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A map too far? Arnhem 1944

Mike Nolan

Over the years, usually in September, there have been occasional items in the press regarding the battle at Arnhem including the absence of the bridge from the operational maps. One such, taken from the *Sunday Telegraph* of 24 September 1978 (right), is typical.

Sadly as the years have passed the veterans with an interest have diminished in numbers, as has the correspondence, and the matter has perhaps, until now, fallen out of sight. Having been interested in the subject since 1980, I therefore read Rob Wheeler's article¹ with interest.

In responding, the first thing to stress is that the absence of the bridge on the tactical 1:25,000 scale map of the town in September 1944 was probably not critical. The motorway alignment on the south bank pointed directly to the site of the bridge and up-to-date reconnaissance photographs of the bridge were available. Those taking part in the battle knew where the bridge was and, I suspect, the bridge was visible to many involved from some distance from the town, but in this last opinion I may be wrong.

The 1st Airborne Division Intelligence summary for 5 September 1944² gave the following information on potential river crossings at Arnhem, the bridge numbered 2541/5 at grid reference 747768 being the critical one:

- 2541/5 747768 – road bridge, 3 span steel bowstring, central span 410 feet, two spans each 150 feet, width of water 480, overall length 760, width of road 35. Air cover dated 11 December 1943 shows the smaller span damaged and repair work being carried out.
- 2541/5 738774 – road bridge military, pontoon bridge, 490, 600, air cover dated 11 December 1943
- 2541/5 707764 – Oosterbeek railway bridge
- 2541/5 688768 – vehicle ferry
- 2541/5 665757 – Doorwerth passenger ferry

The 1 Para Brigade operation order No. 1³ quotes the maps in use as:

- 1:25,000 GSGS 4427, Gimbel 388, Ede 387, Renen 5NE, Arnhem 6NW
- 1:100,000 GSGS 2541 sheets 2 and 5
- GSGS 4416 sheet P.1

MOST MILITARY tacticians would agree that in order to take a position, a map showing where it is does come in handy. But historian and former Reconnaissance Corps sergeant John Fairley has come out with the surprising revelation that the famous Arnhem Bridge—the “bridge too far” in Lt-Gen F. A. M. “Boy” Browning’s memorable phrase — never appeared on the Airborne forces’ maps at all.

¹ Rob Wheeler, ‘Arnhem 1944 – were the maps good enough?’, *Sheetlines* 87, 11.

² TNA PRO WO 171/392 or 393.

³ TNA PRO WO 171/393.

Questions on military survey in World War II are often resolved by consulting *Maps and Survey* by Brigadier Clough, the HMSO monograph on military survey in WWII and *Notes on the GSGS maps* of various theatres, all of which are now available as scanned documents on the Defence Surveyors' Association website at www.defencesurveyors.org.uk.

The context of the pre-1944 mapping of the Arnhem area is perhaps worth considering. From 1942 to 1944 the UK was heavily committed to the production of maps of Europe, in particular the *ab-initio* compilation of 1:25,000 scale maps of Normandy for Operation Overlord from aerial photographs, the so called *Benson* project.

It was only in May 1942 that the Loper-Hotine agreement was reached, whereby the United States undertook the mapping of North and South America, Australia, New Zealand, the Pacific, Dutch East Indies, Japan, West Indies, Iceland, Greenland and Bermuda. The United Kingdom undertook to provide reproduction material as required from its library resources.

In March 1943, a revised division of responsibility between UK and US was agreed. For the European theatre of operations the US accepted a commitment to produce 1:100,000 maps of Germany, maps of the Iberian peninsula, and all series of Spanish and French Morocco and Algeria. It also accepted responsibility for a newly drawn and revised 1:25,000 series of the Netherlands and a block of 1:100,000 sheets in southern France. This was, of course, in addition to its responsibility for mapping of the Pacific islands, the Netherlands East Indies, the Philippines, Formosa, Korea and Japan.

Doubtless priorities for map production of various areas were decided upon. Rob Wheeler suggests that the advance to the Rhine and Ruhr pursued by Montgomery initially may not have been the highest priority for the American field commanders. I know of no evidence that Gelderland remained an area of low priority for map production by the Army Map Service (AMS) in the US. It appears that AMS had completed the production of the 1:25,000 scale series between March 1943 and September 1944 amongst its other commitments.

