Hitting the Mark, but Missing the Target: Luftwaffe Deception Operations, 1939–1945

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During the course of the air campaign against the Third Reich, the Luftwaffe employed a variety of active and passive defensive measures. The overwhelming tendency to focus solely on the performance of fighters and flak provides only one piece of the air defence mosaic and has led to a widespread underappreciation of the contributions of deception measures and the role of dummy sites within the Luftwaffe's air defences. The dummy installations and decoy measures experienced varying degrees of success throughout the conflict, but at times they proved instrumental in luring Allied aircraft away from their intended targets. On the one hand, the relatively modest costs associated with these efforts highlighted the benefits that could be achieved by deception. On the other hand, the dynamic nature of these defences and their ability to adapt in the face of Allied countermeasures aptly illustrated the dialectic battle between offence and defence during the Second World War.

United States Army newsreel footage of the devastated landscapes of German cities provides one of the most enduring images of the Second World War. The pictures of gutted buildings and rubble-filled streets offer a stark testament to the ultimate failure of the Luftwaffe in protecting the German homeland from aerial attack. In the course of the war the Royal Air Force (RAF) and the United States Army Air Forces (USAAF) obliterated entire sections of major German industrial and population centres under a hail of high explosive and incendiary bomb loads. Operating largely at night, the RAF launched its 'bomber streams' against Germany's major industrial and urban centres in a strategy of area bombardment designed to 'dehouse' the German population and break its will to fight. In January 1943 the USAAF finally joined the RAF in raids against Germany by focusing on a strategy of daylight 'precision' bombardment aimed at the heart of German industrial production. During the course of the air cam-

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paign against the Third Reich, tens of thousands of British and American bombers pounded targets within Germany with over 1 200 000 tons of bombs.[1] In the end, Allied bombing within Germany killed an estimated 300 000 civilians, wounded an additional 780 000 persons and destroyed 3 600 000 dwellings.[2]

In an attempt to protect the Third Reich from aerial attack, the Luftwaffe employed a variety of active and passive defensive measures. The overwhelming tendency to focus solely on the performance of the fighters and/or flak provides only one piece of the air defence mosaic, and has led to a widespread under-appreciation of the contributions of other organizations within the Luftwaffe's air defences. For example, the activities of the Luftwaffe's dummy installations (*Scheinanlagen*) and measures used to decoy bombers away from their designated objectives have received scant attention in the majority of histories. The dummy installations and decoy measures experienced varying degrees of success throughout the conflict, but at times they proved instrumental in luring a high percentage of RAF and USAAF aircraft away from their intended targets.

Many at the upper echelons of the Luftwaffe leadership, including Reich Marshal Hermann Göring, the commander of the Luftwaffe, and Field Marshal Erhard Milch, state secretary for aviation and the number two ranking officer in the Luftwaffe, demonstrated a limited understanding of the broader outlines and effectiveness of Germany's ground-based air defences. These men were repeatedly guilty of evaluating the performance of the Luftwaffe's air defences using a simple binomial equation that compared flak versus fighter performance. This myopic focus on fighters versus flak led the Luftwaffe's leadership consistently to ignore or grossly underestimate the contributions of other elements of the ground-based air defences. In fairness to the Luftwaffe, British and American intelligence officers also were guilty of underestimating the performance of German ground-based air defences, and it was only through the efforts of the Allied Operational Research Section (ORS) that these views changed by the end of the war. Still, many Luftwaffe leaders often failed to recognize the outstanding returns achieved by decoy and deception measures at a relatively low level of investment, despite the large number of British and American bombs that fell on these sites at various times throughout the war.

I

Despite the extensive resources devoted to the creation of a massive flak force and the Luftwaffe's day and night fighter forces, one of the

[1] Civil Defense Division, *The United States Strategic Bombing Survey: Civil Defense Division Final Report* (Washington, DC, 1945), p. 2.

[2] Strategic Bombing Survey Team, *The United States Strategic Bombing Survey: Summary Report* (Washington, DC, 1945; reprint, Maxwell AFB, AL, 1987), pp. 5–6.

greatest successes achieved by the anti-aircraft air defences in the early stage of the war involved the construction of numerous dummy installations throughout the Reich. In early July 1940 the commander of air region 3, General (shortly thereafter Field Marshal) Hugo Sperrle, ordered the construction of industrial dummy installations throughout his command. Furthermore, he directed the building of these dummy installations 'without consideration to personnel, materials, and capital expenditure'.[3] The urgency in Sperrle's order resulted from two factors. First, at the start of the war Göring had opposed the creation of a night fighter force, and it was not until mid-1940 that he finally ordered the establishment of two *Gruppen* of approximately 27 aircraft each as a dedicated night fighter force.[4] Second, as late as December 1940, the flak arm was experiencing substantial difficulties in successfully tracking and engaging RAF bombers at night.[5]

