

SRH-017

ALLIED STRATEGIC AIR FORCE

TARGET PLANNING

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A. Selection of Target Systems

Strategic planning requires a comprehensive knowledge of the enemy, involving geographic, economic, social and political factors as well as the strength, capabilities and plans of his fighting forces. Planning offensive programmes for the Allied strategic air forces against Germany was no exception to this rule, and it is not surprising to find that Ultra was only one of a number of intelligence sources which contributed to an understanding of the problems faced by Allied air commanders. Obviously only occasional pieces of Ultra intelligence were relevant to the problems of weighing the relative importance and vulnerability of such items as steel, anti-friction bearings, abrasives, coal, electric power plants, railways, and water transportation systems in Germany's war production scheme. Even in the initial consideration of attacks on the production of items more directly affecting the supply and equipment of the fighting forces, such as oil, ammunition, aircraft, tanks and U-boats, vital questions of production capacity, reserves and rates of consumption and wastage could not be determined without careful study of intelligence from all possible sources. Here, however, Ultra did produce some important evidence, often through the able but not always correctly informed Japanese Naval Attache in Berlin.

In June 1944 reference was made in Ultra to a new type of submarine which, according to further information, was the Type XXI, which had an under-water speed of 15 knots and was designed to spend most of its time at sea submerged. In October 1944 the Abwehr initiated requests for detailed information on convoys from the northeast coast of North America. In the same month Grossadmiral Doenitz referred to the impending start of a new U-boat campaign. These portents, together with information from P/Ws and photographic reconnaissance were responsible for forecasts in December 1944 that a portion of the strategic air effort would have to be committed against this menace in the near future. Actually, the Germans were unable to execute their plans, owing in part to timely bombing of construction yards, and the end of the war found them without the dangerous fleet they had planned. Similarly, the knowledge of

German plans for the employment of jet aircraft was an important factor in strategic air force plans, resulting in a series of attacks during the first part of 1945 on the light metal industry in an endeavour to impede the production of jet engines. Earlier in the war the decision to employ the strategic air forces against the V-1 launching sites under construction at the end of 1943 and in the early months of 1944 was based on the nature of the threat as revealed by Ultra in combination with other intelligence.

These three instances of U-boats, jet aircraft and the V-1 flying bomb are all examples of a defensive point of view in strategic air operations. Since they were concerned with armament and with operations actually contemplated, Ultra was able to supply significant items of intelligence in a manner which it could not imitate on subjects less closely connected with operations. Even the production of such items as aircraft and tanks was not normally within the province of MSS Ultra (although analysis of the works numbers referred to in GAF traffic was very successfully used as a basis for estimating output of aircraft, of both the jet and the orthodox types). It should be emphasised that even in the cases so far described Ultra intelligence was only one of the bases, albeit a valuable one, for major decisions on the employment of strategic air power. The other sources of intelligence provided a picture of the situation which was clarified and given further meaning by Ultra. As Ultra increased their usefulness, they enhanced its value.

Generally speaking, in fields other than those just mentioned Ultra was not a source of major importance in the initiation of target systems for attack. Once a programme was under way, however, results reported in Ultra were of real value in confirming the validity of the original conclusions as to the importance and vulnerability of the target system selected. The continuance of a programme of attack or a change in the relative priority of systems was guided in part by this type of Ultra evidence. The prompt and most satisfactory reaction to the attacks on oil was a notable example; Ultra was to a large extent responsible for the high priority given the oil targets as the war

progressed, and this may have been the outstanding service rendered by Ultra to the strategic air war in Europe. On the other hand, the Ultra reaction to attacks on anti-friction bearing plants was negligible, but no sound inference could be drawn from this silence which could have resulted simply from the fact that the traffic which was being read was not likely to deal with bearings. The fact that the bulk of, and the most reliable, Ultra information available was MSS and was concerned with HQs of the armed forces, primarily, and only incidentally touched upon matters of production and general economics had to be kept in mind. In the last six months of the war, it is true, an increasing volume of economic intelligence dealing with problems of individual factories and bomb damage to industry began to come through non-Ultra links, partially because of the setting up of the armaments HQs (Ruekos) to assist and co-ordinate activities of war production plants. This information was so fragmentary that it was of little direct use and, as no large effort was made to develop it, the information did not play a significant part in current appreciations. One use of this type of material was shown in a compilation of reports on coal shortages, made by the Air Ministry in early February 1945, which was relevant to plans under consideration for an attack on the railways surrounding the Ruhr. A more detailed description of the ways in which Ultra contributed to the determination of bombing results is given in section C., below, but it has been mentioned here because bombing results were quite as important in decisions on policy as in the day-to-day conduct of operations.

On the whole, it seems fair to say that the major decisions on the employment of strategic air power would have been the same had Ultra not been available. This opinion has been expressed by men in the economic field who have had an opportunity to observe the work of uninitiated colleagues, and it is borne out by observation of studies in more tactical fields. This is not to say, however, that Ultra was redundant or mere duplication. It was new intelligence, almost without exception, filling in gaps in Allied knowledge, confirming inferences made on other grounds and otherwise open to some question, and showing the state of the German mind.

It was on the basis of sound and well documented reasoning in the spring of 1944 that the attack of oil targets was urged as bound to be more productive of results than a continuation of the attack on aircraft production. But when Ultra revealed a shift in Flak defences from aircraft factories to hydrogenation plants in May 1944 after the first attacks on the latter, it was important intelligence that the Germans were of the same opinion as regards the relative priority of the two industries.

Valuable as Ultra could be to back up conclusions from other sources, there was always the danger of attaching too much importance to Ultra intelligence items. In addition to the elaborate security precautions, the fact that Ultra was often the only raw intelligence seen by higher commanders was likely to lead them to give it an importance beyond its intrinsic worth, and there was an additional danger that the soundness of conclusions not supported by Ultra might not be sufficiently appreciated. It has been found in practice that a commander may for these reasons be much more impressed by one Ultra quotation than by the mass of background material which justifies the acceptance of the Ultra conclusion. This "sales value" of Ultra had a worth of its own and was utilized in the presentation of material to commanders insufficiently moved by more prosaic forms of intelligence, but that use was hardly the most important attribute of Ultra. Its true merits as an especially valuable, prolific and reliable source of intelligence were quite separate and were always evident to those who worked with the material.

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B. Individual Target Selection:

The designation of individual targets to carry out a given policy involved the discovery and accurate location of installations of the prescribed type and then the evaluation of the relative importance of each such installation. In this somewhat detailed work of drawing up a list of the members of a target system, Ultra played little part. The instances where Ultra provided a lead to the discovery of targets as a result of analysis of reports of rail shipments, showing that certain products originated in given localities were very few.

One instance is known where an incidental reference to a firm revealed a worthwhile target for the programme against jet aircraft production. On 18 April 1944 OKL relayed a German Air Ministry communication concerning the Me 163^{*} which stated that preparation of ground crews for operations with this aircraft required "training with the firm of Walter KG at Kiel in the handling of the power unit." There was also a reference to the need for personnel to set up a "branch technical service of the firm of Walter Kiel" because of "continual power-unit difficulties". The inference that this firm was engaged in production of rocket propulsion units was clear. The USSTAF SI and AM Report states: "This particular message ... did lead us directly to a vital target which was effectively bombed, though reconnaissance troubles and weather somewhat delayed action." Of course, further intelligence had to be obtained to determine the exact location of the plant at Kiel, and probably enough was learned of the previous work of this firm to indicate that a jet propulsion unit was a possible product. In addition, another branch of the same firm near Prague was suspected of similar activity and later included in the anti-jet programs.

It is safe to say that Ultra never was sufficient by itself for target purposes. For bombing operations the target had

* Although this was the first Ultra reference to the Me 163, the Air Ministry already knew enough to comment, in the signal to Allied commands on the 19th, "This aircraft believed to be rocket-propelled fighter with extremely short endurance."

to be identified on a photograph, or at the very least, if urgency prevented obtaining photographs, on a large scale map. A verbal description or reference was by its very nature inadequate for this purpose though it could suggest to photo-interpreters a locality to examine for the installation referred to. In view of these limitations on Ultra and furthermore, since most of the knowledge about industrial Germany came from non-Ultra sources, it is not surprising that Ultra was rarely responsible for uncovering new strategic targets. Its value for this purpose was more as a guide to searches in other sources of intelligence than as a primary source itself.

With respect to the initial allocation of priorities among targets of a given system, Ultra could contribute evidence of activity at particular installations from reports of shipments, from notification of the commencement or cessation of production and from various other indications. Once a bombing programme was under way, Ultra gave a considerable amount of information on results and was of material assistance in readjusting target priorities as certain installations were knocked out and others recovered from damage. This use of Ultra is discussed in detail in section C., below.

In the tactical field where armed forces installations were concerned, such as Panzer depots, ammunition depots and fuel storage, there was, naturally, more Ultra information. Two examples of ^{tactical} target intelligence work are given to illustrate the integration of Ultra with other intelligence for this purpose. The problems in the strategic field would have been similar.

On 26 February 1945 Allied commands were passed the information that according to an Ultra message of 9 February a motor vehicle Central Spare Parts Depot was open and stocking up in Wermelskirchen (on the south side of the Ruhr). At the air force concerned, through co-operation with the related army group, this information was linked with a report from a P/7 which referred to a tank spare parts depot in a rail-served building about 200 metres long in Wermelskirchen. Examination of photographs showed

only one building in Wermelskirchen which would reasonably fit the description. Since at that time the air force was interested in all motor vehicle and tank installations, the appropriate tactical air command was told that this was a probable spare parts depot for motor vehicles or tanks and should be considered for fighter-bomber attack.

A second example in the tactical field is found in a message of 23 February 1945 (passed to commands 2 March) stating that production of certain types of ammunition at Sythen and Wulfen (on the north of the Ruhr) was ordered by OKH, in a reversal of a previous decision. In addition it was stated that direct taking over of the ammunition by Army Group H without allocation through channels was refused, as the intended production of two of the types amounted "to an excessively high proportion of the total production". This message tended to confirm the conclusion previously arrived at from other sources that the German ammunition position was strained. Ammunition filling plants were already known at both Wulfen and Sythen and had been identified on photographs but evidence as to the extent of activity had been lacking. In the light of this new intelligence attacks were ordered on these and certain other known ammunition depots.

In attacks on airfields, on which the strategic air forces were employed from time to time in a role more tactical in nature than strategic, the knowledge of the GAF which Ultra provided was invaluable. At at least four critical points during the war (i.e. during the period immediately following the Normandy landing, at the time the Ardennes battle reached its climax, in preparation for the Rhine River crossings, and as a final blow in April 1945) airfields were struck in an endeavour to curtail GAF operations for a limited period of time. For this purpose it was necessary to know what fields were operational and the type of units based at each location. No detailed explanation is needed here of the important part which Ultra played in selecting the airfields to be attacked in these operations, although Y intelligence and photography must also receive their due acknowledgement. By way of contrast, the attacks on French airfields prior to the Normandy D-day were bound to

be guided more by photography than by other intelligence, because as the purpose was to create an air "desert" which was to be an area devoid of physical facilities for aircraft servicing and maintenance, extending over the operational radius of action from the beachhead. The selection of targets for this purpose was based on the installations present and undestroyed rather than on current operational use, and photographic interpretation clearly surpassed other sources of information on these matters.

These examples are typical of the way in which Ultra was useful when other intelligence was taken into account as well. They show the usual dependence of operational HQs upon photography for location and identification of the target, and the value of Ultra in assessing the importance of the target. Neither source by itself could justify a bombing attack while the combination of two or three sources could and did establish a basis for action. In fixing priorities, the relative weight to be assigned to items of intelligence of similar reliability obviously did not depend on the nature of the source but upon the relation of the intelligence to the purpose to be achieved by attack. An appreciation of this fact might have reduced some of the argument between proponents of the various sources of intelligence, some of whom were inclined to rely on their specialities to the exclusion of others.

