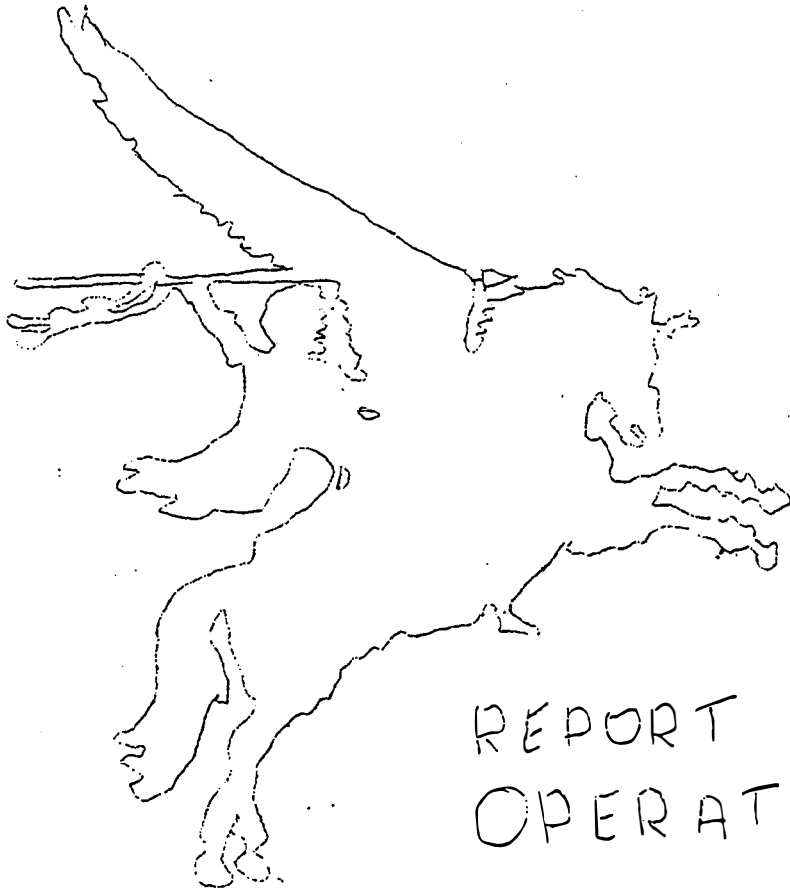


ANNEXURE T

SECRET

1ST AIRBORNE DIVISIONAL SIGNALS



REPORT ON
OPERATION

MARKET

17 SEP 1944 TO 26 SEP 1944

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INTRODUCTION AND OUTLINE PLAN.INDEX A.

1. Although it really has no place in a report of this nature, the outline plan of the operation is given here for the convenience of those who may not be familiar with it.
2. By the middle of Sep 44, 21 Army Group had reached the line of the ESCAUT CANAL. On front of 2nd Army there were some German Parachute formations who were comparatively lightly armed and without a full proportion of arty etc. Commander 2nd Army was confident that when he was ready he could easily break through this screen.
3. Commander 21 Army Group decided that in conjunction with 2nd Army a large Airborne Force would be dropped in the area of the enemy with the object of seizing the crossings over the LOWER RHINE and MAAS. These consisted of three bridges at GRAVE over the R MAAS, at NIJMEGEN over the R WAAL, and at ARNHEM over the R LEK. The destruction of any of these crossings, it was calculated, would delay the advance of 2nd Army by at least one week.
4. The Airborne plan was to use three Airborne Divisions, 101 and 82 US Airborne Divisions and 1st Br Airborne Division. 101 Airborne Div were given the task of seizing the bridge at GRAVE and a number of smaller bridges on the road further SOUTH. 82 Airborne Div would seize the bridge at NIJMEGAN, and 1 British Airborne Div the bridge at ARNHEM. British Airborne Corps, who would command the three divisions, would land in the area of NIJMEGAN. Priority of aircraft was from SOUTH to NORTH. Owing to the enormous air effort required it was not possible for 1 Airborne Div to fly in complete on D day. Commander 1 Airborne Div therefore decided that on D Day 1 Para Brigade and 1 Air Landing Brigade with a proportion of divisional troops should go, 4 Para Brigade and the remainder of Div troops should go on D + 1 and the Polish Para Brigade, who had been placed under command for the operation, should arrive on D + 2.
5. ARNHEM is a town of about 86,000 inhabitants with a large residential area surrounding it. The country outside is undulating and heavily wooded, with a large proportion of coniferous trees and some heather. DZ and LZs were approximately 8 miles from the main bridge. ARNHEM is normally the administrative capital of Holland; it has well equipped barracks and a German garrison.
6. Before the operation, orders were given that no destruction to communications was permissible except the cutting of what was obviously German field cable. All trunk cables and locals in the area are buried; switchboards, except for trunk switchboards, are automatic. The high tension electric supply network, which is extensive throughout the country, has its own trunk telephone system, whose switchboards are kept separate from the Post Office switchboards.
7. The only switchboard which was captured by 1 Airborne Div was at OOSTERBEEK; this was an automatic switchboard and had been completely destroyed by the Germans. The Dutch resistance movement appeared to be well organized in the Post Office and Dutch Liaison Officers assured OC Signals that the main trunk switchboard at ARNHEM had been rendered unusable to the Germans. The main ARNHEM auto switchboard was working however, and by its means some information of enemy movements the far side of the town was obtained from members of the Dutch resistance movement.

