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The Bomber's Baedeker – Target Book for Strategic Bombing in the Economic Warfare against German Towns 1943-45

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ABSTRACT: In 1943, the British Ministry of Economic Warfare (MEW) issued the "Bomber's Baedeker. A Guide to the Economic Importance of German Towns and Cities", followed by a second extended edition in 1944. Both editions have now been analysed completely for the first time. Based on information taken from the second edition, the analysis on the macro-level allows statements about the spatial distribution of the most important war-economic targets of the German Reich within the borders of 1937, as seen from the British point of view, just as about the distribution of target priorities within the town hierarchy, classified by population size, and on the micro-level about the information density provided for any single town. The final picture to emerge of the destruction of German towns at the end of the war reveals that quite a number were bombed which the MEW had not recommended for attack. This was due to the economically orientated target selection of the MEW being eclipsed and intermingled with the aims of those who promised to decide the war by demoralising the German population through general 'dehousing' as well as by bombardments in support of ground forces advancing into the German hinterland at the end of the war.

Introduction

At the same time as German town planners were already working out and discussing rebuilding plans for German towns, British experts were compiling lists with the names of those German towns to be bombed with priority. Consideration was also given as to how these towns could be comprehensively destroyed by a strategic choice of target points and by composing the bomb load according to each town's building structure. A major selection criterion favoured by Arthur T. Harris, Chief of the Bomber Command of the Royal Air Force (RAF) from 23 February 1942 until the end of the war, was a town population of at least 100,000. There were two reasons for this: first, numerous technical difficulties weakened the efficiency of precision attacks and, second, since 1942 the British bombing policy no longer focused primarily on the destruction of targets important for the war economy, but aimed at demoralising the German civilian population by means of 'dehousing' and the obliteration of German cities by area bombing. However, simply working through the list of German towns as had been intended by Harris was not generally approved of. Especially the Ministry of Economic Warfare (MEW) was in favour of selecting target towns according to their importance for the German war effort. In order to facilitate such a choice of towns and cities on the basis of rational, fundamental positions, in 1943 – at a time when area bombing had already been the official British air war strategy for one year – the MEW issued the Bomber's Baedeker: an extensive collection of German towns of more than 15,000 inhabitants, evaluated according to the war-economic significance of their industries, infrastructure and traffic. In the 1944 second edition of the Bomber's Baedeker the number of towns had risen considerably from 392 to 518. Even municipalities with fewer than 1,000 inhabitants had been included, provided that they housed industries of war-economic significance.

Whereas the MEW strategy consisted of *selective* area bombing of important military and industrial cities, Harris was obsessed by the idea of demoralising the civilian population by *indiscriminate* area bombing of major cities and later also medium-sized towns. For this reason, the air war was characterised by an almost endlessly occurring controversy on target choice between MEW experts and the Air Ministry, responsible for the Bomber Command. In Harris' opinion, the MEW overestimated the importance of industrial targets. When in November 1944 Charles Portal, Chief of the Air Staff, for instance, ordered attacks based on intelligence findings on oil and fuel targets instead of the general area bombing, Harris responded in a letter:

"... in the past MEW experts have never failed to overstate their case on 'panacea', eg ball bearings, molybdenum, locomotives, etc., in so far as, after the battle has been joined and the original targets attacked, more and more sources of supply or other factors unpredicted by MEW have become revealed. The oil plan has already displayed similar symptoms".

(Harris to Portal, 12. 12. 1994; Webster et al. 1961, Vol. III, p. 85). And in a second letter to Portal on 28 December 1944 Harris summarized his opinion about the MEW in the one sentence

"I repeat that I have no faith in anything that MEW says."

(Webster et al. 1961, Vol. III, p. 86f).

Even though freely available in London's Public Record Office since 1969, neither Vol. III of the 1943 first Bomber's Baedeker edition comprising a target list of 264 pages, nor the superceding 1944 second edition covering 809 pages have yet been subjected to comprehensive analysis. Only few interested municipal archives and local historians referred to targets named in the Bomber's Baedeker in their publications on the bombing of their towns, eg the Stadtarchiv Darmstadt (Municipal Archives), Meyer-Hartmann for Hildesheim and Dettmar for Kassel. On a regional level, only Vogt et al. analysed the first edition of the Bomber's Baedeker for the Lower Rhine region from Dinslaken to Düsseldorf and compiled a map showing factories and traffic junctions of the highest destruction priority. Both editions of the Bomber's Baedeker have now been analysed completely. On the macro level this complete analysis now allows first-time statements about the spatial distribution of the most important war-economic targets of the German Reich within the borders of 1937 (Fig 1, based on information from the second 1944 edition) as seen from the British point of view and about the distribution of the 5 categories of target priorities within the town hierarchy defined according to differences in population size. On the micro level the city of Kassel provides an example for the information density of the Bomber's Baedeker, how this information was used for planning attacks and how these attacks were optimised still further by using information about the inner structure of a city (Fig 4). The final picture to emerge of the destruction of German towns at the end of the war reveals that quite a number were bombed which the MEW had not recommended for attack (Fig 2 and 3), because the economically-orientated target choice of the MEW intermingled with other war-strategic motives as well as bombardments to support ground forces advancing at the end of the war.

The Ministry of Economic Warfare and the Bomber's Baedeker

Background to the Creation of the Bomber's Baedeker

Planning a successful and effective strategic bombing offensive against the German hinterland depended on thorough information about German war potential and the selection of suitable targets. The Ministry of Economic Warfare (MEW) was established in September 1939 with the aim of disrupting the enemy's economy and preventing it from continuing the war. Among all agencies supplying economic, industrial and technical information about potential targets, the MEW took pride of place (Webster et al. 1961, Vol. III, p. 302). It was divided into the General Branch and the Enemy Branch. In 1942 the latter developed into a pure intelligence organisation and in April 1944 was transferred to the Foreign Office, where it became the Economic Advisory Branch (PRO, MEW 715.1.1).

The Objectives Department - organised in 1942, directed by O. L. Lawrence and commanded by the Enemy Branch – had the function of providing advice on bombing targets for the strategic offensive against the enemy and occupied territories. It therefore communicated closely with the Air Intelligence and Bomber Operations Directorates of the Air Ministry (Webster et al. 1961, Vol. I, p. 264, 458). Target information was administered extremely carefully. The department prepared and maintained files. Already in 1940 the MEW had begun to issue Industrial Target Reports, later called Industrial Damage Reports, a fortnightly series of surveys of the damage and the probable effects. Decisive progress had been made in November 1940 with the start of photographic reconnaissance. From now on, aerial photographs yielded more detailed information resulting in improved target maps. The results of photographic reconnaissance, which, along with signals intelligence, developed into the most valuable source of intelligence during the war, were used inter alia by the MEW to improve target maps and to estimate the economic effects of the damage done. Rather soon the problem arose that the information sent from the MEW to the Bomber Command became so vast and rapidly obsolete that simplification was necessary. In November 1941 it was calculated that 2,400 targets were included in the German target books at the Bomber Commands stations and that dossiers and maps existed for 1,500 of them.

These circumstances as well as the request of the Air Ministry in 1942 to discover

"what specific industries were the best targets as well as what towns should be the primary objects of area bombing" (Webster et al. 1961, Vol. I., p. 460)

were the reasons for producing the target books, known as The Bomber's Baedeker (Webster et al. 1961, Vol. I, p. 266 f.). Even though neither of the volumes gives any hint as to why their name should have been taken from the famous German tourist guide, it can be suspected that this was in reply to the macabre term "Baedeker raids", chosen by the Germans for a series of attacks ordered by Hitler in April and May 1942 on towns like Exeter, Canterbury, Bath, York and Norwich, which were

"chosen because they were weakly defended but also because they were historic and cultural centres whose destruction was expected to hurt Britons' pride and make them regret what bombers were doing to German cities." (Hewitt 1983, p. 281).

However, the Bomber's Baedeker by no means served the purpose of selecting towns of cultural and historic importance, but was rather, as the subtitle states,

"a guide to the economic importance of German towns and cities".

The First and Second Editions of the Bomber's Baedeker: Objectives and Contents

The first edition – consisting of three parts – was issued by the Enemy Branch of the MEW on 2 January 1943 as a target guide for area bombing as well as for precision attacks. Its preface explained that the economic effects of bombings could be divided into direct and indirect ones. The direct effects were subdivided into the destruction of and damage to a) buildings and homes and b) factories and commercial properties, the interruption of utility services and communication. The loss of working time due to the general dislocation of economic life (a) and the expenditure of manpower and materials in rebuilding (b) were regarded as indirect effects. One of the main objectives was to identify towns where maximum effect on war production could be obtained by the destruction of factories, communication and public utilities. In addition, the Bomber's Baedeker provided information on specific industries, indicating their importance for the German war economy, their vulnerability and repair facilities (Webster et al. 1961, Vol. I, p. 469). Furthermore, the towns were classified by rating each according to its economic importance, called the 'key point ratio' (KPR), and for its economic importance in relation to its size, named the 'key point factor' (KPF). The third part of this first edition had the subtitle "Survey of Economic Keypoints in German Towns and Cities. (Population 15,000 and over.)" and included 392 towns. Details about latitude and longitude, the flying distance, the population and the provision of general information about the town were followed by the naming of targets which were regarded to be of importance for the German war economy. Each target was assigned to one of 14 industry branches and received a priority rating according to its importance, during which the definition of the three main categories used was as follows:

1. factories of leading importance in the German war effort,
2. minor plants in major industries and
3. factories of minor importance (Webster et al. 1961, Vol. I, p. 470).

In addition, category 1 plants were awarded a '+' if of particularly great importance.

In April 1944 the Enemy Branch of the MEW was transferred to the Foreign Office, where it became the Economic Advisory Branch (PRO, MEW 715.1.1). This is the reason why on the front page of the second edition the entry does not read "Ministry of Economic Warfare, Enemy Branch" as had been the case in the first edition, but "Enemy Branch (Foreign Office & Ministry of Economic Warfare)". This second edition was a revised and amplified version of part III of the Bomber's Baedeker issued in January 1943, which it replaced. Although the preface was written in May 1944, in a note of the Air Ministry dated 10 August 1944, in which the addressee is missing, it says: "We are enclosing herewith two copies . . . of a revised edition of Part III to the Bomber's Baedeker, which has *just* been issued by the Enemy Branch of The Ministry of Economic Warfare." (PRO, AIR 14-2662-XP 0305, italics by author). The new edition had been extended in size "to cover all towns in Germany (regardless of size) which are of any industrial significance, and it has been possible to expand the number of industrial establishments listed in each town." (PRO, AIR 14-2662-XP 0305, preface, i).

The proportions of the guide made two volumes necessary. The first covered the towns Aachen to Küstrin, the second the towns from Lahr to Zwickau, all in alphabetical order. Altogether 518 towns and municipalities were included plus the additional rural targets of Kachlet (dam and power station), Lechfeld (airfield), Walchensee (hydroscheme) and Wenzendorf (airfield). 463 towns and municipalities name single target points, while – contrary to the Bomber's Baedeker's intention – 55 municipalities were listed even though they lacked a target of any war-economic importance or even anything close to one.

