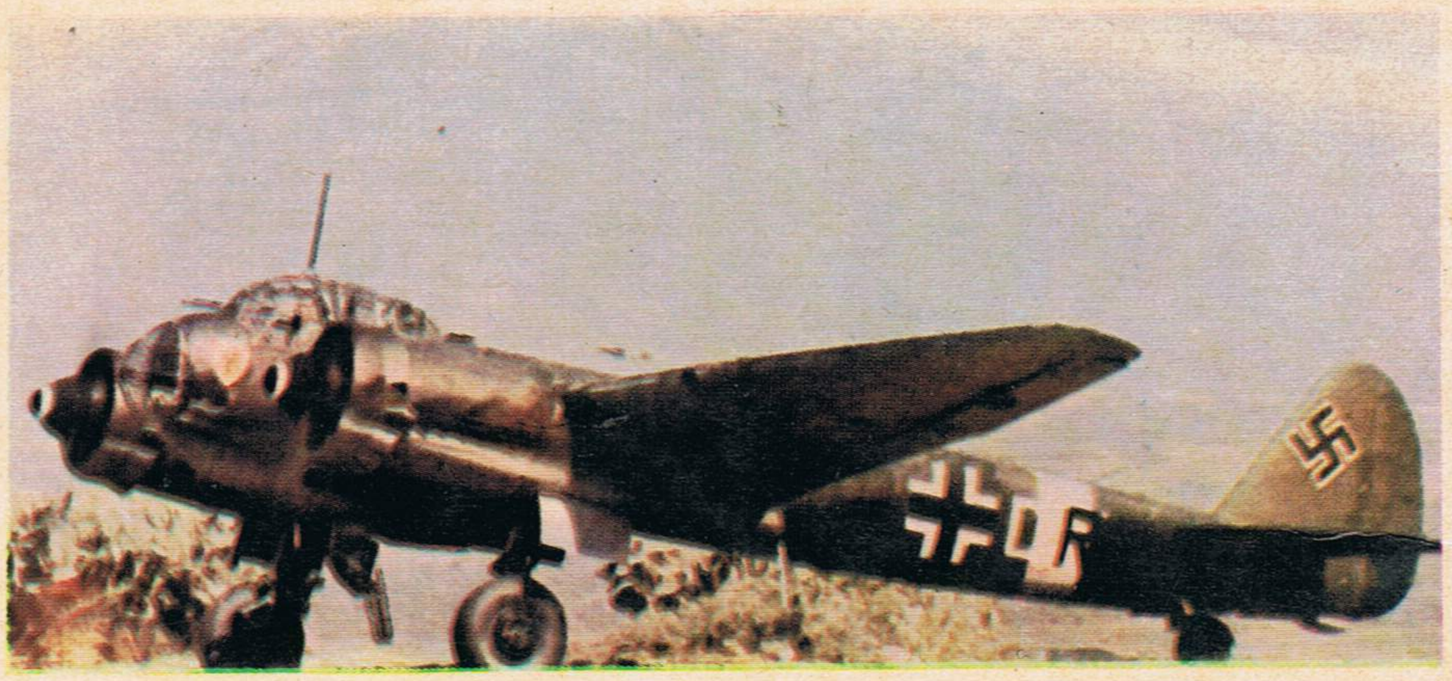


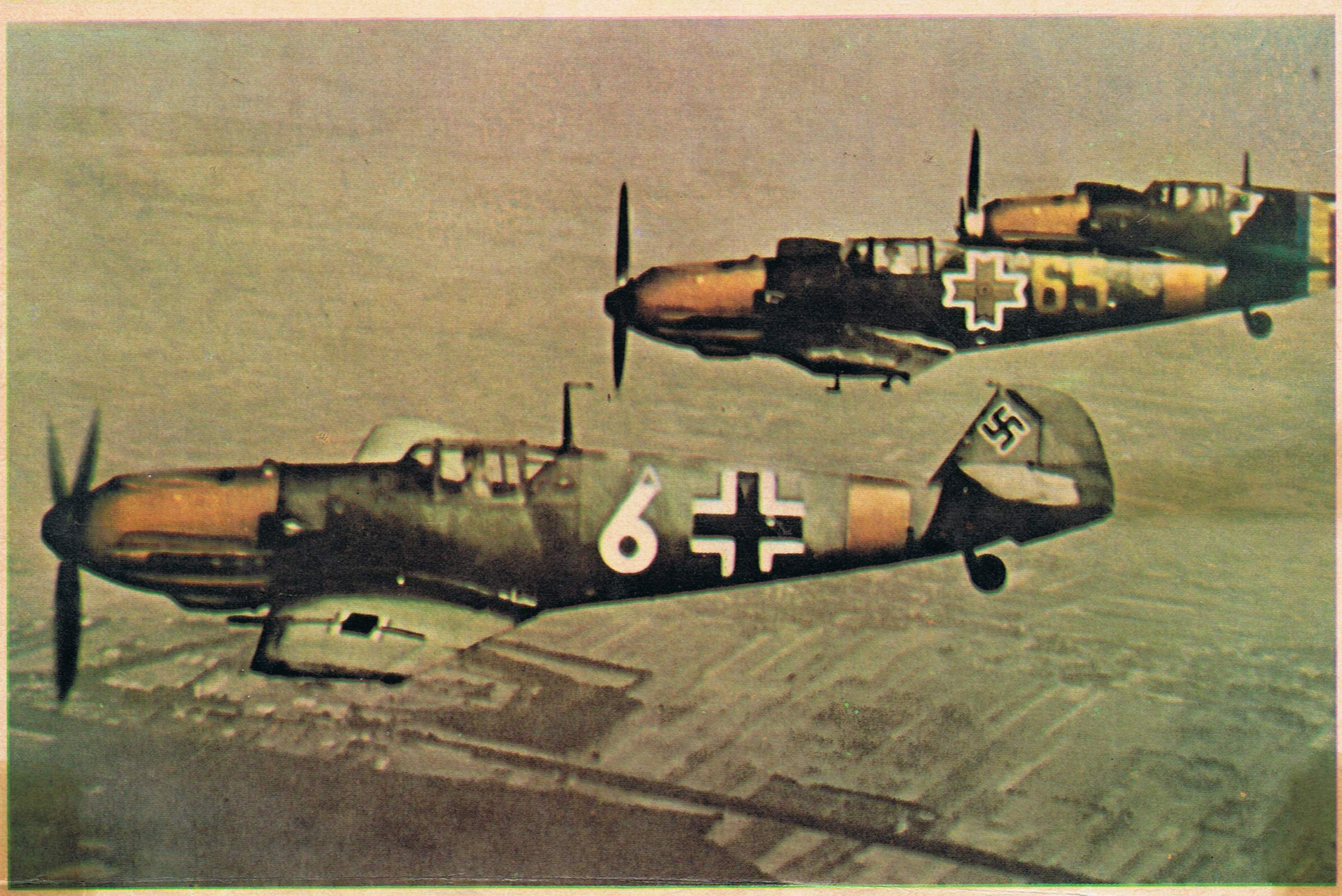


German Aircraft Markings

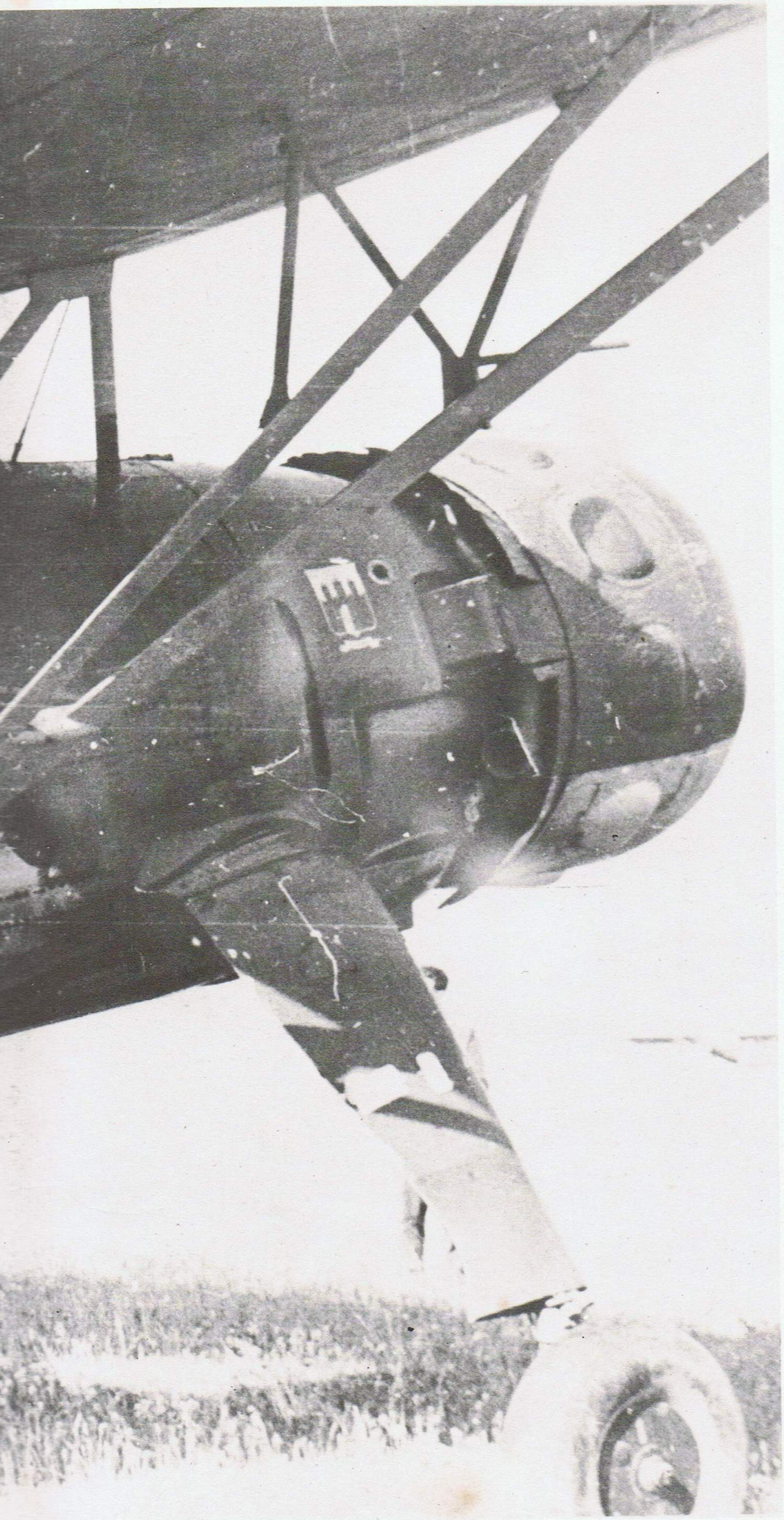
1939-1945

K.A.Merrick









German Aircraft Markings

1939-1945

K.A.Merrick

LONDON

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Introduction

The colours and markings worn by Luftwaffe aircraft have long provided a rich source for exploration by historian and modeller alike. The reason for the universal fascination that this subject holds is as difficult to define as it is to untangle the web of truths and half truths which attend it. The contents of this book are the result of more than a decade of attempting to isolate fact from supposition, the mileage covered, both mental and physical, being a direct measure of the complexities involved. The basis of the book, like any historical work, is founded on a proportion of primary documents, all that are known to have survived. Undoubtedly others still remain to be rediscovered but many have been lost for all time. It is perhaps this element of incompleteness, this lack of total indisputable definition that is the key to the subject's fascination.

So many people have contributed to the research for this work that to single out individuals is difficult. Special mention must, however, be made of the following individuals for their constant assistance and unselfish contributions from their own research results. David Vincent has maintained a steady flow of information, and photographic material as well as contributing one of the appendices. My old associate in the pursuit of aviation history, Charles Schaedel, kindly read the work in its original form and corrected the draft. Mrs. Christine Shute is also thanked for her patience in translating that draft into its finished typed form. Translation work was carried out by several people, principally Mr. H. Tusch, Mr. S. Polyak and Mrs. C. Luscombe. From America Tom Hitchcock, Jim Kitchens and Richard Lutz maintained a flow of information and photographs, while in Europe William Berge, Doug Carrick, Hans Obert and William Hesz were equally generous. David Carpenter in England and Hank Volker in Canada are also thanked for their special assistance.

In addition the following people and institutions provided assistance; *Musée de l'Air, Militärgeschichliches Forschumgsamt der Bundeswehr,* Air Historical Branch of the Ministry of Defence (UK), Royal Netherlands Air Force Museum, Swedish Military Archives, *Heinkel Flugzeugbau GmbH, Herbol-Werke,* F. Heydrich, W. Wagner, T. Römer, J. Rosenstock, W. Witts, d'E. Darby, P. Anderson, T. Seay and G. Duval.

Photographs are the key to any study such as this one and I am indebted to Herr H. Regel of *Bundesarchiv,* H. Birett and R. Zwillsperger of *Deutches Museum,* M. Dalancourt of the *Etablissement Cinématographic Des Armées,* E. Hine of the Imperial War Museum, A. Sweeting of the Australian War Memorial, Dr. Buschorn of *Vereinigte Flugtechnische Werke-Fokker GmbH,* J. Pöllitsche of *Junkers Flugzeugund Motorenwerke AG, Messerschmitt-Bölkow-Blohm AG,* Smithsonian Institution, Icare, Kosmos, Syndicate International Ltd., United Press International, Fox Photos Ltd., Ing. H-J. Klein of His Aero Col Par, R. Harrison of Candid Aero Files, Ltd. Col. A. Krüger, S. Haggard, E. Tusch, B. Nicolas, H. Jonas, J. Greiner, B. Robertson, H. Nowarra, G. Long, I. Primmer, Z. Titz, N. Parnell, M. Pegg, H. de Weerd, E. Sommer and Real Photographs Co. Ltd. For most of the colour photographs I am indebted to N-A. Nillson, P. Malone, F. Smith and Tom Hitchcock.

Kenneth Merrick
Highbury, South Australia

The Making of the Luftwaffe

Top right: An early production Fw 44B, a type that was to be used extensively as a primary training aircraft. Finish is silver with what appears to be dark blue upper decking anti-glare trim. */Real photographs*

Centre right: A He 51, W.Nr. 1084, wearing a form of marking that has defied satisfactory explanation. The 'code' A1 and the rear fuselage bands were possibly both of unit origin, serving as some form of distinctive identification, particularly air-to-air. Other aircraft present at the time wore only civil registration markings; the fuselage legend on one listed the owner unit as *Fliegergruppe Döberitz* which eventually became I/JG 132. */Bundesarchiv*

Bottom right: Ar 68Fs of JG 134, lined up in front of some He 45s, during the presentation ceremony to the Führer on May 15th, 1936. The new *Balkenkreuz* marking is seen here without the accompanying D-prefix registration. This may have been done for propaganda purposes (the international press were invited to attend the ceremony) because aircraft in the rear ranks wear normal registration markings but no military *Balkenkreuze*.

Right: A Pfalz D XII at an aircraft graveyard at Cologne bears traces of its former colourful markings. *Balkenkreuze* of similar style and proportions were to appear again less than two decades later. */IWM*

When the Armistice brought World War I to a close in 1918, the Imperial German Air Service disappeared virtually overnight from the skies of western Europe. A few aircraft flew again briefly in the hands of Allied pilots, but they were a pale reflection of the multi-coloured machines that formerly brightened those dangerous skies. Consigned to aircraft dumps, most of the heraldry of a generation was soon consumed by the flames of peace.

The destruction of aircraft was a physical action; less simple to destroy was the spirit of the old Imperial German Air Service. A small band of officers, determined to nurture and rekindle the spark of resurrection, contrived to circumvent the harsh Allied treaty which drastically curtained the development of aviation in Germany. Their task proved successful after sixteen long years, when a new air force emerged to bear heraldry which, if not as exotic, was certainly as imaginative as that worn by its predecessor.

While this undercurrent gained momentum, civil flying in Germany began on an organised basis. A simple registration system came into operation comprising the letter D, for Deutschland, followed by a number. The numerical sequence progressed arithmetically to a four figure group.

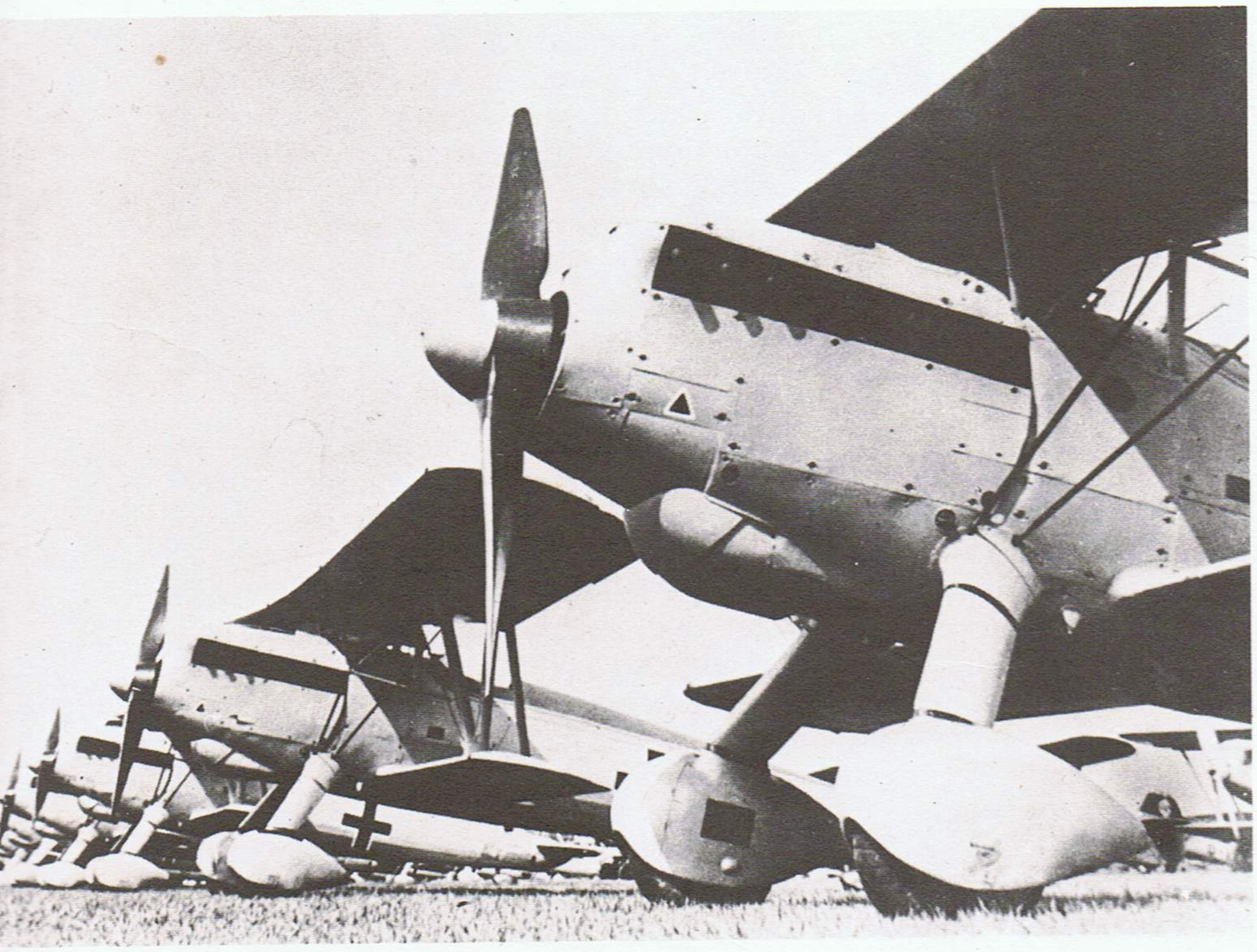
The value of glider flying was recognised as an aid to the long term ambitions for a new military air force, and the German government was able to give some open support to this activity because of its seemingly non-military nature. At the Rhoen gliding trials of 1920 the first sprinkling of former air force personnel made their appearance; the numbers were to increase steadily as the years passed.

The lifting in 1922 of the ban on aircraft construction in Germany added impetus to the clandestine preparations. Allied terms stipulated that construction and design work be limited to light aircraft in general, parameters that were exploited to the full in order to experiment with ideas









for aircraft capable of far more aggressive roles. The most blatant evasion of Allied restrictions was the use of company subsidiaries set up in foreign countries.

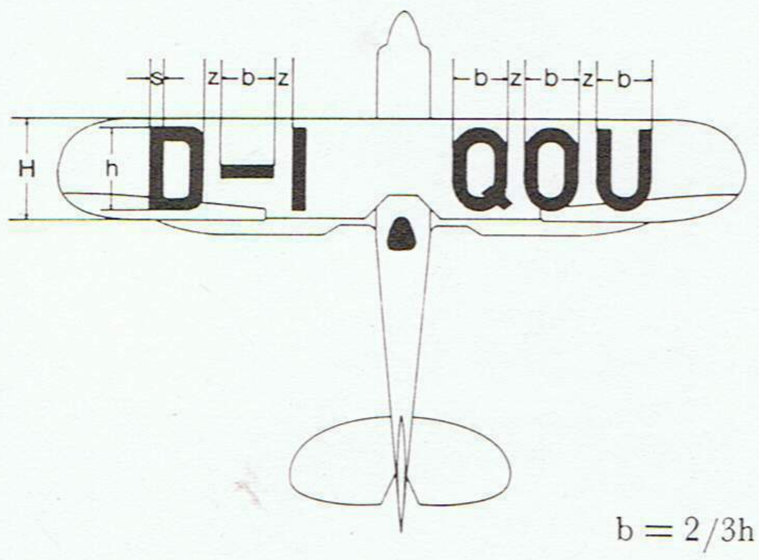
A further easing of restrictions in 1923 allowed the German aviation industry to openly begin design of military training aircraft. The loose definition of 'training' was also exploited in order to keep abreast of world trends in military aviation. More advanced 'training' aircraft were transferred to Lipezk airfield in Russia where a training base was set up in 1925.

Intended primarily as a fighter training school, Lipezk airfield had its facilities built up and fifty Fokker D XIII biplane fighters shipped in. With the exception of the wing surfaces, which were painted in yellow, all fabric covered areas were finished in dark green, metal panels remaining in natural finish. Each aircraft was allocated a number from the sequence one to fifty applied in white, and as large as practicable immediately aft of the cockpit. Between the aircraft number and the tail unit a white band encircled the rear fuselage; in some instances this was formed into a chevron marking on the fuselage sides with the apex pointing forward.

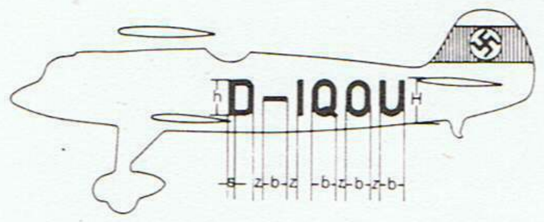
From the scant evidence still available the use of a white chevron marking was limited to but a few aircraft, specifically those with low identification numbers, the highest recorded number being eight. As the primary function of the school was advanced fighter training, the staff instructors' flight logically required some form of distinctive marking. Significantly, those aircraft bearing a chevon marking also used horizontal red and white fin and rudder stripes. Coloured tail markings were also recorded on at least two other aircraft but both of these wore a white fuselage band; the assumption is that they were possibly used as formation lead aircraft during fighter exercises by advanced students.

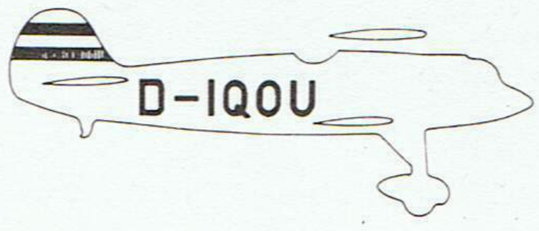
Observer training was commenced in 1926 but the school's ultimate potential was never realised. The establishment of basic flying training schools within Germany proper had already become a reality despite the restrictions imposed by the occupying powers. Flying for sport became a national pastime and ten civilian airfields were allocated as flying centres. A small company had already come into existence in 1924 specifically to handle gunnery target towing duties for the small German naval force allowed under the terms of the Allied Control Commission. Thus a means was found to keep former naval pilots in training.

1



Size and spacing of civil registration letters.





H = wing chord at first letter

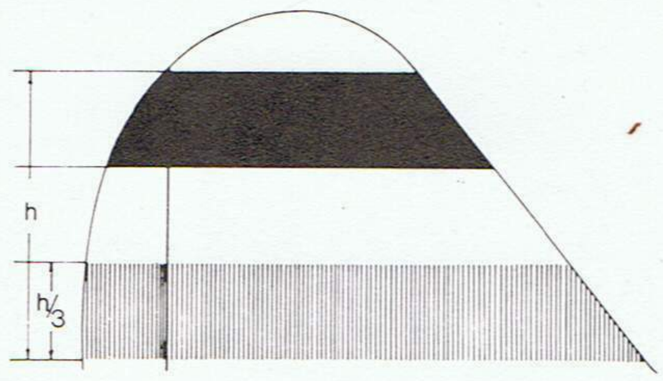
h = 4/5H (max 2.5 metres)

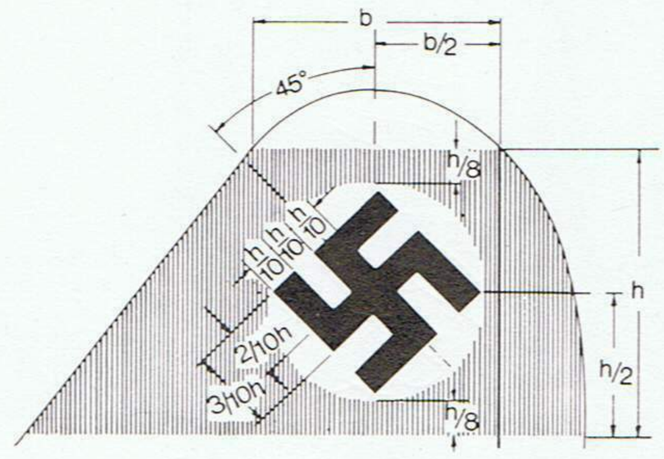
b = 2/3h

s = 1/6h

z = 1/3b

2





By far the most important single development had been the establishment of the Deutsche Verkehrsfliegerschule (German Commercial Pilot's School) which opened its main training centre in 1924 at Berlin-Staaken where excellent training aids existed. Future military pilots were integrated into this school in increasing numbers and by 1927 it had become necessary to transfer some of the training to two other airfields, Braunschweig and Schleissheim. A further DVS centre was also established at Warnemunde where seaplane training was undertaken. Such, however, was the intensity of activity that Braunschweig soon became responsible for observer training while Schleissheim concentrated on both ab initio and advanced flying training.

Aircraft used at the various flying schools and training centres were a veritable potpourri of types both old and new. Apart from civil registration markings on both fuselage and wings, most aircraft carried few markings other than a simple club badge. Colour schemes were equally simple, with bleached fabric, lacquered plywood, and bare metal being the general standard.

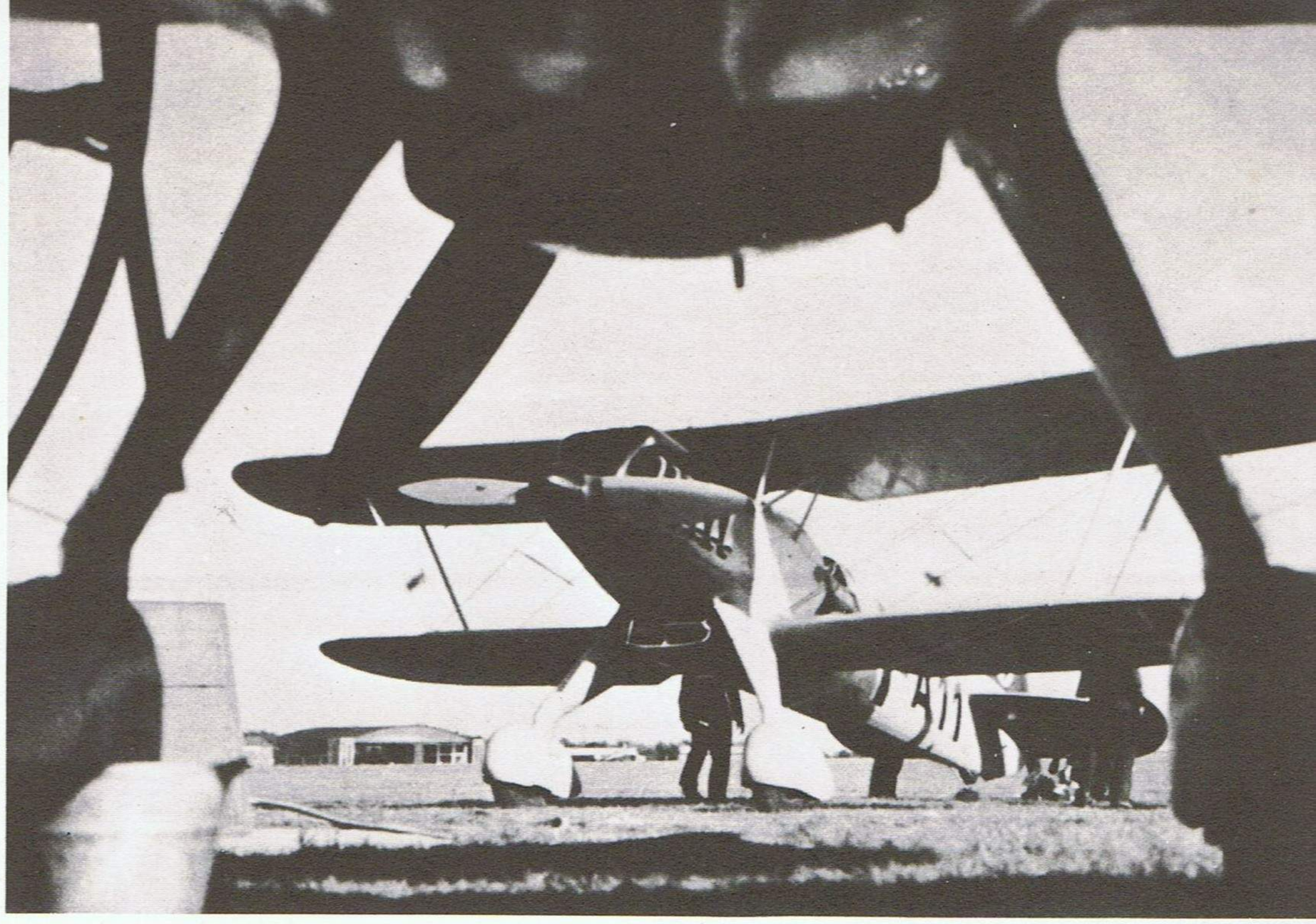
Schleissheim, however, began to display an individuality that was to distinguish this school from others. Combinations of coloured stripes, reputedly blue and yellow, were applied to the rudder and elevators of both the basic and advanced training aircraft. In the latter case, bold spanwise panels of yellow adorned both upper and lower surfaces of top and bottom wings. In most instances an additional chordwise wide red stripe was used on the upper surface of the top wing and the lower surface of the bottom wing. Red wing tips were also a common feature of the general colour scheme. With the introduction of more modern advanced training aircraft, such as the Albatros L75 and L76 series, an overall finish of silver with either black or dark blue anti-dazzle panels became common. Silver paint also appeared as the basic wing fabric colouring on some of the other aircraft at the school.

In 1933 the National Socialist Party gained political control and early the following year the civil registration system for aircraft was revised. The numerical suffix to the letter D was replaced by a four letter sequence, a hyphen being introduced to separate the two elements. Whereas the old system had given no indication of an aircraft's size or function the new one did. From the breakdown of a registration it was possible to deduce quite a lot of basic information about an aircraft without having seen it. Details of the system are laid out below.

Above: A Do 23G of the *Fliegergruppen* displays the combination of civil registration and military markings which endured for only a brief period. Overall finish appears to be 63 which came into general use during 1936. */Deutsches Museum Munich*

Centre left: The He 111C-02 *Leipzig*, photographed at Templehof airport in 1936, shows the replacement of the horizontal fin and rudder striping with the styalised National Socialist Party marking on the starboard side. (The He 111C-03 *Koln* and the He 111V4 *Dresden* carried out clandestine photographic reconnaissance duties during 1937. */Deutsches Museum Munich*

Bottom left: Transition – of extremely poor quality but historically significant, this photograph of two He 51s of I/JG 132 (21+G11 and 21+D11) shows the combination of the officially superceded horizontal tail striping, military codes and 'traditional' colour application to the engine nacelle. Both JG 132 and JG 232 initially carried grossly oversize *Balkenkreuze* and codes. */Alfred W. Krüger*



Right: 21+A11 of I/JG 132 wearing red nacelle colouring and oversize codes and *Balkenkreuze* markings. */Alfred W. Krüger*

Top right: Diagram 4. Positioning of codes on military aircraft. Aircraft with complex undercarriages, e.g. seaplanes, group the aircraft letter with the last two numerals of the code.

Centre right: A He 70F-1 of Aufkl.Gr. (F)/122 carrying the type of code used by both land-and-sea-based reconnaissance units, as detailed in the text. The designation of this unit changed to Aufkl.Gr.(F)/22 early in 1937. */Heinkel Archives*

Bottom right: Factory fresh He 51s still wearing production identification numbers applied in white to both sides of the fuselage. These aircraft had just been delivered to JG 132 and were photographed prior to the application of unit codes. */R. Harrison*

Landplanes

Class	Registration	Personnel and weights
A1	D-Y . . .	1 person, all-up-weight 500 Kg
A2	D-E . . .	1 to 3 persons, all-up-weight 1,000 Kg
B1	D-J . . .	1 to 4 persons, all-up-weight between 1,000 and 2,5000 Kg
B2	D-O . . .	1 to 8 persons, all-up-weight between 2,500 and 5,000 Kg
C	D-U . . .	single engined
	D-A . . .	multi engined – all-up-weight over 5,000 Kg

Seaplanes

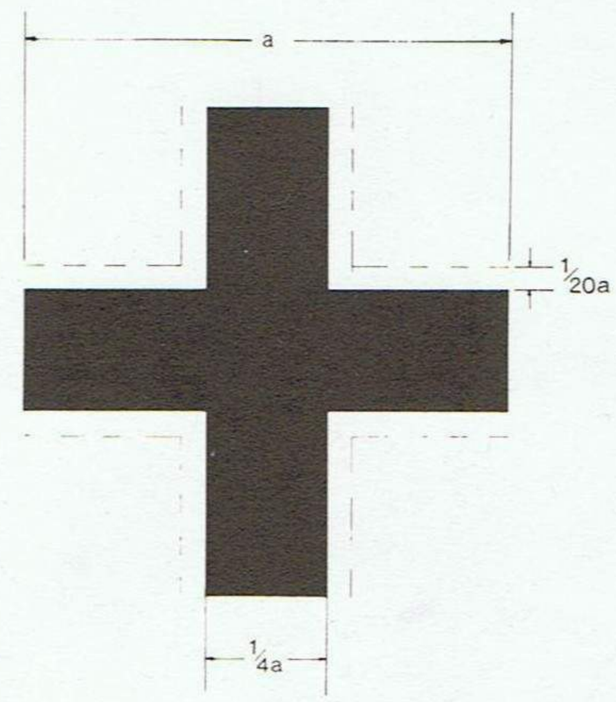
Classification is identical with that for landplanes except for the following details.

A1 all-up-weight is 600 Kg
A2 all-up-weight is 2,200 Kg
B all-up-weight is 5,000 Kg
C all-up-weight over 5,500 Kg
(Although the B1 group was set down as commencing D-J . . . no example has ever been found, all aircraft in this classification group being registered D-I . . .)

The remaining three letters of the registration group were allocated in strict alphabetic sequence starting at AAA and ending at ZZZ. This made available the following blocks of registration letters;

D-YAAA to D-YZZZ
D-EAAA to D-EZZZ
D-IAAA to D-IZZZ
D-OAAA to D-OZZZ
D-UAAA to D-UZZZ
D-AAAA to D-AZZZ

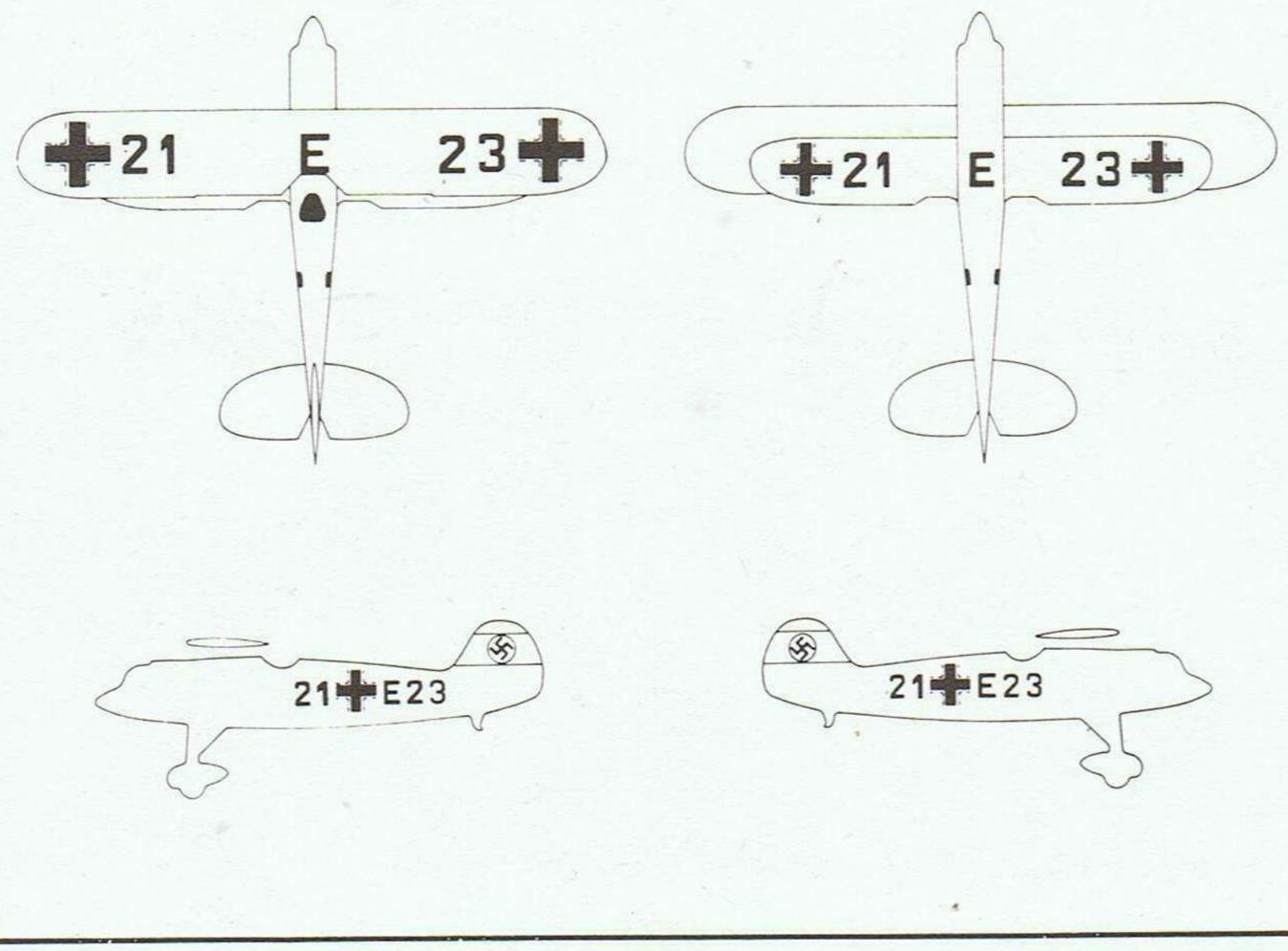
3



A subtle indication of the slow but persistent progression toward a revitalized military air arm was seen in the reservation of the D-IAAA to D-IZZZ group for 'experimental' aircraft. Significantly, the bulk of 'experimental' aircraft types registered in that group eventually formed the main equipment of the clandestine para-military organisations.

Unlike the previous registration system the letters were allowed to overlap the wing control surfaces, a single registration spanning both wings. The geometric factors for setting out the markings are given in the accompanying diagram. In the earlier system the height H was decided by the available tip chord without overlapping the control surfaces.

4







The revised registration system had been preceded by the introduction of rudder markings in July 1933. On the port side a stylised National Socialist Party flag composed of a black *Hakenkreuz* within a white disc on a red background, to starboard a simple horizontal tricolour of black, white and red. The restriction of the insignia to rudder sufaces alone was extremely brief, and by April both markings spanned fin and rudder. Wherever practicable the *Hakenkreuz* marking was centred on the mid-point between fin leading edge and rudder trailing edge. The precise geometry for setting out the marking is given in the accompanying diagram.

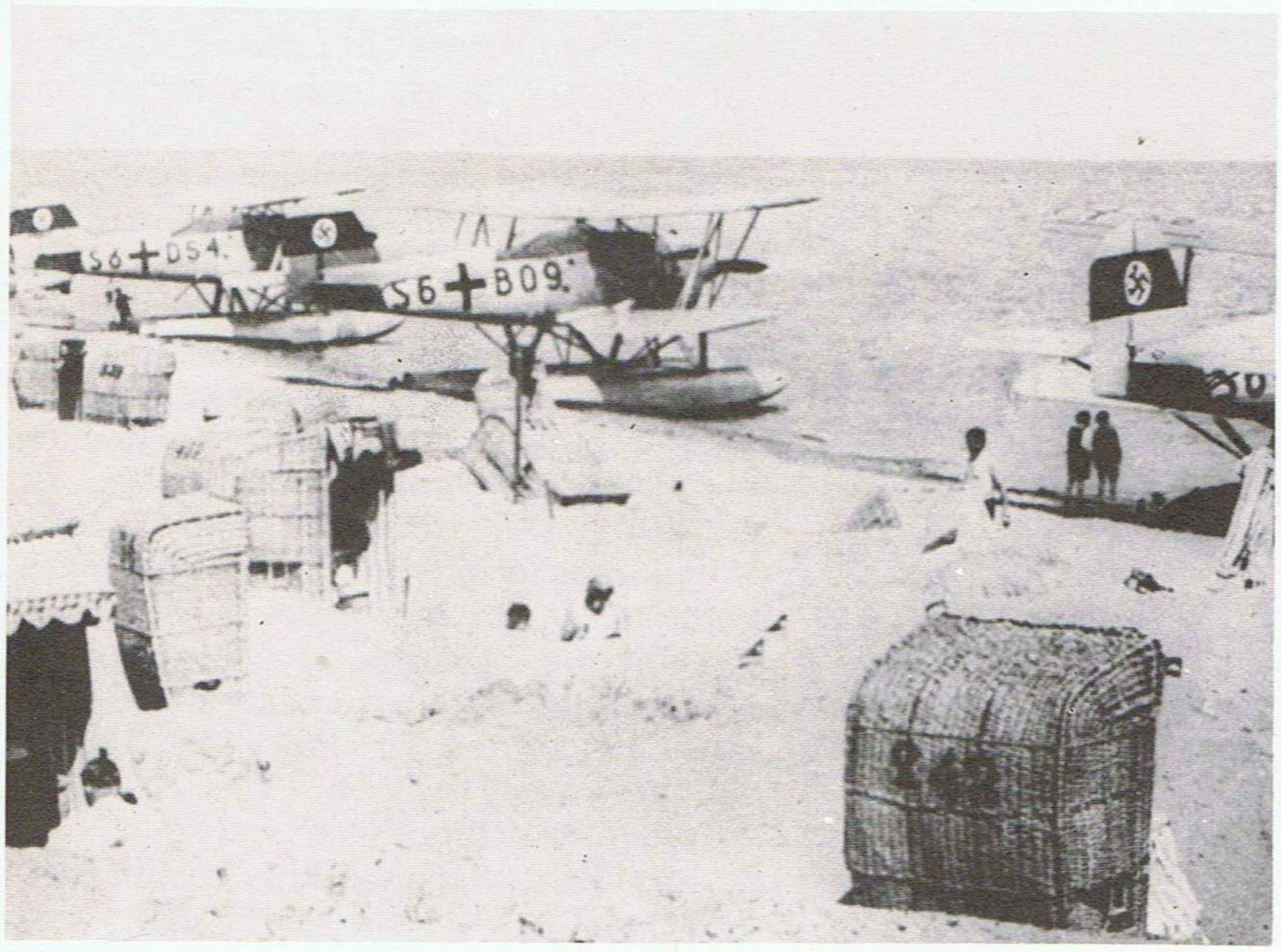
The adoption of the new empennage markings naturally meant the demise of the colourful rudder markings of the aircraft at Schleissheim's training complex. The elevator markings appear to have been discarded at the same time, and a system of coloured fuselage bands introduced aft of the cockpit to identify the various sections of this school's growing aircraft population. Both single and double band applications in the colours red, yellow and white are known to have been used. In view of later developments in aircraft markings one is left to contemplate the possible connections in this significant choice of colours.

The new registration system remained in force for military aircraft after the public revelation of the new German Air Force, the Luftwaffe, in March 1935. In the spring of 1936, however, the first of a series of rapid changes took place. Aircraft used by first line Luftwaffe units were allocated a set of military markings in the form of a *Balkenkreuz* of similar style to that used during the closing stages of World War I by the old Imperial German Air Service. (The reader is reminded that the *Hakenkreuz* marking identified a political party and was not a national marking.) The *Balkenkreuz* was inserted at the mid-point on the fuselage sides, between wing and tail unit, with the registration group evenly divided on either side of it. On the wing surfaces it was placed at either end of the registration marking which meant that it appeared at virtually the wing tip extremities. Proportions for the *Balkenkreuz* are given in the accompanying diagram.

This combination of 'civil' registration and military markings endured for only a brief period and in June two further changes were ordered. The National Socialist Party marking was to replace the horizontal tricolour marking on the starboard side of the fin and rudder, and







military codes were issued to replace the registration letters. As before and in later instances, orders were issued virtually overnight but their physical implementation took longer to achieve. Thus for a brief period some aircraft were to be seen bearing a combination of old and new markings.

A third form of new marking began to appear at this time, when the Luftwaffe took the opportunity to publicise its fighter force by the addition of a touch of flamboyance. The *Jagdgeschwadern* were honoured by the bestowal of 'traditional' colours which were to be displayed on their aircraft. Two units, because of their association with the prominent German national figures Manfred von Richthofen and Horst Wessel, were given the colours red and brown respectively. A complete list of units and colours is given below:

JG 131 Black	JG 232 Green
JG 132 Red	JG 233 Blue
JG 134 Brown	JG 234 Orange

With few exceptions the colour was restricted to the nose of each aircraft.

The new code system consisted of five characters, two to left and three to right of the fuselage *Balkenkreuz* as shown in the accompanying diagram. The information contained within the codes varied with their specific application as explained below. One main distinction must, however, be made to avoid confusion. Because both land and sea based reconnaissance units never reached sufficient proportions to form a full *Geschwader*, the second character of their code group was always a naught.

For all bomber, fighter and recon-

naissance units; (e.g. Do 23 of KG 253 coded 32+F25).

First Numeral	*Second Numeral*	*Letter*	*Third Numeral*	*Fourth Numeral*
Lufkreis	Numerical position of *Geschwader* within the *Luftkreis*	Aircraft code letter within the *Staffel*	*Gruppe* within the *Geschwader*	*Staffel* within the *Gruppe*
3	2	F	2	5

Unit identification numbers also contained similarly related information, the three figures used revealing the following information; e.g. St.G.165

First Number	*Second Number*	*Third Number*
Numerical position of unit within the *Luftkreis*	Class of Aircraft	*Luftkreis*
1	6	5

It will also be noted that the last number of the unit identity was repeated as the first number of the code group; e.g. Hs 123 of St.G.165 coded 52+J13.

Seven numerals were used to identify the various aircraft classes as follows:

Numeral	*Type of Duty Performed*	*Example*
0	Armed reconnaissance (sea based)	Kü.F1.Gr.206
1	Short range reconnaissance (land based)	Aufkl.Gr. (H)/114
2	Long range reconnaissance (land based)	Aufkl.Gr. (F)/125
3	Fighter	JG 132
4	Heavy fighter	JG(s) 141*
5	Heavy bomber	KG 154
6	Dive bomber	St.G.165

(*The 's' designation stood for *schwere,* meaning heavy, and although used in some official documentation was not seen in more general references. Only four heavy fighter units were created, JG 141, JG 142, JG143 and JG144, all of which were eventually redesignated *Zerst-örergruppen.)*

Top left: Another example of the unusual markings that occurred during the early and formative years of the Luftwaffe. The code of this He 51, 05(or3)+F(or E)20. indicates that it belonged to a unit which operated independantly of any *Luftkreis* (indicated by the first 0), and also did not belong to a *Staffel* (indicated by the second 0). The narrow black edging to the *Balkenkreuze* shows that the photograph was taken after July 2, while the code style limits the latest date to September, 1936.

Centre left: A He 46 of A Flight *(Staffel?)*, the nineteenth aircraft on the strength of a school under the control of *Luftekreis* 7./*G. Long via Lutz*

Bottom left: He 60s of *Flugzeugführerschule (See)* under the control of *Luftkreis* 6. The very low aircraft number on S6+B09 indicated that the letter A was not used at this particular school./*I. Primmer*

Below: The floatplane version of the He 51 served with *Küstenjagdgruppe* 136, the unit also operating a land based *Staffel* of He 51s. As with the latter the floatplane version used conventional fighter codes, a white number thinly outlined in black, on both sides of the fuselage, the upper wing centre section and below the fuselage beneath the wing roots./*R. Harrison*



This page, top: He 51s of 2 *Staffel* of an unidentified *Jagdgeschwader* with aircraft from 3 *Staffel* in the right background. This illustrates well the point that *Staffel* identity was easily recognisable but unit identity remained unknown except for the use of the traditional colouring, an item easily dispensed with in emergency. In the extreme left background are several Fw 56s bearing the code identity of 2./Kü.F1.Gr.406, e.g. 60+W42. This *Staffel* also used a small number of He 51s and was eventually renamed Kü.J.St. 136 and re-equipped with Bf 109s. */R. Harrison*

This page, bottom: Diagram 5. Lettering and numbering for aircraft. Height -6/10 the maximum height of the *Balkenkreuz*. Width -4/10 the maximum height of the *Balkenkreuz*. Stroke width -1/10 the maximum height of the *Balkenkreuz*. Spacing -2/10 the maximum height of the *Balkenkreuz*.

