

## Appendix A

# Documents and Records Used by No.2 ORS

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### A. Before an Operation

1. Defence Overprints are 1:25,000 and 1:12,500 maps overprinted with the latest Intelligence information on the location and nature of the enemy's defence installations, based on the interpretation of aerial photographs and various forms of reconnaissance. They form a useful guide to the battlefield afterwards.
2. Operation Instructions are detailed plans for the conduct of the battle, issued by Corps and Div HQ. For security reasons their distribution is strictly limited before D day.
3. Air Plan. This is drawn up by the appropriate RAF HQ and shows targets and times of attacks before the battle as well as the responsibilities of tactical aircraft during it.
4. Order of Battle is a top secret document to which amendments are issued almost daily. This shows exactly which units are under command of the various Corps and Divisions.
5. Artillery Operation Orders are generally issued from Corps HQ.
6. Artillery Planning Instructions as above. Both these documents supplement the Corps Ops Instructions with full details of the artillery set-up.
7. Artillery Fire plan has a useful map showing where barrages and concentrations are to be aimed.
8. Counter Battery Intelligence Summaries, issued daily by the CBO give information about the activity of hostile artillery together with locations of new positions.
9. Hostile Battery Location List is brought up to date by frequent amendments and gives 6 or 8 figure map references for all enemy batteries that have been located by various means. Many will be found to have been unoccupied alternative positions.
10. Div and Corps Intelligence Summaries are prepared by IOs to give their HQ all available information about the enemy in their sector of the front. They provide identification of enemy units and tell of their strength and morale.

## B. During and After an Operation

1. Cositireps. Combined Situation and Intelligence Reports, available daily at Army Group. They record the positions of our own formations down to Brigade level.
2. Ops Logs are issued at various levels and give the battle situation in varying degrees of detail. They have to be collected soon after issue or they are liable to be burnt.
3. Wostels. War Office Situation Teleprints. Copies of these are held at Army Group for considerable periods and although they deal with no formations lower than Brigades, they are useful checks when no other source of information is available.
4. Air Force Ops Flashes are teleprints from Wings or Squadrons giving full details of attacks made by planes of the Tactical Air Force.
5. Air Force Daily Log. 2nd TAF produced a daily record of all their operations giving time, number and type of aircraft, load and a brief statement about the target and results. It should be noted that map references are not 100% reliable and often a string of place-names is followed by a statement to the effect that 3 tanks and 5 MT were destroyed, such informations being quite useless to the ground investigators.
6. Air Ministry War Room Air Staff Operation Summaries are known as "pink 'uns." They give numbers of aircrafts, weight of bombs and pilots' claims for all the air forces all over the world. Published daily, they are a most fruitful source of information when dealing with weights of attack but give no details as to size of bombs or their fuses.
7. Hostile Battery History Sheets can be obtained from the CBO. They give the date, method and accuracy of location of each battery together with information about weights of counter-battery fire put down on it and some idea of the duration of its activity.
8. Gun History Sheets come from Battery HQ and record, among other things, the number of equivalent full charges fired and the state of calibration.
9. Ammunition Expenditure Returns. It is usually best to consult the GPO or the No.1 of the gun for details of rounds fired in a particular engagement.
10. Artillery Meteorological Data can be obtained from the Met party associated with the operation but it is necessary to arrange with them beforehand for the preservation of all their records. If Rawin ascents are made, data can be obtained from the GL team.
11. Divisional RA Log, kept by the CRA, records any extra barrages or harassing fire over and above the original plan.
12. REME Recovery Section Tank Casualty Location Lists show where all knocked-out tanks are situated though they tend to exclude "brew-ups" which are not worth recovering.
13. REME Workshop Tank Repair Records provide information about the type of damage sustained by the various tanks that have been recovered.
14. POW Intelligence Summaries are issued periodically from various HQ and cover all manner of subjects on which information has been gathered by interrogators.
15. Shellreps sent to the CBO, record the arrival of hostile shells with some idea of the direction from which they came.
16. 2nd Echelon Casualty Returns give the daily numbers of killed, wounded and missing in each unit.
17. Divisional Medical Returns are consolidated by the ADMS from all CCS and FDS reports. They usually indicate the weapon responsible for the death or wound.
18. Div and Corps Intelligence Summaries, referred to in Section A above, can give useful information of the enemy's reaction to the operation.
19. Aerial Photographs can be used to find where bombs, shells and rockets landed. In good weather many sorties are flown and it is then possible, by comparing photos taken before and after a bombardment, to distinguish new craters from old.