Like in the first edition, the enterprises were assigned to 14 industrial groups. The headings were as follows:

1. Transportation
2. Public Utility Services
3. Solid Fuels
4. Liquid Fuels & Substitutes
5. Iron, Steel & Ferro-Alloys
6. Non-Ferrous Metal Smelting, Refining & Manufacture
7. Aircraft & Aero-engines
8. Shipbuilding
9. Other Engineering and Armament Industries
10. Chemicals & Explosives
11. Textiles, Rayon, Pulp & Paper
12. Rubber & Tyres
13. Leather
14. Food industries

In contrast to the first edition, the allocation of priority numbers to enterprises was more differentiated, featuring five separately defined priority ratings:

1 + Factories of outstanding importance to the German war effort

1 Major plants in major industries

2 Minor plants in major industries or major plants in minor industries

3 Factories of relatively small importance to the German war effort

- Factories of almost certainly little importance to the German war effort and establishments, concerning which the available information is not sufficient to enable any priority rating.

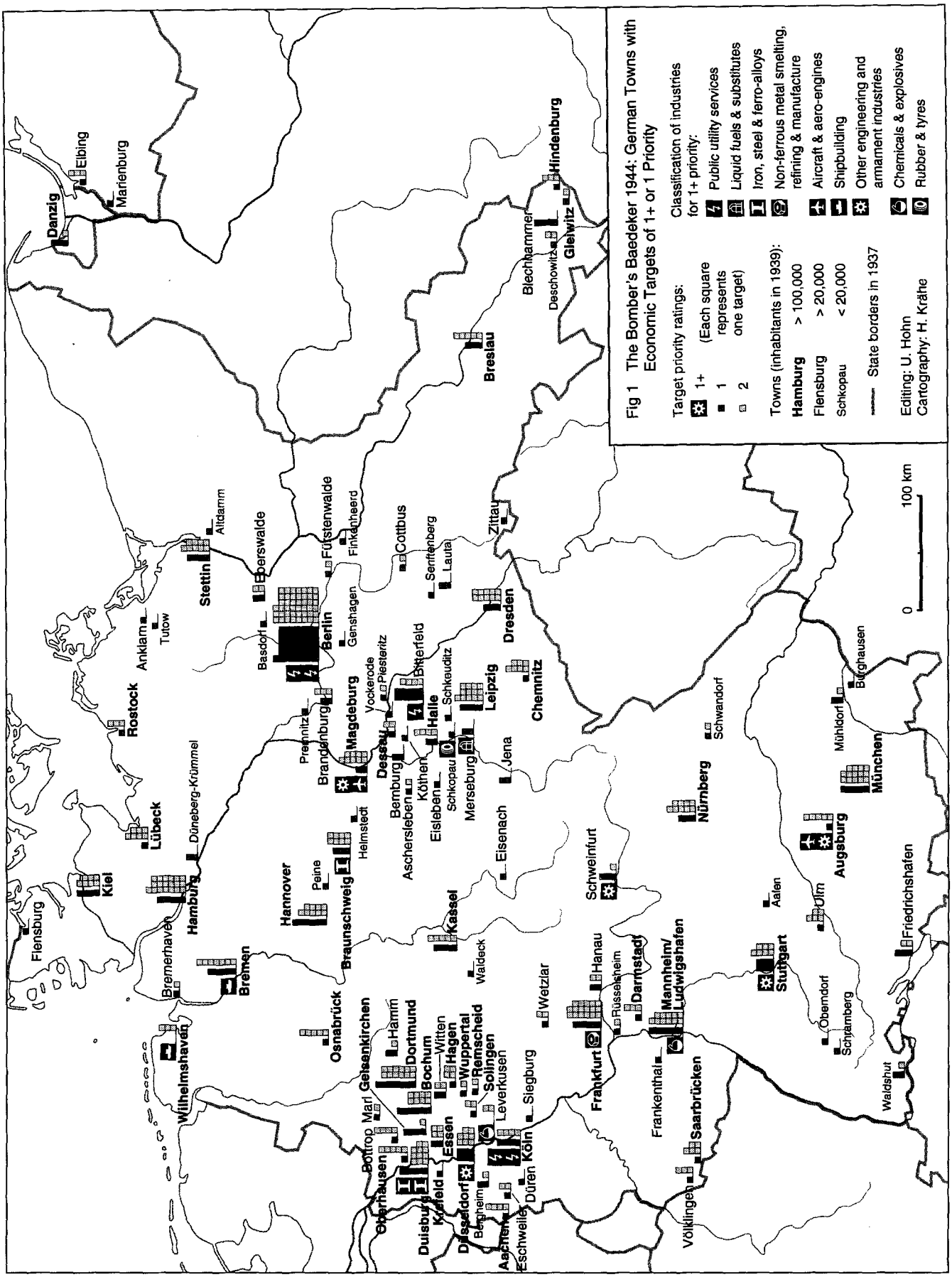
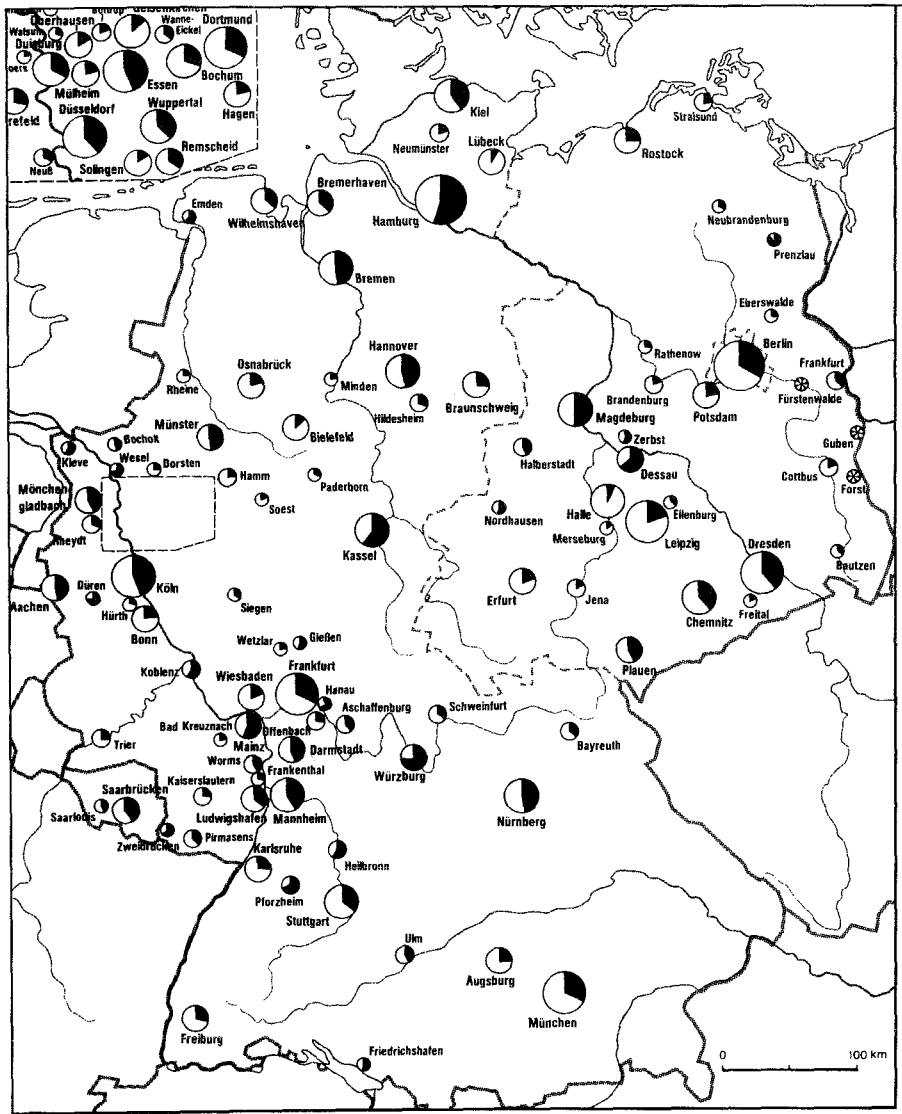


Fig 1 The Bomber's Baedeker 1944: German Towns with Economic Targets of 1+ or 1 Priority
Target priority ratings:
1+ (Each square represents one target)
1
2
Classification of industries for 1+ priority:
Public utility services
Liquid fuels & substitutes
Iron, steel & ferro-alloys
Non-ferrous metal smelting, refining & manufacture
Aircraft & aero-engines
Shipbuilding
Other engineering and armament industries
Chemicals & explosives
Rubber & tyres
Towns (inhabitants in 1939):
Hamburg > 100,000
Flensburg > 20,000
Schkopau < 20,000
State borders in 1937
Editing: U. Hohn
Cartography: H. Krähe
0
100 km
Danzig
Elbing
Marienburg
Hindenburg
Blechhammer
Deschowitz
Gleiwitz
Breslau
Zittau
Dresden
Chemnitz
Leipzig
Halle
Schkeuditz
Bitterfeld
Dessau
Magdeburg
Vockerode
Piesteritz
Berlin
Basdorf
Genshagen
Finkenheerd
Fürstenwalde
Eberswalde
Cottbus
Senftenberg
Lauta
Stettin
Altdamm
Anklam
Tutow
Rostock
Lübeck
Düneberg-Krümmel
Kiel
Flensburg
Hamburg
Bremerhaven
Bremen
Wilhelmshaven
Hannover
Peine
Braunschweig
Helmstedt
Premnitz
Brandenburg
Bernburg
Köthen
Aschersleben
Eisleben
Schkopau
Merseburg
Jena
Eisenach
Kassel
Waldeck
Osnabrück
Gelsenkirchen
Hamm
Dortmund
Witten
Hagen
Bochum
Wuppertal
Remscheid
Solingen
Leverkusen
Marl
Bottrop
Essen
Oberhausen
Duisburg
Krefeld
Düsseldorf
Bergheim
Aachen
Eschweiler
Düren
Köln
Siegburg
Wetzlar
Frankfurt
Hanau
Rüsselsheim
Darmstadt
Mannheim/Ludwigshafen
Schweinfurt
Frankenthal
Saarbrücken
Völklingen
Nürnberg
Schwandorf
Stuttgart
Aalen
Ulm
Oberndorf
Schramberg
Waldshut
Friedrichshafen
Augsburg
München
Mühldorf
Burghausen