Top far right: In the foreground two He 51s of 4./JG 132 with a line up of 2 *Staffel* aircraft in the background. Overall colouring of the aircraft is green-grey 63, standard finish for all land-based aircraft of this period. */Alfred W. Krüger*

Centre far right: The mount of the *Kommadore* of III/JG 132 as shown by the double chevron and bar symbols on this He 51. */Alfred W. Krüger*

Bottom far right: A He 51 of 6./JG 132 displays its combination of *Gruppe* and *Staffel* identification emblems. The upper decking of this particular aircraft wears dark anti-glare paintwork which should not be confused with the traditional colouring used on the engine nacelle and as a backing for the rear fuselage white disc marking. */Alfred W. Krüger*

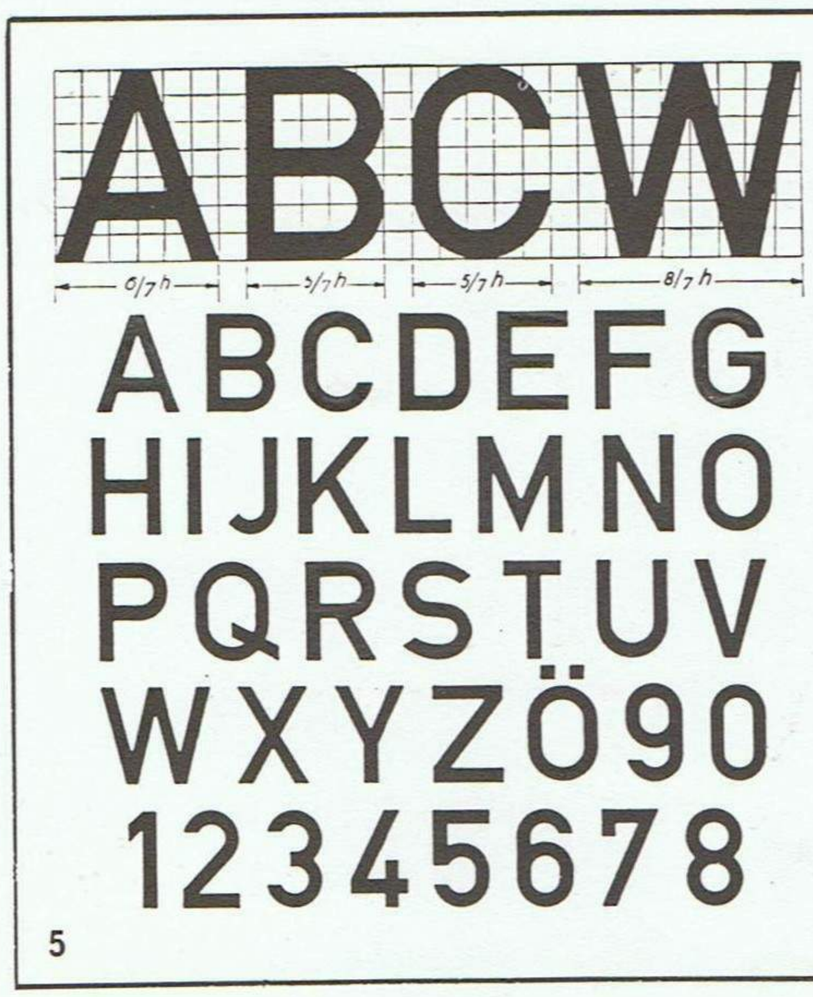
Bottom, far right: Diagram 6. The revised form of *Balkenkreuz* with added black borders.

Coastal units also require additional explanation because of their composition and a peculiarity contained within their code structure. Firstly, each of the *Küstenfliegergruppen* acted as an independent unit and contained the normal three *Steffeln* associated with any *Gruppe;* however, the *Gruppe* identity coincided with the first numeral of the unit identity e.g. I/Kü.Fl.Gr.106, II/Kü.Fl.Gr.206 etc. Unit identity could also be determined from the actual code group by reading the first three *numbers* in reverse, e.g. He 59 coded 60+A13 belonged to Kü.Fl.Gr.106.

The other user of the new code system was the training organisation. Upon first examination training unit codes appear to have a similar structure to those used by first line units but variations, both obvious and subtle, produced a marked difference. A comparison between the table below and the first one will clarify these differences. Example: He 46 of a *Flugzeugführerschule,* coded S2+A38.

First Letter	*First Numeral*	*Second Letter*	*Third & Fourth Numeral*
Always S to denote school aircraft	*Luftkreis*	Flight identity within the school	Numerical identity of aircraft within the entire school
S	*2*	A	38





As so often occurs when researching this period few records have survived to provide a clear picture of the training school structure, its administration and size. It is, however, possible to determine a few useful facts from the remaining evidence. Each school was subdivided into flights (possibly termed *Staffeln* to conform with normal Luftwaffe practice) which were identified by a letter. With individual aircraft numbers running as high as sixty it becomes obvious that each school, within a particular *Luftkreis,* could not have used the entire alphabet. Examples selected from within a single *Luftkreis* do, however, reveal that the whole range of the alphabet was divided up amongst the schools under its control. Probably some letters were not allocated for security purposes but this does not



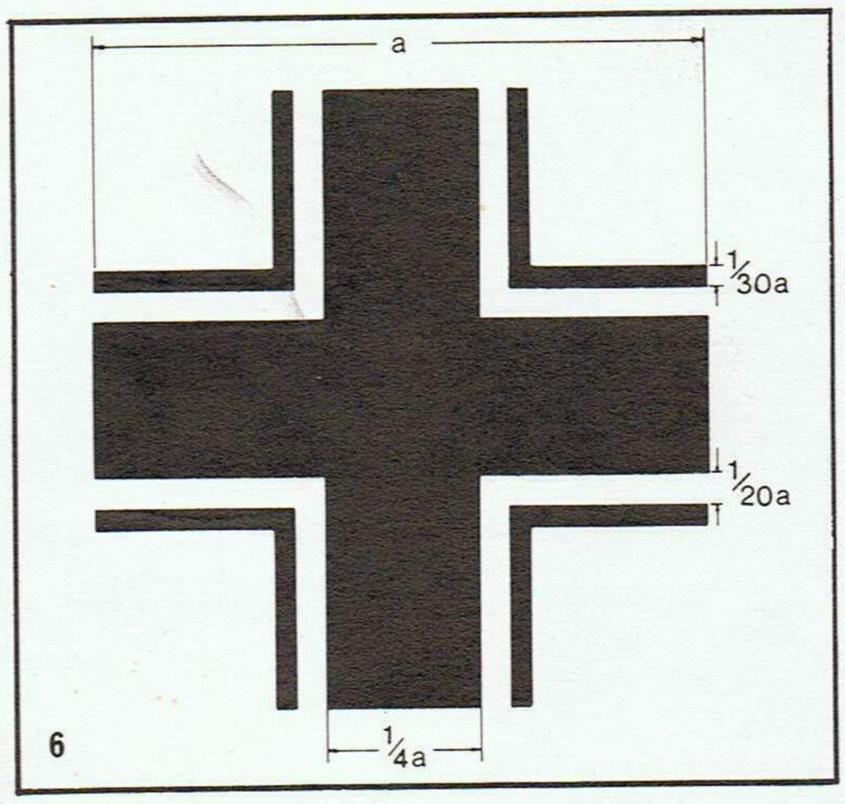




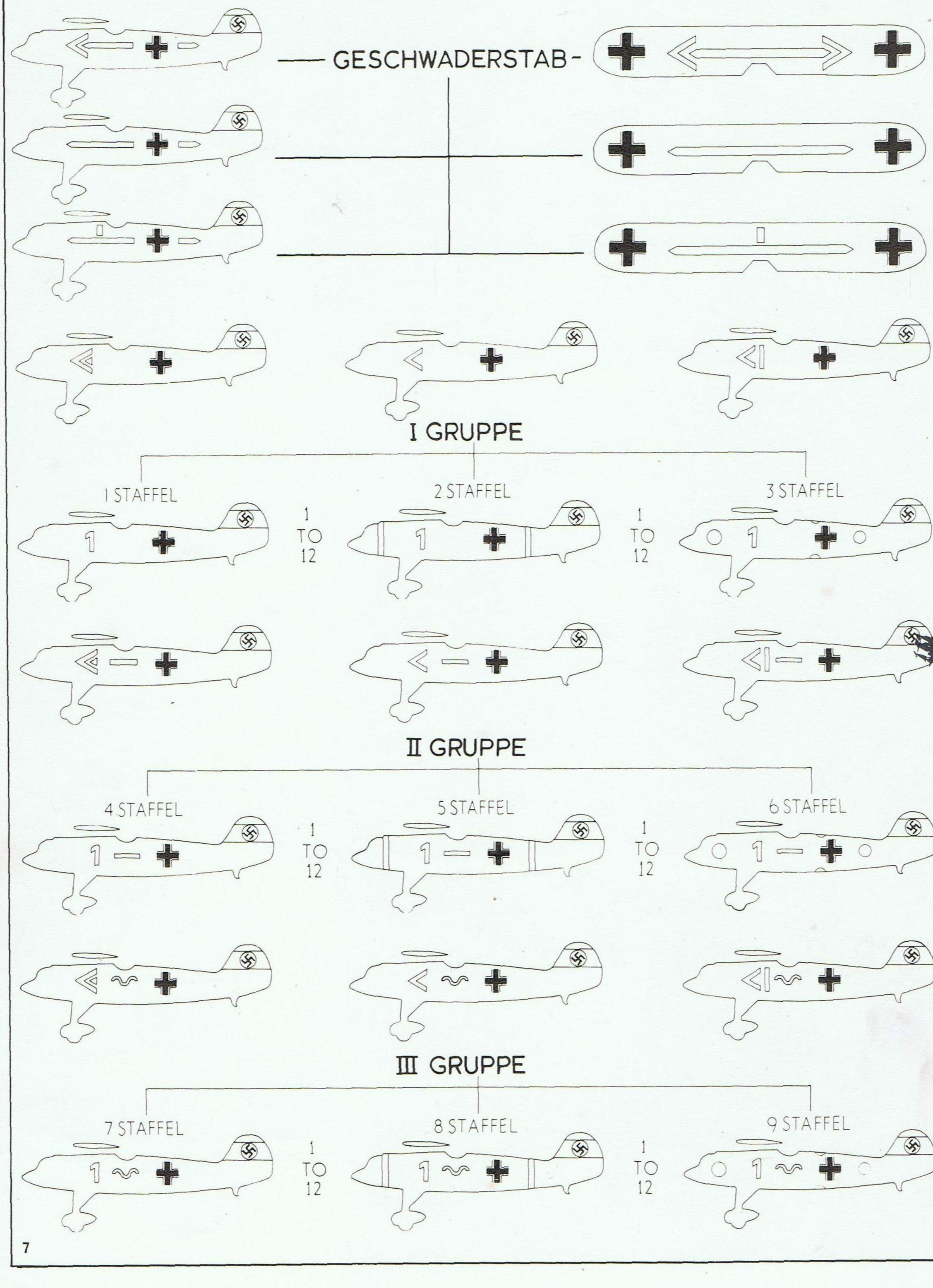
alter the method of application. This style of code remained in force until the general revision undertaken in 1939.

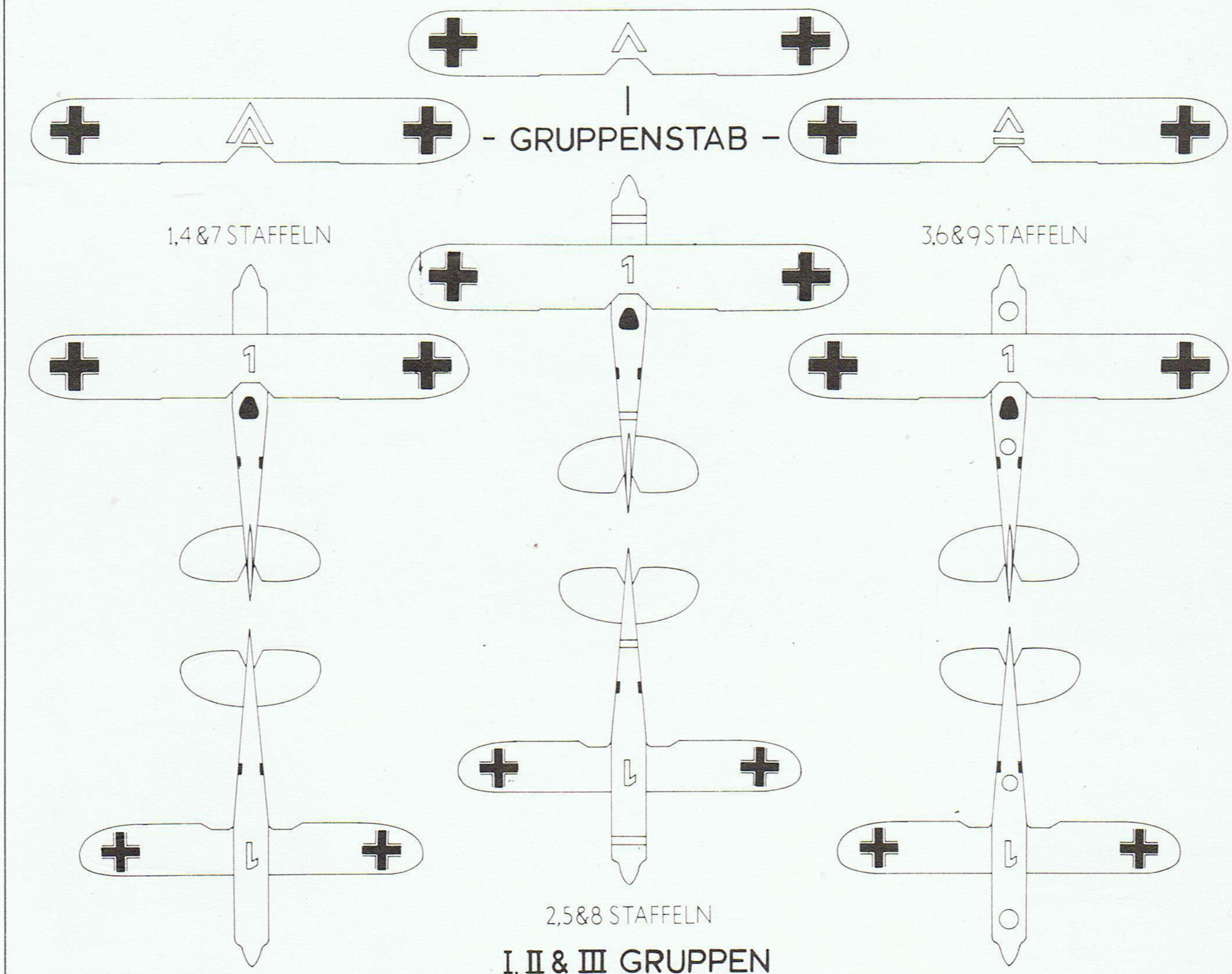
In addition to its powered aircraft the Luftwaffe also had a number of gliders on the charge of its *A-Schulen* where ab initio training was conducted. National Socialist Party Markings were carried right across fin and rudder but no *Balkenkreuz*-markings were applied because the aircraft were engaged on second line duties. A three part code was used comprising the letter D followed by a number in Roman numerals, which identified the *Luftkreis*. This was followed by a number expressed in Arabic numerals which was the aircraft's individual identity. A simple hyphen was used to separate the three elements of the code group. The code was repeated both above and below the wings with two parts confined to one wing and the third to the other wing.

Returning for the moment to first line fighter aircraft, the marking of the new codes produced some interesting variations. To establish overall size by



6


GESCHWADERSTAB-
I GRUPPE
1 STAFFEL
2 STAFFEL
3 STAFFEL
1 TO 12
1 TO 12
II GRUPPE
4 STAFFEL
5 STAFFEL
6 STAFFEL
1 TO 12
1 TO 12
III GRUPPE
7 STAFFEL
8 STAFFEL
9 STAFFEL
1 TO 12
1 TO 12
7

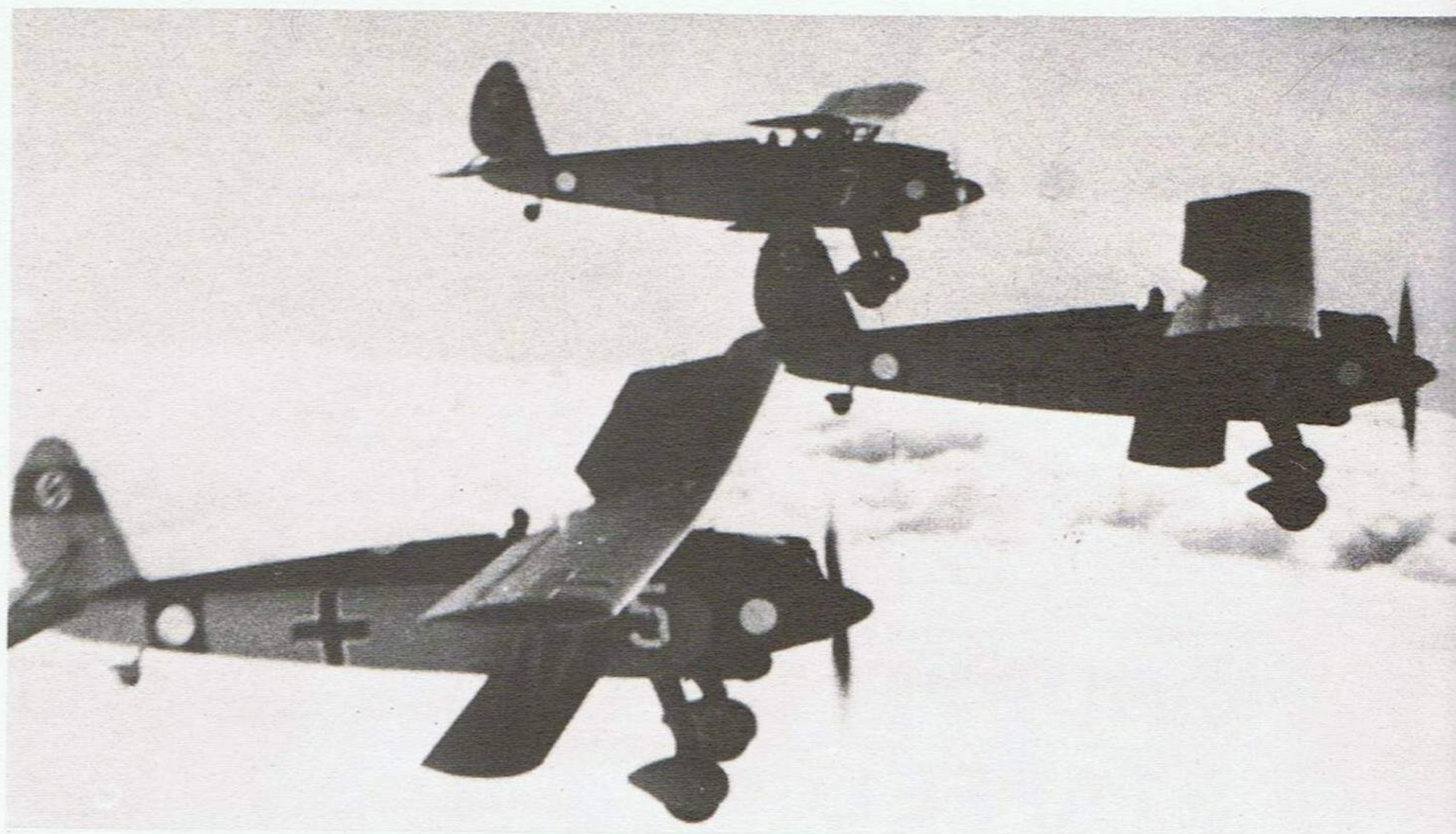


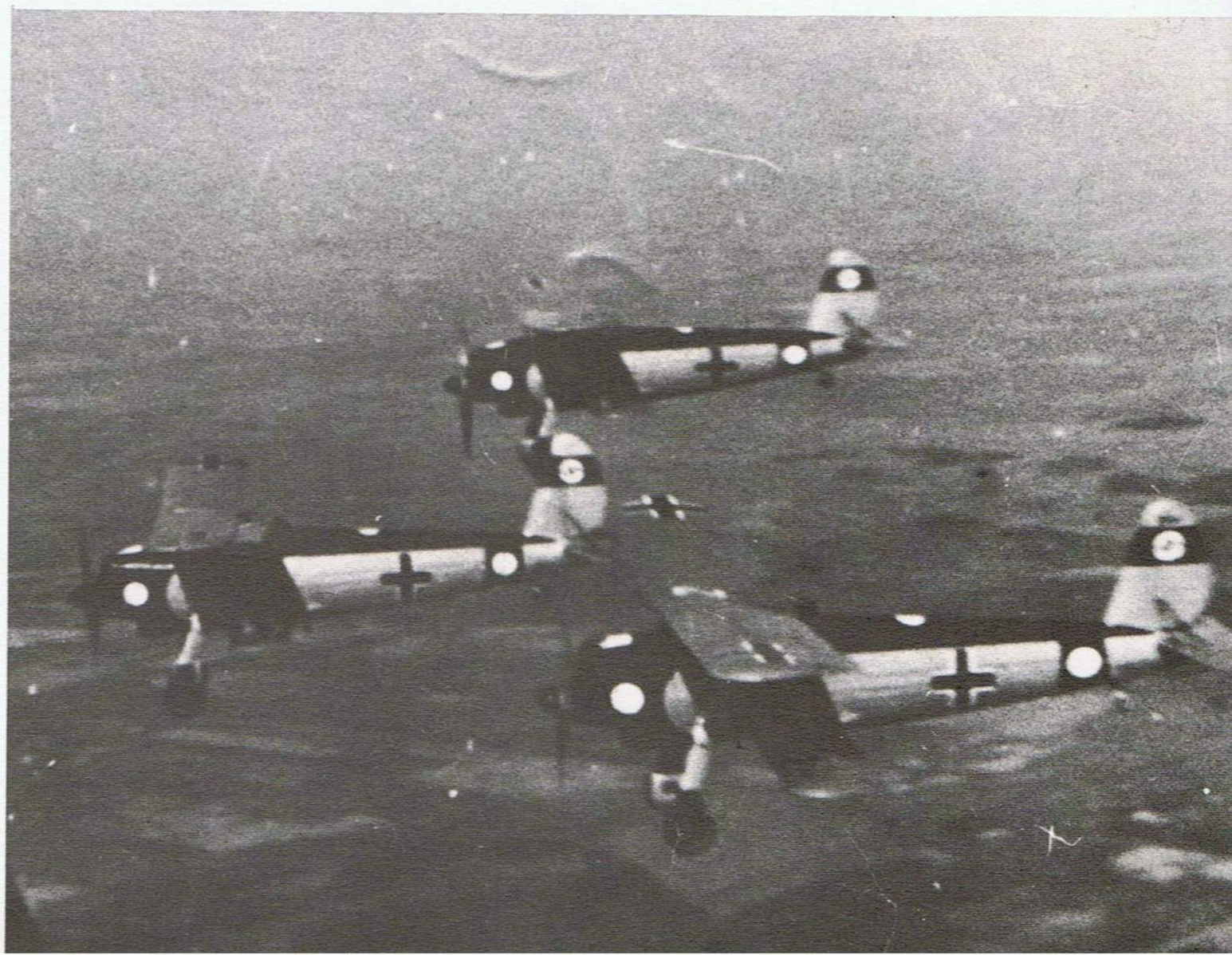
GRUPPE	I	II	III	STAFFEL SYMBOL
STAFFEL	1	4	7	
	2	5	8	WHITE BAND Eng 300mm Fus 200mm
	3	6	9	WHITE DISC Eng 500mm Fus 400mm
GRUPPE SYMBOL		1100mm	1098mm	

Diagram 7. The large drawing shows the markings carried by a full *Jagdgeschwader*. The smaller drawing illustrates the same range of markings but it will be noted that while *Gruppe* identity can still be determined it is no longer possible to distinguish individual *Staffeln* within a single *Gruppe*. The table sets out the main information in condensed form.

using the maximum available depth of the fuselage at the mid-point between the line of the top wing trailing edge and the leading edge of the tailplane resulted in a very large *Balkenkreuz*. This in turn produced very large codes since they were required to be applied in the proportion of six-tenths of the height of the *Balkenkreuz*. Because of the distribution of the code group with two characters to the left and three to the right, the two fuselage *Balkenkreuze* were not diametrically opposite each other. Positioning of the codes across both wings was also incorrect with the three parts being equally spaced between the two *Balkenkreuze*. Both JG 132 and JG 232 were recorded as bearing this incorrect style of application, the latter unit retaining it even after JG 132 had taken corrective action for its codes.

This style of code for fighter aircraft was very short lived. The standard five figure group was certainly adequate for military duty where formation work was required, as with bomber aircraft, or even for solo reconnaissance duties. For fighter operations, where higher speeds were encountered and rapid air to air identification was essential, the codes proved totally inadequate. Accordingly the Luftwaffe *Amt*, the research section responsible for developing battle tactics, among other things, issued directive LA Nr 1290/36 geh. LA 11/Fl. In.3. rescinding the use of the current code system for fighter aircraft. It was replaced by system







of markings and numerals as shown in the accompanying diagram.

The department issuing the order was aware of the problems associated with putting such orders into practice and an implementation date of September, 1936, was included. Considering the relatively few fighter aircraft involved, the two month period allowed provides some measure of the time factor anticipated for these changes. Coincident with this revision of fighter markings, a general modification to *Balkenkreuze* resulted in a thin black edging being added to the white border to increase the visual recognition distance.

Military air exercises were held in that year, and temporary markings made what is believed to be their first appearance when He 45s of Aufkl.Gr.(F)/123 were seen wearing all white from the leading edge of the tailplane aft. A minor markings peculiarity noted on one of these aircraft was the grouping of the aircraft letter with the *Gruppe* numeral on the top starboard wing.

Further refinement to the art of aerial warfare appeared later in 1936, with the introduction of camouflage for all bomber and dive bomber aircraft. That some form of defensive camouflage would eventuate for the Luftwaffe was inevitable; the timing, however, may have been accelerated to some small degree by the events in Spain. (See next chapter.)

Paints used by the German military forces were supplied under individual company contracts, each company using its own reference number system to identify the various types of paint; e.g. Lüdicke & Co. supplied a variety of paint finishes and colours – *Avionorm Nitro-Decklack silber Nr.1708, Nitro-Lasurlack silber V 192, Nitro-Decklack grau Nr. 7007, Olgrund hellgrau Nr.5759, Zwischenlack rot Nr. 6663* etc. Examination of the extensive listings still available reveals that a variety of paint types existed which were coloured varying shades of grey plus silver, black, white, yellow, brown, green, red and blue. There were also certain colourless paints and sealers used for the final external finish. The latter were mixed together, in specific proportions, to provide a weatherproof finish, e.g. *Cellesta-N-Flugzeug Ubz.L.Nr.1606* and 2000, and *Cellesta Ausgleichsflüssegkeit* Nr. 611, all being products of Atlas-Ago L-M.

Prior to 1936 most first line aircraft were given a primer coat of oilbase light grey, a base coat of silver and a top coat of grey. Over this was applied the combination clear finishing coat which produced the glossy grey finish common to aircraft of this period.

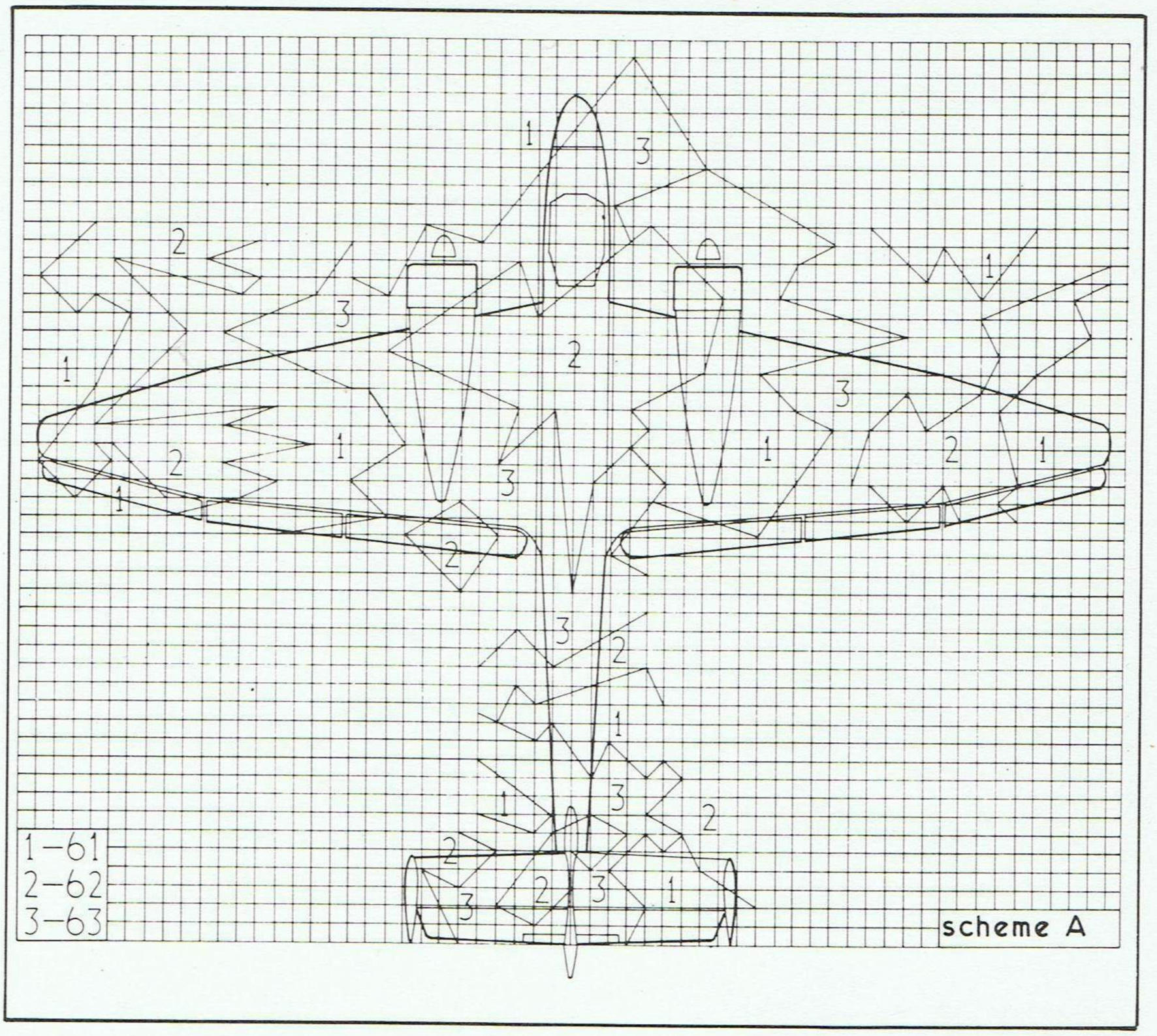
As recorded, 1936 saw the commencement of a major re-organisation of the Luftwaffe from its very foundations upwards. The paint supply system described continued to operate but a new item appeared on the painting schedules, the suffix *grüngrau* 63. (green-grey 63). This was an early example of a new system

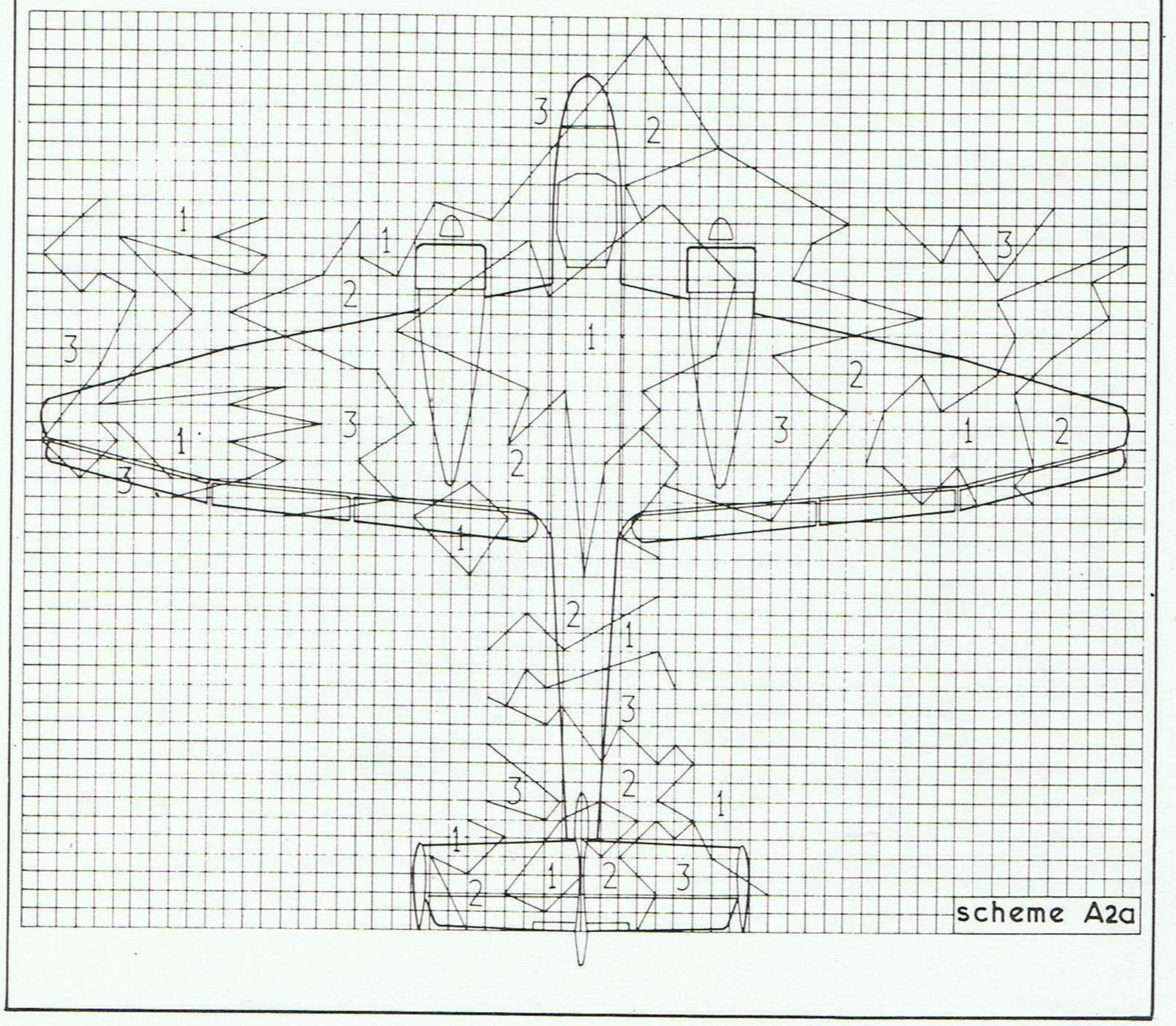
Top left: Ar 68Fs, believed to belong to JG 131, display their 2 *Staffel* white band markings. In this instance the traditional colouring happened to be black and it was used as an anti-glare finish for the upper decking connecting the engine and rear fuselage colouring in one continuous segment. */Alfred W. Krüger*

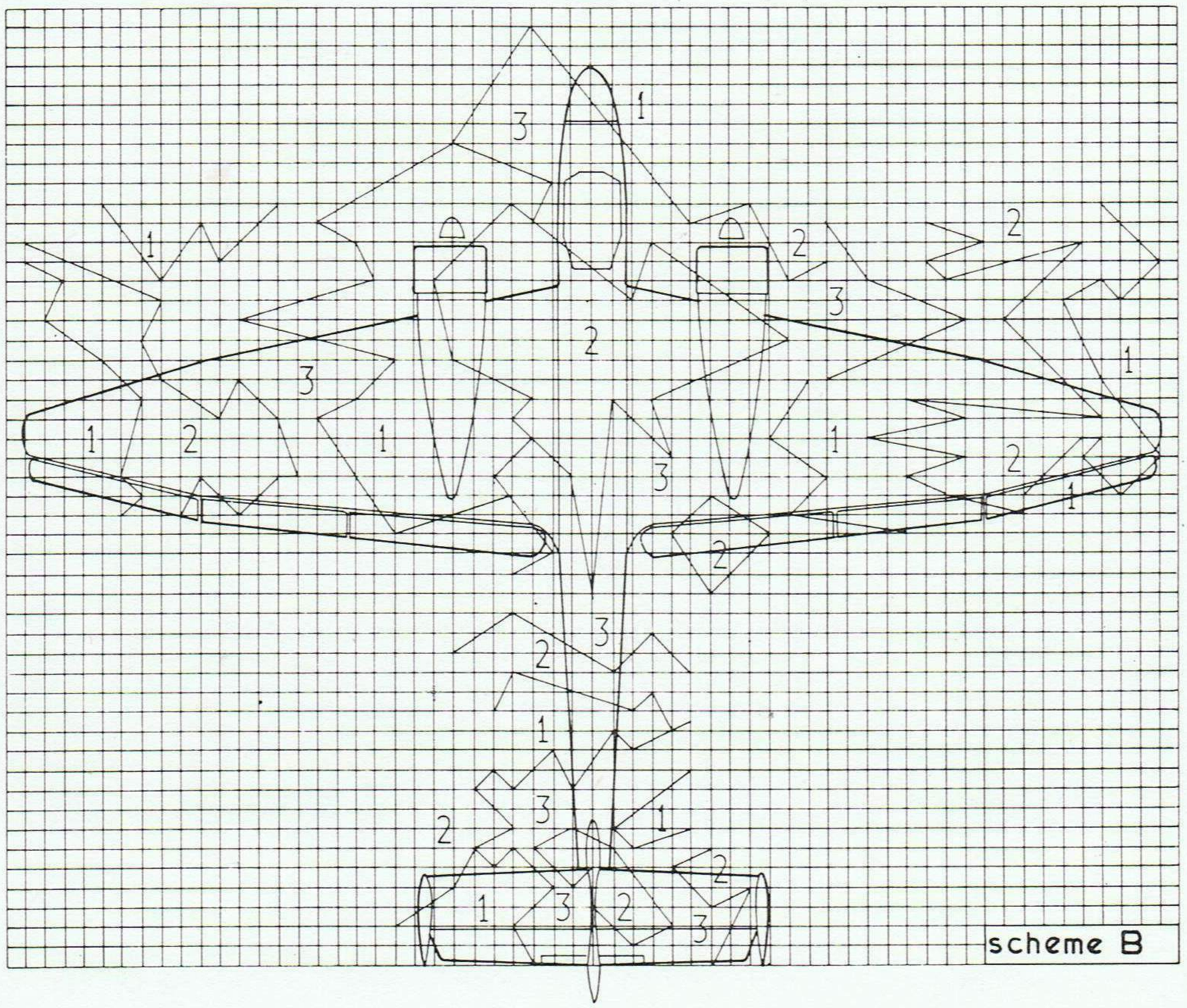
Left: Despite the lack of sharpness the 3 *Staffel* markings on these Ar 68Fs of JG 131 are still easily distinguished. This illustrates the effectiveness of these visual aids to identification. */Alfred W. Krüger*

Above: Ultimate successor to the He 51 in first line units was the Ar 68E as shown here in standard overall finish of 63 colouring, with white identification numbering thinly outlined in black. Lack of any other markings identifies this machine as a 1 *Staffel* aircraft but the unit identity is not revealed. */ G. Long via Lutz*

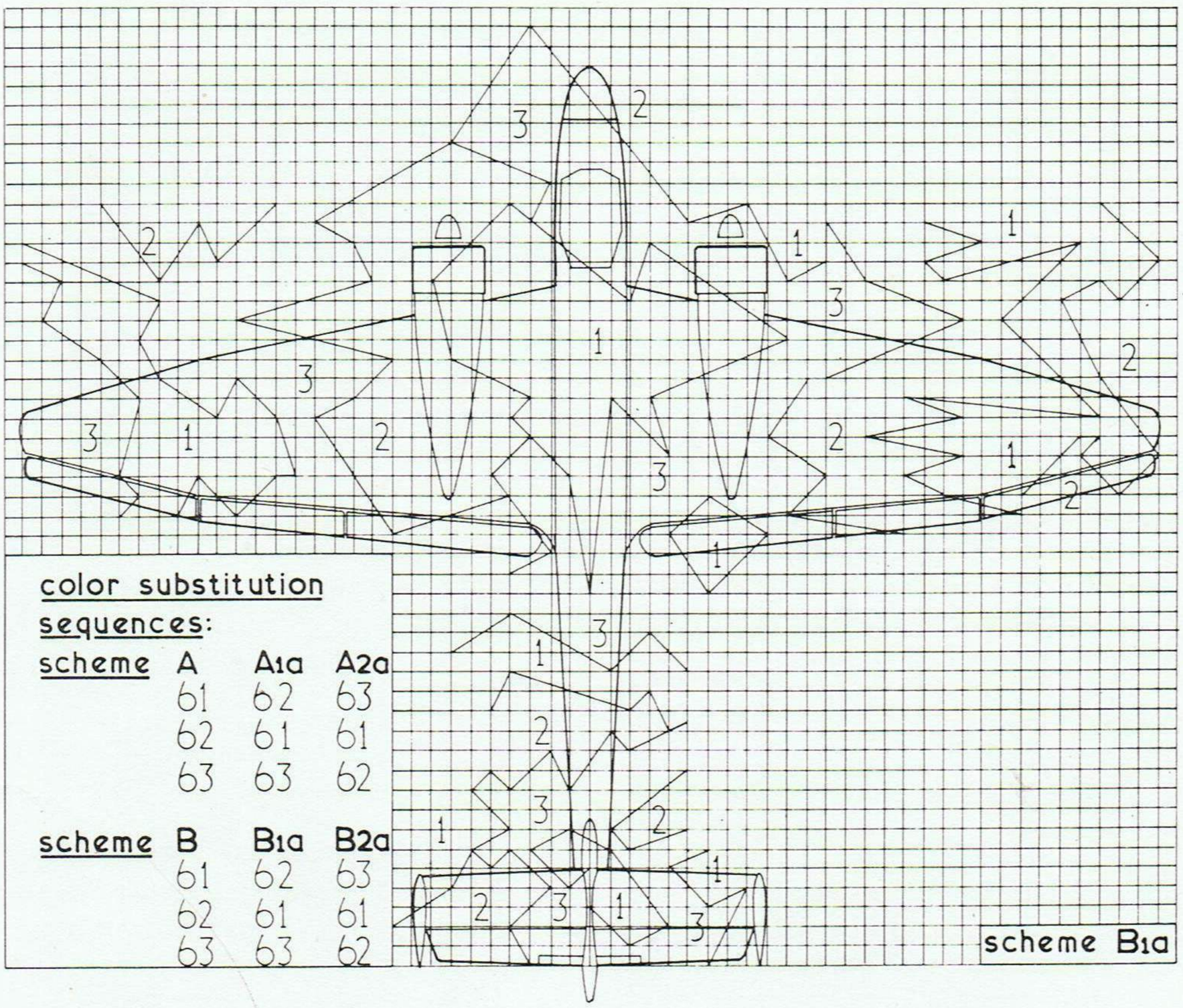
Diagram 8. These illustrations show four of the six possible camouflage variations that can be achieved.







scheme B

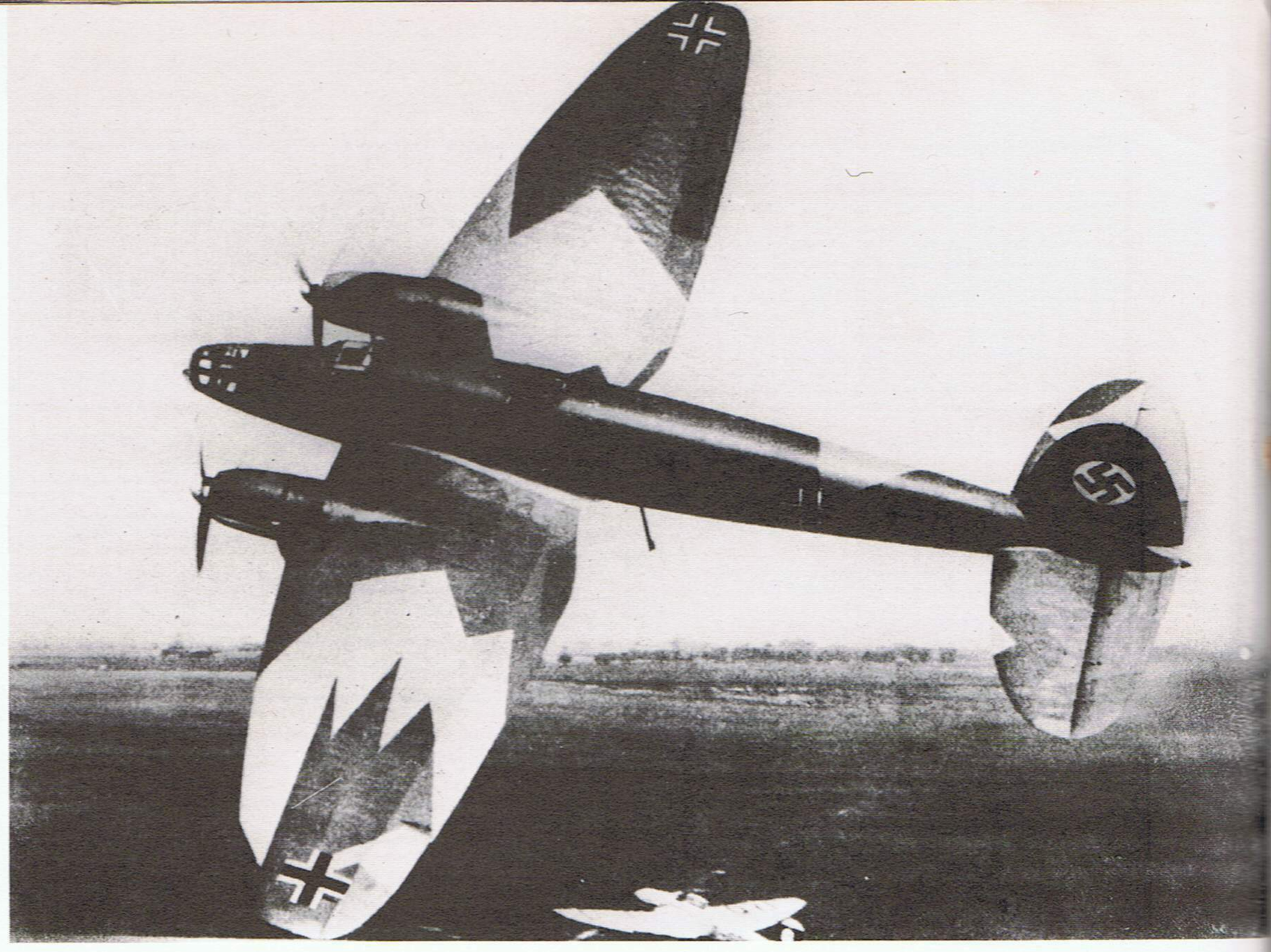


color substitution sequences:

scheme	A	A1a	A2a
	61	62	63
	62	61	61
	63	63	62

scheme	B	B1a	B2a
	61	62	63
	62	61	61
	63	63	62

scheme B1a



Right: A He 111B wearing the type of multi-coloured segmented camouflage that was introduced for Luftwaffe bomber aircraft in late 1936. Transposition of the upper surface colours produced seemingly wide variations in camouflage pattern amongst aircraft of the same type. */Real Photographs*

Top right: The relative position of the wing and tailplane also produced what appeared to be different camouflage schemes. This Hs 123 52+A13, W.Nr.968 of 3./St.G.165, wears an identical camouflage pattern and colour sequence to the He 111 shown in the previous photograph. Hs 123s were different somewhat with their code application, white being used for the aircraft letter and only this letter appearing on the wing upper surfaces as shown here. */Monogram Aviation Publications*

Centre right, above: A pair of Ju 86s with yellow nose bands applied, in temporary paint, for the 1937 air exercises. The nearest aircraft, 42+C26, is an A-1 model, the one in the background being a D-1.

