

CHAPTER IX

NORTH WEST AFRICA. (OPERATION "TORCH")

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SECTION 1. SURVEY ORGANIZATION AND NARRATIVE

Historical background

From the time when the United States entered the war in December, 1941, the possibilities of an Allied expedition to French North West Africa had been considered. During 1941 and 1942 the following factors tended to strengthen the desirability for such an operation:—

- (a) The German offensive against Russia not only endangered the whole existence of the Russian Armies but involved such a deep thrust into southern Russia that it formed a dangerous threat to the Caucasus oilfields and the Middle East itself. Russia was pressing the Allies for the opening of a second front to relieve the strain.
- (b) The German and Italian forces in Libya produced a growing threat against Egypt and the Middle East generally.
- (c) The increasing difficulty of passing convoys through the Mediterranean, and the Axis threat against Malta were of serious moment to the Allies.

The decision to undertake a joint British-U.S. operation in North West Africa to clean up all the German and Italian forces in North Africa, to open up the Mediterranean and relieve Malta, and to relieve indirectly the strain against Russia was made by the Combined Chiefs of Staff and approved by the two Governments concerned on 24th July, 1942. The code name for the operation was "Torch."

Strategical and military considerations

Rommel's offensive against the British forces in Libya was launched in May, 1942, and by early July had reached the El Alamein area and was threatening the Nile Valley. By mid-August the enemy drive had been stopped, and the build-up of Eighth Army was being rapidly undertaken with a view to an autumn offensive in October.

The main objects of operation "Torch" were thus to secure French Morocco and Algeria with a view to the earliest possible occupation of Tunisia including its airfields, so as to help in opening up the Mediterranean for convoys, and to prevent the enemy forces in Libya from using Tunisia as a base. Indirectly it was hoped that this would relieve the strain on Russia and cause the enemy

to withdraw forces from the Russian front. For success it depended partly on surprise, and partly upon the degree of opposition or otherwise which might be offered by the French in North Africa. The United States, unlike Britain, had maintained relations with the Vichy Government and, for political reasons, it was considered that an initial assault operation having an American bias would meet with more local support than one in which British troops were in the van. It was arranged, therefore, that U.S. troops should participate predominantly in the assault phase, and that the British Commander of the Eastern Task Force, on which the burden of the initial fighting was likely to fall during the subsequent advance into Tunisia, should not assume command until after the actual assault phase was ended.

The plans for the landings envisaged an Eastern and a Central Task Force which should both land inside the Mediterranean, and a Western Task Force which would land in the vicinity of Casablanca in French Morocco. Originally it was intended that the landings of the Eastern Force should extend as far east as Philippeville and Bone, so as to reach Tunis as quickly as possible. The proposed landings to the east of Algiers were, however, dropped out during the planning stage in view of uncertainty as to the probable extent of air opposition against shipping in the more easterly harbours.

The final plan called for assault operations as under:—

(a) *Force based on the United Kingdom.*

The Central and Eastern Task Forces were to land in the vicinity of Oran and Algiers respectively. The landing at Oran was to be undertaken entirely by U.S. Forces. At Algiers one British infantry brigade group and two commando formations were to land simultaneously with the U.S. 34 Division, with a British infantry brigade group of 78 Division in floating reserve.

(b) *Force based on the U.S.A.*

The Western Task Force, sailing direct from the United States, was to land at Casablanca or in the vicinity.

Following the initial assault, the Eastern Task Force, under its British Commander, was to move rapidly eastwards into Tunisia to capture Tunis and Bizerta and essential airfields on the way, together with the Algerian ports of Bougie, Philippeville and Bone.

Such was the operational picture for which survey planning was required.

Survey planning

The Geographical Section (War Office) had, during 1941, put in hand the preparation of map series covering French North Africa in anticipation of possible operations in that area. These mapping programmes, which are dealt with more fully in Section 2, were initiated in 1941 as part of the normal policy of map production, as far in advance as possible, for all likely operational areas. Such a programme of map preparation over wide areas, whilst providing insurance against a sudden emergency, acted also as security cover for the mapping of areas which were definitely required for impending operations.

In 1942, when plans for "Torch" became firmer, the North African mapping programme was intensified with all due security precautions.

Allied Force Headquarters (A.F.H.Q.) was formed in August, 1942, as an integrated British-U.S. planning staff under General Eisenhower, the Commander of the Allied Forces for the operation. For the first two months all map and survey matters were handled by an engineer officer on the staff of the American Chief Engineer. This was in accordance with U.S. Army practice, whereby survey was the responsibility of the Engineer Section, there being no provision made for a separate survey staff organization. The officer concerned had one technical serjeant allotted to him as his sole assistant for survey matters. Map planning was conducted by him partly by direct contact with the Geographical Section (War Office), and partly by contact with the D.D. Survey First (British) Army (Colonel R. P. Wheeler).

It soon became obvious that map planning requirements were growing rapidly and were outstripping the powers of one engineer officer. On 21st October, therefore the War Office appointed a British officer (Colonel E. B. Elkington) to assume survey duties at A.F.H.Q. At that time there was no authorized establishment for a separate survey staff but, about 1st November, another British survey officer joined him and, in the course of the next few weeks, a staff of British other ranks was collected consisting of one serjeant, one clerk, two computers and three draughtsmen. This small Survey Directorate, though part of the Engineer Section, looked after the rapidly growing requirements of A.F.H.Q. with regard to maps for planning, and made arrangements for the subsequent bulk shipments of maps overseas in successive convoys. For some considerable time the personnel remained almost wholly British.

For the British planning of the operation First Army Headquarters was formed, which held on its authorized establishment an Army Survey Directorate. Security being of vital importance it was decided to keep the British survey staff as small as possible during planning, so work was begun at corps level, with an A.D. Survey and a Corps Survey Directorate. Later this was increased to the authorized Army Survey Directorate, but the full establishment was not filled during the planning stage, as it was considered unnecessary to have too many individuals conversant with the planning details. Four officers, with Colonel R. P. Wheeler as D.D. Survey, and Lieut.-Colonel S. G. Hudson as A.D. Survey, together with four other ranks only, were employed on planning in London, and one officer and three other ranks were employed on the assembly of the bulk map stocks at a map depot at Swindon. These latter personnel were not aware of planning details, and worked entirely in code.

For security reasons the exchange of information and instructions between the War Office and D.D. Survey (First Army) was kept almost entirely on a verbal basis. The absence of recorded data has made it somewhat difficult to piece together the survey story of the planning and early operational periods.

Colonel Wheeler attended the regular conferences of the planning staff, and was thus enabled to keep abreast of the plans as they were unfolded, and so make provision with the War Office for the supply of the required maps and other survey data.

One of the biggest problems during planning was caused by the frequent changes in plans for the tactical loading of the ships. To maintain security it was essential that the troops should not open their maps and see where they were going until they had embarked and were well out to sea with no prospect of returning to port. In the first place, an attempt was made to allocate map consignments to ships to fit the actual units which were scheduled to embark on each ship. Constant changes in the loading plans, however, made this

impossible and in the end the only solution was to give each ship a reasonable complement of maps, according to its loading capacity, irrespective of the actual units which would embark thereon.

By an agreement dealing with spheres of mapping responsibilities throughout the world between the War Office and the U.S. War Department (*see* Chapter IV), the former was responsible for all matters relating to map design, grids, and initial production for North Africa, which fell within the British sphere of cartographic responsibility. In accordance with this agreement colour pulls, kodak film negatives, and other forms of reproduction material for all maps produced by the War Office in their areas of responsibility were sent over to Washington as they were published, so that map stocks could be printed there for supply to any U.S. forces which might proceed direct to a theatre of operations without passing through British map supply channels.

The map supply planning details for the Western Task Force, which was to proceed direct from the United States to the Casablanca area, were therefore entirely taken over by Washington. In the case of American formations in the Central and Eastern Task Forces, which would proceed direct from the United Kingdom, the map supply arrangements were in the hands of the Chief of the Engineer Intelligence Division at H.Q. European Theatre of Operations (E.T.O.) in London. This officer (Colonel H. Milwit), came over to England during the summer of 1942, and worked in very close touch with the Director of Military Survey at the War Office. Having ascertained the mapping requirements of the U.S. Forces taking part in the operation, he placed his demands with the War Office, and the latter arranged for printing and bulk supply of the necessary stocks.

The first phase. The race for Tunis and Bizerta (8th November to the end of December, 1942)

The initial landings having been successfully carried through, the role of First Army was to establish a base at Algiers and occupy Eastern Algeria and Tunisia as quickly as possible. To assist in this forward rush into Tunisia, U.S. units from Oran and Casablanca were sent forward piecemeal, and were at first operating under British brigade and divisional commanders.

The British force, forming First Army, was built up slowly as convoys arrived. The initial move towards Tunis was made by 78 Division and one tank regiment. Actually 78 Division was not complete till 1st December, and 6 Armoured Division by about 15th December. The later build-up included 46 Division which arrived early in February, 1 Division during March, and 4 Division in mid-April, and one Tank Brigade. Later still, when transferred from Eighth Army there were, in addition, 4 (Indian) Division, 7 Armoured Division, and 201 Guards Brigade with their divisional and administrative troops.