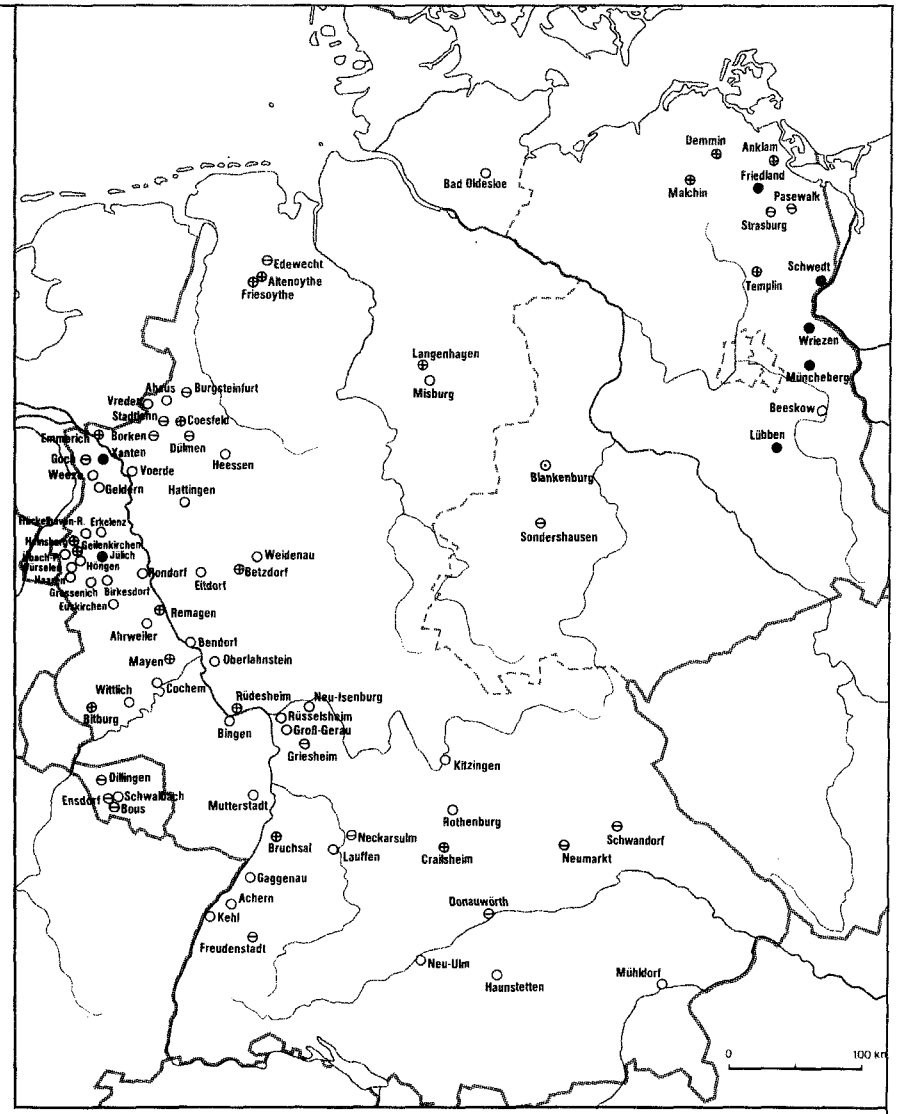


Fig 2 Destruction of German Large- and Medium-sized Towns in 1945

Rate of total destruction of homes:
(for definition see text)

- Cities over 100,000 inh.
- Towns over 20,000 inh. and rate of destruction > 20 %
- Rate of destruction > 20 %, but no exact value

Inhabitants (1939):

> 1,000,000
> 500,000
> 200,000
> 100,000
> 50,000
> 20,000

— State borders in 1945
- - - Boundary between East and West Germany

Editing: Uta Hohn
Source: own research 1988
Cartography: W. Gebhardt / H. Krähe

Fig 3 Destruction of German Small Towns in 1945
(1939 size: 5,000 – 20,000 inhabitants)

Rate of total destruction of homes:
(for definition see text)

- ● > 80 %
- ⊕ 60 – 80 %
- ⊖ 40 – 60 %
- ○ 20 – 40 %
- ⊙ > 20 %, but no exact value

The description of activities and priority ratings was "intended only as a general guide to the size and relative importance of the individual undertakings." (PRO, AIR 14-2662-XP 0305, preface, i).

In the course of allotting priorities, already existing damages were only taken into account if these damages had had a lasting impact on the productivity of a plant; if this had not been the case, allotting took place on the basis of full productivity. "The priority rating of a factory in the Bomber's Baedeker consequently does not necessarily reflect its current importance and should not be used for the purpose of appreciations without reference to its current damage status." (underlined, ibid., preface ii) The second edition contained two supplementary maps showing a) all towns covered by this edition and b) the division of the industrial area of the Ruhr into 14 districts. Prior to an attack, targets critical for the German war effort were entered on the pilots' target maps (Die Zerstörung Darmstadts 1984, p. 19).

Considering how difficult it was to obtain information during the war, both editions of the Bomber's Baedeker perforce contained inaccuracies and mistakes. On the one hand, for instance, disused plants were included, while on the other, the commencement of war-significant production or the relocation of plants were not always recognised. For Hildesheim, Meyer-Hartmann points out that, for instance, the 1944 Bomber's Baedeker did not include the Vereinigte Deutsche Metallwerke AG (VDM), even though they were of major importance to the German aircraft industry since they produced aeroengine parts (Meyer-Hartmann 1971, p. 53f.). And Groehler states that the synthetic fuel production in Böhlen, near Leipzig, was allotted priority 2 , an allocation too low as Böhlen, with more than 2,200 employees and in September 1944 a production of over 10,000 tons of fuel, was temporarily one of Germany's most important producers in the mineral oil sector (Groehler 1990, p. 224). Yet, despite such shortcomings, the second edition of the Bomber's Baedeker, in particular, is proof of the MEW's extensive knowledge of the German war economy and German towns. Knowledge which, with regard to both quantity and quality, had improved considerably during the war.

The Development of the Strategic Air War against Germany and the Role of the Bomber's Baedeker

From the Beginning of the Strategic Air War against Germany to the Official Decision on Area Bombing

One day after the beginning of the German West Offensive and one day after Winston Churchill's assumption of office as Prime Minister, on 11 May 1940, the British War Cabinet passed a resolution to employ the strategic air war concept against Germany. This concept was based on the hypothesis that it was of war-determining significance to destroy the enemy's political and industrial centres as well as to bring traffic and transportation to a standstill within the first days of war and thus to trigger a rebellion of the population against their government. Therefore, this concept set on demoralising the population by means of air raids. Moreover, it knowingly accepted civilian casualties. In order to realise this concept, bombers were to fly great numbers of bombs deep into the enemy's hinterland. Although the Britons had started to develop such four-engine heavy bombers, by May 1940 they were not yet ready for action. Therefore, the strategic air war against Germany began on 15 May 1940 with attacks on oil stocks and railway targets in the Ruhr area. Yet, the intensity of these attacks during the first phase, which lasted until February 1942 (21 months), was incomparable to any of the following phases regarding the bombers used and the numbers of bombs dropped. Many technical problems, especially in navigation, as well as ethical-political scruples, accounted for the fact that the strategic air war got off to only a slow start (Hohn 1991, p. 7f.).

At first, the foremost objective in selecting targets was to weaken the German war economy and, if possible, to bring it to a standstill. Thus, in the summer of 1940 attacks were flown against industrial targets like oil refineries north of Hanover, aircraft construction plants, war industries concentrated in the Ruhr area as well as U-boat shipyards and ports along the Deutsche Bucht (North Sea coast). Following Churchill's idea to concentrate the attacks on German major cities, Charles Portal, Chief of Air Staff, produced a list of the following 19 towns in September 1940: Berlin, Bremen, Brunswick, Darmstadt, Düsseldorf, Essen, Frankfurt/Main, Hamburg, Hanover, Kiel, Koblenz, Leipzig, Magdeburg, Mainz, Mannheim, Munich, Münster, Nuremberg, and Stuttgart (Webster et al. 1961, Vol. I, p. 153). Seen in the light of the second edition of the Bomber's Baedeker published in May 1944, this list makes only a rather temporary impression. For instance, Duisburg and Cologne are missing, two towns which the Bomber's Baedeker listed with two entries under the target rating "Factories of outstanding importance in German war effort (1+)" and which are listed four or five times respectively under the category "Major plants in major industries (1)". In contrast to this, Koblenz was neither a major city nor a target of war-economic importance as it shows only five entries under rating 3. This is also true for the two cities of Mainz and Münster which were not entered under the ratings 1 and 1+. For Mainz, not even rating 2 is given and about Münster the Bomber's Baedeker says explicitly: "There are a variety of industries which include flour milling, agricultural machinery, and dye works. None of these is of outstanding importance." (PRO, AIR 14-2663-XC 026053, p. 498).

A new stage of the strategic air war had been arrived at when on 16 December 1940 the crews of 134 bombers were sent to Mannheim. They were not given any industrial targets of significant importance, but were ordered to destroy the city centre of Mannheim as thoroughly as possible (Verrier 1970, p. 131). Officially though, this new stage began on 14 February 1942 when the British War Cabinet decided that area bombing was to be the new

strategy. The main reason for this decision was the realisation that nocturnal bombing of especially small sized targets, like industrial plants, had turned out to be rather inefficient. The United States Strategic Bombing Survey from January 1947 states with respect to the problem of target finding : "Even with the earlier forms of radar, an attack on a target smaller than a city area of at least 100,000 population was not economical." (USSBS, The Economic Effects of the Air Offensive against German Cities, p. 3, quoted by Shandroff 1972, p. 63).

In addition to this, there was the fact that daytime attacks were too dangerous as they could not be accompanied by fighter planes. In November 1940 the Bomber Command formed an aerial photo reconnaissance unit to ascertain both the efficiency of air raids and the accuracy of an estimation, according to which only 35% of all bombers were successful in finding their targets. Finally, on 18 August 1941, Bensusan-Butt, a member of the Cabinet Office who also worked for the Churchill adviser Prof. Lindemann, produced the so-called Butt Report which was based on the analysis of 600 nocturnal pictures taken from June to July 1941. The result was depressing. Only a quarter of those planes whose crews had reported a successful bomb attack on a German target had actually come within a five mile radius of the said target. With regard to attacks on towns in the Rhine-Ruhr area this was even true for only 10% of the bombers. (Webster et al. 1961, Vol. IV, p. 205-213). Already one month prior to the report, the Air Staff had reacted to the inefficiency of previous bombings by issuing a directive to the Bomber Command on 9 July 1941. Deputy Chief of the Air Staff, Bottomley, implemented the directive given to Air Marshall Peirse as follows: "I am directed to inform you that a comprehensive review of the enemy's present political and military situation discloses that the weakest points in his armour lie in the morale of the civil population and in his inland transportation system." (Webster et al. 1961, Vol. IV, p. 135 f.). From now on, precision attacks on railway installations were only to be carried out on moonlit nights, whereas heavy, concentrated area bombings of industrial workers' residential areas and industrial sites in carefully chosen towns, chiefly in the Rhine-Ruhr district, were to be flown on roughly 75% of nights (Webster et al. 1961, Vol. IV, p. 137, 139). The close proximity of industrial facilities and workers' residential areas, ie of precision and area bombing targets, were able to satisfy both those in favour of selective bombing of targets important for the war economy and those favouring indiscriminate area bombing aimed at demoralising the civilian population. In late September 1941, it was already possible to foresee how a further development of bombers, bombs and bombing techniques was to affect German towns. This development was based on the requirement to create the wherewithal with which to achieve a complete destruction of the most important German towns. Turning away from this area bombing by improving precision bombing was, however, not of interest. On 25 September 1941, the RAF submitted a memorandum and a plan to Churchill according to which 43 German towns totalling 15 million inhabitants were, if possible, to be destroyed completely. This would, however, have needed 4000 bombers; ten times more than were available at that time (Bailey 1981, p. 36). The target list included Group A towns which were within a 640 km radius of the British air base Mildenhall and were subdivided into three regional groups:

A 1: Ruhr area (17 towns totalling 5 million inhabitants): Dortmund, Essen, Cologne, Düsseldorf, Duisburg, Bochum, Gelsenkirchen, Wuppertal, Aachen, Hagen, Krefeld, Mönchengladbach, Mülheim, Oberhausen, Remscheid, Solingen, Münster

A 2. Northwest Germany (3 towns totalling 2.5 million inhabitants): Hamburg, Bremen, Kiel

A 3. Western Germany (10 towns totalling 2.5 million inhabitants): Frankfurt/Main, Hanover, Mannheim, Bielefeld, Darmstadt, Saarbrücken, Kassel, Ludwigshafen, Mainz, Wiesbaden.

