravely borne, aged 83. Our deepest sympathies are extended to his widow and daughter.

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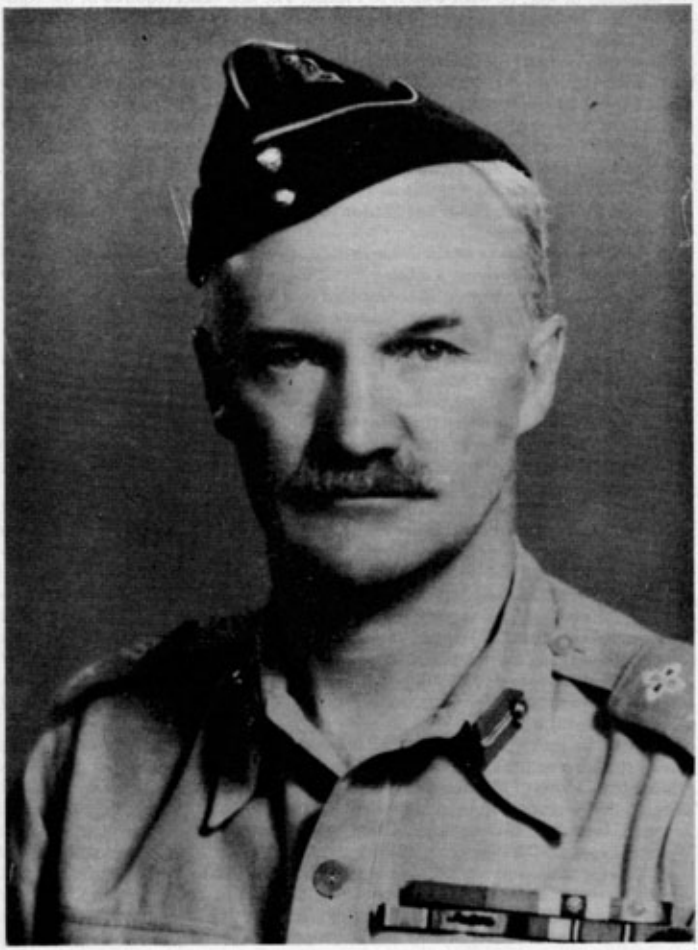

MAJOR-GENERAL I. S. O. PLAYFAIR, CB, DSO, MC*

MAJOR-GENERAL PLAYFAIR, who was from 1943 to 1945 Major-General General Staff Allied Forces South East Asia and Deputy Chief of Staff Allied Control Commission Germany from 1945 to 1946, died at his home on 21 March 1972.

Ian Stanley Ord Playfair was born at Ranikhet on 10 April 1894, the son of Colonel F. H. G. Playfair, the Royal Hampshire Regiment. He was educated at Cheltenham College and the RMA Woolwich, and was commissioned into the Royal Engineers on 18 July 1913.

In June 1914 he was posted to the 12th (Field) Company RE at Fermoy and, on

Major-General I S O Playfair CB DSO MC

the outbreak of war, he went with it to France. The first tasks required of the company were the construction of a pontoon bridge over the River Aisne at Vailly and an off-loading bay for medium howitzers. Soon the whole of the Western Front became stabilised and the interminable period of trench warfare began with its many and varied tasks for RE companies. A spell as Adjutant 3rd Divisional Engineers was followed by the appointment of Brigade Major 76th Infantry Brigade. A short tour as an instructor at the Senior Officers' School, Aldershot was followed by another Brigade Major's appointment this time with the 75th Infantry Brigade—an appointment he held until the end of the war.

He was twice wounded. He was awarded his first Military Cross in 1916 for distinguished Service in the Field. The citation for the bar to his Military Cross, awarded the following year, read:

"*For conspicuous gallantry and devotion to duty. After the repulse of an enemy counter-attack he made his way through a heavy barrage to brigade headquarters to report the situation, all communications with the forward area having been cut off by the barrage. His gallant action was of the greatest possible value.*"

In December 1917 he was awarded the DSO for Valuable Services in connection with military operations in the Field.

After attending a Supplementary Course at the SME he became a Company Officer at the RMA Woolwich for four years, followed by three years as Adjutant of the Training Battalion RE. In April 1927 he went to Hong Kong with the 56th (Field) Company RE, but left after a few months for Singapore to take up his first, and only, Works appointment as DCRE Eastern Defences Malaya Command.