The idea of using mock installations and facilities to simulate their operational counterparts was not new. In fact the German military considered building dummy industrial structures in the First World War, and the Luftwaffe introduced dummy installations as a measure to protect their air force during war-game simulations against the French in the winter of 1934–35.[6] The Luftwaffe's objective was to build dummy installations that looked similar to and were located close enough to existing industrial and military sites to confuse British bomber crews. By mid-July construction crews finished building one of the first dummy installations in the vicinity of Augsburg.[7] Soon thereafter dummy installations appeared outside of Stuttgart and Karlsruhe. By the end of the year there were 11 dummy installations in the vicinity of Hamburg alone.[8] Table 1 lists dummy installations in air district VII that were in operation by the first week of August 1940.[9]

Luftwaffe construction teams went to great lengths to deceive the RAF pilots into believing that these were actual targets. They constructed replica buildings, factory facilities, railway stations and even streetcar lines, including devices to simulate the electric sparks gener-

[3] 'Kriegstagebuch des Luftgaukommandos VII [7 June–8 October 1940]', RL 19, Luftgaukommandos/Luftgaustäbe, folder 78, p. 78, entry from 8 July 1940, Bundesarchiv-Militärarchiv (hereafter BA-MA).

[4] P. Hinchliffe, *The Other Battle: Luftwaffe Night Aces versus Bomber Command* (Osceola, WI, 1996), pp. 30–31, 39–40.

[5] 'Kriegstagebuch des Luftgaukommandos VII [20 December 1940]', RL 19, folder 79, p. 155, BA-MA.

[6] Kriegswissenschaftliche Abteilung der Luftwaffe, ed., *Der Luftschutz im Weltkrieg* (Berlin, 1941), p. 119; see also 'Winter-Kriegsspiel, 1934–35', RL 2 II, Generalstab der Luftwaffe/Luftwaffe Führungsstab, folder 76, BA-MA.

[7] 'Kriegstagebuch des Luftgaukommandos VII [17 July 1940]', RL 19, folder 78, p. 86, BA-MA.

[8] 'Richtlinien für die Kampfführung in der Flakgruppe Vorfeld-West [6 December 1940]', RL 12, Verbände und Einheiten der Flakartillerie, folder 39, p. 28, BA-MA.

[9] 'Kriegstagebuch des Luftgaukommandos VII [3 August 1940]', RL 19, folder 78, p. 108, BA-MA.

Table 1 Dummy installations

Location	Codename
Hardtwald, north of Karlsruhe	Venezuela
Söllingen	Columbia
Stuttgart/Lauffen	Brazil
Stein am Kocher	Peru
Stadt Augsburg	Argentina
Messerschmitt factory/Augsburg	Bolivia
Dummy airfield near Schwäbisch Hall	Costa Rica
Karlsruhe (south)	Panama
Göppingen	Guatemala

ated in the overhead lines by the passage of a streetcar.[10] They also placed flak guns and searchlights around the targets. In order to lure RAF crews to the phoney target, the facilities were poorly lighted to make it appear as if the lighting was a product of sloppy blackout procedures. In addition, flak guns commenced firing and searchlights scanned the skies upon the approach of British aircraft in order to draw their attention away from the actual target towards the fake. The Luftwaffe also detonated pyrotechnics at the fake sites to simulate bomb bursts in a further effort to divert approaching aircraft to the site.[11]

On 6 August 1940 air district VII headquarters released several guidelines for the operation of the dummy installations. First, the directive emphasized that the flak batteries and the searchlight units should conduct their activities in such a manner as to convince the bomber crews that they were protecting a vital installation. The second guideline called for flak forces to change their positions at regular intervals in an effort to exaggerate their true strength; however, the directive cautioned that the flak forces should not overdo it lest the bombers choose to avoid the area. Finally, the air district headquarters guidelines discouraged flak operations during the day, as the chance of duping the bomber crews in daylight conditions was dramatically less than at night.[12]

At first, RAF crews appeared adept at distinguishing between the real and the fake installations. In one respect flak batteries apparently showed their hand through a too-obvious display of gunnery. German interrogations of British prisoners of war found that several remarked on the 'extraordinary firing displays' in the vicinity of the dummy installations. In the period between 26 July and 9 August 1940, British

[10] N. Hoffmann, 'Der Luftangriff auf Lauffen am 13. April 1944', *Lauffener Heimatblätter* VIII (April 1994), p. 8.
[11] 'Kriegstagebuch des Luftgaukommandos VII [19 July 1940]', RL 19, folder 78, p. 90, BA-MA.
[12] Op. cit. [6 August 1940], p. 112.

aircraft flew over several of the installations even releasing flares, but not their bomb loads.[13] By the middle of August, however, RAF bombers increasingly began bombing the phoney sites, leading the Luftwaffe to believe that the deception was working.[14] By the middle of September the improved success of the dummy installations led to the construction of several new sites. However, the effectiveness of the dummy installations proved to be a two-edged sword. This was the case for a small town in the vicinity of one site whose mayor complained that these deceptive measures increased the risk of collateral damage to his village. The mayor's request to have the site relocated was denied, but the Luftwaffe noted that it was important to provide small communities near the sites with timely air-raid warnings.[15]