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C. Results of Bombing

As the preceding discussions have indicated, bombing results may be studied from the standpoint of individual target selection, that is, the day-to-day conduct of bombing operations, where it is important to know how much damage has been inflicted on a particular target, and also from the standpoint of assessing policy in the employment of air power, where it is important to determine whether operations are producing the desired effect on the enemy's economy and war machine. A third point of view is that of overall assessment of the state of the enemy, his will and ability to wage war. It is these last named factors, the enemy's will and ability to wage war, that are the ultimate concern of the supreme commander. The extent to which aerial bombardment contributes to their destruction can be measured, if at all, only by taking the sum of all intelligence and attempting to relate it to the various operations on land, sea and air. For the purpose of this discussion, however, no such exhaustive study, involving as it would all Ultra intelligence, can be made. Here it seems sufficient to show by example what sort of Ultra intelligence was of significance in the other two methods of studying bombing results: the progress of a particular bombing programme in terms of damage, and the assessment of the value of that programme in terms of the effects of the damage accomplished.

The immediate results of bombing are damage and destruction of physical installations and injury and death to people (plus the intangible effects on morale). Satisfying as it may be from a technician's point of view to contemplate these rearrangements of matter by explosive force and fire neatly conforming to well laid plans, they are only a means to an end, which is to deprive the enemy of the use of the installation: its productive capacity if it is an industry, its capacity for service if it is a transport or communication facility, its usefulness for fighting if it is an armament, equipment or supplies for the armed forces. This loss of use, in its turn, may cause a shortage of equipment, supplies, or fighting power which affects the actual conduct of operations; that is, the enemy's fighting suffers.

As an example of these progressive stages of the effect of bombing, the attack on a synthetic oil plant may be taken. After the bombing, photographs and various reports, possibly including Ultra, will show or describe what part of the plant was hit and how badly damaged it was. From the photographs or descriptions it is possible to estimate the effect on production and the length of time production will be curtailed; or, such information may be reported directly, perhaps in Ultra. Then as a result of the bombing of this and other oil production plants, an oil shortage may arise, very possibly reflected in Ultra from the wails of quartermasters. Lastly, the GAF may have to curtail operations for lack of fuel, a conclusion which might tentatively be drawn from estimates of production losses or might be furnished directly by the Germans in an Ultra message.

The effect of bombing on armed forces operations may be felt, not only in the interference with operations planned and in course of execution, but also in the planning itself, in that the enemy may realise limitations imposed upon him as a result of effective bombing and make his plans accordingly. Thus for a full appreciation of the effectiveness of bombing it becomes necessary to look into the enemy's mind as much as possible, to learn what he would have preferred to do had conditions been otherwise and to find out the factors which influenced his decisions. For these purposes Ultra was practically the only source of intelligence.

In the discussion that follows examples are given of the way in which Ultra contributed to intelligence of this progression of bombing results, taking in turn description of bomb damage, the loss of production or use of the bombed installation, and then the resulting shortage of supplies or equipment, with its effect on operations and plans.

1. Description of physical damage:

Ultra contributions to intelligence of bomb damage can scarcely be assessed properly without a prior reference to the

important part which photographic intelligence played in this field. It must be kept in mind that for the conduct of operations it was necessary to assess the results of every attack, so far as possible, and to do so in some detail. Photography best filled these requirements since it could be obtained on order, albeit subject to delay on account of weather, and in skilled hands it could yield much detailed information. One picture is still worth a thousand words. Nevertheless, Ultra did on occasion give bomb damage information in advance of photography where bad weather had intervened, and even where photography was available Ultra had the advantage of identifying structures by name or function, thus providing a useful supplement to and check on the photo-interpretation and other sources of information.

Reproduced as Appendix A are six Ultra messages chosen to represent the sort of information that did appear from time to time. Briefly, these are (1) an elaborate damage report on a night raid on the city of Karlsruhe, (2) reports from two sources on an 8th Air Force attack on the GAF experimental station at Karlsruher, near Peenemünde, where V-weapons were developed and tested, (3) a GAF report on an attack on the oil refineries at Ploesti, (4) a Luftflotte Reich air situation report detailing attacks throughout the Reich for a 24-hour period, (5) an Armaments District HQ report on damage to the Sythen ammunition plant, and (6) a similar report on damage to a synthetic oil installation at Scholven.

Although the RAF attack on Karlsruhe on the night of 26-27 September 1944 with about 1000 tons of bombs was of moderate size by usual standards, the report on this raid has been reproduced at length as one of the more interesting reports on area bombing. It showed the part which fire had in the destruction accomplished and the concern over fire fighting. Some 40% of industrial and commercial premises were stated to be destroyed, and damage to the railway, electricity, gas, and telephone systems was mentioned. About 28,000 people were estimated to be homeless (out of a pre-war population of 178,000). Nevertheless, assurance was given that "after a short interruption production continues at full

speed", and the statement of damage to "factories of war importance" did not show much effect. Although the report invites the conclusion that as a normal city Karlsruhe no longer existed it also brings to mind the reassurance addressed by Himmler to the head of the SS in Dresden after raids in February 1945:"

"I have received your report. The attacks were obviously very severe, yet every first air raid always gives the impression that the town has been completely destroyed. Take all necessary measures at once ..."

Himmler may have been referring to a police report from Dresden which concluded:

"In the raging conflagration that arose almost complete destruction of the city must be anticipated. Estimated that 500,000 are homeless. Reich assistance on the greatest scale immediately and urgently required."

By way of comparison with the Karlsruhe report, portions of the Luftflotte Reich air sitrep of 22 July 1944 may be noted, such as:

"Munich: Industrial damage slight. Heavy damage to buildings in centre of town and on the south and southwest."

"Dueren: Railway installations damaged. Heavy damage to buildings in adjacent parts of the town. Gas and electricity supply have failed."

These refer to attacks of 254 tons and 41 tons respectively and are typical of a large number of the reports forwarded by various Luftwaffe headquarters. They were too vague and general to be of importance operationally.

To a staff conducting operations against a given target system the most useful messages were those which detailed damage at a particular installation. Several examples of this type are included in Appendix A. From the GAF HQ in Rumania a complete report was sent on an attack against the Ploesti oil refineries

* The Himmler message was picked up in the non-Ultra police traffic. It is possible that the Karlsruhe report was one which normally would have gone through police channels but was routed otherwise because of damage at the main police station, mentioned in the report as destroyed. The contents are similar to, though more detailed than, the usual police report.

Police reports were generally decoded rather late (samples show intervals from two to four weeks) and were not regularly disseminated to commands as was the OSS Ultra material, though an examination of the messages shows a steady flow of information on bomb damage in what seem to have been routine raid reports.

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on 15 July 1944. Taking each refinery group in turn, it described the structures hit and the effect on production. Another example from the oil programme was contained in an Armament District report on the Scholven hydrogenation plant dated 17 February 1945 which stated: "Completely destroyed: pump house, heavy oil storage tank, electrical workshop, joiners' workshop." A similar description was contained in the Luftflotte Reich report of 22 July 1944: "Hydrogenation works Maltheuren near Brueck: damage to distillery, oxygen plant and among the tanks." The same message said of an attack on Schweinfurt with 231 tons:

"Considerable damage to ball-bearing factories. One shadow plant completely destroyed. Main railway station heavily ((damaged)), railway administration building destroyed. Railway traffic stopped for the time being."

Damage at the Sythen ammunition plant, which was selected as a target on the basis of Ultra evidence referred to in Section B., above, was described as:

"Boiler house damaged. Chimney severely hit. Pulley vehicles all destroyed. Production buildings mainly intact. Hand grenade production more seriously damaged. Total production at a standstill on account of lack of current, water and steam."

Descriptions such as these were of considerable value in weighing the need for further attack and readjusting target priorities. However, it must be pointed out again that photography did still play a part. "Damage to oxygen plant" is a useful statement but examination of a picture would enable the expert to verify which structure was the oxygen plant and to estimate how badly it was damaged. "One shadow ((ball-bearing factory)) destroyed" showed progress in the ball-bearing programme but it required a photo-interpreter to point out which factory to cross off the target list -- or perhaps to decide it was one we hadn't known of before.

The bombing of the GAF experimental station Karlshagen, Base Artillery Park 11 and Naval School Zempin, all grouped near Peenemuende, on 19 July 1944 by the 8th Air Force with almost 1,000 tons of bombs produced three messages which gave useful details of

* Unfortunately this message was, through oversight, never passed to Allied commands.

damage. The target was important as the centre of experimental and testing work on V-weapons. The messages revealed destruction of the hangar area with heavy damage to the heating and power plant, technical buildings, workshops, test benches, rotary converter station and railway installations. Aircraft destroyed and damaged were listed, casualties summarised, and the airfield was described as suitable only for liaison type aircraft. One statement, that the "instrumentarium was essentially serviceable" remained obscure because of doubt as to the nature and function of this installation, though it may have been a building for testing of instruments, or equipment.

An example from a more tactical field shows an instance of Ultra providing detail which photo-intelligence was unable to see. The Ruedesheim railway bridge across the Rhine east of Bingen was bombed on 13 January 1945 by the 8th Air Force, and photo-interpreters reported the bridge undamaged and passable after the attack. Ultra, however, in a message of 17 January (passed to commands on 20 January) gave the information that four longitudinal girders had been heavily damaged and that four to five days would be necessary before the damage could be made good. What had been thought to be an unsuccessful attack was thus found to have caused an interruption of traffic for eight or nine days.

To illustrate the limitations of damage reports, eighteen messages contained in twelve LSS reports on the RAF 5,000-ton attack on Kiel the night of 23-24 July 1944 have been assembled as Appendix B to this paper. They are given in the order in which they were reported to the Ministries in London, not in the sequence of origin. The earlier reports were shorter and less detailed; the later reports varied in their emphasis on different aspects of the damage. Most of the reports were from naval HQs, the first ones at 0100 and 0200 hours on the 24th containing scattered details. Two messages of 0900 and 1100 hours dealt mainly with damage to the Holtenau locks, restoration of the northern lock to working order, and delay at the southern lock because of an unexploded bomb. The 0900 hours message also described damage to Flak installations. By the afternoon of the

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24th a detailed report of shipping and floating dock installations sunk or damaged had been submitted, but curiously enough the sinking of possibly 3 U-boats and damage to possibly 4 more U-boats were separately reported in three messages, which leave some doubt as to the correct totals because of possible duplication. None of the reports mentioned mining of the harbour but it had evidently been discovered by the 27th when the fact was cited as indicating the possibility of mining in connection with future raids on ports. Naval War Staff mentioned the bare fact of the raid in its summary issued on the 25th, whilst Luftflotte Reich on the morning of the 24th had boiled it down to some general remarks for its sitrep. The target presentation Gruppe at Kiel-Holtenau GAF station detailed the damage to the airfield and seaplane installations; messages from other GAF HQs formally closed the field, and reported damage without details. Industrial and supply damage was scarcely mentioned in any of the messages. One report gave as results, "Direct hits on administration and supply depot building and on 2 barracks", and "local clothing depot on fire". Another stated, "Severe damage and temporary cessation of work in dockyards. Ordnance arsenal's activities will be interrupted for a fairly long time." Perhaps the most interesting item was a message devoted solely to the statement that the "Walterwerk" was not hit, although a failure of electricity would probably stop production for one or two days. This was apparently the plant engaged in making propulsion motors for the Me 163, which has previously been mentioned as selected for attack (though probably not an aiming point in this particular raid) on the basis of Ultra evidence.

Examination of these messages demonstrates a truism of Ultra intelligence: the information was only as reliable as the German originator of the message. Intelligence officers assessing bomb damage had to discover, if possible, whether the originator really knew whereof he spoke, whether his words adequately conveyed what he did know or, even, whether he was deliberately misleading either to make a case for assistance by exaggerating damage or to sustain morale by minimizing damage. These messages

show particularly the danger of accepting any message as containing the full story, and the impossibility of inferring from the absence of Ultra evidence that there had been no results. Without the express negative as to damage to the Walterwerk it could not have been stated on the basis of Ultra that the plant was undamaged although 17 other messages said nothing on the subject. Even a "No damage" report was open to suspicion. For example, Flak units made regular battle reports on any engagement with aircraft on a proforma that provided for a statement of damage resulting from the raid. This could and often did refer merely to damage to Flak installations, so that a successful attack on an airfield might nevertheless result in a "No damage" statement by the Flak unit. The interests of the reporting unit clearly had to be taken into account. In the Kiel messages this same factor appeared in the GAF reports which concerned only the airfield and sea hangars, whilst the naval reports showed their interest in naval matters. This parochialism naturally accounts for the lack of information on industrial damage in MSS Ultra, for none of the HQs whose messages were regularly read had any direct concern with industry until the appearance in Ultra of the Armaments Districts and other headquarters of the Ruestungstab in early 1945.* The material from this source will be discussed further below.

