

**FIRST DRAFT**

**THE  
STORY OF  
512 FIELD SURVEY COMPANY RE**

by

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(CHAPTERS 1 - 3)

**FIRST DRAFT**

## CHAPTER 1

### 512 (ARMY) FIELD SURVEY COMPANY FORMATION AND MOVE TO EGYPT

On the thirtieth of September 1985, 42 Survey Engineer Regiment ceased to exist. Over the ensuing few weeks its three sub-units, 13 Map Production Squadron, 19 Topographic Squadron and Headquarters Squadron moved 25 miles north from Barton Stacey near Andover to Hermitage where they joined with the School of Military Survey to form 42 Survey Engineer Group. During its 45 year existence, 'The Regiment', as it was known to all in Military Survey, had been based in three different countries and been manned by countless skilled personnel, either voluntarily, by the needs of war or by dint of "call-up" to National Service. It had sent small detachments to all points of the compass and produced millions of maps for a multitude of users. The Messes and Bars of this Regiment had resounded to tales of 'daring-do' from ranging from Aden to the Andes and from Sabah to Salisbury Plain.

The story of 42 Survey began with the formation of its direct predecessor, 512 (Army) Field Survey Company RE in December 1939. That company's founding members were a mixture of regular soldiers, reservists, militiamen and others 'called-up' on the outbreak of war. A great many of them came directly from the Ordnance Survey or had at some time served in that organisation and so a Survey spirit existed from the very beginning. Almost all started their war by entering the portals of Fort Southwick on Portsdown Hill overlooking Portsmouth Harbour. This relic of a bygone time was the home of a newly formed training organisation, Number 1 Survey Training Unit, which had been formed at the outbreak of war to turn surveyors, cartographers and printers into soldiers. Such were the numbers enlisting that soon it was necessary to form Number 2 STU at nearby Fort Widley.

From the 1st September 1939 there was a continuous bustle within the Fort and newly trained subalterns like Kenneth Robertson had the feeling that they were about to embark upon a great drama. Officers were reporting for duty one after another and reservists and recruits, mostly still in civilian clothes, were entering in a stream of small parties. On the square, squads were being formed and marched here and there and the Unit HQ was a hive of administrative activity. Meanwhile, outside the Fort the panorama was astonishing. The Solent was crowded with warships and a forest of barrage balloons, silver in a blue sky, floated over Portsmouth. On the night of the 2nd September there was a heavy storm with much thunder and lightning. Several barrage balloons were struck and flared up in a lurid glow before slowly sinking to earth as if in great pain. Next morning, Sunday 3rd September 1939, all the warships were gone, Mr Chamberlain spoke on the wireless and the sirens sounded. The war had begun.

Kenneth Robertson and four other Young Officers were given recruit parties to put through a course of military training. The training began when many of the men were of necessity still in their civilian clothing and their first route march showed up one of the difficulties. The march started in good heart with much singing but after a mile or two the singing died and men started to fall out. The trouble was their shoes had either gone or were going to pieces. "I'm sorry I can't manage sir", a recruit said, "I haven't boots and fine long legs like you". "Well, I'll try to get you the boots", was the best his officer could reply. Nevertheless, eventually boots and uniforms did arrive, as did rifles and the other accoutrements of the soldier.

Training progressed steadily and the men not only began to look like soldiers, they became soldiers. Indeed, they became Sappers since most of them already had a survey trade. Singing became a unifying force. They sang on the march, they sang in the bathhouse and in the canteen in the evening. In the bus, on the way home after a good day on the ranges, their singing would have shamed any choir.

**FIRST DRAFT**

The military training course finally closed with a highly creditable parade attended by the Director General, Ordnance Survey and the new soldiers were ready to form a new Field Survey Company - 512.

In December 1939 the Company started forming up in Gibraltar Barracks, Aldershot under command of Major FO Metford. It was to consist of a Mobile Echelon of four Topographic Sections for field survey work and an Immobile Echelon comprised of Drawing, Photographic and Reproduction Sections. The organisation was similar to that of 19 (Army) Field Survey Company RE who had accompanied the British Expeditionary Force to France in September that year. The ranks of the new company were filled by the first draft of men to have completed their basic training at Fort Southwick and to them fell the tedious tasks involved in raising a new unit.