Group B comprised 12 towns totalling 5 million inhabitants up to 960 km away from Mildenhall: Brunswick, Chemnitz, Dessau, Dresden, Halle-Merseburg, Karlsruhe, Leipzig, Magdeburg, Nürnberg, Rostock, Stuttgart, Munich (PRO, AIR 20-3718).

Thus, at this point in time those towns to the west or north-west of a line forming Kiel, Hanover, Kassel and Mannheim were especially endangered. Major cities like Beuthen, Breslau, Danzig (Gdansk), Gleiwitz, Hindenburg, Königsberg and Stettin, subsequently all included in the Bomber's Baedeker, could at this time still feel safe of air raids due to their geographic location. Apart from location, size seems to have been the most important selection criterion: the list names Mainz, Mülheim, Mönchengladbach, Münster and Wiesbaden, all major cities of, according to the Bomber's Baedeker, no outstanding economic importance. On the other hand, Augsburg and Wilhelmshaven were not mentioned, although they would have met the Bomber's Baedeker's standards. In order to implement area bombing, it was necessary to concentrate on bombing techniques, resulting in the firebombs' dominating role. They were to cause extensive fires and firestorms, while high-explosive bombs and air mines were to destroy roofs and windows at the beginning of an air raid in order to expose the easily inflammable inner of the houses and to destroy water pipes. The ensuing panic among the fire-fighting population was expected to keep them in their cellars. Under the code name "Unison", the Bomber Command already planned to test the efficiency of incendiary bombs during air raids in November 1941. Although this test could only be carried out successfully during the air raid on Lübeck, 28/29 March 1942, after area bombing had been officially approved, preparations had started long before. These included classifying 19 German towns with regard to their flammability. According to this classification, the use of firebombs appeared especially promising against Lübeck, Bremen, Nuremberg, Freiburg, Rostock and Brunswick. If criteria like distance, air defence and target finding were included in the classification, Hamburg, Hanover,

Hildesheim, Bielefeld, Münster, Aachen, Würzburg, Karlsruhe, Pforzheim, Offenbach and Darmstadt were also considered worthy targets. In contrast to this, Kiel and Frankfurt were considered unsuitable for firebombs (PRO, AIR 14-696). For the first time the list mentioned towns with fewer than 100,000 inhabitants – Hildesheim, Pforzheim and Offenbach. Of these, only Offenbach could later be found in the Bomber's Baedeker with two factories rated category 2, indicating a town of insignificant importance to the war effort.

From Deciding on Area Bombing as a new Air Warfare Strategy to the Casablanca Directive

The strategy of area bombing was officially approved on 14 February 1942 and was aimed at demoralising the German population by destroying the most important towns as completely as possible. If one looks at the target list, at Appendix A of the directive, sent to Air Marshal Baldwin by Deputy Chief of the Air Staff Bottomley on the same day, one could gain the impression that attacks for the coming six months were only planned against transportation and selected industrial targets in 18 major cities, with the exception of Schweinfurt. For Essen, for instance, the entry reads "transportation and heavy industries", for Bremen "naval dockyards", for Rostock "Heinkel factories", for Kassel "locomotives" and for Schweinfurt "ball bearings". In addition to this, Annex B named 12 industrial plants and power stations suitable for precision attacks. Yet when reading the following sentence taken from the accompanying letter, it becomes apparent that both annexes were much rather a formal concession to the MEW:

"... it has been decided that the primary object of your operations should now be focused on the morale of the enemy civil population and in particular, of the industrial workers." (Webster et al. 1961, Vol. IV, p. 144, 146).

As Chief of the Air Staff, Portal, feared that naming industrial targets could cause confusion he, therefore, on 15 February, conveyed the following minute to Bottomley:

"Ref. the new bombing directive: I suppose it is clear that the aiming points are to be the built-up areas, *not*, for instance, the dockyards or aircraft factories where these are mentioned in Appendix A. This must be made quite clear if it is not already understood." (Webster et al. 1961, Vol. I, p. 324).

On 30 March 1942, Prof. Friedrich Alexander Lindemann, alias Lord Cherwell, sent Churchill a note also dealing with the demoralisation of the civilian population by means of "dehousing". Lindemann, head of the Prime Minister's own investigation agency, which had the function of supplying Churchill with analyses of the reports sent to him from the services and other departments (Webster et al. 1961, Vol. I, p. 270), saw two reasons in favour of bombing German workers' residential areas. On the one hand, the bombs available could be used to better effect against these fairly dense built-up areas than against better off areas with a lower population density. On the other hand, precision attacks at that time still suffered from targeting difficulties and an unacceptable failure rate. Based on an extensive analysis of German air raids against Birmingham, Hull and other British towns, Lindemann told Churchill:

"In 1938 over 22 million Germans lived in 58 towns over 100,000 inhabitants, which, with modern equipment, should be easy to find and hit. Our forecast output of heavy bombers (including Wellingtons) between now and the middle of 1943 is about 10,000. If even half the total load of 10,000 bombers were dropped on the built-up areas of these 58 German towns, the great majority of their inhabitants (about one third of the German population) would be turned out of house and home." (Webster et al. 1961, Vol. I., p. 331f. and Birkenhead 1962, p. 261f.).

To realise such considerations, from 23 February 1942 onwards, the Bomber Command was headed by Arthur T. Harris, a man, who in favour of area bombing, acted in full accordance with the new doctrine since his main selection criterion was not industrial plants, but a population of at least 100,000.

In this context it is also worthy of note that Foreign Minister Anthony Eden, in his letter to Sinclair dated 15 April 1942, uttered the advice that towns with fewer than 150,000 inhabitants and a weak air defence should nevertheless find increased inclusion in target lists, even if their military and economic significance was only of secondary importance (Groehler 1990, p. 62, quoted from PRO, AIR 8-424). Here the idea of an "indiscriminate" area bombing already becomes apparent which counted on the devastating psychological effect of such attacks.

At the beginning of 1942, the MEW opposed such a bombing policy whose aim was merely a complete destruction of towns. It had much rather advised the Air Ministry on 8 January 1942 to concentrate air attacks on the target systems electric power, synthetic rubber, some special components of air and armament industries, oil and substitute fuels, alumina plants and soda ash plants and – with the lowest priority – on production sites of diesel engines and accumulators for submarines (Webster et al. 1961, Vol. I, p. 461). Although the MEW had at first hoped that the new radar navigation system "Gee" would improve the hit rate of precision attacks, it now had to concede that it could not prevent the new doctrine of area bombing. On 7 February 1942 it recommended the area bombing of Essen, Duisburg, Bochum, Gelsenkirchen, Dortmund, Düsseldorf, Cologne and Wuppertal. The purpose of this was to direct attacks at a district where area bombing would not only fulfil the function of demoralising the population, but where it would also destroy parts of the German war effort. (Groehler 1990, p. 32). After the official introduction of area bombing to replace precision attacks on 14 February 1942, the MEW was keen to achieve more differentiated selection criteria for area bombings geared chiefly towards the military-economic importance of the town. To determine the priorities among the cities and towns to be attacked by area bombing, it was necessary to

make a comprehensive review of the German war production and its geographical distribution over the Reich. Therefore, while working on the Bomber's Baedeker, the whole German industry was divided into 14 categories, the industrial sectors were evaluated with regard to their war-economic importance and the population density was estimated of those towns housing industries of war importance. After that, towns were classified according to the expected success potential of bombings. This classification was based upon a method first employed by the Ministry of Home Security when it evaluated the air defence requirements of British towns after the German air raids of 1940–41. Although work had not yet been completed , the MEW attached a list of 58 towns as selective area bombing targets to a paper on the Combined Bomber Offensive on 22 October 1942. This paper, which was given to the Defence Committee by the Chief of the Air Staff, served as preparatory material for negotiations during the Casablanca Conference. The following selection criteria were of importance: location, population, population density, key industries and importance of the key industries from the standpoint of economic bottlenecks (Webster et al. 1961, Vol. I, p. 467f.).

The MEW did not limit itself to listing major cities; also included among the 58 towns and cities were 20 with fewer than 50,000 inhabitants. Towns were grouped according to three categories, as follows (Groehler 1990, p. 74):

18 major cities with more than 250,000 inhabitants:
Berlin, Duisburg, Essen, Dortmund, Bochum, Gelsenkirchen, Düsseldorf, Stuttgart, Hanover, Leipzig, Magdeburg, Bremen, Hamburg, Mannheim-Ludwigshafen, Cologne, Frankfurt/Main, Munich, Nuremberg

20 cities with 50,000 to 250,000 inhabitants:
Schweinfurt, Kiel, Kassel, Dessau, Brunswick, Jena, Hagen, Krefeld, Augsburg, Saarbrücken, Wilhelmshaven, Eisenach, Rostock, Bielefeld, Karlsruhe, Osnabrück, Gotha, Erfurt, Flensburg, Weimar

20 towns with fewer than 50,000 inhabitants: Bitterfeld, Merseburg, Hanau, Düren, Völklingen, Emden, Wetzlar, Friedrichshafen, Fulda, Zella-Mehlis, Suhl, Dinslaken, Bernburg, Neunkirchen, Wismar, Oranienburg, Eschweiler, Wittenberge, Rathenow, Oschersleben

Since economic criteria determined the selection, seven cities with more than 250,000 inhabitants (Breslau, Chemnitz, Danzig (Gdansk), Dresden, Königsberg, Stettin and Wuppertal) were not included as they either did not possess industries of war-economic importance or their industrial sectors could also be found in sufficient number in other more accessible locations. The list of smaller towns had a preliminary character and "these towns had been chosen either because they contained the major portion of some highly specialised industry or part of some industry which might be made the principal object of attack in one of the large towns. Thus, if rubber were chosen as the industry to be destroyed, Hanover would be the main target, but the small towns of Hanau and Fulda produced much of the rest of that commodity. The aircraft industry, likewise, could only be attacked with success if the number of smaller towns were included in the target system." (Webster et al. 1961, Vol. I, p. 468).

The first edition of the Bomber's Baedeker was published on 2 January, not even three weeks before the decree of the Casablanca Directive of 21 January 1943. "Though no reference was made to the United States, the idea of a combined offensive in which the Eight Air Force would take part with precision attacks and the advantage of directing the two forces to a common target system was, no doubt, in the minds of those preparing the information." (Webster et al. 1961, Vol. I, p. 469). In 1940, the United States Intelligence Section of the Air Corps Information Division had started to collect information about the industrial structure of Germany, Italy and Japan. Its organisational successor, the Target Information Section of the office of the Assistant Chief of Air Staff, Intelligence, established in 1942, received a lot of information from the MEW (Mac Isaac 1976, p. 23). In addition, after the war broke out, a Board of Economic Warfare with an Enemy Objectives Unit had been organised in Washington having the same functions as the MEW and in 1941 a liaison department of the MEW was set up there. Thus the work carried out by the MEW in 1942, which resulted in the Bomber's Baedeker, had a "considerable influence on the economic appreciations of the Combined Bomber Offensive in 1943–44." (Webster et al. 1961, Vol. I, p. 471f).

From the Casablanca Directive to the Normandy Landings of the Allies

The Casablanca Directive bound the British and US Bomber Commands to a "progressive destruction and dislocation of the German military, industrial and economic system, and the undermining of the morale of the German people to a point where their capacity for armed resistance is fatally weakened." (Webster et al. 1961, Vol. IV, p. 153). Even though area bombings to demoralise the civilian population had been approved of, a priority list for precision attacks to be carried out by American daytime raids was added at the same time. The targets were German submarine yards, the German aircraft industry, transportation, oil plants and "other targets in enemy war industry". (Webster et al. 1961, Vol. IV, p. 153f). Yet:

> "The area attack of this period was deliberately aimed at the destruction of the principal cities of Germany. The object was (...) to destroy in the centre of the cities, the housing, public utilities and communications to such an extent that their inhabitants would not be able to go on working. Though, on occasion, individual factories or groups of factories were designated as the centre of the target and it was also hoped that many would be destroyed or seriously damaged by the overspill of the area attack, it was the destruction of the living quarters of the towns which was the main object of the attack." (Webster et al. 1961, Vol. II, p. 235).