## Appendix B

# Notes on the Examination of a Battlefield

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### 1. Craters

- (a) Except when filled with water, craters will usually yield clues as to their origin in the form of fragments. Learning from experience one soon becomes expert at distinguishing fragments of a 60 lb SAP Rocket Projectile from those of a shell etc. The age of a crater is harder to determine because one is not often on the scene early enough to recognise that easily distinguished appearance of newly-disturbed earth; the sight of vegetation growing in a crater is usually a good indication of age, but in damp soil and with hot weather one can be deceived in this.

(b) Bomb craters

There are so many variables concerned in the determination of crater sizes that no reliable guide can be given (see Memorandum No.8, in Chapter V). The very large and very small bombs make craters that can be recognised but the intermediate sizes present difficulties. However, armed with the knowledge that a target has been attacked with 500 and 1000 lb bombs of the same type and fusing, it is usually possible to distinguish the two sets of craters by their relative size. Craters in roadways will generally be filled in by the time the ground investigators arrive, but one can make a fair estimate of the size of the crater by inspection of the disturbed surface. Bomb craters in shallow water show up quite well on aerial photographs.

(c) Shell craters

These are usually very shallow and pear-shaped, with a very characteristic “butterfly-wing” pattern in the soil; those “wings” are thrown forward along the line of flight. The only notable exceptions among shell craters are those of the super-heavies which are round, 2 or 3 feet deep and without butterfly-wings; this is especially so in wet soil where even mediums tend to make this type of crater.

(d) Mortar craters

Mortar bombs make hardly more than a scar on the surface; usually almost round and very shallow, these are about 18" in diameter. The larger German mortar bombs make craters comparable with those of field artillery shells.

(e) Rocket craters (60 lb SAP/HE Aircraft Rocket)

Although with different types of soil and different angles of dive a variety of shapes and sizes have been encountered, the most usual type of crater is oval, some 8' by 5' and about 18" deep. Digging in the crater will generally reveal characteristic fragments but this is often unnecessary because of the presence, in or near the crater, of the easily recognised rocket motor and/or fins. The motor resembles a 3 foot length of drain pipe (3" diameter).

(f) Land rockets ("Mattress")

The craters are similar to those of the aircraft rocket but the motor tends to split into long thin strips like the peel of an outside banana; these strips will be found protruding from the crater.

(g) Air cannon and MG scars

A metalled road that has been strafed shows very definite pock marks. Where strafing occurs in grassland holes as large as 6" in diameter can often be seen.

## 2. Examining Vehicles

(a) Where a retreat has taken place one has always to be on the lookout for vehicles destroyed by the enemy to prevent them falling into our hands. This is usually indicated by the presence of the metal cases in which the German demolition charges are carried and by the fact that the centre of destruction is located in a standard part of the vehicle, under the hatches of a tank, for example. Vehicles that were destroyed on roads are generally pushed off by bulldozers and one has to try to estimate the position at the time of the kill and to assess what was original damage and what was done by the bulldozer.

(b) Multiple damage

Cases will be found where more than one weapon has done damage to a vehicle and then one has to resort to deductive reasoning and the interrogation of local civilians or to class the damage as "Unknown causes." This problem is aggravated by the tendency of the troops to use knocked out vehicles as practice targets. Knowledge of the course of the battle will serve to show whether a PIAT or Bazooka hit was the cause of destruction or the work of an enthusiastic marksman at a later date.