It is not surprising that the mayor's protest fell on deaf ears as interest in the deception scheme could be found at the highest levels of the Luftwaffe leadership. In fact, both Göring and Milch suggested improvements to the operations. In the case of the latter, Milch ordered that only captured flak pieces be used at the sites, a measure that prevented the further dilution of German air defence resources and saved the best flak guns for the protection of authentic sites.[16] The level of interest in the dummy installations ultimately rested on their effectiveness. In August and September the Luftwaffe calculated that the RAF had dropped 415 high-explosive (HE) bombs, 1607 incendiaries and 376 flares on targets in air district VII. Of this total, 60 HE bombs, 219 incendiaries and 77 flares fell on dummy installations, or 14% of HE bombs and incendiaries and 20% of flares.[17]

The initial results seemed promising, and by mid-November the success achieved through the use of the sites resulted in praise from the Reich minister of propaganda, Joseph Goebbels. Goebbels, writing about the effect of British bombing, noted in a diary entry of 14 November that 'it is apparent that the English have been duped by fake installations to the greatest extent'.[18] Likewise, Sperrle lauded the performance of the sites:

> The great significance of the established dummy installations in the course of the last weeks especially and distinctly stands out. They [the sites] have completely fulfilled their purpose and mandate. This is satisfying proof for the intelligent and skilful balanced solution, under very difficult planning questions and construction

[13] Op. cit. [August 1940], p. 106.
[14] Op. cit. [17 August 1940], p. 128.
[15] Op. cit. [September 1940], pp. 190, 204.
[16] Op. cit. [August 1940], pp. 112, 154.
[17] Op. cit. [1 October 1940], p. 258.
[18] E. Fröhlich, *Die Tagebücher von Joseph Goebbels: Sämtliche Fragmente*, part I, IV (Munich, 1987), p. 395. Diary entry from 14 November 1940.

> execution, in the correct tactical employment [of the sites] and adroit service [by the crews].[19]

Sperrle's commendation followed in the wake of a highly effective week for the dummy installations. Between 4 and 10 November, British bombers released 172 HE bombs and 355 incendiaries over targets within air district VII. Dummy installations absorbed 58 of the bombs and 183 of the incendiaries of the entire RAF effort, or a total of 34% and 51%, respectively.[20] In Augsburg, on the night of 6 November, the fake sites alone received 33% of the high-explosive bombs and 70% of the incendiaries dropped by the RAF bombers. Similarly, in Stuttgart on the night of 8 November, the numbers were almost reversed, with 65% of the high-explosive bombs and 38% of the incendiaries hitting the dummy installations. In contrast, the totals for Munich and Augsburg, on the night of 8 November, proved to be a modest 12% of the number of high-explosive bombs and only 8% of the incendiaries. The Luftwaffe rationalized the low percentage in these areas as a product of too few dummy installations (Munich had only one), and noted that further construction was under way.[21]

By the summer of 1941 the dummy installations had emerged as an important adjunct to the Reich's air defences. In turn, the success of the dummy installations in the early stages of the war offers another measure for gauging the overall effectiveness of the German ground-based air defence system. Although these sites were not bringing down British bombers, they were in fact achieving the desired effect of substantially diluting the impact of the RAF attacks. Additionally they required few resources and very little effort to maintain. Milch's order to use only captured flak guns meant that the guns and, to some extent, the munitions were also an expendable resource. Also, these sites offered an excellent live-fire training ground for inexperienced gun and searchlight crews, as well as recently mobilized reservists.

The improved performance achieved by German anti-aircraft defences in July and August coincided with a change in the RAF's bombing emphasis. In a directive issued on 9 July 1941, Bomber Command restated the objectives of future bombing raids as 'dislocating the German transportation system and destroying the morale of the civilian population as a whole and of the industrial workers in particular'.[22] The RAF's decision to strike at the morale of the civilian population emerged in part in recognition of the abysmal results being achieved by its bomber crews. In August, D.M. Butt released a devastating evaluation of the results of some one hundred RAF bombing raids conducted in the period between 2 June and 25 July 1941. After exam-

[19] 'Kriegstagebuch des Luftgaukommandos VII [November 1940]', RL 19, folder 79, p. 117, BA-MA.
[20] Op. cit. [11 November 1940], p. 109.
[21] Op. cit. [1 December 1940], p. 135.
[22] *The Strategic Air War Against Germany, 1939–1945: Report of the British Bombing Survey Unit* (London, 1998), p. 5.

ining post-strike photographs of the targets, the report concluded that no more than one crew in five of all aircraft dispatched had dropped their bombs within 5 miles of the correct target. Furthermore, the flight crews had obtained even worse results in the heavily built-up and smog-filled Ruhr, where only one in ten bombers placed their bomb load within 5 miles of the target.[23]

The poor accuracy of British bombing in the first two months of the summer occurred as a result of several factors. First, the British lacked a navigational system that would enable them to locate targets precisely. Second, German fighter and anti-aircraft defences continued to expand while becoming more effective, as indicated by the increasing loss rate suffered by the RAF. By the end of March 1941, bomber losses amounted to a mere 181 aircraft; by the end of June this number had grown to 541 aircraft; and by the end of September the total stood at 1170 aircraft. Admittedly, these losses included non-combat accidents and mishaps, but German air defences still directly or indirectly accounted for the majority of RAF losses in the period.[24]