Those first few weeks were filled with the business of drawing, checking and accounting for all manner of stores. The heavy printing machinery gave particular problems that were solved by building an improvised gantry of bridging cubes with an RSJ perched across the top to assist in the unloading of the awkward, heavy crates from lorries. Throughout this time, more and more officers and men arrived to swell the ranks. Captain AHG Dobson arrived to command a Topographic Section, Captain DI Burnett took command of the Drawing and Reproduction Sections. Captains Baker, Birch and Turner also joined the Company. When working parties could be spared from handling stores they were detailed for more military training for which Lieutenant Robertson was again made responsible

Passive Air Defence was at that time an Army craze and they learned something about the mysteries of stirrup pumps, gas masks, big boots and gas capes. Apart from these duties there was also sport, for which Aldershot has always offered plenty of opportunity.

This was the time of the "phoney war", broken only by the brilliant naval victory of the River Plate and the end of the pocket battleship Graf Spee. Christmas and New Year shortly followed. Both the 51st Highland and the 1st Canadian Divisions were in Aldershot at that time and innocent surveyors kept off the streets at night! At the time the war seemed remote and so everyone became a trifle over confident. Russia became embroiled with Finland and to most people the way forward looked a bit muddled.

New Year 1940 saw Britain gripped in one of the most severe winters for many years. It was in these conditions that 512 Company moved from the comparative comfort of Aldershot to Puckeridge Hill Camp on the road from Aldershot to Fleet. This hatted camp had formerly been the home of the Army School of Hygiene and offered what can only be described as Spartan conditions. By February the thermometer was attempting all time low records as rumours of what was to become of 512 grew and grew. One day they were told to learn French phrases but the next day there was talk of skis being seen in the stores.

Little did Spr Eric Gilliam know, as he shivered in the sentry box and watched a puddle turn into ice, that within a month he would be sweating in the sun with the temperature in the nineties. There was short notice of the move to Egypt which for most of the men was a journey into the complete unknown. What knowledge they had of the Land of the Pharaohs had been gleaned from Sunday School stories of the like of Moses in the bulrushes.

On the 3rd of March the Company marched out of Puckeridge Hill Camp to start their journey. On Sunday the 4th they embarked at Southampton for the Channel crossing to Cherbourg that night. Each person was issued with a buff Field Service postcard to send to their next-of-kin. On the reverse of this postcard was printed the laconic statement "I am well" for them to sign. From that moment onwards they were on active service and all mail to the loved ones, who many would not see again for four years, was censored by unit officers.

## **FIRST DRAFT**

At Cherbourg they boarded a train for the tedious journey south to Marseilles. The soldiers drew lots to see who would have the dubious pleasure of sleeping on the overhead luggage racks but spirits were generally not dampened as most of the young men felt they were starting an adventure which would provide them with a host of memories for their old age.

Waiting for them in Marseilles dock was the troopship '*Nevasa*'. She was a coal-burning vessel of some 7,000 tons and clearly belonged to a previous era. The holds had been boarded over in tiers to form troop decks where the men slept crowded together in hammocks and overrun with cockroaches. Ventilation was provided by canvas chutes which were hoisted up the masts and air was then funnelled down to the troops below. Officers and Warrant Officers had cabins. The food was prepared centrally and then carried to the troop decks to be consumed. The duty of carrying a dixie of porridge from the galley was hazardous as the old steamer pitched dreadfully in the mildest sea and frequently left the landlubber surveyor on his knees.

The '*Nevasa*' left port in the teeth of a strong Mistral wind with the seas extremely rough and so almost everyone was desperately seasick. The journey was carried out in total blackout and, as most of the men like Cyril Oakes had never been to sea before, it was generally a very unhappily experience. Alongside the troopship the seas were breaking clean over the escort destroyer as she pitched and rolled hideously and the seasick surveyors had the consolation of knowing that unlike those sailors, their time at sea would be short. However, in a couple of days everything changed for the better. The sea became calm, the sky blue and the sun shone warmly. Endless games of housey-housey were played on the foredeck and everyone relaxed to enjoy the brightness of the Mediterranean.

The '*Nevasa*' arrived in Port Said on the night of 14th March and only then could the crew relax. Somebody had an accordion and there were a couple of harmonica players in the Company so soon passengers and crew were singing every ballad in the book well into the small hours. It was there that some of the musical talent that was to abound in 512 first became apparent. The old Steamer still had a piece of education left for the surveyors as they were to witness the refuelling programme. Three huge barges came alongside. They were loaded with coal and had hundreds of Egyptians on board. Each man carried a basket full of coal up a ramp and dumped it into the fuel hold and by the time the ship was refuelled it was impossible to tell the coal loaders from the young soldiers.