Moreover, bombardments declared as precision attacks often had the same effects as area bombings. The Summary Report of the United States Strategic Bombing Survey (USSBS) states: "Conventionally the air forces designated as the 'target area' a circle having a radius of 1000 feet

(304,8 m, author) around the aiming point of attack. While accuracy improved during the war, survey studies show that in the over-all, *only about 20% of the bombs aimed at precision targets fell within this target area."* (USSBS, Summary Report (European War), p. 5, quoted after Shandroff 1972, p. 107).

The major attacks from March to July 1943 against the Rhine-Ruhr-area, the bombing of Hamburg from the end of July to early August and the large-scale offensive against Berlin, beginning 18 November 1943 and ending 24 March 1944, were milestones in the air battle against Germany. Improved radar technology and the employment of the pathfinder force assisted target finding. The attack on Wuppertal in the night of 29 to 30 May 1943 led to the first firestorm, also to wreak havoc in Hamburg in July and in Hanover and Kassel in October. On 3 November 1943 Harris produced an assessment of the air war to Churchill in which he saw the purpose of the same as fulfilled to 50% on account of 19 towns having been completely destroyed, 19 seriously damaged and 9 damaged. He grouped the subdivided targets for the coming months in nine geographically defined categories:

1. Berlin
2. the so-called "minor Ruhr district" including Leipzig, Chemnitz, Dresden, Eisenach, Gotha, Erfurt, Weimar and Schweinfurt
3. the "Route to Berlin" including Bremen, Hanover, Brunswick, Magdeburg and Osnabrück
4. the Upper-Rhine towns including Frankfurt/Main, Ludwigshafen, Karlsruhe, Darmstadt and Stuttgart
5. the south-east including Friedrichshafen, Augsburg, Munich and Nuremberg
6. the east including Pilsen, Posen, Breslau, Vienna and Wiener Neustadt
7. the Baltic Sea including Kiel, Wismar and Stettin
8. completing the destruction of the Saarland
9. completing the destruction of the Ruhr area (Groehler 1990, p. 179).

Here, it becomes apparent that the regional emphasis of the air war had shifted to central Germany and to the south-east, a change which was to bring devastation to the centre of Leipzig on 3 December 1943 and the first large-scale attack on Magdeburg on 21/22 January 1944. However, at the turn of the year 1943/44, Harris' one-sided area bombing itself came under attack from certain factions of the RAF associated with Bottomley and Bufton who favoured concentrating the main activities on air armament targets and ball bearing plants. In December 1943 and January 1944 these differing opinions led to a veritable power struggle between the Air Staff and Harris. After an urgent recommendation by the MEW, Bottomley ordered the Bomber Command to attack Schweinfurt with its ball bearing industry on 17 December. Harris protested arguing that the bombardment of such panacea targets would lead nowhere. Harris was re-ordered to attack on 17 January. Again he refused, which, on 27 January, led to the third command. Harris then finally ordered the attack on Schweinfurt on 24 February 1944 (Groehler 1990, p. 181f.). This conflict is an impressive illustration of Harris' powerful standing in the British political-military system. The fact that, until the end of the war, Harris was able to oppose all recommendations and directives to switch to selective area bombing of industrial targets without losing his position, underlines the hypothesis that political calculations and characters are often more important during a war than the results of logical intelligence analysis (Handel 1993, p. 694).

The first six months of 1944 were characterised by preparations for the Normandy landings. The directive by the Air Ministry to the Bomber Command, dated 28 January 1944, states "that to ensure best possible use of short time before 'OVERLORD' maximum effort of strategic bomber forces is to be concentrated upon key installations in the German fighter aircraft industry and ball bearing industries, and the towns associated with these key installations." (Webster et al. 1961, Vol. IV, p. 162). This directive ordered the RAF Bomber Command to attack selected towns associated with key industries. Listed in order of priority for attack were Schweinfurt, Leipzig, Brunswick, Regensburg and Augsburg. (Webster et al. 1961, Vol. IV, p. 163). From May 1944, hydrogenating plants and oil refineries were given the same target priority rating as the above mentioned key industries, airports and railway junctions. As a consequence of this, the German side faced an increasing shortage of aviation fuel, a fact which was to help the allied air forces to gain air supremacy in autumn of the same year (Lux 1971, p. 13). The second edition of the Bomber's Baedeker also dates back to May 1944. Despite some inaccuracies, this second revised edition was a superb source of information for identifying single targets for precision attacks as well as whole towns with key industries for selected area bombings. Between February and August 1944, 60 to 70% of all air force long-haul operations were aimed at industrial targets. The strategic air forces contributed more to ending the war in this phase than during any other (Groehler 1990, p. 210). Therefore, the revised edition of the Bomber's Baedeker was published at time of crucial strategic importance.

From the Normandy Landings of the Allies to the End of the War

The final eleven months of the war brought an inconceivable escalation of town bombardments with them, from which, in August 1944, not even a far-flung town such as Königsberg was to be spared. For instance, far more bombs were dropped over urban living quarters during the last three months of 1944 than during the whole of 1943. Although ordered by Portal in the summer of 1944 to concentrate attacks on hydrogenating plants, oil refineries and transport routes, now considered to be decisive for the war, Harris' main aim remained the complete destruction of towns. On 1 November, he told Portal that 45 towns had already been destroyed

completely and that the destruction of another 12 major cities would expedite Germany's final defeat. Harris named Magdeburg, Halle, Leipzig, Dresden, Chemnitz, Breslau, Nuremberg, Munich, Koblenz, Karlsruhe, Berlin and Hanover. Yet, Portal and the majority of the Air Staff were convinced that attacks on the oil industry showed more promise – a belief shared by the MEW (Groehler 1990, p. 383; quoted from PRO, AIR 8-1020). Harris, however, succeeded in having the systematic destruction of the towns he had named in November tied in with the verbal approval granted for the bombing of oil installations. A supplementary list of 19 towns, produced on 23 January 1945, bore the illuminating note that several of these towns had no targets of any military or industrial significance and were only included because they still possessed large undestroyed areas. Harris named Stettin, Plauen, Wiesbaden, Mannheim, Würzburg, Gera, Stuttgart, Bonn, Zwickau, Bremen, Mainz, Potsdam, Jena, Hildesheim, Bernburg, Worms, Kassel and Regensburg (Groehler 1990, p. 385). If the 1944 Bomber's Baedeker is used to evaluate the military-industrial importance of these towns, the only targets worthy of attack in the categories 1+ and 1 would have been Stettin with 4, Mannheim with 5, Stuttgart with 7, Bremen with 6, Jena and Bernburg with 2 each as well as Kassel with 4 entries. Consequently, from the autumn of 1944 onwards, numerous hitherto unharmed medium-sized and small towns of no war-economic importance were included in the air battle. The destruction of towns like Hildesheim, Heilbronn, Ulm, Pforzheim, Halberstadt and Nordhausen constituted a striking example of this. Added to this were attacks on towns connected with the progress made by ground troops which, among others, hit towns along the front line to the left of the Rhine like Düren, Jülich and Heinsberg. Perfected navigation and bombing techniques were now able to cause destruction far surpassing that of earlier war phases (Hohn 1991, p. 21). For Lübeck and Rostock, it now proved an advantage to have , in a way, only served as "guinea-pigs" for the bombing strategy; had they been included on the 1945 target list, they would have been completely obliterated. (Groehler 1990, p. 393).

In a letter to Bottomley, dated 26 January 1945, Portal said:

"We should use available effort in one big attack on Berlin and attacks on Dresden, Leipzig, Chemnitz, or any other cities where a severe blitz* will not only cause confusion in the evacuation from the East but will also hamper the movement of troops from the West." (Webster et al. 1961, Vol. III, p. 101).

In anticipation of the Yalta Conference, Churchill was especially interested in attacks on towns in the central German Reich in order to demonstrate the ability of the western strategic air force to support Soviet operations in the East to Stalin, which in the final analysis was tantamount to a display of one's own strength. (Webster et al. 1961, Vol. III, p. 103). A target list compiled by the Combined Strategic Target Committee was attached to a directive to the Bomber Command dated 8 February 1945, according to which such towns were to be bombed with priority whose traffic junctions were vital for evacuation or for the German supply of the eastern front. The target towns listed were: Berlin, Dresden, Chemnitz, Leipzig, Halle, Plauen, Dessau, Potsdam, Erfurt and Magdeburg. Therefore, in 1945, strategic air raids were centred over the region later to become the German Democratic Republic and concentrated on major cities in Saxony and Saxony-Anhalt as these had up to that time either remained unscathed or had been only slightly damaged. A list of alternative targets contained 17 "industrial area targets" which were selected according to their industrial significance and relation to main group targets: Kassel, Nuremberg, Hanover, Zwickau, Hildesheim, Flensburg, Munich, Mannheim, Gera, Würzburg, Weimar, Jena, Hanau, Bielefeld, Pforzheim, Worms, Ludwigshafen (PRO, AIR 20-3724, quoted after Dunkhase 1980, p. 8). Here again, the shift in emphasis to central and south Germany becomes apparent. In Saxony, 81 % of the destruction of housing took place during the last four months of the war, for Thuringia the figure is 69% and for Saxony-Anhalt 64% (Groehler 1990, p. 395). During the "Clarion" offensive, which began 22 February and lasted for seven days, mainly towns of minor ranking within the towns' hierarchy became air raid targets. Officially, the offensive was aimed at traffic targets, but caused extensive destruction especially in smaller towns (Webster et al. 1961, Vol. II, p. 255). At the end of February and in March 1945, air raids in support of ground troops devastated numerous small and medium-sized towns in the north-west and south-west of Germany. At the end of the war, this extensive destruction along the west border of the German Reich was mirrored by the destruction in the Soviet Zone along the Oder (Fig 3).

Target Classification of the Bomber's Baedeker on the Macro Level

On the macro level, target selection was determined by the war-economic significance of a town, its population and its distance from the British air base Mildenhall.

The 1944 second edition of the Bomber's Baedeker included 459 municipalities and cities for which singular targets were named. These have now been grouped according to the number of inhabitants, the distribution is as follows:

100,000 inhabitants or more	59
20,000 to 100,000 inhabitants	211
5,000 to 20,000 inhabitants	139
fewer than 5,000 inhabitants	50

* While "blitz" in English usually is referring to an air raid, the term "Blitzkrieg" in German means "surprising attack, aiming at rapid and complete occupation of a large region or country with minimum destruction" (cf. Tietze, Wolf: Military Geography - Wehrgeographie - Geography of Security. GeoJournal 31.2, 215-219 (1993).

Priority	Major Cities Targets Total	in %	Remaining Municipalities Targets Total	in %	Total Targets Total	in %
1+	17	1,0	5	0,4	2	0,8
1	167	9,5	88	7,0	255	8,5
2	343	19,7	223	17,8	566	18,9
3	952	54,6	670	53,5	1622	54,1
–	266	15,2	267	21,3	533	17,8
Total	1745	100,0	1253	100,0	2998	100,0

Tab 1

While the 59 major cities totalled 1,745 singular targets allocated to one of the five priority ratings, the 404 municipalities with fewer than 100,000 inhabitants only totalled 1,253 target entries altogether (Tab 1).