Centre right, below: He 111Bs of KG 157 wearing camouflage scheme A2a */Heinkel Archive*

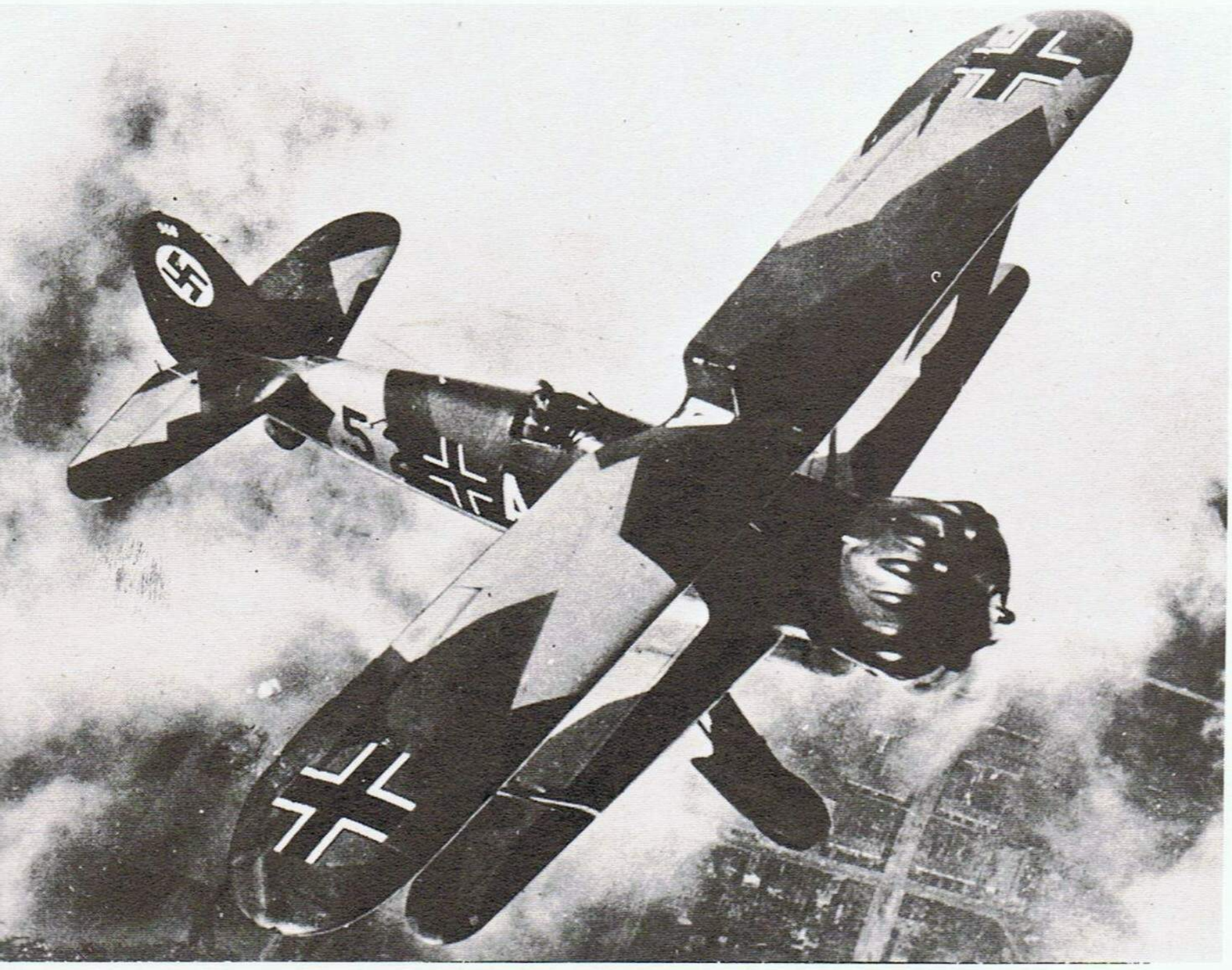
Bottom right: Fresh from the production line this Bf 109B-2 wears the 70/71/65 camouflage scheme introduced for fighter aircraft in 1937. */Real Photographs*

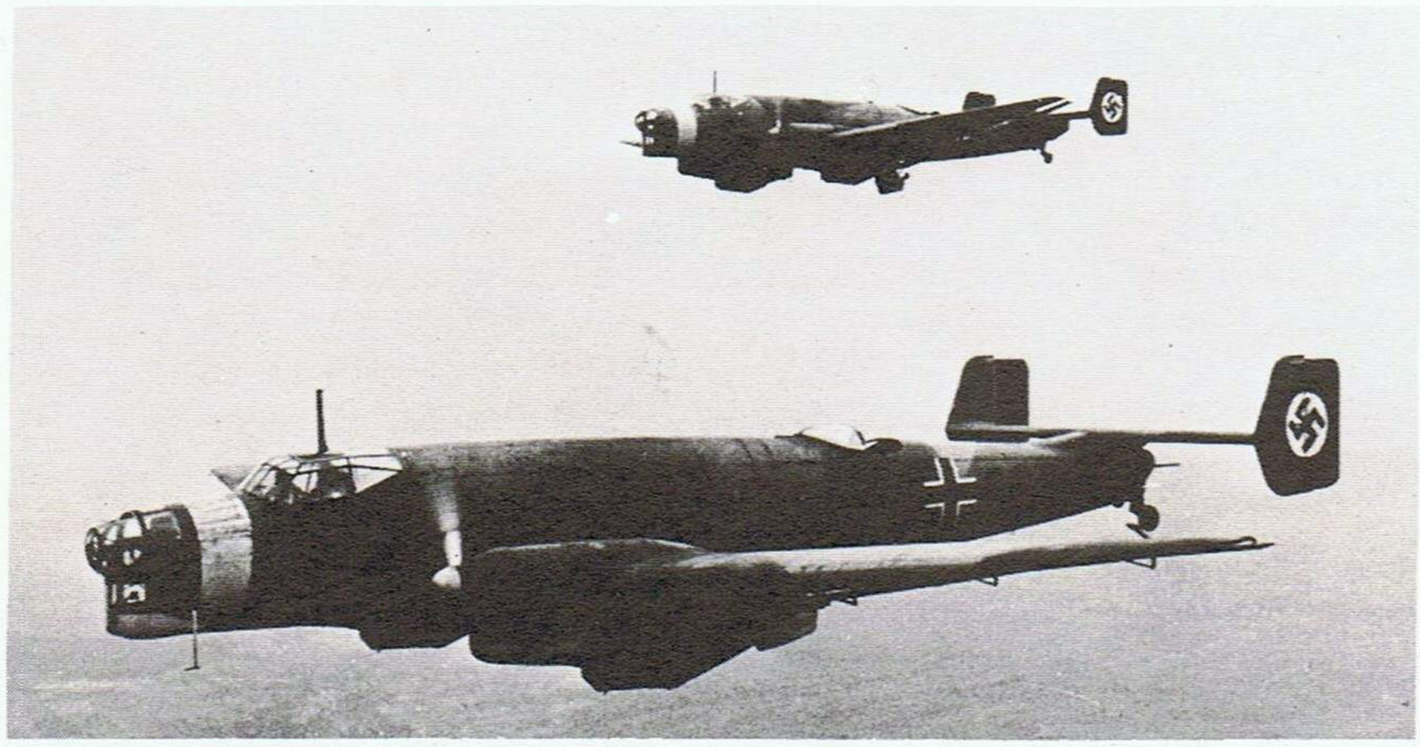
wherein paint colours were to be precisely identified by a single universal code number rather than the previous written descriptions. This was in addition to the existing company reference number which still identified the actual paint type. A further major revision to this system was to occur, but initially paint finishes and colours appeared as described, e.g. *Cellesta-N-Flugzeug* Ubz.L.Nr.2000 *grüngrau* 63. The 63 colouring was added to the paint mentioned, this finish being followed by a composite application of the same paint and colouring, plus two other colourless sealers, which produced a glossy grey-green finish.

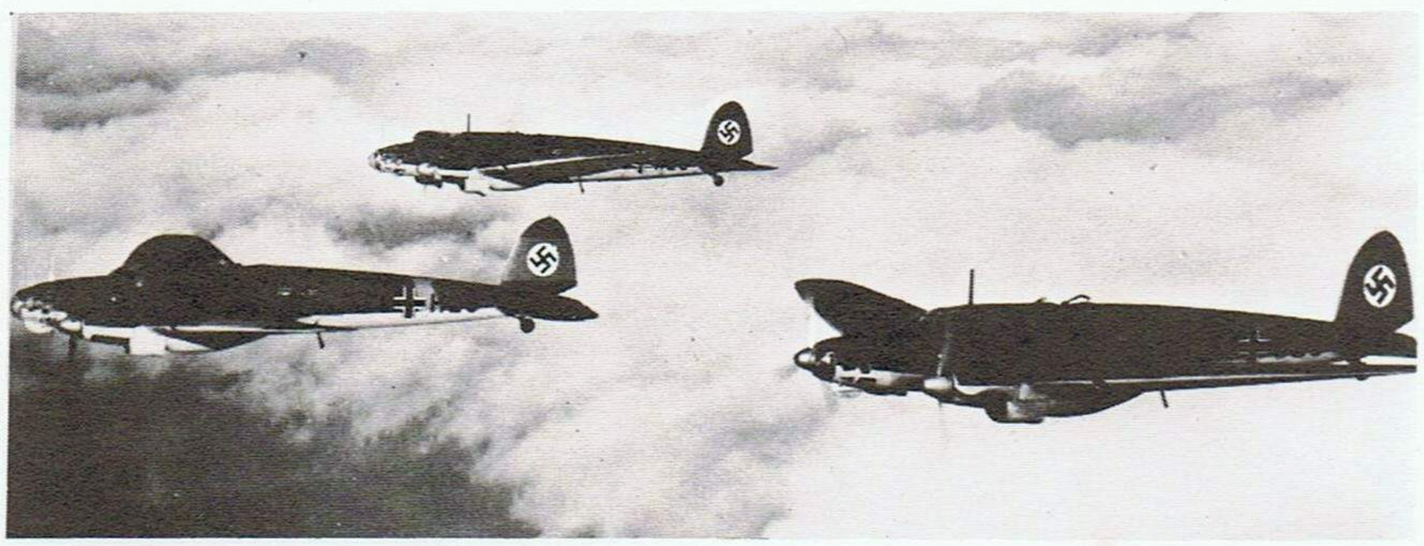
Introduction of a fighter camouflage scheme appears to have been synonymous with the first recorded issue of a formal directive relating to colour standards for Luftwaffe paints and aircraft finishes. The advent of the monoplane fighter also meant a further revision of fighter markings. The basic difference between existing biplane fighters and the new type made it physically impractical to retain the ventral and dorsal markings or the *Geschwaderstab* and *Gruppenstab* wing markings. For some time, dictated no doubt by the relatively small number of Bf 109s in service in Germany (only I and II/JG 132 and I/JG 234 were equipped with the type), fighter markings remained in a transitory state with Ar 68s wearing their full complement and the Bf 109s only portion of them. White band and white disc *Staffel* markings were used by the Bf 109s, but only on the rear fuselage.

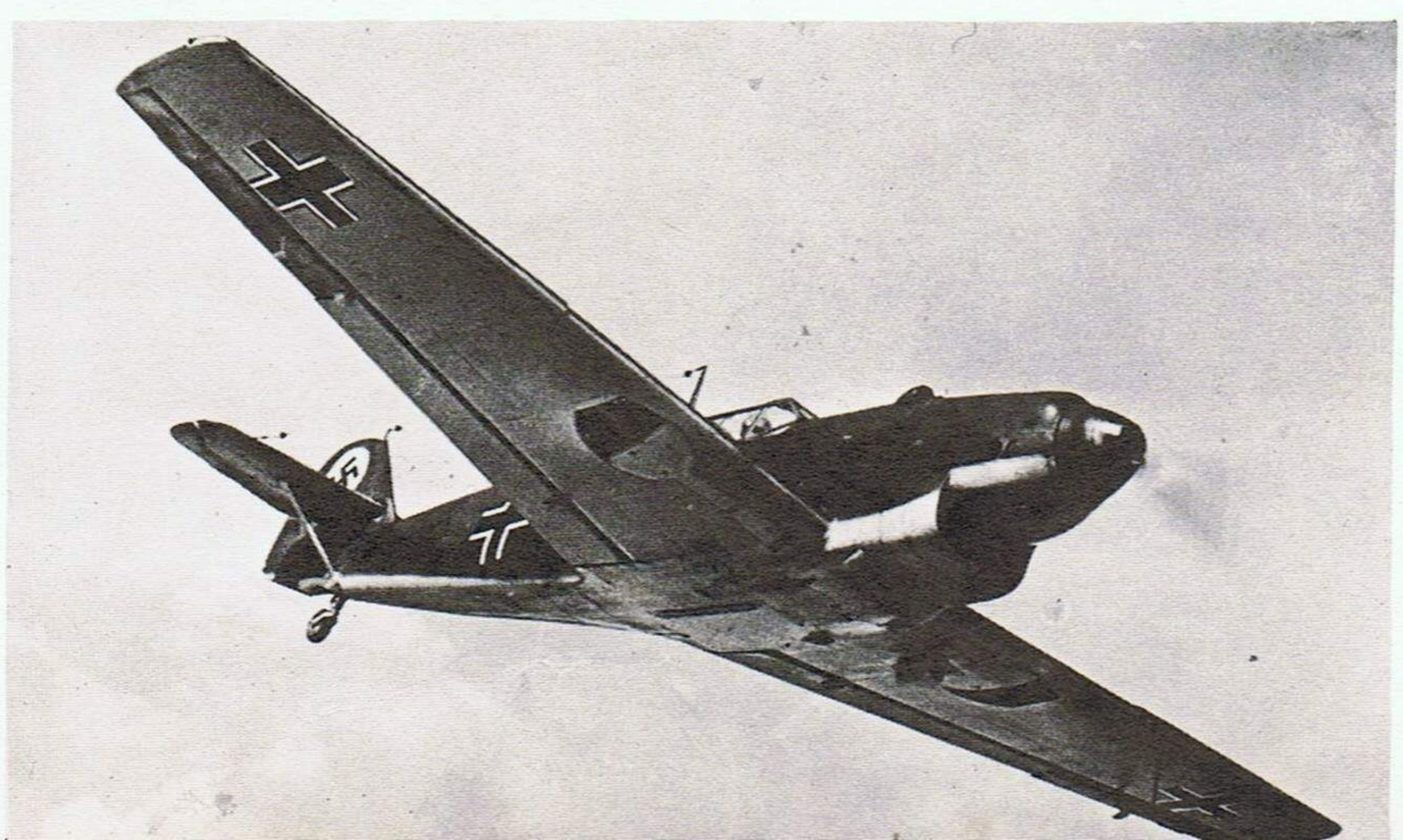
It is noteworthy that when the paint identification system was finally rationalised the official colour descriptions were much less accurate. Under the old system 63 was described quite accurately as green-grey, whereas under the new system it was listed simply as light grey. The use of this colour overall for first line aircraft continued well into 1937, but bomber and land based reconnaissance aircraft received a multi-coloured camouflage late in 1936. No positive date of introduction has been determined, but in December five of the new Hs 123 dive bombers were sent to Spain wearing the new camouflage scheme.

The pattern used for all upper and side surfaces was composed of straight edged, random pattern areas in three colours; a dark reddish-brown (*dunkelbraun* 61), a medium green (*grün* 62) and the existing grey-green (now officially described as *hellgrau* 63). All lower surfaces were coloured a pale blue-grey which bore the official designation of *hellblau* 65. Again this title was a little misleading. The camouflage pattern contained some ingenious innovations; it could be applied in reverse (mirror image) form and all three colours were interchangeable in set sequences. The pattern itself was based on a grid of equal squares whose size could be varied to increase or decrease the overall area covered. This grid was superimposed over a plan view of a particular aircraft type so that the entire aircraft was contained within the boundaries of the grid. Normal practice dictated that the rear-









most portion of the aircraft drawing should touch the base line of the grid. Depending upon the aircraft type this produced the varied patterns seen, which were in fact caused only by relative wing position, size and shape. It is difficult to describe this process clearly, but the accompanying diagrams should clarify matters. The subject aircraft used in the illustration is the Ju 86D and it will be noted that the small fuselage extension peculiar to this sub-variant lies outside the grid diagram, since the camouflage pattern had already been determined for the earlier model.

Sea-borne aircraft of all classes also received a revised overall colour scheme of 02, a greenish-grey of darker shade than 63. Floats or parts of hulls that were in direct contact with water were finished with silver coloured protective paints.

A camouflage scheme for fighter aircraft failed to materialise for some considerable time, the earliest recorded instance being summer of 1937 when a new breed of fighter aircraft, the Bf 109B, made its public appearance. Two colours were used for the upper surfaces, black-green (*schwarzgrün* 70) and dark green (*dunkelgrün* 71) with lower surfaces in blue-grey 65. A straight edged, random pattern was used, but of a far simpler style than that of the bomber aircraft.

One other minor change occurred very early in 1937. An expansion programme called for a considerable increase in Luftwaffe strength and *Geschwadern* finally assumed major proportions. Despite the expansion, the long and short range *Aufklärungsgruppen* still had too few numbers to warrant forming a full *Geschwader*. Because of the nature of their duties the additional numbers required could not be justified within the foreseeable future. In consequence the first digit of their unit identity was discarded e.g. Aufkl.Gr.(F)/121 became Aufkl.Gr.(F)/21. The precise date of change is not known, but extracts from the log book of Ofw. Bähnk show his unit designation expressed as 2.(F)/22 from April 8, the day of his first operational flight in a Do 17 coded 20+A12. (The code 20 was recorded for both the DO 17s and He 45s until his transfer to 10./KG 157 in January 1938.)

The reason for the slow re-equipment of home based fighter units with the Bf 109 was due to the diversion of a major portion of the early production output to the Luftwaffe's only active theatre of war – Spain.

The Proving Ground

Top right: Other Ju 52s appeared at intervals in Spain, principally those serving with the *Luftfeldpoststaffel* whose task it was to deliver military mail to all locations. This particular Ju 52, photographed at Leon, bears the emblem of a German military eagle carrying a letter in its beak. / *Greiner Collection*

Centre right: The earliest recorded examples of the multi-coloured 61/62/63/65 camouflage appeared with five Hs 123s in late December 1936. The fire breathing devil's emblem with the word *Teufel* (devil) beneath it was presumably a personal emblem. / *Bundesarchiv*

Bottom right: He 59Bs of AS/88 at the island of Majorca. Both are finished overall in the colour 02 and bear double, black disc, fuselage markings and white wingtips. The aircraft in the foreground is a cannon armed B-2 model. *Greiner Collection*

Civil war, that most cruel of conflicts, erupted on the Iberian peninsula in July 1936. Within a very short space of time Europe divided itself into two camps, and support for the favoured combatant group arrived in varying forms.

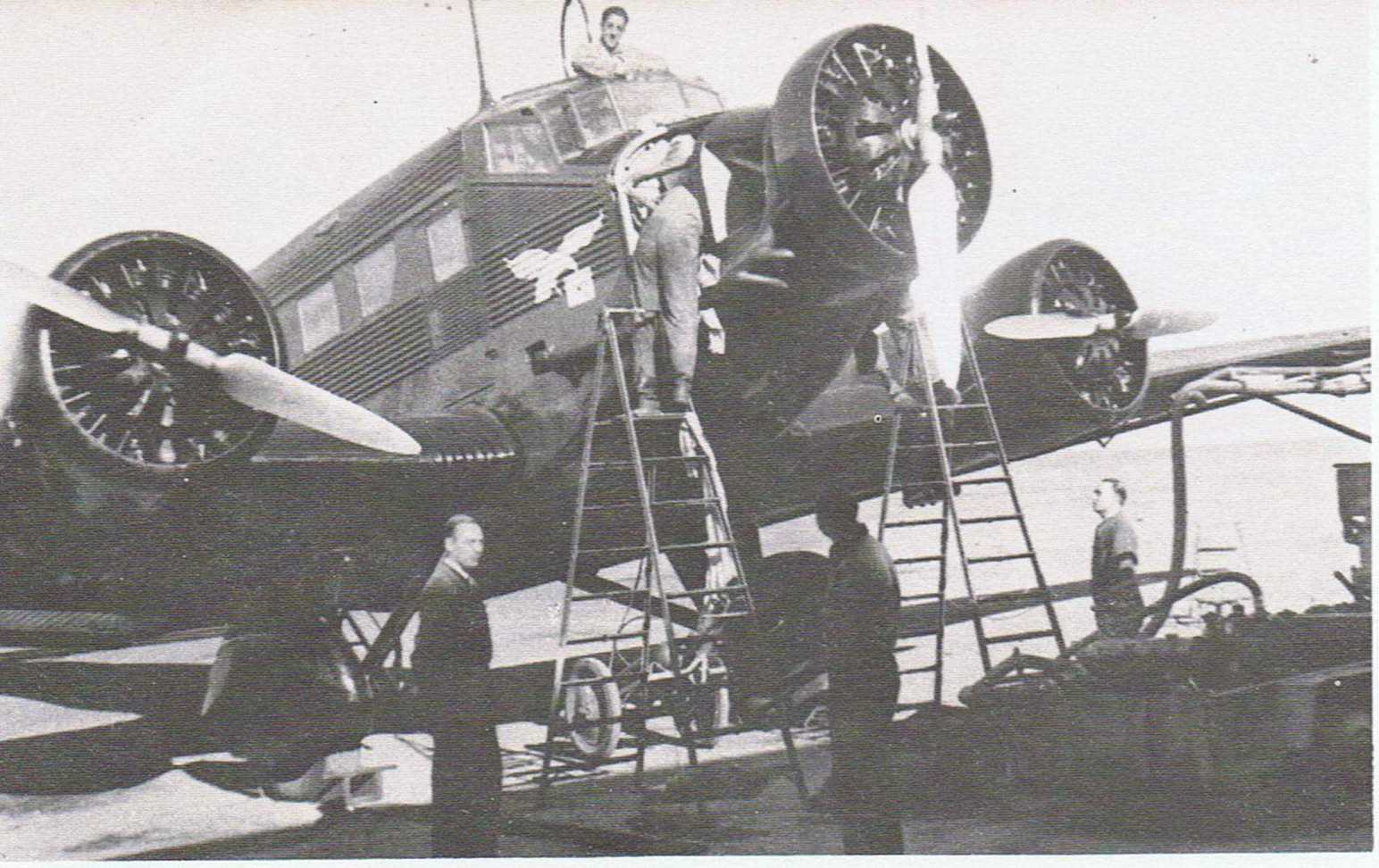
Germany and Italy supported Genralissimo Franco's Nationalist forces and both countries sent aid in the form of men and equipment. Germany's initial contribution, a batch of 20 Ju 52s, arrived within a week of hostilities commencing. Finished overall in green-grey 63 with characteristic neat black trim, they immediately began the airlift of troops from Morocco to Seville; this task was integrated with conversion training of Nationalist aircrew on to the type.

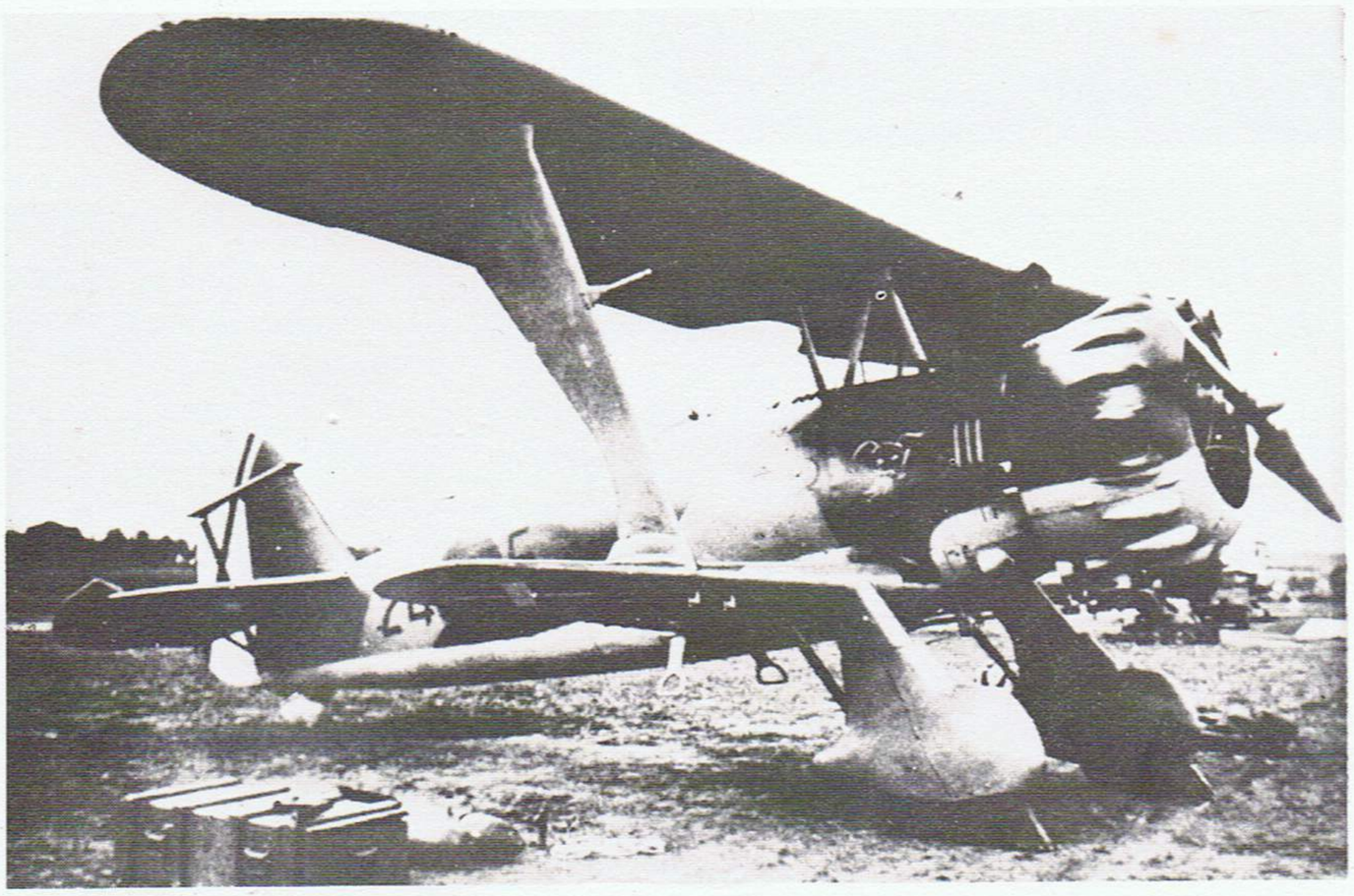
Six He 51 fighters were also dispatched to Spain on July 31, along with 85 men, but this contingent travelled by sea and arrived well after the Ju 52s which had begun operations on July 20. The He 51s were also finished in 63 overall and, like the Ju 52s, bore no trace of their previous ownership. Within a week of their arrival the Nationalist pilots had the He 51s in action, and made their operational debut with four kills on August 18. Further supplies of He 51s arrived in September and two full Escuadrillas were formed under *Gruppo 2*. Twenty He 46s also arrived in September, these having been ordered by the Nationalists shortly after the outbreak of war. Issued to *Gruppo 3* the He 46s were soon in the thick of the fighting.

The Nationalist Air Force had what can only be described as a somewhat unusual collection of aircraft that was matched only by the Republican Air Forces equipment for variety. The necessity for a set of distinctive markings for both sides thus became more than usually essential. The Nationalists had intended to use the pre-1931 colours of red-yellow-red, but under

Right: Ju 52 22●80 after a forced landing. Early deliveries of this type of aircraft wore an overall finish of 63 and retained the characteristic neat black trim used by Junkers aircraft of the period. /*Greiner Collection*









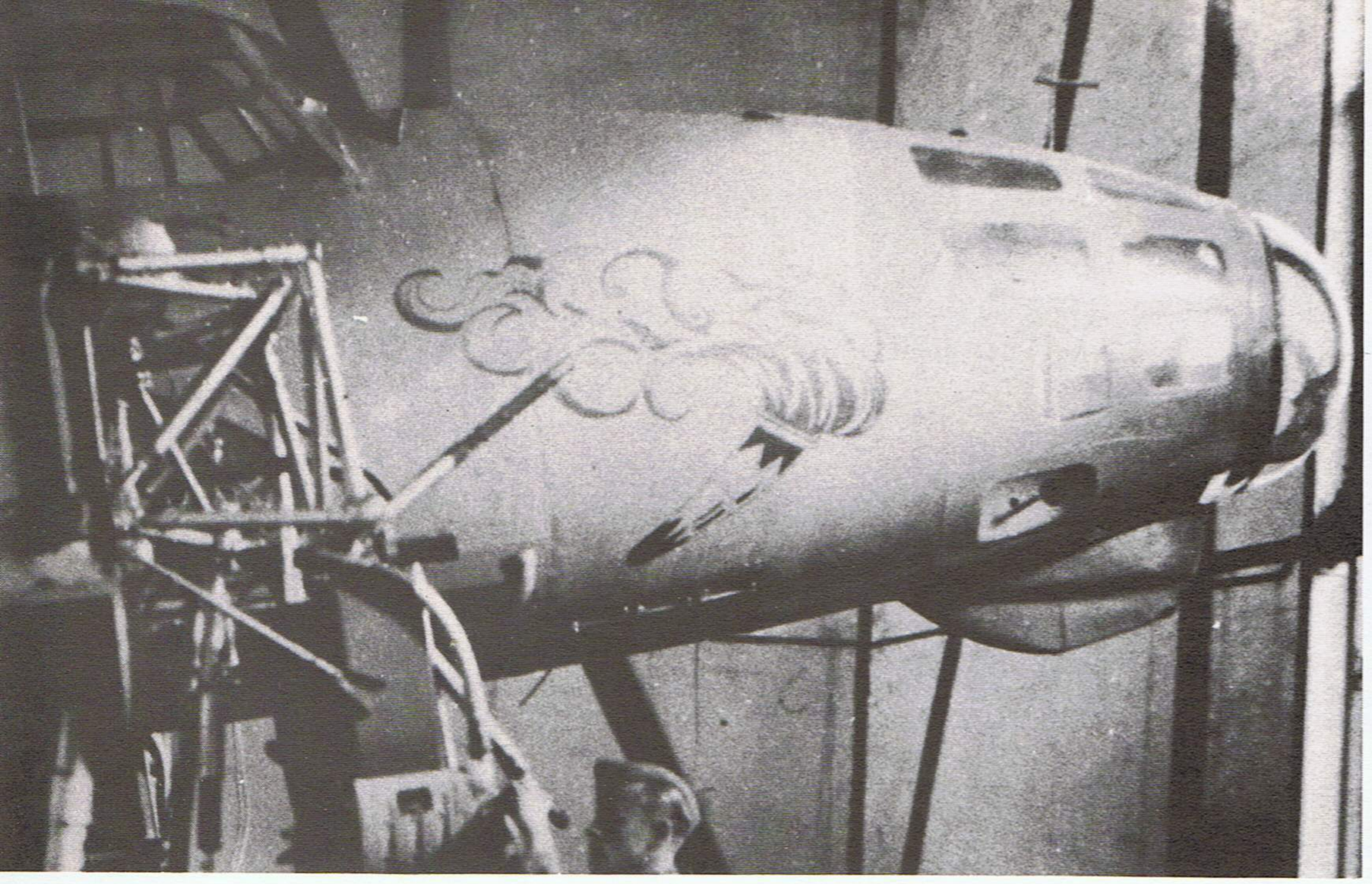
battle conditions these were almost impossible to distinguish from the red-yellow-purple of the Republican markings. Instead, the Nationalist forces adopted a simple black disc marking for both fuselage and wings, and a black cross on a white background for rudders.

For ease of maintenance and operational efficiency, the Nationalists rationalised their aircraft into units based on either a single aircraft type or types that were compatible. With the advent of bulk supplies of specific types from Germany and Italy this process was expanded, so when the Condor Legion, as the German 'volunteer' force was named, commenced operations in November 1936 its aircraft were marked in accordance with the Nationalist markings and code system. To the external observer the aircraft were clearly Nationalist operated; but seeing was not necessarily believing, and the Condor Legion remained largely autonomous and organised along normal Luftwaffe standards.

Nationalist codes were simple in form and applied in black to the fuselage, either forward of the disc marking or aft on both sides of the fuselage, with a hyphen separating the *Gruppo* identity from the aircraft's individual number. (See Appendix One.) This form of application did not last very long because the Nationalist markings, including those of the Condor Legion, underwent a series of changes during the initial phase of the civil war.

As stated, the main force of the Condor Legion arrived late in 1936, and most units commenced operations in November and December. The four main elements were comprised of a land-based reconnaissance unit, *Aufklärungsstaffel* A/88, equipped with 18 He 70Fs plus a special attachment of six He 45Cs for tactical reconnaissance; a sea-based reconnaissance unit, *See-Aufklärungsstaffel* AS/88, equipped with 10 He 59s, a bomber unit, *Kampfgruppe* K/88, equipped with 36 Ju 52/3ms; and a fighter unit, *Jagdgruppe* J/88 equipped with 36 He 51s. The two *Gruppen*, K/88 and J/88, were each subdivided into three *Staffeln*.

Allocation of unit codes was done, as stated, in accordance with Nationalist Air Force requirements. Thus the code allocation for the He 51s of J/88 had already been determined as 2, because *Gruppo* 2 of the Nationalists were already operating the type and German policy was to be ostensibly nothing more than part of that force. For the same reason 22 became the code allocation for the Ju 52s of K/88. In both instances individual aircraft



Left: Exotic emblems were not the prerogative of fighter units, this flaming torch emblem adorned the nose of a He 111B. */Greiner Collection*

Below: Do 17E 27●9 after a heavy landing. Note the application of the tail markings to both sides of the fin and rudder. */via Vincent*

Bottom : Routine maintenance to a Do 17E of K/88. The red devil's head emblem was retained after the close of the war when the surviving Do 17s were taken over by the Nationalist Air Force. */Greiner Collection*

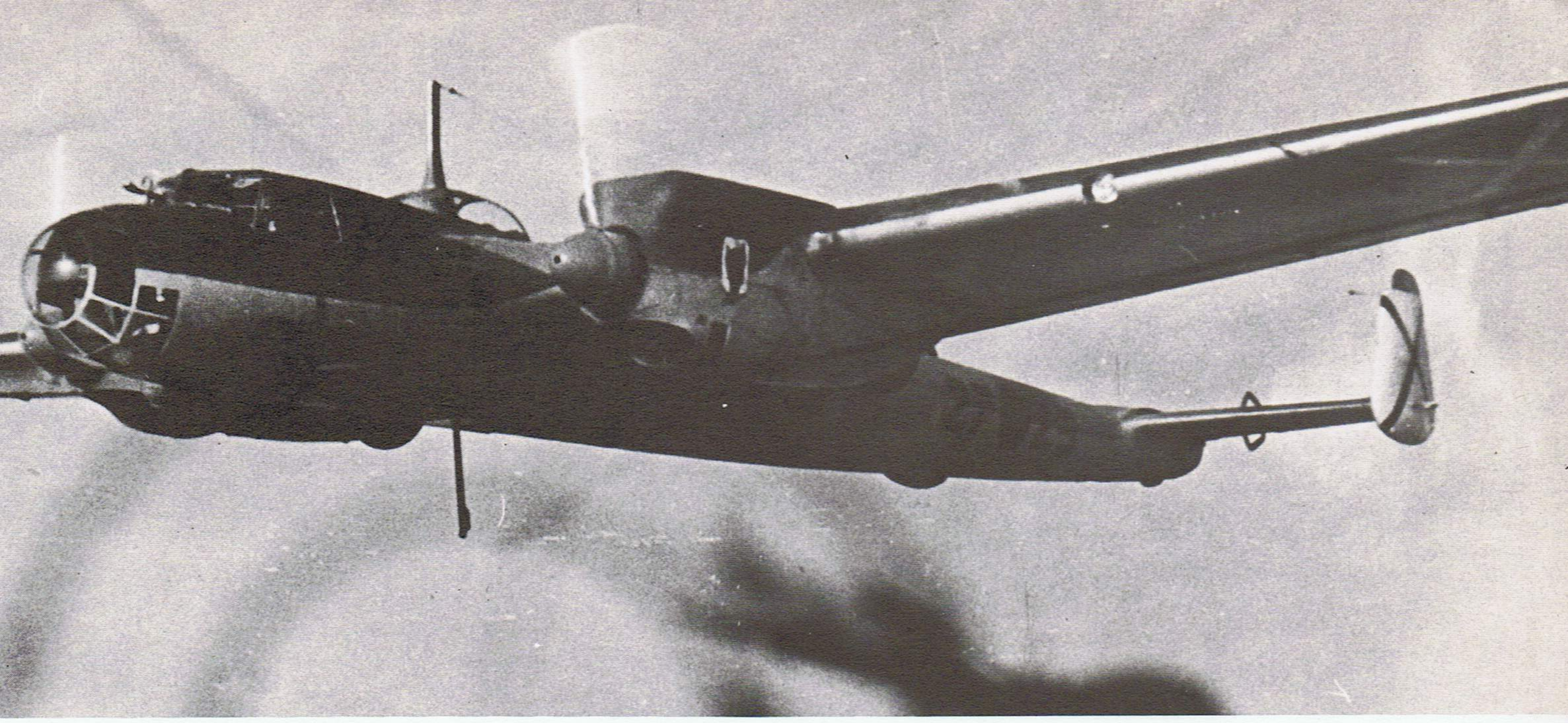
numbers were commenced at a relatively high figure, and progressed in a normal arithmetical sequence.

The policy of rationalising individual units on one type where possible, can be seen in the allocation of codes to the aircraft of A/88; the He 70s received the unit number 14 while the special detachment of He 45s received the number 15. The He 59s of AS/88 were allocated the number 71, the random choice of unit numbers no doubt reflecting the needs of security. Perhaps the most illuminating example of this practice occurred in March 1937 when the Ju 52s of 3.K/88 were replaced by He 111Bs. Although still part of K/88, the new aircraft were allocated the code 25.

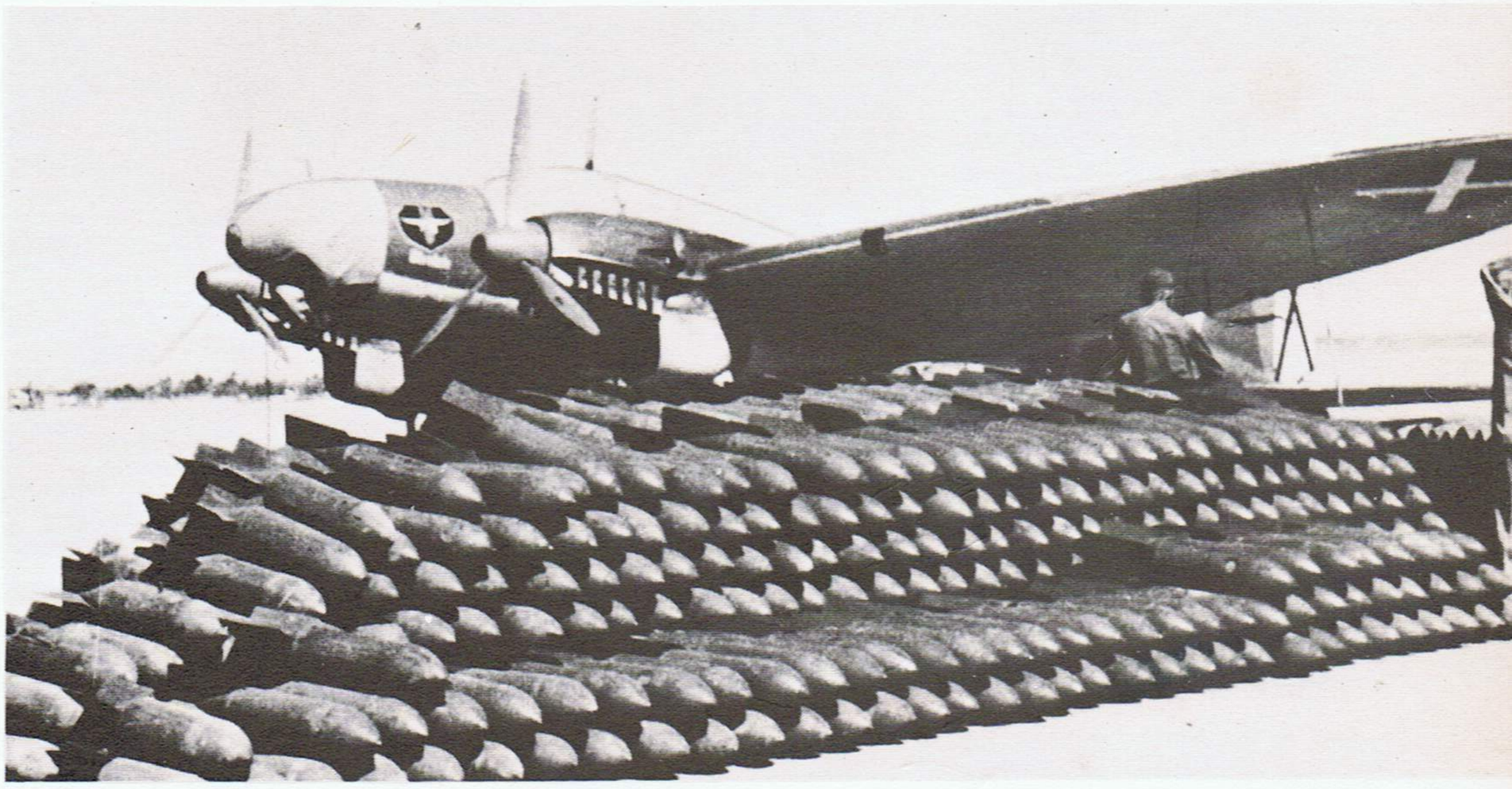
Returning to the closing weeks of 1936, some additional points require recording. All Luftwaffe aircraft that had arrived were finished overall in 63 if land-based, or 02 if sea-based, the former colour proving totally inadequate for the changing Iberian landscape. One small mystery still attends the equipment of AS/88. The Nationalists had ordered six He 60s which were sent to Spain with the Condor Legion, who were supposed to hand them over on arrival. Instead, this was not done until April 1937 when the six aircraft formed *Gruppo* 60. With aircraft at a premium it is possible that the He 60s were operated by AS/88 to supplement its hard worked He 59s. If this was the case it would be interesting to know whether the code 60 was applied during the period mentioned. Code applications to all types were done with very plain numerals, only the occasional minor embellishment adding any variation. This would eventually change with the introduction of a more flowing style, thicker stroke, type of numeral, which in turn, produced a minor







Above: Another K/88 Do 17E 27●25; it displays both the *Staffel* emblem on its engine nacelles as well as a personal emblem, a devil riding a bomb, beneath the cockpit. */via Vincent*

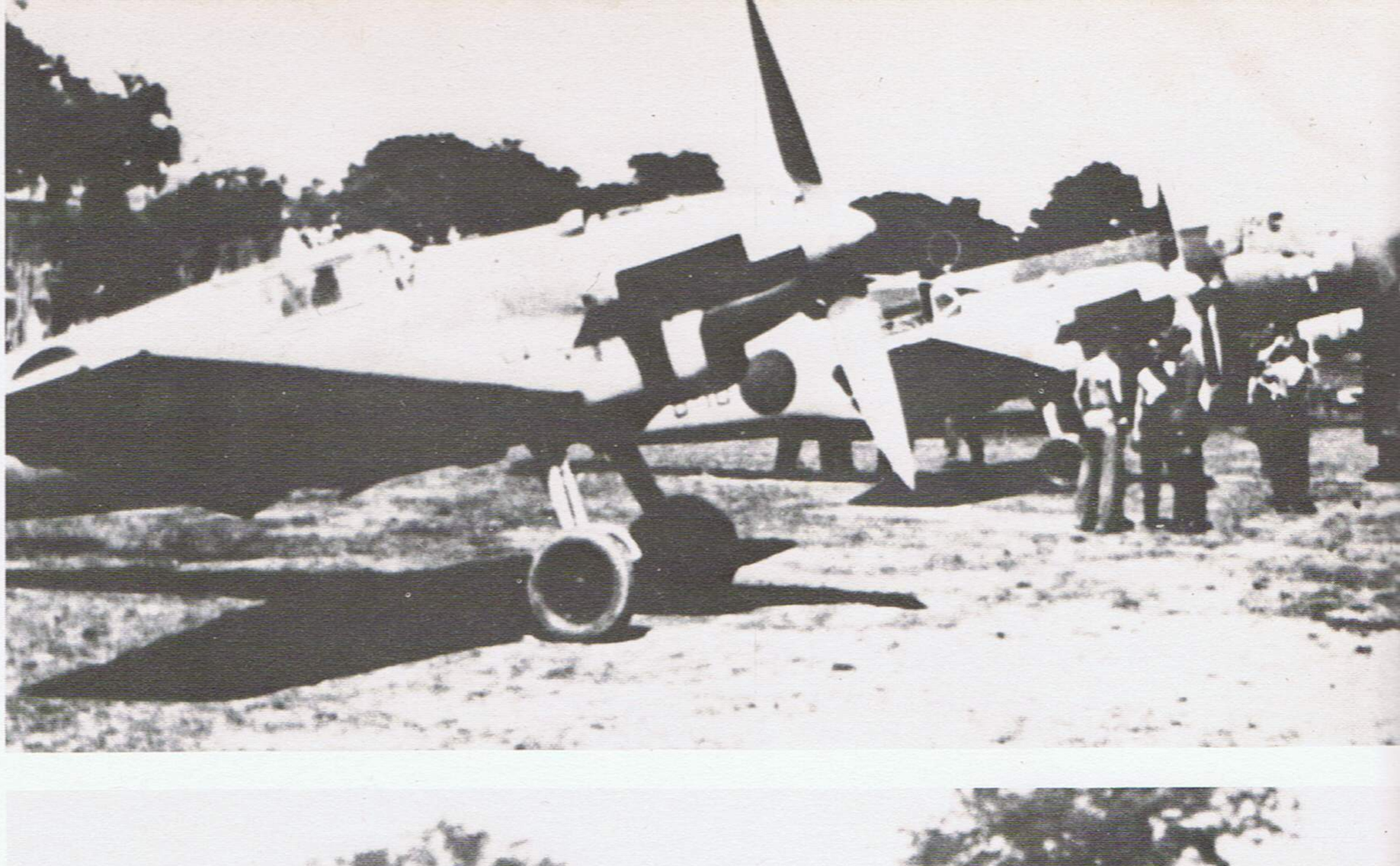


Right: As was to be expected, emblems carried by the bombers of K/88 tended to use a bomb as the main theme. Many of these emblems formed the basis of those used by several *Kampfgeschwaderen* during the European war. The bombs piled in the foreground are painted in regulation 71 green.

variation to markings as noted further on.

The first real splash of camouflage colour appeared with the arrival in late December 1936 of five Hs 123s wearing the new 61/62/63/65 colour scheme. To this was added a set of black codes and the additional markings recently adopted by the Nationalists and all Condor Legion aircraft. These additional markings were the result of attempts to aid air-to-air identification. The single black disc marking was too easily confused with the Republican roundel under combat conditions, where light and shadow did little to aid the fleeting glimpse afforded under relatively high attacking speeds. The bold black and white rudder marking proved most adequate but was of limited use in stern attacks.

Early attempts to aid recognition were the adoption of red chordwise bands beneath the wings of biplane types, a band of the same colour around the rear fuselage, plus the addition of an extra black disc marking on the upper surface of the top wings. The attempt was a failure because it still did not overcome the basic problem of visual identification at a reasonable distance. In consequence a much bolder set of markings was adopted. All wingtips were painted white on both upper and lower surfaces, and for biplanes a large full chord white cross was applied inboard of the black disc marking on the upper surface of the top wings and the lower surface of the bottom wings. Because of the restricted space available on the bottom wing of the Hs 123 due to the narrow chord and bomb racks, the white cross was incorporated within a single black disc marking. Monoplanes, because of their comparative rareness and different combat usage, did not have the double black disc marking applied to

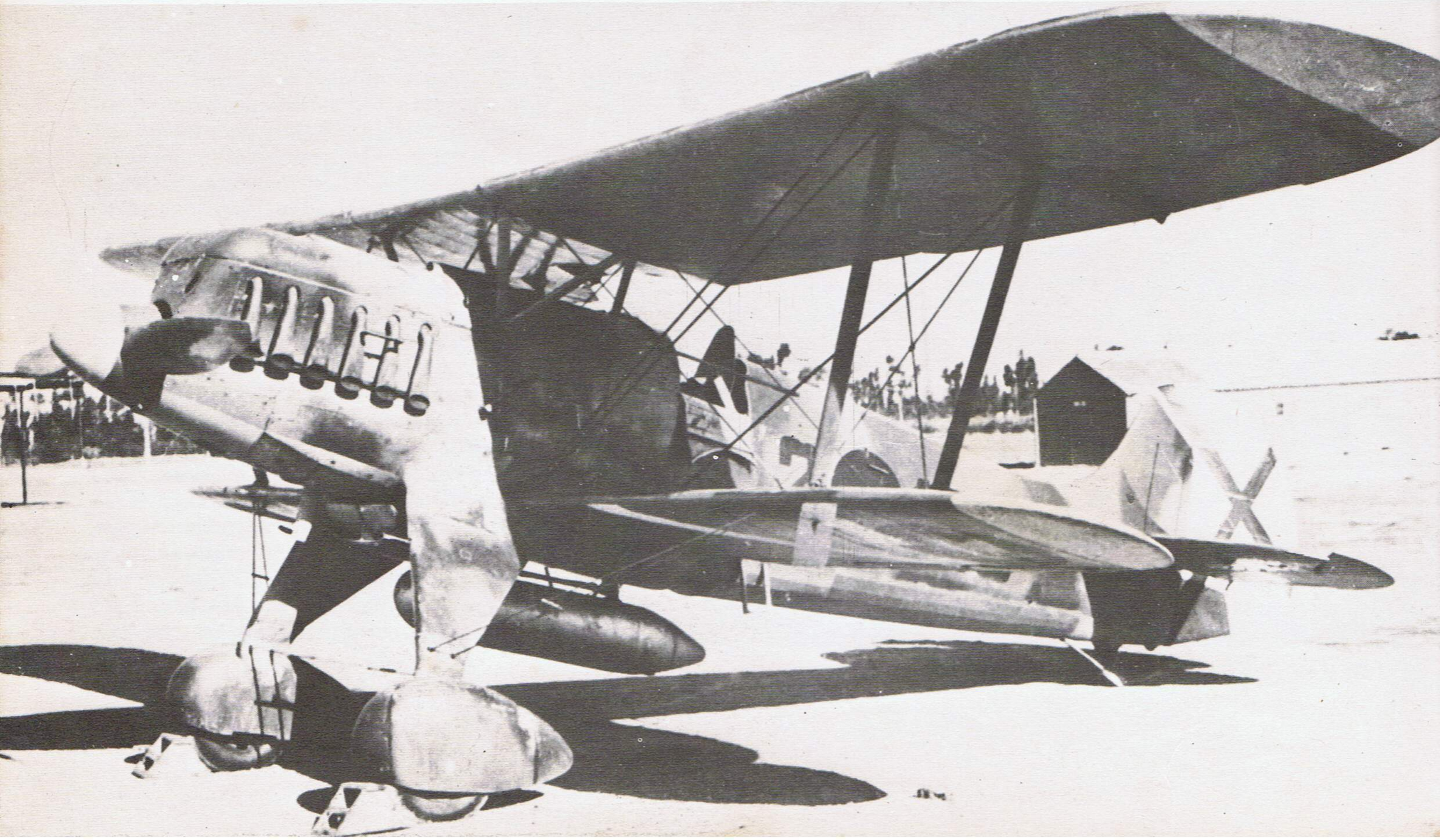


Top right: Of extremely poor quality but, as so often, of historic importance, this photograph shows a pair of bare metal finish Bf 109B-1s in company with a Ju 86D, coded 26●1. The second Bf 109B is 6-16 and both fighters bear white crosses on their underwing black disc markings. */T. Hitchcock*



Centre right: Again of poor quality but equally of importance this photograph illustrates the practice of applying a name in white block lettering beneath the cockpit with the aircraft's number in white below that. On the original print it was possible to read the name *FUMO* with the number 3 beneath it. The Ju 86 in the previous photograph also wore the name *FUMO* but with the number 1 beneath it. */T. Hitchcock*

Below: An excellent example of the extensive use made of stocks of camouflage paint which arrived early in 1937. This He 51 of J/88 bears sprayed applications of 61,62,63 and 65 in a highly original and very random style.



them. They did, however, adopt the white wingtip markings, and as the intensity of combat increased, most of them used the white cross marking within the black disc wing markings.