Before leaving the subject of bomb damage description, mention should be made of the fact that diplomatic traffic occasionally included descriptions of damage to cities like Berlin. These had a value above many of the diplomatic messages, to the extent that they were based on personal observation, but they were not significant for any particular class of information, unless perhaps as estimates of German morale.

* Armaments Inspectorate XVII (possibly co-extensive with Wehrkreis XVII in Austria) was, however, picked up in Ultra at least as early as May 1944.

Any verbal description of physical damage is bound to have limitations. Many of the limitations of Ultra intelligence in this field stem from that fact, and it was not surprising to find that operations officers turned from the German summary to actual photographs, if they could obtain them. They did, in fact, turn from their own photo-interpreter's report to the pictures, in spite of all that intelligence men could do to urge him to rely on the expert's opinion. This is not to say that conscientious operations officers were inclined to ignore the German's or the Allied photo-interpreter's opinions, but that with a picture for context the opinions and descriptions had far greater meaning. This difficulty is apparent if one reads the messages cited above and tries to gain from them an adequate understanding for a decision as to whether the attack should be repeated and, if so, against what part of the target.

2. Loss of production or use of the bombed installation:

The Ultra contribution to the bombing story increased as the circle of effects expanded. Estimates of lost production time could be made by deduction from photographic evidence but Ultra frequently provided the conclusion directly and usually more reliably, although the Germans could make erroneous judgments too. One of the notable examples of information of this type is contained in the Ploesti report previously referred to, where the production possibilities of each refinery were mentioned, and the capacity of the entire field summarized. "Resumption of production ((at Romana Americana)) in approximately 8 days", "Vega can probably resume production in 8 days", and "No interruption to production ((at Standard))" were valuable reports in assessing results. The difficulties with German statistics, however, are illustrated by the comment appended by Hut 3 to the Ploesti message (see Appendix A) which concludes that one of the figures is a misprint. The comment also demonstrates the fallibility, and perhaps the optimism, of German estimates by pointing out that the actual production eight days later as reported in Ultra fell short of the estimates by 3,000 tons, or some

The report on the Peenemünde raid stated:

"In about 14 days ((the Artillery Park)) will have resumed its activity in full except for one installation. GAF ((experimental station Karlshagen)) will be fit to receive work in about 3 weeks, if ... places can be provided in good time."

These two sentences provided a basis for estimating the results of the attack considerably better than anything that could be determined from studying photographs of the physical damage, since it was difficult to weigh the importance of each structure to the functions of these stations.

The report on the Scholven hydrogenation works stated, "The plant, which had just started out with small scale production, will be put into operation again in about 8-10 days." Thus the timing of the attack was verified and a basis furnished for planning a further attack within a short time. Similarly the report on the Sythen ammunition plant showed production stopped for lack of electricity, water and steam, and continued, "The production of 100 tons of high explosive ... is not possible on account of air-raid damage. Stop deliveries from Bitterfeld." Evidently a particular order could not be fulfilled and delivery of materials for production had to be halted. Negative information, such as has been cited from the Ploesti report, that production was not affected was of value where there was actual damage which might wrongly have been interpreted as interfering with output.

If the premise be accepted that foreign diplomats were not likely to be given information which would exaggerate the effect of Allied raids on Germany, a message of the Japanese Minister in Vienna dated 25 February 1944 is of interest. He stated that damage to a "motor car and ball bearing" factory at Steyr was "not so very great" after an attack of 23 February but damage to the electric power station would shut down the plant and a subsidiary works manufacturing tanks for two or three weeks. He also related that the Hei r Neustadt Messerschmidt factory had been moved because of bomb damage, and the transfer plus a shortage of iron and tinplate had resulted in production only one third of that contemplated.

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Ultra reports on damage to rail lines might be considered under the previous heading as descriptions of physical damage but, since they were important primarily for showing what rail lines were impassable, it seems more appropriate to treat them here in the discussion of loss of use. Ultra provided rather good coverage on the Italian railway situation, and in February 1944 when the Air Ministry made a study of the effectiveness of railroad bridge bombing a considerable part of the material relied upon was obtained from this source, and the conclusions reached were important for the planning of the Normandy invasion, where bridge bombing was made a part of the air programme on a trial basis.** Most of the messages used were simply direct reports of a bridge destroyed or damaged so that traffic was interrupted, with an estimate of time required for repair frequently added. Sometimes, however, less direct evidence was available. One message was summarised thus by the Air Ministry:

"Source MESS gave a list of supply trains destined for central and southern Italy crossing the Italian frontier on the various routes into Italy from 8 Sept 1943 onwards: this list contained no trains crossing the Brenner before 2305 hours on 12 Sept 1943."

The attack on the railway system in Germany also produced a considerable amount of Ultra material, although the complexity of the German rail network compared to that in Italy made the information less directly useful. At the end of February 1945 the Air Ministry compiled Ultra evidence of damage to German communications for the period from October 1944 to February 1945, inclusive, in a paper for the use of the strategic air force commanders. That evidence is reproduced as Appendix C, below. The extracts show a large number of reports on bridges and numerous references to traffic interruptions. Of interest also among the specific items are statements of damage to locomotives and trains caused by fighter-bomber attacks.** The Chairman of Armaments Commission and Wehrkreis Commissioner XII B complained sadly on 29 December 1944 that enemy fighter-bombers had, during the last

* Bridge bombing is considered to have proved itself beyond question in the Normandy campaign, although no outstanding Ultra evidence is available.

** Although there was by no means sufficient Ultra evidence to assess results of fighter-bomber attacks in general, there was a scarcity of immediate intelligence on this subject and every such item was of interest to the tactical commands.

few days destroyed traffic installations on an extensive scale and brought the laborious repair work to nothing within a few hours. Telephone facilities hardly existed and it was impossible to re-route trains. He concluded by asking for fighter protection. This message referred to the area west of the Rhine between the Moselle and the Saarland where the XIX Tactical Air Command was doing such effective work in front of General Patton's Third Army. It is noticeable that useful information on rail installations was available less frequently on targets in Germany distant from the Western Front. There was little in Ultra of importance on the extensive bombing of marshalling yards carried out from November 1944 onwards. The Hamm marshalling yard did appear several times and there were occasional brief reports, such as that of 31 December 1944 on Koeln/Grenberg where it was stated that all traffic was blocked and traffic would be resumed in about 14 days. Interruption to through lines was likely to be mentioned if there were any details at all, but loss of use of marshalling yards, locomotive servicing facilities and the like were infrequently reported.

Production in an industry as a whole was not likely to be a subject of MSS traffic but the diplomatic messages provided some information of this type. When the Japanese Naval Attaché at Berlin, a month after the devastating series of attacks on aircraft production in February 1944, had an interview with Genfeldm Milch, who was responsible for provision of aircraft for the GAF, the German was reported as stating that production of first-line aircraft remained at about 2,600 to 2,700 a month but a planned increase had not taken place because of "transfer of plant carried out in expectation of intensification of enemy air raids, strategic bombing by British and American aircraft, production of new types, etc." He was also reported as giving the monthly production of fighters during February and March as 1,400. Although USSTAF in its report states that these figures are double the Allied estimate on fighter production, Milch was correct at least in his admission that a projected increase in production had not been possible because of bombing.

A similar type of report on oil production is found in a message from the Japanese Military Attache in Berlin, dated 17 February 1945, summarising the effects of bombing of German oil installations. He stated:

"... after the first five months the output had fallen to 25%, but subsequently, owing to bad weather and the repair of installations by the German authorities it was restored temporarily to 55%. But from December onwards heavy bombing has again been continued, and consequently the factories in the Ruhr, Hannover and Hamburg have been destroyed. The monthly output is thus now 100,000 tons, that is, it has fallen to one fifth of the amount produced a year ago."

Where the Japanese got his figures is unknown but it is interesting to compare them with a report by the Japanese Naval Attache dated only five days later. After observing that the loss of oil production through bombing and capture, and the interruption of fuel supply and distribution by bombing were having "a very great effect on the future of the war", he mentioned the contemplated underground plants and showed some scepticism as to whether the programme would be attained. He went on to say:

"At present their ((the Germans')) yearly production of natural oil (300,000 - 500,000 tons) and synthetic oil (2,500,000 tons) is said to amount to a total of 3,000,000 tons. However, even supposing 10% of the synthetic oil is refined for aviation fuel, the yearly production would amount to 800,000 tons and even if they have besides a certain amount in store, it will be very difficult for the Germans adequately to maintain their air force at its present strength or increase it, taking their transport problem as well into account."

These two contributions by the Japanese, one from the military and one from the naval side, show the difficulty of extracting quantitative conclusions from Ultra. What the military attache's 100,000 tons refer to is problematical. Whether the naval attache's figure for aviation fuel -- 67,000 tons a month -- means the same thing is another question, as is the matter of whether the latter figure takes account of the projected production from underground plants or even of bomb damage. The descriptive tenor of both Japanese reports was correct enough. The oil situation was critical and production was cut lower than ever before. The Allied experts, analysing photographs and every other scrap of evidence, were in agreement on this score, and it is likely that they could have made a more reliable estimate than the Japanese.

It was a German, however, who had the last word on oil production. On 16 April 1945 Genfeldm Keitel, Chief of OKW, found it necessary to criticise Army Group G for unauthorised encroachment upon fuel reserves at the Neuberg-am-Danau depot, stating by way of emphasis:

"After the loss of all new production the intentions of the supreme commander are specially jeopardised on the other fronts in the east and north in a way which can no longer be remedied, since supplies have already become extremely scarce."

Whether or not Keitel really knew that his statement about oil production was true and although it was hardly news to the Allies, it was the ultimate in German declarations on the oil story. The rest of his message may be dismissed as simply a vast understatement.

3. Shortages and effect on German operations:

If the assumptions on which a given industrial target system had been chosen were sound, effective prosecution of the bombing programme should have resulted in a shortage of the product of that industry. Thus a determination that such a shortage had been created was confirmation of the validity of the original arguments for the target system and a valuable guide for future planning. The cause of a shortage, however, was not always apparent. It could have been caused by a fault in the enemy's original plans for production which failed to anticipate requirements; that is the probable explanation of an aircraft shortage reported in December 1941 as affecting the GAF on the Russian front. Similarly, a shortage in a secondary theatre of operations could be attributable to a low priority on available supplies for that theatre rather than to any drop in production. Even more common as a cause for shortage was difficulty with transportation. German quartermasters in the Normandy campaign were likely to be short of everything, but the immediate cause was clearly what von Runstedt called the "traffic desert" surrounding the battle area. Even in the industrial field it was difficult to separate the effect of transportation bombing from production bombing and in fact the two were closely related. Bombing of industry drove the Germans to disperse manufacture among

smaller plants and into separate stages so that no one attack nor even a small series of successful attacks could seriously affect total output. Bombing of the railway system thus became more profitable since it was the main link between the dispersed plants. Likewise the complex relation of industrial plants, with each one depending on products of several others for operation, made any attempt to trace the cause of a particular breakdown a difficult task.

Ultra provided a considerable part of the evidence on shortages. As has been stated before, Ultra was at its best where the Wehrmacht was directly concerned and there it was a natural channel for voicing complaints or warnings of important supply difficulties. On the other hand, in industrial fields where the product was rarely used as such by the Wehrmacht there was not likely to be much of value in Ultra on shortages. With respect to ball bearings, for instance, apart from a sensitiveness shown by a move of Flak and smoke screen in October 1943 to Villa Perosa, where an Italian ball bearing plant was located, an indication of shortage has been found in only one message. On 2 October 1944, as the withdrawal from France was slowing with only Alsace-Lorraine remaining in German hands, a Luftgau engineer office, addressing a GAF equipment issuing station near Stuttgart, ordered that ball bearings and roller bearings should have first priority in bringing back of armed forces equipment. An isolated message such as this had little value and other sources than Ultra had to be relied upon for assessing the worth of the antifriction bearing programme.