The fact remains that the few tactical scale sheets at 1:250,000, 1:100,000, 1:50,000 or 1:25,000 scale of the Arnhem area were but a very few of the literally thousands of sheets compiled in haste by UK and US between 1942 and 1944, often with wartime recruited and hastily trained cartographers. Furthermore, before the war, the US probably had little interest in the possibility of widespread production of maps of Europe and was initially heavily dependent upon the provision of suitable source material from the GSGS library holdings and survey standard vertical aerial photography as it was acquired throughout the war by reconnaissance by 1 Air Survey Liaison Section R.E.

A factor that must be taken into account is the pace of events. *Maps and Survey*, quoted by Rob Wheeler, also devotes a section to the mapping-up of the First Allied Airborne Army (FAAA) from 15 August 1944 to 20 May 1945, a section probably based on the document in The National Archives, at WO

402/365. Briefly this makes the point that the FAAA, which had formed up on 15 August 1944 immediately planned for an assault crossing of the River Seine. On 19 August 1944 those plans were cancelled and a new plan was made to cut off the Pas de Calais and capture the V weapon launch sites, the Tedder plan. On 24 August full scale preparations were being made for Operation Boxer only to be cancelled the next day in favour of Operation Linnet to capture the Lille-Arras-Douai area. On 3 September Operation Linnet was cancelled and Operation Comet appeared, to capture bridges in south-east Holland on 7 September. On 10 September Operation Infatuate for the capture of Walcheren Island was initiated and on the same day Operation Comet was replaced by Operation Market with a target date of 14 September. On 12 September D-Day for Operation Market was fixed for 17 September and all troops were mapped-up by the 15 September.

For all these operations FAAA was mapped-up from a map depot in Newbury and one can imagine the hectic work that took place. Meanwhile 30 Corps, the key formation, and other units on the mainland of Europe, were being supplied with maps by Field Survey Depots that had crossed the Channel in June 1944. In but 104 days the British and Canadians had advanced from Normandy to the Meuse-Escaut Canal just south of Eindhoven where they were poised for the final advance to the Rhine at Arnhem as part of Operation Market Garden. The DAD Survey of FAAA and the map depot staff in support of the operation were probably fully engaged in just providing the stocks of current editions to the units involved. I suspect that it is doubtful that he would have even considered asking the GSGS, through whatever channels were in place, for a last-minute update of the mapping, any more than he would have sought updates of the mapping for all the previous cancelled operations.

In view of the timetable of events above, it is just not conceivable that FAAA could have been provided with a last-minute revision overprint of maps of Arnhem, and even more unlikely that 30 Corps could have been similarly mapped-up with the same maps even had they been revised in UK. In other words, as is so often the case, the army just had to make do with the current operational edition, whatever its faults.

Rob Wheeler poses the question, 'how did the view that a good road map is essential fall out of sight?' In the context of 1944 operations, the 1892 quote by Farquharson, for a need 'to enable a General to move his troops to desired points' would have been met by 1:250,000 or 1:100,000 scale topographic maps, although special road maps were also produced. How errors in the depiction of roads on tactical topographic map occurred is pertinent. However, in view of the overall production programme hinted at above and the short time-frame involved, errors of omission on a few sheets, with no immediate tactical significance when they were compiled, might be forgiven. In the mobile operations that characterised the preceding campaigns in the Western Desert and North Africa, and even in the breakout from Normandy across France in which tracked vehicles and some four-wheel drive vehicles were used, the

omission of a particular stretch of road might be of little account. Unfortunately, in the autumn approach to Arnhem across the flat and often impassable terrain of the Netherlands, the difficulty of off-road movement made the availability of good roads and information on them paramount.

Looking at the available map series by increasing scale:

1:500,000 - GSGS 4072 and GSGS 4369

The aeronautical chart series at 1:500,000 scale meeting most needs for operational cover over continental Europe was series GSGS 4072. Series GSGS 4369 is not included in the list of operational maps or air maps. It is, however, shown on the combined index for series GSGS 4072 and GSGS 4369. Neither of these series is relevant to the operation.

1:250,000 - GSGS 4042 - NW Europe Army/Air

This, and other 1:250,000 scale series of north-west Europe are described in *Notes on GSGS maps of France Belgium & Holland*, December 1943 as being roughly equivalent to the quarter-inch maps of Great Britain. They were produced in Army/Air style with the aim of showing the maximum military information possible for the scale but with a clarity suitable for flying conditions.

Rob Wheeler does not mention this scale at all, but this is probably the series which met the need for a general road map, or rather, a general topographic map showing road communications, and Sheets 2 and 5 of this series are quoted in 1 Para Brigade operation order No. 1.