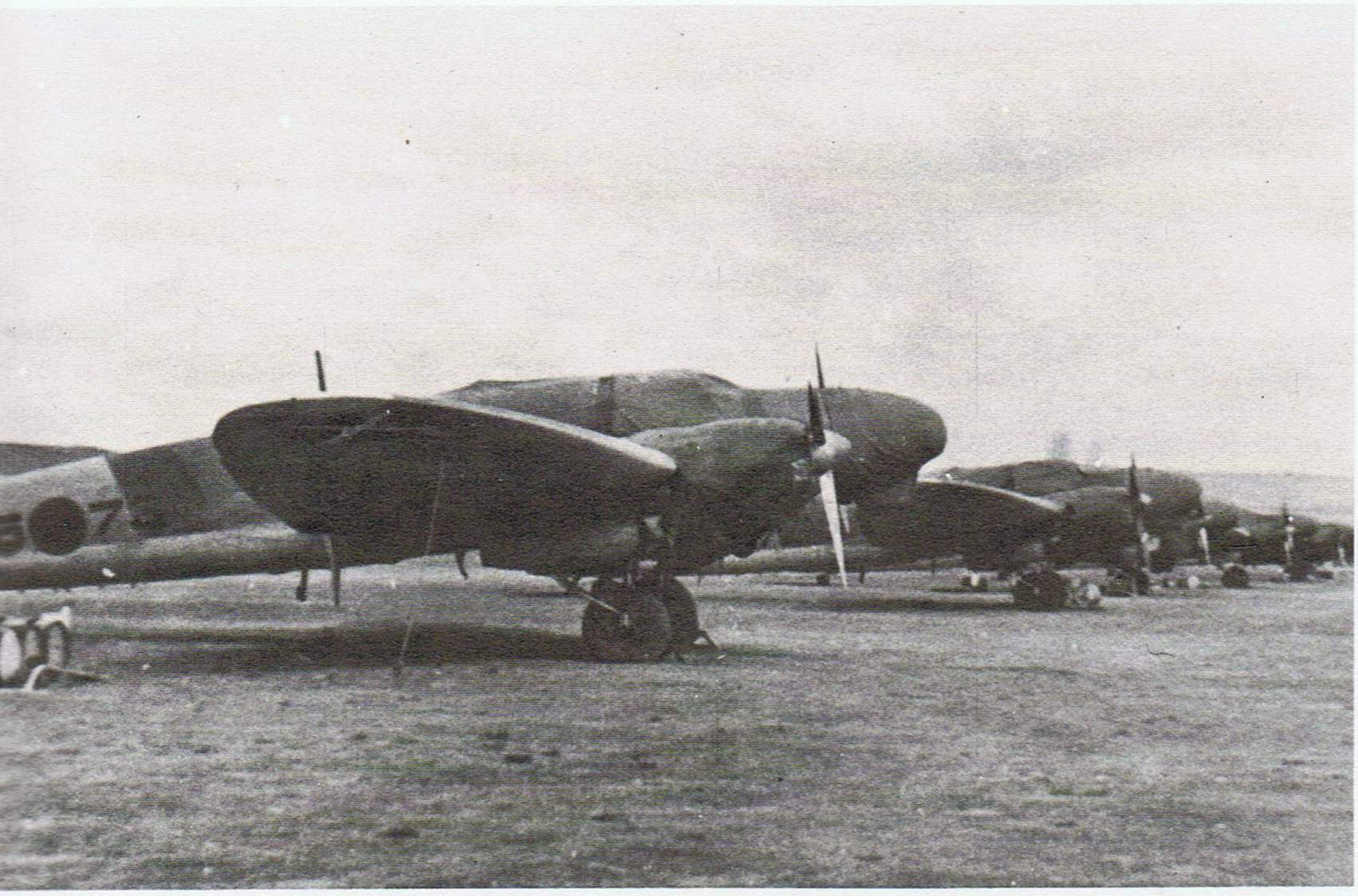
Possibly because of their different area of operation, the He 59s of AS/88 did not adopt the double black wing disc marking, but they did use two discs on the sides of the fuselage. The extra disc was marked beneath the cockpit, making it possible for aircraft approaching from any quarter to see the identification markings. Prior to the adoption of the additional disc the bulk of the engine nacelles and wing struts obscured the markings from the forward quarters, and only aircraft approaching from the stern quarters were able to determine the aircraft's identity. However, the additional disc proved to be ineffectual under normal operational conditions once the He 59s became engaged in semi-nocturnal anti-shipping and bombing operations in addition to their normal reconnaissance duties. The adoption of white wingtips and full chord crosses overcame this handicap.

Thirty of the new He 111B bombers arrived in March 1937, many of them in plain 63 overall finish, and full Nationalist markings were added to them. Plain style codes were applied to these aircraft which replaced the Ju 52s of 3.K/88 and also formed a new *Staffel*, 4.K/88. Twenty Do 17Es arrived soon after to replace the remaining Ju 52s of 1 and 2 *Staffel* K/88. As with the He 111Bs, these aircraft wore the new camouflage colour scheme of 61/62/63/65 to which Nationalist markings





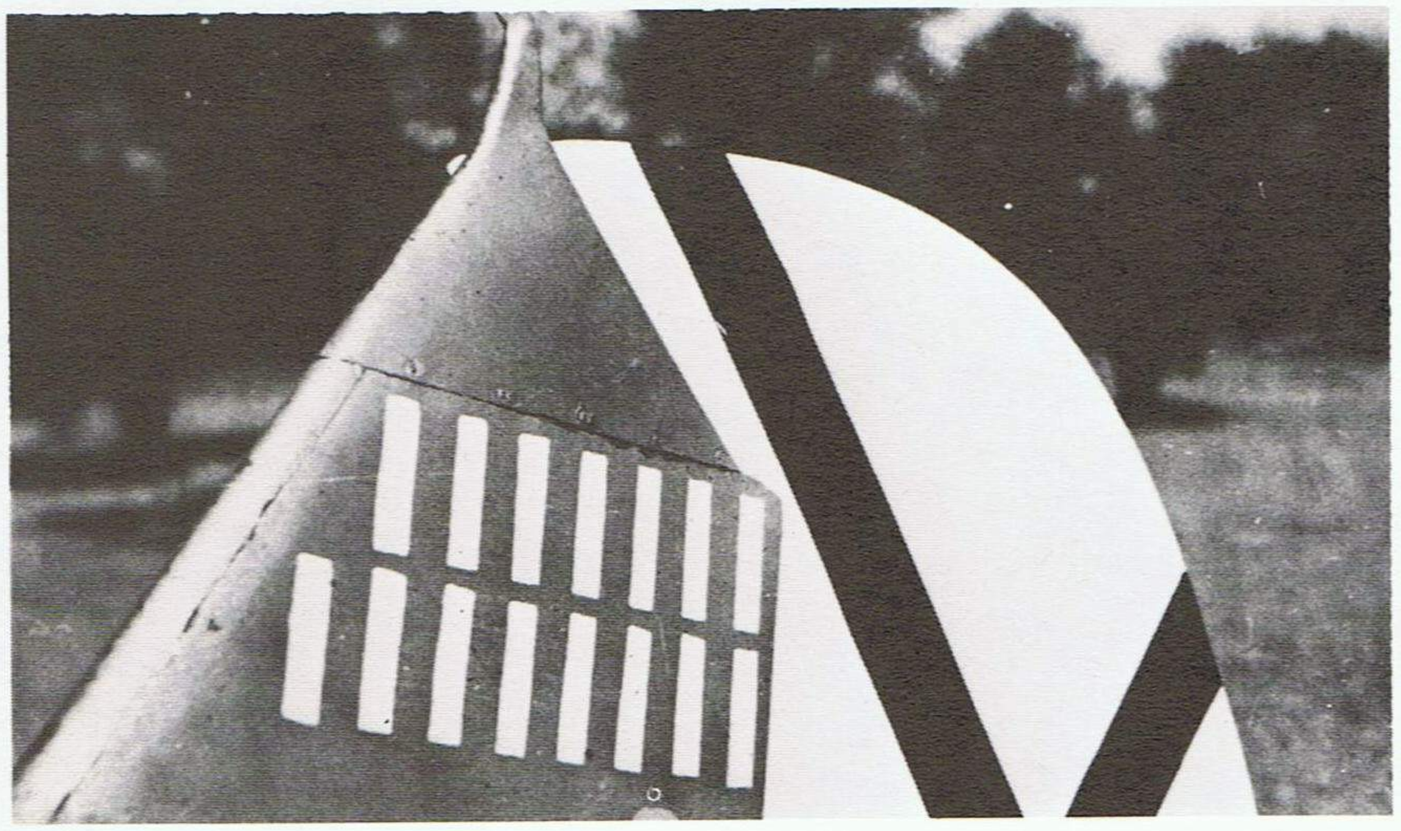
Top: The two Ar 68Fs, which were used for night fighter trials in Spain, photographed in the late evening. Coded 9●1 and 9●2, they retained their overall colouring of 63 which was then currently standard for home based biplane fighter aircraft. */Greiner Collection*



Above: A Bf 109B-1 from the first batch of 45 delivered to the Condor Legion. Coded 6●4 it wears camouflage scheme of 61 brown on the upper surfaces of wings and tailplane with fuselage top and side surfaces in 62 green. All lower surfaces remain in their original 63 greenish-grey colouring. */H. Obert*

Left: He 111Bs lined up with their protective canvas covers in place. The first two aircraft are 25●73 and 25●72. */via Vincent*







Top, centre right: Contrasting with the previous photograph these two show one of the original batch of He 111Bs, 25●15, still wearing its overall 63 coloured finish. The very elaborate epitaph to the crew's mascot (which was killed over Sagunta during a raid) clearly identifies the date as after mid-June 1938. The use of the fuselage black disc as a background for an emblem was fairly common amongst Condor Legion aircraft. */H. Obert*

Above: Fifteen kill markings on the fin of what is believed to be Werner Mölders' Bf 109. It was previously thought that Mölders, J/88s top scorer, had achieved only 14 kills in Spain. Camouflage appears to be 62 green, the damaged paintwork revealing the 02 primer coat. */Greiner Collection*

and codes were added, the latter in some instances in the semi-script style that was rapidly replacing the earlier form. These were not the first Do 17s to join the Condor Legion, as 15 of the F model had arrived at about the same time as the He 111Bs. These replaced the He 70Fs of 1.A/88, which were transferred to the Nationalist forces. Code style on the Do 17Fs was the earlier very plain style. Again we see an example of the type rationalisation policy with the code 27 being carried by the Dorniers, which equipped both 1.A/88 and 1 and 2.K/88.

Another aircraft type made its appearance in Spain when the first batch of 45 Bf 109Bs arrived close on the heels of the He 111Bs and Do 17Fs. The urgency with which the Bf 109Bs had been dispatched to Spain possibly explains why the first ones to arrive were still in bare metal, overpainted with a clear protective finish and black trim around the exhaust areas. Nationalist markings were applied and plain style codes which curiously enough were grouped aft of the fuselage disc marking. Apart from the He 59s, which maintained this early form, this style of application was anachronistic. This was soon corrected but another inconsistency persisted for some time, a white cross marking to the black fuselage disc.

Coincident with the arrival of the Bf 109Bs was that of a batch of five Ju 86Ds. Painted in the colours 61/62/63/65 these aircraft had the usual plain style codes and Nationalist markings added to their finish. They also exhibited an additional white marking in the form of the name *FUMO* painted in block letters on the nose with the aircraft's individual number immediately beneath. This practice was also used on some Do 17s and He 111Bs, the names *PABLO* and *PEDRO* being used respectively in conjunction with the individual aircraft number.

Until recently it was always assumed that the five Ju 86Ds did not arrive in Spain until late in 1937 but the

availability of more detailed information about delivery dates, plus a more definite dating of the transition period from the old style code application to the newer variety has clarified the matter considerably. The Ju 86Ds were placed under the control of K/88 for operational proving trials.

The arrival of substantial numbers of aircraft wearing the new camouflage colours also meant the arrival of stocks of paint to maintain their finish. The paints were soon put to other uses. Spring and summer rapidly turned the Spanish terrain into rich browns splashed with greens. The fighter contingent found that their pale coloured mounts were easily discernable against such a background, and field experiments soon lead to a variety of camouflage schemes of widely varying styles.

He 51s appear to have worn perhaps the most extensive and complex variations. Making use of all the available colours, their applications ran the full gambit from straight sided random segments, through soft edged sprayed patches to relatively crude hand-painted combinations of two colours. A few of the early delivery Bf 109Bs were given a modicum of camouflage in the form of 65 coloured under-surfaces. This certainly aided concealment at high altitudes but proved ineffectual for general combat conditions. In a few cases entire upper surfaces and fuselage sides were painted with 61 and under surfaces in 65. More extensive use was made of 61 and 62 for upper surface colouring, but unlike the He 51s the two colours were kept to large, well defined



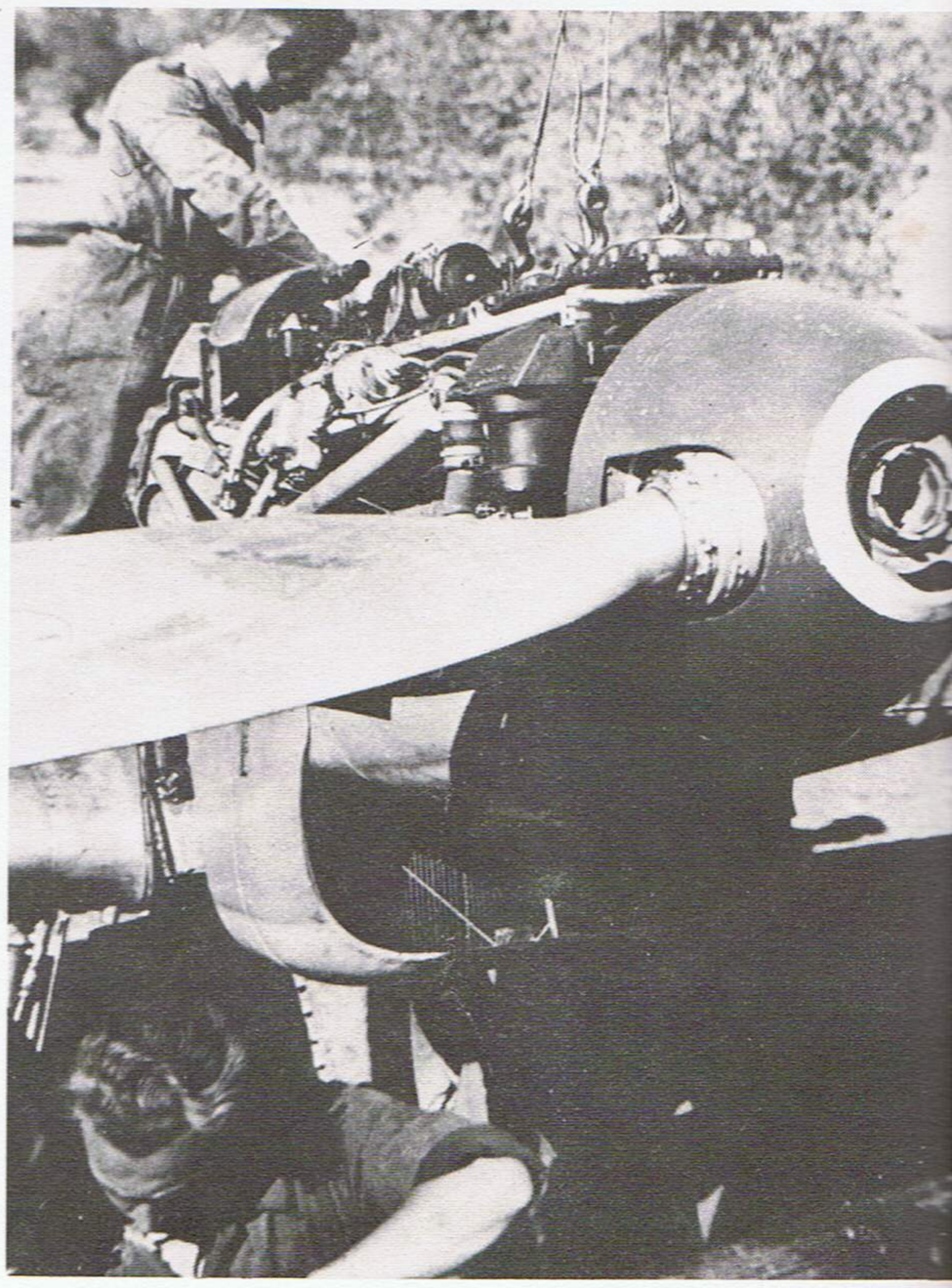
Left: Application of Nationalist markings to the wing of a Bf 109. The camouflage appears to be 62 green on the upper surfaces. */ Greiner Collection*

Below: One of five Bf 109D-1s delivered in 1938, this aircraft appears to have been left in its 02 coloured primer coat. */H. Obert*

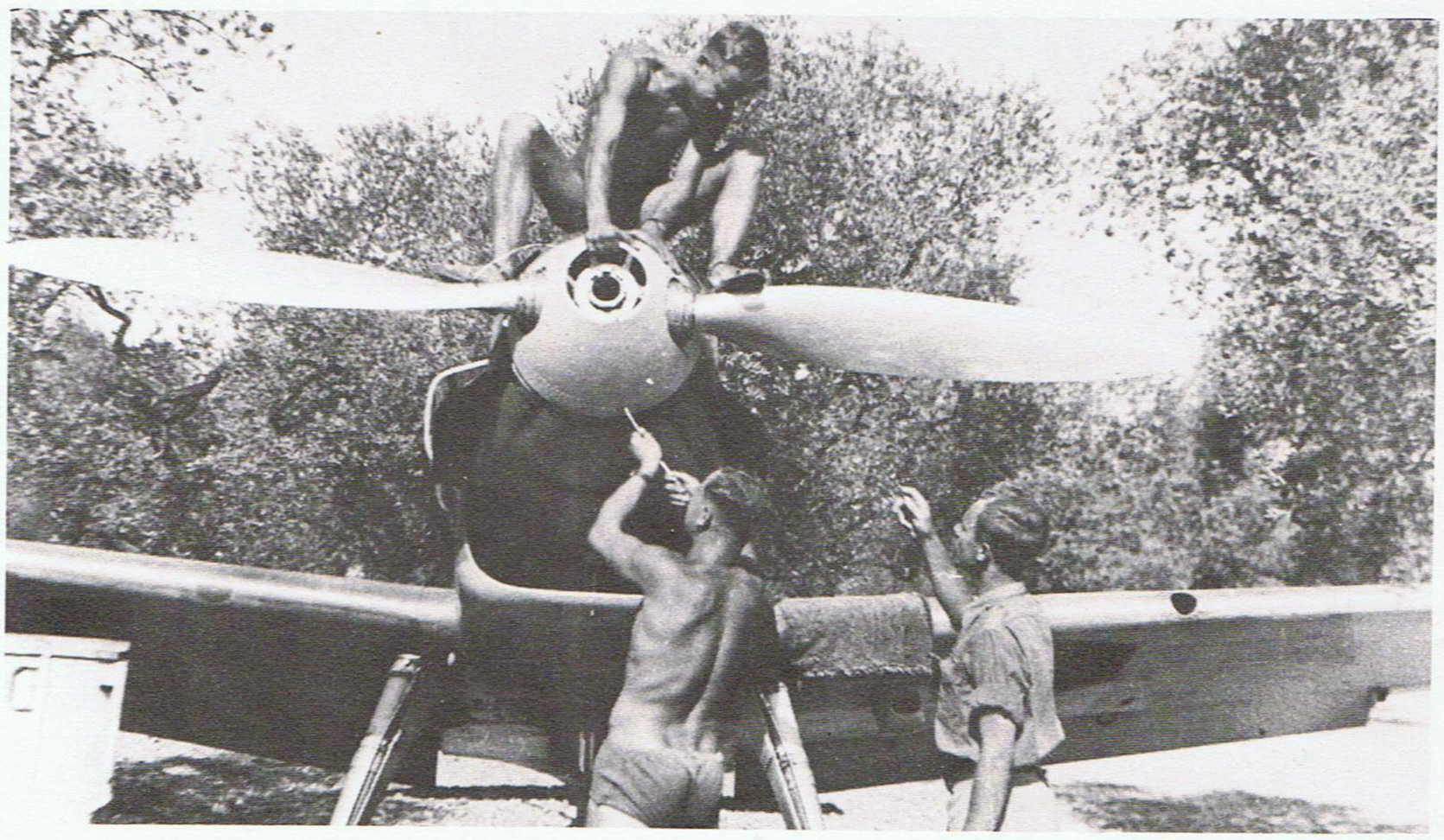


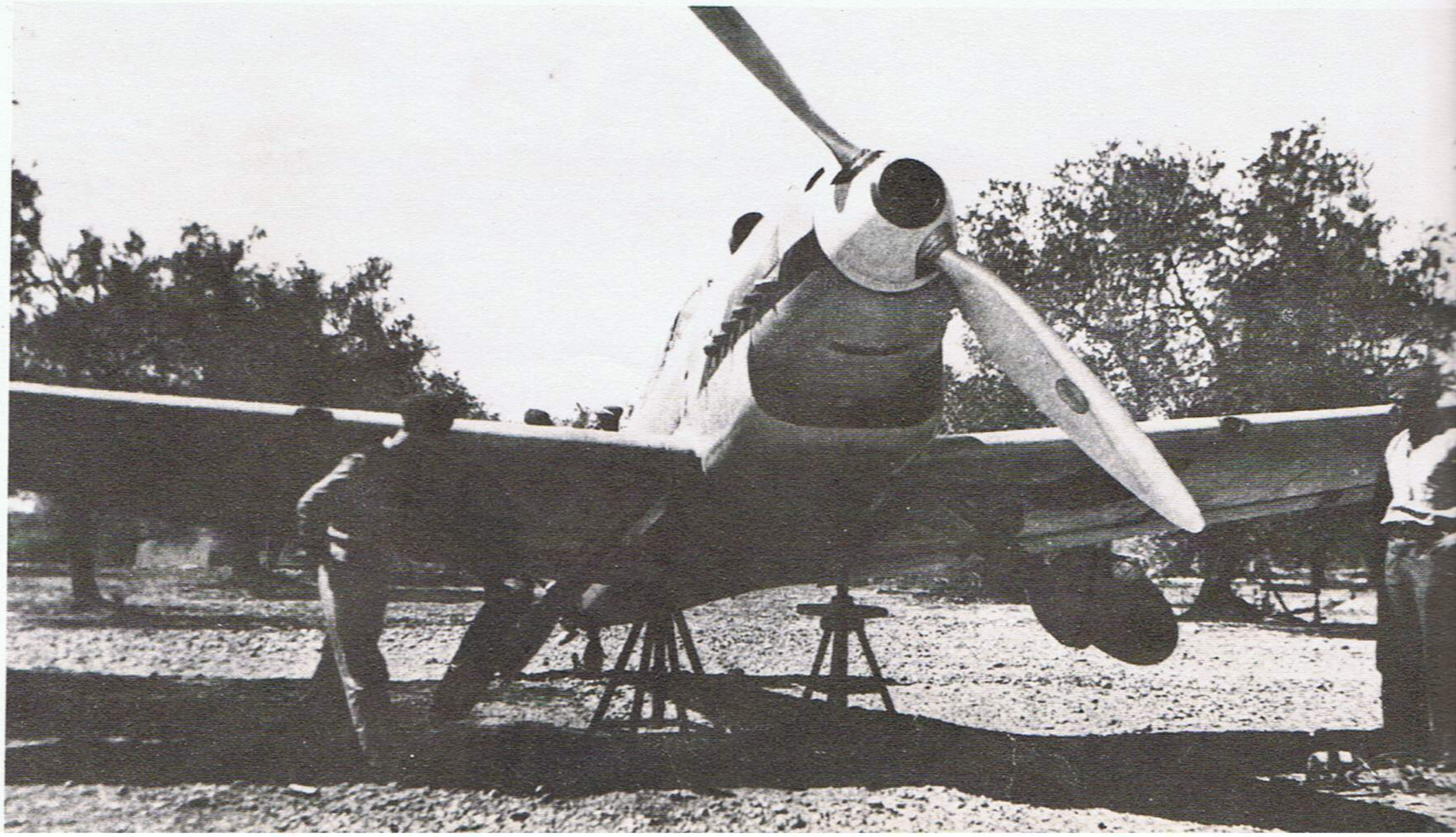
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Spinners appear to have provided the venue for individuality of colouring in J/88. These four photographs show a wide variety of colours and combinations. Camouflage for all the Bf 109s appears to be 62 green upper and side surfaces and 65 blue-grey lower surfaces. */Greiner Collection*







Above: In addition to colours some pilots added emblems to their aricraft spinner. */Greiner Collection.*

areas. Fuselages were painted in 62 while wing and tailplane upper surfaces were sprayed with 61. Spinners were often resprayed to match the fuselage colouring but a wide variety of colours were soon to appear, often embellished with an extra band of colour or even a motif.

With the advent of 70/71/65 camouflage colouring for Bf 109s in Germany, deliveries of the type to Spain were made with the aircraft still in their 02 coloured primer coat. Camouflage to local requirements was then applied on arrival. The adoption of large stylish numerals for the codes produced a change in the positioning of the fuselage black disc marking, the starboard side one being further aft in the region of frame five, in order to keep the codes between the tailplane and the wing root.

Some aircraft still displayed overall monochromatic colour schemes, such as the two Ar 68Es which arrived in Spain to undergo field night interception trials with *Gruppo* 9. (Despite the advent of the 70/71/65 colour scheme for Bf 109s, home-based biplane fighter types still retained their old 63 colour scheme. Events in 1938 would change this, but at the time under discussion the practice still persisted.) Some of the original He 111Bs still retained their overall 63 scheme and a few would do so for the remainder of the civil war. Others were repainted in accordance with the official diagrams that were now being issued in the aircraft technical manuals.

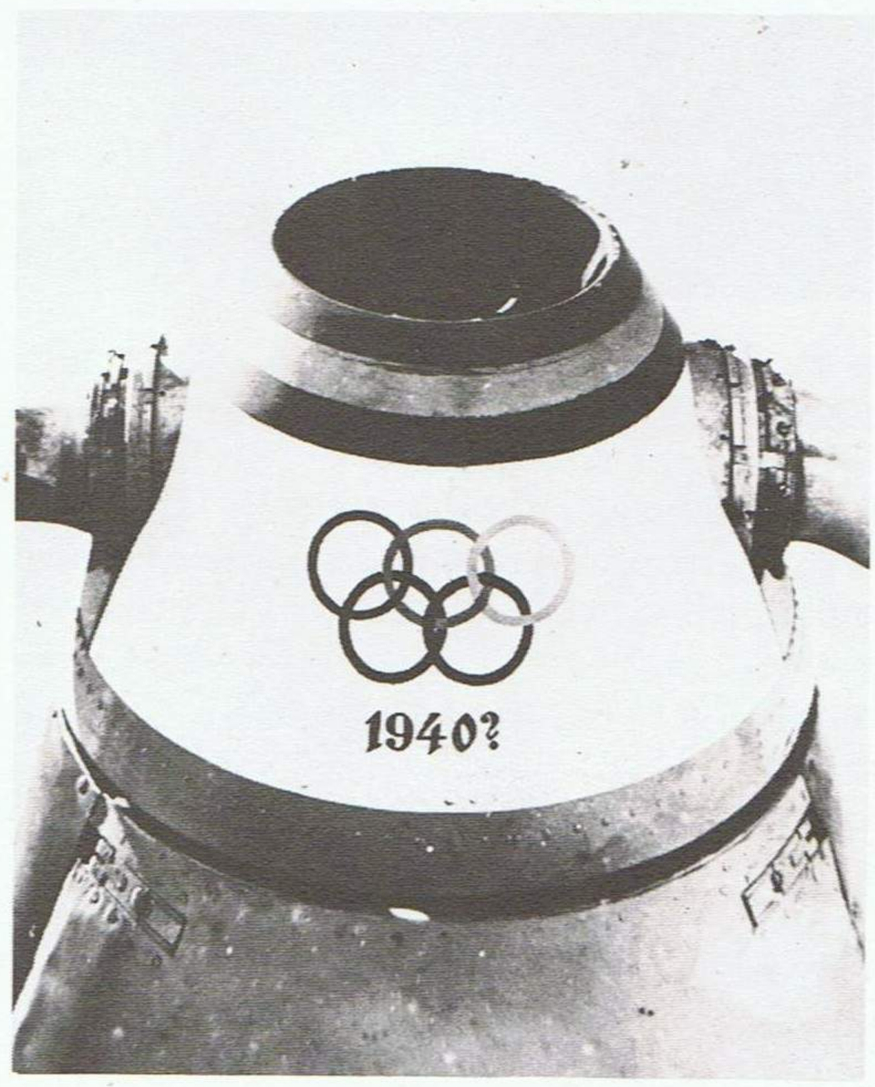
The revival of both unit and personal emblems occurred in quantity amongst the Condor Legion's aircraft. Variety was matched only by ingenuity in a wide range of applications that covered the spectrum from simple names to elaborate motifs and badges. The black fuselage disc proved a popular background for markings which were by no means confined to fighter aircraft alone. Many of the badges and designs which originated in Spain were to be carried, in one form or another, by Luftwaffe units throughout World War II.

Germany's aid to the Nationalist cause had been given principally on political grounds, because it was felt that a common enemy was being fought. As the war progressed, however, the opportunity was not overlooked to test aircraft types and develop battle tactics. The Hs 123s and Ar 68Es that were sent to Spain were part of this programme. Crews sent on tours of operations returned to Germany to form the nucleus of the Luftwaffe's experienced field commanders who would spearhead the opening of the second world war.

A new generation of dive bombers began to replace the sturdy Hs 213 when the first Ju 87A-1s entered service with I/St.G.162 in Germany. Entrusted with working up the new aircraft type, three Ju 87As were sent to Spain in the late autumn of 1937. These aircraft wore standard 61/62/63/65 bomber camouflage to which the usual Nationalist markings were added. Almost a year later five of the improved Ju 87Bs arrived for field testing, and rapidly emulated the successes of their contemporaries. These new arrivals, however, wore the revised bomber camouflage of 70/71/65.



Perhaps the best known example of spinner decoration in J/88 was that adorning Gotthard Handrick's aircraft. Previously published photographs, however, show his first aircraft 6●56, a Bf 109D-1. These two show the revised spinner decoration worn by his last aircraft, and were taken during the farewell ceremony on the day of his departure for Germany. The message translates as 'to part is pain'. */Greiner Collection*



Other aircraft to arrive wearing the new camouflage colours were six Hs 126As sent for operational field tests. These replaced the ageing He 45s of A/88, taking over their reconnaissance duties but also adding some bombing to demonstrate their versatility. Additional supplies of Bf 109s also arrived in 1938, this being the third batch allocated to the Condor Legion. The original shipment of B-1s (coded 1 to 45), had been followed by five C-1s (coded 46-50) in late 1937. Six Bf 109D-1s (coded 51 to 56) formed the latest shipment, but more substantial numbers were to arrive early in 1939 in the form of 40 Bf 109E-1s and E-3s (coded 91 to 130). Of the late arrivals very few saw actual combat action, as less than half were assembled before peace was officially declared on April 1, 1939. The colour scheme adopted for the late arrivals was a much simplified one of 62 for all upper and side surfaces and 65 for the under surfaces. The only other colour used was the chemically treated black finish applied to the areas effected by the exhaust stains.

Not all Condor Legion aircraft were front line types, for the important role of communication/liaison was also tested under field conditions. During the winter of 1937/38 the first Fi 156As had begun to leave the production lines and, as so often before, a batch of five were sent to Spain. They arrived wearing an overall finish of 02 but later a more practical finish of 71/65 was applied. Indications are that this took place in 1938 when the Ju 87Bs and Hs 126s arrived complete with paint stocks. A similar number of Bf 108Bs are also known to have arrived at about the same time as the Fi 156s and underwent a similar repainting process.

One other German aircraft type, the Junkers W34, is known to have served in Spain on second line duties. Towards the close of hostilities three transport units were formed by the Nationalists. Categorisation was decided by the number of engines, *Gruppo 43* being equipped with single-engined aircraft, *Gruppo 42* with twin-engined aircraft and *Gruppo 45* with three-engined aircraft. Various types were used by each Gruppo but grouping by engine numbers was the most practical compromise. The lone Junkers W 34, coded 43 ● 8, found itself in company with two Northrop Deltas (43 ● 4 and 43 ● 5) and a Vultee V-1a (43 ● 7).

The war in Spain ceased at a time when Europe was heading rapidly towards its own war, but first we must step back a little in time to examine the effects on the Luftwaffe of the previous year or so.

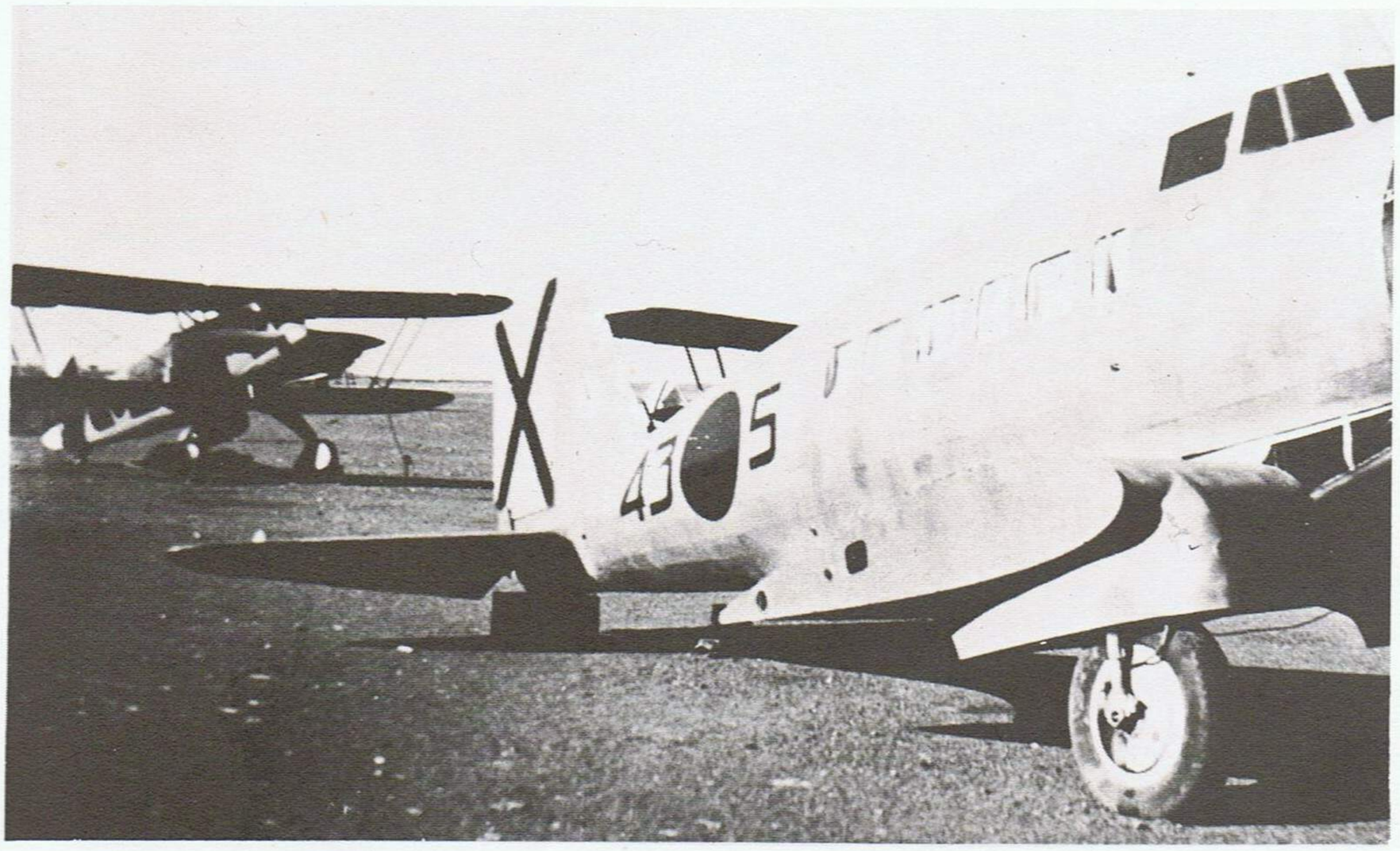




Above: Originally delivered in their primer coat of 02, the five Fi 156s were camouflaged locally in 71 green on the upper and side surfaces and 65 blue-grey on the lower surfaces. */H. Obert*

Centre left: One of the 40 Bf 109Es delivered early in 1939 (note the bare trees in the background) showing its 62 green upper surface and 65 blue-grey lower surface colouring. The black painted areas around the exhaust stubs has been carried back over the wing root. Part of the Mickey Mouse emblem of 3.J/88 is just visible below the rear line of the cockpit. */via Vincent*

Below left: One of the two Northrop Deltas which served with the Junkers W 34 43●8 in *Gruppo* 43. In the background are He 51s wearing a multi-coloured, straight edged, segmented pattern camouflage. */via Vincent*



The Path to War

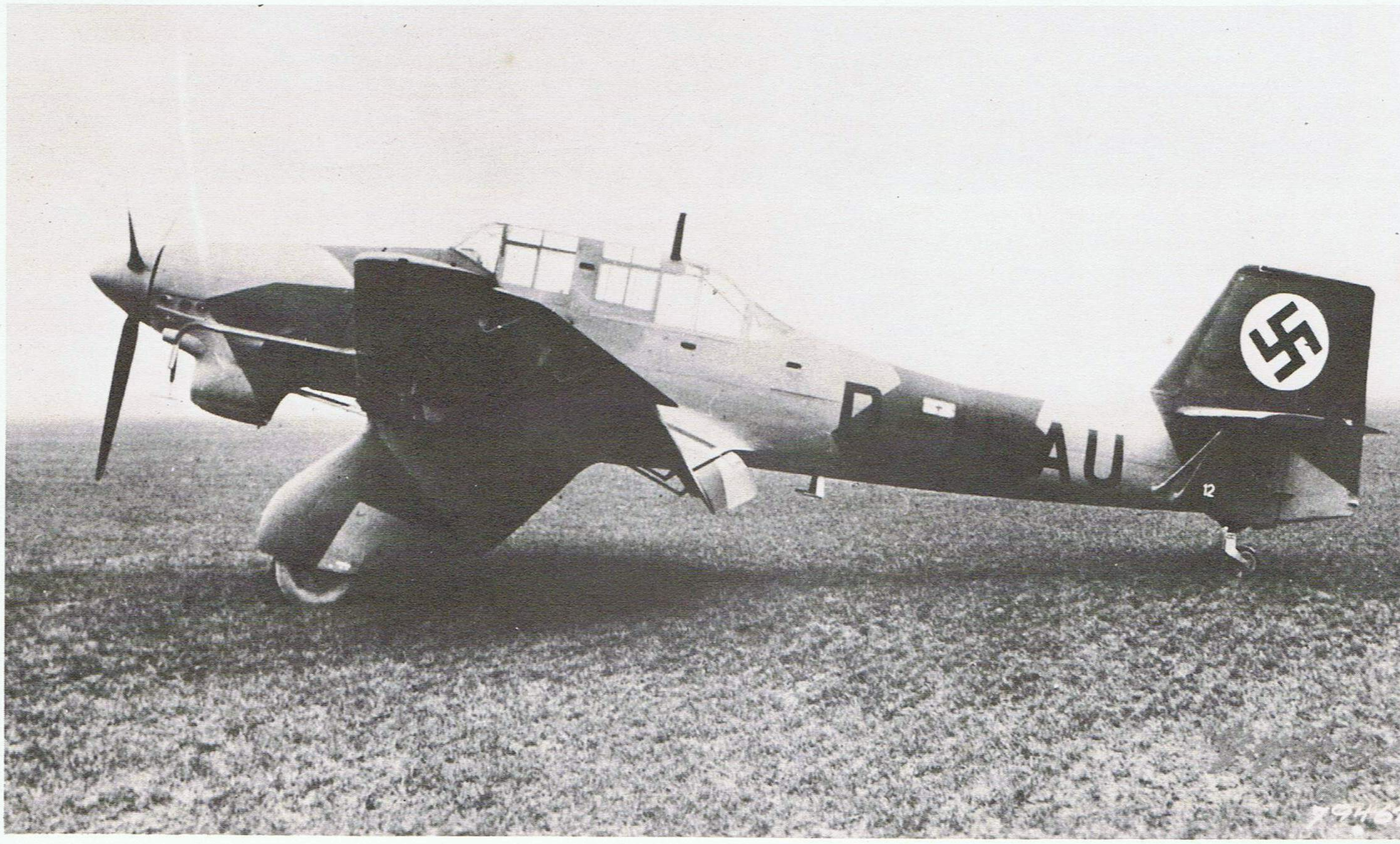
Reference has already been made to the two figure code group used to identify the colours added to paints used on and in Luftwaffe aircraft. This was only part of a complex system whereby all paints and allied products were clearly and precisely identified by a numerical code sequence.

Some form of initial directive had been issued in 1937 but the first definitive issue, *Luftwaffen-Dienstvorschriften* 521/1, of March 22, 1938, provided a complete coverage of the revised system plus detailed instructions for the care, preparation and use of paints for use on powered military aircraft. A supplementary issue, L.Dv.521/2, provided similar information for unpowered aircraft i.e. gliders, in military service. (Preparations for the first DFS 230 glider assault unit were already in hand.)

Paints were divided into specific groups, each group being identified by the title *Flieglackkette* plus a two figure code group. At the time under discussion the following groups existed; 01, 02, 03, 20, 21, 30, 31 and 32. Thus it is clear that provision existed for the addition of new groups. These *Flieglackketten* were divided into two distinct categories, 01 to 19 identifying paint groups used only for metal surfaces, while 20 to 39 were restricted to use on wood and fabric surfaces.

Individual paints were identified by a *Fliegerwerkstoff-Nummer* (F.Nr. 7000 to 7499 being reserved for paint products), a four figure code, plus the title *Flieglack*. The *Farbton*, the actual colour pigment added to the paint, was identified by a two figure code number. This sequence commenced at 00 and the March 1938 issue of L.Dv. 521/1 included numbers up to 73.

Below, below right: The twelfth production Ju 87A and an early production Ju 87B show the apparent variation in camouflage pattern produced by transposition of the colours. The Ju 87A carries its production identity number in small white figures beneath the tailplane.



Colour pigment numbers formed a suffix to the actual paint type number and were separated by a full stop e.g. 7135.01. Paint type numbers listed with both a full stop and a hyphen after them denoted that an appropriate choice of pigment could be added to meet a specific need. This option applied principally to paints used for external finishes i.e. camouflage.

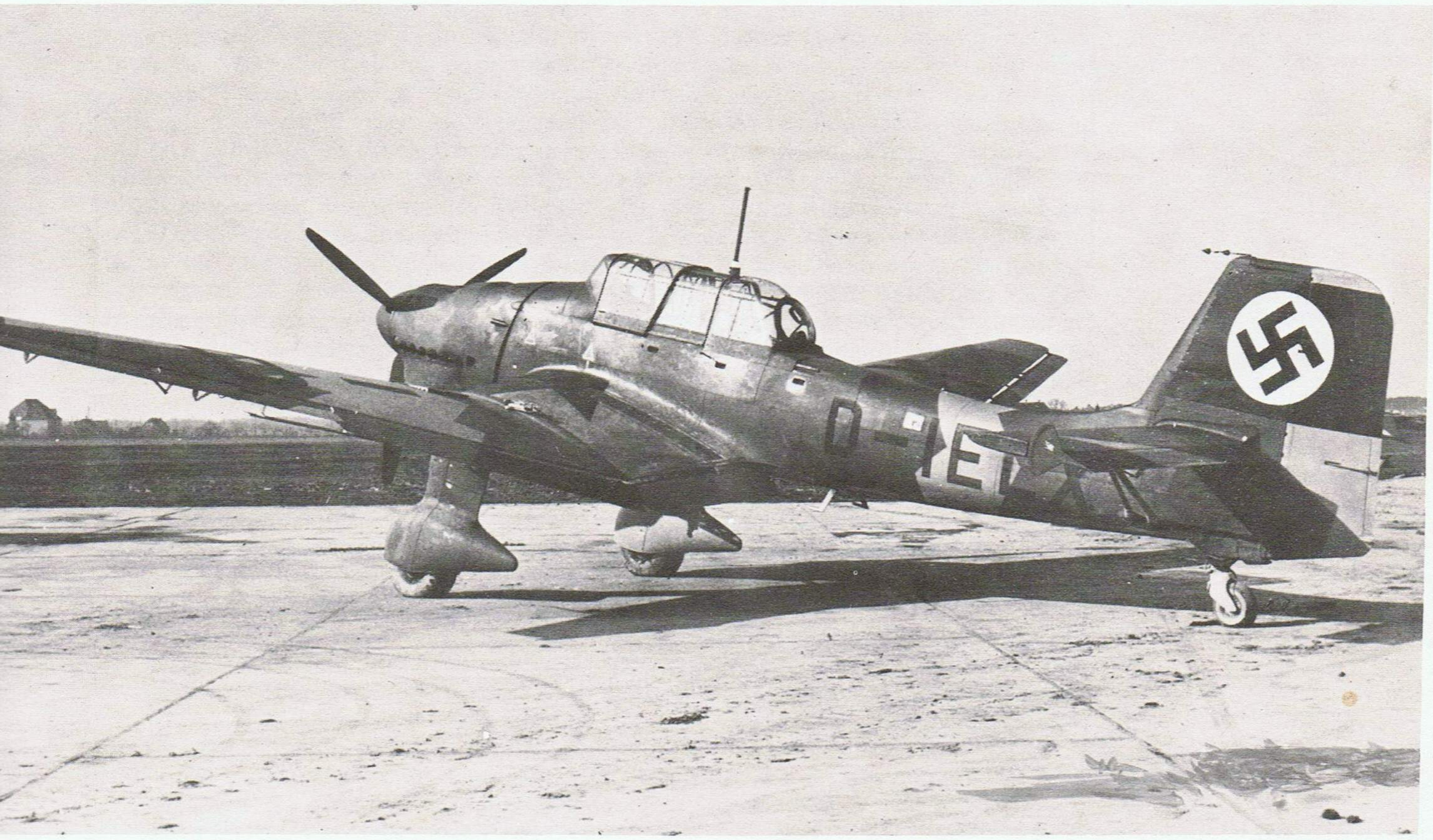
Prior to the introduction of this new system the previous rather cumbersome company codes and descriptions had been used. After the introduction of the universal *Fliegerwerkstoff-Nummern* the old paint specifications remained unaltered, new numbers being simply substituted for the original company numbers.

At first examination there appear to be grounds for some confusion between the various parts of this code system. However this does not occur because colour pigment codes were only expressed in conjunction with a paint type code, i.e. as a six figure group, while the paint groups were always expressed in conjunction with their identifying title i.e. *Flieglackketten Nr.01*. (See Appendix Three.)

The issue of a comprehensive painting instruction manual occurred at a time when Germany had begun the first moves outward from its borders, the Austrian *Anschluss* taking place in the same month that L.Dv.521/1 and 2 were issued. The timing was undoubtedly coincidental but the general trend was nevertheless unmistakeable, and Luftwaffe camouflage and markings were to prove a direct reflection of this rising undercurrent.

Until1938 military aircraft of all classes had been delivered from the manufacturers bearing civil registrations on both upper and lower surfaces of wings and on the fuselage. Production numbers, (not to be confused with aircraft airframe serial numbers which were termed *Werk Nummer*, i.e. the actual numerical sequence in which an aircraft left the assembly line), had been painted in small white numerals on the aft fuselage. After March, however, a new system of registration was introduced using a four letter combination which was generally confined to the wing lower surfaces. (Some of Dornier's products appear to have been the exception.) The first two letters indicated the manufacturers identity e.g. JU for Junkers, HS for Henschel etc., and the last two letters the aircraft's identity. This distinction extended to licence built aircraft e.g. Bf 109s built by Focke-Wulf bore factory registrations commencing with FO. The last two letters of the registration progressed alphabetically from the first letter i.e. AA, BA, CA etc., the next sequence commencing AB, BB CB etc.

During 1937 an important development had occurred with the creation of the Lehr





The Ar 96 proved to be one of the finest training aircraft used by the Luftwaffe. The combination of civil registration and full tail markings is typical of the period late autumn 1938 by which time school codes had been abandoned. On the rudder, above the legend Ar96/2069, is marked the telephone number of the aircraft's home airfield; a common practice that continued on some training aircraft throughout the war.

Division at Griefswald. Prime function of its units was to devise handling and tactics for new military aircraft types about to enter service. For this purpose, special experimental units were formed, the Division growing steadily throughout 1937 and 1938 (eventually it was to comprise eight *Gruppen*). Perhaps the best known of its units was *Lehrgeschwader* 1 and 2, their unique status being reflected in the codes that they used, L1 and L2. The substitution of a letter L signified ownership by an authority other than a *Luftkreis*.

In August tension mounted to a peak over the Sudeten crisis in Czechoslovakia and Europe paused on the brink of war. On September 29 the tension was relieved by the signing of an agreement at Munich which ceded some 10,000 square miles of the frontier region to Germany and 6,000 square miles to Hungary and Poland. War had not been stopped, merely postponed. The German High Command realised that it was now but a matter of time, and went ahead as rapidly as possible with the necessary military programmes.

In October *Luftkrieskommando VII* was created, taking over part of *Luftkreiskommando IVs* territory and units, thus KG 154 was redesignated KG 157 and a new unit, KG 257, was activated and equipped with He IIIs. The seven area commands then consisted of the following;

Luftkreiskommando	I	Königsberg
	II	Berlin
	III	Dresden
	IV	Münster
	V	München
	VI	Kiel
	VII	Hanover

The Luftwaffe again mirrored the process. The 61/62/63/65 colours for camouflage, already abandoned for use on all but heavy bombers since the previous spring, were finally superseded completely. All front line military aircraft leaving the production lines were finished in the new camouflage colours of 70/71/65. The exceptions were sea based aircraft which received camouflage in the colours 72/73/65. Bomber aircraft already painted in the old four colour scheme retained their finish pending eventual replacemnt.

A more pointed indication of the situation was the deletion of the horizontal red band and white disc background to the *Hakenkreuz* on military aircraft. A special diagram (reproduced page 42) was issued giving dimensions for a narrow white surround and thin black border. The actual positioning of the *Hakenkreuz* remained unaltered. The four letter registration system was also abandoned soon afterwards, undoubtedly for security reasons, since it did provide some very useful information. Codes for training aircraft also disappeared being replaced by D prefixed civil registrations.