Operation MARKETS E C R E T.Diary of Events at Div HQ.

1.

GENERAL.

Copies of Div Signals Insts. 1,2, and 3 and Div Op Order for Ops LINNET and MARKET are at Index B in order to show the signal comms which it was intended should be provided.

2. D DAY.

All Gliders arrived except Glider C. Gliders landed at approx 1300 hrs, unloaded and vehs proceeded immediately to the first position of Div HQ which was on the edge of the wood beside the LZ. The parachute party landed very shortly after the gliders. Comms were set up only on those sets which could operate on the move since the Comd wished to keep Div HQ as mobile as possible. This prevented sets being erected to work to Base, Phantom, etc. On the Div Comd net the following stations were through by 1607 hrs:-

1 Para Bde
A L Bde
21 Ind Para Coy
Tac Div HQ(Para party)
GOC's Rover.

At 1645 hrs 1 Para Bde started to move from the DZ and they reported at the same time that their lateral set (SCR-300) was in communication with 82 US Airborne Div.

The Div Comd freq was proving unsatisfactory at this time there being a powerful British station almost exactly on it, and it was therefore decided to change over the A and B freqs at 1900 hrs; a message to this effect was sent to all concerned.

1 Para Bde had with them only a No 68P set working on the Div Comd net since they had not waited for their glider element to join them before moving off. Consequently they were soon out of range and the message about change of freq could not be got to them.

A SDR was sent to 1 Para Bde at 1730 hrs with an OP message among others, but returned at 2050 hrs to report he could not find them. G Staff thereupon ordered that no further DRs should be allowed out without their permission.

At 1930 hrs Div HQ closed and moved into a lager among the gliders on the LZ. It was now dark and open wire aeriels were erected for the longer links. Interference however was very bad. Links worked as follows:-

A Wave - unable to work until 2300 hrs when A L Bde and 21 Ind Para Coy came on the air. There was no comm with 1 Para Bde or GOC's Rover, which latter was still absent from Div HQ.

B Wave - No comm owing to heavy interference.

Base Set - contact with Airborne Corps at 2145 hrs. Corps reported they could work Base 5/5. Contact was lost soon afterwards.

RA Comms - RA net was through to 1 Bty, 3 Bty, 1 A Tk Bty, and CO Lt Regt.

Other sets, which did not establish comms on D Day were:-

Phantom set, PR set, Air Sp. Set.

Index C.

It is clear that the 1 Para Dde No 68P set was out of range, and it transpired that the GOC's Rover set had been put out of action by a mortar bomb. On the B Wave comm was most difficult owing to the heavy interference and lack of selectivity in the R 109. Similarly the same reasons probably were the cause of failure of the Base and PR links.

The LO from the Recce Sqdn at Div HQ reported through to his tps with 1 Para Bde and 1 A L Bde but comm to the former was lost shortly after dark.

3. D+1

At 0015 hrs comm 3/3 was established with Base. Traffic could be passed on DC procedure R1 and Recce reported they had lost touch with their sets with 1 Para Bde, otherwise no change in comms.

At 0630 hrs Div HQ moved into some scrub at the edge of the LZ. Comms were as follows:-

A Wave - A L Bde and 21 Ind Para Coy.
B Wave - A L Bde
Base - Base and Corps
Others - Nil.

2 i/c Div Sigs was despatched at 0715 hrs with orders to go to 1 Para Bde, see what the trouble was and inform them of the change of frequency.

The order "prepare to move" came at 0730 hrs by which time no further comms had been established. At 0800 hrs Div HQ close and moved on to the main road ARNHEM - UTRECHT and established a new HQ at HILL OEK at 0930 hrs. Aerials were erected immediately. The GOC's Rover set was still off the air on the A wave, but A L Bde and 21 Ind Para Coy were still on. At 0945 hrs 2 S Staffs were ordered to reinforce 1 Para Bde. A No 68P set working on the Div Comd net was attached to them and they left Div HQ at 1010 hrs.

At 1030 hrs a LO with Jeep and No 22 set was despatched to endeavour to get to the main br at ARNHEM. This LO however, could only get about half-way where he found 2 i/c Div Sigs with 1 Para Bn. The latter had informed 1 Para Bde by wireless of the change of Div Comd frequency, using the Bde comd net. The LO shortly afterwards returned to Div HQ, and 2 i/c Div Sigs continued on with 1 Para Bde. The latter shortly afterwards was forced to lie up and took no further part in the sp.

Throughout the morning Base, PR, Phantom and Air Sp Sets tried hard to establish comms but all failed. Base set contacted Airborne Corps strength 3/3 at 1335 hrs.

At 1415 hrs 2nd lift aircraft began to appear and 4 Para Bde were on Div Comd net at 1530 hrs. Phantom set reported contact with 30 Corps at 1510 hrs. At 1630 hrs Div HQ prepared to move in direction of ARNHEM and opened at PARK HOTEL, HARTENSTEIN at 1740 hrs. There was still no news of the GOC.