In April 1930 he was appointed Chief Instructor in Field Works and Bridging at the SME, and in April 1934 was posted back to Malaya, this time as Staff Officer to the Chief Engineer. After a short time he was abruptly moved to Quetta as an Instructor (GSO 2) at the Staff College, an unusual appointment for a non-*p.s.c.* officer. Two years later he was sent to the Imperial Defence College and, on completion of the course, he was given the post of Inspector of Anti-Gas Training, raised to Inspector of Chemical Warfare on the outbreak of war in September 1939. This job did not last long for in December he was ordered to the War Office as Director of Plans in the Directorate of Military Operations and Intelligence, which carried with it the role of Army Member of the Joint Planning Staff, at the very hub of the central direction of the war.

A Commander-in-Chief with a small planning headquarters had been set up in the Far East and, when the Chief of Staff became ill, Playfair was sent out in 1941 to replace him. Much of his time was spent in visiting the Dutch in Sumatra, Java and Borneo, the Americans in the Philippines and the British in Hong Kong. The rapid Japanese successes in December of that year led to the appointment of General Wavell, then C-in-C India, to co-ordinate the Allied Forces in the whole area but this move was too weak and too late. In Ceylon it was possible to place the land, sea and air forces under a single Commander (Admiral Layton, hitherto C-in-C Eastern Fleet) who chose Playfair to be his Chief of Staff. The Japanese attacked Ceylon at Easter with carrier-borne aircraft but were driven off and the attack was never repeated.

When the Allied counter to the Japanese offensive was ready it was a powerful one. The land force element of the new South East Asia Command was the 11th Army Group, concerned mainly with the Burma front. The Army Group Commander felt obliged to have his headquarters in the Calcutta area (Barrackpore) which had the drawback of being some 1,200 miles from Admiral Mountbatten's SEAC headquarters in Ceylon. This made it necessary to have a responsible representative of the Army Group at SEAC, where decisions were normally taken; this meant that the representative (the Major-General General Staff—Playfair) had to be always a jump ahead and had to be prepared to commit his Commander-in-Chief and put forward his views at very short notice. This could not have been an easy task.

Playfair's last Army job was Deputy Chief of Staff Allied Control Commission Germany where he presided over the trial for War Crimes of nine senior Wehrmacht officers and German civilians. He then accepted the post of Official Historian for the Mediterranean and Middle East theatres of war in the Second World War; four of the planned six volumes had been published when ill-health compelled him to give up.

He was a keen musician, able to orchestrate and conduct. He composed several light pieces, marches, dance numbers and songs, and edited the well-known Corps Song "Hurrah for the CRE" which was based on two Afrikaans tunes "Marching to Pretoria" and "Dah leh de ding" which became "Laffan's Plain" and "Make fast the Dinghy" respectively. His march Invicta was played by the RE Band at Buckingham Palace.

He was an active supporter of the RE Drag and a natural games player. He was a member of the very successful Corps hockey side in the early twenties, but his true love was golf and he won the first Corps competition for the Bigge Snuff Box with rounds of 77 and 79 over the stiff Deal course.

He contributed more than forty articles to *Punch*, principally in the late nineteen twenties.

In 1930 he married Jocelyn, daughter of Colonel L. N. Malan RE and had two sons. Our deepest sympathies are extended to his widow and family.

E. F. T. writes:

It was at The Shop that I first met Ian Playfair. (He never liked his universal nickname of "Bungy".) We usually sat next to each other and his witty comments used to relieve the dullest of lectures. He became a most efficient Under-Officer, and would most certainly have passed out top but for a sudden illness during our final exams. We were to spend a carefree time at the pre-war SME, especially during our survey tour for which we had identical motor-bikes still novelties in 1914. Projects caused him no trouble and were never allowed to interfere with his games. While still YOs we were suddenly chosen to join the two sister Field Companies of the 6th Division, mobilizing in Ireland and, after shipping delays and some long marches, reached the fighting on the Aisne. During the following winter of mud and wire he became a well known and popular figure in the front line. Our ways however parted in 1915 when my company was sent to Salonika.

Immediately after the war we were to meet again at a light-hearted Supplementary Course, during which he was the soul of the party, especially when seated at the Mess piano. Though a born and serious musician he quickly recognized the magic of ragtime, and I remember watching him glance through some new song-sheets in a local shop and casually pick out by eye the two tunes that were to become world famous. Although we had much enjoyed our time as Brigade Majors, we both firmly decided that true sappering was to be our aim; but this was not to be, for later on he was quite rightly launched upon a brilliant Staff career by his unexpected appointment as an Instructor at Quetta. While we were both teaching the young, he at Woolwich and myself at Chatham, he kindly consented to be my best man. I saw much of him during his time in the Fieldworks and Bridging School, where he introduced a new outlook to meet the more technical problems of modern military engineering.