(c) Cannon and MG hits

When small holes are found in the roof, bonnet or upper surfaces of mudguards it is generally safe to assume that the vehicle has been strafed, but, as pilots are apt to fire at "dead" vehicles, other possible causes of damage must be sought as well. Bullet holes in the sides may be caused by the machine gun of an AFV but are often the results of musketry practice.

(d) Fragments of shells and bombs

Such fragments make jagged holes in the sides of vehicles. It is generally advisable to go to the crater and see whether fragments from it could have struck the vehicles, always remembering that if it was in motion at the time of the burst it would have moved some distance before coming to rest.

(e) Direct hits by bombs and rockets

As neither bombs nor rockets are ever used singly, except in the case of mechanical hang-ups, one should look around for the other one of a pair; it should not be many yards away.

(f) Fires in vehicles

Vehicles that have been hit by any form of projectile tend to take fire and this causes extra damage due to bursting petrol tanks and exploding ammunition. The appearance of the vegetation in the immediate vicinity will usually give a good indication of when the fire took place.

(g) Dead bodies

The presence of dead bodies in a knocked-out vehicle is a sure sign that it was not destroyed by the crew. An examination of their situation and attitude may yield useful information if one applies the Sherlock Holmes technique; in fact, this technique is used so often in battlefield investigation that one can say that the famous detective would have been a first class Operational Researcher.

### 3. Examining Gun Positions

(a) All types of gun positions have been examined, ranging from the shallow pit dug for the 20 mm LAA gun to the reinforced concrete casemates of the heavy coastal guns. They fall into two classes, those apparently made by the troops in the field (varying enormously according to the circumstances) and those made by conscripted labour (prepared long before the battle and built to standard specifications).

(b) Finding gun positions

They are easy to find when built in the open as they are more built up than excavated. Quite large positions were, however, nearly missed when they were hidden along the edge of a village but the prominent barrel of the abandoned gun usually caught the eye.

(c) Unoccupied sites

When a gun site is overrun or the troop is forced to retreat, some evidence of occupation is invariably left; empty cases, clothes, papers, empty tins and cigarette packets. But when no such evidence is found, one should examine the ground for tracks before stating that the site had definitely been unoccupied.

(d) Dummy sites

These were often so well devised that they deceived the eye until one approached quite near. Wooden poles were used to simulate gun barrels.

(e) Damaged guns

Guns still on site when the positions were investigated were either intact, suggesting surrender or rapid retreat, destroyed by the crew, indicated by standard damage (breech blocks blown, muzzles split or, in the case of AA guns, mountings demolished) or destroyed by some weapon of ours.

(f) Signs of activity

Empty cartridge cases tell their own story. The number of unused rounds found on site is often of interest as cases have occurred where positions were overrun because the ammunition was exhausted. All records, documents and personal papers such as letters and diaries are well worth scrutiny. Identification of the unit from such sources can be tied up with the PW interrogation. Graves, with or without dates on them, and dead bodies all yield valuable information. Wheel tracks through or purposely avoiding recent craters suggest withdrawal after shelling had begun.

#### 4. Tank tracks

- (a) A knowledge of the appearance of the impressions made by the tracks of all types of AFVs, both British and German, allows one to reconstruct the course of events to a very considerable extent.
- (b) The depth of the impressions made by such tracks and indications of skidding and bellying enable the investigator to assess the effects of the tank-carrying capacity of the soil on the course of the battle.

# Interrogation of Military and Civilian Personnel

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This appendix is intended to show what results may be expected from interrogations and to give some indications as to the methods used.

## 1. Enemy Prisoners

### (a) Information Obtainable

Enemy order of battle, losses, actions, weapons, methods, reactions and opinions. Thus, PW are a potential source for everything we wish to know about the enemy.