78% of the highest priority targets (1+) and 65% of the second highest priority targets (1) belong to the group of major cities. However, this group also includes another 15 cities for which no category 1+ or 1 target existed, namely: the west German towns of Münster, Mönchengladbach, Mülheim, Bonn, Bielefeld; the south-western towns of Mainz, Wiesbaden, Karlsruhe and Freiburg; the central German towns Erfurt, Plauen and Potsdam; the southern town of Würzburg; Beuthen in Silesia and, finally, Königsberg in East Prussia.

Tab 2 contains the 44 major cities with category 1+ or 1 targets and the distribution of the targets named by priority level, their allocation to the 14 industrial groups as well as the rating of the cities measured by the number of first and second priority targets.

Next to 12 major cities, the medium-sized towns of Bitterfeld, Merseburg, Schweinfurt and Leverkusen as well as the small town of Schkopau also had one priority 1+ target each. A regional concentration over the central German industrial area surrounding Leipzig becomes apparent here, but – disregarding the special status held by Berlin – Magdeburg and Leipzig are actually the first central German principal cities to feature in the list of major cities at places 14 and 16. The area with the highest concentration of priority 1+ and 1 targets is, by far, the Rhine-Ruhr area. With Duisburg, Düsseldorf, Dortmund, Cologne and Bochum, five cities within this region rank among the top 10. The fact that Essen was assessed to be of relatively low war-economic significance, place 26, was due to the fact that the MEW assumed Krupp's industrial production in particular to have been considerably disturbed during the course of heavy bombardments in 1943. Therefore, unlike in the 1943 Bomber's Baedeker, Krupp was only assigned priority 1, not 1+. Distinct downgradings owing to severe destruction following large-scale attacks in 1943 were undertaken for Hamburg (1943: 3 x 1+/13 x 1), Kassel (1943: 2 x 1+/7 x 1), Hanover (1943: 6 x 1+/3 x 1) and Berlin (1943: 10 x 1+/32 x 1). With five entries each and thus almost half of all targets, the distribution of the 22 category 1+ targets by industrial branches is concentrated on the areas of public utilities as well as engineering and armament. "Public utilities" constitute the Berlin-based power stations Berlin-West and Klingenberg, the power station Knapsack-Goldenberg, the RWE transformer station 'Brauweiler' in Cologne as well as the Elektrowerke AG Golpa-Zschornewitz near Bitterfeld. The group "engineering and armament" comprises the MAN Maschinenfabrik in Augsburg, the Rheinmetall Borsig AG in Düsseldorf, the Krupp-Grusonwerk in Magdeburg, the Kugelfischer Schoefer AG in Schweinfurt and the Robert Bosch AG in Stuttgart. According to its frequency of appearance, Group 5 "iron, steel and ferro-alloys" takes 3rd place, naming the Friedrich Alfred Hütte and the August Thyssen Hütte in Duisburg and the Reichswerke AG für Erzbergbau und Eisenhütten Hermann Göring in Hallendorf (Salzgitter) near Brunswick. The categories 7, 8 and 10 list two targets each, namely: the Messerschmitt AG in Augsburg and the Junkers Werk in Rothensee near Magdeburg for category 7, "aircraft and aero-engines"; the Deutsche Schiff- und Maschinenbau AG (DESCHIMAG) in Bremen and the Kriegsmarine Werft in Wilhelmshaven for category 8, "shipbuilding"; the IG Farben Konzern, owned by the Bayer Werke in Leverkusen, and the BASF in Ludwigshafen for category 10, "chemicals and explosives". Finally, single entries are found in group 4 "liquid fuels and substitutes" with the IG Farben-owned Ammoniakwerke Merseburg in Leuna; in group 6 "non-ferrous smelting, refining and manufacture" with the Vereinigte Deutsche Metallwerke (VDM) in Frankfurt and in group 12 "rubber and tyres" with the Buna Werke in Schkopau. With 74 entries, 1943 Bomber's Baedeker had named more than three times as many category 1+ targets distributed over 26 major cities and 11 medium-sized towns as well as the small town of Schkopau, belonging to Halle. Category 1 also had more entries in 1943 (372 targets) than in 1944 (255 targets). The following 21 towns, which in 1943 were still listed as a category 1+ target, are no longer part of the 1944 list, namely: Bernburg (Deutsche Solvay Werke), Bochum (Vereinigte Stahlwerke Bochumer Verein), Breslau (Linke-Hofmann-Werke), Danzig (Schichau Werft), Dessau (2 plants of Junkers Flugzeug & Motoren), Eisenach (BMW), Elbing (Schichau Werft), Emden (Nordseewerke), Essen (Friedrich Krupp AG), Gelsenkirchen (Gelsenberg Benzin AG, Hydrierwerke Scholven AG), Hagen (Accumulatorenfabrik), Hamburg (Ebano Asphaltwerke AG/Rhenania Ossag Mineralölwerke, Blohm & Voss, Howaldtswerke AG), Hanover (Gesellschaft Deutsche Erdöl Raffinerie, Hanomag, 3 plants of the Continental Gummiwerke), Jena (Carl Zeiss, Schott Genossen), Kassel (Henschel, Spinnfaser AG), Kiel (Deutsche Werke Kiel AG, Friedrich Krupp Germania Werft, Kriegsmarinewerft), Krefeld (Deutsche Edelstahlwerke), Marl (Chemische Werke Hüls), Oberhausen (Gutehoffnungshütte), Rüsselsheim (Adam Opel AG) and Stettin (Hydrierwerk Pölitz AG).

If one now examines the list of medium and small-sized towns (Tab 3), corresponding to Tab 2, a striking target concentration in central and east Germany becomes apparent. Of the 60 towns with a population of under

Town/Inhabitants	Classification of Industries*																Priority Levels of Targets		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	–	3	2	1	1+
Berlin 4.400.000	28	21	-	4	-	7	27	-	74	9	-	-	-	-	4	76	45	43	2
Duisburg 437.600	8	14	10	2	9	4	-	-	8	3	-	-	-	-	2	38	11	5	2
Düsseldorf 559.000	6	3	-	1	1	1	-	-	45	3	-	3	-	5	14	39	8	6	1
Stuttgart 600.000	5	4	-	-	-	3	5	-	31	1	-	1	-	1	1	36	7	6	1
Mannheim/Ludwigshafen 430.000	5	5	-	-	1	-	1	1	10	10	-	-	-	8	8	15	11	6	1
Dortmund 640.000	8	11	22	4	4	2	-	-	14	3	-	-	-	1	13	37	12	7	-
Cologne 912.000	11	5	-	5	1	3	-	1	23	6	2	7	-	4	20	38	4	4	2
Frankfurt 570.000	6	8	-	1	-	3	3	-	24	8	1	1	1	3	3	33	17	5	1
Bremen 383.000	5	4	-	2	1	-	2	3	4	-	2	-	-	6	5	11	7	5	1
Bochum 336.000	3	8	14	3	5	-	-	-	9	1	-	-	-	-	1	28	8	6	-
Hanover 450.000	6	3	1	1	1	2	1	-	15	3	1	4	-	-	8	15	9	6	-
Hamburg 1.700.000	8	16	1	10	-	7	10	8	25	6	-	12	-	19	30	68	19	5	-
Munich 825.000	7	3	-	-	-	2	8	-	14	9	-	1	-	2	5	22	14	5	-
Magdeburg 320.000	6	5	-	2	-	1	1	-	9	2	-	-	-	2	3	12	9	2	2
Brunswick 196.000	3	3	1	-	1	-	6	-	9	-	1	-	-	-	-	12	8	3	1
Leipzig 720.000	4	5	1	1	-	3	11	-	18	4	3	3	-	-	9	27	13	4	-
Gelsenkirchen 333.000	3	7	15	2	2	2	-	-	4	1	-	-	-	-	4	27	1	4	-
Stettin 380.000	3	4	2	2	1	-	1	3	4	3	-	-	-	2	4	8	9	4	-
Kiel 260.000	2	2	-	5	-	-	2	4	7	-	-	-	-	1	5	7	7	4	-
Kassel 216.000	3	3	-	-	-	-	4	-	9	-	3	-	-	-	5	8	5	4	-
Augsburg 186.000	2	2	-	-	-	-	2	-	6	1	2	-	-	-	2	5	5	1	2
Dresden 640.000	4	4	-	-	1	-	2	1	22	4	-	-	-	2	6	21	10	3	-
Breslau 625.000	2	2	-	-	-	6	3	2	12	5	2	-	-	6	11	21	5	3	-
Nuremberg 450.000	5	2	-	-	-	1	-	-	17	-	-	-	-	-	1	12	9	3	-
Gdansk 260.000	7	2	-	3	-	-	-	4	-	1	-	-	-	3	4	12	1	3	-
Essen 1.139.000	4	7	16	-	1	3	-	-	3	1	-	-	-	-	3	26	4	2	-
Halle 210.000	3	2	-	-	-	-	1	-	6	1	-	-	-	-	1	6	4	2	-
Wilhelmshaven 140.000	1	2	-	1	-	-	1	3	1	-	-	-	-	-	-	5	3	-	1
Chemnitz 370.000	3	2	-	-	-	-	-	-	38	1	3	-	-	-	9	30	7	1	-
Hagen & District 234.000	4	4	-	-	1	1	-	-	16	2	-	-	-	-	6	17	4	1	-
Wuppertal 411.000	1	3	-	-	-	1	-	-	13	3	5	-	-	-	9	15	1	1	-
Oberhausen 194.000	5	3	6	2	1	1	-	-	2	2	-	-	-	-	1	15	5	1	-
Remscheid 124.000	1	1	-	-	3	-	-	-	16	-	-	-	-	-	5	14	1	1	-
Saarbrücken 130.000	4	2	7	-	2	-	-	-	5	-	-	-	-	-	-	14	5	1	-
Solingen & District 153.600	2	2	-	-	-	-	-	-	14	1	1	-	-	-	8	9	2	1	-
Gleiwitz 120.000	4	1	2	-	-	-	-	-	8	1	-	1	-	-	2	13	1	1	-
Osnabrück 100.000	4	3	1	-	1	1	-	-	4	-	2	-	-	-	-	10	5	1	-
Lübeck 133.000	1	3	1	-	1	-	1	1	6	1	-	-	-	-	3	4	7	1	-
Aachen 164.000	3	2	2	-	-	-	-	-	5	-	-	2	-	-	-	9	4	1	-
Hindenburg 130.000	2	1	8	-	1	-	-	-	1	-	-	-	-	-	-	9	3	1	-
Dessau 200.000	2	-	-	1	-	-	1	1	6	1	-	-	-	-	1	8	2	1	-
Rostock 122.000	3	2	-	-	-	-	5	1	-	-	-	-	-	-	-	7	3	1	-
Darmstadt 110.000	3	-	-	-	-	-	1	-	5	2	-	-	-	-	1	6	3	1	-
Krefeld 170.000	1	1	-	-	1	-	-	-	6	-	-	-	-	-	4	4	-	1	-
Total	201	187	110	52	40	54	99	33	568	99	28	35	1	65	221	849	318	167	17

* For the explanation of classification numbers and priority levels see chapter 2.2 "The first and Second Editoins of the Bomber's Baedeker: . . ."