For some time the French would not agree to their troops coming under British command, but eventually a French corps operated as part of First Army. The American troops were organized as the U.S. II Corps.

During this first phase German forces were reinforced in Tunisia both by air and sea. The First Army lines of communication back to Algiers extended over 500 miles, the weather was very bad with heavy rains reducing all roads to a condition of deep mud, and the race for Tunis just failed.

The British survey organization during the early part of the campaign was as under:—

(a) *Survey Directorate A.F.H.Q. (D. Survey—Colonel E. B. Elkington).* When D.D. Survey (First Army) left London for embarkation early in November, all matters relating to his survey units and map supply which remained outstanding were handed over to the Survey Directorate at A.F.H.Q. This latter, with the remainder of the Engineer Section, remained in England till 9th December when it embarked for North Africa. It consisted at that time of two officers (British), six other ranks (British), and one technical serjeant (U.S.). The ship on which Colonel Elkington was travelling was torpedoed on 21st December off the African coast, and he landed at Oran, proceeding to Algiers the following day, where he joined up with the Chief Engineer (U.S.) and the remainder of the Engineer Section. By this time D.D. Survey (First Army) was forward at Constantine, 518 Field Survey Company R.E. and the main part of 12 Field Survey Depot R.E. also being forward in First Army area. A small rear party of the depot, had, however, been left behind at Algiers, and this rear map depot then came under the control of A.F.H.Q. and was manned by personnel of No. 12 Depot until No. 7 Field Survey Depot eventually arrived from the United Kingdom.

The Survey Directorate, as part of the Engineer Section, was accommodated at Algiers, and remained there during the whole campaign.

(b) *First Army Survey Directorate (D.D. Survey—Colonel R. P. Wheeler).* This was of the normal type and, in addition to the D.D. Survey, A.D. Survey and D.A.D. Survey, it had three captains (corps liaison officers) to work with 5 Corps (British), 19 Corps (French), and II Corps (U.S.). A small advance party consisting of one officer and three other ranks landed with the initial assault, their primary duty being to establish contact with the head of the French Service Géographique at Algiers, and to ensure that their survey records were protected from destruction. A.D. Survey and half the directorate followed by the second convoy, arriving on "D" + 4, the remainder arriving by third convoy on "D" + 14.

(c) *518 Field Survey Company R.E.* This unit was of the normal corps type, and was equipped with the newly supplied demy-size printing machines and ancillary equipment mounted in special lorries. One topographical section reached Algiers by second convoy on "D" + 4, the remainder arriving by third convoy on "D" + 14.

(d) *516 Field Survey Company R.E.* Also of normal corps type. This unit, under the original shipping arrangements, should have travelled complete in convoy KM.6. Unfortunately this was altered to KM.9 without the agreement of D.D. Survey after his departure from London, and it did not reach North Africa till February.

(e) *12 Field Survey Depot R.E.* This unit, of standard type, had the function of holding and issuing map stocks and survey stores for First Army during the entire campaign. It went out by second convoy arriving on "D" + 4.

The Army Survey Directorate controlled all survey activities, including map supply, which might be required east of Algiers by British, American and

French forces. It always worked at advanced army H.Q. and, being responsible directly to the B.G.S. was thus fully acquainted with planning and operations at all stages. D.D. Survey maintained close touch with the operational and artillery staffs at Corps headquarters.

For the first three months the only units available were 518 Field Survey Company R.E. and 12 Field Survey Depot, the latter confining its activities to map depot duties. But for the outstanding efforts of these two units, the Survey Service would not have been able to carry out its responsibilities.

Until 18 Army Group was formed towards the end of February, 1943, First Army operated directly under A.F.H.Q., and the survey directorates at A.F.H.Q. and at H.Q. First Army formed the only organizations for survey and mapping control within the theatre.

The directorate at A.F.H.Q. which, until it was augmented and integrated in February, consisted only of the original small British party, had a full-time job. It dealt direct with the War Office on all matters of survey policy, bulk map supply, and the provision of new survey units. It also effected co-ordination of map stocks and supply, both British and American, over the whole theatre extending from French Morocco to the Tunisian battle zone. It assumed control over the map production resources of the French in Algiers, and established contact with the Middle East Survey Directorate in Cairo so as to arrange for the efficient sharing of the work of preparing maps and other survey data for Eighth Army which would later be entering the Tunisian battle zone.

First Army Survey Directorate remained responsible for the survey needs of all troops under First Army command, including American and French troops, and as the U.S. forces operating in eastern Algeria and Tunisia had no survey units of their own in the field until about February, 1943, they relied on the British organization with First Army to fulfil their needs.

A.F.H.Q. was responsible for map supply to all troops and other users outside First Army. This included the Air Forces and certain requirements of the Navy.

The map situation for the initial operations is dealt with in detail in Section 2. The map series which had been prepared by the Survey Directorate (War Office) comprised those on scales of 1/1,000,000, 1/500,000, 1/200,000 and 1/50,000, the latter series being incomplete. Production of these had begun during 1941 using copies of French maps in the War Office map library as basic material. The programme was intensified and bulk printing undertaken as soon as a definite decision had been taken to stage the operation. As already stated maps had been placed on board the ships going out in convoy for issue to the troops during the voyage. Bulk stocks were also shipped to form a first reserve with 12 Field Survey Depot in Algiers and the forward depots.

The leading British formations had therefore been provided with maps of Algeria and Tunisia for their eastward move after landing. The American troops who landed in Morocco and at Oran, and who were sent east to reinforce the British 5 Corps somewhat earlier than had been anticipated, had not been issued with any maps of eastern Algeria and Tunisia. To meet this emergency French civilian printing firms in Algiers were employed to print monochrome maps, and this just saved the situation, as the reproduction sections of 518 Field Survey Company did not arrive till "D" + 14.

Contact with the French Service Géographique in Algiers was first established by the small advanced party of the First Army Survey Directorate which accompanied the initial landing. Though they were willing to co-operate, there was a feeling of inertia during the first month. Thereafter they co-operated wholeheartedly and threw all their energies into assisting the Allied Force with the somewhat limited resources at their disposal.

518 Field Survey Company, which arrived at Algiers on 22nd November, detailed one topographical section to carry out surveys for the anti-aircraft defence of Algiers, moving on to Bone at the end of the month for similar work there. The other topographical section was at first employed assisting 12 Field Survey Depot to organize the map depot and sort out the map stocks. The drawing section at once began the revision of 1/50,000 maps of the Bizerta-Tunis area from whatever air photographs could be obtained.

The reproduction sections began work on 2nd December, their first task being the printing of 1/200,000 maps of Tunisia.

After installing their main map depot in Algiers, 12 Field Survey Depot established a forward depot, first of all at Bone, using sea transport, and then at Constantine. The transport of 518 Field Survey Company was used for a map convoy service between the main depot at Algiers and Constantine.

On 23rd December 518 Field Survey Company left its location at Menerville and moved forward to Condé Smendou.

The second phase (January, February and March, 1943)

During this phase, both sides in Tunisia were building up their forces, and were engaged in an attempt to hold or seize ground features of tactical importance for future operations. The Allies were struggling all the time to maintain and improve their long lines of communication which, owing to heavy rain and mud, were very precarious. Week by week Rommel's forces were being driven by Eighth Army further and further westward towards Tunisia.

The general line of contact between the Allied and German forces in Tunisia during this period extended roughly from Cap Serrat to Gafsa, with U.S. II Corps on the right, the French 19 Corps in the centre, and the British 5 Corps on the left. During January the enemy attacked frequently, mostly in the Bou Arada and Pont du Fahs areas, and late in February they penetrated the vital Kasserine Pass held by U.S. II Corps. The situation was restored and, by March, the American Corps staged an offensive to help Eighth Army in connection with its attack against the Mareth position. By early April contact had been made between the First and Eighth Armies.

Early in February it was obvious that the small British survey directorate, which had been functioning at A.F.H.Q. since the planning stage, was neither large enough nor suitably composed to deal with the developing situation. A proposal was therefore submitted by the Chief Engineer for the establishment of an integrated survey directorate. Approval for this was not granted until 10th April. In the meantime the work had to be carried on and, from January onwards, further British and American survey officers were being absorbed into the directorate. In the absence of an authorized war establishment they were either borrowed from units or acquired in other ways. Colonel E. B. Elkington had an American officer as his deputy. Other officer appointments were for the control of map production (British), air photos (U.S.), map distribution (British), and printing (U.S.).

Early tasks of the directorate included the development of contact with the French Service Géographique so as to utilize their limited mapping and reproduction facilities, including the use of civil printing firms in Algiers. Base stocks of maps had to be built up, including imported consignments from the United Kingdom and those printed locally by all means available.

In North West Africa, as elsewhere, there was a limited demand for photo-maps. These were nothing more nor less than half-tone lithographic reproductions of photo-mosaics, touched up to intensify roads and other detail, and carrying a grid. They were prepared by U.S. topographical units in the theatre, 62 Engineer Topographical Company and 951 Engineer Topographical Company being placed at the disposal of A.F.H.Q. for this purpose. The merits and demerits of these photo-maps are discussed elsewhere, and it is of interest to note that they were poor in quality and very little used, thus confirming the experience gained in other theatres.