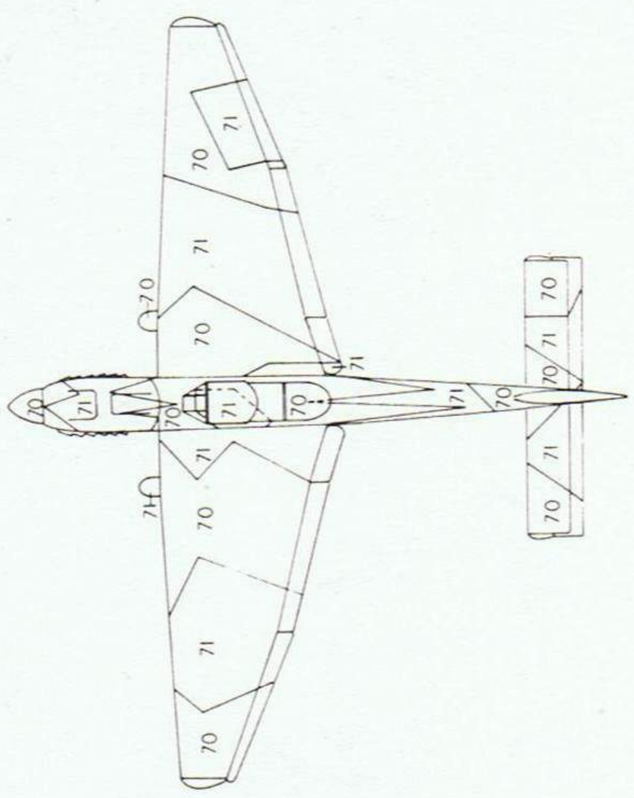
Military exercises assumed even greater importance in most countries of western Europe, and Germany was no exception.

The Luftwaffe had already adopted the almost universal scheme of using temporary markings to identify 'attacking' force, and during the 1937 and 1938 exercises large red discs were used to overpaint the *Balkenkreuze* in all six positions. The paint used was 7120.23, a temporary finish that could be removed with wooden scrapers.

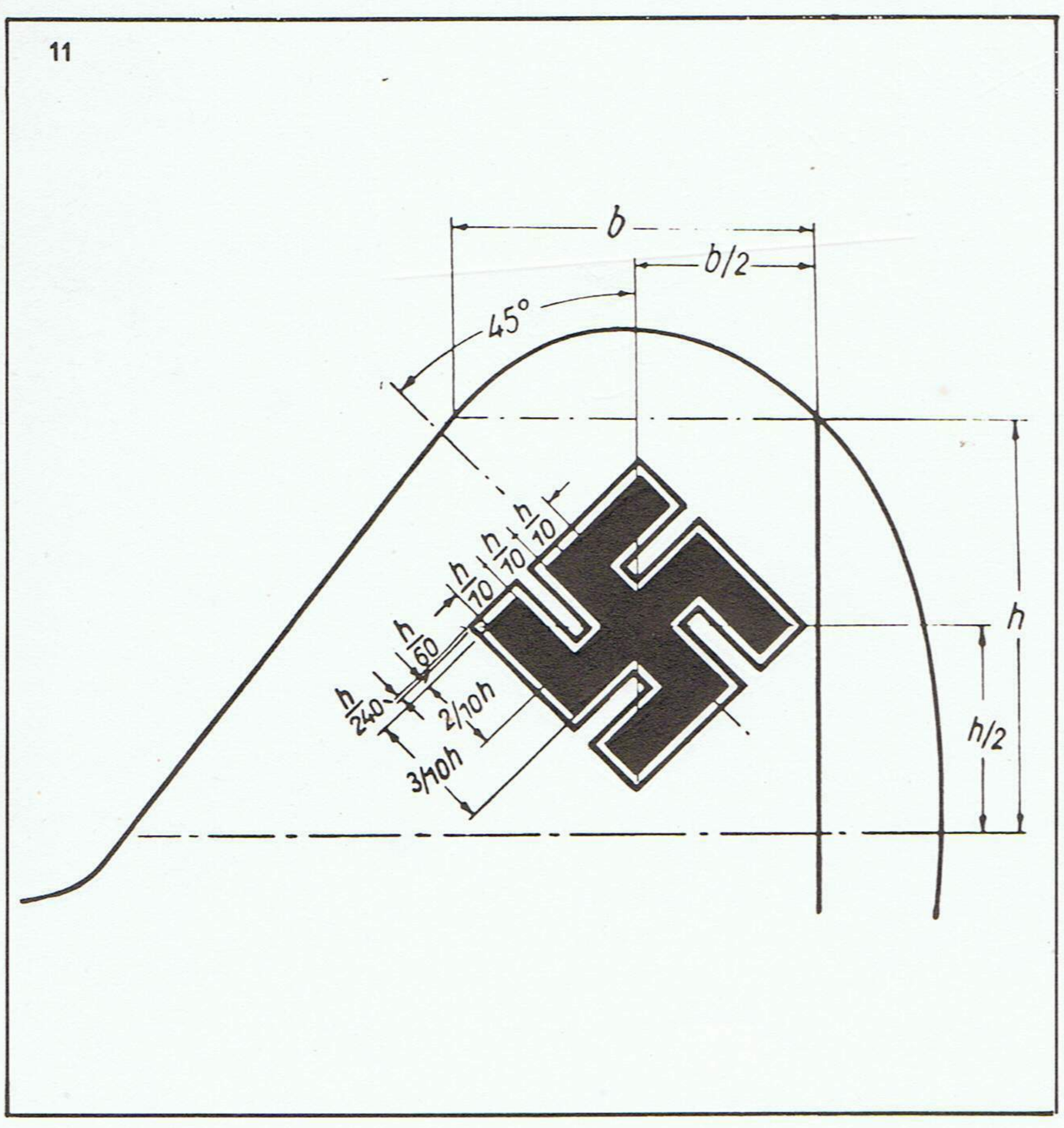
A considerable amount of 'window dressing' was done in both Britain and Germany in an attempt to conceal the inadequacy of their military forces. At the time of the Munich agreement Luftwaffe first line fighter strength stood at 811, consisting of 640 Ar 68s and 171 Bf 109s. On both sides of the Channel, many obsolescent aircraft were made 'combat ready' by the simple expedient of a coat of camouflage. The advanced training schools in Germany were among the custodians of obsolescent aircraft capable of being armed. Because of the importance of their role, however, distinction was made whereby they could continue their training duties unhindered, with suitable warning to other users of the skies, and still remain ready for front line duty. Full fighter camouflage of 70/71/65 colouring was applied, but in addition a broad white band was painted around the rear fuselage and the upper surface of the top wing centre section was also painted white. On either side of the fuselage and on the centre section the aircraft's individual identification number, within the particular school, was painted in black. This enforced series of markings remained in use, with modification, for all aircraft used at advanced training schools until the end of World War Two. Until 1941 any markings changes ordered for front line fighters were usually also applied to these training aircraft.

The remaining Ar 68 fighters in front line service were soon sporting the camouflage colours 70/71/65 but in some instances varying greatly from the regulation pattern. Under the circumstances which precipitated the change, it is easy to understand why such irregularities occurred. The new

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71





camouflage schemes of 70/71/65 and 72/73/65 were set out by a similar method to the older multi-coloured scheme, a grid pattern overlay being used for the various aircraft types. Again only one basic pattern existed, but four variations were possible by using a mirror image reversal plus an interchange of the 70 and 71 colours.

Adoption of the very dark camouflage schemes made visual identification by codes a virtual impossibility, the black characters having an extremely low contrast with the background colours. To overcome this the third and fifth characters, i.e. the aircraft's letter and *Staffel* identity, were repainted in white.

The low contrast value between the colours 70,71,72 and 73 has led to many erroneous reports of Luftwaffe aircraft of this period being painted in an overall finish of very dark green on all upper and side surfaces. There were probably instances of this practice among the obsolescent aircraft which came in for very hurried repainting after the Munich crisis, but it has yet to be verified that any aircraft leaving the production lines were painted in this manner.

Luftwaffe aircraft engaged on second line duties, i.e. training (including



gliders), communications, transport, ambulance duties etc., used civil registrations, but in January 1939 the D prefix was deleted and the letters WL (*Wehrmacht Luft*) substituted to identify military ownership. Exceptions to this order were military prototypes which retained civil registration and full National Socialist Party tail markings.

For the factory fresh aircraft the implementation of the revised markings provided no difficulties, but ground crews of units with aircraft already on charge were faced with a variety of problems. In many instances the D-prefixed registration had been applied large enough to fill most of the space on the fuselage between the tailplane and the trailing edge of the wing. In many instances the substitution of two letters in the space originally allotted for one proved almost a physical impossibility, without deleting the entire registration and starting afresh. It has already been pointed out that schools generally had a large number of aircraft on strength, and ground crews were thus faced with an enormous task and a limited time in which to complete it. The result was compromise and some very cramped forms of registration were seen with the letter L underlapping the hyphen which separated both elements of the registration. With the outbreak of war in September 1939, further confusion resulted when the order was received to add full military markings to all second line aircraft. This required a *Balkenkreuz* marking to be added to wings and fuselage. On most aircraft the black hyphen was simply used as the basis for the *Balkenkreuz*, which resulted in the two fuselage markings not being diametrically opposite each other. For those aircraft already suffering from acute crowding of their registration it became virtually impossible to apply the required *Balkenkreuz* markings to the fuselage. In some extreme cases they were applied above the registration, but the final solution to the problem was near at hand.

General reorientation of the Luftwaffe during 1938 plus lack of sufficient skilled workers had been the prime factors in the failure of the aircraft industry to expand. The repair organisation remained on a relatively small scale with no major back up for the otherwise well organised and efficient airfield facilities. The rapid build up of production during 1939 was to remove any opportunity to establish such an organisation, and this, in turn was to have a definite effect on camouflage

Above left: A Ju 87B wearing 70/71/65 camouflage and the factory registration introduced after March 1938. In this instance the letters JU are visible beneath the starboard wing.

Bottom left: Diagram 11. The revised form of *Hakenkreuz* after issue of the order to delete the red and white background. Note that the proportions are still based on the superceded red band.

Above: Deletion of the red background and white disc for the *Hakenkreuz* and the factory registration JU+EK beneath the wings pinpoints the date of the photograph to late 1938, after the signing of the Munich agreement. Large white production numbers were again in vogue.



A Bf 109E illustrates the low contrast value between the colours 70 and 71. On the original print it was just possible to determine the camouflage pattern. The chevron and bar denote that the aircraft was flown by the adjutant of II *Gruppe*. The small figure 2 indicates that the adjutant's aircraft was the second in the *Stab* status.

schemes seen in operations during the early phase of the war.

Expansion also precipitated a large scale reorganisation of the Luftwaffe's command structure. Early in February 1939 radical changes took place and control of operational flying units was divided between three newly created *Luftflotten* (Air Fleets). *Luftflotte* 1 encompassed northern and eastern Germany, *Luftflotte* 2 north-west Germany and *Luftflotte* 3 south-west Germany. The following month a fourth *Luftflotte* was created to cover south-eastern Germany, Austria and the former Czechoslovakian territory. East Prussia, isolated for the time by Polish territory, came under the control of *Luftflotte* 1. Within each *Luftflotte*, a *Luftgau* (Air District) was responsible for administration matters and replaced the old *Luftkreis*; operational organisation was controlled by a *Fliegerdivision* (Air Division). The latter was eventually renamed *Fliegerkorps* (Air Corps).

Creation of the new *Luftflotten* led to a redesignation of the identity of all *Luftwaffe* units. Those within *Luftflotte* 1 were allocated numbers from 1 to 25, in *Luftflotte* 2, 26 to 50, in *Luftflotte* 3, 51 to 75, and in *Luftflotte* 4, 76 to 99. In addition *Gruppen* (*not Geschwadern*) whose identity ended in 0 or 1 were formed within *Luftflotte* 1, those ending in 2 within *Luftflotte* 2, those ending in 3 within *Luftflotte* 3 and those ending in 4 within *Luftflotte* 4, thus perpetuating at least one aspect of the previous code allocation system. The *Lehrdivision* remained independent.

The *Technisches Amt* (Technical Office), main organ of the RLM, had also undergone a change with the creation of the office of the *Generalluftzeugmeister* (General of Air Production), abbreviated GL, in 1938. Seven *Stabs-Abteilunggen* (Staff Divisions) had been created, Gl 1 to Gl 7, and three directorates, GL/C, GL/E and GL/F. It was the GL/C *Technisches Amt* which controlled the *Erprobungsstellen* (Service Testing Stations), and GL/C-E2VIIC was responsible for Luftwaffe camouflage.

It was established practice to provide a small table of information, relative to the paint finish, on the port side of an aircraft's fuselage. This gave the date of painting, and the types of paint and colouring used on the various airframe materials.

e.g. *Lackierung* v. 1.7.40. (Painted on 1.7.40)
Metall: Fl. 7122.65/70/71 (Metal: Paint Type 7122.65/70/71)
Holze: Fl = Kette 30 (Wood: Paint Group 30)
Stoff: Fl = Kette 20 (Fabric: Paint Group 20)

Aircraft used to test new paint finishes or schemes bore similar information.

e.g. *Lackversuchstrager* (Experimental paint carrier)
Lackierung v. 15.8.39 (Painted on 15.8.39)
Metall: Lehmann & Co. AS 420 (Metal: Lehmann & Co. AS 420)
Stoff: A. B. Meyer-17c32 (Fabric: A.B. Meyer-17c32)
OS=Liste beachten (OS=List to be adhered to)
Any failure to meet the standards expected had to be reported to RLM-GL/C-E2VII.

Under normal service conditions a record was kept in the aircraft's maintenance log regarding external paintwork, which after a prescribed time had to be refurbished. The Luftwaffe maintained a very high standard in this regard throughout the war, even when supplies became difficult to obtain.

Just twelve months after the Austrian *Anschluss*, the sparks of war were kindled into flame. Slovakia, completely autonomous since the Munich agreement, gained a somewhat tenuous independence when Germany annexed the provinces of Bohemia and Moravia in March 1939. Simultaneously, Hungary annexed the other Czech province of Ruthenia which had also gained autonomy the previous October.

A last ferment of change erupted as the final preparations for war were completed. Fighter codes and markings, which had for so long been in a state of metamorphis were rationalised. The old elaborate system of symbols had virtually disappeared with the phasing in of the Bf 109 into front line service, and only parts of the *Geschwader, Gruppe* and *Staffel* identification markings remained in modified form. Because of physical limitations *Staffel* markings were finally replaced by a system of colours, white, red and yellow, which respectively identified the first, second and third *Staffel* within each *Gruppe*. The white fuselage band and white disc marking finally slipped from usage, although like most changes their passing was not instantaneous. For clarity the revised markings are presented in tabular form in the accompanying diagram.

The introduction of colours to denote

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JAGDVERBÄNDE					
STAB	GESCHWADER SYMBOL				GRUPPE SYMBOL
KOMMODORE	◀| OR ◀|				◀ OR ◀
ADJUTANT	<|				<
IA	<– OR <–				NONE
TO	<|O				<O
MAJOR	<||				NONE
GRUPPE	I	II	III	IV	STAFFEL COLOUR
STAFFEL	1	4	7	10	WHITE
STAFFEL	2	5	8	11	RED
STAFFEL	3	6	9	12	YELLOW
GRUPPE SYMBOL	NONE	—	~	+ OR ●	

12

KAMPFVERBÄNDE						
STAB	LAST LETTER OF CODE		AIRCRAFT LETTER COLOUR			
GESCHWADER	A		BLUE			
GRUPPE I	B					
GRUPPE II	C		OR			
GRUPPE III	D		GREEN			
GRUPPE IV	E					
GRUPPE V	F					
GRUPPE	I	II	III	IV	V	STAFFEL
COLOUR	WHITE	RED	YELLOW	BLUE	GREEN	COLOUR
STAFFEL	1	4	7	10	13	WHITE
LAST LETTER	H	M	R	U	X	
STAFFEL	2	5	8	11	14	RED
LAST LETTER	K	N	S	V	Y	
STAFFEL	3	6	9	12	15	YELLOW
LAST LETTER	L	P	T	W	Z	



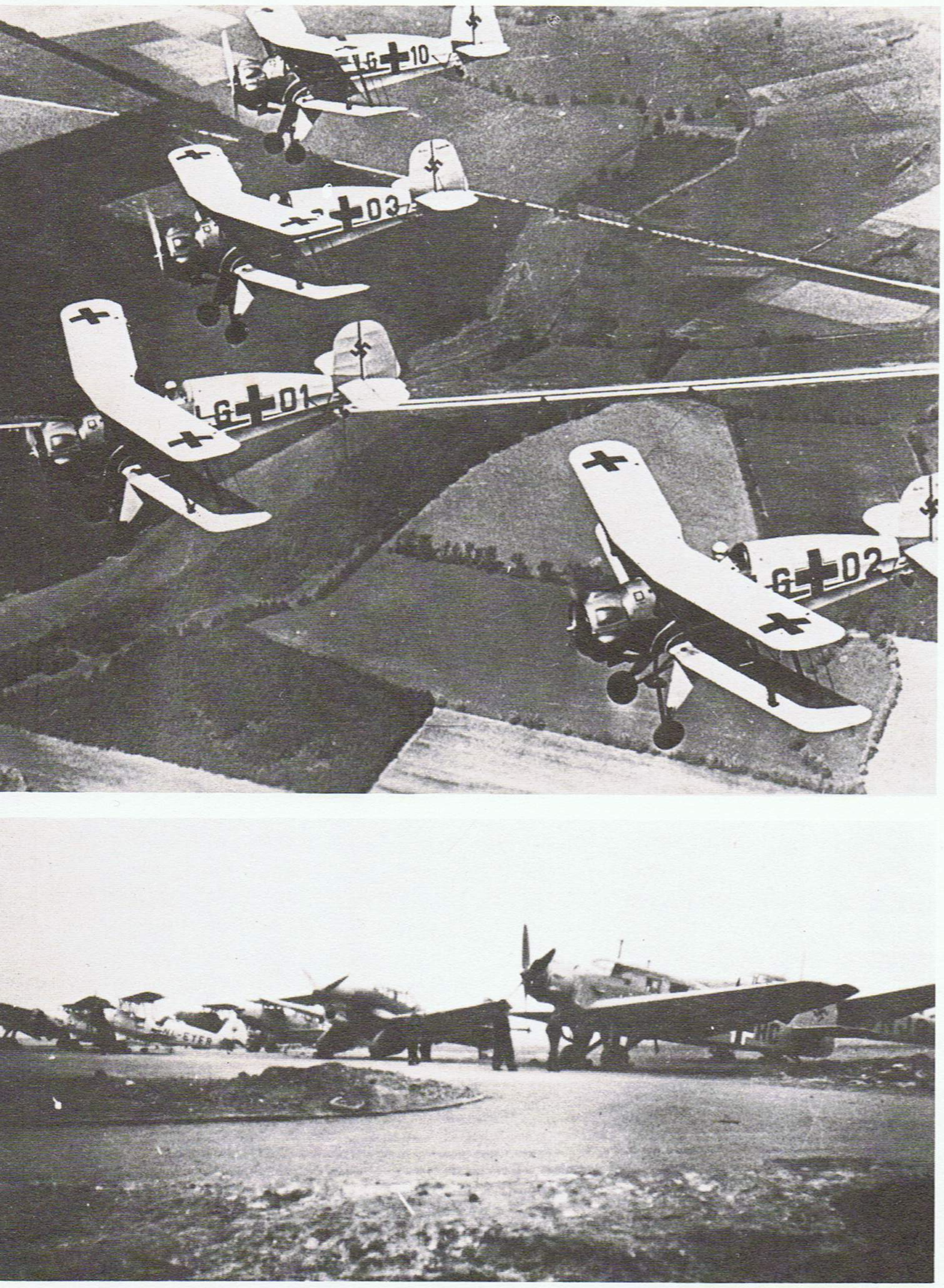
Above: The 25th porduction Bf 110C-1 built under licence by the Focke-Wulf company. Abandoning of the four letter factory registration system denied such information to curious eyes.

Top right: Bü 131s of a *Jagdfliegerschule* display the revised registration markings introduced after October, 1939. The last two letters of the registration have been deleted and two numerals substituted, a practice normally confined to aircraft of the advanced training schools, (the Bü 131 was an outstanding aircraft for advanced aerobatic instruction). Normally the last two letters of the registration group should have appeared on the starboard side, forward of the *Balkenkreuze,* but in this case LG appeared forward of the *Balkenkreuze* on both sides of all the aircraft in the photograph. This is a classic example of incorrectly applied revised markings to existing aircraft. The numerals would have been in existence since the immediate post-Munich period and all four aircraft have had the red and white background of their *Hakenkreuze* removed. Overall colour scheme is 02 with red trim.

fighter *Staffeln* identity was the preliminary step toward simplifying *Kampfgruppe* markings. A system using four characters in place of five was introduced literally on the eve of the war. Instances occurred where parts of some units went into action wearing the old five character codes, a situation that continued for at least the first two or three weeks of the war. Extracts from the *Flugbuch* of Ofw Bähnk, who was serving with III (K)/LG 1, shows consistent use of the old style codes up to September 19. e.g. He 111 coded L1 + E38. The next entry, dated September 24 records the use of the new code style e.g. He 111 Ll+ND, which remained standard from that point onwards. Last minute application of the revised form of codes was to be expected for security reasons. The RAF took similar action in changing unit codes as soon as war broke out.

The new code system for bombers is explained in the accompanying diagram. It will be seen that where *Stabsmachinen* (Staff aircraft) of fighter units carried distinguishing symbols, their counterparts of the *Kampfgeschwadern* were supposed to use a distinguishing colour. It is this particular point that has proved to be one of the most contentious aspects of the entire study of Luftwaffe camouflage and markings. For many years writers and researchers, including the author, have held certain reservations about the actual colours allocated for the codes on *Geschwader* and *Gruppe Stab* aircraft, dark blue 24 and green 25 being put forward respectively as the two colours concerned. Some have favoured a reverse order for the two colours while others have simply favoured the use of only one colour for all *Stab* aircraft.

At last, through the availability of several hundred technical analysis reports on German aircraft brought down during 1940, it has become apparent that both colours were used but in no definite order. Why this should have been the case is not known, but what is known beyond dispute is that both *Geschwader* and *Gruppe Stab* aircraft used the colours 24 and 25 for their aircraft code letter. (The same two colours were also used to identify IV and V *Gruppe*). The matter is not, however, so easily resolved; during the early war period *Stab* codes were also applied in all black or, in some instances, with the aircraft letter in plain white. The all black application also remained common throughout most of the war years. *Gruppe* identity in the form of appropriate spinner colouring was common, and a combination of black codes and spinners painted in one of the *Stab* colours was reasonably common. The use of a band of the appropiate *Gruppe* colour around the fuselage on some *Kampfgeschwader Gruppe Stab* aircraft was also not uncommon and *Staffel* aircraft adopted a similar system.



Above: A mixed bag of aircraft and markings. This illustrates the inevitable transition period that accompanied any change in markings. In the front row, left, is a Fw 44 WL-EYER; on the extreme right a Junkers W 34 wearing the newly introduced four letter registration plus *Balkenkreuze* markings (full chord beneath the wings in this case), while behind it is a Fw 58 carrying the registration WL-ONJG. /*Wilhelm Hesz*

The heavy fighter, the Bf 110, was something of an anomaly in many respects where camouflage and markings were concerned. Its codes conformed to the rules relating to bombers, but it also wore some of the *Stab* markings appropriate to single engined fighters. At the same time it also used bomber *Stab* colouring for the individual aircraft letter. This mixture of markings endured until early 1940.

In October 1939, one final change occurred when a new four letter registration system was introduced. Apparently similar in form to the pre-Munich registration used for aircraft leaving production centres, they were applied to all aircraft of all classes at time of manufacture. In addition, all existing aircraft engaged on second line military duties had their WL prefixed registrations deleted and four letter registrations substituted. (See appendices).

As always, there was an exception – gliders. Although these aircraft had adopted the WL prefix in place of the earlier D, they retained their singularly distinctive registration markings until mid 1943 when they were finally brought into line with the four letter registration system. Even then they generally did not adopt the *Balkenkreuz* marking.

Aircraft firms were allocated blocks of registrations which were applied to aircraft as they came out of the assembly shops. These were allocated in sequence of production completion and did not necessarily coincide with *Werk Nummer* allocation. The registration blocks ran in alphabetic sequence, i.e. AA+AA to ZZ+ZZ and a quick calculation will show that the range was vast. Although very similar in some respects to the pre-Munich factory registrations, the method of alphabetic progression differed; the fourth letter completed its sequence, then the third etc. e.g. AA+AA to AA+AZ, then AA+BA to AA+BZ etc. Almost the entire range appears to have been released simultaneously although, no doubt for security reasons, parts of some blocks were withheld. This security aspect is evident in the allocation of sections of different blocks to particular manufacturers.

Units equipped with second line aircraft received blocks of registrations sufficient to meet their existing unit strength. Thus, particularly among training establishments, a wide variety of aircraft types could be seen wearing sequential registrations. Because most second line units received replacement aircraft in small numbers over a wide period of time the mixture of registrations gradually increased. Communications aircraft attached to the staff headquarters of the front line units also wore four letter registrations, often in conjunction with the unit emblem.

Time, or rather lack of it, again produced its spate of non-standard applications which added to the irregularities seen among many second line aircraft. The registration letters were supposed to be applied only to the fuselage sides and wing lower surfaces (see diagram on page 52), and at the same time the wing *Balkenkreuze* were supposed to be moved and modified. The resulting variations on a theme were intriguing to say the least.

Gradually, conformity was to be achieved on a wide scale, but the advent of war began to have its own effects.

Europe in Flames

War finally burst upon Europe in the early hours of September 1, 1939, when German forces invaded Poland. As though mourning the passing of peace, bad visibility prevented major action until after midday. The morning's action was confined to the opening bombing attack (to be precise, 15 minutes before the declaration of war) by Ju 87Bs, plus some limited bombing operations by *Luftflotte* 4 aircraft in the south and a few fighter sorties.

The tempo increased by late afternoon and continued to gain momentum over the next few days. The Polish Air Force was by no means totally destroyed during this early phase; although relatively few aircraft survived the attacks on their airfields Polish fighter aircraft in particular continued to engage the Luftwaffe for several days.

Rapid advances by the *Wehrmacht* during the first week led to some confusion, with Luftwaffe crews experiencing difficulties in identifying German troop positions. This in turn led to some dangerous situations with both air and ground forces firing on each other by mistake. With the rapid achievement of its primary objectives the Luftwaffe was able to release all but its heavy bomber component for close support operations with the *Wehrmacht*.

This situation produced a rapid field modification to wing markings of Luftwaffe aircraft. Prior to the outbreak of war camouflage policy had been strongly orientated toward concealment on the ground, hence the very dark greens used on all upper and side surfaces and the very narrow white border to the *Balkenkreuze*. The Polish campaign reversed this policy, for there proved to be no necessity for concealment on the ground but a vital necessity for rapid identification. Troops engaged in heavy ground fighting have a natural tendency to shoot first and question after, particularly when low flying aircraft suddenly appear overhead.



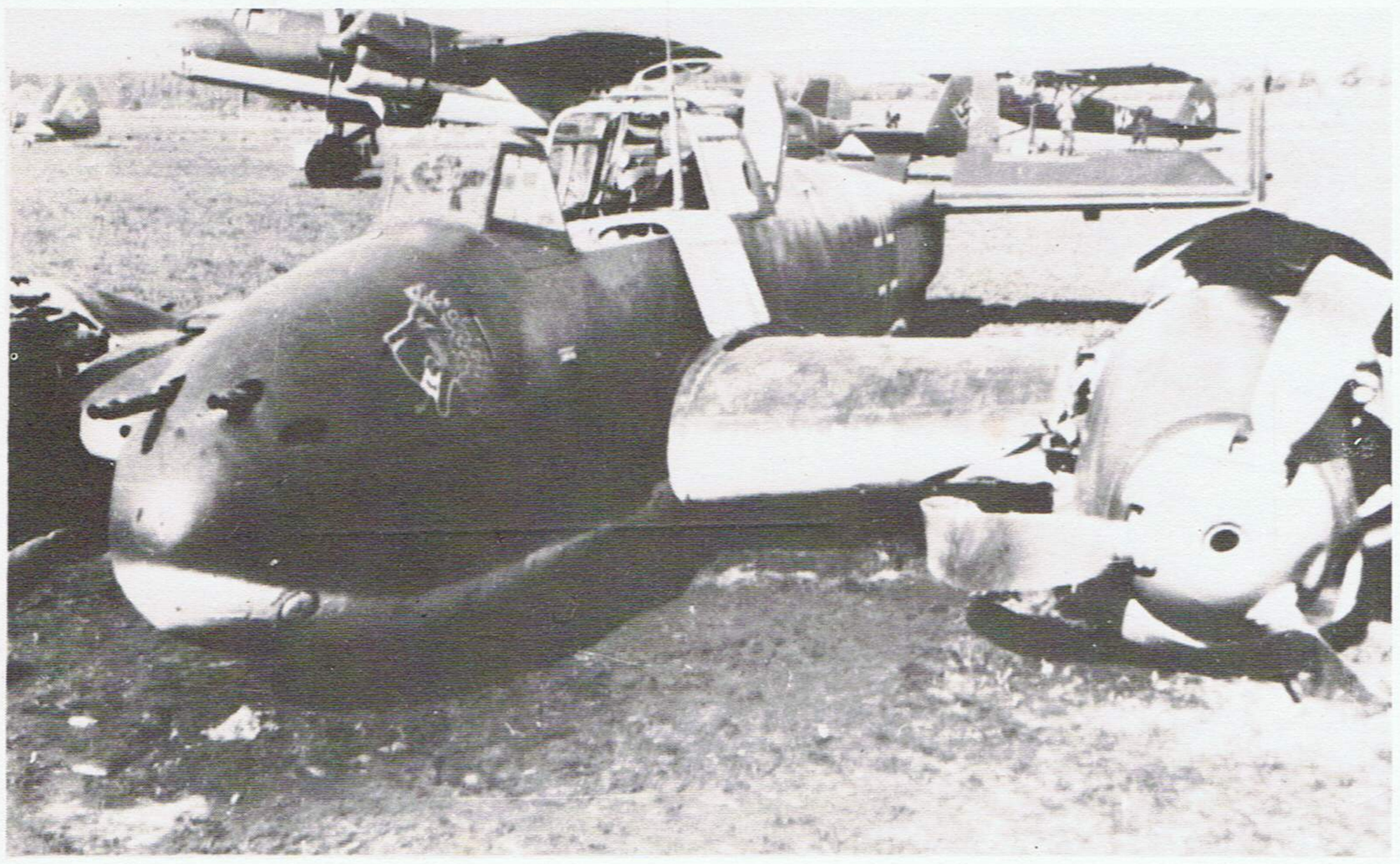
Cranking the inertia starter of a Ju 87B from the *Gruppe Stab* of I/St.G.1. Positioning the *Geschwader* emblem on the undercarriage spats was rather unusual. In the background are A5+AH and A5+CH of 1 *Staffel;* visual perception range of the aircraft letter can be judged from this photograph./*E. C. P. Armées*

Above: Running up the engine of the same *Stab* aircraft, A5+AB. Note the use of white for the aircraft's letter instead of green 25 or blue 24. *Stab* status in this instance appears to be indicated by the narrow fuselage band applied in the I *Gruppe* colour, white. */E. C. P. Armées*

Right: A5+KH of 1./St.G.1 shows the more usual positioning of the unit emblem, beneath the cockpit. The aircraft's letter is repeated in white inboard of the wing *Balkenkreuze. /E. C. P. Armées*







Top left: M8+DK of 2./ZG 76 has its aircraft letter applied in the *Staffel* colour, red, and outlined in the *Gruppe* colour of white. The dark greens of the camouflage colours are well suited for concealment against the backdrop of pine trees. */T. Hitchcock*

Centre left: A Bf 110C of 3./ZG1 which force landed during the fighting in Poland. The nose bears the *Staffel* emblem of a yellow outline lions head with protruding red tongue. The spinners are also yellow. The Do 17P in the background has its rudders swung to port giving the illusion of light coloured paintwork. */H. Obert*

Below: Hs 126s of *Aufklärungsstaffel* (H) 10 show the alterations to the underwing *Balkenkreuz* which resulted from the battle experience in Poland.

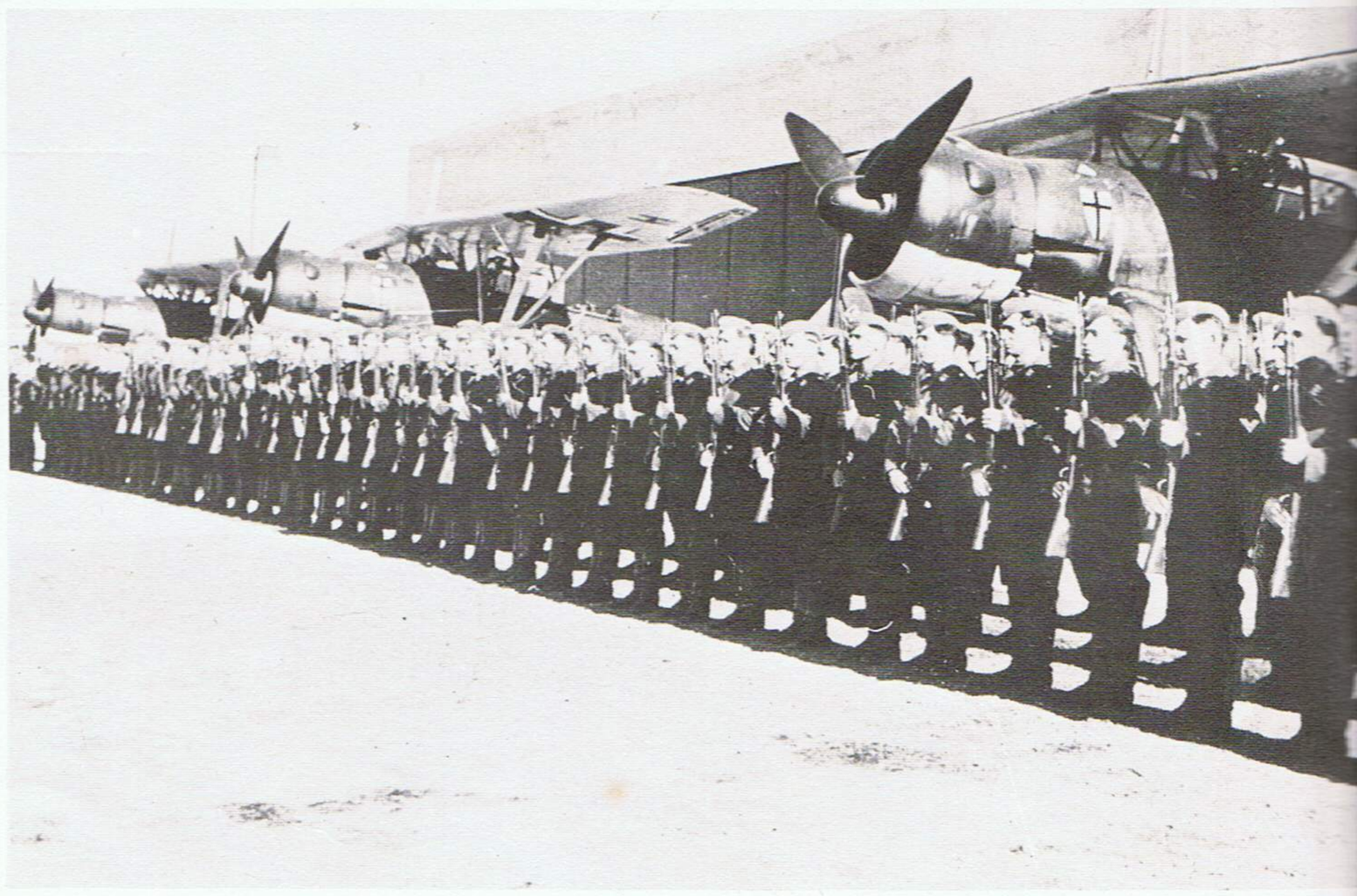
Top right: Diagram 13. The revised *Balkenkreuz* proportions for (left) wing upper surfaces and (right) wing lower surfaces and fuselage.

Centre right: Diagram 14. Location and proportions for registration letters and codes on single engined aircraft.

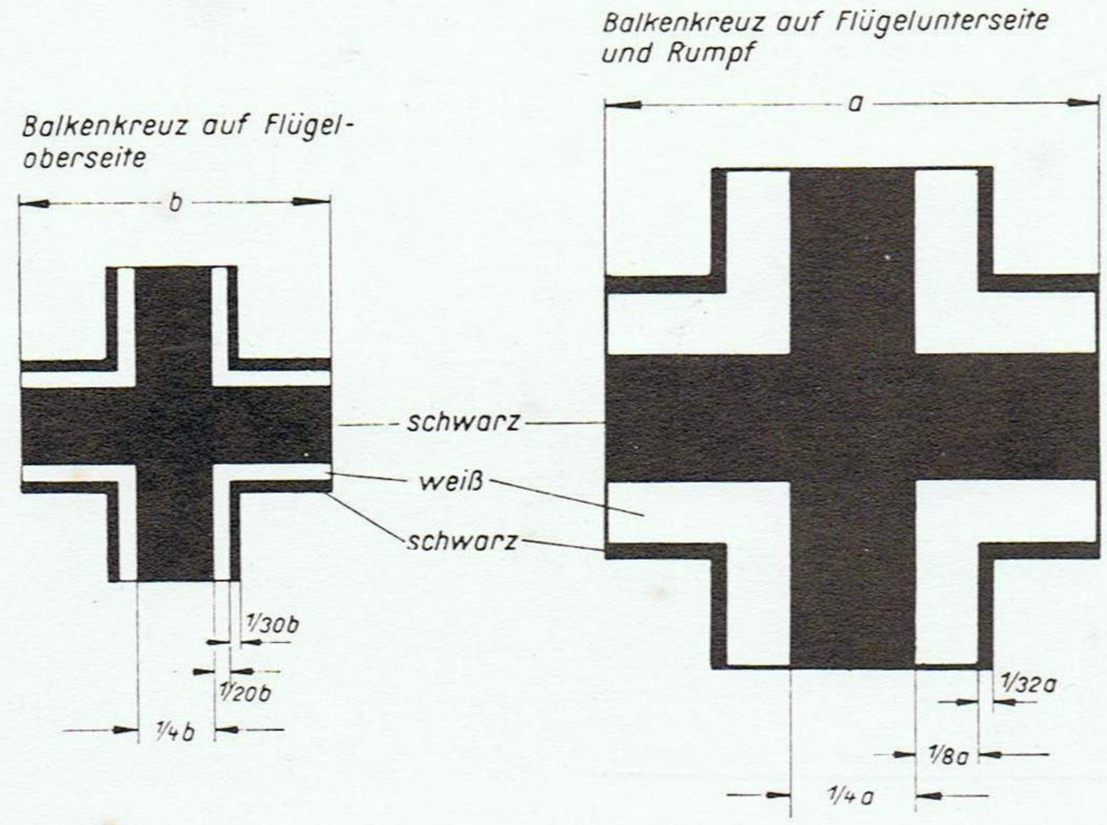
Below right: Diagram 15. Location and proportions for registration letters and codes on twin engined aircraft.

The *Wehrmacht* were operating under just such conditions and reacted in predictable manner. (It would be interesting to know just how many of the 285 aircraft lost and 279 damaged during the Polish campaign succumbed to German bullets.)

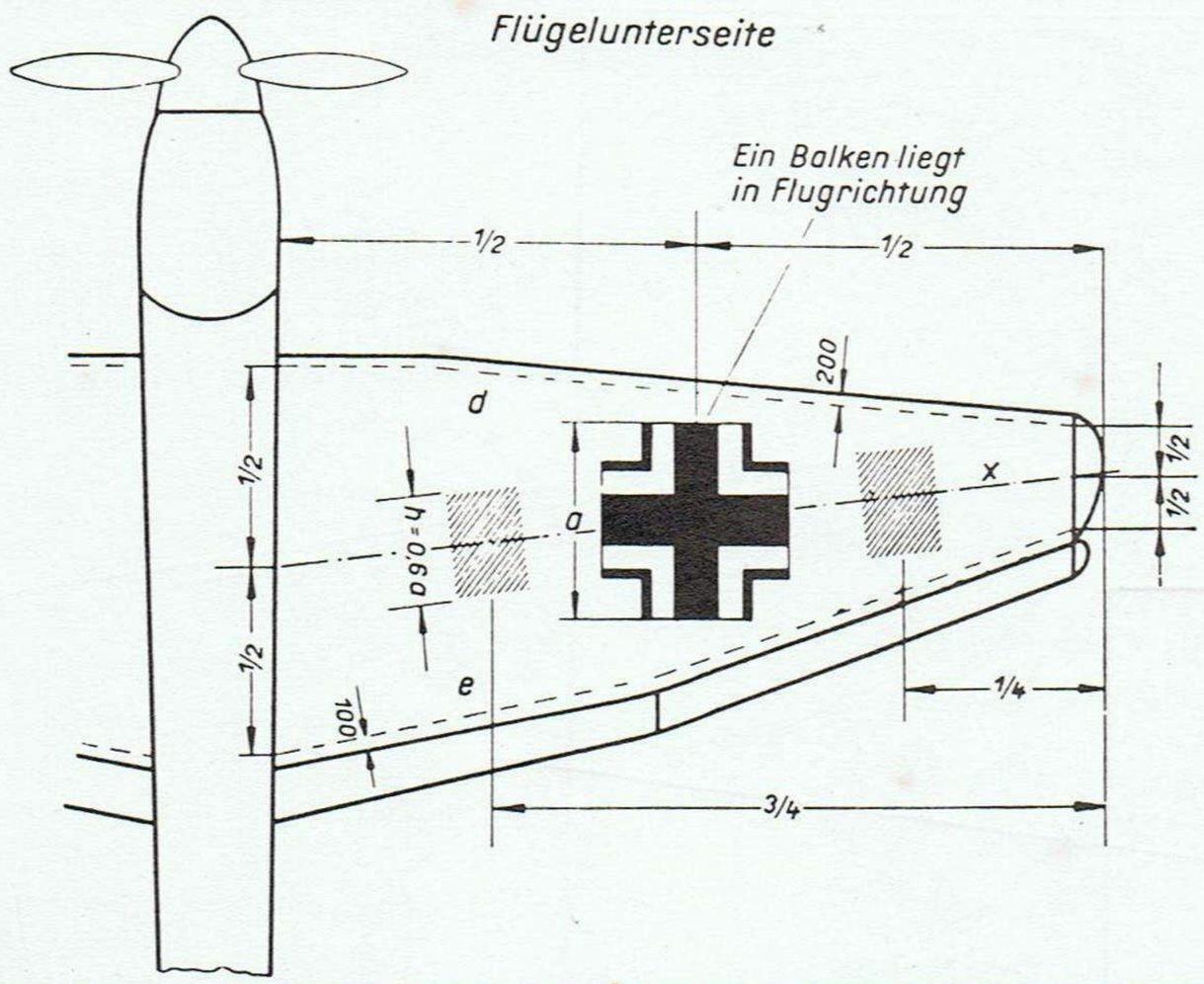
The answer to the problem lay in rapid identification and this was achieved by painting out the existing underwing *Balkenkreuze* and reapplying them in the same proportions but with much larger overall dimensions. In many instances the *Balkenkreuze* were reapplied further inboard to take advantage of the generally greater wing chord of most aircraft types. All aircraft other than bombers, transport and communications machines, had their underwing *Balkenkreuze* altered. Thus Bf 109s, Hs 123s and close support tactical reconnaissance Hs 126s were modified. The Bf 110, present only in relatively small numbers, was used almost exclusively for



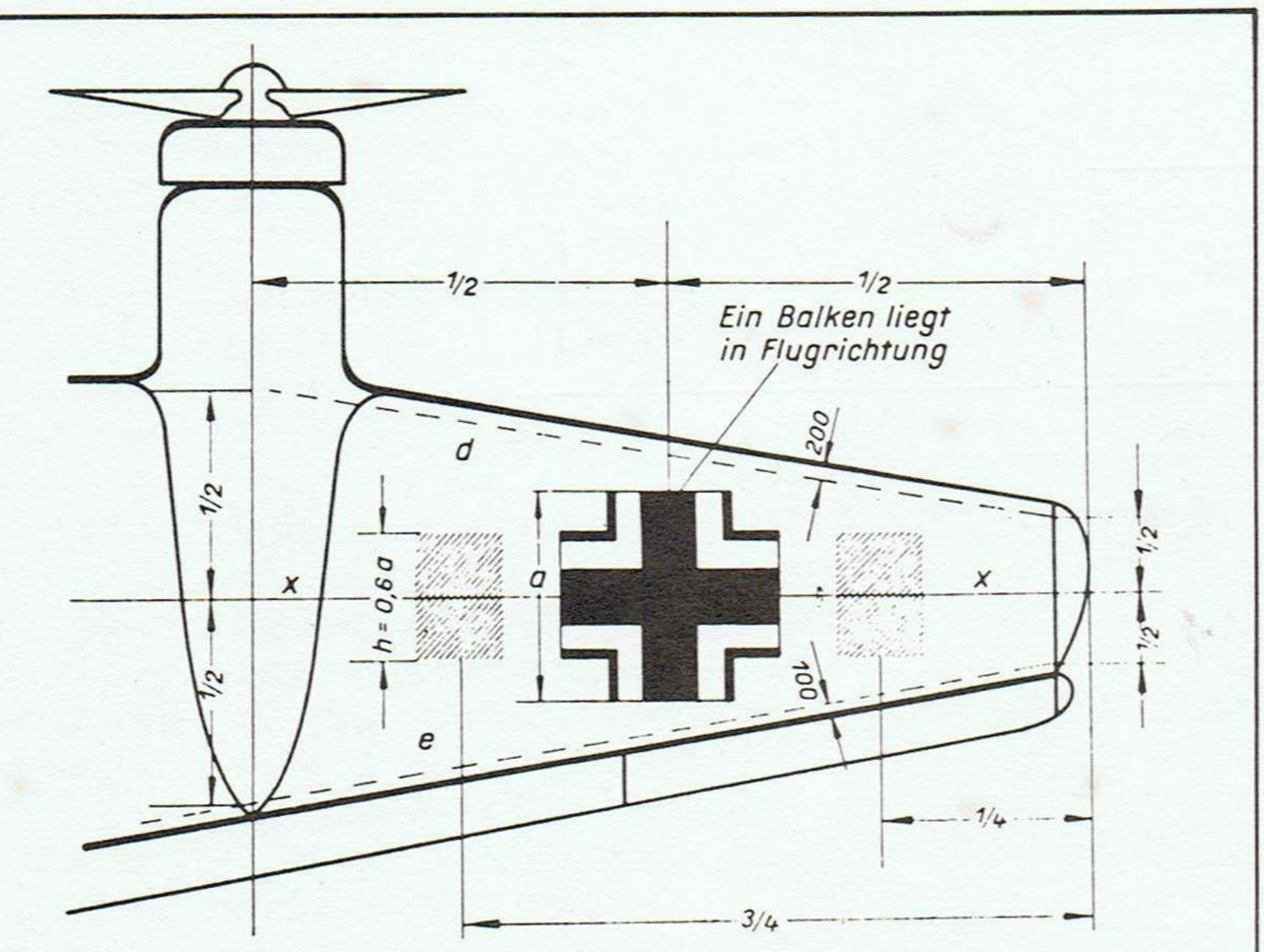
13



14



15



bomber escort duties and ground assault tasks well behind the Polish lines, and therefore did not require its *Balkenkreuze* to be altered.

In the case of the Bf 109 the modifications were taken a step further with the wing upper surface *Balkenkreuze* being moved inboard and enlarged. High speed aircraft need to bank steeply in order to swing rapidly on to ground targets, particularly when they are targets of opportunity. In doing so they expose both their dorsal and ventral plan view dependent upon the position of the ground observer. In addition the Bf 109s were the only single engined fighter aircraft wearing dark green camouflage very similar at a distance to that used by Polish aircraft, and the danger of being bounced from above by other Luftwaffe aircraft was a very real problem.

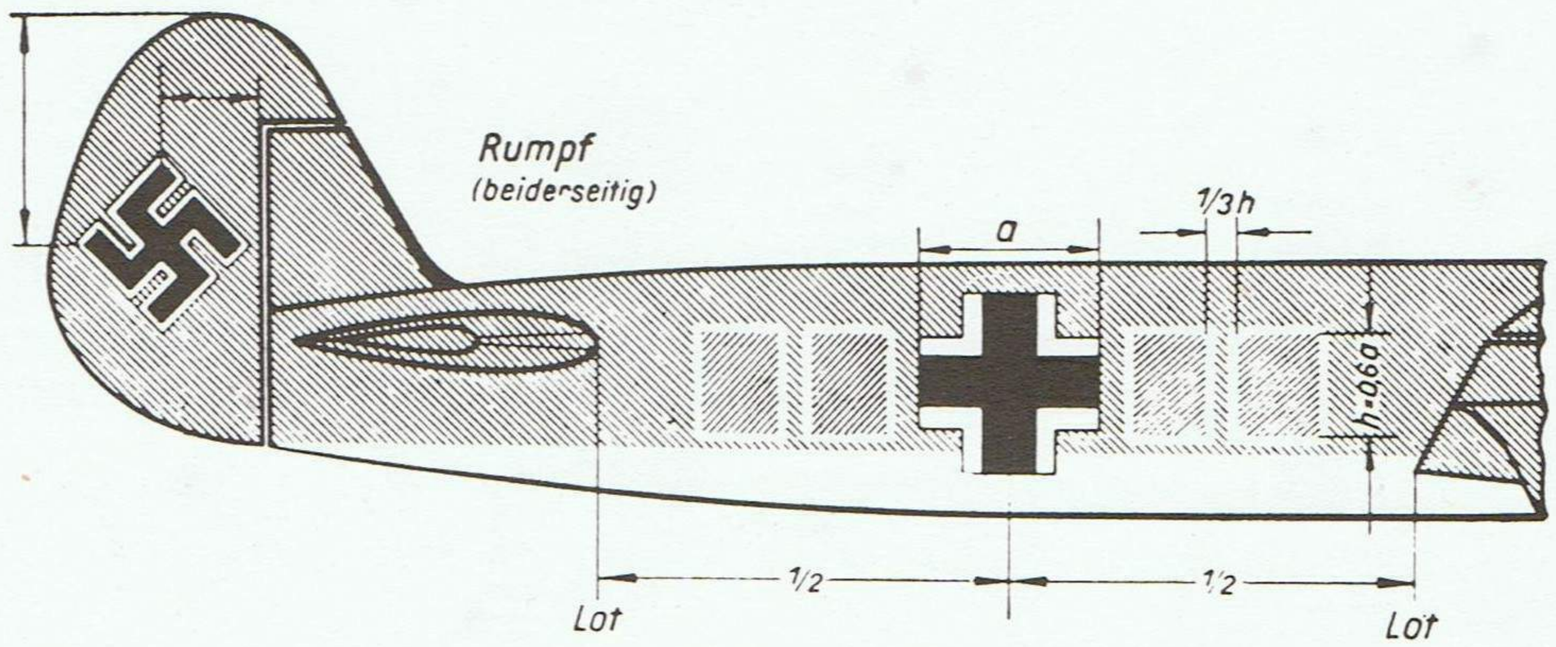
The Hs 123, possibly because of its biplane configuration, distinctive profile and multi-coloured 61/62/63/65 camouflage, does not seem to have used enlarged *Balkenkreuze* on its top wing upper surfaces. The Hs 126 also appears to have retained its original size upper surface *Balkenkreuze*, its relatively low speed and operational role making the modification unnecessary.