An additional factor that helped to explain the poor results achieved by Bomber Command was the Luftwaffe's continued use of dummy installations to decoy RAF crews away from their intended targets. For example, RAF crews dropped 55% of their high-explosive bombs and 69% of their incendiaries on dummy installations in the vicinity of Stuttgart and Karlsruhe in July 1941. In August, Bomber Command wasted 38% of its high-explosive loads and 31% of its incendiaries on phoney sites within air district VII.[25] In another remarkable example, during a raid against Berlin in 1941, RAF crews dropped 43 times more high-explosive bombs and 47 times more incendiaries on a dummy installation than on the city itself.[26] In the case of Berlin, work crews camouflaged major streets and landmarks, thus transforming the aerial view of the city's centre to such an extent as to make visual identification extremely difficult for the bomber crews, especially in blackout conditions.[27] For example, construction crews built a replica of the famous Brandenburg Gate and erected models of government buildings east of the Spree River in an attempt to deceive RAF bom-

[23] C. Webster and N. Frankland, *The Strategic Air Offensive Against Germany*, IV, *Annexes and Appendices* (London, 1961), p. 205. The entire Butt report is reproduced in this volume (pp. 205–13). If one takes into account only aircraft that attacked the target, versus all aircraft dispatched, the total ratio of crews that dropped their bombs within the 5-mile target area was one in three.

[24] W.R. Chorley, *Royal Air Force Bomber Command Losses of the Second World War*, II, *Aircraft and Crew Losses, 1941* (Earl Shilton, Leicester, 1993), p. 129.

[25] 'Kriegstagebuch des Luftgaukommandos VII [August–September 1941]', RL 19, folder 81, pp. 39, 83, BA-MA.

[26] 'Vorstudien zur Luftkriegsgeschichte, Heft 8, Reichsluftverteidigung [1944]', T971, The von Rhoden Collection of Research Materials on the Role of the German Air Force in World War II, reel 69, National Archives and Records Administration, Maryland (hereafter NARA).

[27] Fröhlich, *Tagebücher*, part 2, I, p. 452. Diary entry of 19 September 1941.

bers as to the location of the Wilhelmstrasse, the centre of the Reich government.[28]

The RAF certainly was not oblivious to the efforts of the Luftwaffe with respect to decoy and deception measures. In fact, Air Chief Marshal Sir Charles Portal, the chief of the air staff, sent Prime Minister Winston Churchill a report in October 1941 discussing the nature of Berlin's air defences. Portal informed the prime minister that 'the large numbers of searchlights at Berlin are intensely dazzling and the Germans are continually improving their elaborate systems of decoys and camouflage. For these reasons, crews may take some time in determining their exact position and in deciding on the best run-in to their targets.'[29]

The dummy installations continued to pay a handsome dividend at relatively little cost into the autumn of 1941. As a result, the Luftwaffe construction crews in air district VII began work on two new sites at the beginning of September.[30] In September 1941 the percentage of all bombs dropped on fake installations in air district VII totalled 53% of all high-explosive bombs and 41% of all incendiaries; in October, 37% of all HE bombs and 28% of all incendiaries; and in November, 28% of all HE bombs and 11% of all incendiaries.[31] The decreasing percentage of bombs dropped on the dummy installations through the autumn of 1941 indicated that the RAF crews had become more proficient at recognizing the phoney sites. A Luftwaffe after-action report in November remarked on this trend by noting 'the heavy use of parachute flares over the dummy installations is once again noticeable, allowing for the presumption that the enemy is reckoning with such installations and is seeking to identify them'.[32]

By the summer of 1941 the RAF was well on the way to developing a radio-navigational system to improve bombing accuracy.[33] Despite these efforts, Bomber Command did not correctly identify one dummy installation constructed to simulate the Krupp works near Essen until 1943, by which time they had dropped 64% of all high-explosive bombs and 75% of all incendiaries on the fake factory instead of its authentic counterpart. In addition, Berlin lay beyond the range of the new radio navigation devices, and the 16 dummy sites surrounding the capital were more or less effective throughout the war.[34] The phoney sites in

[28] A. Read and D. Fisher, *The Fall of Berlin* (New York, 1992), p. 76.
[29] Letter from Air Chief Marshal Sir Charles Portal to Air Marshal Sir Richard Peirse, 19 October 1941. AIR 14, Air Ministry: Bomber Command, folder 1928, Public Records Office, Kew. Portal forwarded Peirse a copy of his report to the prime minister.
[30] 'Kriegstagebuch des Luftgaukommandos VII [1 September 1941]', RL 19, folder 81, p. 81, BA-MA.
[31] Op. cit. [October–December 1941], pp. 129, 183, 233.
[32] Op. cit. [November 1941], p. 183.
[33] B. Greenhous, S.J. Harris, W.C. Johnston and W.G.P. Rawling, *The Official History of the Royal Canadian Air Force*, III, *The Crucible of War, 1939–1945* (Toronto, 1994), p. 552.
[34] W. Wolf, *Luftangriffe auf die deutsche Industrie, 1942–45* (Munich, 1985), pp. 129–30.