Towards the end of February 18 Army Group H.Q. was formed, under A.F.H.Q. control, to co-ordinate the operations of the First and Eighth Armies. This brought about certain changes in survey organization. Colonel R. P. Wheeler was appointed D.D. Survey 18 Army Group, being succeeded as D.D. Survey First Army by Colonel S. G. Hudson who had hitherto been his A.D. Survey.

516 Field Survey Company R.E. arrived from the United Kingdom at the beginning of February, and moved to Draa. One topographical section was assigned for survey duty with U.S. II Corps, as the topographical unit belonging to that corps, 62 Engineer Topographical Company, was not yet available. It there joined up with one topographical section of 518 Field Survey Company which, having been moved from the map depot to Bone for anti-aircraft surveys, was also assigned to II Corps (U.S.). These two sections remained with the corps working in conjunction with the field observation battalion until 62 Engineer Topographical Company was ready to take over, towards the end of March. No. 1 topographical section of 516 Company then went into 19 Corps (French) area, and No. 1 topographical section of 518 Company moved up into 5 Corps area along the line Beja-Medjez el Bab. Meanwhile No. 2 topographical section (516 Company) carried out surveys for anti-aircraft defences at Bougie until about the middle of March, when it was withdrawn for employment on air-photo revision. The drawing and reproduction sections of the two field survey companies were employed on map revision, the preparation of special large scale battle maps, and the reproduction and printing of large numbers of maps for the fighting troops and for staff use.

A detachment of 12 Field Survey Depot, which had moved forward from Algiers to Constantine, opened an advanced map depot at Souk Ahras early in March, with a view to the move forward to that location of the whole unit during April. Arrangements were made by A.F.H.Q. for a map depot detachment (U.S.) to be organized to take over the premises at Constantine so as to operate it on behalf of the U.S. Eastern Base Section.

Three new British survey units reached the theatre towards the end of March. No 7 Field Survey Depot R.E. took over the depot in Algiers, the rear details of No. 12 Field Survey Depot then rejoining their own unit in First Army area. Nos. 11 and 12 Map Reproduction Sections, with their double-demy printing equipment, moved out to Chebli, about 20 miles south of Algiers.

By the end of January the American topographic organization, apart from the element with the survey directorate at A.F.H.Q., was as under:—

(a) *With the Mediterranean Base Section. Oran (Algeria).*

No. 62 Engineer Topographical Company really belonged to II Corps which was forward in the battle zone. The personnel of this unit, while completing their training for survey duties in the field, were being used on various engineer survey duties. Although they had equipment adequate for field survey work, their printing presses and stores had not arrived. The unit moved forward to join II Corps in March.

The map supply depot at Oran was in good working order. It supplied the needs of Fifth (U.S.) Army H.Q., which had been lately formed, and also the 12 U.S. Army Air Force. There were no lithographic printing facilities available in Oran, either military or civil.

(b) *With the Atlantic Base Section. Casablanca (Morocco).*

No. 66 Engineer Topographical Company belonged to I (Armoured) Corps which, though still at Casablanca at the end of January, was due to move shortly. This unit was fully trained and equipped and ready for the field. The drawing and reproduction sections were engaged on mapping work of local areas, and the survey section was working on engineering surveys.

No. 951 Engineer Topographical Company (Air) formed part of 12 Army Air Force.

Maps were being supplied from three depots:—

Atlantic Base Section (A.B.S.) depot.

12 Air Force depot.

I Armoured Corps depot.

This led to a good deal of uneconomical working, so all bulk stocks were turned over to the A.B.S. Depot.

66 Engineer Topographical Company had its reproduction plant in good shape and carried sets of kodak negatives of the local map series. There were no local lithographic printing facilities in Casablanca, though at Rabat the Institut Géographique National had three old flat-bed presses. There was a base supply depot which was in good working order, but it held little in the way of survey stores for map reproduction.

(c) *At A.F.H.Q. 649 Engineer Topographical Battalion (Army) was expected to arrive from the United States about the middle of April.*

Proposals were submitted to Washington, through the French rearmament commission, for the re-equipment of the Service Géographique in Algiers, and for the supply of expendable stores. A French officer was appointed to act as liaison officer at A.F.H.Q. so as to keep in close touch with mapping and other requirements which might be passed to the Service Géographique for execution.

During the early stages of the campaign the only photographs available were those taken on reconnaissance sorties, mainly by American "Lightning" aircraft. Some of these sorties were used for map revision purposes, but were not up to the necessary specification for new mapping. A discussion was held at Algiers on this subject which was attended by D. Survey, Middle East, and also by Colonel Milwit, the head of the U.S. Engineer topographical branch who was visiting from London. A long-term photographic programme was drawn up and requests were submitted for the provision of suitable aircraft and other equipment for air survey purposes.

The final phase (April–May, 1943)

Operational background. The final phase was a period of offensive action. Starting with the First Army counter-attack at Djebel Abiod at the end of March, it ended with the final destruction of the Axis forces in Africa in the middle of May. The month of April was occupied in achieving certain essential advances, and the capture of important features which would not only act as a strong base for the final operation of overpowering the enemy forces and capturing Tunis, but would also free certain vital lines of lateral communication. This was necessary in order to facilitate the build-up of dumps of supplies and ammunition, and to permit the regrouping of important formations from one flank to the other. Operations in the south had, as their main object, the harassing of Axis forces retreating in front of Eighth Army.

The orders for the final offensive, which was to start on 22nd April, were issued by 18 Army Group on 12th April. For this operation First Army consisted of the British 5th and 9th Corps and the French 19 Corps, with 1 (British) Armoured Division, 139 Infantry Brigade Group, 1 King's Dragoon Guards, and 51 Royal Tank Regiment in Army reserve. The II (U.S.) Corps remained under H.Q. 18 Army Group though H.Q. First Army was responsible for co-ordinating its action with that of First Army, and for issuing all necessary orders. The switching of formations from one flank to the other and the preparation for a heavy artillery battle involved Survey in extensive programmes of map supply and distribution and the carrying out of field surveys over wide areas in conjunction with artillery survey units.

Eighth Army was to attack at Enfidaville on 20th April with the intention of drawing off enemy forces from First Army.

This final operation lasted from 22nd April until 12th May by which date the Axis forces had been completely defeated.

Survey Organization.—Even though First Army itself was built up piecemeal, it grew with an increasing momentum which outstripped its survey capacity and the full survey order of battle for the force was not complete until A.F.H.Q. had obtained its base survey units and developed local printing resources. Until then First Army had to carry rather more than its own share of the survey work within the theatre. When supported by base survey units and local resources under A.F.H.Q. control, the survey strength of First Army was just about sufficient to compete with an army of four corps, but with little margin for maintenance and rest. Differences of nationality naturally added to the difficulties. The British units, in accordance with current policy, operated under army control, and the 5th and 9th Corps had no survey directorates or survey units. The French 19th Corps had no survey units at any time, but its map demands were lighter than those of British corps, being equivalent to that of about one British division. The U.S. II Corps had two survey units of its own, one being an engineer topographical company and the other a corps observation battalion of artillery. These two units only became available to II Corps during the later stages of the campaign, which meant that British units had to do survey work in the U.S. II Corps and French 19 Corps areas as well as for the British 5 and 9 Corps. Owing to losses of equipment in transit, casualties during operations and, to some extent, lack of sufficient training, II Corps was never fully self-supporting from a survey standpoint. The result of this was that the British units had to be employed in an unecological opportunist role, controlling and strengthening the artillery survey

work in those areas where a battle seemed imminent. Eighth Army entered Tunisia with a fully manned survey order of battle. It never had to deal with more than two corps, and there was never any doubt that its survey capacity was fully equal to compete with its tasks. On 10th April, the integrated A.F.H.Q. survey directorate, which had for some time been functioning with borrowed personnel, was legalized by the approval of its war establishment. The three new British units (7 Field Survey Depot, and Nos. 11 and 12 Reproduction Sections) had arrived and were working as base units directly under A.F.H.Q. In the absence of a proper survey stores depot, which did not reach the theatre till June, No. 7 Field Survey Depot had to handle stores as well as maps.

62 Engineer Topographical Company having moved forward to join II Corps in the battle zone, 66 Engineer Topographical Company and 951 Engineer Topographical Company (Aviation) were lent to A.F.H.Q. for map production and printing. By this time a few civilian printing firms in Algiers were being used, and arrangements were in hand for equipping the French Service Géographique with equipment and stores from the United States.

On 14th April 649 Engineer Topographical Battalion (Army) reached Oran from the United States and provided a welcome increase of mapping strength at A.F.H.Q. Its reproduction train and Multiplex plotting equipment did not, however, arrive until later. It was accommodated at Fouka.

Colonel S. G. Hudson succeeded Colonel Wheeler as D.D. Survey First Army and had at his disposal the following survey units:—

518 Field Survey Company R.E., which had been with First Army from the start.

516 Field Survey Company R.E., which arrived from the United Kingdom on 1st February.

12 Field Survey Depot R.E., which had been available since shortly after "D"-day. This was of the standard type, with one officer, 18 other ranks and one lorry only.

Owing to the needs of A.F.H.Q., the First Army Survey Directorate was always one officer short. This was a serious disadvantage, seeing that survey liaison was required with 5 (British) Corps, II (U.S.) Corps, 19 (French) Corps and, in the later stages, 9 (British) Corps as well.