### (b) Method of Obtaining Information

Enemy PW are stupid and hostile, it therefore requires a trained interrogator to extract their knowledge from them. He should be in touch with all other intelligence sources (i.e. documents captured, summaries). This is a limitation as, while a battle is in progress, all available interrogators are required to obtain purely operational information. On the other hand PW have nothing else to do other than answer questions and the method of evacuation draws witnesses from all parts of a battlefield to one central point - the PW cage - so that a few interrogators can cover a wide field. Although for administrative reasons PW are evacuated rapidly to the rear, it is possible to follow back along the L of C any bunch that is particularly interesting. This was done by this section in the course of enquiries following the Ardennes Battle and Operation Veritable. Visits were made to base cages and information obtained during the battles was used to pick out PW who might have useful knowledge.

### (c) PW as a guide to enemy morale

Experience shows that only limited information can be obtained as to enemy reactions and morale. The physical appearance of prisoners as long as they have only just left the battlefield may be a guide to the effect of our attacks, but PW stories of reactions were never very satisfactory. An American team of psychologists made an attempt at Boulogne to assess scientifically the morale effects of our attacks on the fortress. They asked a

large number of prisoners a number of psychological questions and analysed their answers in terms of their own psychological teaching. This method, though offering possibilities, also requires especially skilled persons for its application. At British Base Cages other methods were used with some success in order to obtain PW opinions and reactions without the intrusion of an interrogator. These methods useful for establishing general trends in PW thought were too long range for the needs of a section which hoped to report on a battle within a week or so of its conclusion.

Generally speaking, the best guides as to morale effects were:-

- (i) The comparison of PW stories with other authentic accounts - PW from Walcheren gave the interrogator the impression that the German batteries had remained in action half the day, whereas an official naval observer showed them to have fired for less than an hour.
- (ii) The interrogator's own opinion based on observation of the man in question.
- (iii) The ratio of enemy killed and wounded to the number of prisoners.

A final limitation to the information obtainable from prisoners is their usual complete lack of knowledge in respect of the time and place of any events that they describe.

## 2. The Civilian Population

Whereas more limited in the information that it was able to give, the civil population had certain advantages over enemy prisoners as a source.

Time and place were usually more easy to identify. If we wanted information from a farmer whose haystack had been burnt whilst concealing a tank or some other enemy vehicle, it was not like asking a soldier who had seen plenty of burning haystacks. The farmer nearly always knew exactly how and when he had become suddenly a much poorer man.

Whereas it was not possible to get an accurate picture of the nature of enemy traffic on a given road, it was possible to establish which actual road was used and when, two points seldom clear to PW.

In dealing with the civilians it was not necessary for the interrogator to be trained and in France and Belgium, as most of the section spoke adequate French, they were able to ask questions at will. Even in Germany no serious difficulties occurred on this account; the civilian population was sometimes stupid but seldom hostile.



## Appendix D

# The Administration of Operation Research Section

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Whilst the Section was an integral part of HQ 21 Army Group, the day to day administration was very little different from that of any ordinary unit of comparable size. It was not until late August when the Section went off out into the blue to live on its own that new problems had to be faced.

Then the non-commissioned personnel had to undertake tasks that do not usually fall to their lot. Driver batmen had not only to drive and to “bat” but had to do far more of the repair and maintenance of their vehicles than is usual for men in their position. They had also to be able to cook as they often went off for days with their officers and from a box of rations and a petrol cooker were expected to produce 3 meals a day or starve. In many cases they had to assist their officers in the examination of gun-pits, bomb craters and the like.

Parties frequently returned to Section HQ in the afternoon and announced that they were due to set off again at 0900 hours next morning. This meant that the vehicles had to be overhauled, lamps and cookers repaired or replaced, rations for several days packed up and a hundred and one odd details attended to. It was essential, therefore, to have at the base the requisite personnel to deal with such emergencies. The MT mechanic and the Corporal between them saw to it that these things went smoothly.

With such a fluid section as this it was impossible to predict how many people would be present at HQ at any given time and though officers in the field tried to send messages warning of their arrival the bodies usually preceded the paper by several hours and complicated the feeding problem.