1:100,000 - GSGS 2541 Holland

This sheet was published in September 1944 and it is assumed that it was available for Operation Market Garden. Rob Wheeler quotes 'Partially revised from Dutch maps of 1936-39. Communications revised from GSGS 4183 and 2185 and Autokaart Van Nederland, Intelligence Reports to 1942'. There are evidently three different printings of this edition, each with different compilation notes.

Rob Wheeler also states 'That their intelligence reports did not include the dropping of the Rhine and Waal bridges is a little more surprising'. As he states that the railway bridge had its central span destroyed by the Germans in September 1944, it is not surprising that the sheet published in September 1944 compiled from earlier material does not take note of that fact. It would appear that a total of 65,000 copies of the three different printings of edition 3 were produced in UK in September, with a further unspecified print run by an unspecified map reproduction section, possibly on the continent.

1:100,000 – Series GSGS 4416, Series AMS M651 & M671

GSGS 4416 was a 1:100,000 series that was published in three versions, a topographic (M671), a trafficability (unknown) and an air version (M651). The existence of a trafficability version indicates that there was an awareness of terrain problems and the need for road information.

Sheet P.1 is quoted in 1 Para Brigade operation order No. 1. Unfortunately, I

have not yet found any examples of the trafficability version but it seems to have been adapted later by 21 Army Group as series 21 AG 39. On this series, based on official Dutch sources, a detailed roads legend is included as prepared by Branch of Research and Analysis, OSS 14 November 1944. It is possible that either GSGS 4416 or 21 AG 39 will show the state of the approach road and routes over the Rhine at Arnhem if copies can be found.

1:50,000 – Series GSGS 4083

This series is not relevant. Rob Wheeler is correct in saying that this was considered too cluttered for issue to troops.

1:25,000 – Series GSGS 4427

The town of Arnhem falls in the north-east corner of Sheet 6NW, a sheet at the eastern extremity of the cover. East of this sheet cover is in series GSGS 4414 Germany 1:25,000. The edition presumed to have been used on the operation is the completely redrawn January 1944 First Edition compiled in Washington ‘.. partly revised from 1940, 1941, 1942 and 1943 aerial photography’. This edition shows the southern approach road from Elden to about 600 metres from the south bank, but not the bridge.

Sheets Gimbel 388, Ede 387, Renen 5NE, Arnhem 6NW are quoted in 1 Para Brigade operation order No. 1.

1:7000 – Series GSGS 4458

Finally, of course, a town plan series had been produced in series GSGS 4458. The Arnhem sheet at 1:7000 scale is not included in the list of sheets available in *Notes on GSGS maps of France Belgium & Holland*, December 1943, and there is no general series description, presumably due to the variety of sources used for the series and the presumed variety of styles. However readers were advised that other sheets were imminent, and the Arnhem sheet was one of these, 5000 copies being printed in May 1944. It is not known if this map was used during the operation. It should have been invaluable for the fighting that took place in the built-up area. The key to important buildings, numbered 1 to 103, includes 68 Rijn Bridge and 90 Pontoon Bridge. The railway bridge is not shown, being to the west of the cover of this town plan.

1:12,500 – Series CA 20

Rob Wheeler asks, what about maps of Arnhem in November 1944 after it had been the front line for two months? In response to this question *Maps and Survey* throws further light upon remedial action taken after Operation Market: ‘When enemy resistance stiffened in Holland, Canadian survey units were again occupied with 1:25,000 printing. The new series covering western Holland (GSGS 4427) which had been produced in eight colours was not suitable for economical printing in the field and, though it was a well drawn and extremely clear map, it contained many errors due to faulty interpretation. The Canadians, who were operationally concerned with this part of Holland, therefore revised a number of sheets, and in the process they reduced the number of printings

from eight to four'.⁴ This probably refers to the Canadian 1:12,500 series CA 20.

In addition to the base production of standard series maps in US and UK already described above, the British and Canadian Field Survey companies and Map Reproduction sections supported the advance of the British and Canadian units in their drive from Normandy to the Rhine. The British units were limited to producing new mapping from aerial photography by graphical radial line techniques, with heighting and contouring by stereoscope and parallax bar methods, in essence, Hotine's Arundel Method. However, the Canadian Field Survey companies were already in 1944 equipped with, and proficient in the use, of the Multiplex aerial photo stereo-plotter which prior to D-Day had been used to some effect to produce special beach maps of the Normandy coast and very large scale detailed contoured plans of potential airfield sites in the anticipated Normandy bridgehead area. When the advance on the Rhine stalled, it was the Canadian units who produced up-to-date large scale mapping of the Rhine obstacle.