This field modification revealed a flaw in tactical planning, but the lesson was rapidly absorbed and an order issued to home based single engined fighter units and close support aircraft to modify the wing *Balkenkreuze* of their aircraft. Possibly the speed with which home based units attempted to comply with this new regulation, urged no doubt by the thought that retaliatory attacks from the west were almost inevitable at any time, lead to misinterpretation and some highly unorthodox applications.

The restriction to wing markings alone and single engined fighter aircraft and close support aircraft in particular, points strongly to the initial order for alteration being based on immediate battle experience rather than post battle general analysis. It should be remembered that German military tactics had been based on just the type of battle being fought in Poland – a swift, closely co-ordinated battle with the Luftwaffe paralysing the enemy so that the ground armour and troops could thrust their way through – a *Blitzkrieg*.

The Polish war proved to be just what the High Command had envisaged but with variations not entirely anticipated, such as the use of fighter aircraft in the close support role. With the Polish campaign but a few days old and declarations

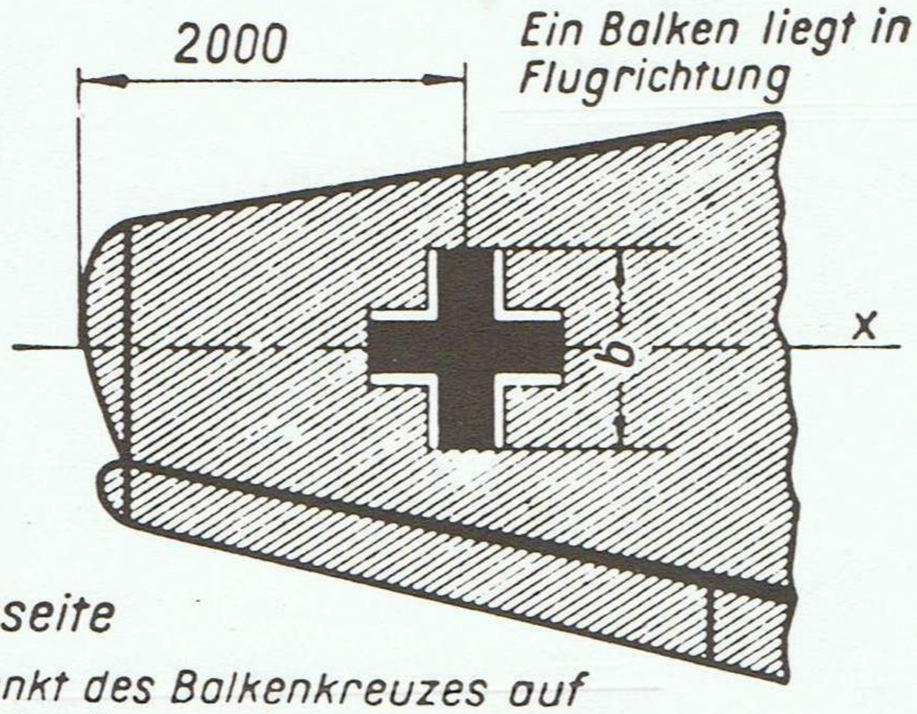
16



Right: Diagram 16. Location and proportions for registration letters and codes on fuselages. Note that as in the previous diagrams proportions and positioning is also given for the military markings. Lowest permissable positioning of the *Hakenkreuz* is 2 metres.

Below: Diagram 17. The revised positioning for wing upper surface *Balkenkreuz*.

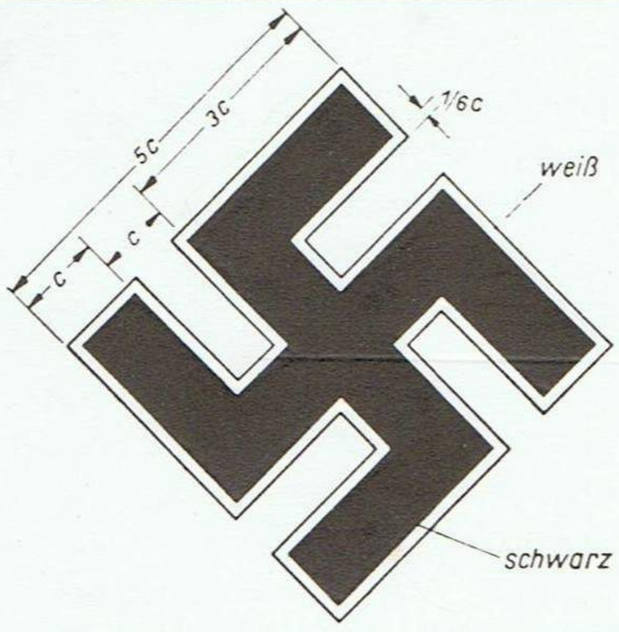
17



Flügeloberseite

Der Mittelpunkt des Balkenkreuzes auf Flügeloberseite liegt auf der festgelegten Mittellinie X 2000mm vom Flügelende entfernt.

18

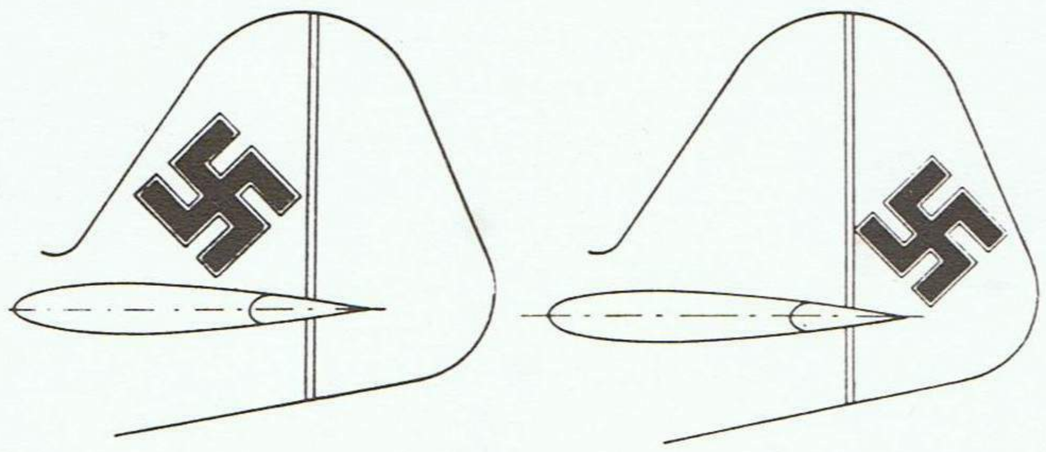


Abmessungen

Größe 5c	315	(400)	500	(630)	800	
c	63	80	100	126	160	
3c	189	240	300	378	480	
1/6c	10	13	17	21	27	

Auf Sichtschutzanstrich Farbton 70÷75 fällt schwarzes Innenteil des Hakenkreuzes fort.

19



of war by Britain and France, it is easy to understand why immediate battle experience was passed back to home based units which could reasonably expect to face similar tactical situations in the west at any time.

Fortunately for Germany the situation did not eventuate and her forces were able to conclude the war in Poland without facing two simultaneous battle fronts. The campaign was brought to a successful conclusion on September 27 and the subsequent lull in operations allowed a more specific analysis to be made.

Clearly, with the opening of a war against the western powers concealment would still be a necessity, but recognition remained the vital factor. In October a general order was issued calling for modification of *Balkenkreuze* applied to lower and side surfaces. The white border was increased in width to extend the visual recognition range, and markings on lower wing surfaces were also moved inboard to the mid-wing position and increased in overall size. Wing upper surface *Balkenkreuze* remained unaltered as this would have compromised the ground concealment value of the camouflage, but they were moved inboard to a point two metres from the wingtips as shown in the accompanying diagrams. Overall height of the fuselage *Balkenkreuze* remained at $\frac{1}{4}$ of the fuselage circumference at the point of application.

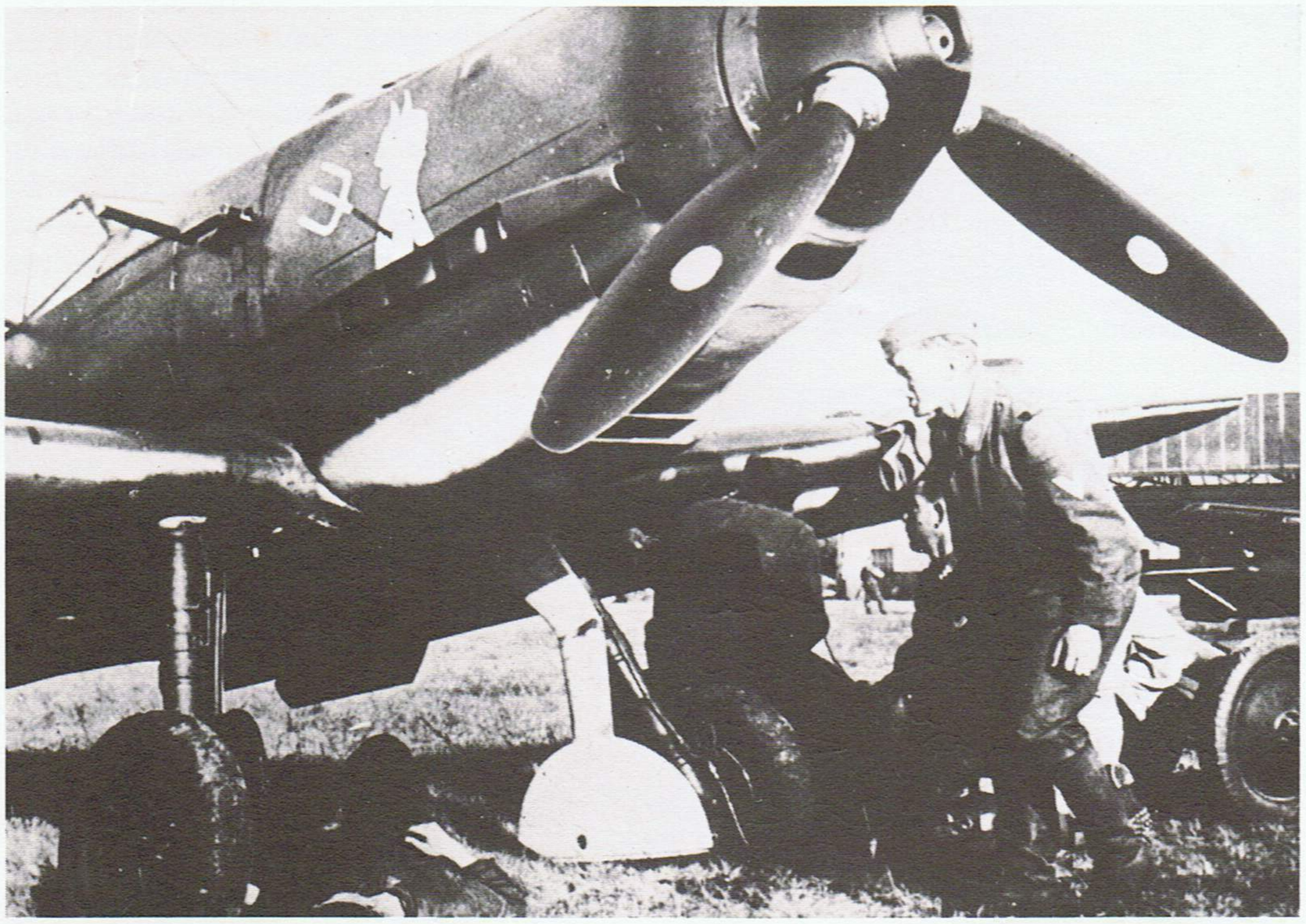
Code letters for all front line aircraft, other than single engined fighters, were to be displayed in a revised form with all four characters confined to the fuselage and wing lower surfaces in the proportions shown. Wing lower surface codes were split with one pair per wing and each pair further divided by the *Balkenkreuz*. Codes were not to be displayed on wing upper surfaces as they would compromise the camouflage. Such was the official in-



Far left, centre: Diagram 18. The revised proportions for the *Hakenkreuz* after issue of the order to move it onto either fin or rudder.

Far left, bottom: Diagram 19. Alternative positioning for the *Hakenkreuz*. Rudder positioning is only permitted where the fin area is restricted e.g. Fi 156.

Left: An example of misinterpretation of the modification orders passed back from Poland to home based units. This Bf 109E of JG 51 has had its fuselage *Balkenkreuze* white surrounds enlarged to the correct proportions, but the same proportions have also been applied to the wing *Balkenkreuze*. The latter are also grossly oversize although correctly located. Strong sunlight on the rudder, which is over to port, gives the appearance of light coloured paintwork. Forward of and just below the cockpit is the I *Gruppe* emblem with the 3 *Staffel* skeletal hand emblem aft of it.



Below left: An unidentified emblem of a yellow (?) pitchfork carrying devil. The positioning of this emblem on the engine cowling, and on the starboard side in particular, indicates that this was most probably a unit emblem rather than a personal one. It bears some relationship to 2./JG 54s emblem but this may well be pure coincidence. */Ferenc Kovács*

tention, but practice proved otherwise.

No doubt tension was still running high on both sides during this lull in the fighting, and again some units managed to misinterpret some parts of the order in their haste to comply. Aircraft of all classes were involved and some very unusual markings were to be seen for a short period of time. Some fighter aircraft, having already moved both upper and lower surface *Balkenkreuze* to the mid wing position, simply increased the width of the white border on *both* surfaces. A few Do 18s were also seen with similar markings, one in particular displaying both its original wing upper surface *Balkenkreuze* as well as full chord wide bordered *Balkenkreuze* at the mid-wing position. A similar instance was noted on the He 111 of KG 26 which was brought down near Edinburgh a month after the close of the Polish campaign. It also displayed double markings on the wing upper surfaces but retained narrow white borders for both sizes of *Balkenkreuz*.

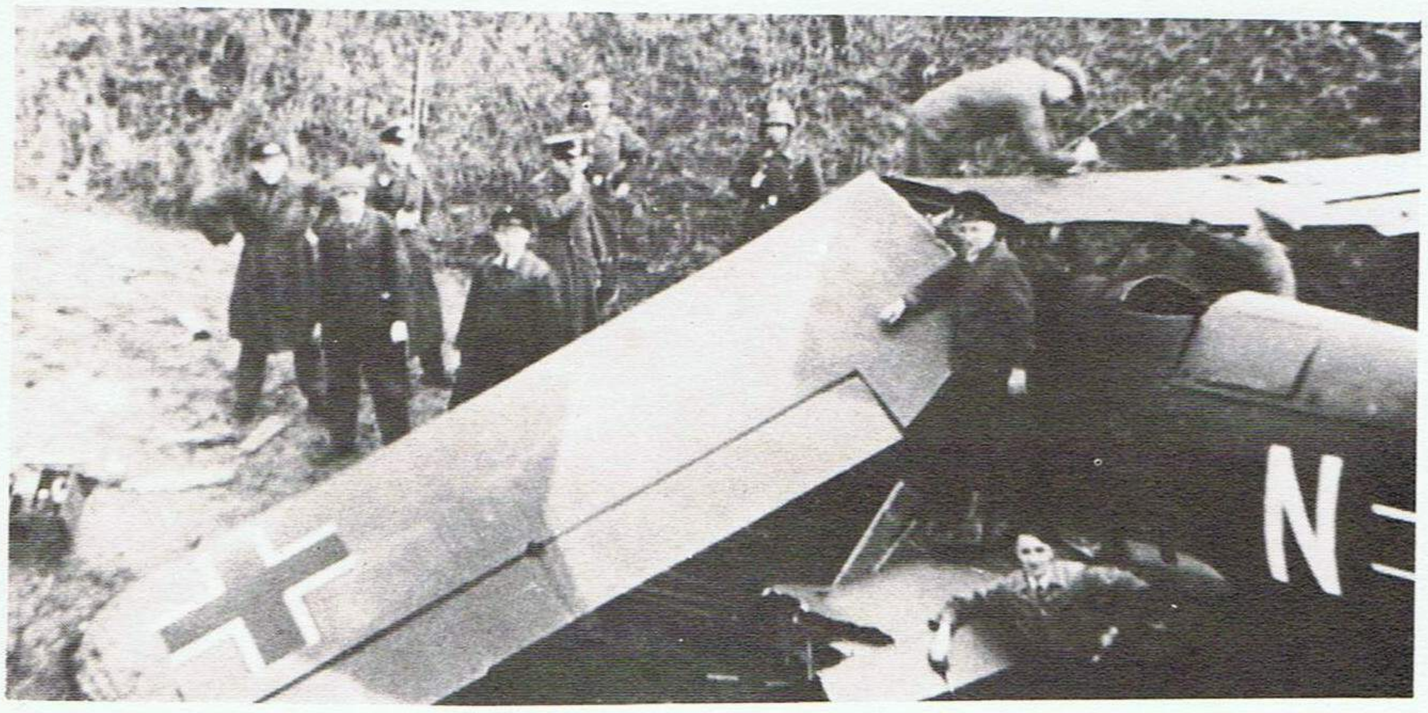
This particular aircraft exhibited two other anomalies which continued to persist. It bore its full code of 1H+JA in black with no attempt to use a distinguishing colour for its individual letter, its *Stab* status being indicated only by the colour of its spinners. It also displayed its full code, again in black, on both upper and lower wing surfaces with each pair grouped inboard of the *Balkenkreuz*. Aircraft from this unit were still displaying code anomalies when a second He 111 was brought down virtually intact on February 10, 1940. National markings were correct this time but the code was dis-

played in pairs, one to a wing, outboard of the *Balkenkreuz*.

By contrast some aircraft already showed a reduction of wing codes to the bare minimum, i.e. just the aircraft letter. The use of the aircraft letter on wing upper surfaces was, however, a more prevalent habit and one that endured well into 1941. No official directive permitting this variation from the October order has been found, but the extensive usage bears witness to some form of tacit sanction. Colouring for this single letter application varied from plain black through the normal range of *Staffeln* colours. Colouring for *Stab* codes was still very much a random affair and in many instances black was still used. At the time under discussion about the only variation that can be verified beyond doubt was the use of white for the aircraft letter on some *Stab* aircraft. Of the many thousands of photographs in circulation of Luftwaffe aircraft not one has been found that conclusively proves the use of either the colour green or blue for heavy bomber *Stab* codes prior to 1940.

To return to the official directive, two





Above: A damaged Ar 68F night fighter shows its 70/71 upper surface camouflage and white codes. The camouflage pattern appears to have been correctly applied, a comparatively rare occurrence. Note that the N appears to the left of the *Balkenkreuze* on both sides of the fuselage. */via Vincent*



Right: These two photographs of a Ju 87B help illustrate the revised *Balkenkreuze* markings, albeit that the starboard one appears to have been almost obliterated with 65 coloured paint. The emblem an umberella carrying Felix, the cat, provides a mystery however. The code T6+EP identifies the aircraft as belonging to 6./St.G.2, the letter E and the spinner tip being painted in the correct *Staffel* colour of yellow. The emblem, however, is that of 8./St.G.51 which became 5./St.G1. */via Vincent*

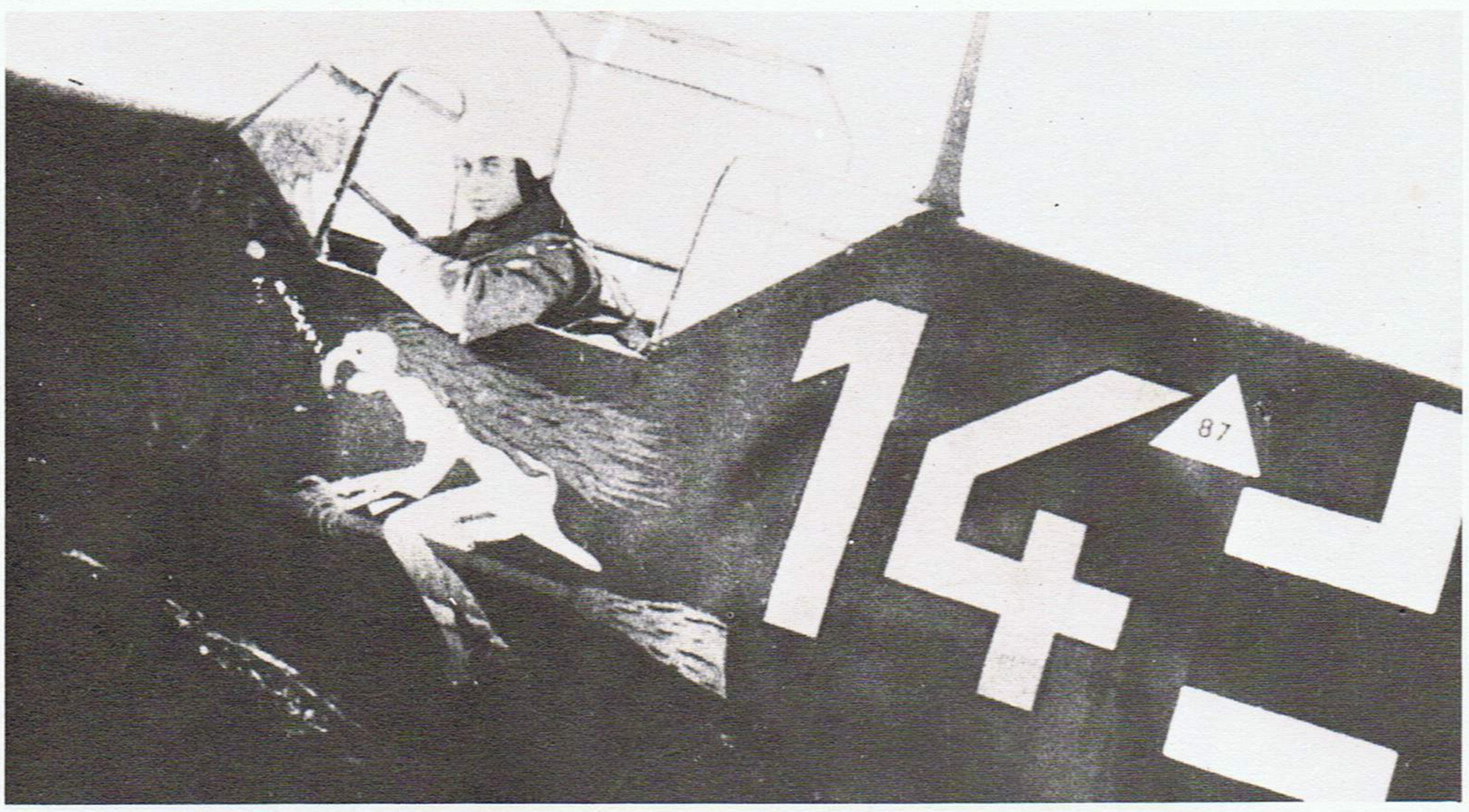


other classes of aircraft were effected. Training aircraft and all other second line aircraft were required to mark their factory registration letters on fuselage and wing undersurfaces in conformity with the new standard. Unlike first line aircraft, however, the repetition of the aircraft's individual letter on the wing upper surfaces was an extreme rarity.

Single engined fighter aircraft were effected by only part of the directive. The identifying number had to be applied in the proportion of six-tenths the overall height of the fuselage *Balkenkreuz*, the latter also being increased in size. The almost diametrically opposed upper and lower surface wing *Balkenkreuze* were a result of the actual wing dimensions of the BF 109. The mid-wingspan position of the lower surface marking was only slightly further inboard than the regulation two metres from the wingtip positioning of the upper surface marking. As time progressed positioning became slightly less pedantic and the two markings were sometimes seen virtually diametrically opposed.

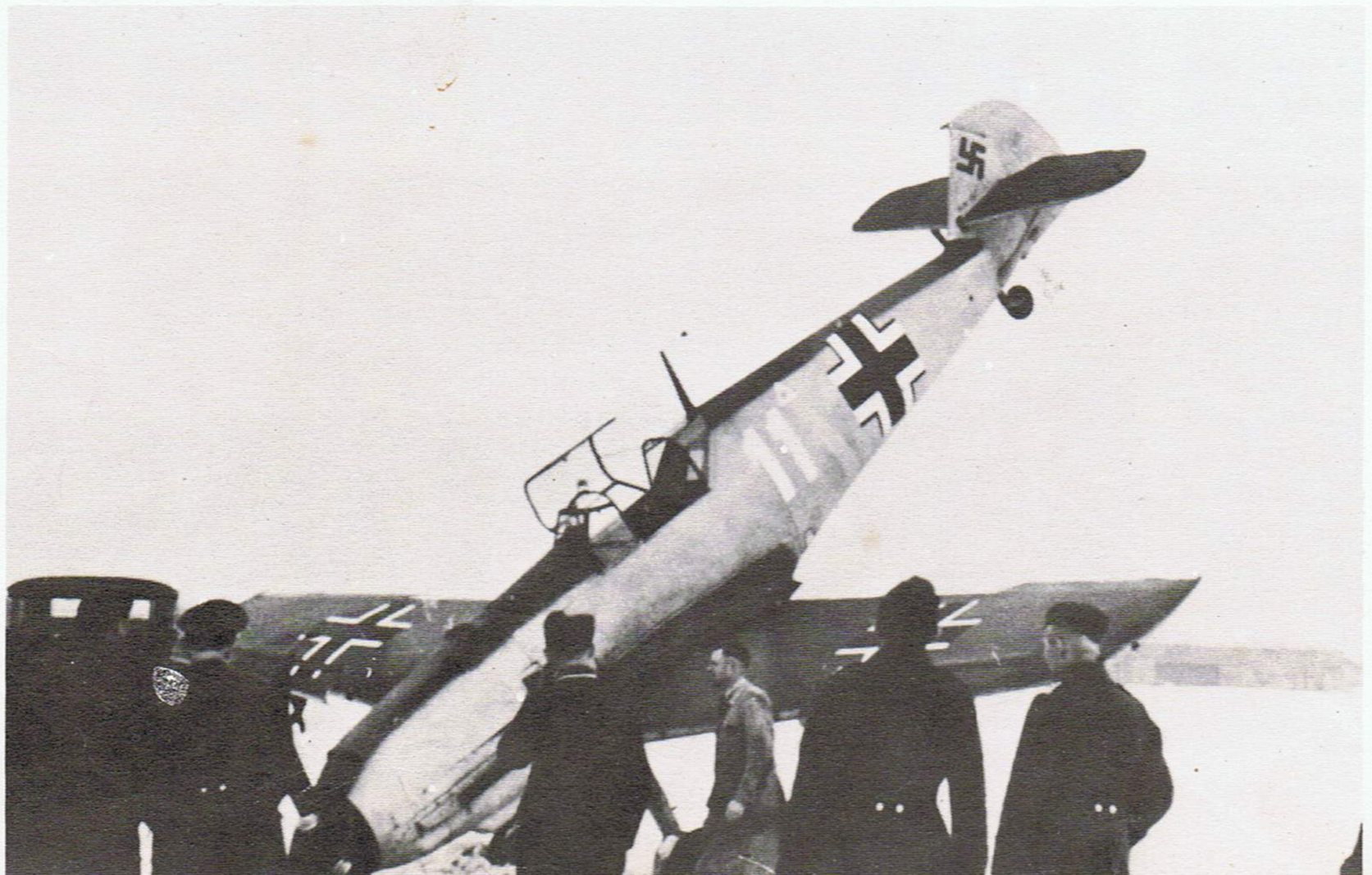
One particular type of aircraft operation that had occurred during the brief Polish campaign requires a note of explanation. Air ambulance work had been undertaken by Ju 52s; pre-war these aircraft had retained their standard 61/62/63/65 coloured camouflage and national markings to which had been added the appropriate white disc and red cross markings. The aircraft's role was identified by large white lettering, which read *San.Flz.* (abbreviation for *Sanitätsflugzeug*), followed by a white number. This was painted aft of the *Balkenkreuz* with a red cross marking forward of it on each side of the fuselage. The WL prefixed registration was applied in full to each wing on both upper and lower surfaces, a red cross disc marking being used to separate the two parts of the registration.

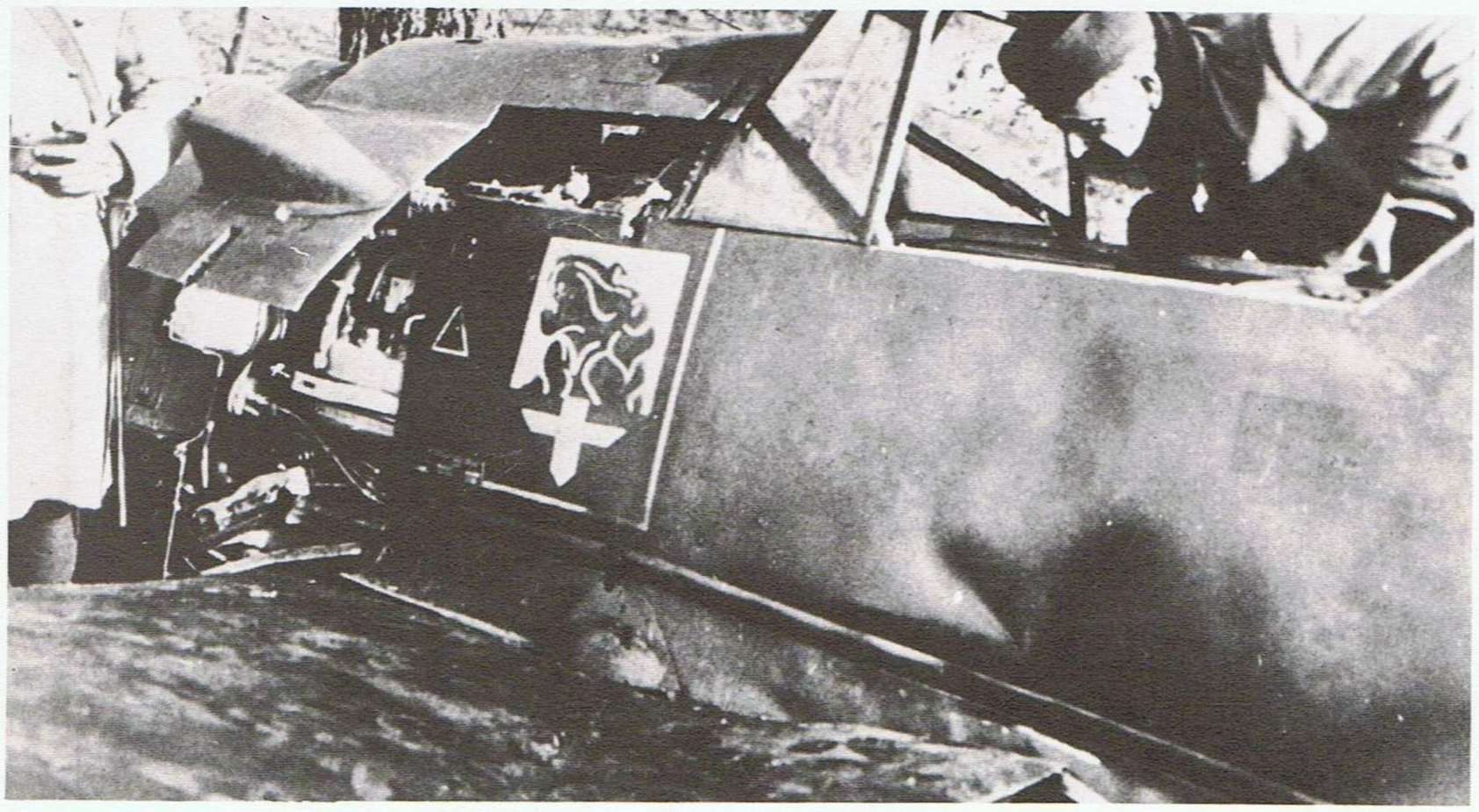
With the outbreak of war an overall white finish replaced the camouflage and red crosses were positioned aft of the fuselage *Balkenkreuze* and just inboard of the wing *Balkenkreuze* on both surfaces. An additional ventral and dorsal red cross marking was also carried on the fuselage. The WL prefixed registration markings were applied in black as normal.



Left: The elaborate emblem of I/JG 77 displayed in very generous proportions. The style of the yellow 4 was uncommon but not rare. (The figure four was to exhibit more variations than any other number used by the Luftwaffe throughout the war years).

Below left: A good example of the standard set for markings and camouflage by the winter of 1939/40. The fuselage *Balkenkreuze* are also the new size of 900 mm, a size determined by the maximum available fuselage depth at frame four. */via Vincent*





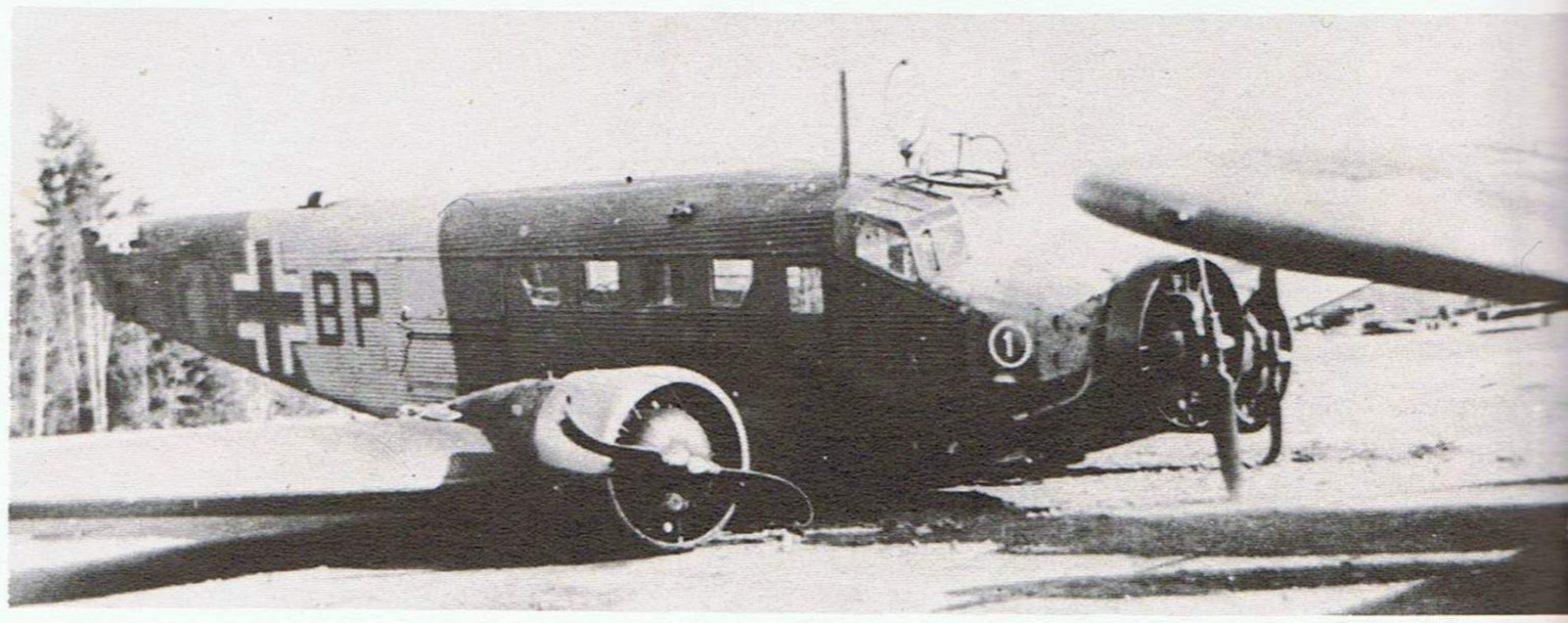
Left: Indicative of the slow transition associated with changes to operational aircraft already in service is this photograph of a Bf 109E-3. It was the first of two to fall into French hands. Previously incorrectly identified as belonging to II/JG 54 it did in fact belong to I/JG 76 which was renumbered II/JG 54 on July 6th, 1940. This aircraft still retains its 70/71 coloured fuselage sides and small, 650 mm, narrow bordered fuselage *Balkenkreuze. /Bernard Nicolas*

In the general revision of markings ordered in October 1939, ambulance aircraft markings were altered. The overall white finish was retained but all military markings and service registration were deleted. Plain red cross markings and a D prefixed civil registration were substituted along with a *Reichsdienstflagge* (State Service Flag) marking replacing the military *Hakenkreuz* tail markings.

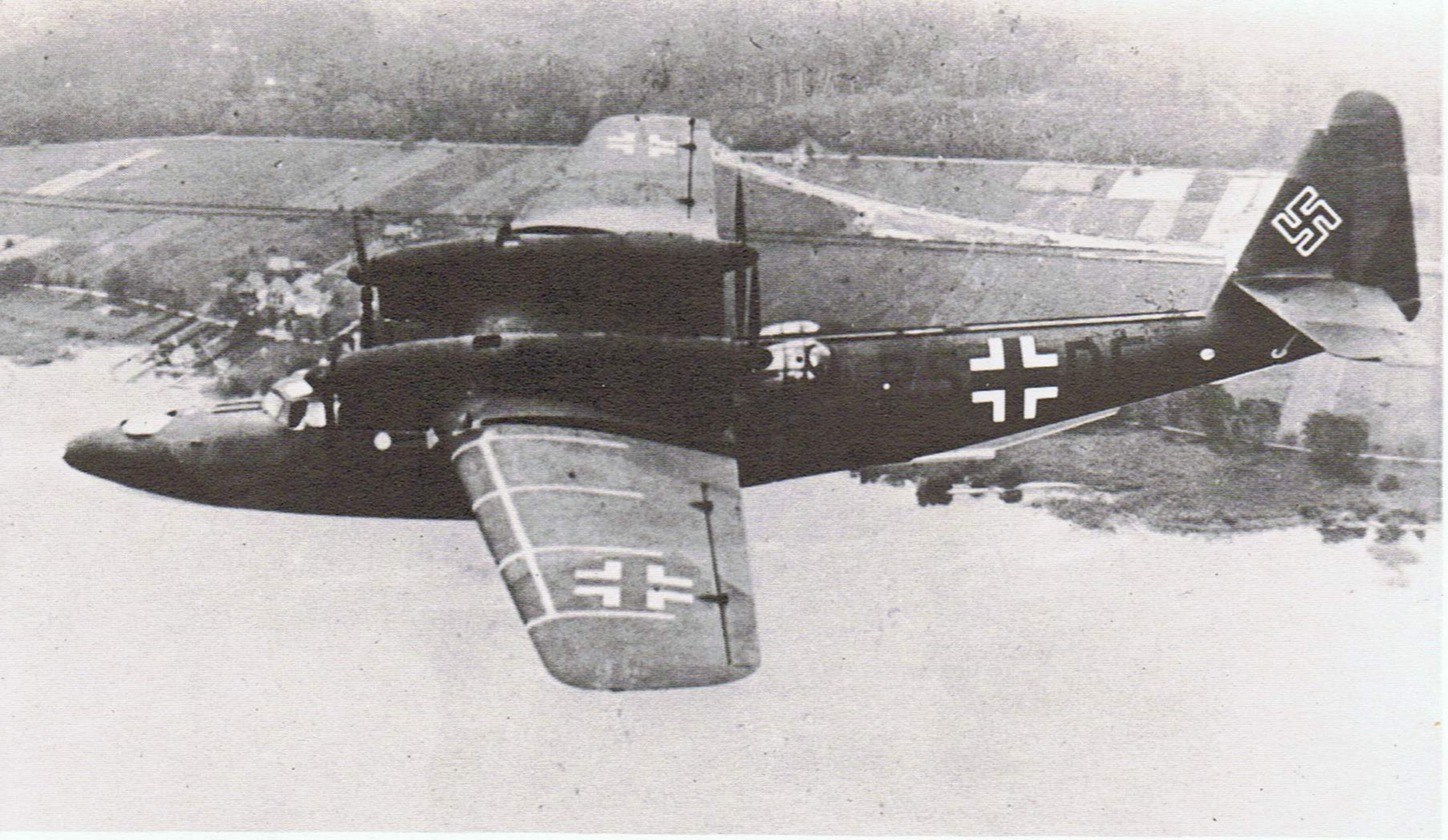
Other revisions to overall finish also occurred during the period immediately following the Polish campaign. Germany's territorial ambitions were aimed, in the long term, at the east where vast land areas and rich mineral/petroleum resources abounded. One of the major problems that had faced Germany for so long (and was to become a veritable nightmare during the final stages of the war) was her almost total dependence on imported materials. German scientists had done a lot to overcome certain shortages by the skilful creation of synthetic substitutes, of which aircraft paints were a prime example.

German aircraft paints varied considerably from their British/American counterparts. For metal parts the Germans used the less costly zinc oxide primer instead of zinc chromate and clear lacquer doping for fabric covered surfaces. A non-oxidizing paint (referred to in German documentation as lacquer and in British documents as enamel) was applied directly over both lacquered and zinc oxide coated surfaces. This non-oxidizing paint protected the lacquered fabric surfaces from the deterioration normally caused to such materials by ultra-violet light. An additional advantage of the non-oxidizing paint was its ease of removal using toluol or a similar chemical stripper without damaging lacquered fabric sur-









Left: The Do 26 V4, which operated with the V2, V3, V5 and V6 as a *Sonderstaffel* attached to Kü.F1.Gr. 406 for long range reconnaissance duties. The codes P5+DF are somewhat unusual, being a combination of Luftwaffe and manufacturer's markings. The last two letters on all the aircraft mentioned progressed DD, DE, DF, DG and DH. Wing upper surface *Balkenkreuze* were incorrectly applied having a wide white surround. */Luftfahrt Archive*

Below: A similar instance of incorrectly proportioned wing upper surface *Balkenkreuze* is seen on this Fw 156. Camouflage is standard 70/71/65. The positioning of the *Hakenkreuze* on the rudder was a permissible variation in this case due to the restricted fin area.

Left: Variation on a theme. Here we see the correct camouflage application but the old style and size *Balkenkreuze* has been retained. The top hat emblem was first used by 2.J/88 in Spain and in this instance is believed to be carried by a II/JG 53 Bf 109E. Note also the soft edge to the sprayed camouflage finish. */Ferenc Kovács*

Centre left: The damaged remains of a Ju 52 used in the invasion of Norway. This particular aircraft was drawn from the second line force and thus wears a four letter registration, CN+BP. Just visible on the broad yellow nose band is a white figure one in a white circle this being its temporary 'unit' identification for this carefully executed mass movement of troops. This particular aircraft retains the old pre-war camouflage scheme of 61/62/63/65. */Sommer Collection*

Bottom left: Elderly Bf 109Cs in service with 11(N)./JG 2 at Vaernes airfield near Trondheim in Norway. They wear correct camouflage and markings. In the extreme background a Fw 200B of K.Gr.z.b.V 105 is just airborne, its dark 70/71 camouflage blending well with the backdrop of mountains */Bundesarchiv*



faces. British/American oxidizing alkyd-resin based enamels lacked this advantage and could not be completely removed by chemical means, so that a film of enamel remained which was both difficult to remove and impossible to repaint successfully. The only disadvantage of the German paint was its relatively low pigmentation density which dictated the application of several coats and was thus heavier, per unit area, than its British/American counterparts.

A feature of Luftwaffe paints often misinterpreted was their actual finish; this was flat and not matt. The exceptions to this were the temporary finishes used for tactical markings and night operations as described further on in the book. There is a distinct physical difference between the two types of finish, flat paint exhibiting a small amount of light reflection under certain lighting conditions. Of the permanent paint finishes, those used for general camouflage had a very flat finish while the black and white used for the national markings and codes had a definitely more reflective quality.

The signing of a non-aggression pact with Russia did not alter Germany's eastward intentions, it merely bought necessary time to conclude operations in the west. Once war had become a definite resolution, camouflage suitable to the topography of central Europe had evolved in the form of the very dark greens 70 and 71. The day was fast approaching, however, when Luftwaffe aircraft would be engaged in operations far to the east where the general topography and colouring varied markedly from that of central Europe.