## CHAPTER 2

### EARLY DAYS IN EGYPT

The Company disembarked on the 15th of March and was taken by train to Cairo where they took up temporary residence in Abbassia Garrison. This was a peacetime camp built by, and for, the Royal Engineers and therefore it was fairly comfortable. The soldiers were accommodated in long wooden huts each housing twenty men. The temperature was reasonable and the food meagre but sufficient and so all told, life was quite bearable as the Company started to sort out their great mass of stores.

On April the 15th the Company moved to their intended permanent base which was in North Camp adjacent to the busy aerodrome at Heliopolis. All the administrative and technical accommodation such as the offices, stores, Drawing and Reproduction Sections were single storey brick buildings. The Messes were wooden huts and, although all sleeping quarters were in tents, generally the Company was again living and working in reasonably comfortable conditions.

On the 10<sup>th</sup> of June Italy entered the war and so there was a possibility of air raids. Immediately a great deal of the soldier's time was spent digging endless slit trenches and filling sandbags so that soon the camp was a maze of obstacles all designed to trap the innocent Sapper returning from the NAAFI after 'lights out'.

It was finally realised that slit trenches were not really feasible in the very loose sand without the aid of an enormous amount of revetment and a continuous maintenance programme. It was therefore decided to provide protection within the area of the brick buildings that would be at least splinter proof. The buildings had been sited in the shape of a quadrangle with verandas along the inward facing sides. By sandbagging the verandas it was possible to provide areas which had at least two brick walls on one side and a sandbag wall on the opposite side. Sandbag traverses were also built across the verandas. Wise though this was, it virtually precluded the use of the verandas as passages. Nevertheless, splinter proof protection was thus provided and during air raid practices the whole unit huddled on the verandas although there is no denying that a direct hit, or even a near miss, would have caused heavy casualties.

The sandbagging parties even had their own song, which they sang to the tune of "We are but little children weak", with the following words:

We are but little Sappers weak  
We only get eight bob a week  
The more we work the more we may  
'Cause it makes no difference to our pay

We joined the army in our trade  
A lot of difference this has made  
We fill sandbags from morn till night  
And start again when it is light

The Sergeants are a rotten lot  
For them we don't care a jot  
Despite the things they say  
They can't put us in the "family way"

To print and prove was our desire

**FIRST DRAFT**

To higher heights we did aspire  
Since they classed us with the "wogs"  
They treat us like a lot of dogs

The remaining verses are not really printable!

One of the joys of living in a bell tent is that it can be moved and as everyone with any authority had different ideas on how the camp should be laid out, each tent was pulled down and put up again a few yards away with monotonous regularity. Living in tents was grim when the Khamsin started to blow and sand was everywhere. The sand and the flies were something the surveyors just had to get used to and make the best of. Each tent pole was reserved for photographs and bits of poetry that were pinned all around it. One particularly popular poem was:

Because of you in my small world is found  
More sympathy and love for all around  
Because of you I want to be more kind  
With gentler tongue and tenderness of mind  
Because of you I want to bring a smile  
To some sad heart to make life worthwhile  
Because of you as long as I live  
I have the loveliest thing that life can give.

Their favourite poem ended with the words:

For there's nothing I'd not say and nothing I'd not do  
To bring the sunshine out again and keep it there for you!

When the heat was bad and the sand was blowing the soldiers really loved those lines.

Music particularly helped to make life bearable and Sappers Leach and Lowenthal became partners on the NAAFI piano where they could silence the room full of men in a matter of minutes with their nostalgic duets. Jimmie Ogilvie wrote the words for their music which was only the beginning of the talent that was to emerge.

Whilst the men moved sand and tents the Egyptian builders were constructing the print shop. Firstly the roof was made of thick concrete supported on pillars and then the walls were infilled with a form of breeze block, a design which proved cool in the really hot weather. As soon as the building was complete the printing engineers, Ward, Frost and Hatherley, started to erect the fast running double-deny lithographic printing machines, process cameras and other ancillary equipment and so the technical life of 512 commenced.