Tab 2 44 major target cities and target priorities

100,000 and targets of category 1+ or 1, 24 are located in the later GDR territory and six still farther east. Of the 270 target entries, 88 are of category 1 and 5 of 1+. With regard to the distribution of the 88 category 1 entries over the 14 industrial groups, the groups 2 "public utilities" (27%), 9 "engineering and armament" (17%), 6 "non-ferrous metal smelting, refining and manufacture" (15%), 7 "aircraft and aero-engines" (15%) as well as "chemicals and explosives" (13%) are particularly outstanding, while there are no entries at all for groups 3, 11, 13 and 14. Every second small and medium-sized town with a category 1 or 1+ target was located east of what was later to become the eastern border of the Federal Republic of Germany. This is mainly due to the relocation of production facilities, especially of the aircraft industry, as the central and eastern territories of the Reich were thought to be safer. When planning the relocation of major industries on 19 December 1942, the Reichsministerium für Rüstung und Kriegsproduktion (Reichs Ministry for Armaments and War Production) considered the territory west of the line Stettin-Berlin-Munich to be under particular threat. Between 1943 and November 1944, altogether 4,150 plants were relocated for the purpose of air defence. Far more than half of these were moved to the arms inspection districts of Dresden, Upper Rhine, Vienna, Breslau, Berlin, Prague and Kassel. Most often, facilities for the production of aircraft compartments and for aeroengines were moved, accounting for 18.4% and 17.4% of the overall relocation. The Bremen-based Focke-

Tab 3
Towns which became targets worthy of attack on account of industry relocations or expansions

Town	Inhabitants	Priority Levels of Targets (–)	(3)	(2)	(1)	(1+)
Bitterfeld	35.000	–	1	4	10	1
Schweinfurt	60.000	–	7	1	3	1
Blechhammer	25.000	–	–	–	4	–
Merseburg	45.000	–	1	–	2	1
Friedrichshafen	25.000	–	2	2	3	–
Witten	76.000	2	10	2	2	–
Eberswalde	39.000	–	5	2	2	–
Hanau	41.000	3	2	2	2	–
Jena	69.000	–	7	–	2	–
Hamm	56.000	–	5	1	2	–
Brandenburg	76.900	–	2	3	2	–
Waldshut	7.000	2	1	1	2	–
Bergheim	13.300	–	2	1	2	–
Mühldorf	8.000	–	1	1	2	–
Lauta	6.000	–	2	–	2	–
Bernburg	40.000	–	1	–	2	–
Schkopau	2.000	–	–	–	1	1
Düneberg–Krümmel	8.500	–	–	–	2	–
Ulm	68.000	–	9	5	1	–
Wetzlar	26.000	2	4	2	1	–
Eschweiler	34.000	1	4	2	1	–
Senftenberg	19.000	–	7	–	1	–
Bremerhaven	79.000	2	3	1	1	–
Fürstenwalde	28.000	2	3	1	1	–
Bottrop	86.000	–	1	4	1	–
Zittau	40.000	1	4	–	1	–
Elbing	81.000	–	1	3	1	–
Völklingen	44.000	–	–	3	1	–
Aschersleben	40.000	–	2	1	1	–
Marl	36.000	–	2	1	1	–
Düren	46.000	–	3	–	1	–
Flensburg	66.000	1	2	–	1	–
Frankenthal	27.000	2	1	–	1	–
Leverkusen	50.000	–	–	2	–	1
Deschowitz	15.000	–	–	2	1	–
Cottbus	55.600	–	1	1	1	–
Piesteritz	10.000	–	1	1	1	–
Eisenach	50.000	–	2	–	1	–
Köthen	29.000	–	2	–	1	–
Peine	18.000	–	2	–	1	–
Siegburg	22.000	–	2	–	1	–
Rüsselsheim	14.000	–	–	1	1	–
Schwandorf	11.000	–	–	1	1	–
Premnitz	4.000	–	1	–	1	–
Schkeuditz	14.500	–	1	–	1	–
Helmstedt	18.000	1	–	–	1	–
Aalen/Wasseralfingen	17.000	–	–	–	1	–
Altdamm	15.200	–	–	–	1	–
Anklam	20.000	–	–	–	1	–
Basdorf	10.000	–	–	–	1	–
Burghausen	6.300	–	–	–	1	–
Eisleben	24.000	–	–	–	1	–
Finkenheerd	3.000	–	–	–	1	–
Genshagen	13.000	–	–	–	1	–
Marienburg	27.000	–	–	–	1	–
Oberndorf	10.000	–	–	–	1	–
Schramberg	16.000	–	–	–	1	–
Tutow	–	–	–	–	1	–
Vockerode	400	–	–	–	1	–
Waldeck	1.000	–	–	–	1	–
Total		*19*	*107*	*51*	*88*	*5*

Wulf-Werke, for instance, had already moved major parts of their production to Marienburg, Sorau, Cottbus and Posen in 1941 (Groehler 1990, p. 284ff). The entry for Marienburg/East Prussia in the Bomber's Baedeker astutely comments: "In peacetime there were no industries of great importance, and the town was mainly an agricultural centre. Since the war, however, a Focke-Wulf aircraft works has been erected near the town." (PRO, AIR 14-2662-XP 0305, p. 472). Tab 3 lists further examples of towns and municipalities which became targets worthy of attack for the MEW solely on account of industry relocations or expansions: Brandenburg (Arado), Aschersleben (Junkers), Cottbus (Focke-Wulf), Altdamm (aeroengines), Anklam (Arado), Fürstenwalde (torpedo

works), Bernburg (Junkers), Genshagen (aeroengines), Schkeuditz (aircraft) and Tutow (Arado).

The Bomber's Baedeker provides the information necessary to visualise the geographic distribution of war-economically significant targets in Germany and their accessibility on the macro level (see Fig 1). In 1944, a total of 22 category 1+ targets were to be found in 12 major cities of the German Reich and in 4 medium-sized towns and one small town. Moreover, there were 255 category 1 targets in 43 major cities and 26 small and 33 medium-sized towns. Of 14 industrial branches, 9 had category 1+ targets. Of these, 45% belonged to group 2 "public utilities" (5) and group 9 "engineering and armament industries" (5). Compared to 1943, a shift in priorities had taken place as in 1943 the sector "shipbuilding" (10 entries or 14% respectively) followed the top scoring group "engineering and armament industries" (29 entries or 39%, respectively). In 1944, only two targets of the highest priority could be found in this industrial group. This figure indicates that by 1944, seaports had lost their significance as targets considerably. The downgrading from category 1+/1 was especially significant in the cases of Hamburg (1943: 3/13; 1944: -/5), Kiel (1943: 3/3; 1944: -/4), Bremen (1943: 3/6; 1944: 1/5) and Emden (1943: 1/2; 1944: -/-). With regard to the 255 category 1 targets, the list was clearly headed by the industrial group 9 "engineering and armament industries" with 82 entries (32%) followed by group 2 "public utilities" with 49 entries (19%) and group 7 "aircraft and aeroengines" with 27 entries (11%). Thus, 62% of priority 1 targets were concentrated in just 3 industrial branches. The industries 11 "textiles ...", 13 "leather" and 14 "food industries" had no priority 1+ or 1 target due to their negligible war-economic importance. In 1943, the distribution of the 372 target category 1 entries was as follows: 1. "engineering and armament industries" (92 targets, 25%), 2. "transportation" (56 targets, 15%), 3. "solid fuels" (46 targets, 12%) and 4. "aircraft and aeroengines" (43 targets, 12%). If target categories 1 and 1+ are looked upon as one unit, from 1943 to 1944, target entries for "public utilities" increased by 27 or by 100% even though the total highest category targets had fallen from 446 to 277 (-38%). Further above average decreases are evident for the industrial groups "textiles ..." (-100%, -15 targets), "food industries" (-100%, -2 targets), "solid fuels" (-98%, -45 targets), "transportation" (-68%, -39 targets), "liquid fuels" (-56%, -14 targets) and "chemicals & explosives" (-42%, -13 targets).

The distribution of category 1 or 1+ targets over the various towns, Fig 1, shows – under exclusion of Berlin's special status – major regional concentrations in the Rhine-Ruhr-district as well as the central German area around Magdeburg and Halle. A third, smaller yet still prominent concentration can be found in the region between Frankfurt/Main and Mannheim/Ludwigshafen and a fourth of relatively minor importance in the industrial area of Upper Silesia. These target concentrations must be distinguished from chain-like target groups: on the one hand, North and Baltic-Sea ports, on the other hand, the towns of Osnabrück, Hanover and Brunswick along the "Route to Berlin". Similar is true for the line formed by Stuttgart, Augsburg and Munich, while Nuremberg and Kassel can be seen as solitary targets.

Target Determination on the Micro Level

In order to assist target finding on the micro level, the Bomber's Baedeker provided detailed information on a town's topographic characteristics and named the part of the town or even the street in which each of the targets could be found.

Information on Kassel, for instance, covers five pages and includes, next to information on position, given as 51 Grad 20'N, 9 Grad 30'E; air distance from Mildenhall, given as 420 miles (676 km); population size 216,000, general information preceding detailed intelligence on facilities important in the war effort and their priority ranking: "Next to Frankfurt on Main Kassel is the chief town of the province of Hesse Nassau. Among the town's industries the Henschel locomotive works and the Fieseler aircraft works are of major importance to the German war production. There are two large textile factories and a number of engineering works. Kassel is one of the main railway junctions of Central Germany. The town is built mainly on the left or Western bank of the Fulda and the Henschel works are in the Northern half of the built-up area. South-east of the town and East of the river is the suburb of Bettenhausen where there is another group of industries." (PRO, AIR 14-2662-XP 0305, p. 381). After general information on the historical development and the current significance of the Henschel Werke, whose three plants were assigned target category 1, it bears the following entry about plant 1 located in the Henschelstrasse: "The parent factory of Henschel is immediately North of the town centre. This factory is the main locomotive-assembly works but it is also reported to be important in the production of tanks, both of the heavy and the medium type." (PRO, AIR 14-2662-XP 0305, p. 383).