The leading example of Ultra intelligence of shortages was without doubt on the subject of oil. This evidence was so prompt and persuasive that it may well be considered one of the principal contributions of Ultra to the conduct of the air war. Some of the indications of the importance the Germans attached to the maintenance of oil production, notably the shift in Flak defences from aircraft factories to hydrogenation plants and the remarks of the Japanese Naval Attache in March 1945, have already been mentioned. That the German oil situation was never comfortable was well known, even before systematic bombing of oil targets began, but the degree of

discomfort was not then ascertainable. There were occasional messages such as two indicating a strained fuel situation in Italy in August 1943, but with May of 1944, when the strategic air forces seriously entered into a programme of bombing refineries and synthetic oil plants, a flow of Ultra messages on oil began which ended only with surrender a year later. The first one of this series is of interest because a naval formation on 22 May 1944 in ordering economy in "consumption of mineral oil in every form" gave as a reason: "in view of effects of Allied action in Rumania and on German hydrogenation plants, extensive failures in mineral oil production and a considerable reduction in the June allocation ... are to be expected."

It was not often that messages were so explicit as to cause. With the Normandy landing, reports from ground force units began to come in, and on 23 June 1944 the QM of I SS Pz Corps requested more fuel saying that "the allocation of 200 cbm has still not made it possible to reach the minimum amount of fuel necessary for the conduct of operations." This situation was undoubtedly the result of transportation difficulties rather than lack of production of the relatively small amount of fuel required, and it also had to be kept in mind that a QM was likely to overstate the importance of the needs for operations of the fuel he was requesting. That the situation, however local, was more or less chronic was shown by a number of complaints, including one by C-in-C West, Genfeldm von Kluge, when he based his request of 16 August 1944 for permission to withdraw from the Argentan-Falaise pocket on a deficiency of tank forces, plus a shortage of fuel, which was "the contributing decisive factor."

In the meantime the GAF, too, was showing signs of trouble. A training programme for bomber pilots intended to be conducted by KG 100 at Toulouse was cancelled by OKL on 24 June 1944, "on account of the restricted fuel allocation." On 6 July 1944 Goering ordered transport and liaison flying to be cut to the minimum necessary for operations, and forbade the use of aviation fuel in motor vehicles except in emergency cases decisive for the war. The impact of one shortage on another was

demonstrated by a report of 13 July that the salvage of crashed aircraft "very important for conduct of war" was being frustrated by lack of fuel". By the end of July it had been announced that "all ceiling testing flights at factories and transit depots are being abandoned owing to fuel shortage", and Luftflotte 3, in the west, was preparing to withdraw fuel from airfields not required for operations, "applying the most exacting criterion." These were clear enough indications that there was no abundance of fuel in the rear areas, and the deliberate sacrifice of operational airfields was a blow at flexibility not likely to be suffered except for compelling reasons.

On 11 August 1944 a more direct restriction on operations was promulgated by OKL which ordered "further considerably greater reduction of all flying activity" because of further damage to fuel production. Specific measures included directions that only fighter operations in defence remained unrestricted and that recon ops were to be carried out only when essential for the general conduct of operations and security. Bomber and ground-attack operations were to be limited to "decisive actions". The evidence was quite persuasive by this time that the shortage of aviation fuel was interfering with operational plans. Not only did Ultra establish this fact in a manner which no study of production figures based on the most expert analysis of bomb damage and reconstruction photographs could do, but it continued throughout the remainder of the German war to give assurance that the fuel situation was not being relieved.

The Ultra evidence on shortage of motor fuel was just as persuasive. As was to be expected because of the disproportionate amount of GAF traffic being read, the GAF supplied much of the information on this subject, but a shortage of fuel for GAF vehicles was impressive since transportation problems were not likely to be the cause of shortages at airfields and an overall shortage could be inferred. A reduction in motor vehicle journeys to the operational minimum was ordered by Luftflotte 3 on 3 July 1944. Fliegerkorps XIV (in charge of all air transport) on 11 July ordered 30% of all passenger motor transport vehicles to

be taken out of service to economise fuel. On 12 August pursuant to an order, apparently of general application in the GAF, standard model cars of more than 2 litres capacity were being laid up pending conversion to gas. On 13 August OKH ordered a widespread conversion of motor vehicles in supply units and staffs to producer gas. The revelation by Ultra of the continuous flow of economy measures and references to the strained fuel situation from every branch of the Wehrmacht -- and occasionally auxiliary organisations -- throughout all German-held territory, and on every front was responsible in no small measure for the general acceptance by all Allied commanders of the priority given oil production targets over competing demands for employment of the strategic air effort.

Even more impressive than the satisfactory evidence of the influence of the oil shortage on general policy, were the smaller-scale evidences of the effect on particular operational plans. One such example is found in a decision of 21 November 1944 not to employ fighter protection for the pocket battleship "Admiral Scheer" on an approach passage to shell Russian troops on the Sworbe Peninsula at the entrance to the Gulf of Riga. Fighters were held at cockpit readiness but were not to fly escort because of the fuel situation. The fuel shortage was clearly imposing serious added risks to German operations when decisions such as this had to be made.

On the ground force side one of the more interesting tributes to the effectiveness of Allied air operations was made near the end of the Ardennes battle on 7 January 1945 by the operations officer of the Fuehrer Escort Pz Bde. His message (which is reproduced in its entirety as Appendix D) contained the statement:

"This fuel situation is no exception but a regular state of affairs. Fuel is a means by which operations are conducted. In the present situation, however, fuel dominates the conduct of operations."

The final sentence might well have been applied to the entire Wehrmacht for it was clear enough that no plans could be made without careful consideration of the fuel problem.

The situation in the Eifel was particularly acute, because preparations for the offensive had not been able to include either a sufficient supply of fuel to start with or more than minimum dump stocks. Hence the aerial onslaught by tactical and strategic air forces on rail and road communications west of the Rhine rapidly brought the fuel situation to the disastrous state described. Allied air operations were so effective that on 28 December the operations officer of Army Group B gave the following description:

"((Allied)) Air Force dominated the skies today too and made full use of this by systematic destruction of all traffic centres. All-out employment of our own fighters resulted in only very limited (C) relief).

"The progressive destruction of railway lines and stations and of multiple road junctions in the Eifel is making the supply situation tense in a way which threatens to be dangerous. ((Comment: missing words probably: Railborn supplies must)) be unloaded at the Rhine. The long distances from the troops resulting from this cannot be covered sufficiently or quickly enough in view of the lack of fuel and tonnage space."

This description is practically a paraphrase of what an Allied operations officer might have written as a statement of our own intentions. Three days later a C-in-C West report showed a lack of optimism in saying:

"The deficiency in supplies in the area of Army Group B caused by the railway situation can only partly be made up with the available lorry transport space. The strained situation in ammunition and fuel is therefore expected to continue."

E/W evidence on local supply difficulties was abundant during the Ardennes battle but Ultra evidence was a welcome and authoritative confirmation of the widespread handicaps which affected the attacking German forces as a result of the concentrated air effort.

The shortage of aviation and motor fuels would not, however, affect directly the operation of jet aircraft, which used a lower grade fuel known as J-2, akin to diesel fuel and easier to produce. It was welcome news, therefore, when OKL on 20 February 1945 ordered that the restrictions applicable to use of fuel in orthodox aircraft applied to the jet types as well. Particularly, the taxi-ing of jet aircraft under their own power

was banned, since the Me 262 consumed 200 litres of fuel while taxiing 5 minutes. It was stated that "monthly production, compared with possibilities of consumption is very small so that fuel for current needs must be met by eating into stocks, which are also very small." Possibly correlative with this order was one of OKH on 24 February placing diesel fuel on a quota basis and stating that it was no longer to be considered an "alternative fuel". Ultra thus proved repeatedly that the oil programme was a success and provided a strong argument for the destruction of every remaining gallon that could be found of the liquids that had become so precious.

None of the other major strategic programmes was so effectively documented in Ultra as the oil programme. It is fair to conclude that at about the time when the shortage of aircraft might have become a serious problem -- the latter half of 1944 -- the fuel situation already dominated the scene and commanders were more concerned with operating the aircraft they had than with asking for more. Mention has already been made of the interest in salvaging aircraft in the Normandy campaign, a process that was handicapped by lack of motor vehicle fuel.

The scarcity of information on the ball bearing situation has also been mentioned, the order for priority in bringing back from Alsace-Lorraine standing practically alone on that subject. It is interesting to note that the relative priority that was attached to bringing back of various types of equipment and supplies in a withdrawal furnished useful evidence of the supply situation more than once. Not all the shortages thus revealed could be credited to bombing, but the interest in machine tools for aircraft production on 14 October 1943 seems to have been significant. It was not surprising to hear Luftgau West France on 11 August 1944, when the retreat from France was gathering momentum, order that "in all evacuations fuel stocks, down to the last pint ((mist)) be taken back."

Complete appraisal of the strategic programmes against railway transportation was difficult to make even when all sources

of intelligence was considered, and it was easily most controversial subject of the war so far as employment of strategic air power was concerned. Effects on operations were sometimes recorded as in the summary already quoted of the Army Group B situation in the latter stages of the Ardennes battle. The situation in Italy was more or less chronically a cause for alarm; in December 1943 Kesselring's OMG complained of the difficulty in complying with motor fuel economy measures in view of the interruption of railway lines by bombing and the need to carry out large movements by motor vehicles. The strategic bombing of railway centres in Germany was bound to affect industry primarily, rather than the Wehrmacht directly, and it is not surprising that the Ultra contribution in this field was limited. Appendix C contains a full and representative series of extracts from German messages on railway damage which demonstrates the usefulness of Ultra in reporting traffic interruptions, although it must not be assumed that these reports cover more than a fair fraction of the interruptions actually effected. What these interruptions meant in terms of war production, supply movements, and troop movements was the difficult question which Ultra did not answer directly, and it was necessary to amass a large amount of P/W and photographic intelligence as well to arrive at a conclusion. Now that the full returns are coming in (autumn 1945), it seems possible that Allied intelligence officers did not at the time have a full appreciation of what railway bombing was doing to the German economy.

An elaborate study of the Ultra traffic of Speer's armaments organisation might have yielded eventually a rather complete picture of the state of German war production which could have been useful in showing bombing effects, but it is doubtful that enough information was available during the interval between mid-January 1945, when the material began to appear in volume, and the end of the war to constitute more than a fair beginning. An emergency war production programme had been devised and the armaments authorities were evidently charged with pushing it through, seeing that necessary priorities were arranged for

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materials and transportation, and taking care of arrangements between firms. Each industrial area, such as the Ruhr, was under a planning staff to co-ordinate the production of the entire area and to supervise the separate armaments districts into which the area was divided. As far as is known there was no large attempt to work out the details of the "emergency programme" or to find out exactly where it was running into difficulties and weakness. Whether or not the material would have repaid such an effort was, of course, for experts in the economic field to decide but the interest to strategic air operations is apparent.

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D. Addendum

The foregoing analysis has dealt with industrial and some military targets without much general consideration of the intelligence concerning the opposition which had to be overcome before those targets could be attacked successfully. On this point a caveat is necessary to give a proper perspective for the conclusions suggested above. It was summarized in May 1945 by the American HQ which had to combat ^{- a large part} ~~most~~ of the day-fighter interceptor forces in Germany:

"In the larger sense, however, Ultra was the root of our strategic target intelligence because of the knowledge it gave us of the strength, disposition, composition, production, wastage, reserves and serviceability of the German air force, which was our major strategic target until April of 1944. These, from the strength report of a unit to the works number of an individual plane, were the raw materials of knowledge that produced most of our picture of the institution we were attacking."