the vicinity of Berlin also included fake airfields created in moors or on lakes replete with runway lighting.[35] All in all, the dummy installations continued to bedevil British night missions until late in the war. Goebbels ruefully remarked on the success of the dummy sites in a diary entry of July 1941, by confiding 'We cannot deny the pompous declarations of success by the RAF, because they mostly concern dummy installations. The statistics mentioned by the English are totally grotesque. But perhaps they even believe them themselves. They give us a certain pause to catch our breath.'[36] On 7 September, Goebbels again remarked that his office would not deny British claims of bombing destruction in western and north-western Germany because 'the English are for the most part hitting dummy sites'.[37] One Luftwaffe report went so far as to describe the role played by the dummy installations during the build-up of the German night defences as 'decisive'.[38]

II

By the summer of 1942 the RAF's increasing success in identifying the dummy sites led the Luftwaffe to pursue new initiatives designed to deceive the bomber crews. In one case British bombers overflew twenty dummy sites in air district VII during the night of 28 August but released only a single high-explosive bomb on a site near Augsburg. Still, even as late as December, an RAF bomber dropped 10 high-explosive bombs and 100 incendiaries on one dummy site. The interrogations of two downed pilots in September produced a mixed evaluation of the sites, with one pilot remarking that the lighting of the dummy sites made them easily discernible, while another pilot described the effectiveness of the sites, especially those north-west of Berlin.[39] The noticeable decrease in the efficacy of the dummy sites led the Luftwaffe to attempt new methods for decoying the bombers away from their intended targets. For example, the Luftwaffe constructed walled enclosures labelled by the British as 'fire sites' in areas near potential RAF targets. These walled enclosures were filled with combustible materials and set alight prior to, or during, an actual bombing raid. At night and from a height of over 10 000 feet, the fire sites resembled burning buildings. The fire sites were simple but extremely effective decoys. In the wake of a failed raid on Mannheim on the night of 19 May 1942, Harris berated his group commanders

[35] H. Hermann, *Eagle's Wings: The Autobiography of a Luftwaffe Pilot*, trans. P. Hinchliffe (Osceola, WI, 1991), p. 186.
[36] Fröhlich, *Tagebücher*, part 1, IV, p. 734. Diary entry of 4 July 1941.
[37] Fröhlich, *Tagebücher*, part 2, I, p. 32. Diary entry of 7 September 1941.
[38] 'Vorstudien zur Luftkriegsgeschichte, Heft 8, Reichsluftverteidigung [1944]', T971, reel 69, NARA.
[39] 'Kriegstagebuch des Luftgaukommandos VII [29 August, 5 September and 7 December 1942]', RL 19, folder 83, pp. 53, 65, 169, BA-MA.

over the issue of bombs being released over the fire sites. In a lengthy harangue, Harris showed his anger with his crews:

> It is apparent from the night photographs and from the reports of crews, that almost the whole effort was wasted in bombing large fires in the local forests, and possibly decoy fires. Nevertheless, in spite of the now incontrovertible evidence that this is what in fact occurred, the reports of the crews on their return from the raid were most definite in very many cases that they had reached the town and bombed it. ... The cause of this failure is beyond doubt to be found in the easy manner in which crews are misled by decoy fires or by fires in the wrong place. ... somehow or other we must cure this disease, for it is a disease, of wasting bombs wholesale upon decoy fires.[40]

An RAF study at the end of the war confirmed Harris's fear and noted that the principal type of decoy used in 1941 and 1942 had been the fire site. The study then concluded that, although these sites were often recognized in night photographs, they were still 'frequently effective in diverting a considerable proportion of our attacks'.[41] Despite Harris's admonition to his crews, the fire sites would continue to retain much of their effectiveness until the RAF introduced target-marking devices for the Pathfinder Force in 1943, at which time the German defenders would initiate a new series of countermeasures in an endless game of action and reaction. In any event, the fire sites demonstrated the Luftwaffe's renewed success in deception operations versus the bombers, and once again highlighted the importance of examining ground-based air defences in a broader context beyond the simplified calculus of flak versus fighters.

As an adjunct to the dummy sites, the Luftwaffe also began to use smoke generators to conceal the primary target and divert the bombers to the fake installations.[42] During the latter half of 1941, smoke generators had proved highly effective in protecting the battleships *Scharnhorst* and *Gneisenau* anchored in the harbour at Brest from RAF bombing raids.[43] Additionally, smoke-generating companies surrounding the oil refinery at Pölitz achieved a 'complete success' in preventing the accurate bombing of the site in December 1942. Likewise, Leroy Newby, a B-24 bombardier, described a raid against Ploesti dur-

[40] Greenhous et al., *Crucible*, p. 584.

[41] Bomber Command Operational Research Section Reports, 'S' series, S-224, 'Report on Decoy Sites in the Mannheim and Frankfurt Areas with Particular Reference to Decoy T.I. Devices [5 July 1945]', Air Historical Branch, Middlesex (hereafter AHB).