The 2nd Glider lift and one Para stick had now landed safely and had joined Div HQ. Also glider C which had failed to arrive on the previous day. HQ R1 also moved to Park Hotel and were established by 1840 hrs and a No 19 HP set took command of the CRAs net. A No. 22 set on another net was working to 2 Lt Bty which had just landed. A further No 22 set with a Captain from 1 FOU was sent out to act as FOO with 4 Para Bde. The second No 19 HP was dug in and a 34 ft rod aerial set up in preparation for the link to the ground from FOOs. Lines were laid to Lt Regt and between G and R1 offices.

At 1800 hrs the B wave crystal in the No 76 set failed. This was quickly rectified. At 2040 hrs the No 76 set on the Base link failed and this was not rectified until 0055 hrs. At 2120 hrs orders were given by OC Signals that since the Air Sp net was not yet through all demands for Air Sp should be cleared through Airborne Corps, 30 Corps or 2nd Army, whichever set was through at the time of demand.

It had been decided that 11 Para Bn should be detached from 4 Para Bde and given the task of relieving 1 Para Bde, who were now involved in fighting in the town and with whom no comms had yet been re-established. A No 22 Set with crew and jeep from A Sec was allotted to 11 Para Bn, which set off at 2300 hrs.

4. D + 2.

At 0055 hrs the Base set now in working order, could hear Airborne Corps and Base working together but was unable to get on net. At 0200 hrs a Jeep SDR was sent with offr to try and get through to 1 Para Bde, but failed and returned. At 0503 hrs RA reported they were through to 3 Bty who were with 1 Para Bde, but comn was lost 7 mins later.

The Comd returned to Div HQ at 0730 hrs, his Rover set having been destroyed. A new set and jeep was immediately prepared and the crew briefed. At 0915 hrs the No 68P set with 2 S Staffs was heard on the Div Comd net but it was so weak that comn could not be established. At 0947 hrs this was re-established. On the Div Comd net there then were:-

4 Para Bde
A L Bde
21 Ind Para Coy
2 S Staffs
11 Para Bn.
GOCs Rover
B Wave - 4 Para Bde, A L Bde.
Base set - Airborne Corps and Base 2/2
PR Set (working to War Office London)-4/4
Phantom and Recce sets, both satisfactory.

At 1200 hrs 2 S Staffs set failed, it was heard again at 1455 hrs but faded away and was not heard again. PR set reported comn had been lost but this was through again at 1250 hrs. The Air Sp set had still not established comm. At 1450 hrs the No 22 set which had been with 11 Para Bn reported back at Div HQ having been given orders to return. At 1700 hrs the 3rd lift aircraft began to arrive and encountered heavy flak. The Polish Para Bde was called on the Div Comd net and on the 1 to 1 link but nothing was heard and it was later ascertained that they had not arrived.

At 2100 hrs the comn state was as follows:-

A Wave - 4 Para Bde, A L Bde, 21 Ind Para Coy.
B Wave - 4 Para Bde, A L Bde
Base set - Out of action as night crystal had failed.
Remainder - No comms.

Lines had now been laid locally and to 4 Para Bde. A L Bde line was about to be started.

At 2300 hrs PR set established comn and traffic was passed.

There was no change in RA comms throughout the day. The spare No 19 HP set was moved to an attic in Park Hotel and a 34 foot rod aerial erected to try and get early as possible contact with ground FOOs.

D + 3.

At 0200 hrs it was reported that there was heavy interference on all links and the Comd net although receiving strength 5 signals was unable to pass traffic. The PR set was satisfactory.

At 0440 hrs 4 Para Bde came up on the B wave. At 0500 hrs Phantom set reported through to 2nd Army and 30 Corps. At 0720 hrs Base set reported through to Base and Airborne Corps.

The Comd held a conference at 0800 hrs. In the middle, GSO 3 (Ops) reported that 1 Para Bde had come up on the Comd net. They were at the North end of the main road bridge at ARNHEM. 1 Para Bde remained through on this net until the evening when it is reported that they were overwhelmed.

Lines were now through to both the other Bdes. During a Recce by the Comd his Jeep was again hit by a mortar bomb but the set was salvaged and repaired. At 1400 hrs the Base set reported unable to pass traffic owing to heavy interference from RAF station P6Z.

During the rest of day A L Bde, 4 Para Bde and 21 Ind Para Coy kept going off the Comd net for short periods; also their lines were similarly out of action. This was due to enemy action. At 1830 hrs a new Rover set was ready for the Comd. At 1900 hrs the GSO 3 (CW) was despatched with Jeep and No. 22 set, netted on the Comd net, with the task of endeavouring to get contact with ground forces believed to be nearing the SOUTH BANK of the river. This set however remained on the NORTH BANK of the river while the offr crossed over. It remained through during the night and, on the offr not returning, was ordered to report back to Div HQ at first light. At 1800 hrs contact with 4 Para Bde was lost on both A and B waves and it subsequently transpired that both the bde sets had been destroyed by enemy action.