Technical control of 512, and also of their partner unit, 2 Field Survey Depot RE, was exercised by Colonel RL 'Bruno' Brown, the Director of Survey Middle East, who had been appointed in early 1940 and resided with his small staff at Military Headquarters, Cairo. The two units were intended to allow the Director to be more or less independent with regard to map production and printing. However, it was soon realised that even with assistance from the Survey Departments of both Egypt and Palestine, the Company did not possess sufficient potential to deal with the map production programmes that it would have to undertake and so an extra five drawing sections were requested. By October 1940 the establishment of 512 Company had increased to 14 officers and 350 soldiers.

The first map reproduction tasks included the preparation of skeleton 1:1,000,000 air charts for the RAF and the reproduction of 1:200,000 maps of Turkey from Turkish originals. The arrival of printing experts like the golf playing 2nd Lieutenant Cyril Powell was a great assistance in those

**FIRST DRAFT**

early days. The Topo Section meanwhile had not a great deal to do and so Captain Tony Dobson with some friends organised a desert reconnaissance to learn something about living and moving in the desert. Lieutenant Robertson and a select band of NCOs and Sappers completed the party and with three vehicles they drove out into the desert westward from the pyramids and spent some days moving and bivouacking.

Seldom have soldiers learned so much useful information in such a short time. The seniors among them, with previous desert experience, put the novices through the do's and don'ts, particularly as regards unditching vehicles and Tony Dobson showed them how to use the sun compass; an instrument fascinating in its simplicity.

Despite the dark events happening elsewhere during the spring and early summer of that year, the easy-going life in Cairo continued and the surveyors felt that they were in another world. However, the momentous events beyond Cairo had one result worth recording. 512 were told not to expect re-supply from the UK for some considerable time and therefore they should set about local purchase to make good existing deficiencies. Although the Company had gone abroad with a multitude of stores the unit still lacked some notable items. The OC therefore authorized a series of shopping expeditions to Cairo. Drawing instruments and materials were not too difficult to come by, although the quality was not always what would have been desired, but finding theodolites was by no means easy. They are not the sort of things to abound among the fly whisks in the bazaars but eventually a Zeiss instrument was found in a camera and instrument shop. With some trepidation a signature was put to its purchase and it was taken 'on approval' for 24 hours after which to the relief of the signatory, the OC accepted it suitable for the unit.

As there was still no definite tasks for the Topo Section, Tony Dobson took the section to Tel-El-Kebir for desert training and practise in surveying. Based on co-ordinates from the Survey of Egypt, the exercise objective was to establish further co-ordinates for the fictitious use by the Gunners' own Surveyors. The freshness of the open desert was a relief after Cairo which was then growing hot and sticky. The cool, brightly starlit evenings in the desert were remarkably pleasant and Tony Dobson demonstrated how to observe the stars and use the nautical almanac to define ones position on the Earth's surface. However, before the Topo Section could complete this training exercise, a real task came along.

In July 1940 the Anti-Aircraft Gunners in Alexandria required to know the exact bearings, ranges and elevations to four or five prominent features around each of their gun positions from which they could calibrate their instruments. The Topo Section was to provide the required information and so the Section moved to Alexandria where it was attached to the Royal Northumberland Fusiliers in Sidi Bishr Camp.

The survey was based on a series of co-ordinates and elevations obtained from the Survey of Egypt and as there were numerous gun positions defending the Naval Base the resulting triangulation resembled a cats cradle. For every gun position a card was produced which showed a silhouette of each of the prominent features selected. A vertical arrow and a horizontal arrow on a silhouette indicated the precise point to which bearings and elevation had been taken and alongside each silhouette the required information was given. The detachment commander selected the features to be targets, NCO and Sapper surveyors carried out the observations and a small Computing Section calculated the co-ordinates. One round of angles to be observed included a ray which crossed Aboukir Bay. The NCO making the observations came home late and said a flying boat had landed in the Bay and moored so that one of its wings neatly clipped through his ray. He had to wait close of two hours before the wind changed and the flying boat swung at its moorings.

One extra mural job the Section collected was the disposal of an unexploded anti-aircraft shell

**FIRST DRAFT**

fired during an air raid and which landed in the garden of a house. No other Sappers were available and so the surveyors from 512 were asked to deal with the thing in a way that almost amounted to an order or, at least, to a challenge. On inspection the shell seemed pretty inert and so it was gingerly picked up and driven through busy Alexandria to be blown up on an area of waste ground behind Sidi Bishr Camp. It was a stupid thing to have done but at the time there seemed little else they could do without a tremendous fuss. Alexandria was far from being geared for bomb disposal procedures in those days. In the event, they were lucky.