During World War II we served in widely separated theatres, but afterwards while he was writing his History we had earnest discussions on the Middle East campaigns, of which he had gained an uncanny knowledge and understanding.

He was undoubtedly one of the most widely gifted officers ever to enter the Corps, and could excel without effort at every one of his very many and varied activities. I shall always remember him with the greatest admiration and affection.

Book Reviews

COURAGE PAST. THE GLASGOW HIGHLANDERS AT THE SOMME, JULY 1916,

ALEX. AIKEN

(159 pages, 12 pages of illustrations, 1 map. £2 post free from A. Aiken, 48 Merrycrest Avenue, Giffnock, Glasgow)

The Great War may still have something to teach us, if not in tactics at least in the field of tribulations nobly borne. This book concerns a once-famous battalion of Territorial infantry during a mere four months in an eventful year, and may appeal to only a limited number of readers, although mine warfare as experienced by the infantry could be compared with the engineer's view.

The author served in the Royal Engineers 1949–1956 in the Territorial Army and on the National Service List, without seeing active service.

A.A.

THE SOLDIER IN MODERN SOCIETY

LIEUTENANT-COLONEL J. C. M. BYERS

(Published by Eyre Methuen, London. Price £3·95. 257 pages)

It being a wet Sunday afternoon, your reviewer sat down to read *The Soldier in Modern Society* by Lieutenant-Colonel J. C. M. Byers, starting at 2 pm, and finished it by dinner time. He would have finished sooner, but he feels compelled to admit that the style adopted sent him to sleep for an hour in the middle. It seems to your reviewer a great pity that a talented and well-read writer should feel bound to adopt the style of the contemporary academic thesis. That is to say, the most banal observation has to be supported by documentary evidence, either as a quotation from the pen of someone who may be incapable of using that instrument, or in the form of foot-notes. A glance at page 203, for example, reveals a half-page extract of American jargon that is scarcely comprehensible. This is what sends one to sleep; the subject matter is very interesting.

The Author is a dedicated soldier, or he would not have forgone a promised place at Oxford to become a Regular Officer. He has plenty of regimental experience, and he has thought deeply about his profession. He writes the book during an academic year at Edinburgh University, where he has made good use of his time. None the less, it is when he is dealing with those matters that come within his own experience that he is at his best, displaying sound and original thought in a vigorous and convincing manner.

The book starts with an interesting Introduction and goes on to examine the purposes for which armies in general, and the British Army in particular, exist; what the British Army looked like in the past and what it is likely to look like in the future. He then devotes seven chapters to the human aspects of soldiering: the attitudes of the public to military service, the types of men acceptable, the maintenance of efficiency and morale, conditions of service, manpower, recruiting, and finally a thoughtful chapter on "A Design for an Army".

It is a reflection of our society—or perhaps it is of the academic society in which the Author found himself—that he thought it necessary to examine critically "whether we now need an Army at all". Happily, philosophy and logic come to the rescue of what in a former generation was taken as axiomatic, and your reviewer feels that even the most left-wing academic must be convinced by the argument proving the need for a British Army today. Amongst the arguments adduced for having a British Army is the need for "security within the British Isles". This raises the question of who controls the Army; to which the Author gives the conventional answer: the Government. It seems to your reviewer that as the Author is so expert in logic he might have explored the more ill-defined regions of thought where the Army and the Government are at loggerheads, or where they are the same thing. Neither, one hopes, is imminent in the United Kingdom; but one would like to have it explored when one has an Author with the intellectual grasp to explore it.

The Author compares the needs of our Army today with those of twenty-five years ago. In 1945 the British Empire had over two million soldiers scattered all over the globe, and attitudes and resources were needed then which are superfluous today. The number of Staff Officers is a case cited. We are told that the intake of the Staff College has not altered in the meantime, and the Author examines the implications. He is bound to be contro-

versial here and in many other ways too; though in a short review it is not possible to do more than mention it. The military reader must certainly read this book for himself. It will make him think; and your reviewer commends it accordingly.

M.C.A.H.