Colonel V. E. H. Sanceau was D.D. Survey Eighth Army with the following units at his disposal:—

517 Field Survey Company R.E.

46 South African Survey Company S.A.E.C. This unit had the field and drawing strength of two normal British field survey companies.

20 Field Survey Depot R.E., which was of the larger type developed in Eighth Army. It consisted of about 60 all ranks and sufficient transport to provide for a main depot, a mobile forward map depot at or near Army H.Q., and a map lorry with the H.Q. of each corps and division. It had been evolved as a result of experience in Eighth Army operations, and was based on a revised conception of map-distribution responsibilities which was accepted for practically all subsequent operations in Europe.

Field Survey activities. These are described more fully in Section 3, some of the major aspects only being considered here.

One of the principal tasks during this last phase was to establish a third-order control for artillery operations during the battle which opened on 7th April to clear the enemy positions in the mountainous area Sidi Nsir-Oued Zarga-Medjez el Bab, as a preliminary to the main final offensive. To enable this work to be done, the topographical sections of 518 Field Survey Company had been moved to Beja on 15th March to establish control on the North African grid before the end of the month. This was done in the area from Beja towards the north-east as far as possible along the road to Sidi Nsir, and also between Beja and Oued Zarga. One topographical section was, for this operation, attached to each survey troop of 5 Survey Regiment R.A., and the co-operation between R.E. and R.A. surveys appears to have been admirable. The topographical sections carried the control forward to keep pace with the advancing battle in face of enemy opposition and other difficulties such as minefields.

The establishment of trig control in 19 (French) Corps area was effected by one topographical section of 516 Field Survey Company in conjunction with the Army Group R.A. On completion of this task on 9th April, this section moved into 5 Corps area to carry out preparatory surveys for the final offensive. This was completed by 21st April, when one section moved north to near Grenadier Hill and the other section went into reserve.

On the completion of the preliminary surveys along the First Army front, three topographical sections were attached to 5 Survey Regiment R.A. for work in the following areas:—

One section (518 Field Survey Company) from Medjez el Bab towards Longstop Hill.

One section (518 Field Survey Company) around Medjez el Bab and towards Grich el Oued.

One section (516 Field Survey Company) in the Grenadier Hill area.

As soon as sufficient ground had been gained by the attack begun on 22nd April, each section carried the triangulation forward, and sufficient points were established to control the great concentration of artillery used for the offensive of 5th–6th May. The advance after that date was so rapid that the topographical sections had practically no further calls made on them.

After the cessation of hostilities in Tunisia on 12th May all topographical sections were employed on anti-aircraft surveys at Bone, Bizerta and Tunis.

SECTION 2. MAPS AND MAP PRODUCTION

Preparations by the War Office

During 1941, the G.S.G.S. initiated the preparation of certain map series covering North West Africa. Although, at that time, the possibility of undertaking a landing operation on the Moroccan or Algerian coasts was in the discussion stage, there was no set plan. The production of the maps concerned offered, in any case, not only an insurance against such a possible operation in the future, but helped to draw attention from other areas of more immediate strategical importance for which maps were also being produced, thereby providing a certain amount of security cover.

When, therefore, it was decided during 1942 to plan intensively for operation "Torch," the mapping programme was already well ahead and had just to be given more priority and enlarged in scope.

The following map series were amongst those produced for the campaign in its early stages:—

- Africa. 1/2 M showing air information.
1/M based on the International Series.
- French North Africa. 1/500,000 covering all Morocco, Algeria and Tunisia.
- Algeria. 1/200,000, extending east to the Tunisian frontier.
1/50,000 (incomplete) covering a strip along the coastal region from French Morocco to the Tunisian frontier.
- Morocco. 1/200,000, covering both French and Spanish Morocco.
(French) 1/50,000 covering the whole coastal region with partial coverage inland.
(Spanish) 1/50,000 covering the whole country.
- Tunisia. 1/200,000 covering the whole country.
1/50,000 covering northern Tunisia only.
1/100,000 covering rather more than the southern half of the country.

There were also town plans of the principal ports and larger inland towns.

Comments on the above maps

The basic material from which the maps were produced consisted of copies of French maps which were held in the War Office map library. They were reproduced by a method of photographic colour separation, thus eliminating the immense labour and time which would have been entailed by the preparation of new drawings. The original French sheets had been printed in several colours and, for economy in printing time and labour, it was decided to reproduce the maps in three colours only, rising to four in certain cases.

As a result of representations from the Royal Armoured Corps, it had been decided to show all roads and tracks on the 1/50,000 series (and very nearly all on the 1/200,000 series) by adding a red road filling, however low their classification. A system of firm lines, pecks and dots was introduced to provide adequate differentiation, and this system was fully explained in the normal type of reference panel. In spite of the fact that the information was there for those who sought it, the resulting maps tended to give such a flattering picture of the road communications "at a glance" that they became the subject of bitter complaint, and the cause of faulty tactical planning. In any theatre such a policy of road classification has not much to recommend it when it is divorced from the special "Going" maps. In a theatre where communications suffer seasonal deterioration, it may be considered dangerously misleading. To the British, "red" roads mean "all weather" roads, and it takes more than a reference panel to destroy this illusion.

The 1/500,000 map was very out of date, and was not used to any extent by the Air Forces. Their tasks required them to use a larger scale map as issued to the ground forces.

The 1/200,000 map, apart from the misleading road classification, was popular, and was an excellent colour reproduction. The large number of colours on the original French sheets was reduced, for military purposes, with little loss of clarity.

The 1/50,000 map was not very popular mainly because of the poor reproduction of detail which was finely drawn on the French sheets. Also the road

information overprint placed too much emphasis on minor tracks and paths. When this map was reprinted locally by First Army survey units the red overprint was simplified so as to give a truer representation of the communications.

Early mapping activities after the landing

It did not take long to find out that many of the maps initially provided were out of date and, after arrival in the theatre, the First Army Survey Directorate took immediate steps to secure the most modern local editions of the French maps of Algeria and Tunisia.

An urgent demand for local map printing arose about "D" + 7, some days before the printing sections of 518 Field Survey Company were due to arrive. Certain American formations were sent east from Oran and Casablanca to reinforce First Army for their drive into Tunisia. They had not been issued with maps of eastern Algeria and Tunisia on board ship on their way out, and urgent action was therefore necessary to produce maps for them. Early contact with the French Service Géographique enabled civil printing firms in Algiers to be employed, and a special photogravure edition in monochrome of the relevant map sheets was quickly run off. The grid was superimposed lithographically.

518 Field Survey Company R.E. arrived on "D" + 16, and provided the only source of military map printing with First Army until 516 Company landed early in February. One of the first tasks given to 518 Company was to revise the 1/200,000 and 1/50,000 maps of northern Tunisia, using the more up-to-date French maps and any air photographs that could be obtained. The size of the unit's printing machines being "demy," it was necessary to divide the 1/50,000 sheets in two parts, and print them back to back on both sides of the paper. The 1/200,000 sheets were also printed in pairs, back and front of the paper.

Allocation of mapping responsibilities to the Service Géographique in Algiers

The printing resources of the Service Géographique were almost negligible but, at A.F.H.Q. request, they were able to arrange for various civilian printing firms in Algiers to be made available for map printing.

During March a conference was held to consider the most suitable allocation of work to the French organization, and the following was agreed:—

- (a) The Service Géographique would relieve First Army of much of the routine mapping of Tunisia and eastern Algeria, so that First Army could undertake the more special and urgent battle commitments that were becoming increasingly necessary.
- (b) The Service Géographique would undertake the production of ground/air style editions of the 1/M International series of areas in south-western Europe.
- (c) It would also undertake the revision of communications on sheets of the 1/500,000 map of North Africa and the production of a new edition.

Map production resources with U.S. Topographical Units

The shipment from the United States of some of their reproduction equipment was somewhat delayed. It was not until February that 62 Engineer

Topographical Company could be sent forward to join II Corps in the battle zone. Before that date both 62 Company and 66 Company (which really belonged to I U.S. Armoured Corps) were temporarily placed at the disposal of Survey Directorate at A.F.H.Q. for urgent mapping tasks, together with a Topographical Company (Aviation) which was operating with the 12th U.S. Army Air Force.

The 649 Engineer Topographical Battalion (Army), with its extensive mapping and reproduction resources, including Multiplex plotting equipment, only arrived in the theatre towards the close of the campaign.

On reaching II Corps in February the reproduction platoons of 62 Topographical Company were offered to D.D. Survey First Army but he was not able to make proper use of them as they were still deficient of important items of equipment, and were often wholly engaged on the production of photo-map substitutes, and in meeting the local needs of II Corps for Intelligence overprints, etc. It would have been useful, from the Army point of view, if it had been possible to brigade the reproduction platoons with the printing sections of the two British field survey units, but this was not feasible.

British map production resources

Within First Army 518 Company was available from about "D" + 16 and 516 Company from early February. To provide A.F.H.Q. with adequate map printing power 11 and 12 Map Reproduction Sections R.E. were sent out by the War Office, arriving towards the end of March.