512 Company's first field survey task was completed in the end and the Anti-Aircraft Gunners must have been pleased with the result since soon afterwards 512 were instructed to repeat the performance in Port Said and Palestine.

The entry of Italy into the war made it certain that hostilities in Africa would soon commence in Libya, the Italian East African colonies and Abyssinia. The available map series published by the War Office were neither extensive nor up to date. Record copies of the best and most up to date maps of the areas involved were obtained from a variety of sources and the Reproduction Section of 512 were tasked with the production of bulk stocks of all the sheets including the overprinting with a military grid.

A considerable amount of research was undertaken such as investigations into the local triangulation systems and the preparation of Trig Lists for use by our own field surveyors and the artillery surveyors. The acquisition by the RAF of aerial photography of selected areas to enable the revision of existing maps and the preparation of new ones to commence ensured that all the specialists of 512 were now busy.

## CHAPTER 3

### THE START OF THE DESERT WAR, GREECE AND THE TURA CAVES

Initially command and control of 512 Company rested with Headquarters British Troops in Egypt (BTE) which was situated in Cairo along with its superior command, GHQ Middle East. In HQ BTE there was an Assistant Director (AD) Survey with a small staff from which a captain was detached to the Western Desert Force to act as a Survey Liaison Officer. The Mobile Echelon was placed under command of HQ BTE and so came under the technical control of the AD Survey.

In the summer of 1940 the Topo Sections were tasked to effect a connection between the local triangulation scheme and the network in Cyrenaica produced by the Italians. This was carried out by intersecting the Italian trig points across the frontier. This work was followed up in August 1940 by field surveys in the Mersa Matruh area to provide control for subsequent air surveys to extend the cover of the Survey of Egypt 1:25,000 series. At the same time a 1:12,500 defence map of Matruh was produced and several subsidiary points surveyed for use by RA Surveyors.

Throughout August and early September the Italians concentrated their forces along the border and on the 14th they finally crossed it and dug in around Sidi Barrani where they stayed for the next three months. On the 9th of December the Western Desert Force, which included the Mobile Echelon of 512, mounted the first British offensive of the desert war. It was so unexpectedly successful that by the 14th of December the Italians were back in Cyrenaica and by the 7th of February 1941 Benghazi and El Agheila had been captured and the Italian Commander General Berganzili surrendered his forces. During the two-month campaign the Western Desert Force had advanced 500 miles and beaten a numerically superior enemy. This rapid advance put great strain on the infant map supply system which emanated from Cairo and stretched all the way forward to the frontline, some 700 miles.

The Topo Sections role in this great offensive was to run a chain of triangulation points from the Egyptian trig stations to connect up to the Italian system. A quantity of Italian survey data was captured and after investigation it became apparent that there were in fact two separate systems. The 512 surveyors sent this valuable triangulation information back to Cairo to be used in amending Trig Lists and then set about establishing a network to link the two different enemy schemes. This was followed by yet more surveys to support the RA Survey parties preparing for the attack on Bardia. During this period the Commanding Officer was never able to retain any effective control over the Mobile Echelon which, to all intents and purposes, acted as an independent unit.

As there was no mobile reproduction equipment available to deploy with the Desert Force, map production had to be carried out back in North Camp at Heliopolis. As the attack progressed, not only were thousands of Italians taken prisoner but also considerable numbers of their maps were seized. They were immediately sent back to the Reproduction Section who rapidly added the British Military Grid, carried out what revision was possible from the available sources which sometimes included air photography and then bulk stocks were printed in monochrome. These rapid response products were then flown as far forward as possible and distributed to the front line troops without delay.

One of the most interesting captures was a single copy of an Italian 1:25,000 map of Tobruk. 512 used this lucky find to produce large scale maps of the Tobruk defence, not only for our own use in the successful assault on that fortress but unfortunately, as events turned out later, for German use as well. The Germans captured a copy of the British reproduction unaware of the existence of the original Italian map at that scale.

**FIRST DRAFT**

During the winter of 1940/41 the war spread to Greece when, in October, the Italians stormed across the border. However, the defending Greeks in a short but bloody campaign then repulsed them. On the 8th of February 1941, fearing a further attack but this time by the Germans, the Greek government asked Great Britain for military assistance. As the Italians were now defeated in North Africa it was decided to send support across the Mediterranean Sea.