After dark some interference was experienced on the Base link.

Mortaring and shelling of the Div area was much heavier than on previous days, and valves in some sets were put out of action through near misses. The No 19 HP set at the top of the house was moved back to the grounds and dug in. A ground FOO was heard for a few moments but no contact could be obtained. Other RA comms were working satisfactorily.

A number of vehs in the Div area had now been put out of action, including both Air Sp vehs. Throughout the day constant search was maintained on both links to Corps without result. Sets were changed and resited and open wire aerials tried. The Div Guard set which had maintained a listening watch hitherto still had made no contact with anyone.

6. D + 4

There is little to report during the early hours of darkness. The PR set failed but was repaired shortly after by an IM. 4 Para Bde Sigs had suffered heavy casualties in men and equipment the previous day and 2 No 22 sets and 3 No 68P sets were made available to Comd 4 Para Bde. Lieut BOSWORTH was ordered to act as Bde Sig Offr. Owing to heavy mortaring, lines kept being cut and linemen were kept busy throughout the day.

The new 4 Para Bde set was on the Div A wave at 0900 hrs and remained through for the rest of the day.

The Phantom set was having difficulty in passing traffic throughout the morning, but improved later.

At mid day Comd decided to move all offices into the basement of the PARK HOTEL, there to form a strong-point. The Signal Office and switchboard were therefore moved and were working by 1530 hrs. Outside locals were duplicated in all cases, four lines being laid to RA. Actually in the building the following sets were located:-

Comd Set; Recce Set; Base Set; B wave set; Polish Bde set.

Since the B wave could now only communicate with A L Bde, and there was little or no formal traffic to be passed, this link was closed down and not reopened. The sets listening on both Corps links and on the Div Guard freq were still searching but had heard nothing.

A large proportion of the Polish Para Bde landed about 1900 hrs SOUTH of the River and both the No.22 sets due to contact them now began to call and search for them. No contact however, was made.

By now both day crystals of the Base set had failed and this link thereafter had to work on the night freq throughout the 24 hrs. Comms was therefore difficult during day time, and at night interference was experienced.

Contact was established at 0900 hrs with 64 Med Regt, using a No.19 HP set, and ranging was commenced at once. This link remained through for the regt of the op and the Arty Sp provided proved invaluable. Other RA comms worked normally throughout the day.

7. D + 5

At 0320 hrs a message arrived saying that 43 Div would come up on Airborne Corps comd frequency and giving the call signs they would use. Hitherto Gds Armd Div had been expected but had not been heard.

Before first light 21 Ind Para Coy was placed under comd 4 Para Bde. They were therefore transferred from the Div Comd wave to 4 Para comd wave.

At 0800 hrs Base set reported through to Airborne Corps and Base ans traffic was being passed. At 0800 hrs by mortaring cut all lines leading into Div HQ.

At 0900 hrs contact was established with the Polish Para Bde on the 1 to 1 link. This link subsequently proved invaluable.

Throughout the day mortaring cut lines frequently and caused the two bde sets to close down on occasions. Breaks, however, were only of short duration and comms were more than adequate to enable the Comd to control the Div. Some interference was being caused at Div HQ owing to sets being so close together.

Throughout the day listening watch was still maintained on both the Airborne Corps links and on the Div Guard wave. Aerials were resited and every possible improvement made but still without success.

During the morning a mortar bomb destroyed four 300 watt charging sets.

This made the battery charging situation very difficult, as a number of batteries had also been destroyed. The utmost economy was ordered and batteries from Jeeps, which had been put out of action, were collected.

Comms on the Phantom and PR sets remained satisfactory throughout the day. The Base link however was difficult, although some traffic was passed both to Base and Corps.

RA Comms throughout the day were normal.

8. D + 6

It now became clear that the remaining charging sets could not hold their own with the battery drain, and early in the day a further charging set was destroyed by enemy action. Furthermore, owing to the number of near misses, the IMs, two of whom had been wounded, could not keep the necessary number of sets in working order. OC Sigs therefore decided to close down the two No. 22 Sets listening for Airborne Corps and also the Div Guard set.

Comms on the Div Comd net, Polish link (Recce, PR and Phantom were satisfactory. Aerials, however, were constantly being blown over by blast so that inevitably there were breaks in comms, Lines also were constantly being cut and linemen were kept busy. The

Base set comm was very difficult, signals being weak and interference fairly heavy. Some traffic however was passed to Airborne Corps and Base.

At 1800 hrs very heavy mortaring occurred and three direct hits were scored on Div HQ. Three working No 22 sets were put out of action and all lines cut. Sets were not repaired before dark and great difficulty was found in establishing comm again since sets had to be kept more or less in the open and the light necessary for the operator to tune the sets constantly drew snipers fire. During the night Base and PR sets reported fading and heavy interference.

A det of the Polish Para Bde was expected to cross the river during the night. A No.22 set in Jeep was despatched to make contact with them and establish comms on the Div Comd net.