When Eighth Army entered Tunisia, and thereafter came under the control of 18 Army Group and A.F.H.Q., it brought with it 46 South African Field Survey Company and 517 Field Survey Company R.E., both of which had mobile reproduction sections of the normal type.

Operational mapping tasks undertaken by 516 and 518 Field Survey Companies R.E.

When planning for the final offensive in Tunisia it was necessary to ensure that all essential maps for such an operation would be ready. Amongst other things this entailed the preparation of a large number of 1/25,000 maps on which to overprint enemy defences and other information.

These 1/25,000 maps of Tunisia were produced by First Army survey units. There was no existing French series on this large scale, and as no survey photography could be obtained which would be suitable for new large scale mapping, it was necessary to utilize, as basic material, the French 1/50,000 series which was of good quality. The detail was enlarged photographically, and revision was incorporated from air photographs taken for intelligence purposes. The scale of these photos varied from about 1/12,000 to 1/50,000, and there were varying tilts and overlaps, and large gaps in the coverage. A small party of topographic draughtsmen was attached to the Army Photo Centre to collect revision information from its library set of photographs.

Over 80 of these 1/25,000 sheets were produced and they were overprinted to show enemy defences. They were published in two stages. A first edition was issued somewhat in advance of the battle, bearing such intelligence information as was then available. A second edition was then usually produced immediately before the operation, containing the most up-to-date information.

In some cases third and fourth editions were produced, but these were exceptional, as time was rarely available.

The General Staff (Intelligence) at Army H.Q. accepted responsibility for all overprint information whatever the source, and no attempt was made to short-circuit the normal channels by going to corps or divisions for information.

Survey, however, accepted responsibility for the positioning of the information on the maps, and for this purpose, a small R.E. survey detachment was attached to the Photo Centre, where it had access to the latest photos.

The reproduction sections of both 516 and 518 Field Survey Companies were kept busy at full stretch on the production and printing of these 1/25,000 maps right up to the cessation of hostilities though, towards the end, the campaign was going so fast that it outran the need for maps on that large scale. Their other main task was the reprinting of the 1/200,000 and 1/50,000 series of Tunisia for stock.

When at full pressure each unit was turning out 1,000,000 or more impressions each month.

For the heavy artillery concentration in the Medjerda Valley before the final thrust it was decided to produce a "barrage overprint." An officer and a draughtsman from the Army Survey Directorate went to H.Q. 9 Corps R.A. in the evening, the draughtsman drew the overprint trace on the spot, and it was flown down to 516 Company, located further back. The required number of copies were run off on previously printed base maps and flown forward to the artillery.

Air survey photography

The arrangements, or perhaps one might say the lack of arrangements, for the provision of air-photos for mapping purposes followed the general pattern familiar in most other theatres during the early stages of operations. Resources for such work were non-existent at the beginning and, when a limited attempt was made, much too late, to provide photos for survey purposes, unsuitable types of aircraft were used. As has been stressed so many times in so many places, survey photography for use in connection with mapping is required as early as possible, otherwise there will be little or no time to utilize it for either new compilation or revision.

In the case of First Army, D.D. Survey passed his demands for survey photos to G/Air at Army H.Q. Where this demand was for new photography, the result was negligible. The demand was added to a waiting list which was sorted out into daily priorities. Almost invariably the survey demand remained in the lower half of this priority list, and there was no direct liaison between Survey and the photographic squadron.

In Eighth Army the situation was better. After obtaining approval from the B.G.S. at Army H.Q., D.D. Survey submitted his demands through the R.A.F. Wing to the survey squadron. This worked well with the minimum of delay. It must be stressed, however, that one reason for the better results with Eighth Army, quite apart from the improved routine procedure which had grown up during some months of active operations, was the fact that they had two Mosquito aircraft on the job, which were ideal for survey photographic work. First Army had no such aircraft. There is no doubt also that, as a result of their operational experience, Eighth Army were more fully conscious

of the need for, and the value of, survey photography if they were to get newer and better maps.

In First Army, practically no strip photography was undertaken for map revision, whereas, for the Eighth Army operations in southern Tunisia, successful strip photography was carried out north of Mareth, at the Skhirra Gap, and north of Enfidaville.

It was unfortunate that during January, February and March, 1943, the temporary airfields in First Army area were in such a condition owing to heavy rains that most of the fighters were grounded. The enemy had temporary air superiority by flying off the permanent airfields at El Aouina and Ste. Marie du Zit. All photography carried out by First Army had of necessity to be of the hit and run type, and even a Mosquito on strip-flying for survey photography would have been operating against heavy odds.

Air-photo revision and overprint information

As a result of the late start made regarding the supply of air photos for First Army, it was obvious that the limited air photographic resources could not supply special photos for map revision as well as for daily Intelligence needs. To make the best use of all the photo material available some survey draughtsmen were attached to the Army Photo Centre when it moved forward from Algiers and was established near Army H.Q. in the middle of March. Photography was provided by a few Lightning aircraft fitted with two 24-inch and one 6-inch cameras, operating from an airfield adjacent to the photo centre. The functions of these draughtsmen were:—

- (a) To keep up to date cover traces of the photographic sorties.
- (b) To revise the 1/25,000 sheets as photos became available.
- (c) To keep up to date defence information traces for the 1/25,000 sheets. This information was then overprinted on the maps, adopting the conventional signs in use at the R.A.F. Central Interpretation Unit at Medmenham in the United Kingdom.

The problem of interpretation from air photos for mapping purposes seems to have had its difficulties in both First and Eighth Armies. For some time the D.D.s Survey in both armies appear to have accepted, for the position of defence and other overprint detail, the map references which had been given by the personnel of the Photo Intelligence Unit in their interpretation reports. In other words they were dependent on the A.P.I.U. interpreters to give position as well as the qualitative annotation of enemy defences, a procedure which clearly could not be expected to give results up to the required standards of survey mapping accuracy.

First Army decided to detail some of their trained air-photo plotters from the survey units to work with A.P.I.U. and do the actual positional plotting. This certainly opened the door to greater accuracy of results, but it is open to some doubt whether it was the best way of attaining such a result. It is possible, for example, that it might have been preferable for a survey unit to have been located close alongside the interpretation unit so that the survey personnel could have done their work under their own officer supervision. A different method was adopted in Eighth Army. There the normal personnel of A.P.I.U. prepared the defence overprint traces and Survey acted only as a printing agency. The latter prepared the base maps, and overprinted

on them the defence information, for which they bore no responsibility for the correctness, completeness or legibility.

This question of the preparation of defence overprints, using information supplied by photo interpretation units, is one which requires careful consideration.

Photo-maps

Photo-maps, or photo map-substitutes as they were often called, were produced in large quantities by American topographical units in North West Africa to cover:—

- (a) Parts of southern Tunisia, for which the largest scale maps available were 1/100,000.
- (b) Parts of Tunisia for which there already existed maps on the scale of 1/50,000 and even 1/25,000.

The first issue included sheets covering the Gafsa-Sfax area. They provided a uniformly grey representation of wide open spaces, on which a town was almost impossible to identify, and on which roads and railways were indistinguishable. They were gridded with a fictitious grid numbered in metres but not computed from any particular origin. Except for the fact that they covered an area for which the largest scale map available was 1/100,000 they were generally considered to be quite useless.

The second lot were of better quality, but within a few days of issue, practically the whole stock had been returned to salvage by II Corps who found no use for them.

It would appear from the evidence that, although there probably was, and always will be, a need by regimental officers and staff alike for good copies of up-to-date photographs, the wholesale production of photo map-substitutes covering large areas which have already been adequately mapped and revised is a wasteful use of resources in both labour and materials.

SECTION 3. TRIANGULATION AND FIELD SURVEYS

Triangulation data

Algeria. Before the landing in North West Africa the only trig data available for Algeria were a limited amount covering the principal port areas, which had been obtained from Washington. Unfortunately the lists had been reproduced by methods which were not dependent on facsimile photographic copying, and were full of errors. After the landing the complete trig data for Algeria were obtained from the French Service Géographique in Algiers. They were in manuscript, and were more comprehensive than the American version. These data were photographed but never reproduced, as the battle zone had by then moved forward into Tunisia.

Tunisia. At the opening of the campaign the survey data for Tunisia available to First Army consisted of:—

- (a) Photographic copies of the French fascicules giving the geographical positions of trig points in grades (longitudes referred to Paris), their heights in metres, and descriptions of the marks.

- (b) A printed booklet prepared by the War Department (U.S.) containing the above data converted to degrees with longitudes referred to the Greenwich meridian, with the addition of further points on or near the coast derived from hydrographic surveys.

Full details of the Tunisian triangulation were secured by the survey reconnaissance officer who went ashore from the first convoy during the initial landing. The data were contained in fascicules giving first-, second-, and third-order points. The descriptions were poor, but there were valuable observation diagrams. The data were republished by First Army on a 1/200,000 sheet basis.

The French triangulation in Tunisia had been observed between 1888 and 1907, was well designed and rigid, and was found to have a much higher order of relative accuracy than was at first supposed. Rarely did a tertiary point fail to check up within a metre or two when included in a scheme based on higher value points. Each tertiary point had been fixed independently from points in the primary and secondary nets, though the rays so used appeared to be longer than was necessary.