Thus, at the end of March 1941, Colonel Martin Hotine, recently returned to Egypt from East Africa, was appointed Deputy Director (DD) Survey and sent to Piraeus in Greece to organise the Survey support to the campaign. He took with him his Directorate staff, the Headquarters and two Mobile Sections of 512 Company, 517 (Corps) Field Survey Company and 9 Field Survey Depot.

He found himself with a particularly difficult task as the only maps of Greece available to the War Office at the outbreak of war were in most cases out of date and great difficulty was experienced in obtaining copies of the latest maps from the Greek authorities. When up to date maps were eventually received it was found that the text was printed in Greek characters and therefore had to be transliterated into Roman characters before new maps could be prepared. This led to considerable delays in production and issue and so in consequence, troops used such maps as were available and soon found that different editions did not agree and in any event, most were inaccurate.

By the time Commonwealth Survey units arrived in the country it was too late to produce standard maps of greater accuracy. Some bulk printing was carried out in Egypt but competition for space on the supply ships was strong and the supply system was extremely stretched. Therefore, it was considered essential that each consignment of maps was escorted all the way by an officer to ensure that they reached their destination.

Hotine's already Herculean task was rendered virtually impossible when almost all of the technical stores of 517 Company were lost at sea when the ship carrying them was sunk through enemy action. It was also immediately apparent that it was inadvisable to send forward heavy trailer-borne printing equipment over the bad roads on what was likely to be a mobile campaign. These problems led to 517 Company taking over a local printing works and the 512 Mobile Sections being employed on anti-aircraft gun position surveys in the vicinity of Athens and Piraeus. Miscellaneous drawing and computing tasks were undertaken and some personnel were used as reinforcement to the Map Depots. Air photographs of Struma Valley were sorted and used to revise existing maps of that area. Also some photographic mosaics of selected areas were produced. It was stated at the time that if the surveyors of the Topographic Sections had also been given training as draughtsman and air survey plotters, far more could have been achieved during the Greek campaign.

The military situation deteriorated so rapidly that the British soon faced withdrawal from the Greek mainland and so 512 Company's Mobile Echelon packed up for evacuation on the 23rd of April 1941. However, the German advance was so rapid that many of its personnel, together with a large portion of 9 Field Survey Depot, the Topographic Sections of 517 Company and part of the Survey Directorate were captured and became prisoners of war.

Whilst the field surveyors were so involved in the ill-fated adventure to Greece, the Immobile Echelon of 512 were very busy in North Camp producing map support for operations in Crete. A 1:200,000 map of Crete was produced and, during the Battle for Crete in May 1941, a second printing was produced as initial stocks were insufficient. A 1:50,000 gridded series of 16 sheets was rapidly produced by duffing out the Greek characters and redrawing the Roman transliteration onto enamel plates. A monochrome version of the series was available in Crete for the initial fighting and although a final four colour version was produced by the 17<sup>th</sup> of May,

**FIRST DRAFT**

only small stocks reached Crete owing to the lack of both air and sea transport. During the same period 512 Company produced half-inch, 1:25,000 and 1:50,000 maps of Cyprus in case that island was also invaded.

By the spring of 1941 the map production system of 512 Company was operating smoothly. Sergeant E Morrison supervised the activities of such skilled tradesmen as Sappers E Sartin, M Richards and E Sertees in the stereo interpretation of RAF photography as the first step in plotting new detail for updating existing maps. The air surveyors were busy producing minor control plots which involved tedious internal and external adjustments and the detail was plotted from the RAF photography, often twin obliques, using the Marriot method. This graphical technique necessitated identifying the plumb point in order to subsequently find the isocentre so that rays could be drawn to the detail to be plotted. Rays to the same points of detail from adjacent photographs provided the intersections necessary to fix the detail. Heights were produced by parallax bar methods.

The production of minor control plots was later mechanised. This was initially by the introduction of the meccano-like 'Lazy Daisy' system shortly replaced by the slotted template method. Proportional compasses were used to transfer detail from photos at one scale to maps at another when rapid revisions were required. The most complex air survey equipment available was a Cambridge Stereocomparator, usually operated by Sapper Jack Francis who with it could measure on photographs to within a few microns.

Many of the instruments and techniques used had been designed by Sapper officers between the wars and the only air survey text books in the unit at that time were Lieutenant Salt's 'Professional Papers Eight' and Lyle Troreys 'Parallax Without Tears'.