APPENDIX A

EXAMPLES OF BOMB DAMAGE

DESCRIPTION

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APPENDIX A

(1) Karlsruhe area attack :

Report addressed to Berlin-Wannsee stamped 1730 hours on 29 Sept 1944:

Damage report on the air raid on the city of Karlsruhe:

Air raid warning 0254 to 1429 hours. The raid started at about 0300 hours and lasted till 0325 hours. The attack was carried out by 300 bombers against all parts of the city. Type of attack: a definite terror attack. Weather: very cloudy. Defence: details of aircraft shot down not known. Bombs dropped: 600 high explosive, 30 landmines, 200,000 nose-rod incendiaries with high explosive element, 75,000 nose-rod incendiaries without high explosive element. Local defence forces *Seibtschutzkrafte* shot up by aircraft armament in all parts of the city. Fires: 310 large fires, 449 medium fires, 5890 small fires. The following were employed in fire-fighting: local defence forces, fire-fighting platoons of the PAD Police *Luftschutzpolizei*.

As a result of the attacks on Strassburg and Mannheim only small forces could be asked for from there. The male population and the Hitler Jugend is employed principally in the construction of the Vosges defensive wall. These forces were lacking in the fire-fighting. The readiness for action of the whole population and the level-headed behaviour of all citizens were exemplary and made it possible to avoid higher casualties. The total number of homeless, so far ascertained, is 28,000.

Casualties and damage to buildings established to date:

20 killed, 30 buried under debris and not yet dug out, 1,235 injured, including smoke casualties. Dwelling houses: An exact survey is not yet possible, as individual fires have broken out again: 1,000 totally destroyed, 1,100 seriously damaged, 12,500 medium damage, 2,010 slight damage, 5,000 damage to glass. Factories of war importance: One important factory totally destroyed (postal M/T factory). One main factory medium damage. Two office buildings of important factories seriously damaged. After a short interruption production continues at full speed, the employees being only temporarily engaged in fighting the large fires. 40% of industrial premises and 40% of commercial premises totally destroyed.

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During the attack about 1,200 head of cattle were killed. Large quantities of hay and straw stocks destroyed. Not yet possible to give detailed figures. Reichsbahn: 4 buildings badly hit. Post: 3 buildings badly hit. Port installations: One building destroyed, 4 buildings badly hit. Ships: 4 seriously damaged, one medium damage.

Armed Forces buildings: The following barracks totally destroyed: Grenadier Barracks, Loretto Barracks, Forstner Barracks, Rhein Barracks, Madra Barracks. In addition, the local HQ and the Armed Forces Reporting Office *£Wehrmeldeamt£* were destroyed. The following Party and official institutions were destroyed: The Rathaus, the Ministry of the Interior, the Ministry of Education, the City Court *£Amtsgericht£*, the University *£Hochschule£*, the Main Police Station and 4 local police stations. One hospital completely destroyed, 2 hospitals badly damaged. One school completely destroyed, 7 schools badly damaged, one school medium damage, 3 schools slight damage. 3 churches completely destroyed, one church badly damaged. One power station slightly damaged, resulting in partial failure of current. The gasworks was again badly hit.

The following historical monuments were completely destroyed: Karlsruhe Castle, the oldest historical monument in the city; the world-famous fan-shaped layout of the City of Karlsruhe has thereby lost its centre. The Baden State Theatre was completely burnt out with all subsidiary buildings; only a very small part of the theatre properties could be rescued. Famous distillery buildings completely burnt down. Evangelical City Church, Catholic City Church, former State Diet *£Landtag£* building, seat of the State Cultural Administrator *£Landeskulturwalter£*, office of the Reichsstatthalter, Technical College, studios of the Karlsruhe Artists still standing after the destruction of the Art School, totally destroyed. The two largest cinemas in the city completely destroyed.

Provision of foodstuffs for about 28,000 guaranteed, after major difficulties, by communal feeding kitchens of the Nat Soc Charitable Organisation *£NSV£*. The general commissariat situation of the city's population is very strained ... (a few words smudged) ... the total

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Authority *MMD 947022*

unserviceability of the goods (C₁ station) ... (several words smudged) ... possible improvement. The lorries indented for by the NSKK have not yet all arrived, as a large part of these vehicles are employed on the construction of the West Wall. Vehicle traffic inside the city itself only possible with great difficulty, as there are large devastated areas. All personnel are now being used to clear the roads.

Main railway station badly hit. Passenger traffic again possible on a very limited scale. Urgently needed goods traffic is being carried out on passenger lines. Electrified suburban lines are again running. Transport of war workers to the factories is assured. Tramway traffic inside the city will be stopped for weeks. Telephone connections in the city environs are interrupted. An emergency exchange has been set up, with repeater installations *Verstaerkeranlagen*. Telephone communication with the larger towns not yet possible. Berlin can only be reached by W/T. District Directorate *Kreisleitung* Karlsruhe can be reached via GAF. W/T Station Boeblingen with direct line to Karlsruhe Airfield. Eastern mains cables *Stromnetz Ost* partially disrupted; this was the cause of the failure of the warning sirens. Siren vans and loudspeaker vans of the Party organisation were put into operation on receipt of warning. Fire-fighting and clearance work in the city are being interrupted by continuous low-level attacks by enemy fighter formations.

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(2) Attack on Peenemuende -- GAF Station Karlsruhen :

First report

From Erprobungsstelle ((Test Station)) Karlsruhen, for information, via Schwerin, to HQ of Erprobungsstellen Rechlin, Gellip ((Luftgau)) III Berlin, ((Luftgau)) XI Hamburg, on 18 July 1944: Attack on GAF station, GAF Erprobungsstelle 1 Karlsruhen. Flak preliminary warning, 0546 hours: air-raid warning 0705 hours. First bombs dropped at 0800 hours. End of attack at about 0830 hours. Strength of aircraft operating: about 400. Type of attack: bomb carpet by formations ~~SPulka~~ of 15 to 30 aircraft. Attack without fighter control, * height of enemy aircraft during attack: 4,000 to 7,000 metres. Direction of attack -- ((few words smudged)) -- course, 220 over target. Type of aircraft not recognizable.

Results of attack: Casualties: 1 soldier fairly severely wounded, 4 soldiers slightly, 4 concentration camp prisoners dead. Hangar area totally destroyed, fires controlled, duty ~~M/T~~ squad ~~Fahr-Bereitschaft~~ totally destroyed, office buildings partly destroyed (B₃ shelters) undamaged, hitted camp partly destroyed.

Aircraft report: Following aircraft have been destroyed: Of the Erprobungsstelle: He 111, SWIK, FZG 76, 100%, He 177, NBOZ, Do 217, KMK, Me 108, KEMR, FW 44, KEMU, Fi 256, DEWD are 100%; Do 217, TELU, partly damaged, FW 190, VLEQ and Me 110, FGSC, partly damaged. Of firms and units: Ju 188, TEWJ, Fieseler, 100%. H(C₃ e 11)1, SGLQ, KG 3, He 111, LGAL, KG 3, He 111, RBY, KG 3, Fi 99, Fieseler, are 100%; Ju 88, 5TEM, ~~***~~ partly damaged. Fifteen aircraft, of which eleven 100%.

Defence by heavy Flak Successes of defence cannot yet be ascertained, will be reported later. (B₃ unit ~~Edienststelle~~) severely damaged, no casualties. Instrumentarium essentially serviceable, work possible in improvised manner. Possible for Storch aircraft to land north of newly constructed runway and on the (smudge) runway.

c German was Leitung, possibly mistake for Begleitung - escort.

*** Marking of 5 KG 101.

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Second Report

From Popp to (2 or 3 words smudged) III, IA, op 3 (PAD), Berlin (smudge) on 19 July 1944: Report of PAD branch station, Stettin on the air attack against Karlshagen on 18 July.

Attack with about 400 aircraft in a number of waves (word or so blurred) SW at a height of 4,000 to 7,000. No. of (C; bombs) dropped has at the moment not yet been indicated, (half line blotted) weighing 1,000 kilo. Very few incendiary bombs.

Main effort of the attack: GAF Erprobungsstelle, Karlshagen, Base Art park 11 and Naval School, Zempin. Following suffered heavy damage: combined central heating plant and power plant, technical buildings including hangars, workshops, test benches, rotary converter stations, railway installations and billets. In Zempin damage to the railway station and some houses destroyed. Losses in killed with the GAF: 4 from works superintendent's office and 3 concentration camp prisoners. Further, 3 slightly wounded. Further report will follow.

Third report

To Gelip ((Luftgau)) III, IA ops, 3 (smudge). Berlin - Dahlem, signed Popp, on 19 July 1944: Supplementary report of PAD Branch Office Stettin on the air attack on Karlshagen on 18 July.

Air-raid alarm from 0703 hours to 09 (... several lines illegible) besides that about 50 Mustangs screened against attack from the south. About 1,500 high explosive and 200 liquid air bombs were dropped, of which 80% to 85% on open country. The telephone network, air-raid warning installation, current and water-supply were destroyed. At HAP 11^e the water supply has been 50% repaired. The (B; lighting) supply and most important telephone communications have been put in working order again. Wireless communication exists. About 80 unexploded bombs (delayed action) so far ascertained, of which 4 were blown up, and 12 exploded by themselves. Flak reports 7 shot down, PAD Abteilung (not)

* HAP 11 clearly Heimatartilleriepark 11 - Base Artillery Park 11.

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24 arrived at 1150 hours, but were not employed as the fires had mostly been extinguished already by own personnel. In about 14 days HAP will have (B³ resumed) its activity in full except for one installation, GAF Erprobungsstelle will be fit to receive work in about three weeks, if (smudge) places Estellens can be provided in good time.

Total losses at the Erprobungsstelle and at HAP 11:

killed, 26 Germans, 7 Russians, 3 concentration camp prisoners.

Number of wounded has not yet been ascertained, expected to be small.

The Gauleiter arrived towards 1400 hours, addressed the employees and promised to exert himself to get alternative accommodation.

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(3) Attack on Ploesti oil refineries :

Document of 16 July 1944 from GAF General in Rumania I WB no. 25326/44 to (1) OKW/Armed Force Ops Staff/Major i G Jereser, (2) OKW War Economics Staff, Dept for Mineral Oil, (3) Field HQ Reichsfuehrer SS.

Battle report for attack on Ploesti on 15 July 1944.

I. Enemy Activity:

(smudge) Liberators and Fortresses with strong fighter protection (half a line smudged) Lightnings, Mustangs and Thunderbolts from the area of southern Italy. Course of flight: Take off (several words illegible) Dubrovnik, crossing Danube from 0701 hours onwards between Vidin - Lom. Continuation of flight ... (line or two torn away) ... to the southeast as far as about 50 km southeast of Bucharest. Thence approach on Ploesti.

Attack on refineries at Ploesti. Time: (B: 0807) - (C: 0922) (1 hour 15 minutes). Height: about 7,000 metres. Method: 5 waves at intervals of 15-20 minutes target approached from south and southeast.

II. Damage:

(1) Refineries:

(a) Astra: Unimportant fire in 1 crude oil tank. Plant (B: not) hit.

(b) Romana Americana: Damage to the (word illegible) distillation, 10 days out of action. Pipe still, cracking plant (smudge) undamaged. Resumption of production in approximately 8 days. Butane separating plant seriously damaged, 3 tanks with approximately 11,000 tons content and 2 small tanks hit. Very heavy damage to railway tracks within refinery.

(c) Vega: All production installation undamaged, 5 large and (single figure illegible) tanks burnt out, chiefly Pacura and crude oil being burnt up. Quantity not established. Vega can probably resume production in 8 days with (B: 1,000) tons daily.

(d) Standard: Production installations and tanks undamaged. An oil stop cock (Abschneider) and a few tank trucks burnt. Slight damage to railway tracks. No interruption to production.

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(c) Unirea: Production installations and tanks undamaged. Slight damage to buildings. No loss of production.

(f) Cramin cracking plant: Slight damage to coke chambers and pumping house. One compressor badly damaged. 30 tanks with 300 tons crude oil burnt out. Loading platform, rail tracks and pipe line slightly damaged. Also foundation for new distillation plant damaged. Loading of crude oil interrupted for short time.

(g) Dacia: No damage, no stop in production.

(h) Colombia Xenia, Orion, Steaua not attacked.

(2) Damage to pipe lines: Ring rain hit in numerous places. Line to Cernavoda interrupted by numerous hits. Pipe lines V and VI in service. Heavy damage to pipe lines from wells to refineries.