The points were well marked, and could easily be located from the 1/50,000 map. The signals were in the form of tall cylindrical stone cairns, and in the case of primary and secondary stations there was a central mark consisting of a masonry pillar about three feet high and 18 inches square. A large number of "up" stations were in the form of minarets and other prominent features which were fixed by intersections, and they made admirable trig points.

The triangulation density averaged one station to 12 square miles, and was fairly evenly distributed over the whole of northern Tunisia. On the whole, therefore, the existing French control was readily available and reliable though for artillery purposes, and for large scale mapping, it needed exploitation and breaking down to more readily accessible points along the roads and valleys.

The use of the trig data in the field

In the battle zone, where operations became temporarily static on the Medjez-Gafsa line, 1/200,000 sheets were provided for the artillery and engineer survey units with the positions of the trig points clearly marked in the form of an overprint. The points were numbered to correspond with the numbering of the trig lists. Generally speaking, there was so much triangulation control, and its quality was so good, that the artillery survey regiments could resect their position almost anywhere from five or six points, and there was little demand on R.E. Survey for help, except during the final battle when R.A./R.E. Survey co-operation was most successful.

Italy, Sicily, Sardinia, and Corsica

In anticipation of subsequent operations which might be undertaken in the above areas A.F.H.Q., with the assistance of First Army Survey units, G.H.Q. Middle East, and the French Service Géographique, undertook the preparation of trig lists involving the conversion of trig co-ordinates from French and Italian lists to the appropriate military grid systems.

Grid Zones (see Diagram 2)

The theatre of operations, including Morocco, Algeria and Tunisia, was covered by the North West Africa Grid Zone, which had junction with other zones as under:—

In the north, with the Iberian Peninsula and southern Italy Zones, the line of junction being in the Mediterranean Sea.

In the north-east, with the southern Italy Zone.

In the south-east, with the Libya Zone, roughly along the frontier between Tunisia and Libya.

The co-ordinate values of points in the original lists obtained from French sources had, of course, to be converted into terms of the North West Africa grid so as to agree with the map. This work was shared by A.F.H.Q., First Army, and the Middle East Survey Directorate. The first conversions were urgently required for use on the anti-aircraft defence surveys round Algiers, Bone, Philippeville, and other ports, and for fixing naval radar direction-finding stations.

There was some confusion at first owing to the fact that two versions were current for the longitude of Paris *viz.*:—

G.S.G.S. (War Office)	02° 20' 13.95"
U.S. Value	02° 20' 14.18"

For a short time First Army used the latter, but soon abandoned it in favour of the G.S.G.S. value so as to ensure that co-ordinates obtained should be in sympathy with the G.S.G.S. map grid.

Field surveys by British units for II (U.S.) Corps

In the middle of February, arrangements were made to give survey assistance to II Corps in the areas Faid-Sbeitla-Feriana-Gafsa, on the southern flank of the allied line. At that time the full American survey organization had not been deployed. The work required was mainly to fix medium and heavy artillery positions, to check the trig list data, and to establish a general framework control for future mobile operations.

One topographical section of 518 Field Survey Company started work in the forward area on 17th February, but had to move back to the hills north-west of Feriana-Kasserine almost at once as a result of aggressive enemy action. They then supplied position and azimuth for artillery units in the area Bou Chebka-Dernaia-Bekhara Pass.

Early in March a second R.E. topographical section reinforced the first and, with the observation battalion of the corps field artillery which had just arrived, they were grouped for surveying the positions of control points along the Kasserine-Sbeitla road to form the basis on which 1/25,000 fire control charts were constructed. These charts were printed by the U.S. Engineer Topographical unit, and were used in much the same way as the British artillery boards. Similar work was done along the Dernaia-Feriana road in preparation for an advance.

The above tasks were carried out in areas which had been recently in enemy occupation, and the survey parties were greatly hampered by anti-personnel mines, anti-tank mines, and booby traps. As testified by the American artillery commander, both sections of 518 Field Survey Company did most meritorious work.

Co-operation with artillery survey units

The R.E. survey units were first employed to assist the artillery in February, 1943, when requests were received that several divisional grids, which had been

established by 5 Survey Régiment R.A., should be put on to the theatre grid. The divisional grids had been kept true to the theatre grid bearings by means of solar azimuth observations, and required little correction for scale and position. The artillery were supplied with conversion factors to enable them to transfer their points to the theatre grid.

During the course of the work, a procedure of close co-operation grew up on the ground between the R.E. and R.A. survey units, and this was intensified during the First Army offensive during April.

The R.E. field surveys took place in three distinct phases:—

Phase I. Checking and breaking down the triangulation in the area of proposed operations, and carrying points forward as far as possible along the probable lines of advance through the valleys.

Phase II. Supplying control points and trig bases for use by artillery surveyors in areas which were not already within the divisional grid surveys.

Phase III. After the initial bombardment, when the artillery moved forward to new positions, the R.E. sections provided quick temporary fixations ahead, sufficient for immediate use, strengthening them later on by tying into the ruling triangulation, thus providing sound data for possible further advances.

During Phase I the topographical sections, up to three or four in number, worked under the control of First Army Survey Directorate. For Phases II and III one section was attached to each survey troop R.A. and one to the headquarter survey section of 5 Survey Regiment.

Procedure varied according to circumstances. Sometimes the R.E. surveyors manned the control base, and observed points ahead that had been selected and occupied by R.A. surveyors, the latter calling up by helio or lamp. The observed angles were sent by despatch rider to the R.A. computing centre. It was necessary to reduce to the minimum the movement of observing trucks owing to the heavy mining of the roads.

At other times the R.A. surveyors occupied the control base, sometimes fixing it themselves, and had a grid bearing thrown in by the R.E.

The area covered in Phase I extended from Beja through Medjez el Bab to Bou Arada, on a front of about 50 miles, and the triangulation consisted of a belt about 5 to 11 miles wide. The work of each section was carefully maintained in sympathy with the ruling triangulation. This phase lasted from about 20th March to 20th April.

Meanwhile Phases II and III were fitted in as found convenient and necessary; first of all in the Beja-Oued Zarga areas where the artillery offensive began on 7th April, and later for the Medjez el Bab offensives on 22nd April and 5th–6th May. When the swift advance of First Army took place between 7th and 12th May, survey control had been carried only about ten miles from the original front. The R.E. sections went forward with the R.A. survey units, but little work was called for before hostilities ceased on 12th May.

Though, no doubt, the expedient of attaching R.E. topographical sections to R.A. survey units was desirable in the circumstances which prevailed, it neither conformed to the basic organization of R.E. survey units nor did it absolve the D.D. Survey from his responsibilities for co-ordinating R.E. and R.A. surveys on the Army front, and for using the R.E. survey units to the best advantage of the Army as a whole.

SECTION 4. MAP SUPPLY AND DISTRIBUTION

Introduction

Operation "Torch" was the first of its kind, involving amongst others the following important factors:—

- (a) Intensive allied planning, with very limited time available between the start of planning and "D"-day.
- (b) The vital need for the highest security precautions.
- (c) The embarkation of British and American forces in British ports, and the subsequent issue to them of their operational maps for the assault landings while on voyage.
- (d) The simultaneous embarkation of American forces in U.S. ports, and their map issues, also under security conditions.
- (e) Map provision for:—
 - (i) The initial landings.
 - (ii) Formations to whom were allotted particular tasks, *e.g.*, the armoured brigade landing at Bone, and the airborne troops.
 - (iii) The development of operations eastwards into Tunisia.
 - (iv) The occupation of Morocco and Algeria in the face of possible French resistance.

Initial assembly of map stocks

As soon as a survey directorate had been established with H.Q. First Army for planning purposes, one officer and three other ranks were detached for duty at one of the War Office map depots to assist in the assembly of map stocks which would be required for the operation. Although the matter will be treated in greater detail below, it should be noted here that, during the planning period, this small party had no knowledge as to the area in which operation "Torch" would take place. They worked entirely in code, handling sealed rolls of maps as they were delivered from the printers.

Apart from those maps which were required by the planning staffs, the stocks which were assembled at the map depot were for disposal as follows:—

- (a) For issue in sealed and coded bundles to the personnel in the ships of the "Torch" convoys, for use by assault troops.
- (b) For loading on ships, packed in sealed cases, for subsequent use as formation and depot reserve stocks in North West Africa.

Security precautions during production and initial distribution

The security aspect in connection with the mapping up of any military force for an operation is of such vital concern that no excuse is offered for describing in some detail the steps that were taken, and the difficulties encountered, during the preparations for "Torch." When initiating the necessary measures for maintaining security and preventing leakage, the Director of Military Survey at the War Office kept in close touch with the Inter-Services Security Board (I.S.S.B.), and the general procedure evolved for "Torch" formed a most successful basic pattern for the remainder of the war. The following notes will be of interest.

- (a) The process of map production, supply, and distribution for any military operation is naturally fraught with considerable danger to security owing to the fact that maps, unlike most warlike stores, convey clear information of the location of the operation for which the maps are issued. About 10,000,000 maps in 700 different map-sheets were produced and distributed to ships for operation "Torch."

An extra complication, and a possible source of leakage, arose from the fact that map data and reproduction material had to be supplied to Washington so as to ensure that British and American troops should operate in combination on identical maps.