[42] *United States Strategic Bombing Survey: Report on the German Flak Effort throughout the War* (n.p., 1945), 21, 137.310–4, Air Force Historical Research Agency, Alabama (hereafter AFHRA).

[43] G. Wagner, ed., *Lagevorträge des Oberbefehlshabers der Kriegsmarine vor Hitler, 1939–1945* (Munich, 1972), p. 305. Hitler and the chief of the German navy, Admiral Erich Raeder, discussed the issue of smoke protection at a conference on 13 November 1941.

ing which columns of smoke from dummy fires 'fooled' several bomber groups, including his own, to drop over 1000 tons of bombs 'into a sea of white smoke'. During this raid the reduced visibility over the target caused by the smoke coverage also led several groups to proceed to the secondary target.[44] By the end of 1942 the Luftwaffe had eight smoke-generating companies consisting of 500 men; however, by 1945 this number soared to 50 000 men and women serving in 100 smoke-generator companies.[45] The major drawback associated with these units was, however, their demand for 15 000 tons of smoke acid per month, a demand that German industry found impossible to meet as the number of smoke-generator companies skyrocketed.[46] The performance of the smoke-generator companies, like that of the dummy installations, provided yet another example of the effectiveness of ground-based air defences when viewed from a holistic perspective.

III

In a review of bombing operations between 1 February and 18 April 1943, the British Operational Research Section determined that of the 29 major bombing operations carried out against German targets, 'only 3 have achieved complete success, 8 have been partially successful, whilst 15 have been complete failures'. In other words, the ORS identified over one-half of the raids in this period as having been 'complete failures'. The section attributed most of the failures to problems with either the radio navigation system, codename OBOE, or H2S ground-mapping radar equipment; however, in five cases the actions of German ground-based air defences proved decisive. The report noted that 'in at least 5 cases out of the ten which have been investigated in detail it is highly probable that the enemy has directly contributed to the failure of the operation by the use of decoys or smoke screens'.[47]

The ORS report in June 1943 also noted that there was some evidence of the use of 'sky marker flares'.[48] For example, during an attack on Bochum in May, Bomber Command aircraft reported seeing red target markers on the ground, despite the fact that Pathfinder Force (PFF) aircraft had failed to mark the area at the designated time. The Luftwaffe's employment of decoy markers was an issue of extreme importance for RAF bombing operations. Bomber Command first introduced red target markers for PFF aircraft in a raid against Berlin on the night of 16 January 1943. In turn, target markers greatly reduced the effectiveness of the Luftwaffe's existing decoy fire sites.

[44] L.W. Newby, *Target Ploesti: View from a Bombsight* (Novato, CA, 1983), p. 107.
[45] *The United States Strategic Bombing Survey: Report on the German Flak Effort throughout the War*, 22, 137.310–4, AFHRA.
[46] Op. cit.
[47] Bomber Command Operational Research Section Memoranda, 'M' series, M-31, 'A Review of Bombing Operations, Feb–April 1943' [June 1943], AHB.
[48] Op. cit.

The Luftwaffe, however, quickly adapted to the changed circumstances and by March had constructed decoy rocket-launching sites in the vicinity of the existing fire sites. Approximately 20 Luftwaffe personnel operated the sites in 12-hour shifts. When an attack appeared imminent, the Luftwaffe ground crews launched decoy rockets in the general direction of the fire sites. The decoy rocket closely simulated the PFF's red target indicator, and the lighting of the fire sites offered an added measure for deceiving Bomber Command aircrews. In addition, to decoy rockets the sites also maintained decoy ground flares in a variety of colours. The sites themselves were both easy to conceal and extremely rudimentary, consisting of wooden crates for launching rockets and concrete launch pads of a few square metres. The use of decoy target markers also took advantage of the tendency among aircrews in the bomber stream to drop on the first target markers or ground fires they encountered. This practice arose from the completely natural reaction of the crews to drop their bomb load and leave the target as soon as possible, but the practice also resulted in the continual 'creep back' of the bomb pattern from the original aim point.[49] Despite growing evidence, the RAF proved somewhat unwilling to believe reports that the Luftwaffe was employing decoy target indicators. In fact it was not until September 1944 that military intelligence confirmed the use of decoy target indicators.[50]

The operation of the decoy target indicator sites was important in several respects. First, the creation of decoy rocket sites, married with the existing fire sites, provided a further illustration of the Luftwaffe's ingenuity in the field of ground-based air defences. Second, these sites required little maintenance, proved difficult to identify from the air and offered high returns on a minimal investment. Even if the sites proved successful in diverting only a portion of the attacking force, they had served their purpose well. Third, the sites, though not by intent, may have played a significant role in inducing the 'creep back' phenomenon associated with many Bomber Command raids during the war. Finally, the sites demonstrated the cat-and-mouse game of move and countermove being played by both sides in the air war over Germany.

In addition to the decoy markers, the Luftwaffe also continued to rely on traditional camouflage and decoy methods. For example, British intelligence identified a 'dummy town' located north-west of Berlin described as 'a realistic reconstruction by dummy lights, factories and marshalling yards of a nearby town or factory target'.[51] One

[49] D. Richards, *The Hardest Victory: RAF Bomber Command in the Second World War* (New York, 1994), p. 170.