(3) Railway damage: Considerable damage to railways. Transit through Floesti interrupted in all directions for 24 hours.

(4) Processing capacity: On 1 (blot) July before attack: 9,000 tons daily. Loss in production at Romana Americana 1,600 tons daily; therefore, after attack 7,500 tons daily -- 57% of target figure for processing. From 21 July onwards Xenia 750, from 23 July onwards (B. Romana Americana) 2,200; Vega 1,000; Steaua 6,000. Therefore on 23 July the probable processing capacity will be 22,350 tons daily, which equals 95% of target.

III. Defence:

(1) Fighters: German - 39 Me 109's, Rumanian - 6 BF 109's.

Successes: German: 1 enemy shot down (Mustang 2 shot out), 1 effectively shot up; Rumanian: nil. Casualties: German: 1 Me 109 missing; Rumanian: 2 Me 109's missing.

1 Fighter School Kronstadt: 3 Me 109's, 6 Ar 80's.

Successes: none. Casualties: 1 Me 109 missing, 1 Ar 80 missing.

(2) Flak: firing from 0802 - 0926. Ammunition expenditure: 12.8 cm -- 2,04 (blot); 10.5 cm -- 3,736; 8.8 cm 14,983; total -- 20,765 rounds. (word illegible) ops - 0703 - 09 (blot) with 1,467 smoke positions. Smoke cover well laid. Successes: 4 enemy shot down, 4 probables. Casualties: 4 German soldiers slightly injured, 1 Rumanian soldier killed.

IV. Weather:

Approach area practically cloudless. Floesti area, 4-6/10 at

2,000 metres above, 8/10 at 3-4,000 metres; Carpathians in cloud.
High wind 6,000 metres; at 3,000, 40-50 km per hour; misty.
Visibility 10 km humidity (blot) - 75%.

V. Appreciation:

A large-scale attack coming within the framework of the offensive against the German fuel position, to destroy the refineries in Ploesti.

The majority of the bomb carpets fell either short of the targets to the south (see high wind) or far beyond the target (Boldesti, Campina). Loss of production solely at Romana Americana and that for 14 days. The relatively slight damage can be attributed to successful smoke screen under favourable weather conditions (6 to 7/10 battle cover) whereby orientation and optical recognition of targets was made difficult. Our own fighters were prevented from making a concentrated attack on enemy bombers by enemy fighter superiority.

Notes:

(1) The figures in para 4 do not seem to make sense. If 7,400 is 57% of normal capacity, then 95% of normal capacity is 12,350 and 100% is 13,000. This suggests that the figure of 22,350 is a mistake for 12,350.

(2) The figure of 22,350 is clearly impossible in the light of the report for 23 July which gives daily capacity unchanged on 22 July as 8,400 tons and estimates that it would rise to 9,300 from 23 July. If the figure of 22,350 is in fact a mistake for 12,350 the estimate for 23 July given after the attack on 15 July has had to be scaled down by some 3,000 tons, a week later.

(3) The figures given in para 4 for Xenia, Romana Americana, Vega and Steaus are almost certainly estimates of output. These four refineries are presumably the only ones whose production was climbing back at the time of the report. Romana Americana is the only one whose production was affected by the attack on 15 July. The other three, therefore, are presumably recovering from damage sustained in previous attacks.

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(4) Luftflotte Reich Air Situation Report for 21 July 1944

From Gedna ((Luftflotte Reich)) to, on 22 July 1944 to Gamot ((Luftflotte 2)): Short report on air situation, 22 July 1944:

(1) On 21 July:

(a) From English bases, widespread attack against aircraft industry and ground organisation, ball-bearing industry, and traffic installations in south and southwest Germany, by about 1,400 bombers with strong fighter protection.

Targets for attack: Aircraft industry and airfields at Munich, Oberpfaffenhofen, Landsberg, Boeblingen, Neubiberg, Schwaebisch-Hall, Obertraubling, Pruefening; ball-bearing factories at Schweinfurt; traffic installations at Saarbruecken, Pirmasens, Landau, Homburg, Stuttgart, and Mannheim-Ludwigshafen. During departure flight, bombs dropped on Darmstadt and Dueren.

(b) From Italian bases, attack by about 300 aircraft on hydrogenation works at Maltheuren near Brueck.

(c) Recce activity over west and central Germany.

Aircraft shot down: By fighters: 13 certain, of which 12 4-engined, 4 probables (4-engined). By Flak: 15 certain, 20 probables.

Principal damage:

Munich: Industrial damage slight. Heavy damage to buildings in centre of town, and on the south and southwest.

Schweinfurt: Considerable damage to ball-bearing factories. 1 shadow factory Auslagerungswerk almost completely destroyed. Main railway station heavily,⁶ railway administration building destroyed. Railway traffic stopped for the time being.

Stuttgart: Damage to buildings in Ludwigsburg and Zuffhausen. Heinkel works not hit.

Boeblingen and Neubiberg: airfields not hit.

Obertraubling and Pruefening: aircraft works on both airfields almost completely destroyed. Stoppage of production 100%.

Saarbruecken: Heavy damage to railway installations and parts of the town near main and goods railway stations.

⁶ Word, such as damaged, presumably omitted here.

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Ludwigshafen: Marshalling yards and adjacent dwellings considerably damaged.

Dueren: Railway installations damaged. Heavy damage to buildings in adjacent parts of the town. Gas and electricity supply have failed.

Pirmasens, Landau, and Homburg: Only slight damage reported.

Hydrogenation works Maltheuren near Brueck: Damage to distillery, oxygen plant, and among the tanks. Most of the bombs fell outside the works.

Komotau: Damage to residential quarters. Industrial buildings not hit.

(2) Night of 21-22 July:

(a) Mosquito attack on Berlin by about 40 aircraft.

Damage to buildings in northeast and east of the town.

(b) Large-scale dropping of agents in the Protectorate by 80-90 aircraft.

(c) Lively long-range night-fighting over west and northwest Germany by about 15 aircraft.

(d) Harassing activity with weak forces over East Prussia.

(e) Mining in sea area north of Nordeney and the Skaggerak.

(f) Flights across Hungarian territory for supplying guerrillas in General Gouvernement, by 8 aircraft.

Aircraft shot down: By fighters: against raids into the Protectorate: 4 certain and 1 probable. By Flak: against raids into the Protectorate: 2 certain in Vienna area.

APPENDIX A

(5) Sythen Ammunition Plant Damage Report 3

Two communications from Kiefer ((HQ Armaments District Recklinghausen)) on morning of 12 March 1945:

(1)

At (smidge) hours, medium-heavy attack on Wasag, Sythen. Boilerhouse damaged. Chimney severely hit. Pulley-vehicles & Drahtfahrzeuge all destroyed. Production & Fertigung buildings mainly intact. Hand grenade production more seriously damaged. Total production at a standstill on account of lack of current, water and steam. Lt. Leonhardt, of the army group, has organised assistance with his own forces.

(2)

The production of 100 tons of high explosive by the Wasag is not possible on account of air-raid damage. Stop deliveries from Bitterfeld.

Note: Further attack on Wasag on 20 March reported in R 497 C 20.

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(6) Scholven Synthetic Oil Plant Damage Report :

Signed Major Fressel, from HQ Armament District Recklinghausen to Ruhr Stab, Armaments Inspectorate of Wehrkreis VI; dated 17 Feb 1945:

Hydrogenation works, Scholven, 60-80 high explosive bombs. Completely destroyed: pump house, heavy oil storage tank, electrical workshop, joiners' workshop. Severely damaged: various important working sites. The plant which had just started out with small-scale production will be put into operation again in about 8-10 days.

APPENDIX B

REPORTS OF THE ATTACK ON KIEL
ON 23-24 JULY 1944

DECLASSIFIED
Authority *MND 947022*

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(1)

According to Naval Chief Command Baltic at 0200 hours on 24 July 1944: Results of heavy bombing attack on Kiel from 2314 hours to 2340 hours on the 23rd were as follows: (1) direct hits on administration and supply depot building and on two barracks in Wik; (2) local clothing depot on fire; (3) numerous fires in centre and north of town; (4) all telephone and teleprinter lines down; (5) one Sperrbrecher apparently sinking; (6) Prinz Heinrich bridge and lock in order.

Secondly, report of 0100 hours mentioned severe dockyard damage.

(2)

Morning of 24 July 1944 Walterwerk reported not hit in Kiel raid previous night. Production stopped to some extent owing failure current, probably for one to two days.

(3)

Seen by Source, dated 24 July 1944:

((1)) Stamped 0130 hours, signed Gigao ((GAF Station Command))
Kiel Holtenau: Damage to GAF station hangars, buildings and material.
Details to follow.

((2)) Stamped 0145 hours: All external telephone lines from the GAF station out of order. Station line out of order.

((3)) AIC Kiel Holtenau closed for (D, all) (C, classes) owing to bomb craters.

((4)) Stamped 0300 hours from Giduc ((Sea Rescue Detachment)) 27 to Sea Rescue Staffel 9, for Gidau ((OC Sea Rescue Service)) 1: Is workshop at Holtenau serviceable to accept Do 24 for cylinder change? Take-off to take place at 1200 hours.

((5)) ((OC Sea Rescue Service)) 1 (Centre) to ((Sea Rescue Detachment)) 27, stamped 1000 hours: Do 24 cannot be accepted. Bomb damage.

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(4)

From document dated 24 July 1944:

Further details Keil attack.

According naval authority at 0900 hours 24th: Bombs on northern town area, centre and inner suburbs Holtenau. Many fires. Bombs on Holtenau lock. One dud or unexploded bomb (lying clear) on westerly roofing of new southern lock gate. Naval radar aircraft reporting and Flak greatly interfered with. Flak measuring impossible. Jagddiv 2 firing prohibition until first bombs were dropped. The third gun of the Hoenkeberg battery out of order from direct hit. Further bombs including three duds or unexploded bombs in battery area. One bomb in a search-light position, damage not yet known. Apparently a dud or unexploded bomb on Lock-island between new and old lock. One bomb penetrated into conduit of new southern lock on east side, one into chamber of old northern lock, both exploded. New northern lock again in order but no current to work gates. Bomb crater and three duds or unexploded bombs in southern road approach to Prinz Heinrich bridge, which is closed.

Secondly, appreciation same attack by IV/Fliegerzielgeschwader 1, at 1200 hours on the 24th. Slight damage to 1 He 111, 1 Ju 52 and 2 W 34's of 13th Staffel. Glass damage to sea-hangar 1 of Stab 4th Gruppe and Gruppe workshop. One large incendiary in hangar extinguished at once. Twenty large incendiaries on platform and delayed-action bomb at distance of 50 metres. One quarter damage to sea-hangar 2. Glass and slight material damage to H/T hangar and delayed-action bomb at distance of 15 metres. 50% damage to office hut of Gruppe workshop. Glass damage to a land hangar of 13th Staffel and two delayed-action bombs at distances of 30 and 100 metres. Also glass and slight damage to billets. Airfield for present unuseable.

(5) *

Extract from no. 1802, from Gedna ((Luftflotte Reich)) ((Io)) interpretation station to Gamot ((Luftflotte 2)) on morning of 24 July:

Abbreviated air situation report for 24 July:

- Editor's Note: This message has been pruned considerably to leave in only the portions concerning the Kiel area. The original communication, covered aerial activity over all Germany.

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Authority NND 947022

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Targets of recon presumably ... naval installations and fitting out yards Erweiterung in the Emden-Wilhelmshaven-Kiel area ...

In the night of 23-24 July attack by about 300 aircraft on Kiel ... Two aircraft probably shot down during the raid on Kiel.

Principal damage: Kiel: most of the bombs on the centre of the town and the west and east part of the Kieler Forde. Considerable damage to buildings. Big fires in workshops installations. Considerable damage to barracks installations in Kiel-Hontenau.

(6)

From documents dated 24 July 1944:

Further to XL 3381. According naval authority at 1100 hours on the 24th. Canal traffic at Hontenau unhindered. Northern lock in full working order and after removal unexploded bomb southern lock to resume operations.