Technical Notes

CIVIL ENGINEERING

Civil Engineering and Public Works Review, December 1971

DETAILING OF REINFORCED CONCRETE CORNERS. In this short article by F. K. Kong and B. Mayfield of the Department of Civil Engineering, Nottingham University, tests of six corner details are described and evaluated. It is particularly interesting to note that a corner detail advocated in "The Standard Method of Detailing Reinforced Concrete", favourably reviewed in this *Journal*, is unacceptably weak. A simple alternative is described.

HOVER PLATFORM. A new heavy duty amphibious hover platform designed by Mackley-Ace Ltd has successfully completed proving trials in Portsmouth harbour. The platform is constructed from the well known Uniflote modular pontoon system together with a loop/segment skirt system produced by Air Cushioning Equipment Ltd of Southampton. The platform is designed to carry dredging, excavating, piling and drilling equipment.

Civil Engineering and Public Works Review, January 1972.

TUNNEL DRIVING AT LOCH NESS. Construction of the 300 MW pumped storage Hydro-electric project was started in 1969 and is due to be completed in 1974. For the civil engineering work two Royal Engineer officers on Long Civil Engineering Courses have been attached to Edmund Nuttall Ltd, the civil engineering contractors. The officers were Major E. R. M. Pringle and Major P. H. Macbeth. This article describes the tunnelling operations in some detail and equipment used.

CONTROL ENGINEERING. The Civil Engineering Data Sheet Ref 10.17 features the use of gabions for coastal defence works. Although some Sappers may feel that the gabion belongs to the age of siege warfare, it can be a most useful civil engineering method. The containment of relatively small sized rock within wire baskets stabilizes the material and avoids the necessity for very large rocks or proprietary concrete armouring on the face of sea defences. In particular the Rono Mattress provides an ultra flexible and porous slab which has many advantages over a concrete apron.

W.G.C.

Civil Engineering and Public Works Review, February 1972.

COMPOSITE BEAM DESIGN CHARTS IN SI UNITS by Colin Davies MSc (Eng), FICE, FI Struct E. This short article describes in simple "cookery book" terms the design procedure for composite steel beams and concrete slabs in buildings. The four charts cater for a range of slab thickness between 125 and 200 mm, ultimate moments of resistance between 20×10^3 and 70×10^3 N/mm and beams to BS4 and grade 43. The position of the plastic neutral axis (within the concrete slab or within the steel beam) is allowed for in the charts. Half the article is devoted to a design example which clarifies much of the preceding paragraphs. For a military engineer faced with the task of designing a suitable composite arrangement this article, with its charts and references to other documents on the subject, would provide a most useful starting point.

SITE AMENITIES—PROFITABLE OR CHARITABLE? by J. R. Smith, ARICS. Those military engineers who have worked on a construction site will realize how far behind the Services most of the smaller civilian organizations are with man management and welfare. This article describes what measures the author considers necessary to combat sickness in the industry. Bronchitis, rheumatism, and arthritis are the main illnesses quoted. Better weather protective clothing, suitable changing and drying rooms and adequate mess rooms and catering facilities are advocated. The Construction (Health and Welfare) Regulations 1966 appear inadequate in themselves to ensure reasonable working conditions. What the author seems to be recommending is for management to show greater concern for those who work for them. This is not a new idea in military circles.

H.E.V.C.

THE MILITARY ENGINEER

NOVEMBER–DECEMBER 1971

Ecology, Ecosystems, Pollution, Biodegradable and Entrophication are words we hear more and more these days. This issue of the *Military Engineer* carries two articles on Environmental pollution and how it is affecting the Corps of Engineers in America.

Field Engineer notes carry short articles on the use of V shaped pickets as keyways for concrete joints, the use of two AVLBs in tandem to cross on river too wide for one, a method of anchoring a floating bridge from the piers of a demolished bridge in a tidal river, and finally an effective wire barrier used by the American Army in Vietnam.

For the Civil Engineer there are articles on Engineering for the Air Force and Continuously Reinforced Concrete Pavements. The latter article deals with the construction of the first military airfield to be built with the Continuously Reinforced Concrete Pavement technique.

An article which will interest all Sappers deals with Military Bridging—Status and Trends. This article deals with current, fixed, floating and AVLBs used by the Americans and indicates the direction in which Bridge research is moving. It is followed by the result of a Military Bridge design contest in which the names of the winners are given; and the features of their designs which were unique.