Experimentation with paint finishes was normally carried out at research centres but tests of camouflage systems required field trials under actual conditions. No reliable documentation has been

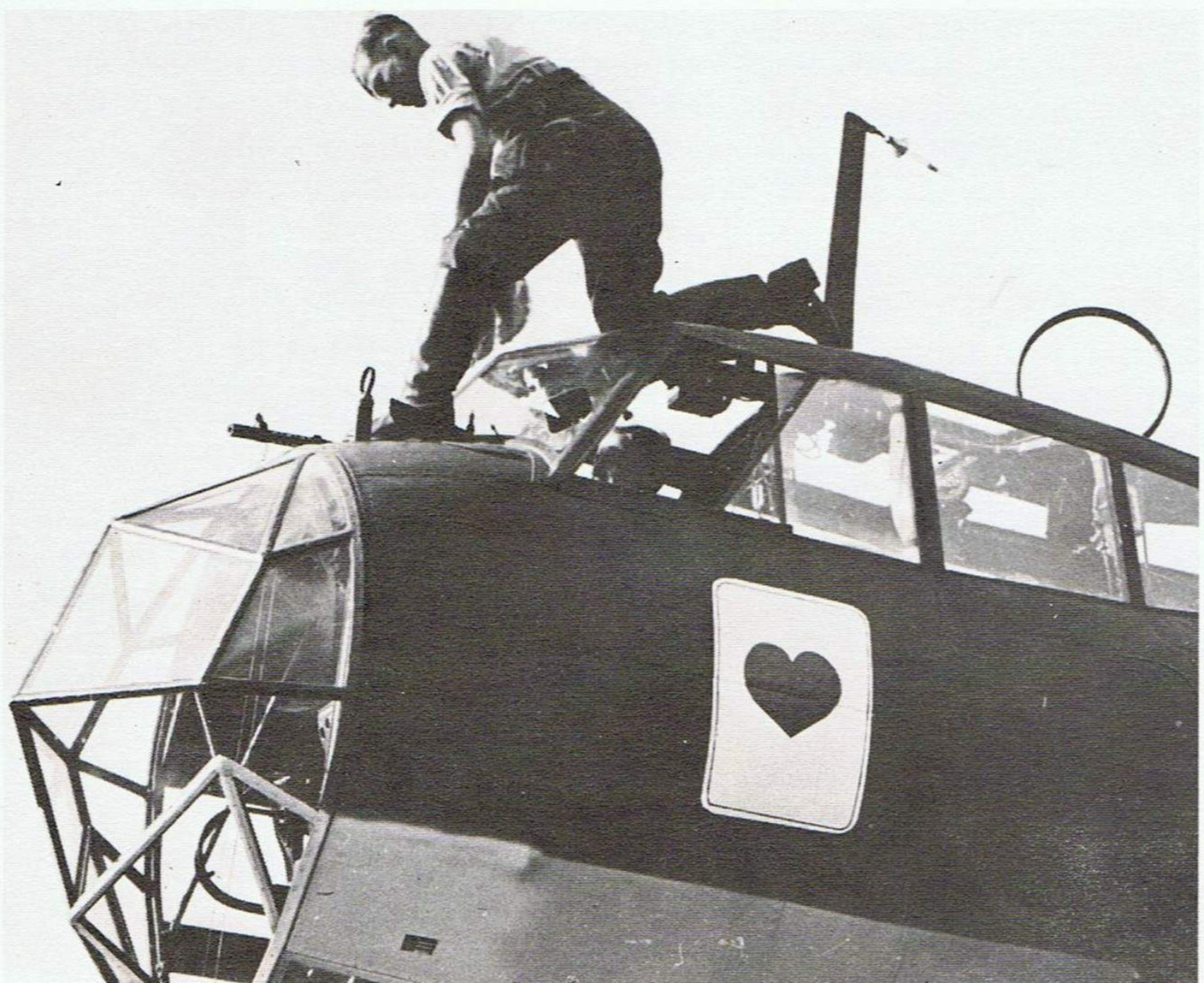


Right: A Do 17Z from the *Stab* of III/KG 3 displays the individual emblems of all three *Staffeln* plus that of the *Stab,* the latter being an ace of diamonds./*E.C.P.Armées*

Below: Two Do 17Zs from III/KG 3 show their *Staffel* emblems. An ace of clubs was used by 7 *Staffel,* and ace of spades by 8 *Staffel* and an ace of hearts by 9 *Staffel.* /*E.C.P. Armées*

Top far right: A He 111 1H+CM of 4./KG 26 taking off from Aalborg airfield in Norway. Spinners are painted in the *Staffel* colour of white and the aircraft letter, C, is repeated in white on the leading edge of the wing. In the background is one of the comparatively rare Do 215s of Aufk 1. Gr. Ob.d/*L. E. Tusch*

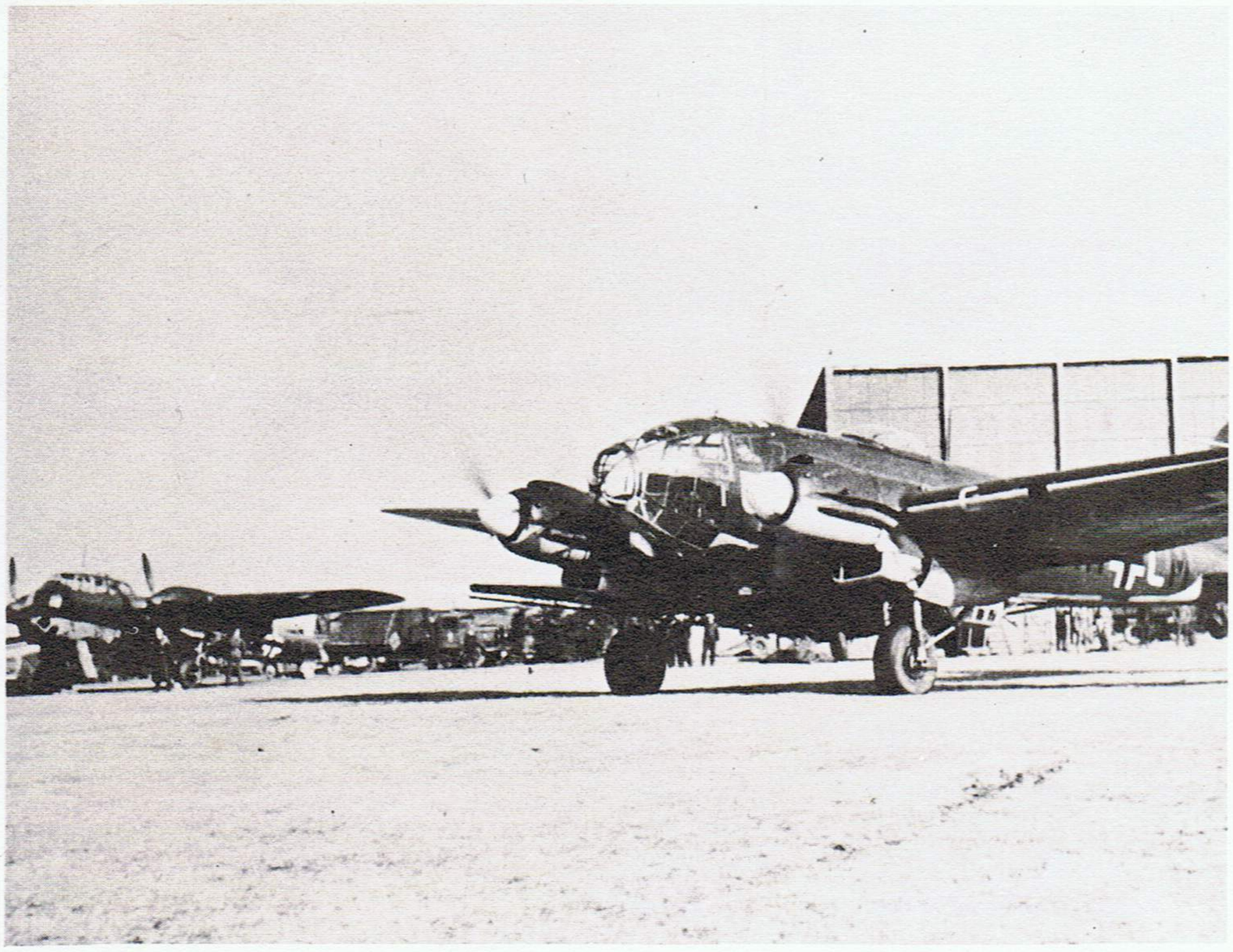


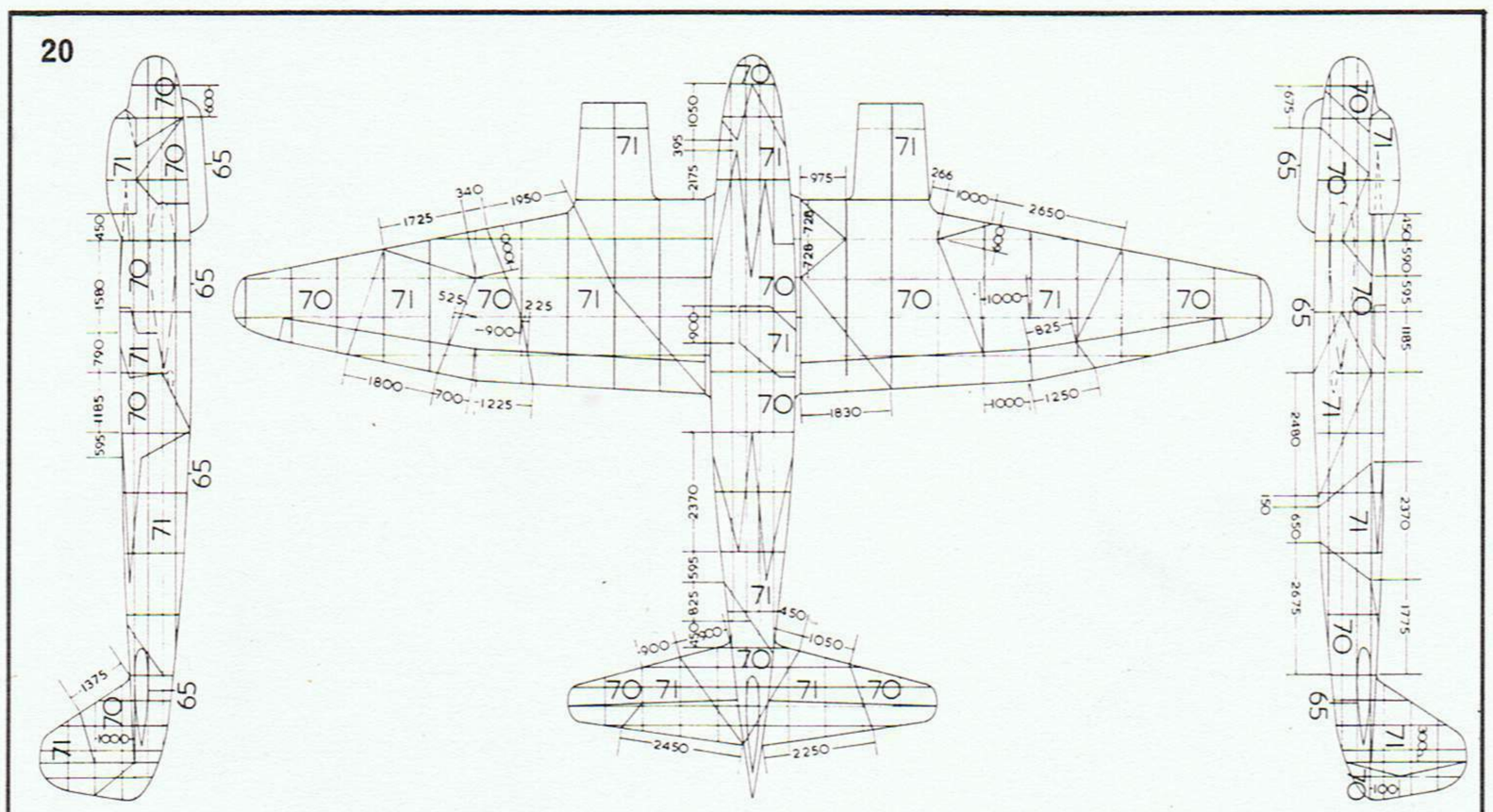


located to give precise details but it is known that such tests were carried out with operational units. *Jagdgeschwader* 53, equipped with Bf 109Es, appears to have been host to such tests during the winter and spring of 1939/40.

It is a point for contention as to whether these field experiments resulted from official prompting by the *Reichsluftministerium* or rather as an off-shoot of experimentation by GL/C-E2 department at Rechlin. The point is academic, but what is of major interest is the introduction of the colour 02 as a substitute, in some instances, for the 70 coloured areas in Luftwaffe camouflage schemes. The qualification, in some instances, is used because examples have been recorded were 02/70/71 schemes were used in very hybrid upper surface camouflage schemes. Tests of the basic 02/70 substitution were also carried out on multi-engined aircraft, several tantalising portions of such aircraft appear in various photographs where it is possible to make a direct comparison with other aircraft wearing a 70/71 upper surface finish. What ever the specific origins of the tests, two facts are definitely known; firstly that a 71/02 scheme was not adopted for multi-engined aircraft, secondly that the combination was used more and more extensively for fighter aircraft as 1940 progressed.

The war had now entered a static phase with both sides carrying out very limited aerial operations, principally reconnaissance and a few minor bombing





Above: Diagram 20. A copy of the official camouflage diagram for the Ju88 as issued on 21.2.40.

attacks on shipping. RAF bombers, when they did intrude over Germany, were restricted to dropping nothing more lethal than propaganda leaflets. Their load was harmless enough but their presence indicated a potential threat, one for which the Luftwaffe had made virtually no provision.

The variety of obsolescent aircraft allotted the duties of night defence reflected the low priority that had been afforded this aspect of the air war. The last of the front line Ar 68Fs formed a major portion of this force in company with Bf 109Bs, Cs and Ds. Pre-war experience had been very limited and the only real tests had been those conducted in Spain by two Ar 68Es. A *Staffel* had been formed in mid-1939 within a standard day fighter unit; designated 10. (Nacht)/JG26 it continued with night fighter trials. The process of forming additional *Staffeln* within existing day fighter units continued throughout the remainder of 1939 and early 1940, Ar 68Fs serving with 10.(N)/JG 53, 10.(N)/JG 72 and 11.(N)/JG 72 while Bf 109Bs, Cs and Ds equipped 10.(N)/JG 26, 10.(N)/JG 2 and 11. (N)/JG 2. Strength thus remained very limited until February 1940 when the three Bf 109 *Staffeln* were amalgamated to form IV/JG 2.

Codes for night fighter *Staffeln* took the form of the normal numerical identity plus a letter N, the latter appearing to the left of the *Balkenkreuze* on both sides of the fuselage. The codes were applied in either plain white, or black, edged in white, because of the dark greens of the camouflage.

The relatively long period of inactivity not only allowed Germany time to digest the results of her earlier conquest, but also gave an indication that Britain and France were not in a position to invade. This failure to carry the war into the German homeland no doubt added impetus to the planning of an aggressive policy for the coming spring offensive against the western powers.

This thinking was clearly reflected in the revision to fighter camouflage and to markings in general. Concealment in the air would now be the prime priority for the Luftwaffe's fighter force. Accordingly, orders were issued to reduce the upper surface camouflage to the extreme plan view i.e. that minimum part of the camouflage required for concealment on the ground. The 65 coloured side and lower surfaces offered much better concealment against the sky for aircraft in a superior attacking position; and the Luftwaffe intended to be in that position. The instruction also called for the repositioning of the *Halkenkreuz* on the fin, permissable exceptions being those aircraft whose fin shape or size did not permit a clear application of the marking (this principally involved the products of the Arado and Fiesler firms).

Aircraft already in operational use were repainted as time permitted, but the next phase of war operations found quite a number still wearing the old style camouflage and with the *Hakenkreuz* overlapping both fin and rudder. Replacement aircraft fresh from the factories wore the revised scheme and it is at this point that the first quantities of 71/02/65 camouflaged fighter aircraft began to appear. A mixture of all three camouflage

schemes amongst the aircraft of one unit was not uncommon.

Bomber aircraft of all classes had retained their original style of camouflage application, the dark greens of the upper surfaces terminating low on the fuselage sides. Since it was virtually impossible to disguise the approach of a bomber formation at altitude, there was little point in altering the distribution of the main camouflage areas. Enemy fighter aircraft usually had the advantage of height so the dark greens remained advantageous, blending the bombers into the ground below. For low-level raids, as executed by the faster of the twin engined bombers, the camouflage was equally as effective. The Bf 110, because it was intended to act as escort to the main bomber force, retained its original style camouflage with the dark greens of the upper surfaces terminating low on the fuselage sides.

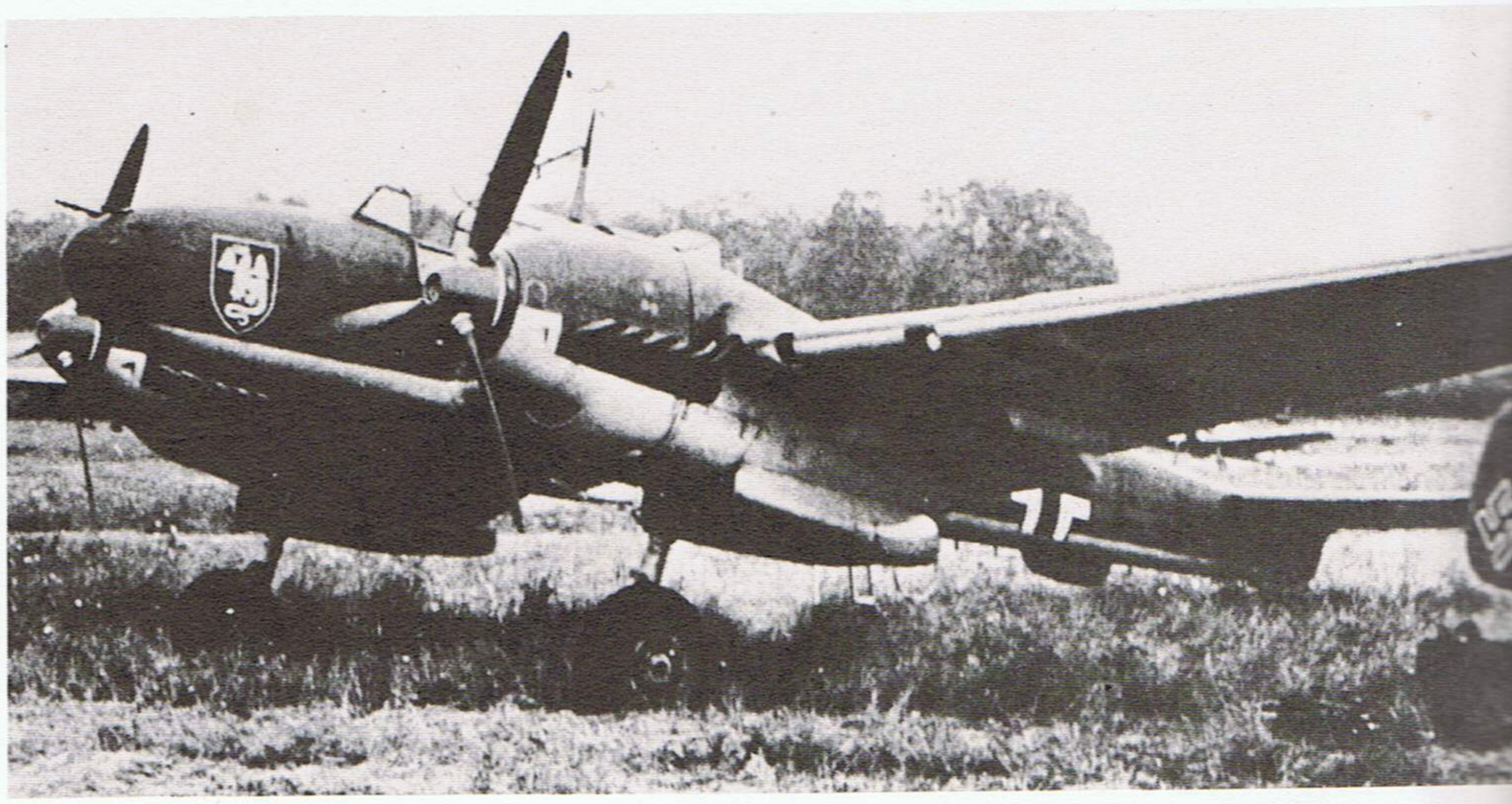
An additional marking made its appearance in limited form, presumably just prior to, or during the opening phase of the invasion of the Low Countries. Fighter *Staffel* identity had sometimes been displayed on the aircraft's spinner, either in the form of thin rings (*not* a spiral) of the appropriate colour over the basic dark green camouflage colouring, or else as a complete overall spinner colouring.

Gruppenkommandeur machines also began to display spinner colours but this time to indicate the *Gruppe*. Fighter units adopted the same system of *Gruppe* colour identification as used by the bomber units. Officially the fighter units never received official sanction for such a practice, since *Gruppe* identity symbols had been issued for this purpose.

The practice was extended even further during 1940, with aircraft carrying both *Staffel* and *Gruppe* colours in a series of geometric patterns. General practice favoured the main spinner colour to identify the *Staffel* and the minor colour for the *Gruppe*. Solid colours, or equal proportions of two colours usually identified a *Geschwader* or *Gruppe Stab* aircraft respectively.

On April 9, 1940, Danish citizens saw their skies filled with German aircraft, and by evening the Government had surrendered rather than cause wholesale bloodshed. What the Danes did not realise was that the aircraft were in fact overflying to occupy Norway, and Germany could have ill-afforded either the time or resources to subdue Denmark.

Before the offensive against France and the Low Countries could be launched, Germany needed to secure the long sea



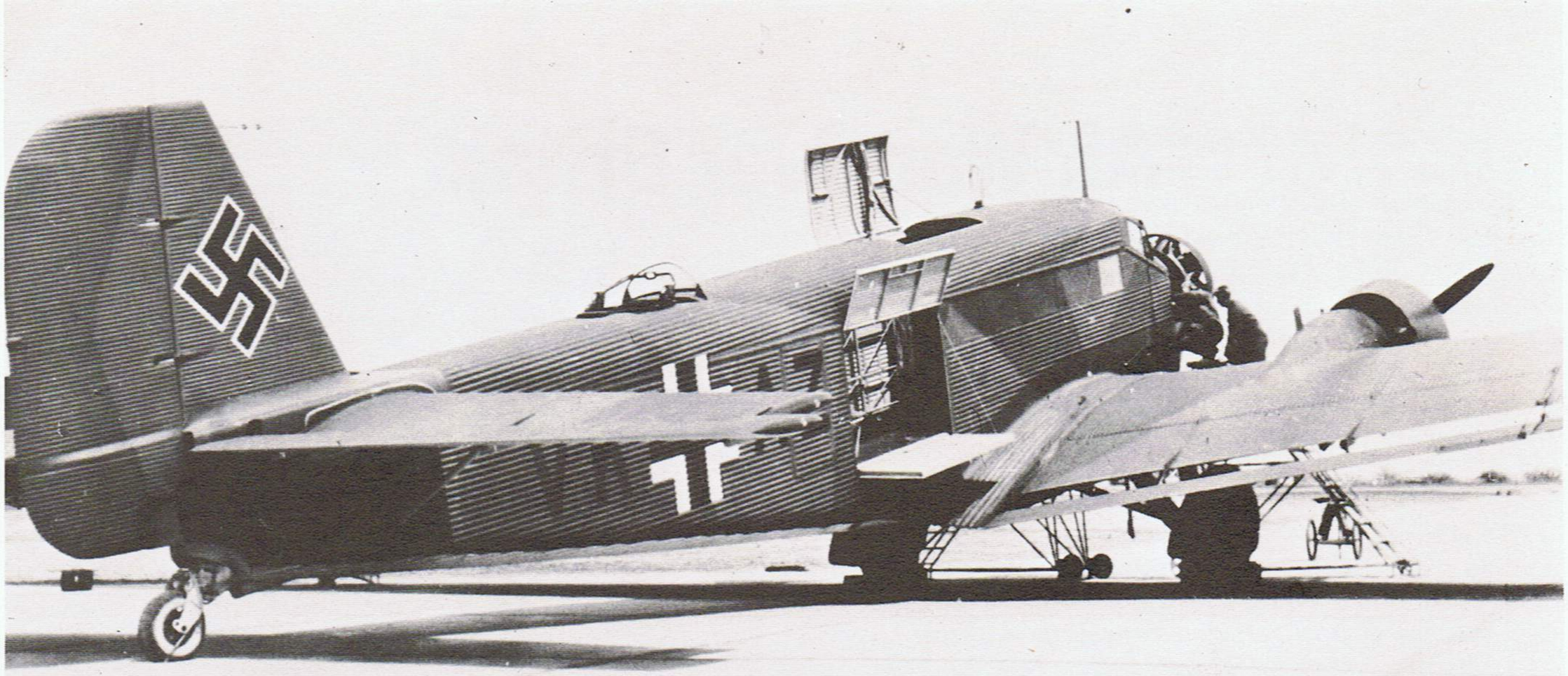
Above: A Bf110 A2+LK of I/ZG 52, a unit destined to be short lived. It was absorbed into ZG 2 as II *Staffel* but retained its code of A2. / *Bundesarchiv*

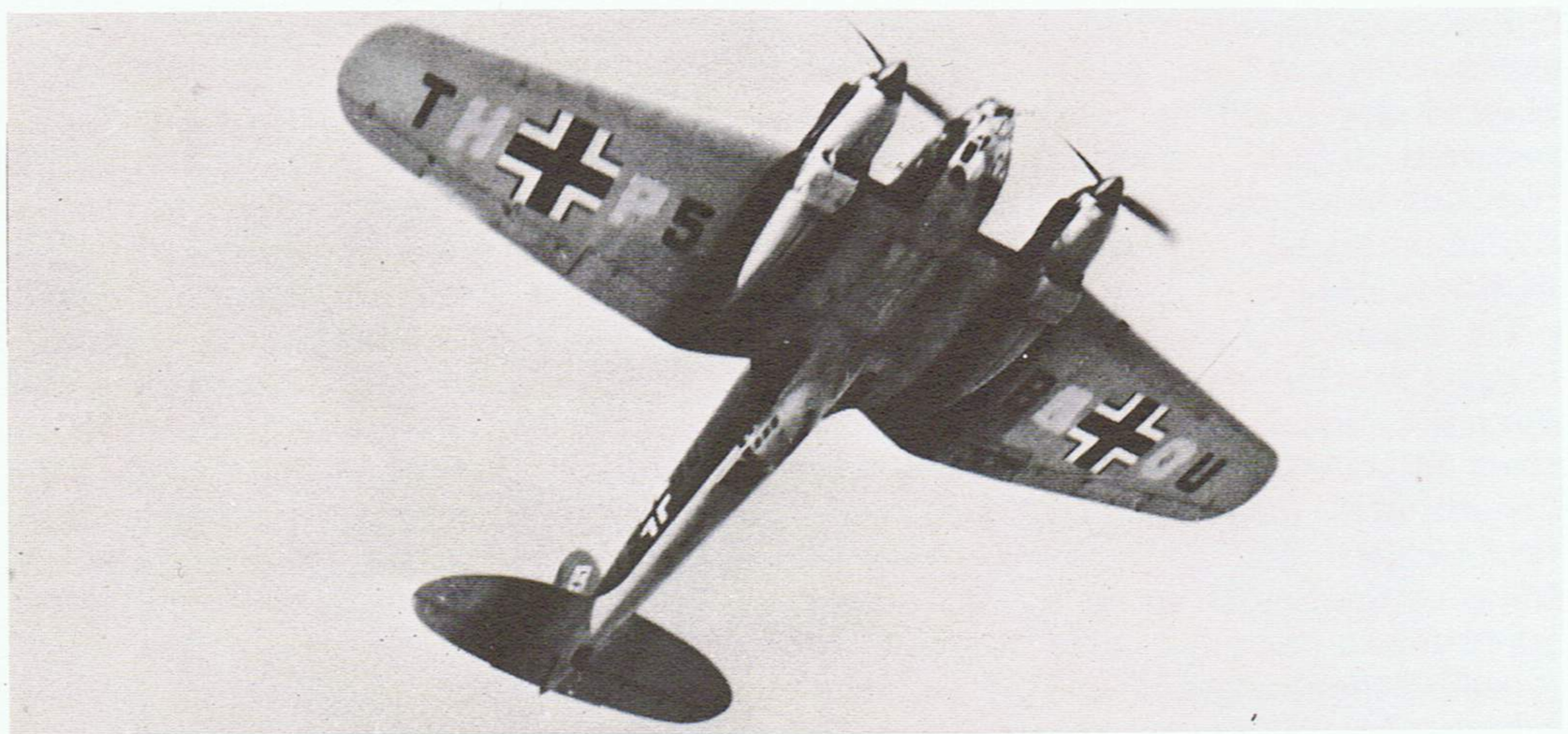
route from Sweden along which the vital iron ore supplies flowed to the German war machine. Occupation of Denmark and Norway was, however, of dual benefit because it secured both the sea route and the German flank for the coming offensive.

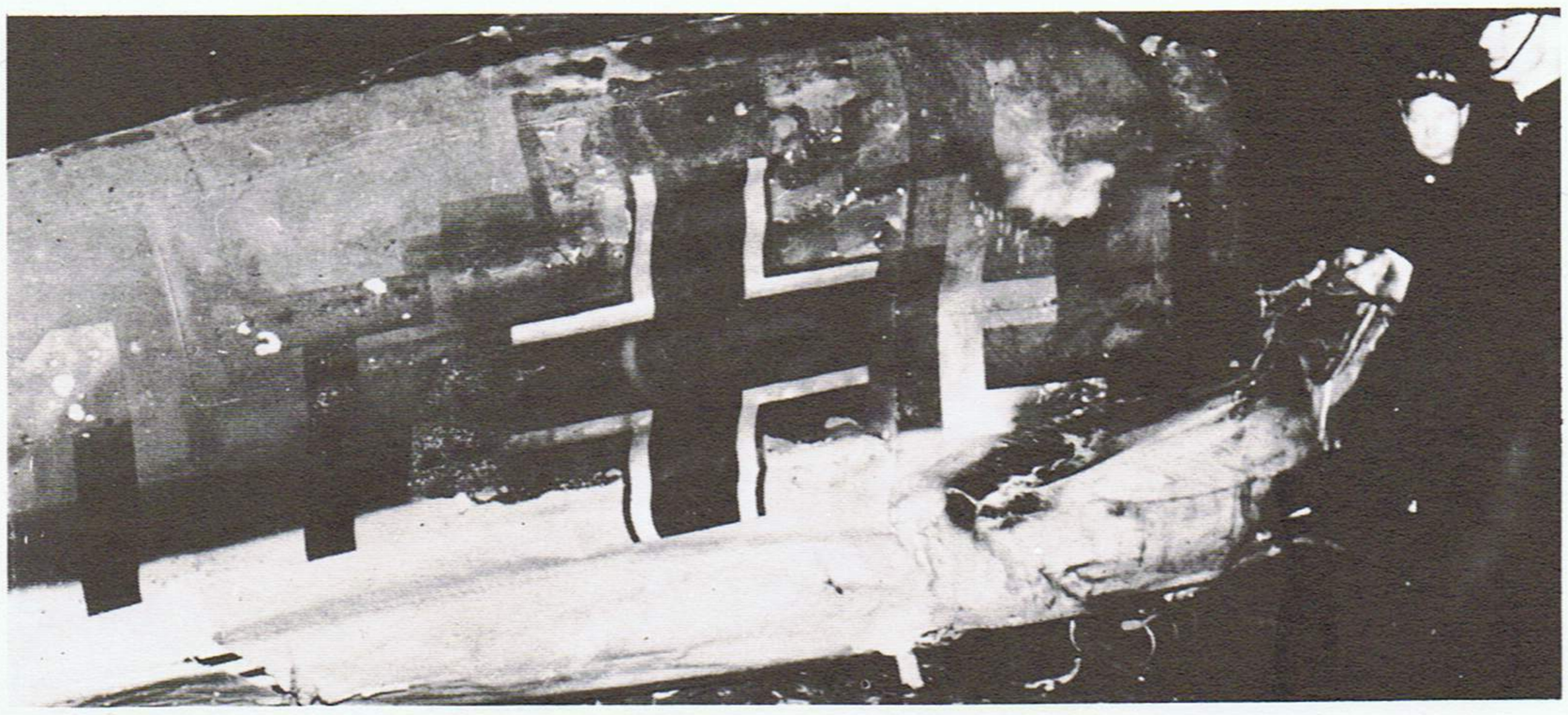
Troop movements were carried out by Ju 52-equipped *Kampfgeschwader zur besonderen Verwendung* (KG.z.b.V), literally bomber *Geschwader* for special duties, supplemented by a small number of Ju 52s from second line units. The Ju 52s of the KG.z.b.V wore standard bomber style codes and camouflage but among them were a few examples of the old pre-war scheme in the colours 61/62/63/65. Other instances of the old camouflage scheme were to be seen on front line operational aircraft, principally Do 17s and Ju 52s, during the campaigns against the Low Countries and the Balkans; but the established norm for front line bomber aircraft was to remain 70/71/65 for most of the war.

The Norwegian operation also marked the introduction of tactical markings on a major scale. All Ju 52s used for the operation wore a yellow band, approximately one metre in width, which completely encircled the nose of the fuselage forward of the cockpit. On this band Ju 52s of the KG.z.b.V wore, on both sides of the fuselage, their Gruppe emblem while the Ju 52s of the second line units appear to have used a temporary 'unit' identification in the form of a number enclosed within a circle.

Denmark had fallen with ease but Norway proved a much harder task. Virtually all the major front line aircraft types operated by the Luftwaffe saw action in those frozen northern skies. Among them were Fw 200s of KG 40 which were used for attacks on British shipping and to supply the German garrison at Narvik. No doubt because of their original purpose, early







Above: The ubiquitous Ju 52. This example wears full camouflage of 70/71/65 and black registration letters, VK+AZ, applicable to second line aircraft.

Left: An He 111P of Aufkl.Gr.0b.d.L. wearing its codes in text book fashion. The overpainted registration, applied at the factory, can be still seen. */R. Harrison*

Below left: Mystery surrounds the markings on the remains of this He 111 of KG 25 which was brought down during a night attack on the British coast in late April. Coded 1T+EL it wore 1939 style and size *Balkenkreuze* on the fuselage, but heat damage revealed a 1940 style and size *Balkenkreuze*, and a letter P, underneath. Overpainting of a previous code was not unusual but why the correct size and style *Balkenkreuze* should have been replaced by a superseded type remains unexplained. */ Syndication International*

Luftwaffe acquisitions of the type had been camouflaged in 70/71/65. With the formation of KG 40 later additions had arrived from the manufacturers wearing the more appropriate 72/73/65 colour scheme. Normal bomber style codes were applied to these aircraft. KG.z.b.V 105 also saw service in Norway on supply missions with its early model Fw 200Bs and four of the C-O model, camouflage for these aircraft being 70/71/65.

The full fury of a second Blitzkrieg broke loose on May 10, 1940 with the German High Command taking full advantage of its earlier battle experience. By June the German forces stood victorious on the shores of Western Europe and looked toward Britain. On the other side of the Channel the remnants of several armies began the painful process of taking stock of their remaining resources, and prepared to face the onslaught that would inevitably pursue them across the dark waters.

Air War Over Britain

By June 1940 the Luftwaffe was very much on the offensive, spearheading a powerful victorious military force that had already swept across most of central and western Europe. Success was clearly reflected in the state of the camouflage and markings carried by its aircraft. As the air war over Britain developed, a series of changes occurred to both camouflage and markings, all being dictated by the needs of battle and reflecting the varying fortunes of the combatants.

On June 30, 1940 a detailed order was issued outlining the proposed air operations against Britain. Briefly, the order of priorities were; to establish and consolidate airfields and associated facilities in France, Belgium and Holland; to probe the British defences with mixed small forces of fighters and bombers; to establish the strength of the RAF and then release the full might of the Luftwaffe upon it and its back-up resources, including the British aircraft industry. Simultaneously, attacks against port facilities were to provide the means of denying the suppy of vital overseas imports. Such, at least, was the intention. What Göring failed to appreciate was the inability of his forces to meet such a wide and all-consuming military programme.

The following day the Luftwaffe was active over Britain, albeit in small numbers. During the hours of darkness a few bombers had caused some restlessness to the inhabitants of 20 counties and a No 29 Squadron Blenheim night fighter had been lost trying to carry out a night interception. Misty conditions during the morning reduced aerial activity on both sides of the Channel. A brace of Do 215s from Aufkl.Gr.Ob.d.L. were lost to anti-aircraft fire on the East Coast; a Ju 88A of 3.(F)/121 failed to return, and six Do 17Zs of KG 77 were shot down. The intensity of military operations may have diminished since Dunkirk, but the enemy had by no means totally disengaged.

The other loss of the day was a He 59 of *Seenotflugkommando* 3. This aircraft was

Below, top right: D-ASUO, a He 59C of *Seenotflugkommando* 1 which was forced down by Plt Off J. Allen of 54 Sq. on July 9, 1940. It wears full sea rescue service finish of white with red cross markings, civil registration and *Reichsdienstflagge* tail markings. Such losses rapidly led to the abandoning of this finish and markings in favour of standard 72/73/65 camouflage and normal second line four figure registrations in black plus full military markings./*Syndication International*

Bottom right: The revised scheme is shown by this He 59B of 3./*Seenotgruppe* from the *Seenotzentrale* Cherbourg. /*Bundesarchiv*







clearly marked with a civil registration, D-ASAM, prominent red crosses and the *Reichsdienstflagge* (State Service Flag) across fin and rudder. The very boldness of colour scheme, overall white with black and red markings, no doubt contributed to its downfall. Sighted quite clearly against the dark backdrop of the sea, it was shot down close to a British convoy. Arguments have since been raised concerning the shooting down of aircraft of the *Seenotdienst* (Air-sea Rescue Service). Whatever the individual feeling at the time, orders were issued and obeyed, following the sending of a communique to the German Government stating that seaplanes found in near proximity to British convoys would be shot down. The *Seenotdienst* was to pay dearly for its efforts, some 45 aircraft being lost from all causes during the period July 1 to October 31 – four He 59s and two Do 24s from *Seenotflugkommando* 1, four He 59s from *Seenotflugkommando* 2, 14 He 59s from *Seenotflugkommando* 3, four He 59s and one Fw 58 from *Seenotflugkommando* 4, one He 59 from *Seenotflugkommando* 5, four He 59s from *Seenotzentrale* Cherbourg, four from *Seenotzentrale* Boulogne and one Fw 58 from *Seenotsonderkommando* Wesermünde.

These losses during the opening weeks of the campaign against Britain were instrumental in the abandoning of the special white finish and civil status of aircraft of the *Seenotdienst*. Normal sea camouflage colours of 72/73/65 were adopted and a standard four letter factory registration replaced the civil registration, while a military *Hakenkreuz* appeared on the fin in place of the *Reichsdienstflagge*. In most instances even the Red Cross markings were deleted, *Balkenkreuze* being used instead.

Of the aircraft lost on July 1 none exhibited anything other than standard markings and camouflage; tactical markings would not appear until the battle swung into full tempo when rapid air-to-air identification would be needed in the crowded skies.

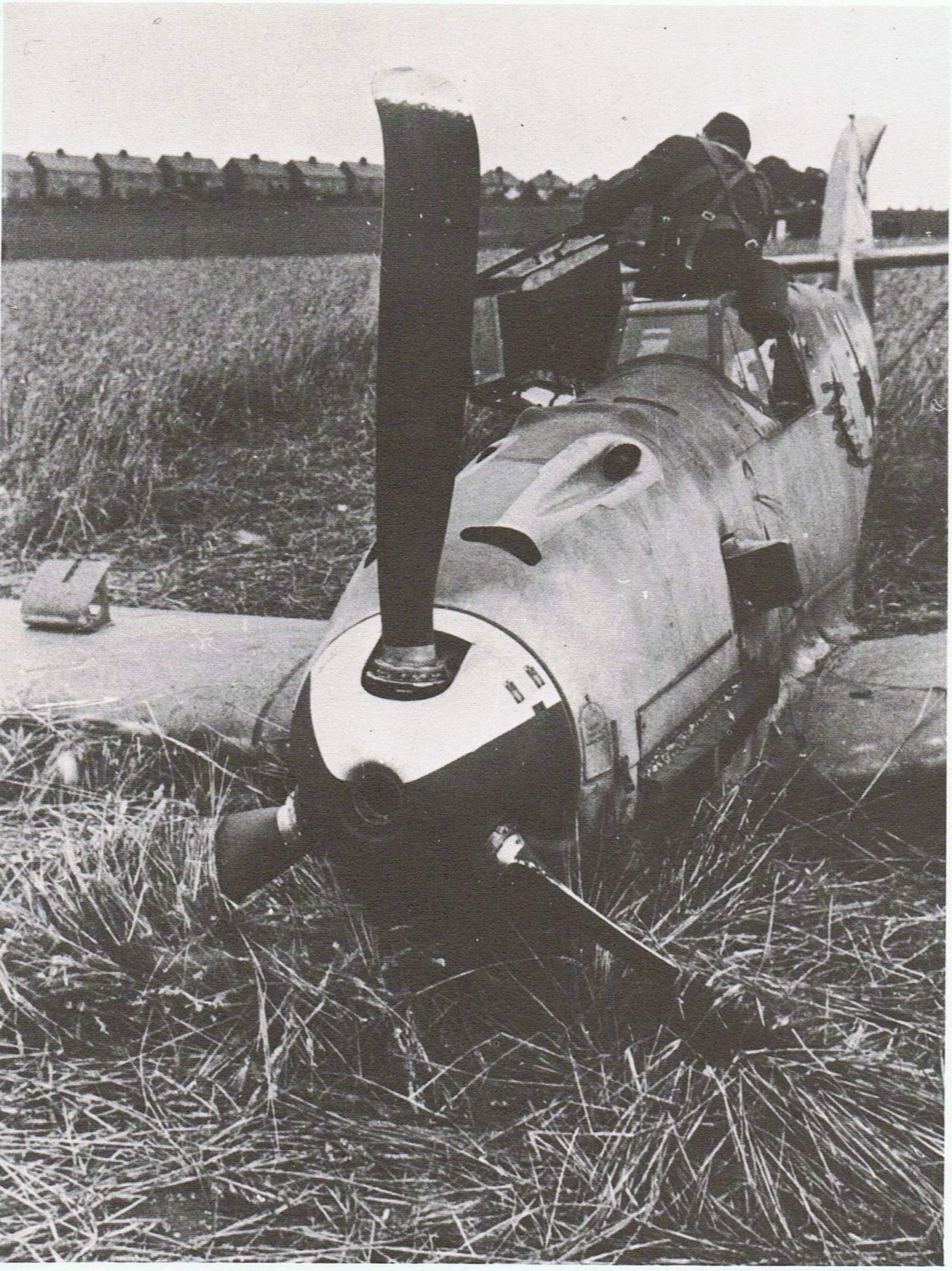
Attacks on convoys had also begun on July 1 and were to continue for some time as part of the prerequisite to the intended seaborne invasion. Examination of surviving film footage and stills of these coastal actions reveal no evidence of any form of tactical markings. Unlike the bomber aircraft committed to land targets, the Ju 87s would not adopt even the most rudimentary tactical markings at any time during the campaign. Until the end of the first week in August, shipping and ports were attacked on a mounting scale whilst night

Above, centre right: A He 111P G1+FA from the *Geschwader Stab* of KG 55 which fell to the concerted attack of six Hurricanes on July 12, 1940. The spinners bear the *Stab* colour of green 25 but the aircraft letter F is only thinly outlined with it. All markings are correct except for the positioning of the *Hakenkreuze* which remains overlapping both fin and rudder. The three-quarters rear view in particular shows traces of an application of temporary night black, the upper extent of which traces a line from the wing root to a point level with the top of the *Balkenkreuze* – as per the regulations. The *Geschwader* emblem is a red Griffon, with yellow claws and blue wings and tongue, on a white shield edged in red./*Syndication International*



Below right, Top far right: Werner Bartel's interestingly marked Bf 109E-1, W.Nr.6296F, from the *Stab* of III/JG 26. The yellow rudder, main point of controversy, is in the paler shade of 27. (The apparent overpainting of the *Stab/Gruppe* markings was the work of the censor on the original print). The fuselage *Balkenkreuze* are of correct proportions but remain in the 1939 size of 650 mm. The *Stab* markings are equally small and edged narrowly in white. Upper surface camouflage was reputed to be a 70/71 combination, but it shows a contrast more appropriate to 71/02; particularly when comparison is made with the black of the fuselage markings. On the starboard wing root the red 23 chordwise wing walk line marking appears distinctly darker than the wing camouflage colouring. The spinner is black and white. /*Syndication International*





attacks on aircraft industrial complexes were continued by small numbers of aircraft.

Tactical markings, which were soon to blossom into full colour, seemed to make an early appearance on July 24 when *Oblt* Werner Bartel, from the *Stab* of III/JG 26, was shot down by a Spitfire of 65 Squadron. Executing an excellent forced landing near Margate, his Bf 109E-1 received only superficial damage. By far the most interesting aspect of this aircraft's markings was the all yellow rudder. This isolated instance has led to speculation regarding the date of introduction of tactical markings. A very thorough examination of records shows it to be just that – an isolated instance; the first British intelligence reports of Luftwaffe fighters wearing yellow as a tactical marking dates from mid-August, a fact supported by the battle situation which precipitated their very needs. Bartel's aircraft was from the *Stab* flight whose unofficial *Gruppe* colour was yellow. It is just possible that the yellow rudder marking was intended, in this instance, to distinguish the *Stab* aircraft during combat. On the day in question 40 Bf 109s from III/JG 26 had been operating as escort to a score of Do 17s. A heavy fighter engagement ensued and another large force of Bf 109s from III/JG 52 joined in to cover the withdrawal of III/JG 26. Under these battle conditions it is not difficult to appreciate the value of some form of distinguishing marking for formation leaders. Whether or not Bartel's aircraft had been marked with yellow as a personal whim or on unit orders remains unknown.

During the first week of August Luftwaffe activity waned, due in part to the drastic reduction in Channel convoy activity by the British. Weather conditions during the previous month had not favoured massed air attacks, but August would see more amenable conditions. *Adler Tag*, scheduled for August 10 was postponed but the pressure of air attacks continued to increase most markedly.

On the afternoon of August 13 *Adlerangriff* was launched, *Adler Tag* had finally arrived. The fighting was heavy and the Luftwaffe suffered its worst losses to date, a ratio of three to one against British losses. The pressure of battle and declining tactical advantage had already begun to show in the markings carried by some Bf 109s. *Oblt* Temme, adjutant of I/JG 2, force landed at Shoreham after an engagement with a Hurricane of No 43 Squadron. A very soft mottling of upper surface colours had been sprayed across both fin and rudder above the tailplane of his Bf 109, breaking up the stark blue-grey colouring. In addition, the fuselage *Balkenkreuze* had the width of their white borders reduced to the 1939 style. Both modifications were a distinct move toward a camouflage style whose primary function was defensive concealment. Tied to the bomber formations as escorts, the Bf 109s' existing camouflage was disadvantageous, particularly if RAF fighters had height advantage, an occurrence that was becoming more frequent.

As the battle progressed, modifications to fighter camouflage continued as units took matters into their own hands. The principal requirement was to break up the starkness of the fuselage sides, and this was achieved by several means. Where

spray painting equipment was available a soft mottling effect, or cross hatch pattern, or wavy line effect was applied using one of the upper surface colours. Some sprayed applications went to the extreme to form an almost continuous haze effect which virtually obliterated the 65 colouring of the side surfaces. Other units used hand painted applications that had obviously been achieved with a short-haired stiff bristle brush which produced a closely marked stipple effect. Other colours than those of the standard camouflage were soon to be introduced.

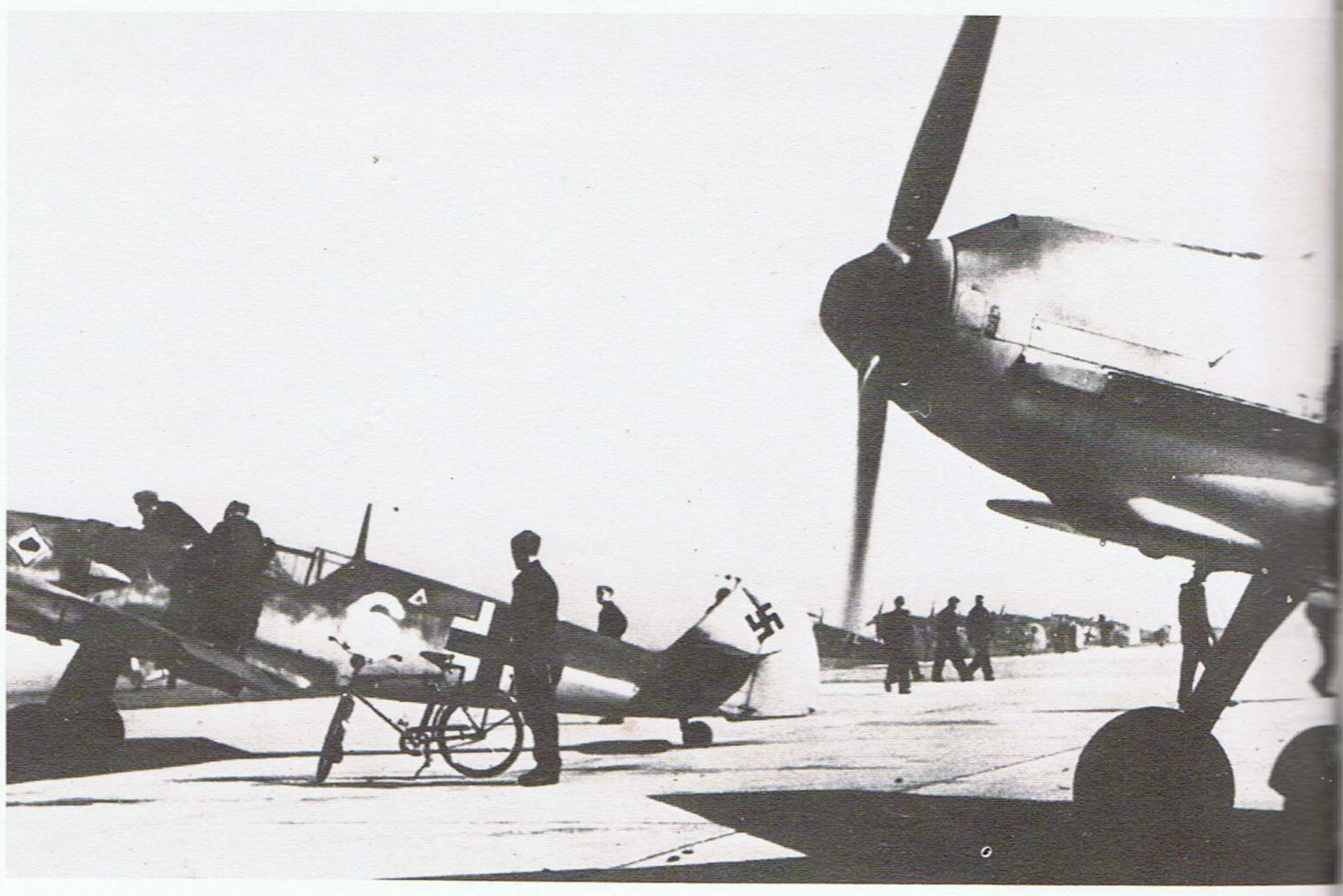
Weather conditions again produced a temporary lull in activity but the whole might of the Luftwaffe was unleashed on the 15th and again losses were high; Luftflotte 5 was never again committed in force to the air war over Britain. Eighty-five of the 90 Luftwaffe aircraft lost that day were directly attributable to combat. Savage fighting and heavy losses occurred again the following day, but on the 17th, despite fine weather, the Luftwaffe was conspicuous by its absence, a solitary Ar 196 being damaged by Royal Navy gunfire.

August 18, however, saw a return of the massed formations and also the first officially recorded appearance of tactical markings, in the form of yellow wingtips, tailplane tips and rudder. No official German documentation has been found which substantiates a specific introduction date for such markings but their appearance, coupled with the renewed massed aerial offensive, provide reasonable indication of when and why they did appear.

The combination of yellow coloured wingtips, tailtips and rudder continued throughout the remainder of the month. An additional area of yellow colouring, the engine nacelle, was first recorded on the 28th. No positive unit identification was listed for this particular Bf 109 but a cross check of the day's losses, as listed by the Luftwaffe Quartermaster General's Returns, indicates that it was from 7./JG 51. The entire engine cowling right back to the windscreen was painted yellow, but the spinner was left in its usual dark green colouring. Markings were a white 13 with a vertical III *Gruppe* bar aft of the *Balkenkreuz*. This use of a vertical bar, in place of the normal horizontal S marking, appeared very early in the battle and virtually supplanted the previous marking. One of the comparatively rare appearances of the old style marking occurred during early September when a Bf 109 of 8./JG 2, coded 2, was shot down. The engine cowling was white and the spinner bore a single red ring.









Above left: A pair of Bf 109Es of 8./JG 51 wearing regulation camouflage and markings very early in the battle. The mottle effect was produced by shadows from the camouflage netting. */Frank Smith*

Centre left: A Bf 109E-3 of 2./JG 77 shows the modification to its 71/02/65 camouflage achieved by mottling the fuselage sides with soft sprayed patches of 71. The spinner appears to be black and white. */H. Obert*

Bottom Left: A line up of Bf 109Es of 4./JG 53 showing at least two aircraft with the *Hakenkreuze* still overlapping both fin and rudder. */Ferenc Kovács*

Above: A closer view of Rudolf Lochner's aircraft which bears his personal black and white heraldic emblem beneath the cockpit. The 70/71 upper surface camouflage has been intensified by overspraying the fuselage sides with 70 obscuring, in part, the fuel octane triangle marking. */Ferenc Kovács*

Camouflage for this particular Bf 109 was officially described as '. . . light blue side and lower surfaces and navy grey mottled on top surfaces.' Greys of varying shades were to become more common as the fighting grew more intense and the fighter units felt the battle going against them.