(7)

From document dated 24 July 1944:

Report dated p.m. 24th gives details of vessels damaged or sunk in air raid on Kiel: (1) Sperrbrecher 25 sank. (2) Depot ship Erwin Wassner capsized. (3) Motor vessel General Osorio (11,590 grt) burnt out aft, beached by the stern. (4) U 1164. (5) U 239. (6) 150 ton crane of the Germania Werft pontoon hit, beached aft. (7) 100 ton (strong indications crane) Deutsche Werke Kiel burnt out, pontoon slightly damaged. (8) Steamship Axet (ex Adla) 1,587 grt sunk. (9) Dock 7 Deutsche Werke Kiel sunk. (10) Dock 8 Deutsche Werke Kiel sunk. (11-12) Ship lifting gear Howald Werke with driving drifter Kiel 15: pontoon afloat, lifting gear severely damaged. (13-15) Floating dock D Howald Werke with a tender severely damaged, also diving drifter (Kolbe Werft). (16) Smoke acid vessel capsized (Naval Arsenal Kiel). (17) Slipway pontoon, Deutsche Werke Kiel severely damaged. (18-21) Four harbour tugs (Naval Arsenal).

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(22) Passenger ship Dragoer (Naval Arsenal). (23) Accommodation boat (Naval Arsenal). (24) Ammunition barge (Naval Arsenal). (25-26) Two ash barges (Naval Arsenal). (27) Two water carriers (Naval Arsenal). (28-29) Two motor launches (Naval Arsenal).

(8)

From 1 Naval War Staff, 1 Op A, very early on 25 July:

Naval summary up to 0600 hours 24 July:

1) Baltic ... night of 23-24 July, heavy bombing attack on Kiel, damage not yet established. So far two aircraft reported shot down.

(9)

From documents dated 24 July 1944:

Two submarines ((comment one ex-Dutch)) now known to have been damaged in air raid on Kiel on 24th in addition to damage reported in

(10)

From documents dated 25 July 1944:

Further : According to a report of 25th air raid on Kiel night 23rd-24th heaviest yet. (Fair indications 2,500) high explosive bombs, numerous incendiaries. Severe damage and temporary cessation of work in dockyards. Ordnance arsenal's activities would be interrupted for a fairly long time. Two U-boats, one Sperrbrecher sunk. One ship lifting gear, one floating dock severely damaged. Erwin Wassner, passenger ship Dragoer, one accommodation boat, several tugs and barges, also "went down".

* Editor's note: This report covered all European waters and has been cut to leave in only the very small fraction relevant to this study.

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(11)

Communication seen by source at a Naval HQ addressed to Admiral Eastern Baltic time-stamped 2030 hours 27 July 1944:

Reference experience of methods of warfare: The air raid on Kiel during the night 23-24 July was accompanied by the simultaneous laying of mines in the harbour. The same enemy tactics are to be expected in your area. Report steps taken and make any necessary proposals.

(12)

From documents dated 24 July 1944:

Further following additional casualties now known to have resulted from air raid on Kiel on night 23-24 July. One U-boat capsized in dock Deutsche Werke, two U-boats damaged. ((Comment: U-boat capsized is 1,100 ton torpedo-carrier))

APPENDIX C

Extracts from Ultra Information
Giving Effects of Air Attacks on
German Communications

A paper prepared

28 Feb 1945.

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Authority WWD 947022

APPENDIX C

Introductory Note

These extracts were compiled at the request of the Deputy Chief of the Air Staff who, jointly with General Spantz was, at the relevant date, in control of the two strategic bomber forces, namely, RAF Bomber Command and the US 8th Air Force. Before reaching conclusions on the future use of these bomber forces at the beginning of March, they wished to know what information was available from Source LSS.

I. Diplomatic Messages:

A telegram despatched _____ on 15 February recorded statements made by various recent arrivals from Germany • All stated it was now impossible to travel by train from Berlin to the south. _____ courier, unable to travel by train, had been compelled to use a private car from the _____ frontier to Berlin. The transport of refugees from the east, large-scale military transport between the various fronts and continual air-raids were causing "great dislocation" in the German railway system, and there seemed no doubt that the situation would become graver until eventually it would be impossible to travel at all.

the misery throughout the Rhineland provinces was now extreme: trains no longer ran, postal facilities were disorganised and the people were compelled to make long journeys on foot to obtain food.

The Ruhr and the Saar areas and the lines of communication there have been smashed by incessant bombing, and now on top of this Silesia has been occupied by the Red Army, with the result that there is an acute shortage of coal throughout the whole country. The Government has been enforcing the strictest economy in consumption for all forms of civilian transport, hoping thereby to ensure adequate supplies to war industries; but it looks as if even these stocks of coal would be exhausted in two or three months, with the result that

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war production will be seriously hampered. Turning to the living conditions of the people, supplies of coal, gas and electricity are exiguous.

At present the most serious difficulties with which the Germans were confronted were water transport being held up by the freezing of rivers and canals linking the western front with the industrial areas and the interior of Germany, and the limitation of land transport due to the attacks of the enemy air forces. Although there are accumulations of ((commodities)) such as coal in the places where they are produced, the inability to transport them is having an adverse effect on the production of various war supplies. If the coal resources of the Upper Silesian region should also be lost at this time, the effect would be very serious.

II. Review of CW/MS Traffic after 1 October 1944:

Because of the increasing air attacks on roads and railways, the Fuehrer on 5 October ordered that special dispersal and camouflage measures were to be taken in west and southwest Germany from eastward of the Rhine.

From Luftgau VI on 6 October: As a result of increasing attacks on communications, the interruption and destruction of road and railway bridges over the Rhine were to be expected. Measures to be taken to prepare ferries and moveable bridges to ensure the bringing up of supplies in the Holland-to-Bonn sector of the Rhine, Flak and artificial fog for the protection of the crossings to be assured.

At 1010 hours on 3 October, an ammunition train was set on fire by fighter-bomber attack 4 kilometres west of Hildesheim.

An unidentified detachment billeted at Greven informed II/JG 53 on 6 October that equipment had not yet arrived. Railway and all telephone communications interrupted by bombing attack.

According to LXXII Corps on 7 October, unspecified railway bridge between Beckingen and Siersburg destroyed.

At 1524 hours 9 October, twelve Marauders bombed railway bridge Busendorf-Dillingen. Completely destroyed.

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On 10 October Luftgau VI instructed that trains arriving at GAF Fuel Tank Depot 7/VII were to be split up immediately on account of increased danger from the air.

From Railway Station HQ II/173 on 9 October: Both exit tracks from Rusdriehen station in direction of Cologne and Bonn destroyed by a direct hit from a super heavy bomb at 1250 hours.

From von Rundstedt on 15 October: A bomb hit on Rhine bridge near Cologne/Muelheim allegedly exploded a fitted demolition charge as well. Hitler had therefore ordered that at all bridges where same danger existed, charges were to be removed and made ready for refitting at short notice.

On 19 October, Army Group B requested Naval Chief Command North and Admiral Netherlands for urgent and additional assistance in further development of Rhine ferries. Railway and road bridges falling out in increasing numbers owing to air attacks.

On 20 October, Reich Minister for Equipment and War Production reported that, on account of destruction of traffic installations and lack of power, 30%-50% of all works in west Germany were at a standstill.

Results of air attacks on 23 October:

Muenchen-Gladbach: Rails damaged. Stretch from Muenchen-Gladbach to Viersen blocked. One Reichsbahn installation damaged.

Schiefbahn: One Reichsbahn installation damaged.

Dated 26 October: 1209 hours, several unidentified aircraft bombs on Berweiler and railway stretch Meksweiler-Puerstenhausen. Line broken. 1120 hours, 15 Thunderbolts; 1150 hours, 30 Thunderbolts in Hagenau area. Bombs on railway station. Damage: 11 locomotives damaged. Repairs possible.

From C-in-C West on 22 October: An enormous number of workmen are working on the road bridge (suspension bridge) area Cologne-Muelheim, which was completely destroyed by aircraft on 14 October, in order to establish quickly in the Rhine, a navigable channel.

At 1500 hours 29 October, thirty twin-engined aircraft dropped bombs on railway bridge at Eller, 6 kilometres southwest of Kochem. Bridge damaged. Railway traffic Trier-Coblenz interrupted for a long time.

On 30 October the transfer of III/JG 26 from Grossrechen to Plantluerne was impossible, since tracks in the vicinity were for the most part destroyed by bombing.

Report for 28 October: Attack with aircraft armament and bombs on railway station at Saarburg, track installations damaged.

At 0302 hours 29 October, an unidentified aircraft in the Homburg area. Two locomotives damaged.

On 29 October 1305-1340 hours, thirty Thunderbolts, aircraft armament attack on railway workshops at Hagenau, sixteen locomotives damaged.

From Detachment Armoured Train Ersatz Abt to Armoured Train Ersatz Abt Milowitz, near Lissa-Elbe, 0830 hours 27 October: Departure on 26 October not possible since, according to telephonic communication from Transport HQ there is a ban on track movements for the whole Reich area and, independently thereof, a special ban for the stretch Marburg - Wiener-Neustadt - Vienna. Expected duration and date for further enquiry: 30 October. Priority permit extended by Senior Armed Forces Officer to 31 October inclusive. . Equipment and communications from tank 25 have not yet arrived.

From GAF Station Gardelegen, on 31 October to JG 11 Wunstorf: No truck for a fortnight. Goods traffic to Hannover banned for an unpredictable period. Please send new orders. It is a question of fetching technical equipment.

On 25 October from 1000 to 1030 hours, line Bernkastel-Wengerohr interrupted. Two hits on railway bridge near Waldraze. Line Trier-Nerueskeil interrupted. One locomotive out of action. On 26 October from 1155 to 1300 hours, districts St Goarshausen, Krcunach, Saarbruecken, Saarlautern und Wittlich attacked. One railway station building damaged. Line Gernweiler - Fuerstenhausen interrupted.

At 1342 hours 1 November, four Thunderbolts attacked Dillingen railway station with aircraft armament and nine bombs.

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Railway installations damaged.

Position on 27 October: The Mittellandkanal was smashed up near Minden for a length of 30 metres in an air attack on 26 October. Two factories collapsed under weight of water, canal traffic at standstill. Through traffic possible on 28 October. Münster main railway station through traffic possible again on the Canabruock-Halterm line from the evening of 23 October.

During attack on Konz on 2 November, the railway bridge over the Moselle was hit. Bridge can no longer be used. During attack on Pfalzel (5 kilometres northeast of Trier) at same time, railway bridge damaged by two hits. Repairs will be completed in three or four days.

During attack on Trier from 1300 to 1400 hours 4 November, power station of the Reichsbahn repair shops was hit.

From LXXVII Corps on 17 November: Since midday, fighter-bombers in continuous attacks on supply routes and railway lines in rear areas, especially Saarpfalz. Own movements considerably hindered.

On 20 November, two officers and 200 men of Engineer Ersatz and Training Bn 6, Minden, were sent to Bochum for the purpose of clearing the Ruhr highway of destroyed railway bridges.

Report by Luftflotte Reich on results of air attack on 16 November: Munich: slight damage to railway installations. Duoren: medium damage to railway installations.

Report of attack on 27 November: Cologne: Railway buildings of the Hohenzollern bridge damaged and blocked. Southern railway station, the Eifeltor station, and Kalk Nord were damaged. Cologne-Coblenz line blocked.

Result of heavy air attack on Hamm on 26 November: Reichsbahn: all tracks, except for Hamm-Hannover line, are serviceable.

Dated 26 November: Day attack on large railway viaduct near Altenbeken. Both tracks and viaduct destroyed.

Report on result of raid on Hamm on 29 November: Railway was principal target. Considerable damage and destruction on all

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sectors. Two bridges destroyed or badly damaged.

Results of attack at 0805 hours 28 November: Lines
Viersen - Muenchen-Gladbach and Viersen - Neuss blocked.
Grevenbroich: 8 high explosive bombs, railway installations
damaged.

Damage from raids on high explosive 1 December: Rastatt:
damage to railway and industry installations. Rhine bridge Koxau:
slight damage. Speyer: damage to railway installations.

From Wehrkreis XII, report for 2 December: At 1134 hours,
ten bomb carpets on Bingen, Bingerbrueck and Ruedesheim. Railway
lines Bingen-Koblenz and Ruedesheim-Niederlandstein blocked, both
tracks. Damage caused in Bingerbrueck railway workshops.