RA comms worked very satisfactorily throughout the day. The second No 19 HP set established comm with Maj Whyte Boycott of the Seaborne FOO element. By the evening 1 Airborne Div could obtain arty support on demand from one med and three fd regts. A large number of targets were registered and arty sp was almost continuous. At 1800 hrs a German station came on the FOO net and endeavoured to confuse fire orders, so that supporting arty would shell our own troops. It appeared however, that the No.19 HP set was sufficiently powerful to prevent confusion and characteristics of the officers working British sets were sufficiently well known to each other to overcome the difficulty.

9. D + 7

At 0800 hrs Maj Holbrook, OC 2 Coy, using a No 22 set came up on the one to one link to the Polish Para Bde. He was at once ordered to report to 130 Bde where he remained for the rest of the op. This link proved invaluable.

Comms were fair up to first light, then things improved and all sets were through and working by 0600 hrs. There was then very heavy mortaring for three hrs and aerals kept being blown down. Great difficulty was experienced in keeping lines through, but it was usually found that either line or wireless was through at any one time. Other wireless links worked satisfactorily, throughout the rest of the day except for the Base set which lost comm about 1800 hrs.

About 1145 hrs two sets using the call sign of the Rover set of Comd Br Airborne Corps, were heard on the Div Comd net. Calls were exchanged but it was impossible to pass any useful traffic. It subsequently transpired that these were sets specially sent forward by 43 Div in an effort to contact us direct, and that they were using the incorrect call sign. As comm with 130 Bde was working very satisfactorily and the two sets were in danger of jamming our comd net, they were asked to close down.

The charging sets still in action were able to keep the remaining sets working. Things were very difficult at Div HQ throughout the day owing to heavy mortaring and the fact that entrances were covered by enemy snipers.

10. D + 8

The Phantom set closed down between 0200 hrs and 0530 hrs. The PR set was out of comm during the same period. Base set established comm in the early hours and remained working for the rest of the day although signals were weak. Other wireless links remained satisfactory throughout the day except for the usual difficulties of aerals being blown down at either end. Mortaring was heavy and linemen were kept busy repairing breaks. The links to 130 Bde and Ground FOOs worked very satisfactorily and arty sp was constantly being demanded. IMs were working hard in repairing sets. Only two Spare No.22 sets were now available.

At 1900 hrs the plan for the evacuation of 1 Airborne Div was given out to the men, the route memorised, and orders issued for the destruction of equipment and records. At 2145 hrs the final call for arty sp was put through and answered. At 2200 hrs the destruction of all equipment was completed except for the sets working to Base and 130 Bde. Wounded signallers who could not be evacuated volunteered to pass traffic on these two links after the departure of Div HQ and one message was received at 130 Bde at 0330 hrs the following morning; that is 5 hours after Div HQ had left.

By 2230 hrs Div HQ had been evacuated, OC Sigs being the last to leave.

1. Signal Security in the Airborne Division is difficult, as no establishment exists for a monitoring section. Much must be left to operators on sets, and close scrutiny on traffic by Signal Officers.
2. RT.

Generally speaking RT security was fairly good. Much time and practice had been put in before the operation and officers had reached a reasonably high standard. At times however, owing to the stress of circumstances some bad breaches of security were committed. One example was during a report by a Brigade to Division on a recent enemy attack on one of their units, it was stated that the attack had been beaten off but it was doubtful if another such attack could be held. This was presumably not Intercept as a similar attack did not occur.
3. AUTHENTICATION.

The usual authentication system was taken into the air and was used, but when units were contacted by our nets and their identity was not known the authentication system did not cover such a circumstance. There was no choice but to use some unauthorised method such as asking a known Officer at the other end some details of his personal history. This occurred on at least two occasions and worked satisfactorily, although it is by no means recommended to be adopted as standard.
4. SLIDEX CODE.

This worked satisfactorily both within the division and to higher formations. The latter had not however made a sufficient distribution of keys, with the result that some delay ensued until the ground unit spotted the fact that special Airborne keys were being used.
5. SIGNAL INFORMATION

As had been previously planned the minimum amount of signal information was taken into the air, this was limited to the frequencies on which Airborne Sets were required to work and the code signs of formations with which they were likely to come in contact with. When the appropriate links to higher formations failed, efforts were made to make contact by putting sets of the command nets of ground formations. This method was doomed to failure since a list of the frequencies and the call signs in use was not held by the Airborne Division. Furthermore, should such a contact have been made the passing of messages by Slidex code would have presented a problem since the keys appropriate to the ground formation were not held in the Airborne Division. It is vital that in all future operations this information is at the disposal of the Airborne formation and taken by them into the air. One example of the difficulties which were encountered was when Major Holbrook, OC No 2 Coy, who was with the ground formations, came up on the air from the Polish Parachute Brigade area on the SOUTH Bank of the river, and it was desired to order him to report to 130 Infantry Brigade. Since however the code sign of the latter was not known, he had to be ordered to go to a formation whose Sunray's name was " _____ "
6. COMPROMISE.

Owing to the confused fighting in the 1 Para Brigade area, it is not known whether the information contained in the self-destroying tubes was denied to the enemy; it was assumed that it had been. The Polish Parachute Brigade however, reported that their Slidex and Maplay keys had been lost and compromised. Reserve one keys were taken into effect at 0100 hours the following day and the change worked smoothly.
7. MAPLAY

As far as could be ascertained no instance exists of the employment of Maplay for disguising map references.