The Draughtsmen relied upon their own hand skills to fair drawn on the new drawing material, Kodatrace, and used the co-ordinatograph to produce the grids.

Lithographic artists worked on zinc plates under the watchful eye of Sergeant J Bray whilst Sergeant J Bigwood and the likes of Sapper Agnew operated the big Hunter-Penrose process camera.

Printing plates were sensitised and spun on the whirler whilst the rattle of marbles from the graining machine was non-stop. Sergeant E Westcott exposed the plates in true helio fashion by using the sun as the light source and work was proved on a large flat-bed proving press. The final products, maps in the tens of thousands, streamed from the four modern presses under the watchful eyes of Sergeant Storr and Bowden.

During 1941 Military Survey representation in the Middle East was enhanced with a number of Corps Field Survey Companies and Field Survey Depots sent out from the United Kingdom and by Australian, South African, East African and Southern Rhodesian Survey Units. In spite of all these new units reinforcing the theatre, 512 remained the main base plant map production facility and, as such, was a critical theatre asset. Its position on the edge of Heliopolis airfield was now considered far too vulnerable and so it was decided to move the unit, together with 2 Field Survey Depot, responsible for storage and distribution of the maps, and 11 Field Survey (Stores) Depot which looked after all the technical stores required to keep 512 in operation, and the GHQ Map Record and Production Sections to the safety of the caves at Tura.

About 12 miles south of Cairo and 2 miles east of the Nile, near the village of Tura, there is a limestone escarpment some 200 to 300 ft high. In 1941 the face of this escarpment was studded with openings, some rectangular, some square but mostly of an irregular shape. The holes were the entrances to enormous caverns whose mouths were largely choked with broken stones. They did not appear to be natural caves as the vertical and horizontal lines of the walls and roof

**FIRST DRAFT**

left no doubt that they had been excavated by man. However, they seemed to be too regular to have been ordinary quarries.

The caves lie almost equidistant from the Pyramids of Gizeh and those of Sakkara but on the opposite bank of the Nile. In the period 4000 BC, when those Pyramids were built, the Nile had not yet been harnessed and so in times of flood its waters would have licked the foot of the escarpment on the one side and approached the sites of the Pyramids on the other. Plaques and cartouches were found which were said to date from the time of the Pyramids and the limestone of which the Pyramids are built is of the same type of that in the escarpment. In one cave a large block of stone was uncovered, the dimensions of which approximated to those of the base stones used in the construction of the Great Pyramid of Cheops. This stone, which had been accurately cut to rectangular shape 15ft by 6ft by 3ft and weighted 20 tons, was found to be resting on small stone pillars and levelled up with timber wedges. Moreover, underneath it were one or two cylindrical wooden rollers that had obviously been set for rolling the block to the entrance of the cave. This collection of facts gives good reason for the belief that the caves produced the stone to build the Pyramids.

The excellent protection against air attack offered by the caves was quickly realized and so in February 1940 work was started on clearing the first cave. This was named Zero and was to be used as an ammunition store, which was safe as it was roofed with 150 to 200 ft of solid rock and whose proximity to the Nile made transport comparatively easy.

The caves, when cleared, were found to consist of a large domed space extending for about 70 ft from the entrance, with six galleries of lengths from 60 ft to 250 ft spreading into the heart of the rock. The height, when the rubble had been removed and the floor levelled, averaged about 25 ft whilst the galleries in no case exceeded 25 ft in width. The walls were so straight and plumb and the ceiling smooth and horizontal that there was no doubt that the ancient Egyptians had precise instruments to set out such accurate work. The general effect was of the interior of some prehistoric place of worship.

Their methods appear to have been to cut a number of holes in the vertical face of the wall, to serve as footholds and hand grips. Using these as a ladder, workmen climbed to 25 ft and, probably by means of wooden wedges made to expand by being wetted, cut out the first block. Further blocks were cut by working along the ledge so formed and so on down the face of the wall. Steps were then cut in the new face and the same procedure repeated. Pieces of rope, probably used for lowering the blocks, were found in some of the caves.

When the rubble had been cleared away, the floor was levelled and finished with concrete. A Decauville railway, known affectionately as the Chatanooga Choo Choo, was then laid to connect all the galleries with the entrance and the whole cave was provided with electric light. After about 5 months work the first cave was taken over for use by the RAOC in June 1940, the other caves were then cleared and occupied in quick succession.