JANUARY–FEBRUARY 1972

The opening article in this edition gives the German approach to tactical river crossings for the 1980s. In new bridge designs it discusses the German AVLB based on the German "Leopard" tank and the Krupp bridge for dry gap crossings, and for river crossings details of their amphibious bridge the "ASB" and the Trestle AVLB, SAS are given. A new system of water propulsion using the push tube propulsion system is described, together with an ingenious method of gaining extra traction using their Amphibious Engineer Universal Vehicle (APM) (the "Lauster Axle"). This is basically a treaded axle. The APM has been designed to overcome the age old problem of river exits and seems to be providing the answers.

Two articles which will be of interest deal with soil erosion and the hovertrain. Neither of these articles deal with the subject in depth. However the former does raise some interesting points on soil erosion caused directly by engineering works and indicates methods of prevention; while the latter article covers, in general terms, the development of the hovertrain from monorail development to the discovery of the hover principle and its application in conjunction with the linear motor to create the hovertrain. It concludes by indicating the lines on which research is proceeding to bring into being this unique mode of transport.

The last article in this publication will be of interest to the Surveyor. It deals with Photogrammetric Instruments used by the American Corps of Engineer and traces the developments and accuracy of these instruments from the early days, 1891, up to the present day.

Forthcoming Events

5–9 June	Engineer Symposium & Sales Week	Brompton & Chattenden
6 June	Beating Retreat	Brompton Square
7 June	Engineer Symposium Dinner Night	RE HQ Mess
28 June	Corps AGM and Dinner	London
29 June	Colonels' Commandant Garden Party	Hurlingham
7 July	RE Summer Ball	RE HQ Mess
9–16 July	RE Cricket Week	Chatham
13–16 July	Medway Regatta	River Medway
20–21 July	RE Musical Extravaganza	Aldershot
22–23 July	REA Weekend	Aldershot
2–3 September	RSME Open Day & Veterans Weekend	Brompton
22 September	RESA AGM	Brompton

SPORTS AND GAMES FIXTURES

RE CRICKET CLUB

9 July	RNCC	Chatham
10 July	RCT	Chatham
11 July	RAC	Chatham
12–13 July	R Sigs	Chatham
14 July	RM	Chatham
15 July	Infantry	Chatham
16 July	Free Foresters	Chatham
20–21 July	RA	Chatham
12–13 August	Band of Brothers	Chatham
16–17 August	Oxford Harlequins	Chatham

RE GOLFING SOCIETY

14 June	RAOC GS	Effingham
22 June	RAMC GS	Woking
24–25 June	Rye GC	Rye
6 July	ACC GS	West Hill
12 July	Royal Norfolk GC	Branchester
13 July	RCT GS	Worplesdon
15 July	Chartered Surveyors GS	Hankley Common
20 July	RM GS	Liphook

RE LAWN TENNIS CLUB

7 June	RAEC	Aldershot
14 June	RAPC	Roehampton
28 June	REME	Chatham
12 July	RMCS	Shrivenham
19 July	RCT	Minley Manor
21 July	RA	Chatham
26 July	RAOC	Aldershot
2 August	R Sigs	Blandford