On 12 December, as result of air attack, railway section
Bovinghausen-Marten blocked.

From Director of PAD, Soest, on 5 December: ... State
Railway through line Soest-Lippstadt cut. Shunting yard damaged.

Luftgau VII on 18 December ordered that in view of the
continuously rising scale of the attacks on traffic installations
in the areas Rosenheim, Innsbruck, Salzburg and Ulm, railway Flak
units be brought up in order to prevent further severe damage to the
south German railway network.

From Armed Forces HQ Cologne on 25 December: Air attack on
Cologne 1725-1857 hours 24 December: Four traffic installations and
one ammunition train hit. Stretch of line Cologne-Neuss closed.
Nippes marshalling yard hit.

Attack on Cologne Ehrenfeld railway station, 21-22 December:
Whole of permanent way destroyed. Repairs will take 4-5 days. Single
track working in three days.

Attack on Cologne Nippes railway station, 21-22 December:
Permanent way and entire superstructure destroyed. Repairs will take
5-6 days. Single track working in 48 hours.

Report of damage after air attack on Gdynia on 18 December:
Oxhoeft railway station direct hit. Several hits on round locomotive
sheds, and one side wall blown out. Cross-over lines between naval

railway and State railway hit and passenger line at Ochoeft destroyed.

Luftgau VI report: 1820 hours 29 December: railway tracks at Troisdorf hit and traffic stopped. 1200 hours 29 December: railway station at Zuelpich hit. Booking hall destroyed, permanent way seriously damaged.

Chairman of Armaments Commission and Wehrkreis Commissioner XII B complained on 29 December that enemy fighter-bombers had, during the last few days destroyed traffic installations on an extensive scale and brought the laborious repair work to nothing within a few hours. Telephone facilities hardly existed and it was impossible to re-route trains. Fighter protection requested. Areas affected: Westmark and Gau Moselland.

Army Group B on 28 December complained that the progressive destruction of railway lines, and stations and roads in the Eifel was making the supply situation tense in a way that threatened to be dangerous.

Report from Director General of Transport West dated 28 December: Clearance of traffic in Lonsheim, Lendau, Neustadt and Grumstadt impeded badly in places owing to many tracks being out of action. On 26 December lines Ettlingen - Karlsruhe and Pforzheim - Karlsruhe interrupted by bomb craters. An unexploded bomb on line Karlsruhe main station - Pforzheim. Lines Karlsruhe - Ettlingen and Karlsruhe - Pforzheim blocked.

Railway traffic interrupted at Siegburg on 28 December.

On 28 December, attack on Cologne/Grenberg marshalling yard. All traffic blocked. Traffic will be resumed in about 14 days.

On 31 December, Army Group B reported that owing to heavy attacks on Neunkirchen, Dusseldorf, Coblenz and Remagen, transport and supply situation was not expected to become less strained in the near future.

Bridge situation report from C-in-C West on 31 December:

Remagen: bridge damaged by bombing and probably closed for several weeks.

Koblenz: ship and road bridge open only for pedestrians.

Bingen: railway bridge not damaged during air attack, but

the Saarbrücken railway lines on the right bank of the Rhine were hit.

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no traffic possible.

On 2 January 1945, Army Group B ordered ruthless seizing of M/T to overcome the supply difficulties that had arisen from the temporary breakdown of the railways.

From Luftgau XIV: At 1110 hours 2 January attack on Kreuznach passenger and goods station. Traffic interrupted. At same time attack on Koblenz-Luetzel. Hits scored on railway installations but Moselle bridge not hit.

(1) Rhine Commandant Koblenz reported that during attacks on 29 December, no Rhine bridges were hit, but the Balduist bridge over the Moselle slightly damaged. Open again after removal of unexploded bombs.

(2) Reported on 3 January that hospital train was seriously damaged in Moscheln by bombing attack.

Reported on 7 January from Hamm that as result of air raid the railway line to Muenster was interrupted for several hours.

Results of air attack on 2 January: Donaueschingen: railway station heavily damaged. Rail traffic crippled.

Transport train with 22 trucks of repair and maintenance sections badly damaged by terror-bombers on the evening of 6 January in railway station Hanau North.

Issued on afternoon of 10 January: Both bridges at Roth hit by low flying aircraft. Traffic interrupted. Up to now three shot down by Flak.

Luftgau VI reported that as a result of air attack on Cologne on 6 January, the South bridge was destroyed, the Hohenzollern and Hindenburg bridges hit by passable.

Wehrkreis XII reported that as a result of air attack on Mannheim on 6 January the Adolf Hitler bridge over the Neckar was slightly damaged. Temporarily closed to traffic.

Report of 7 January stated: Hamm main railway station - line to Muenster closed for some hours, all other lines open. Marshalling yard, nine hits.

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Wehrkreis III reported on 13 January that the Germersheim bridge over the Rhine was hit in air attack on 13 January. Sections 1 and 9 destroyed, longitudinal and transverse girders bent. Railway, road and pedestrian traffic stopped. On the same day the Rhine bridge at Worms was hit. Sections 1 and 2 west side each two hits, section 3 one hit. Underside of arch broken through. Footway torn away. Railway and pedestrian traffic stopped.

At 1315 hours 14 January, Osnabrueck attacked. Railway slightly damaged, but serviceable.

Jagdkorps II reported on 15 January that the Hindenburg bridge at Cologne was closed as result of air attack.

Report from Wehrkreis XII for 13 January: Wiesbaden: 200 high explosive bombs; railway line Frankfurt-Mainz-Ruedesheim-Niedernhausen temporarily interrupted. Mannheim: goods station severely hit. Ludwigshafen: railway bridge Ludwigshafen-Mannheim hit; traffic interrupted; several bombs on main railway station. Worms: railway bridge severely hit. Bingen: railway line to Kreuznach and Mainz interrupted.

Report for 15 January: Bombs dropped at Grevenbroich. Goods and shunting station destroyed.

Wehrkreis VI reported that during air attack on Duesseldorf on 10 January the South bridge was damaged and was hanging by the girders of the arch. Carrying capacity of the bridge reduced.

Wehrkreis XII reported that Limburg was attacked on 14 January and damage caused to the engine and M/T sheds. P/W transport in marshalling yard hit.

Todd Organisation reported on 7 January that the Herzam Goering bridge at Neuwied had been totally destroyed by air attack.

General situation on 16 January as given to Army Group G: Still very strained as a result of new enemy action in Mainz area, long alerts, effects of previous enemy action, traffic jams before nodal railway stations, trains dropping behind schedule. Cologne districts strained owing to blocked lines and frost. Provision of locomotives difficult as railway workshop out of action. Saarbruecken district: extremely strained. During the day work seriously hampered

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by unfavourable air situation. Karlsruhe district unsatisfactory. Rhine bridge at Laxau probably impassable for a fortnight.

Reported on 15 January: damage to railway bridge Bingen-Ruedesheim. Can be made good in 4-5 days.

Town authorities at Minden reported on 25 January that ten locomotives had been damaged by aircraft armament attack.

Damage report on 26 January stated that 60 high explosive bombs were dropped at Grevenbroich. Railway line cut and one warehouse destroyed.

Two attacks on Duisburg on 28 January. Railway station Duisburg 20 direct hits, railway bridge Rheinhausen impassable. Graf Spee bridge passable for light M/T. Stretches of railway line in Duisburg area hit.

At 0800 hours 29 January, Cologne main railway station hit. Adolf Hitler bridge impassable. Slight damage to Catharin marshalling yard.

On 29 January Luftgau XIV reported 24 high explosive bombs on Rhine bridge at Remagen at 1400 hours 28 January. Bridge badly damaged. Railway traffic interrupted.

From Wehrkreis XII 29 January: Koblenz: 500 high explosive bombs round main railway station. Through highway to Buppard and Hunsrückhöhen Strasse blocked. Railway lines from Ehrenbreitstein-Niederlahnstein, Koblenz-Mainz, Koblenz-Niederlahnstein blocked. Camp: Railway line Kestert - Camp damaged. Kaiserslautern: 20 high explosive bombs on railway installations. Railway repair works, goods station and locomotive sheds hit. Heidelberg: 8 high explosive bombs on armed forces transport train. Railway tracks and loaded vehicles damaged. Kirchheim/Heidelberg: 5 high explosive bombs on armed forces transport train.

At 1430 hours 3 February attack on Ahr railway bridge. Bridge not hit. Auxiliary superstructure slightly damaged. Both lines hit three times. Reichsbahn traffic interrupted. Repair will take about 48 hours.

As a result of air attacks on 8 February, the Lurg bridge at Rastatt and the Offenburg railway bridge over Kinzig were destroyed.

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Wehrkreis VI reported on 6 February that in the past week, lively fighter-bomber activity had taken place in entire Wehrkreis district. From 28 to 30 January, 15 attacks on passenger trains, 17 on goods trains, 6 on military trains, 16 on M/T, 63 on railway installations, 82 on towns and localities. 59 locomotives damaged.

Wehrkreis VI reported on 9 February that in the afternoon attack on Duelsman, railway viaduct at Bielefeld damaged.

As a result of attack on Arnsberg on 9 February, railway line Arnsberg interrupted for five days.

Report at 0700 hours 10 February stated that as a result of attack on viaduct at Arnsberg, Hagen-Kassel line was closed. Ruhr-Lippe railway partly destroyed.

Report dated 15 February: One unexploded bomb damage to railway Heuss. Two high explosive bombs on feeder line, damage to tracks. Sixteen bombs on railway tunnel Heuss-Dueren, rail traffic interrupted. Viersen: six high explosive bombs, three unexploded bombs, two traffic installations hit. Grevenbroich: 200 high explosive bombs, five unexploded bombs on railway installations.

Report for 7 February: Dietersheim-Bingen: three bombs dropped including one on the railway track of bridge. Line cut. Obersuelzen: two hits on bridge on the roadway. Impassable for heavy M/T. Several trucks burnt out in railway station.

From Wehrkreis VI on 14 February: The west end of the Buederich-Wesel highway bridge damaged in air attack. 41 metres of the second span of the anti-flood bridge collapsed. Traffic blocked, but is continuing over planked-up railway bridge.

Army Group B reported that on 14 February Kronprinz Wilhelm railway bridge near Engels received several hits. Bridge closed.

Hamm authorities on 16 February reported that as result of air attack, rail traffic in all directions was interrupted, probably for three days.

Wehrkreis VI report on Wesel raid on 18 February: Wesel railway bridge damaged at (?) span on east side. Closed to traffic. Repairs in progress. Road traffic inside the town interrupted again. Bridge forming part of Reich Road 8 over the Lippe unserviceable owing to bomb crater(s).

APPENDIX D

Fuel Situation in the Ardennes (T429/16)

From Obstln Reidel, Fuehrer Escort Brigade Ia, No 53 to
Inspector General of Panzer Troops on 7 June 1945:

Report on the fuel situation:

(1) Fuel situation at 1000 hours, 7 January, 0.2,^a 9
consumption units.

(2) Bringing up of supplies: since 5 January 40 ckm Bonn,
5 of which were for the journey to fetch it. Since 7 January, 10 ckm
Luerlenbach.

(3) This fuel situation is no exception but a regular state
of affairs. Fuel is a means by which operations are conducted. In the
present situation, however, fuel dominates the conduct of operations.
Tanks with 0.2 consumption units facing the enemy in the front line
constitute a risk. They impair the fighting morale of the crews.
For days there have been continuous attacks by the infantry with few
tanks. The main burden of the fighting is borne by the infantry, because,
in spite of all concentrations of fuel supplies our tanks have only been
mobile in special circumstances.

(4) 7/1, new allocation of 6 assault guns and 4 Hornisse in
Bergisch Gladbach. They cannot be fetched as ordered because no fuel
can be made available for the purpose.

(5) A similar situation exists with the Panzer workshop
company. Bringing up of repaired tanks and removal of damaged tanks is
impossible as every drop of fuel is necessary for the battle.

^a It seems possible in view of paragraph 3 that the "9" is a clerical
error and superfluous. i.e. vehicles have enough fuel for a journey of
20 kilometres.