The ground outside was very uneven and in some cases the floors of the caves were a considerable height above the plain that lay between the escarpment and the Nile. Many miles of road were built to connect the standard gauge railway sidings on the plain at Assadrán with the Decauville railways in the caves. A considerable amount of living accommodation was also constructed, mainly in stone taken from the caves, on the rough ground on the plain. Advantage was taken of the unevenness of the terrain to make these buildings as inconspicuous as possible from the air and in fact the area was never bombed.

In June 1941, 512 Company moved into its caves and skilled tradesmen like Sergeant Cliff Ward were soon erecting the presses. Living and working in this complex which had a generally claustrophobic effect was an experience never to be forgotten. An ever-present problem was the

**FIRST DRAFT**

presence of millions of fleas that during the daytime concentrated on the Egyptian workmen. However, when they went home and the nightshift came on, they made life quite impossible for fair skinned Europeans and for some poor Sappers a night working in the caves meant legs and arms being bitten raw like a burn.

In some cases, notably at the entrances, cracks in the ceiling appeared and widened until flakes of stone fell to the ground. This happened more frequently in the Military Survey cave than in others and continued to do so even after occupation, to such an extent that evacuation was actually contemplated. On balance it was considered that the benefits of safety from bombing exceeded the danger from falling stone. There was a constant inspection of the cave roof by a team of native engineers lead by an expert miner. Working from scaffolding they would tap the roof with a long handled hammer and an experienced ear could tell if the roof was loose. If this was so they either brought the offending area down or built a brick supporting pillar up to the roof.

It was a miracle that nobody from 512 was injured by the roof although about two tons of limestone did come down without warning and caught one of the Egyptians who was not a pretty sight when they got him out! The loose rock would creak and groan which was the signal to get moving sharply before it came away from the roof. A number of draughtsmen's tables were destroyed in seconds in the drawing office, luckily the men had made a hasty retreat before a ton or two of limestone came down.

The caves were very cool and daytime working was not unpleasant. The company was now able to work two twelve-hour shifts which had not been possible at North Camp as the heat was too great after midday. Sleep was a problem as the huts they lived in were almost as hot as the tents and daytime sleeping was difficult. Another hindrance to sleep came from the next cave to 512's which housed 111 Maintenance Unit RAF. They had thirteen test benches in front of their cave on which aircraft engines were constantly running on test. If by some chance the tests were completed in the night and no engines were running, the desert silence would wake one from sleep as though an explosion had happened.

Once the Company was settled in at Tura the work increased as there were constant issues of maps to the various Depots in the Middle East. The Camera Section did a tremendous job using the "Wet Plate" process. The Helio Section made "Deep Etch" plates using the sun for ultra violet exposure during the daytime and a battery of carbon arcs during night shift. Proving and printing were done under conditions that would have been ruled out as impossible in "civvy street". The fact that the printing machinery continued to run was a tribute to both the machinery and the service engineers such as Terry Dugmore who knew every nut and bolt on the equipment.

Entertainment had to be self-made and soon there were thriving football and cricket teams based at the nearby Gezira Sporting Club who made the news regularly. The Rugby Club were particularly noteworthy, perhaps due to the presence in the team of nine Welshmen led by the pre-war London Welsh player, Elwyn Probert. Angus Patterson and 'Tanker' Avery were both first class long distance runners and Harry Binders Weight-Lifting Club and the Boxing Club were also popular. Sapper Allay and half-a-dozen others were keen enough cyclists to join the local branch, called RAFAT (RAF and Army Tura), of the famous Middle East Cycling Club, the 'Buckshee Wheelers'.

The Concert Party boasted a host of talent from crooners and instrumentalists to comedians and Stan Dix the magician from Liverpool. The way he took a wad of old newspapers and did his tearing act along with Lancastrian patter to finally unravel the Royal Engineers badge, neatly cut out, usually brought the house down. The dance band was available for Mess functions and they were so good that they often played in Cairo. The 512 Male Voice Choir, administered by Major

**FIRST DRAFT**

Douglas Cleak and conducted by Jack Francis, performed all over the area and even broadcast home to Blighty on the wireless on one occasion

By the winter of 1941 life in 512 Company was relatively safe, at least from the enemy if not from falling rocks, although as time passed there was a feeling of hopeless boredom as the chance of returning home seemed even further away. At times the mail was very erratic and there was a general feeling that they had been abandoned in a land of flies and sand.