8. CIPHER

(a) As far as can be ascertained Double Transposition cipher was never used.

(b) One time letter cipher was used for messages between Polish Para Brigade and Airborne Division.

(c) One-time-pad cipher was used on all the links outside the Airborne Division. It proved a great success and was found quick and simple to operate. There were only two snags. The first was that a three leg pad would have proved invaluable to work to 30 Corps and Airborne Corps, since a large number of messages were for these two addresses. Since such a pad had been withdrawn just before the operation messages for these two had to be en-ciphered and sent twice. The second snag was that 30 Corps had not passed on one leg of the six way pad to 43 Div, and as a result no one-time link existed between that formation and the Airborne Div.

1. GENERAL.

Although the direct air support was provided by the RAF the communications were provided from American re-sources under arrangements made by 1st Allied Airborne Army. They consisted of two air support parties with 1 Airborne Div working on a net to the other two airborne divs and to Airborne Corps. Control was at Second Army. Each of these parties consisted of one Officer and 4 ORs, a "Veep" and a Jeep. A "Veep" is a Jeep fitted with an SCR-193 for ground-to-ground communication and a VHF transreceiver for ground-to-air communication. The SCR-193 set is crystal controlled, the required frequency being slightly different from the crystal frequency; two frequencies were provided.

2. Owing to last minute changes the air support parties were not briefed until the middle of the night prior to take-off. They were flown in with the first lift, Waco gliders being used. On arrival at ARNHEM it was found that neither set could be tuned to the lower of the two frequencies allotted. Every effort was made to establish contact on the higher of the two frequencies, but unfortunately without success, and as a result these air support parties were quite useless.

3. After D + 2 when the HQ area began to be more or less heavily mortared and shelled, it became necessary to dig in all working sets. The equipment in the Veep however could not be dismantled for the following reasons:-

- (a) It is extremely bulky.
- (b) It is wired into the vehicle.
- (c) It is necessary to use the vehicle engine when operating.

As a result of this both sets were soon riddled and put out of action.

4. This arrangement for air support communications is unsatisfactory since the personnel had never actually worked with the equipment they went with, nor had they worked with the other crews on the same net. In future it is strongly recommended that air support communications are provided from an existing air support signal unit, or alternatively that the crews are practised together before the operation. Smaller equipment is required, capable of being dismantled from vehicles and dug in in slit trenches.

5. GROUND TO AIR COMMUNICATIONS.

All arrangements for ground to air communications are made by OC Independent Parachute Coy direct with the RAF. These consist of ground to air recognition signals, coloured smoke and frequencies for Eureka's etc. After the initial phase it was found in practice that Signals were called upon to undertake this task, and it is strongly recommended that they should be made responsible from the planning stage onwards. In this connection a R Signals officer is already attached to the Independent Parachute Coy.

6. RE SUPPLY

It is thought that the Germans were endeavouring to confuse the signals which were being displayed during re-supply, owing to the very large number of aircraft which continually dropped supplies in the wrong place. This fact is borne out by conversations overheard by officers evading, and in future operations it is very desirable to change from day to day the ground to air signals and, if possible, frequencies for Eureka's. It is known that at least one Eureka was captured by the enemy.

1. GENERAL.

All the sets at HQ RA could not be flown in on the first lift, with the result that the normal RA layout was not possible until after the arrival of the 2nd lift.

2. In spite of some non-arrivals on the first day HQ RA was fully complete by the evening of D + 1. Communications worked well on D day and D + 1 except that great difficulty was experienced in keeping through to the OP with 1 Parachute Brigade in ARNHEM. Lines were laid on D + 1 from HQ RA to the Light Regiment and G Office. On arrival of the second lift a No 19 HP set was used for the control set.

3. As will be seen from the diary of events no contact with the ground formation was made until D + 4, when a No 19 HP set established contact with 64 Medium Regiment at a range of about eleven miles. Ranging was commenced immediately and a number of targets registered. A No 22 set was being used at the distant end and it was found that although communications worked well during the day, at night a step-up set was necessary; the latter was provided by using an FOO belonging to the regiment.

OC 1 FOU and three FOOs with one No 19 HP and three No 22 sets had been attached to RA 30 Corps, with the task of making early contact with RA 1 Airborne Div; a special frequency had been provided for this purpose. Communication to the No 19 HP set was not, however, established until D + 6, the range then being about 10 miles. Communications were then quickly organised and by the evening of that day one medium and three field regiment RA were all on call to 1 Airborne Div. For the remainder of the operation these communications worked satisfactorily and artillery support was extremely good.

4. It is clear from the experience gained in this operation that the No 22 set has not an adequate range nor is its receiver sufficiently selective for communication between the Airborne Division and FOOs coming up with the relieving ground forces. The No 19 HP set with its greater range and better receiver is more suitable, but even so a more powerful set is desirable.