- (b) *Allied Co-operation.* In April, 1942, an officer from G.S.G.S. (War Office) went to Washington to settle the broad principles of co-operation in map supply for any large scale Anglo-American operation that might take place (see Chapter IV). It was agreed that:—

- (i) There should be a continuous general interchange of information and mapping material, so as to avoid the likelihood of drawing attention to a particular area at a particular time through a sudden increase in the transit of mapping material of any such area.
- (ii) All U.S. Army and Air Force units proceeding from, or based in, the United Kingdom should be supplied with maps entirely under G.S.G.S. arrangements, so as to avoid a sudden increase in low-grade cipher messages indicating specific areas, and to prevent sudden large bulk-shipments of a particular area from America.

The first serious threat to security in connection with Allied mapping co-operation was owing to a non-observance of the above conditions. It appears that a quasi-independent map supply organization for the Army Air Force had grown up in the United States since the date of the agreement referred to above. Although A.F.H.Q. (in London) had been fully informed of the April, 1942, agreement, and the closest technical liaison had been maintained throughout, an officer at this H.Q. ordered from the U.S. Air Force map supply organization large quantities of maps to be sent over from America for the use of U.S. Air Force units which would be proceeding to North West Africa from the United Kingdom. These maps consisted entirely of G.S.G.S. series which had been printed in the United States from reproduction material sent over from the War Office. The consignments, which arrived unheralded, were insecurely packed, and carried packing notes *in clear* in envelopes nailed to the outside of the cases. They were promptly "frozen" when they found their way, by accident, into War Office map supply channels, but not before several of the packing notes had been detached and lost. Fortunately, all the maps were on small scales. If they had been larger scale maps covering localized areas such as specific ports, the security of the whole operation might have been prejudiced. The maps were not in fact required and were not used, and A.F.H.Q. took drastic steps to prevent a recurrence.

The second serious threat to security occurred when a consignment of maps was being moved by road from a War Office map depot to an American headquarters at Cheltenham. This move was a routine one organized by the U.S. Services of Supply (S.O.S.) and the maps concerned, though covering wide areas, contained certain sheets which had been

produced under security conditions for "Torch." S.O.S. had therefore been asked to take full precautions. Unfortunately, these precautions were not complete, and a number of maps fell out of the back of the lorry unnoticed. By sheer bad luck the maps which lay strewn along the road were of Morocco, but fortunately of an inland area, and non-committal as to any precise coastal location connected with the coming assault. The maps were collected by the police, and the affair covered by the Security Board. From then on, no maps of any potential operational area were issued loose from any War Office map depot.

Except for the above lapses the arrangements for Allied co-operation regarding map supply worked admirably and preserved security.

- (c) *Security during production.* When it is considered what a large number of people in the United Kingdom were concerned with the production of maps of any area, the wide field for possible leakage will be realized. That any serious leakages did not occur, so far as is known, is a great tribute to the honesty of purpose and sense of responsibility of all those who took part in such production.

G.S.G.S. controlled its own map printing installation, but this could only deal with a small fraction of the total requirements. Much of the work was placed out with the Ordnance Survey, and through them to a number of civilian firms widely scattered over the country.

All employees in the G.S.G.S. and O.S. installations had the need for "security" impressed upon them continuously but, amongst a large crowd of people, there may always be some who find it difficult to keep things to themselves, and who feel an urge to advertise to their friends the importance of their work. Also, although carefully vetted by M.I.5, there was no guarantee that some of them might not subsequently acquire undesirable contacts.

It was therefore considered that the best course was to spread map production over widely dispersed resources, and to apply fictitious urgency from time to time to various items. To effect this it was essential to look well ahead, and to make an early start on such major commitments as maps for operation "Torch" so as to have the work interspersed with requirements for other potential operational areas. Map production for "Torch" was therefore begun on receipt of the first breath of information indicating that an operation in North West Africa was a future possibility. This demonstrates forcibly the vital importance of a Director of Survey maintaining the closest possible contact with the planning and operational staffs for whom he works, and holding their implicit confidence. Without such confidence he will obviously not be given all the information which he must have to do his job properly.

In actual fact full production was in hand some weeks before the outline plan, produced by the Joint Planning Staff, had been accepted by the Chiefs of Staff. If this had not been done, few maps of this large area, on scales larger than 1/200,000, could have been produced with full security. As events turned out, in addition to the smaller scales, revised 1/50,000 maps, and even larger scales of limited areas for the assault, as well as town plans, were produced covering all those areas for which they might reasonably be required.

Based on the table for scales of issue which were at that time current in Home Forces, an initial appreciation showed that about 30,000,000

maps would be required for operation "Torch." As a matter of interest this number was just about equivalent to the total map production for the entire British Army during the 1914-18 war. The printing of this large number in the time available could only have been attained by a system of wholesale contracting out to printing firms all over the country on a top priority basis. This would have meant flooding the country with duplicate printing plates of a "hot" area, and a stream of contacts and correspondence of a very urgent nature which would obviously have aroused suspicions. As such a procedure had never been adopted before, suspicion would have become a certainty and our intentions would have been disclosed.

It was therefore decided to base map issue scales at 30 per cent of the existing full scale. This, of course, produced a chorus of complaints from troops the majority of whom had been in the United Kingdom for some time and had become extravagantly minded with regard to map issues. They did not realize the vital security reason for this reduction in issue scale which was now applied.

One example of how security leakage was avoided when dealing with a civil firm is afforded by the following incident. A printing firm had been working on the 1/200,000 Algeria series on a long-term basis, some time before the area became a "hot" one. Acceleration of this work then became essential. To remove the job from the firm and have it completed in the War Office production installation, even if this had been practicable, would have aroused suspicion. The firm was therefore asked to complete the job quickly so as to get it out of the way *before taking up a large contract dealing with maps of Germany*. These latter were really not urgently needed at that time, but this action produced the Algerian maps quickly, and with the excuse of the German maps to cover the real reason for the urgency, tended to divert attention from North Africa.

Wherever possible high-security work was handled in the G.S.G.S. or Ordnance Survey installations. Even here, however, production tended to concentrate on North West Africa and this was corrected by feeding in maps of a "cover plan" area at intervals on a "clear the line" urgency.

The larger scales required special treatment, and were handled by the G.S.G.S. map production installation which was accustomed to such jobs. Town plans were security "covered" by arranging the concurrent production of plans of such places as Cherbourg, Le Havre and Brest, so as to convey the idea of long-term preparation. Again, some most secret air navigation charts, which were required for use by reinforcement aircraft from the United States, were given fictitious titles such as "Staff College Exercise" or "U.S. Army Air Corps, Leaflet Dropping Raid."

- (d) *Distribution security.* It had been current practice for some time before "Torch" that all maps produced by War Office for despatch to overseas theatres should be code-bundled for security. This included those for normal maintenance in established theatres, and those simply intended to be stored against future use. It was therefore not introducing any new procedure when all maps prepared for "Torch" were securely bundled with double brown-paper wrapping, and code-labelled

on the outside to indicate series and sheet. The code list was treated as a "Most Secret" document, and copies were issued only to the survey directorate concerned, and to the senior officers of the personnel ships when they received their sealed orders.

The bundles were made up in sacks for issue to the assault troops on board ship, and in wooden cases for formation and map depot reserve stocks. Both sacks and cases were securely machine-banded.

The above operations were split between several depots so as to minimize the chance of leakage. As each sheet was printed the maps were bundled in their first wrapping in a room adjacent to the machine-room. The plain bundles were then removed to another room for the second wrapping and for code-labelling with the specially printed code strips. As a rule the sacking and casing was undertaken in yet another location.

The finished sacks and cases were then removed to an intermediate "Shipping Depot," all the personnel of which were completely ignorant of the contents of the bundles and cases. None of the personnel from this intermediate depot was allowed to accompany the consignments when they were sent on to the port of shipment.

All issues to personnel ships were made by road with an officer escort and armed tail-guards to ensure that nothing fell out of the back of the lorry.

Sealed cases containing reserve stocks for subsequent use after the assault were moved by train in locked containers, and they were met at their destination by an officer who had the keys of the containers.

Precautions were taken to ensure that no code labelling tape was available at the intermediate depot for resealing. One routine check, however, indicated that a bundle had been opened. No special attention was drawn to this at that moment, but an "accidentally"(?) broken bundle taken from a cover plan area was fed through in the next consignment with just enough, but not too much, publicity. The entire staff was then assembled and given a lecture on "security." There was no direct evidence as to the individual responsible for breaking open the bundle, if indeed he did so, but the depot personnel were moved elsewhere and certain individuals were eliminated for safety.

One of the ships carrying some cased stock caught fire, and was beached before the convoy sailed. Arrangements were at once made for an immediate field security guard. Though slightly damaged by steam, no cases were missing, and none of them had broken open, so they were eventually reissued.

Orders originally issued by the Eastern Task Force were that the sacks of assault maps would be opened, and the maps issued, 48 hours after leaving British territorial waters. This was considered unsound, as a ship might easily be damaged early in the voyage and put back into port. Issues were therefore restricted at that stage to a bare minimum for planning, and general issues were postponed until 48 hours before landing.

This question of the proper time for issue in the case of an assault operation such as "Torch" is a most important one, and each such case will require most careful consideration on its own merits.