'The 1:12,500 River Rhine series was another new large scale compilation from air-photos. First of all there were 12 sheets in the Arnhem-Zutphen area, and these were followed by several others covering the R. Rhine from Arnhem to Duisburg. Part of this was done to assist Second Army in their preparations for the Rhine crossing.'⁵ There are about 22 sheets in the collection. Some sheets follow the sinuous river line at various orientations and are simply numbered, e.g. 1 to 11. Other, standard, north-oriented sheets, have standard alpha-numeric sheet numbering e.g. 5NE/2, 6NW/1, 6NW/2, 6NW/3. Some have Defence Overprints, some do not.

Aerial photography

Rob Wheeler asks if the aerial photography used for the map compilation was taken when the area was flooded and if those using them were confused in their interpretation of detail. Perhaps the answer lies in photography hopefully archived at TARA (The aerial reconnaissance archive). What is certain is that the air photo coverage diagram for Holland in *Notes on GSGS maps of France Belgium & Holland*, December 1943 shows complete cover of the Arnhem area had been obtained by that date and it must be assumed that the accepted cover was to survey standards showing the topography in a normal state without floods.

⁴ *Maps and Survey*, 406-407.

⁵ *Maps and Survey*, 407.



However, perhaps as a postscript to the foregoing notes, a vertical reconnaissance photograph taken on 18 September 1944 with a 24-inch focal length camera from 19,000 feet with a resulting nominal scale of 1:9500, clearly shows the bridge and its southern approaches and, I suspect, the 'brewed-up' column of German vehicles at the north end of the bridge. It also shows the pontoon bridge further to the west with the centre section moored against the northern section on the north bank of the river (arrowed above) possibly within reach of the troops trying to reach the bridge to the east. The title strip on this photo indicates that it was taken by a Lightning aircraft of the 27th Squadron of the United States 7th photo recce group.

[photograph from Focus on Arnhem, Photographic reconnaissance and Operation Market Garden by J Taylor. Jimmy Taylor is a Spitfire pilot who flew over Arnhem]

Rob Wheeler adds:

The 1:100,000 sheet I referred to was brought as a photocopy by Francis Herbert to CCS meeting at Edinburgh in September 2009. It had print code 50,000/1/44.Wa and appeared to both of us to have been used in the operation. If so, then the September 1944 printings of GSGS 2541, which have different compilation notes, were not the version (or at least not the only version) used in the operation.

I had made three criticisms of the maps:

1. There was disagreement between the maps available to 30 Corps during the operation on the state of the Arnhem-Nijmegen motorway.
2. Depiction of bridges on the November 1944 printing of GSGS 4427 was erroneous.
3. The redrawing of GSGS 4427 had made the map more difficult to interpret.

I had not criticised the depiction of the Arnhem bridges at the time of the operation, because I was uncertain which edition of GSGS 4427 was in use, nor did I know how recent photographic coverage might be.

With regard to the first criticism, I was aware of the numerous cancelled operations that preceded Operation Market Garden. I had not supposed that special revision might be possible and I was aware that this was not an area where imminent operations were expected; that is what I meant when I suggested that the Gelderland ought not to have been accorded a high priority. I agree that there were extenuating circumstances. I still think it is possible that this deficiency may have contributed to the unfortunate decision of 30 Corps not to push forward from Nijmegen on the afternoon of 20 September. I have not seen the 30 Corps operation order but I note that the 1 Para Brigade operation order that Mike quotes refers to GSGS 2541 and 4427, which is why the exact printing of GSGS 2541 in use may be important.

With regard to the second criticism, the Rhine at Arnhem had now been the front line for two months. I still find it curious that well-known facts about the state of the bridges at the end of September were not incorporated in a field reprint made in November.

With regard to the third, I must confess to being highly irritated by the self-congratulatory tone of *Maps and Survey* regarding this 'well-drawn and extremely clear map'. I would value Mike's views on how the depiction of the old main road running SW from the old pontoon bridge at Praets should be interpreted (figure 2 of my original article).

Mike's information is immensely helpful in drawing attention to a range of highly relevant sources. One which struck me particularly was the 5 September 1944 intelligence summary, based on photographic coverage of 11 December 1943. Those photographs showed repair work under way on one span of the road bridge. We now know that this work continued for eight months; only in August 1944 was the bridge opened to traffic. Did those responsible for planning this operation know that the bridge was passable or were they just assuming that whatever repair work was in progress could not be too serious? Of course, the USAF air photo of 18 September 1944 would have provided confirmation that the bridge was open, but by then the operation was already under way.