With each move of Section HQ and with the setting up of each Tac HQ, the Administrative officer had his work cut out to visit the proposed area, obtain accommodation and return to organise the move.

The Clerical staff, at one time only a Sergeant typist and a non-typing clerk, was later augmented by the acquisition (surplus to establishment) of a second typist. The production of the many reports and (on average one every 8 days) was a big task, as each involved second drafts including tables of figures and calculations and the language was generally somewhat above the heads of the typists.

The life of the section was such that for days and even weeks some men would be working at full pressure and then a brief respite follow. Although every opportunity was taken to give the men time off, we had often to refuse allocations of vacancies for short leave in Paris as there was no one free to go. The

men were all hand-picked and responded magnificently to the somewhat unorthodox discipline of the Section. That the corporal, who was a Jack of all Trades, kept this unusual body of men going smoothly was a credit to himself and of inestimable value to the Section.

The strength of No. 2 Operational Research Section was as follows:-

1 Sergeant (typist)	1 Humber staff car
1 Corporal (i/c discipline, etc.)	3 Jeeps and 2 trailers
1 MT mechanic	1 Bedford 3-ton lorry
1 cook	1 15 cwt truck
5 Driver-batmen	2 motorcycles
2 Clerks	
2 General Duties men	

## Appendix E

# List of Reports and Memoranda

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### A. 2 ORS Reports

1. Self Propelled Artillery in the Assault
2. Royal Marine Artillery in Operation "NEPTUNE"
3. Investigation of an Attack on a German Column near La Baleine
4. Air Attacks on Enemy Tanks and MT in the Mortain area, August 1944
5. Bombing of Caen, 7th July 1944 (op CHARNWOOD)
6. Bombing in operation GOODWOOD
7. Bombing in operation BLUECOAT
8. Bombing in operation TOTALISE
9. Effect of 90 lb Fragmentation Bombs
10. Suggested Plan to block German Retreat from Argentan and Falaise
11. Location of Enemy Mortars
12. Analysis of 75 mm Sherman Tank Casualties, 6th June - 10th July 1944
14. Heavy Bombing in Support of the Army
15. Enemy Casualties in Vehicles and Equipment in the Retreat from Normandy to the Seine
16. Air and Ground Support in the Assault on Boulogne
17. Analysis of German Tank Casualties in France 6th June - 31st August 1944
18. Tank Casualties During the Exploitation Phase after crossing the Seine
19. Infantry Officer Casualties
21. GL III in Forecasting Wind for Artillery Meteor
22. Effect of Artillery Fire on Enemy Forward Defensive Positions in the Attack on Geilenkirchen (30 Corps)

24. Accuracy of Predicted Shooting - Operation SWITCHBACK
25. Effect of Various Forms of Fire Support on the Western Defences of Walcheren
26. Fire Support Operation VERITABLE - Effect on Forward Defensive Positions
27. Anti-Tank guns in the Ardennes
28. Use of Mobile Radar Control Posts for Air Support of the Army
29. Effect of Counter-Battery Fire in operation VERITABLE
30. Speed of Build-up in the Assault Crossing of the Rhine
31. Accuracy of Predicted Fire in operation VERITABLE
32. Armoured Pursuit after Crossing the Rhine
33. Use of the Panzerfaust in the NW European Campaign

**B. Joint Reports (2 ORS and ORS/TAF)**

1. Air Attack on Enemy Armour in the Ardennes
3. Rocket-firing Typhoons in Close Support of Military Operations
4. German Flak and Allied Counter-flak Measures in operation VARSITY

**C. 2 ORS Memoranda**

1. Crater Bombing of River Lines in Normandy
2. Bombing of Communication Centres prior to operation PLUNDER
3. Interdiction of Road Communications by Bombing
4. American Incendiary Bombs
5. Effects of Bombing on Wet Ground
6. Contribution of the Air Forces to Stemming the Enemy Thrust in the Ardennes, December 1944
7. Morale Effects of Artillery
8. Unloading of Gliders in operation OVERLORD