[50] Bomber Command Operational Research Section Reports, 'S' Series, S-224. In some reports, crews reported a slight difference in the red of the target indicators and those of the decoy markers; however, this might appear to be an academic question for most crews facing German air defences in the vicinity of the target area.

[51] 'No. 5 Group Tactical Notes (Provisional), 2nd edition, November 1943', Air Tactics Box 2, AHB.

such site north of Berlin near the town of Frohnau was completely constructed out of canvas and plywood.[52] In another case the RAF verified the existence of a decoy lake at Wedel near Hamburg altered to resemble the port city's famous Außen Alster. In this case the deception was believed to have contributed to fooling a 'large proportion' of aircraft during a raid on the night of 3 March 1943. In fact an ORS report noted that 'It seems likely that the whole village of Wedel has been made into a decoy for Hamburg, which it resembles somewhat in shape, and the possibility that such decoys exist for other German cities should not be overlooked'.[53] It is unclear what opinion the citizens of Wedel held concerning these measures, but certainly their countrymen in Hamburg appreciated any measure designed to provide them with some respite from RAF bombing. Despite some success, Bomber Command's increasing use of H2S ground-mapping radar reduced the general effectiveness of sites in western Germany, leading to their deactivation at the end of 1943.[54] In the end, passive decoy measures by themselves could not prove decisive over the long term; nevertheless these measures had constituted an important but auxiliary method for degrading the effectiveness of Allied bombing in 1941–43.

IV

Throughout 1944 the Luftwaffe continued to recognize the value of dummy installations and decoy measures as an important adjunct to the flak gun defences. The growing Allied practice of relying on radar bombing during periods of poor weather led to the introduction of an ingenious countermeasure in the form of radar-reflective floats. The early versions of Allied H2S/H2X ground-mapping radar were limited in their ability to distinguish between terrain features; however, large bodies of water offered an excellent contrast with land features, and provided navigators with important information to fix their positions. Berlin, a major Allied target, is surrounded by a number of lakes that greatly facilitated navigation by the bombers when an overcast covered the city. In order to confuse Allied navigators, the Luftwaffe constructed cruciform-shaped metal plates on wooden floats and placed them in rows across lakes on the western approaches to the capital.[55] These floats in turn reflected radar energy back to Allied planes providing an image that made one lake appear as two or more

[52] Read and Fisher, *Fall of Berlin*, p. 75.
[53] Bomber Command Operational Research Section Memoranda, 'M' Series, M-31.
[54] Hoffmann, 'Der Luftangriff auf Lauffen'.
[55] M. Middlebrook, *The Berlin Raids: RAF Bomber Command Winter, 1943–1944* (New York, 1988), p. 28.

bodies of water.[56] Post-war investigation teams from the American military described this deception measure as 'quite successful'.[57]

Throughout 1944 the Luftwaffe also continued to employ decoy target indicators to divert Bomber Command aircraft from their objectives. An Operational Research Section report of 14 April 1944 warned that 'a large volume of evidence has now been collected which shows beyond reasonable possibility of doubt that the enemy is making attempts to divert our attacks from his cities by the use of decoy TI markers, and that his efforts have been meeting with some degree of success.' The report also remarked on the decreased effectiveness of German fire sites, but cautioned that 'used in conjunction with decoy TI's, and possibly smoke screens as well, they can form an effective decoy system. ... [and] it appears probable that he [the enemy] is planning a rapid expansion of these decoy activities in the near future.' Finally, in order to counter the German effort, the ORS report suggested the development of a new target marker that could not be easily duplicated.[58]

In addition to the decoy measures involving radar-reflective floats and decoy target indicators, the Luftwaffe constructed dummy flak batteries and dummy airfields in the vicinity of important urban and industrial targets. On the phoney airfields, damaged aircraft or fabric and wood models provided effective decoys. Likewise, the Luftwaffe set up phoney anti-aircraft batteries to conceal the departure of flak defences from specific areas.[59] In the case of the dummy flak sites, one 8th Air Force flak report observed, 'It is possible that the enemy is deceiving us to some extent by leaving behind dummy equipment whenever he abandons or temporarily leaves unoccupied a gun position.' This report then continued, 'A possible example of this is at Bielefeld where photographs still show 10 heavy guns although no Flak has been encountered there during the past month even in visual conditions. On the same basis it is possible that some of the guns in the Ruhr have been removed.'[60] By concealing the removal of flak guns from specific sites, the Luftwaffe hoped to prevent Allied flak intelligence officers from noticing the shift in gun batteries from secondary objects to the protection of high priority areas during the last year of the war.

In conjunction with the dummy airfields and flak sites, the Luftwaffe continued to rely heavily on dummy installations throughout 1944 to

[56] 'Summary, German Flak [1945]', 519.601A-1, AFHRA. This report was compiled from the findings of the 'Air Defense Investigation' field teams during the period between April and July 1945.

[57] Op. cit.

[58] Bomber Command Operational Research Memoranda, 'M' Series, Memo-66, 'Observations on Enemy Decoy T.I. Markers [14 April 1944]', AHB.