5. Communications for the FOOs with Parachute and Air Landing Battalions is not satisfactory, it being found that the No 68R set is quite inadequate for this task. Ranges obtained in the very wooded country were far less than the specified ranges, and contact was soon lost between FOOs and FOO Controls at Brigade HQ. A FOO is quite useless without a means of communication and a more powerful set must be found. The SCR-694 may prove to be suitable.

1. GENERAL.

During the first two days when the battle was still mobile, a fair opinion could be formed as to the behaviour of equipment, and as a result of experience gained the following have come to light.

2. SCALES OF EQUIPMENT

(a) Air landing battalions.

Existing scales are adequate except for the following changes:-

Add - one Switchboard UC 10 line. This is required since existing scale only allows one, and in an airborne operation this should be duplicated. Furthermore during the static phase it was found that a large number of lines were laid and two switchboards are really required.

Delete - Three Wireless sets No 22 and one Wavemeter Class C. These were required for the Recce Platoon which is no longer allowed on WE.

(b) Parachute Battalion.

There is a definite requirement for line equipment on the same scale as an ordinary inf or air landing battalion. A para bn is required to undertake much the same tasks, and therefore requires the same scale of signal equipment. It is recommended however, owing to limitations in weight, that only half the amount of assault cable be added.

(c) Mortar Platoons

Telephones Head and Breast Sound Powered No 2 should be replaced by Telephone Sets L, the reason being that the former have really insufficient range, they are bulky and heavy, they are uncomfortable and they have no calling device. The telephone L has been chosen since it has magneto ringing and no adjustable parts.

3. PERFORMANCE OF EQUIPMENT.

(a) No.18 set.

This worked extremely well, and it was found that its range is perfectly adequate. There is a demand for the controls to be painted with luminescent paint, and Aerial bases No 10 should be mounted on top of the set. The existing aerial rods were found to be very fragile, but the last modification recommended will obviate this.

(b) No.38 set.

This set appears to have worked well, the only criticism being the old one of the junction box. Batteries appear to have required replenishment only every 48 hours.

(c) SCR-536

This appeared to have worked well, but its lack of robustness was criticised. It was noted that when units make reports of losses of major items of equipment and from which demands for resupply are prepared, in the case of this set the frequency required was never stated.

(d) Assault Cable.

This was generally liked, it appears however to be a little fragile and thicker insulation would improve it.

(e) Battery Supply.

No 2 batteries for No 18 and No 68 Sets proved a great success and in some cases appeared to have lasted up to 72 hours each.

4.

ME

Establishment if signal pls are inadequate. The same amount of signal equipment as in an ordinary inf is held and a similar ME is required. In the case of para bns who have only three coys a reduction of five signallers is permissible. More MC orderlies would have been a great advantage in both cases.

5.

TRAINING.

The trg of personel to work No 38 and SCR-536 sets appears to have been adequate.

6.

AERIALS.

No open wire aerials with No 18 sets were used during the operation.

No instances are reported of personnel carrying sets being deliberately sniped for that reason.

1. SCALE.

The scale of Pigeons throughout the Airborne Divisions is laid down in 1 Airborne Div Signals Operation Instruction No 3. Pigeons were provided from RAF sources, the lofts being situated in the London area.

2. The distance which pigeons had to fly was approximately 240 miles. They were distributed over the glider element to units and formation HQ, except for Para Battalions who dropped with them in the one bird cylinders. Since everyone was delivered to the correct LZ and DZ there was really very little scope for the use of pigeons. Some were released immediately on landing when it was evident they would not be required, some were obviously kept in their containers and subsequently released. A proportion of these were to be seen in the Div area right up to the evacuation, obviously having made no attempt to go home.

3. Of the 82 Pigeons taken on the operation 14 returned to their home loft; of these eleven carried no messages, the messages carried by the other three being delivered to Airborne Corps Rear.

4. A German Pigeon loft was situated in the grounds of PARK HOTEL HARTESTEIN, that is, at Div HQ. Although no experienced pigeon personnel had been taken on the operation, birds were distributed to Brigades but they were never used for communication purposes. By D + 3 the shelling and mortaring in the vicinity of the loft was so bad that the pigeons seldom used it. In the first two days a number of homing pigeons carrying German messages arrived at the loft and the messages were passed to I.

It is really doubtful whether pigeons are worth taking on future airborne operations similar to this.

1. COMPANY SET FOR INF.

The alternative sets are the No 38 and the SCR-536. It is understood that the latter set is no longer in production in America and the set to replace it has not yet appeared. In the circumstances therefore, there appears to be no alternative. The No 38 set is satisfactory. Furthermore a new model is shortly to be introduced with certain advantages over the old model.

2. BATTALION SET.

The alternatives are:-

Wireless set No 18
Wireless set No 46
Wireless set No 68R
Wireless set SCR-300.

The No 46 set was originally produced for combined operations. It has a nominal range of 5 to 8 miles, and is crystal controlled, each set having one common and two other crystal frequencies. In practice however it is found that the range of the set is much less. It cannot be guaranteed that the spot frequencies on which the set is to operate will in fact be workable and the lack of flexibility and difficulties in resupply consequent on having crystals makes this set unsuitable for airborne.