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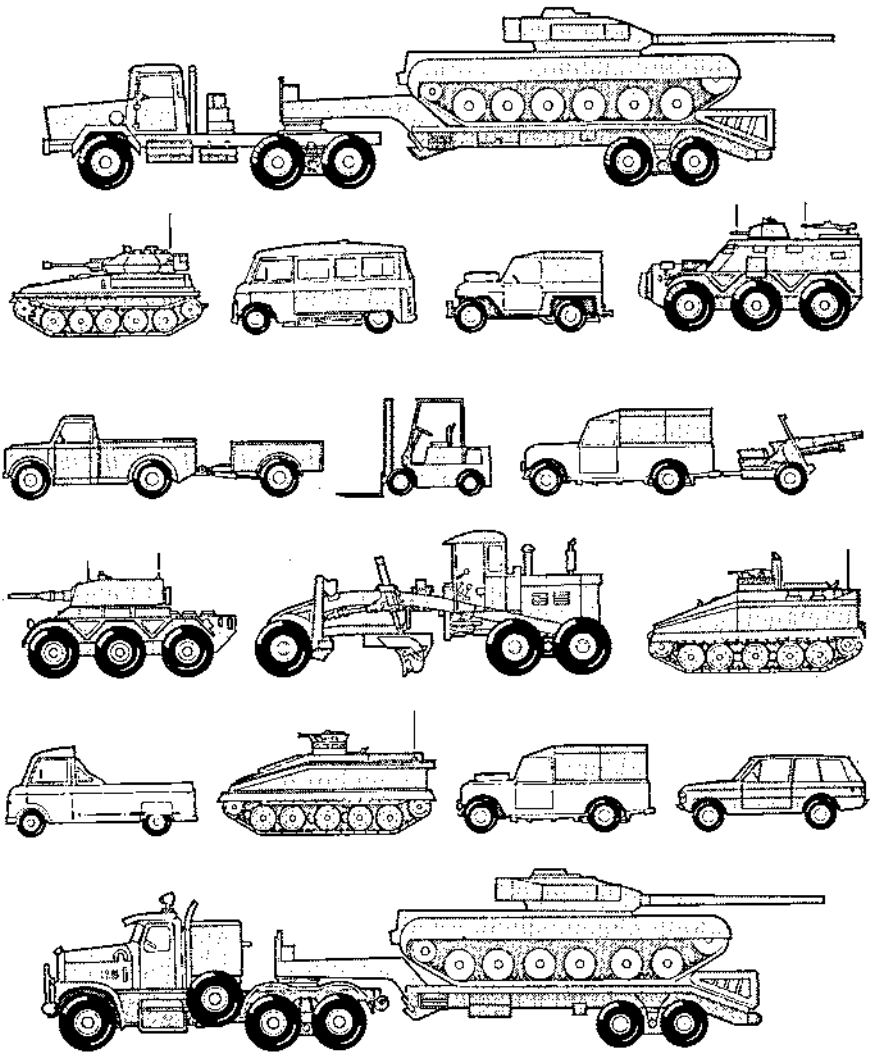

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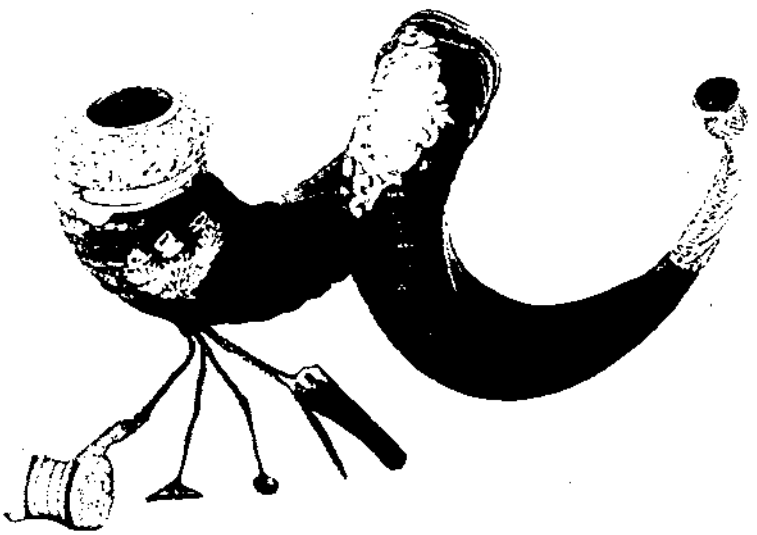

This snuff box was presented to the Mess in 1844 by George Sim, Bengal Engineers. It is one of the many historical pieces of the RE HQ Mess collection. Photographs and descriptive details, written by the Late Colonel J. M. Lambert, of fifteen Mess portraits and forty-one pieces of Mess silver are included in a beautifully illustrated booklet entitled

THE PORTRAITS AND SILVER OF THE RE HQ MESS

The book is obtainable from the Secretary, Institution of Royal Engineers, Chatham, Kent. Price £1·50 post free in the United Kingdom.

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THE *Journal* depends for its existence on articles submitted for publication on historical, professional and technical subjects of interest to Military Engineers.

They may be of any length, but preferably not more than 6,000 words. They should be typed in duplicate on one side of the paper only, double spaced with one-inch margin. A third copy should be retained by the author for checking with proofs.

Photographs to illustrate an article should be black and white prints on glossy paper. Usually not more than four photographs will be published to illustrate each article. More photographs may, however, be submitted from which the Editor will make a selection. The size of the photographs does not matter as they can be reduced in size for publication. Line drawings, maps, etc must be in black ink, and all lines, lettering, etc must be bold and clear to allow for reduction in size when reproduced. Scales must be drawn and not worded.

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Articles may be submitted at any time and correspondence is always welcome. However, the following dates are normally the latest for inclusion in the issues shown:

March issue	1 December	September issue	1 June
June issue	1 March	December issue	1 September

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

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