[59] W. von Renz, *The Development of German Antiaircraft Weapons and Equipment of all Types up to 1945* (Maxwell AFB, AL, 1958), pp. 334–335, K113.107–194, AFHRA.

[60] '2d Bombardment Division Monthly Flak Report, November 1944', 502.3813, AFHRA.

divert Allied bombers from their intended targets. The worsening petroleum crisis caused by the Allied bombing of oil facilities led the Luftwaffe to focus on the construction of dummy installations in the vicinity of oil refineries and the Reich's critical synthetic oil plants. For example, the Luftwaffe constructed two separate dummy facilities near Ploesti in an effort to fool Allied bombers. These dummy sites were located approximately 8 miles north-west and 7 miles east of the real oil facilities.[61] In another example, decoy plants surrounding the synthetic oil plant at Leuna successfully diverted a total of 4550 bombs away from the actual site.[62] In fact, more bombs hit the dummy sites than the real facility in seven of the first eight attacks aimed at the plant.[63] Likewise, the United States Strategic Bombing Survey team that inspected the synthetic oil plant at Meerbeck remarked that a dummy plant located some 3 miles from the main plant proved 'very effective until May 1944'. In the case of Meerbeck, the RAF dropped 23 926 high-explosive bombs and 103 743 incendiary bombs during 41 attacks, but after the war the survey team found evidence of only 328 bomb craters within the plant area.[64] While the incendiaries would not have produced a crater, the fact that little more than 1% of the high-explosive bombs fell within the plant area highlighted the RAF's difficulties with night bombing accuracy against point targets, and provides a strong indicator as to the effectiveness of the nearby dummy site.

By mid-1944 attempts to protect German industry also included extensive use of camouflage as well as dispersing industrial facilities and moving them underground.[65] In the face of the increasing Allied aerial bombardment, the government ordered the dispersal of 'vital industries' to less threatened areas in March 1944.[66] Likewise, the British raid against Peenemünde in August 1943 had started a movement to put V-2 missile production underground. By 1944 the infamous Buchenwald satellite camp, Dora, employed thousands of forced labourers and prisoners of war working and living in atrocious conditions beneath the earth.[67] In the face of increasing American attacks on the German aircraft industry, Hitler tasked the Organization Todt with the

[61] Newby, *Target Ploesti*, p. 56.
[62] Oil Division, *The United States Strategic Bombing Survey: Ammoniakwerke Merseburg GmbH Leuna, Germany* (Washington, DC, 1946), p. 19.
[63] Oil Division, *The United States Strategic Bombing Survey: Oil Division Final Report, Appendix* (Washington, DC, 1945), p. 34.
[64] Oil Division, *The United States Strategic Bombing Survey: Meerbeck Rheinpreussen Synthetic Oil Plant* (Washington DC, 1946), pp. 12, 14.
[65] Oil Division, *The United States Strategic Bombing Survey: Underground and Dispersal Plants in Greater Germany* (Washington DC, 1945), pp. 1–4. The movement of factories and facilities involved a number of major disadvantages, including high cost, delays in production, and increased difficulties in transporting resources and materials to these sites.
[66] Oil Division, *The United States Strategic Bombing Survey: Meerbeck Rheinpreussen Synthetic Oil Plant*, p. 14.
[67] M.J. Neufeld, *The Rocket and the Reich: Peenemünde and the Coming of the Ballistic Missile Era* (Cambridge, MA, 1995), pp. 200–13.

construction of subterranean aircraft factories.[68] Camouflage, dispersal and the movement of critical industries underground were important passive defence measures that complemented efforts associated with the dummy installations. In the final analysis, the innovative decoy and deception measures introduced by the Luftwaffe throughout the war demonstrated a continuing facility for adaptation and ingenuity within the ground-based air defence force. The success of these forces was one of the major achievements of the air defence effort.

V

By the end of 1944 the Luftwaffe's dummy sites, deception measures and smoke generators had provided the Third Reich with a string of Pyrrhic victories. The overwhelming Allied aerial assault had smashed the German oil industry and was laying waste to the Reich's transportation system. Clearly, by this stage of the war, passive defences alone could not stem the flood of British and American strategic and tactical aircraft visiting destruction on the German homeland. Still, the dummy sites married with deception measures demonstrated the important role of passive defences when used in conjunction with active defences. By 1945 these measures achieved only marginal effects; however, these defences nonetheless had made important contributions to the protection of German industry and urban areas in the first four years of the war. On the one hand, the relatively modest costs associated with these efforts highlighted the benefits that could be achieved by deception. On the other hand, the dynamic nature of these defences and their ability to adapt in the face of Allied countermeasures aptly illustrated the dialectic battle between offence and defence during the Second World War. In the end the dummy sites could not prevent the obliteration of German industry and urban centres, but they did show that on numerous occasions as Allied bombers were hitting their marks, they were in fact missing their targets.

[68] 'Stenographische Niederschrift über die Besprechung beim Reichsmarschall [29 May 1944]', RL 3, Generalluftzeugmeister, folder 62, p. 86, BA-MA.