In autumn 1941, in order to obtain the most comprehensive information possible about the effects of urban air raids, the Research and Experiments Department of the Ministry of Home Security had begun to analyse the results of German attacks on British towns very carefully so as to draw consequences for destroying German towns as efficiently as possible. The destruction caused to German towns was evaluated with the help of aerial pictures, a technology which had been perfected during the war. Head of the Department, which was part of the Ministry of Home Security, but under the direction of the Operations Branch of the Air Ministry, was Squadron Leader Dewdney (Webster et al. 1961, Vol. I, p. 267, 473 f.). Dewdney obtained the services of the geographer R. E. Dickinson who had studied the urban planning of Germany. "It was he (Dickinson, author) who first divided German towns into

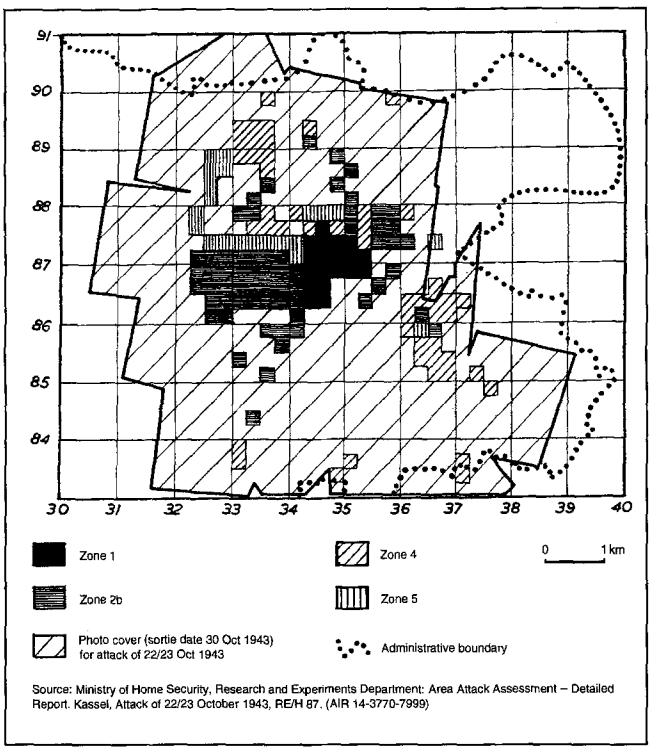


Fig 4 Kassel Zone Plot (for definition of zones see text)

zones, the central zone, the old core of the town, a residential zone round it of fairly high density of population and a factory zone outside that. In the central zone which sometimes dated back to medieval times, many houses were often old, highly inflammable and the open spaces were few. Zone maps were issued by a department of the Air Ministry Intelligence Directorate." (Webster et al. 1961, Vol. I, p. 475). Kassel shall serve as an example of what such a compartmentation looked like. In Kassel the major attack flown by the RAF on 22/23 October 1943 caused a firestorm and great devastation. After this attack, 27,063 homes (42%) were regarded as totally destroyed (Hohn 1991, p. 98). The main attack was aimed at the Martinsplatz and the Martinskirche in the city centre (Dettmar 1983, p. 100). Both the analysis of aerial pictures after the attack as well as the Area Attack Assessment – Detailed Report produced by the Research and Experiment Department compartmentalize Kassel into the following zones (Fig 4).

"Zone 1. The Inner Town

Since Kassel is a relatively small town it has no clearly defined central city area with a small night population. The Inner Town falls into three districts:
(a) the Old Town: this is fully built up with narrow winding streets containing old houses many of which are timbered.
(b) The 18th Century Town: this has a rectangular street plan with wide streets and many large open spaces. It is occupied mainly by public buildings including government buildings and the town hall. The houses have two or three storeys and are separated by gardens and open spaces. The main shopping thoroughfare runs across the area from NE to SW
(c) The closely built-up area extends northwards from (a) and (b) to the railway station and the marshalling yards. More public buildings, hotels and artisan dwellings are included in this northward extension.

Zone 2 b. Partly built-up residential areas

The main residential area is the western district, but there are two smaller areas to the NE of the town and across the river to the SE Large houses with gardens and open spaces are more frequent than tenements. The western district has no factories and extends to the hospital. The other two areas lie near factories and are therefore probably artisan quarters. To the north of the city are blocks of tenements and hutments in open land presumably housing factory workers.

Zone 3. Suburban areas

The chief of these, consisting of detached single family houses, are in the NE and the W. The former houses factory workers and the latter is the best residential district.

Zone 4. Industrial areas

There are three main industrial districts and scattered smaller factories (...)

Zone 5. Railways

There are marshalling yards lying to the NW of the town and also form an east-west belt, penetrating to the central station in the centre of the town." (PRO, AIR 14/3770 7999, p. 5).

Paragraph (b), industries of the report, refers to the Bomber's Baedeker and its priority rating. It claims that two thirds of the 61,000 industrial workers were employed in factories with an MEW rating of 1 or 1+, of which the most important were the Henschel works with 25,000 employees and the Fieseler complexes with about 9,000. Regarding the distribution of industrial areas it is said that

"there are two main industrial areas in Kassel, of which the first is a compact group bounded on the west and south by the marshalling yards and main station, and includes the three Henschel armaments and engineering works. The second area is at Bettenhausen and contains the major component factory of the Fieseler group, the town gas works, and the artificial silk factory of Spinnfaser AG, as well as a number of small factories included in the Bettenhausen trading estate. Two important outlying targets are formed by the Henschel aero-engine works at Alten-Beuna and the Fieseler fuselage and assembly works at Waldau." (PRO, AIR 14/3770 7999, p. 6f.).

The destruction on the micro level was also improved by the so-called "fire plans". Fire experts compiled these for every important area or single target to provide information about each target's fire vulnerability, the best possible blends for explosive and incendiary bombs and the location of the best target points (Rumpf 1956; Bond 1951). Based on the compartmentation into zones, the Area Attack Assessment – Detailed Report, for instance, assesses Kassel's fire vulnerability as follows:

"The Old Town area of zone 1 in Kassel is considered to be of a higher degree of vulnerability of IB (incendiary bomb, author) attack than the 18th Century Town or the closely built-up areas extending northward. This is due to the mixed character of the buildings, the absence of normal compartmentation by visible parapetted fire walls and the presence of narrow winding streets. Zone 2b in Kassel is of average construction and arrangement and is such that minimum spread of fire may be expected to result from incendiary attack." (PRO, AIR 14/3770 7999, p. 7).

The Bomber's Baedeker and the Final Result of the Destruction of German Towns on the Regional and Local Levels

The results of the damage caused during the war, recorded on the maps "Destruction of German large and medium-sized towns in 1945" (Fig 2)and "Destruction of German small towns in 1945 (1939 size: 5,000 – 20,000 inhabitants)" (Fig 3), were based on an evaluation of all available statistical data for each individual town. The level of living-quarter destruction of the entire town formed the comparative base, whereby it was attempted to ascertain the value for the destruction category 60-100% and failing that, a value of at least 50-100% was assumed. Housing which belonged to this destruction category was either regarded as being irreparable or so badly damaged that rebuilding costs would have exceeded those for a new build (Hohn 1991).

The area of the present-day Federal Republic of Germany provided the basis for comparing the destruction of towns and constituted the main platform for area bombing. It must be mentioned, though, that allied attack-planning was geared towards the 1937 borders of the German Reich and also caused severe devastation to the towns of Stettin, Danzig, Königsberg and Breslau. The sheer human suffering, veiled by the percentages of material destruction, can only be guessed at by the bare number of civilian fatalities. Within the area of the German Reich of 31 December 1937, 410,000 civilians lost their lives in the air war before allied ground troops had even reached the respective areas (Schwarz 1956, p. 494). Prior to the official commencement of area bombing in February 1942, 219 persons had died per month as a result of the air war. After the allies had attained air supremacy, the air war claimed 13,536 fatalities per month between July 1944 and January 1945 (covering the area as it was on 31 December 1942, excluding the protectorates of Bohemia and Moravia; Sperling 1962, p. 140). Among the German cities, Hamburg suffered the greatest losses with 49,000 fatalities as a result of the air war, in front of Dresden and Berlin with roughly 35,000 fatalities each. The highest relative population losses, though, going by the 1939 populations, were sustained by Pforzheim with 22.3% (17,000 deaths) and Nordhausen with 20.7% (8,800 deaths), followed by Heilbronn (8.4%), Kassel (6%), Darmstadt (5.9%) and Dresden (5.6%) (Hohn 1991, p. 52).

If one compares the spatial distribution of destruction in Fig 2 with the distribution map of high and highest priority targets based on the 1944 Bomber's Baedeker (Fig 1), the main target concentration, as one may expect, matches the main destruction area, namely:

1. the Rhine-Ruhr area
2. Central Germany
3. the Rhine-Main and Rhine-Neckar area
4. the Harbour towns
5. the line formed by the axis Osnabrück-Hanover-Brunswick
6. the line formed by the axis Stuttgart-Ulm-Augsburg-Munich
7. the solitary towns of Nuremberg and Kassel.

At the same time, it also becomes clear that the scale of destruction in central Germany and above all in Berlin was significantly less severe than may have been expected on account of the dense concentration of targets worthy of attack. Conversely, numerous towns, chiefly in the west of Germany, were badly destroyed which, according to the Bomber's Baedecker criteria, should not have been attacked at all. And finally, the two destruction zones along the west and east frontiers (Fig 3), which included many small towns, were caused by ground battles and their supporting air cover at the end of the war. The discrepancy between a relatively low density of high-ranking targets and a high concentration of relatively badly hit towns was particularly marked in the west of the Münsterland, at the lower Rhine, in the area surrounding Aachen, in Rhineland-Palatinate, in the north of Baden-Württemberg and in Lower Fanconia. In the 1944 Bomber's Baedeker, for instance, of the two major cities and 13 medium-sized town named for Rhineland Palatinate, only the city of Ludwigshafen and the medium-sized town of Frankenthal were listed as having high priority targets. However, at the end of the war these two towns ranked only at sixth and seventh place (with 36 and 28%) in the list rating destruction in the province. The greatest housing losses much rather occurred in Zweibrücken (61%), Koblenz (55%), Mainz (54%) and Worms (42%); all towns for which no category 1 or 1+ entries exist in either of the two Bomber's Baedeker editions. It is also interesting to note that the most severe bombing of these war-economically unimportant towns only took place in the Autumn of 1944 or even immediately prior to war end. The major attack on Zweibrücken on 14 March 1945 destroyed the entire core of the town; in Koblenz, the inner city burned down following the raid on 6 November 1944; the worst bombing of Mainz occurred on 27 February 1945 while the attack on Worms on 21 February 1945 caused the much-feared firestorm. Like with Ludwigshafen for Rhineland-Palatinate, for Baden-Württemberg, owing to effective air defence measures, the target concentration Stuttgart was only at sixth place in the province's list of destroyed major cities and medium-sized towns at the end of the war. In Bavaria, Augsburg, at least listed in the Bomber's Baedeker with two category 1+ targets, occupied seventh place with a level of destruction of 24%. In these provinces again those towns which, on the basis of the Bomber's Baedeker should not have been regarded worthy targets at all, were worst hit and again the most severe damage was caused immediately before the

* all figures refer to the (registered) inhabitants; Dresden, eg has at the time of the air raids, had been flooded by at least 100,000 refugees (some estimates go up to 200,000); most refugees were without shelter, personally unknown, and definitely not registered; nobody knows how many of them fell victim.

end of the war. 65% of Pforzheim was destroyed on 23 Februar 1945 after 44% of Heilbronn had been hit on 4 December. In Lower Franconia, the attack on 21 November 1944 on Aschaffenburg destroyed 38% of all housing before finally 75% of Würzburg was destroyed on the evening of 16 March 1945, thus making it the worst hit town of Germany. These highlights illustrate that from autumn 1944 and moreover from 1945 onwards, target selection based on war-economic importance had been relinquished. It was replaced by indiscriminate area bombing of a growning number of German major cities and medium-sized towns and was complemented by tactical-operative air raids in support of the ground troops, made possible by allied air supremacy. The list of the worst hit major German cities is as follows: Würzburg (75%), Dessau (63%), Kassel (60%), Hamburg (54%), Mainz (54%), and with Würzburg and Mainz contains two towns which in 1944 had neither a priority 1+ nor a priority 1 target. Of 39 German major cities and medium-sized towns destroyed by more than 40% at the end of the war, 23 (59%) had not been assigned a target of these priority levels in the 1944 Bomber's Baedeker. Among the 19 major cities and medium-sized towns with housing destruction totalling at least 50%, this applies to 12, ie even 63%, of the towns. The picture of regional and local destruction of German towns can therefore only be explained by the intermingling of two strategic air war concepts: the selective area bombing strategy orientated towards the number and importance of targets for the war economy, as favoured by, among others, the MEW, and the indiscriminate area bombing approach aimed at demoralising the civilian population, chiefly favoured by Harris.

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