- (e) *Security in connection with map issues for planning.* Reverting to the earlier planning stage for the operation, many situations arose which tended to compromise security.

At that period there were comparatively few officers on the staff of G.S.G.S. who knew about the impending operation. The civil assistant at the map office, which G.S.G.S. maintained in the main War Office building, certainly did not know anything about it. When, therefore, a queue of strange senior officers lined up at that office, and even went direct to the map store, all asking for maps of North West Africa, it became almost impossible to preserve security. Arrangements were therefore made for all planning issues to be effected through a particular branch of the planning staff which was in the habit of drawing maps at short notice and at frequent intervals for areas widely scattered all over the world.

The improper use of a code word by an Intelligence officer of First Army nearly broke security on one occasion when he went to the G.S.G.S. map office in the main War Office building and asked the civil assistant there for "Torch" maps. When met with blank incomprehension he was barely restrained by a G.S.G.S. officer in the room who was "in the know," from explaining what it was all about!

- (f) *Disclosure of plans to Officers.* It will always be difficult to decide at what stage to disclose to selected survey officers details of any operation which is taken up for planning, and this will require constant care. Although, at first sight, it might seem better to keep the number down to a minimum, it is sometimes more dangerous to leave an officer uninformed when he will obviously draw his own conclusions, than to brief him, either partially or wholly, and make him realize the necessity for care in his conversations and dealings with others. For this reason the junior survey staff officer at G.S.G.S. who was responsible for supervising the map store in the War Office main building was, at an early date, given general information regarding the "Torch" area, but not, of course, of the planned date for the operation. Altogether there were eight officers at G.S.G.S. who were "in the picture," either fully or partially, at various stages of planning.
- (g) *Security in connection with other organizations.* The following examples are quoted to illustrate the type of situations that arose during "Torch" planning in connection with this aspect of security:—

The Inter-Service Topographical Department (I.S.T.D.) at one time asked for duplicate printing plates of certain large scale maps around Algiers so as to have the maps overprinted with enemy defences by the Admiralty Hydrographic Department. As this would have been a somewhat unusual job for a chart-producing establishment to undertake, it was thought that it might possibly provide an element of risk to security, and the request was not granted. Instead, G.S.G.S. undertook to do the whole of such work for I.S.T.D., thus obviating the need to send printing plates of the vital areas away from the central War Office printing installation.

The Intelligence Branch (G-2) at A.F.H.Q. wanted 5,000 copies each of 90 photo-mosaics of the Oran area for issue to one of the Task Forces. G-2 ordered them direct from the R.A.F. Central

Interpretation Unit. They found their way eventually into the American map distribution channels, where their handling, under security arrangements, added a considerable extra strain.

Map issues to personnel ships

When planning the map distribution details for the personnel ships, it was at first intended to make up each ship's consignment on the basis of the units and other personnel who were allocated to each particular ship. There were, however, so many changes in the order of battle, and in the plans for the tactical loading of the ships, that it was impossible to arrange distribution on such a basis.

Eventually the only possible solution was to allot to each ship a quantity of maps based simply as a percentage of the total numbers who would be carried, irrespective of the type of unit. This procedure proved to be quite satisfactory.

Special issues

Special map sets were made up and issued to formations which had been allotted particular tasks, e.g., the armoured brigade landing at Bone and the parachute brigade which flew out with the mission of "dropping" in the Tunis area.

Bulk stocks

Convoys carried bulk map stocks in cases, for use subsequent to the initial landing in accordance with a prearranged programme. This programme had to be adjusted later when First Army Survey took up sheets for revision after their arrival in Africa.

Map issues to assault formations

These issues were made by O.C.s troops in each ship during the voyage out, under security conditions which have been described above. The actual times for general issue were given by signal from the convoy flagships and this was approximately 48 hours before landing. Some people were of the opinion that distribution was unnecessarily delayed, thereby prejudicing successful distribution, but security precaution had been given first priority.

Map depot activities with First Army

Only one Field Survey Depot (No. 12), which was of standard type (one officer, 18 other ranks, and one lorry) was available to First Army. Its first task was to set up a map depot in Algiers, and to receive and sort the bulk stocks as they arrived from the United Kingdom in successive convoys. The strength of this unit was at all times too small for its task, and for some months it had to do duty at the base and on the lines of communication as well as in the army area. It was bolstered up at first by employing a topographical section of 518 Field Survey Company R.E. to help with the work of sorting out the bulk stocks and organizing the map depot. Extra labour was obtained locally, including pioneers, Frenchmen and Arabs. As will be seen later, personnel of 12 Field Survey Depot R.E. continued to run the base depot at Algiers until relieved by 7 Field Survey Depot R.E. when it arrived in March.

While leaving half their personnel in Algiers, the remaining half moved forward to Bone to open up an advanced map depot for feeding First Army in the battle zone. Consignments of cased maps were ordered forward from Algiers to Bone as required. These went by sea, and were eventually moved from Bone to Constantine by lorry.

First Army H.Q. moved to Constantine early in December, and the advanced map depot also moved forward there as soon as an L. of C. area headquarters had been established about "D" + 15.

Each area and sub-area (at the ports) held stocks of maps on an agreed basis, and sent weekly stock reports to the survey directorate, who arranged for replenishment. They issued maps to all units working in their areas and, in the case of units passing through, gave them a skeleton issue, for staff use only, covering the battle area. These area headquarters co-operated wholeheartedly and efficiently, thus relieving the survey organization of much detailed map issuing.

Each corps, whether British, American or French, held agreed stocks of their own operational areas and, in addition, a 25 per cent stock of the rest of the army front. They were responsible for issues to divisions and independent brigades under their command at an agreed standard scale of issue. In the event of a sudden move of a formation across the front, a happening which frequently occurred at short notice, both the despatching and the receiving corps made a 25 per cent issue, the balance being sent forward by Army H.Q. as soon as possible.

Divisions obtained wastage replacements from the corps stocks, of which a weekly return was sent to Army H.Q. Stocks were brought up to the agreed level automatically.

The Army survey directorate retained strict control over all bulk issues as resources were limited, and as it was always in touch with the operational plan, it was able to view the picture as a whole.

The advanced depot remained at Constantine under army control until difficult communications made it necessary for it to move forward to Souk Ahras railhead. Both the advanced and rear depots were at all times controlled by the Army survey directorate.

First Army H.Q. later moved to near Souk el Arba and for the final offensive 12 Field Survey Depot, which by then had been relieved of L. of C. responsibilities and was at full strength, was installed at Souk Ahras railhead and at Teboursouk, a central position which was more or less on a level with corps headquarters.

At all times the need for a field survey depot large enough to form adequate rear and advanced depots was acutely felt. There was also the need for detachments with corps and divisions, as had been adopted by Eighth Army, and as was used later during the Italian campaign. When Eighth Army entered Tunisia towards the end of their advance from Egypt, they already had a field survey depot of the larger type which was capable of carrying out all these necessary tasks.

Had the operations not been limited geographically by the sea and other topographical features, efficient map distribution might have been quite impracticable with such slender map depot resources as were available to First Army.

Map supply arrangements under U.S. Army control

After their landings in North Africa, the U.S. forces detailed map depot detachments to operate depots as under:—

At Casablanca on behalf of Atlantic Base Section.

At Oran on behalf of Mediterranean Base Section.

In addition, 12th Army Air Force and I Armoured Corps each set up its own map depots in Casablanca, resulting in a good deal of unnecessary overlapping. The map stocks held by these two private depots were later transferred to the Atlantic Base Section Depot, 12th Air Force retaining a small map library at Casablanca to meet urgent and immediate demands for maps in small quantities.

Later on, when 12 Field Survey Depot R.E. moved forward from Constantine, the map depot there was taken over by a U.S. map depot detachment, under the Engineer of the Eastern Base Section.

A.F.H.Q. control of map supply and distribution

When an integrated survey directorate was organized at A.F.H.Q., a map supply section was formed within it to control the general policy of map supply and distribution within the theatre. Its responsibilities regarding the base depot were eased during March when 7 Field Survey Depot R.E. arrived from the United Kingdom. This released the rear party of 12 Field Survey Depot which was then able to rejoin its own unit in the battle zone.

A directive issued by A.F.H.Q. to all concerned laid down the policy to be followed regarding the following:—

- (a) The maintenance of stock records.
- (b) The control of map supply from the United Kingdom and Washington.
- (c) Map supply and distribution.
- (d) Stock transfers.
- (e) Indents, requisitions, and forecasts of future requirements.

Map supply for the air forces

A small section of the Algiers depot was lent to the air forces for use as an "Air" map library, personnel for which were supplied by the air forces. The map depot was responsible only for the bulk supply of maps to the library.

The North African Tactical Air Force experienced some difficulty in distributing maps to its forward units in the southern sector. Arrangements were therefore made for stocks of certain map series to be held for the Air Force at the Constantine depot.

During the early part of the campaign, most of the maps required by 12th U.S. Air Force were obtained from the United States and shipped to Oran. This policy was altered in March, when it was arranged that maps required by forward air force units would be obtained from the United Kingdom *via* Algiers, and that only those maps required by rear formations of 12th Air Force would be obtained from the United States.