The No 68R although already in use in the Airborne Division would present a considerable problem in frequency allotment if used in infantry battalions. As it works in the lower end of the Army band (3.2 to 5 Mc/s) it is doubtful whether, when all division and enemy nets are working, sufficient channels could be found for the set. Furthermore the range of the set was found under the conditions of the operation only to be 1 to 2 miles and this is insufficient.

The No 18 set was satisfactory, and it is recommended that unless a better set of proved reliability and range is known to be available, no change is desirable.

The SCR-300 set is an American set similar to the No 18, but it has two distinct advantages. Firstly, it works in a much higher band (40 to 50 Mc/s) and secondly it is frequency modulated. The higher frequency, although making the set more liable to shadow effect, is much quieter and less adjustable under most conditions. The advantages of FM, particularly in a tropical climate, are enormous, the signal noise ratio being much better than with AM. As a long term policy it is recommended that this set might be adopted.

3. BRIGADE SET.

The alternatives are:-

Wireless set No 68P
Wireless set No 22
Wireless set SCR-694

At present the No 68P set is used, except in Air Landing Brigades where the No 22 set is used. It has been found however that the No 68P set has really insufficient range; in other respects it is perfectly satisfactory.

The No 22 set is really too heavy and bulky for parachute brigades.

The SCR-694 set, with its nominal range of 15 miles RT, appears to be the most suitable, it has still however to be given field trials in this formation.

4. DIVISIONAL COMMAND SET.

The alternatives are:-

Wireless set No 22
Wireless set No 19
Wireless set SCR-694
Wireless set No 62

The No 22 set has been used hitherto, crystal controlled sets having been provided. In practice however, it is found that the range of the set is not always sufficient, and the receiver owing to its lack of sensitivity frequently made communications most difficult, even though a fair signal was being received. This last drawback is considered serious.

The No 19 set is a most attractive proposition. Although it has a higher current consumption than the No 22 set it has better RT performance and a more selective receiver; it thus ensures communications being established when possibly a No 22 set would not get through. As a short term policy it is strongly recommended that it be adopted.

The SCR-694 is a possible set for this link, but as stated above it has not had a field trial in this unit. It is not known at present whether the set can be battery operated, and unless this can be done satisfactorily it is unsuitable.

The wireless set No 62 is a new set replacing the No 22. It is the same size as the No 22 set less its power unit and a little lighter. Its frequency band is wider (2 to 10 Mc/s) and it has both AM and FM facilities. This last makes it a most attractive proposition. Originally large quantities were promised for delivery this year, but it now transpires that only about 100 will be available. It is highly probable that a large proportion of these would be made available to Airborne Forces, but there is always a danger of having teething troubles when adopting a set just in production, and although the sets may be available very shortly it is strongly recommended that they are not adopted as the standard set in the division until they have proved themselves over a period of time.

5. DIVISIONAL REAR LINK SETS.

No 22 set has proved quite inadequate for this role; other possible sets are:-

Wireless set C52 or C9
Wireless set No 12 HP
Wireless set SCR-499
Wireless set No 53

The Wireless set No C9 is a Canadian version of the old No 9 set; its performance is extremely good, giving 25 miles RT and up to 100 miles WT, and it has proved itself most reliable during operations. It is larger than the No 19 HP, the complete station including charging equipment weighing 1,000 lbs, but it can be fitted conveniently into a trailer 10cwt.

The wireless set No C52 is a development from the C9; it is exactly the same size and current consumption, but with a better performance. This set is now in production and would be available for field trials immediately. Both these sets, although bulky compared with sets already in use in the Airborne Division, are quite capable of being sited in a slit trench.

The wireless set No 12 HP, although it undoubtedly has sufficient range, is not considered suitable since its current consumption is extremely large, it requires a power unit working the whole time, and it cannot be taken out from its vehicle and sited in a slit trench.

The same remarks apply to the Wireless set SCR-499 as to the No 12 HP.

Under this heading should be mentioned the No 76 set; this has always proved itself a fairly good set, but a receiver better than the R109 is definitely required. Should a suitable one not be found then it is worth while taking some R107s by air.

6. AIR SUPPORT.

The set in use in Air Support Signal Units is the wireless set No C9. This set has proved itself extremely good, and is reported never to have failed on WT. This set, or the C52 in due course, should be the standard set for air support tentacles with airborne.

7. RA COMMUNICATIONS

(a) Battalion FOOs.

The No 68R set proved itself quite inadequate and the only alternative appears to be the SCR-694. Field trials of this set will be carried out as quickly as possible.

(b) Light Regiment.

Within batteries and for the regimental command net the No 22 set is quite adequate and no change is contemplated.

(c) FOO Communications.

The No 22 set, for obvious reasons, is unsuitable and it is recommended that these be replaced by No 19 sets. The No 19 HP sets should be replaced by the C9 or C52. It is recommended that those sets from 1 FOU who will be accompanying the ground forces should be carried in trucks 15 cwt fitted for wireless. At least one set should be mounted in an armoured car or other armoured vehicle to enable it to press forward as a step up set with the ground formation when a soft skinned vehicle might not be able to get forward.