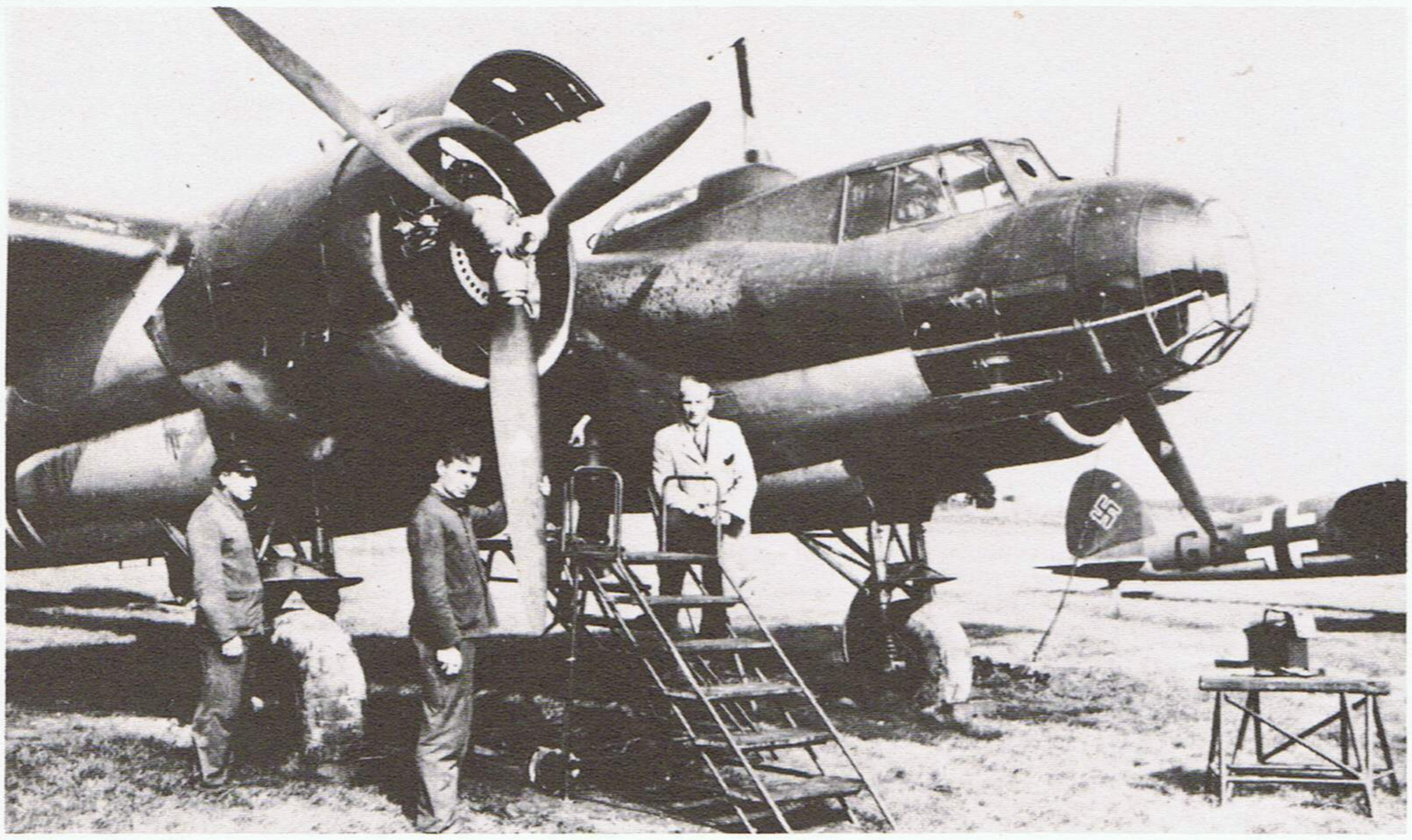
The actual colours used reflected the ingenuity of the individual ground staff personnel; top surface camouflage greens mixed with the blue-grey used for sides and under surfaces produced varying shades of dirty blue-grey dependent upon the proportions of each used. Black-green 70, which was almost black under most light conditions, was a handy strong tinter for the 65 and 02 coloured paints. Pure black, available in the form of 22, and black-grey 66 were both ready sources for producing a dark blue-grey colour when mixed with 65. Dark blue 24, normally used for internal pipe markings and IV *Gruppe* and *Stab* codes, was also a suitable starting point for acceptable colour mixes. Precise colour details for these unofficial camouflage schemes are impossible due to the variables involved, but the official records include descriptions such as navy grey mottle, light navy grey, mottled grey and blue, two shades of grey, cloudy grey and battleship grey, dappled dark blue and yellow green, grey dappled black. These descriptions are not meant to imply that the more usual upper surface camouflage schemes had been dispensed with; in many instances both 71/02 and the older 70/71 colour schemes were also recorded, often with some form of mottling to the fuselage sides and, in some instances, over the upper surface colours. A Bf 109E-1 of 7./JG 53 (coded white 12) provides a good example of such variations. Shot down on September 30, it carried a yellow engine cowling and rudder and its camouflage was described as '. . . blue and green dappled yellow and green on upper surfaces with sky blue beneath.' Others were less elaborate e.g. '. . . dark and light green with grey mottle', or simply, 'standard camouflage with yellow engine cowling and rudder'.

As the battle progressed, the growing anomaly of increased defensive camouflage and glaring yellow tactical markings became more apparent. British raids on German fighter bases were highly improbable and the defensive camouflage of the German fighter aircraft was designed for actual combat use. The need, however, for instant split second recognition made retention of the brightly coloured tactical markings of equal necessity. The dilemma must have been a nightmare for the Luftwaffe's fighter pilots. The continued display of *Staffel* emblems, regardless of size, seems to have been accepted as a tolerable risk. Among the 57 aircraft lost in combat on September 30 was a 6./JG 52 Bf 109E-1 (W.Nr.3192) flown by *Gefr* Strasser. The spinner tip was yellow as also was the engine cowling but adorning the latter was a four feet long eagle, painted in blue.

Returning to the actual course of the battle, on August 25 a change of tactics occurred. Until then a limited night bombing offensive had been maintained against Britain, but the decision was taken to add more weight to this phase of operations. The bomber force from *Luftflotte* 3 was temporarily withdrawn from daylight operations and used instead against the industrial heart of the Midlands. This released the *Luftflotte's* fighter force, which was placed under the control of *Luftflotte* 2, thus providing a greatly increased number of aircraft available for fighter escort duties to the remaining day bomber force.

On August 30 the battle entered what historians have described as its critical phase. For the next nine days the tempo would increase to a crippling crescendo of destruction as the promised invasion date drew closer.

This change was marked by a temporary disappearance of yellow, with white replacing it as the colour for tactical markings. White wingtips and rudders were the most common form although some Bf 109s also exhibited white engine cowlings. The Bf 110 also adopted the revised tactical marking colour, this being almost exclusively applied to the nose of the aircraft. The haste with which this form of marking was applied is apparent from sur-



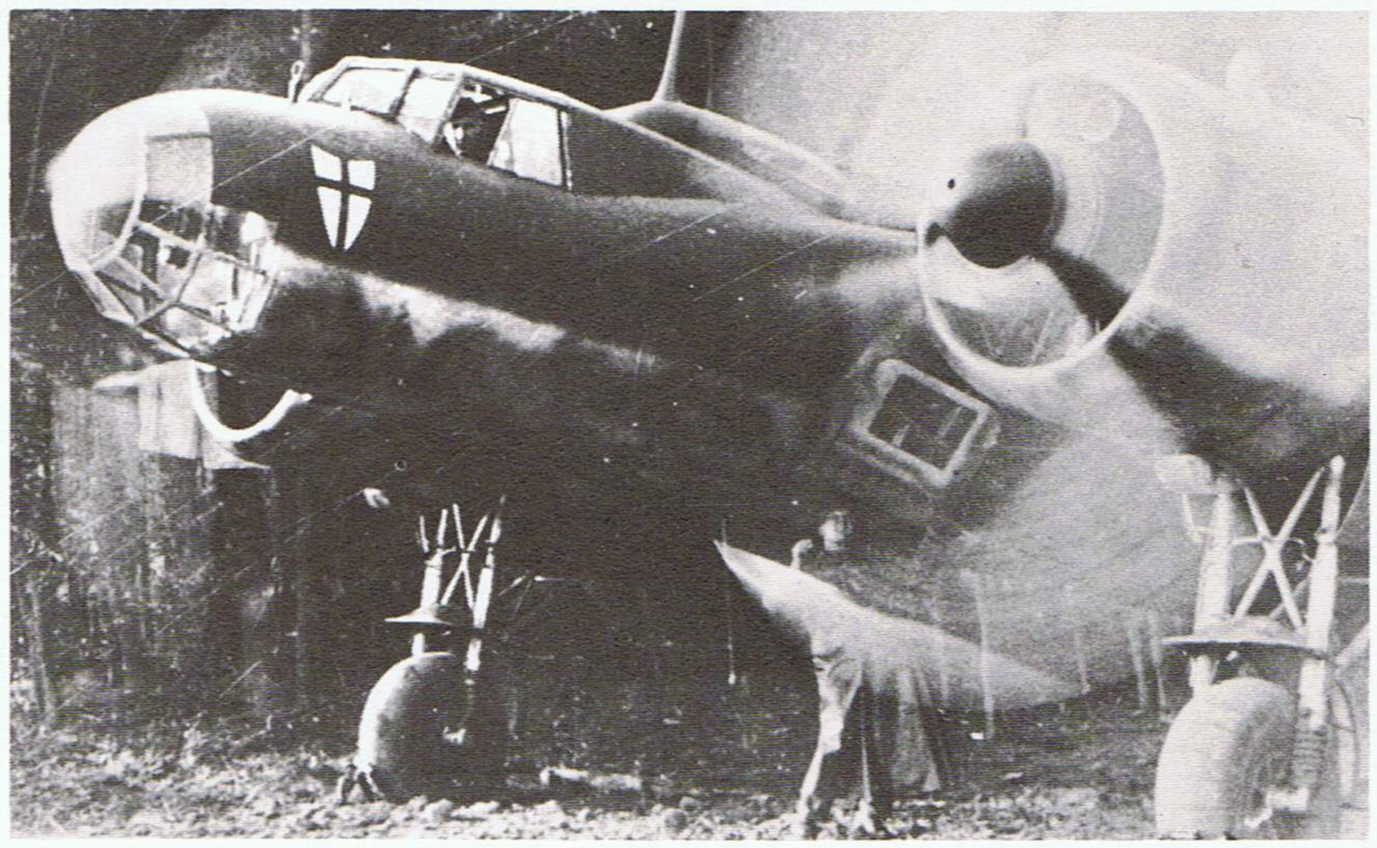
Left: A reconnaissance Do 17P undergoing field maintenance. In the background is a replacement He 111 wearing correct *Balkenkreuze* but with the *Hakenkreuze* overlapping both fin and rudder.

Below: A Do 17P of Aufk1.Gr.(F)10 has it engines run up. Reconnaissance aircraft often adopted low level penetration techniques to avoid detection, mottled undersurfaces being used to reduce the stark contrast between the upper and lower surface colouring. The small camouflage net hanging over the starboard wing covers the *Balkenkreuze* marking, a common practice for aircraft at dispersal. */H. Obert*

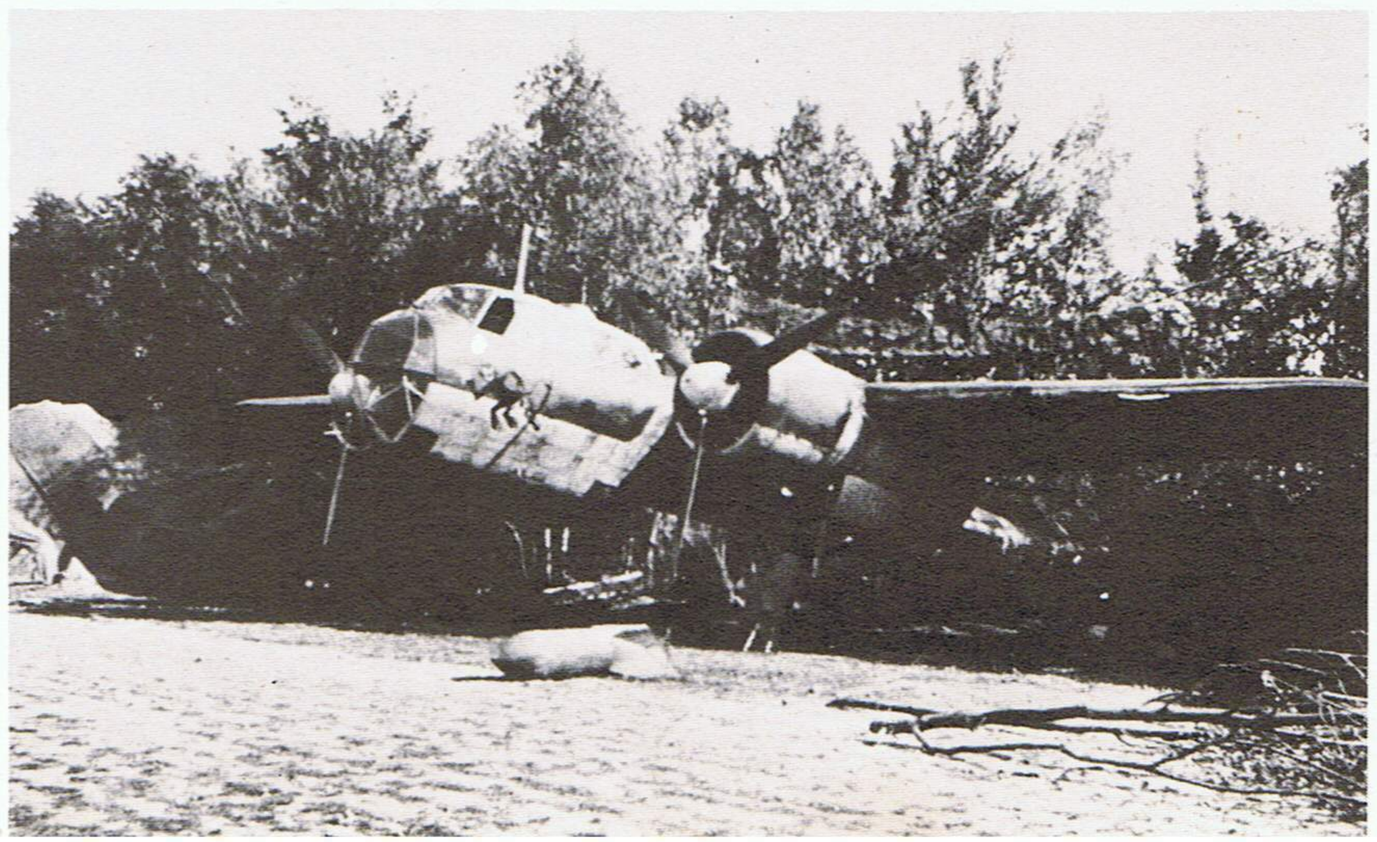
viving photographs of Bf 110s, some applications being rough in the extreme.

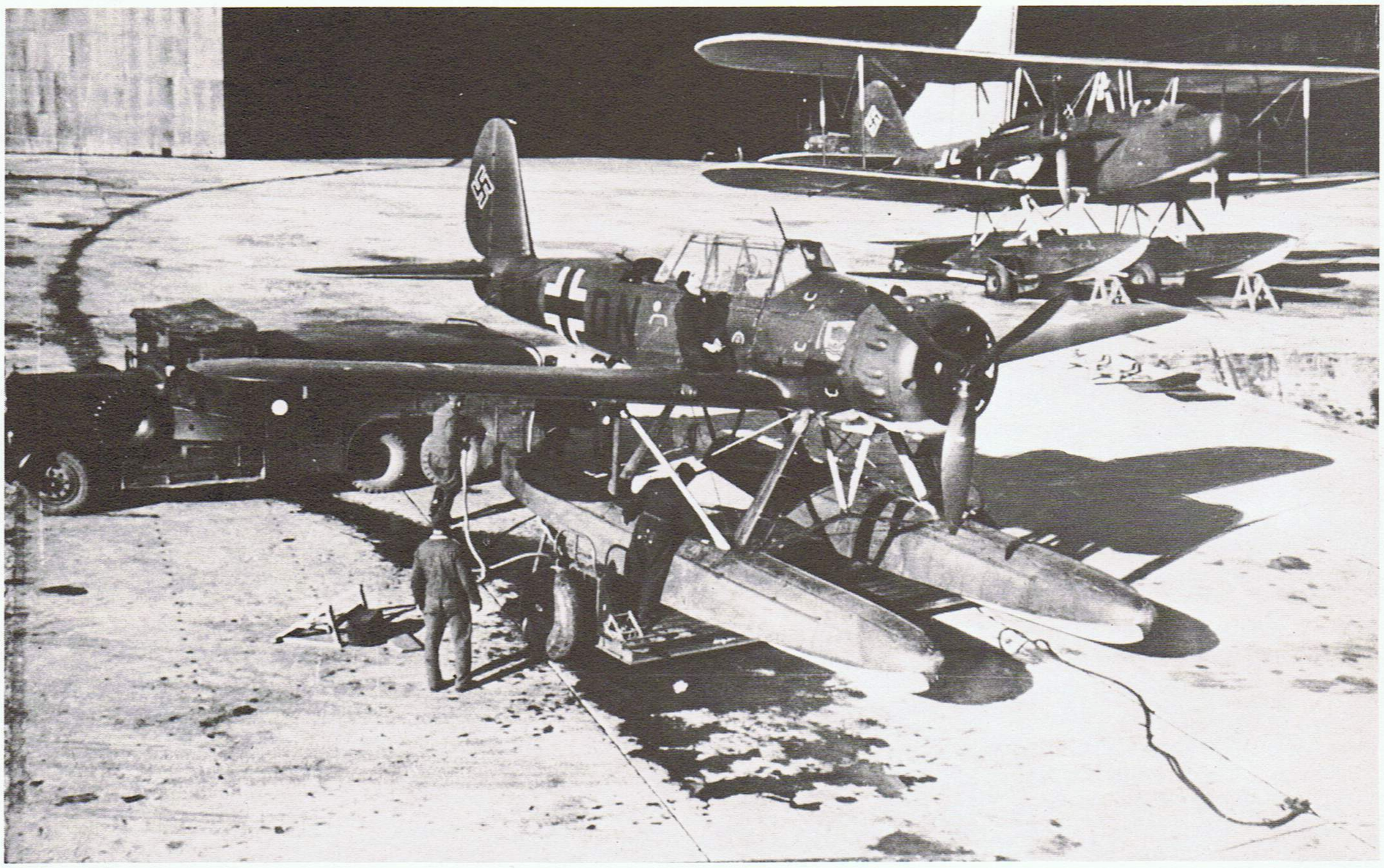
The type of paint used was 7120, the same variety as used for the temporary yellow markings. Some Bf 110s also displayed additional markings during this period, but these are thought to have been a form of *Gruppe/Staffel* identification aid rather than a pure tactical marking, e.g. on September 3 two of the nine Bf 110s shot down wore yellow markings. Of the two aircraft in question, the one coded 3U+KR of 7./ZG 26 wore its aircraft letter and spinners in white (the *Staffel* colour), plus yellow tail tips and stripes on the outside of the rudders (the *Gruppe* colour). The other Bf 110, whose unit identity was not made in the official British report, bore yellow wingtips and three yellow stripes on the fin. Only one other III *Gruppe* Bf 110 was lost that day, 3U+GT of 9./ZG 26 falling to the cannon armed Spitfires of No 19 Squadron at the same time as 3U+KR.

The wreckage of one other Bf 110 was examined on September 3, 3M+ML of 3./ZG 2. Apart from the aircraft letter being painted in the *Staffel* colour of yellow, no other additional markings were listed. Its camouflage was, however, a little more unusual. Normal dark greens were used for the upper surfaces, but the fuselage sides were described as light green with light blue-green for the lower surfaces. At some point in the battle the camouflage for Bf 110s is known to have changed from its existing bomber style to something approximating that of the single engined fighters. This is the first positively dated instance of such a variation and again it parallels a shift in tactical policy regarding the Bf 110 which was, at last, starting to operate with









Centre left: Examples of both camouflage schemes. Nearest the camera is 6M+TL of 3.Aufkl.Gr.(F)/11 and behind is 4N+TL of 3.Aufkl.Gr.(F)/22. In both instances the full code has been applied in black. Note also that the upper surface camouflage on the rearmost Do 17P is confined to the extreme dorsal areas. *H. Obert*

Bottom left: A Do 17Z F1+BH of 1./KG 76 in its camouflaged dispersal at Beauvais. Both the spinners and the aircraft letter are white. The *Staffel* emblem, a pistol armed red devil, is almost the size of a man. *E. Tusch*

Above: Operations at sea were largely confined to reconnaissance and rescue work, two of its workhorses are seen here. The Ar 196B, 6W+DN, belonged to Kü.F1.Gr.196 and wears standard 72/73/65 camouflage. Behind it is a He 59 wearing a four letter registration which identifies it as belonging to the *Seenotdienst*. *lBundesarchiv*

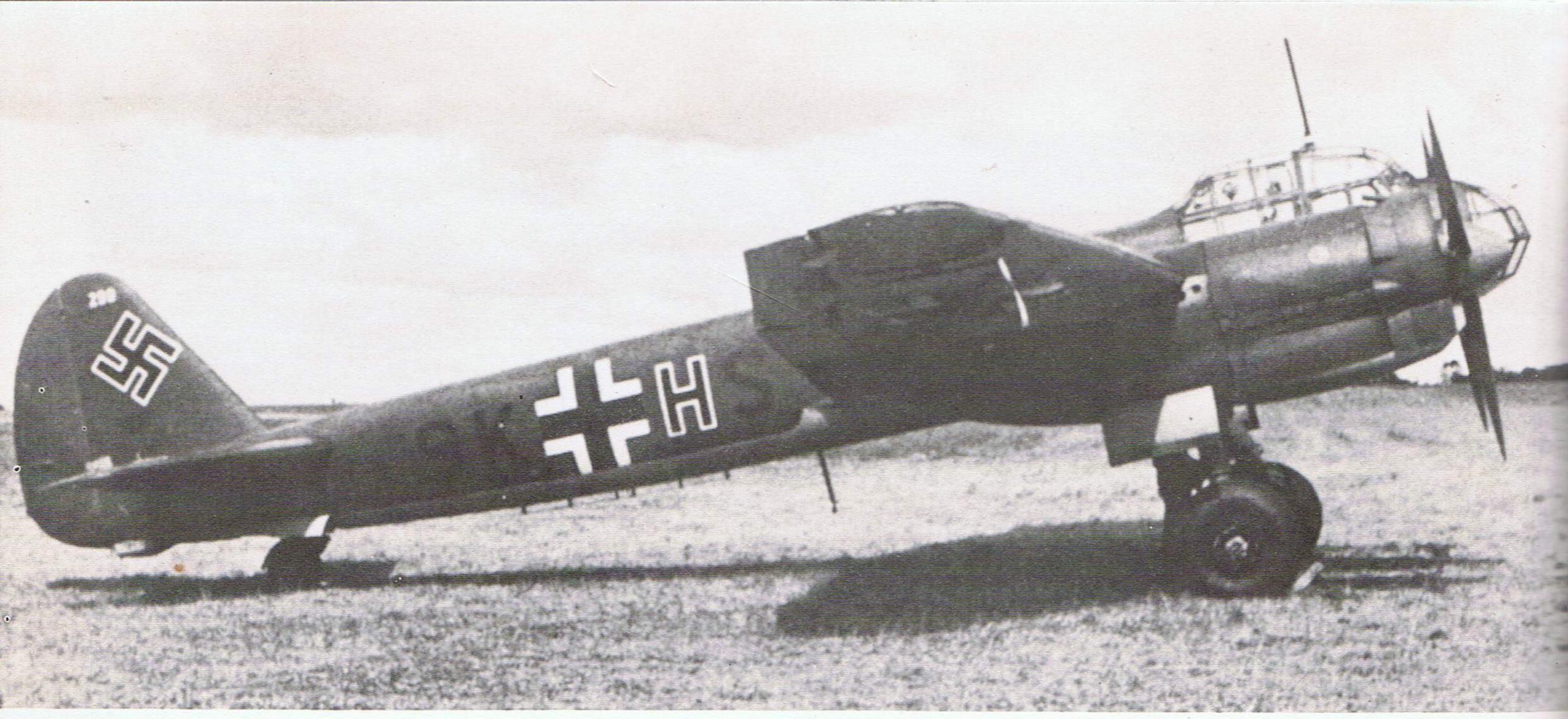
some degree of independence from the main bomber force.

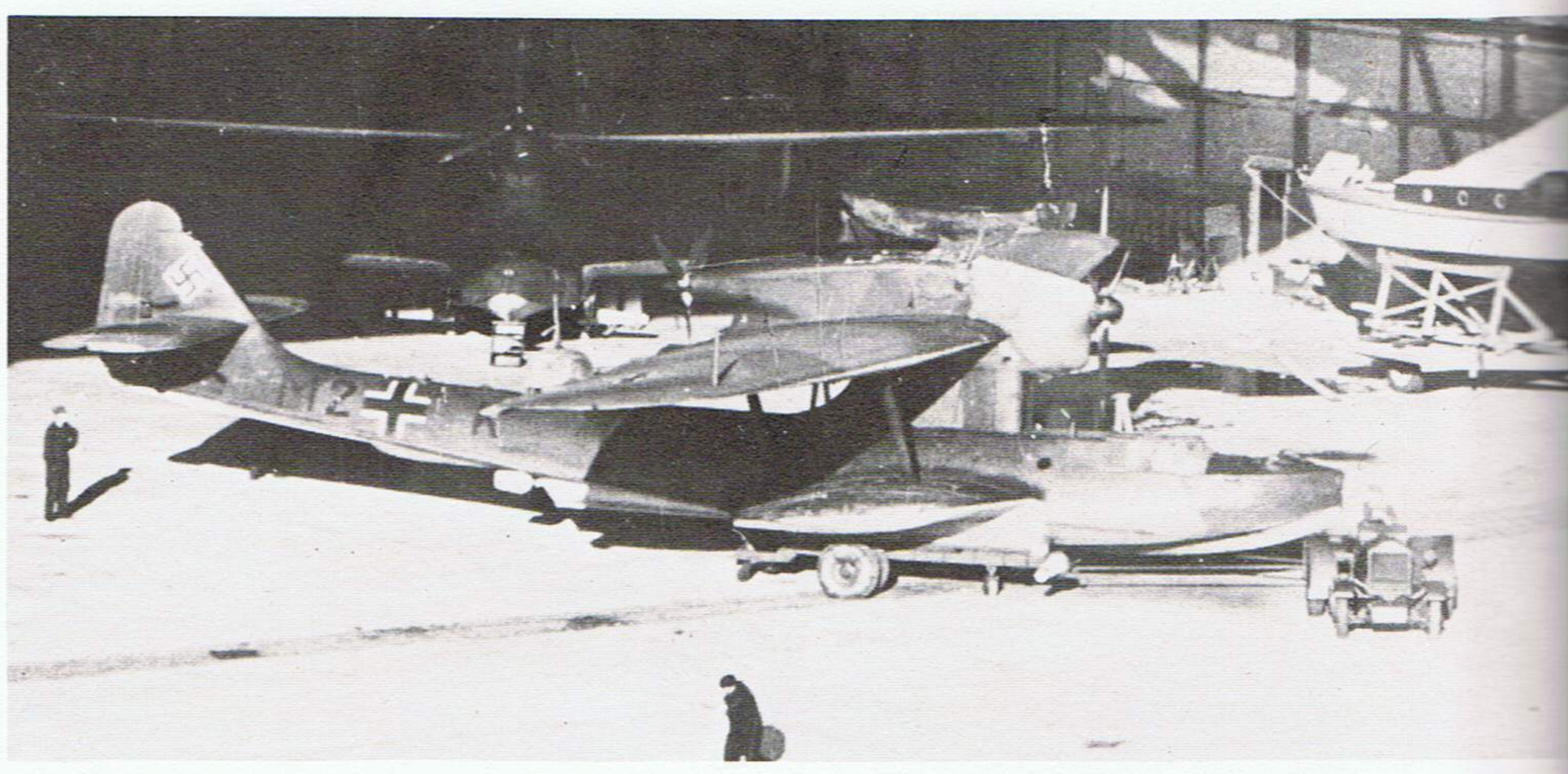
The rapidity with which the white tactical markings were applied, and the obviously intended brevity of their retention were reflected in the markings carried by *Uffz* Schulte's Bf 109E-4 of 7./JG 53, which was shot down on September 6. Coded 5 in white, the camouflage was described as mottled light and dark green and grey with a white spinner, cowling and rudder. A thick red band around the engine cowling had been overpainted. This reference to a red band was a form of marking peculiar to JG 53 which had been introduced as an aid to unit identity. The width of the band, which completely encircled the engine cowling at about its mid-point, varied, most reports mentioning dimensions between 10 and 12 inches. The first British report about this marking appeared on September 5 when a Bf 109E-1 from the *Stab* of II/JG 53 was examined. Camouflaged mottled grey and blue, with white wingtips, a red band encircled the engine cowling while the spinner was half red and half white. The actual *Stab* markings of –+–1> were somewhat intriguing and provide an example of the irregularities that occurred. As a II *Gruppe Stab* aircraft the horizontal bar aft of the *Balkenkreuz* was correct, but the other markings were a peculiar mixture of those applicable to a *Geschwader* adjutant and a 1A.

Other combinations of seemingly incorrect markings occurred at various times and places throughout the war, and there are indications that in some units, aircraft of the *Geschwader Stab* led *Gruppe Stab/Gruppe* formations, i.e. each *Staffel* within a *Gruppe* was led by one of the three *Gruppe Stab* aircraft, with a *Geschwader Stab* aircraft leading the whole *Gruppe* formation. Under such circumstances some form of additional marking appears to have been adopted by the specific *Geschwader Stab* aircraft. The necessary conditions for such occurrences would appear to have been when mass formations of fighters were used, such as over Britain and during the initial phase of the war against Russia.

Regarding the red band marking, several other JG 53 Bf 109s brought down were subjected to examination. In all instances these were from I and III *Gruppe*, a more positive identification being possible in the case of some 7 and 8 *Staffel* aircraft. The last recorded instance of the use of the red band marking occurred on November 2 when a damaged Bf 109 was examined, but at what point the marking was finally abandoned is not positively known.

Luftwaffe losses for August 31 had included a new mark of Bf 109, the E-7, a





type that was entering service with LG 2. This particular aircraft, W.Nr.5600, was operated by I/LG 2 and unfortunately no details of its markings were recorded. Two other Bf 109E-7s were brought down on September 6 both from II/LG 2, one falling in Herne Bay and the other, flown by *Fw* Gottschalk, came down in the Canterbury area. The latter aircraft was available for examination.

Its markings were something not previously recorded, a yellow letter C forward of the fuselage *Balkenkreuz* and a black triangle aft. The rudder was white as were the wingtips, although in the latter instance the yellow colouring of the previous tactical markings was discernible in places. The spinner was blue with white and black vertical stripes (rings). The general camouflage was two shades of grey on the upper surfaces and '. . .standard duck egg blue lower surfaces'. The 6./LG 2 emblem was also carried.

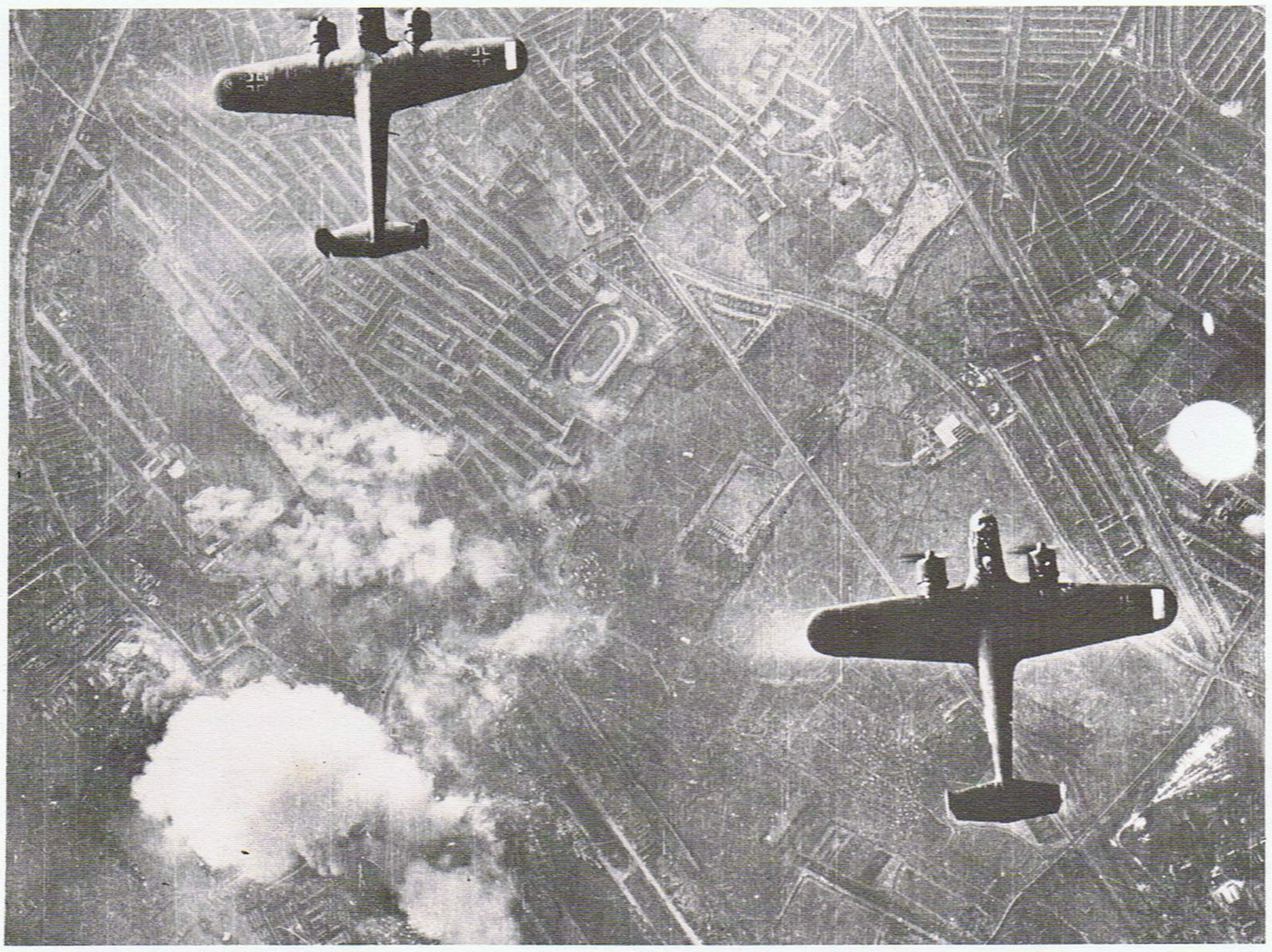
The black triangle marking was a new addition to the Luftwaffe markings system and identified aircraft belonging to a *Schlacht Gruppe* (Ground attack *Gruppe*), forerunner of the *Schlacht Geschwadern* that were to become predominent during the next two years. The adoption of letters in place of numbers was the other distinguishing feature, colouring following the established *Staffel* system. The code and the black triangle marking were always separated by the *Balkenkreuz* and always presented in the same order on both sides of the fuselage on a particular aircraft, i.e. with the code letters diametrically opposite each other. The order of precedence, however, was not fixed, the black triangle marking appearing both forward and aft of the *Balkenkreuz* on various aircraft, e.g. *Uffz* Mörschel's Bf 109E, brought down on October 7, wore a reverse combination with the black triangle, outlined in white in this instance, forward of the *Balkenkreuz* and a white F aft. Nose, rudder and wingtips were yellow.

Some degree of confusion appears to have attended the markings carried by a 6./LG 2 Bf 109 shot down by No 66 Squadron two days before Mörschel's aircraft. The code markings were a yellow letter M forward of the *Balkenkreuz*, with a black triangle followed by a vertical black bar aft. The appearance of the 6 *Staffel* emblem of a black cat wearing spurred boots and holding a lantern rules out the vertical bar being a III *Gruppe* marking as also does the use of yellow for this marking. Nose and rudder were yellow but the spinner was pale blue with a white tip, thus adding to the complete confusion of markings. As will be seen further on, both of the *Lehrgeschwadern* were to prove the source of code and marking irregularities.

Top: Ju 88 9K+HS, W.Nr.299 of III/KG 51 in almost 100% correct camouflage and markings. The code appears in black with the aircraft letter outlined in white, (it should be solid red). The spinners are painted in the *Gruppe* colour of yellow. */T. Hitchcock*

Above: A Do 18 of 2./Kü.Fl.Gr. 106 being towed out of its hangar at Norderney. At the time that the photographs was taken the aircraft lacked an identification letter in its code group i.e. M2+K. A protective canvas cover is fitted to the front engine. */Bundesarchiv*





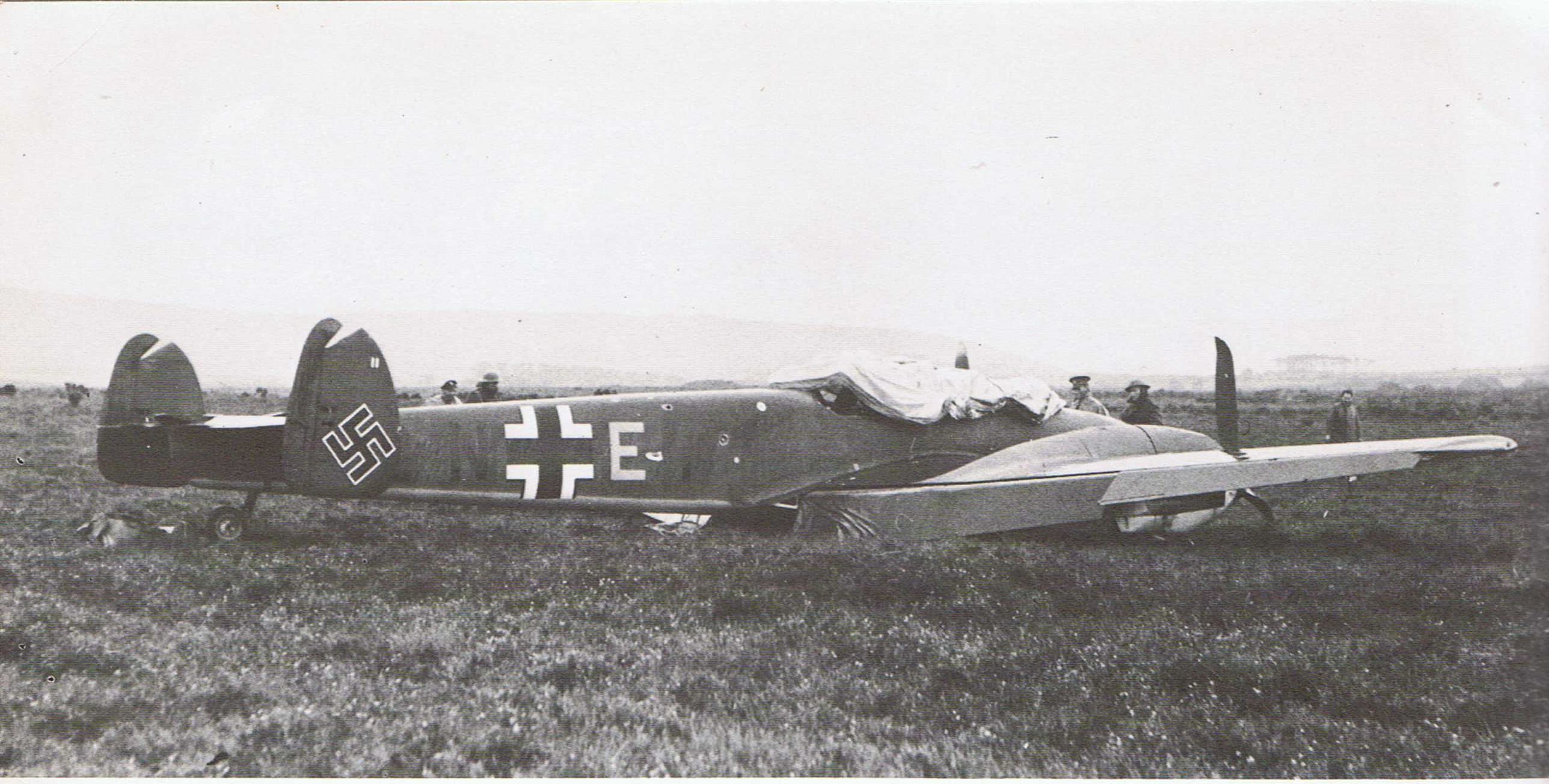
Above: Variety abounded amongst the aircraft finishes of the mid-battle period. Brought down on August 31, 1940, *Leutnant* Fronhöfer's Bf 109E-4, W.Nr.1184, of III/JG 26 carries both the *Geschwader's* Gothic S and the 9 *Staffel* emblem. The fuselage *Balkenkreuze* are the 1939 size with subsequently small code numbering (yellow 10 in this case), and reduced height III *Gruppe* symbol. In contrast the wing markings are the maximum permissible size. Both the spinner and the propeller blades are regulation 70 black-green. Camouflage on the fueselage spine and the horizontal tailplane is 71/02 (note the contrast on the elevators), but the wings are finished in only one colour which appears to be a slightly thinned coat of 71. (The intelligence report mentions only green). Both wing leading edges have a thin red line from the machine gun to the wing tip, broken half way by the stencilled legend *Hier Nicht Schieben* (Do Not Push Here). */Fox Photos*

Left: Reputedly taken over London during the evening raid of September 7, 1940, a pair of Do 17Zs from KG 76 display the tactical markings adopted for concentrated massed formation bombing attacks. On the original print it is possible to determine the horizontal white stripe across the starboard fin and rudder of the left hand aircraft; it also carries a black letter G, thinly outlined in white or yellow, on the port wing tip

The Bf 109E-7s equipping LG 2 were fitted with a fuselage rack capable of carrying either a 300 litre drop tank or an ETC 50 or 500 bomb. The latter load was the norm in this instance as people in Southern England soon learned. One interesting off-shoot of this version of the Bf 109E series was the fact that *Werk Nummern* for LG 2s initial aircraft came from blocks used for the E-4 production machines long since in service. In addition, both of the last two mentioned aircraft were listed in German records as E-4s, the conclusion being that some existing E-4s were converted to E-7 configuration.

Other markings made an appearance during the first hectic week of September, and several bombers shot down were found to be wearing their four letter factory registration, an occurrence not infrequent over the next few weeks as the daily pressure of battle saw replacement aircraft put straight into operations without even time to apply the appropriate unit codes. More exotic forms of markings were, however, about to make an appearance again as a direct result of battle requirements.

London, symbolically the heart of Britain, became the prime target listed in a new battle order for the Luftwaffe. It was



to be bombed by day and by night. *Luftflotte* 2 was charged with the daylight task while *Luftflotte* 3 concentrated on the night bombing aspect. September 7 marked the opening day of the new campaign, the operational orders calling for three particular bomber units to undertake an especially concentrated form of attack under the protection of a large force of escorting fighters.

The three *Kampfgeschwadern* were to fly in three parallel columns; the Do 17s of KG 76 on the left between 15,000 and 17,000 feet, the He 111s of KG 1 between 18,000 and 20,000 feet in the centre, and the Ju 88s of KG 30, plus those of II/KG 76, on the right flank at the same height band as the main KG 76 force. The battle order also contained the specific directive '. . . to achieve the necessary maximum effect it is essential that units fly as a highly concentrated force during the approach, attack and particularly during the return'. Other bomber units were used in the attack but they formed a second, less concentrated wave.

The result of the strict concentration, even of part of the force, paid obvious dividends. The RAF lost 42 aircraft to the Luftwaffe's 54, and of those 54 only one bomber from the first wave was actually brought down over England. (Three others from the force were damaged, two subsequently crashing in France with complete loss of life). The raids of the following days were mere pin pricks by comparison, the main weight of attack occurring after dusk.

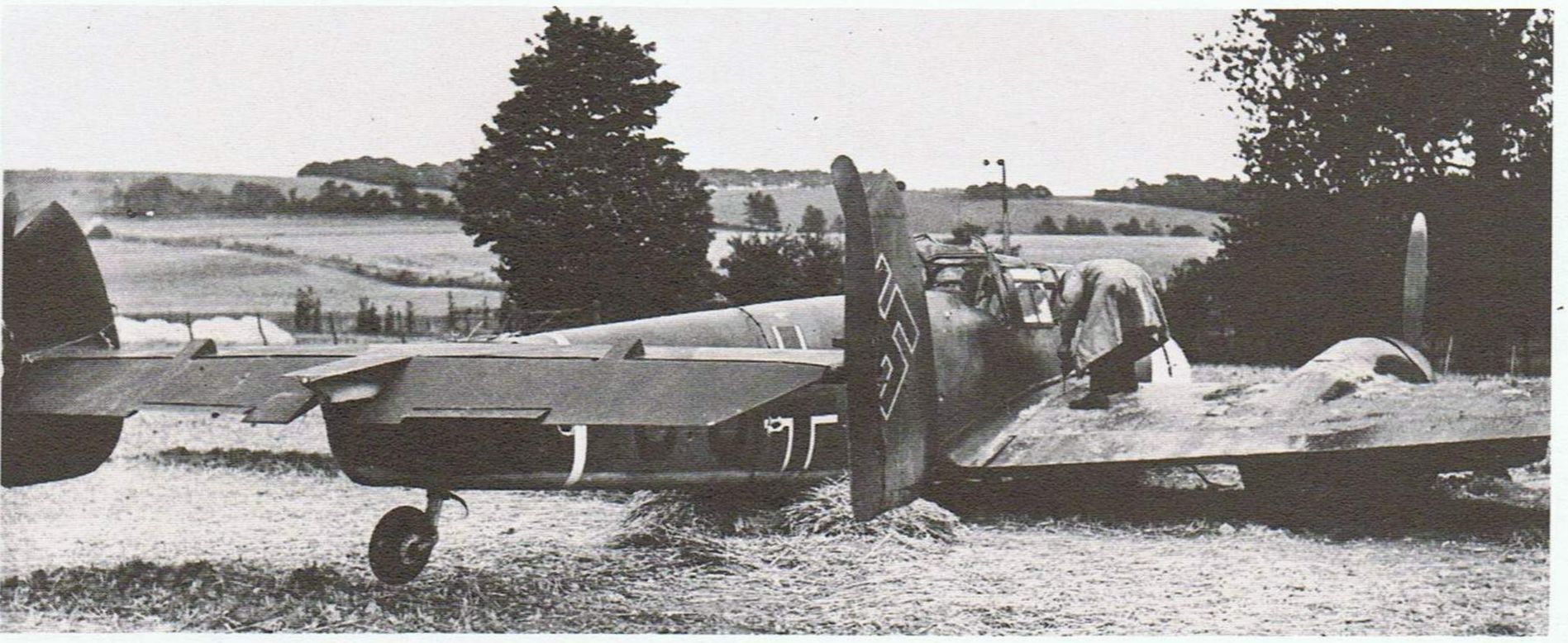
Aerial activity on September 9 was also spasmodic, the largest single raid being carried out by 26 He 111s escorted by 20 Bf 110s and 60 Bf 109s. Activity during the daylight hours of the following day was very restricted, a limited number of widespread nuisance raids being the result. By contrast the RAF mounted its own small scale daylight raid, Blenheims attacking Eindhoven airfield, destroying nine He 111s and damaging two more, all from II/KG 4, without loss to themselves. The Luftwaffe, however, maintained its nightly assault on the British capital.

Poor weather conditions kept Luftwaffe activity to a minimum on the morning of the 11th, but in the afternoon a heavy concentration of bombers attacked London. Their fighter escort, from LG 2 and JG 51, was forced to withdraw due to fuel shortage before the bomber force had completed its attack. This exposed the He 111s of KG 26 to heavy fighter attack during the run in to the target, seven bombers being lost and 10 badly damaged.



Above: Shot down on September 9, 1940 by a Hurricane of No 310 Sq., this aircraft illustrates the nonconformity of markings that existed in some Bf 110 equipped units during the battle. Coded 2N+EP its individual letter is yellow as would be expected for a 6 *Staffel* aircraft. As a II *Gruppe* machine, as indicated by its code, the colour red should have appeared on the spinner tips. Instead yellow, the III *Gruppe* colour, was used and German records list the aircraft as belonging to III *Gruppe*. Such inconsistencies are frequent throughout ZG 76's loss returns. Camouflage for this Bf 110C is standard in every respect, 70/71/65 with 70 as the propeller and spinner main colouring. Two kill markings appear on both fins. / *Syndication International*





Above, centre left: U8+HL of I/ZG 26, brought down on September 11, 1940, shows that a degree of code conformity existed amongst some Bf 110 equipped units. The aircraft letter H is applied in the 3 *Staffel* colour of yellow and each spinner wears a narrow band of white, the I *Gruppe* colour. Camouflage is standard 70/71/65 but both *Hakenkreuze* and *Balkenkreuze* are of the 1939 style and positioning. (W.Nr.1372 must have been a relatively old aircraft). The temporary nose marking shows signs of the haste with which it was applied. The narrow fuselage band however, was applied with care and apparently in permanent white, being intended as a long term *Gruppe* identification marking, a practice not uncommon amongst Bf 110 equipped units of the period. The small 3./ZG 26 railway engine emblem is just visible below the cockpit. */Kent Messenger*



Below left: Undoubtedly the best known Bf 110 photograph taken during the battle, and one that is historically very significant in the development of camouflage for this type of aircraft. It belonged to Aufkl.Gr.(F.)/14. Forced down on September 26, 1940, it wears camouflage of 71/02/65 with a soft mottling of both colours taken well down the fuselage sides. Note also that the application of the two upper surface camouflage colours on 5F+CM was done with a soft, wavy edged pattern and not the more usual straight edged segments. */IWM*





Above: Heavily mottled, this 3 *Staffel* aircraft wears camouflage similar in appearance to 71/02/65 but, as detailed in the text, precise identification of colours is often impossible where Bf 109Es are concerned. The rudder and undersurfaces of the engine cowling are yellow. */Ferenc Kovács*

When examined, one of the He 111s brought down, 1H+CB of the *Gruppe Stab* of I/KG 26, was found to be wearing two white stripes on both the port wingtip and the rudder. As the days passed more bombers, wearing combinations of stripes in either the colour white, yellow or 'salmon' pink, were to fall. The colours were the same three that featured in all Luftwaffe matters relating to unit identification. The paint used for these temporary tactical formation markings, for that is what they were, was 7120. This, however, was normally only available in the colours white, black and yellow (the first for tactical markings and winter schemes, the second for night operations and the third for tactical markings). White and yellow were thus available but red had to be 'manufactured' by tinting quantities of white with the standard red paint used for *Staffel* codes. The incompatibility of the two paint types probably added to the difficulty in obtaining a stronger shade than the pink recorded. Too much red paint would have made the markings difficult to remove.

Use of the markings was not based on a single *Geschwader* formation but rather on a single mass formation basis, and thus the three colours did not coincide with normal *Staffel/Gruppe* allocations. To give some idea of the numbers of aircraft involved in the mass formations of this period, one single frame of a movie film taken during the peak of the battle shows over 200 aircraft. The actual physical application of the markings varied with the aircraft type, He 111s and Ju 88s using spanwise wing stripes and vertical fin and rudder stripes while Do 17s used chordwise wing stripes and horizontal fin and



Far left, top: Full circle! *Fw* Bosche's white 2, a Bf 109E-1 (W.Nr.3465) of 4./JG 52 which was shot down on October 8, 1940, wears a complete top and side surface camouflage of 70/71 with bold yellow engine cowling and rudder. The spinner is black-green 70 with one quarter white. Detail photographs of the red cat on a white disc emblem reveal that it is a very unsophisticated application as compared with some other emblems seen during the battle.

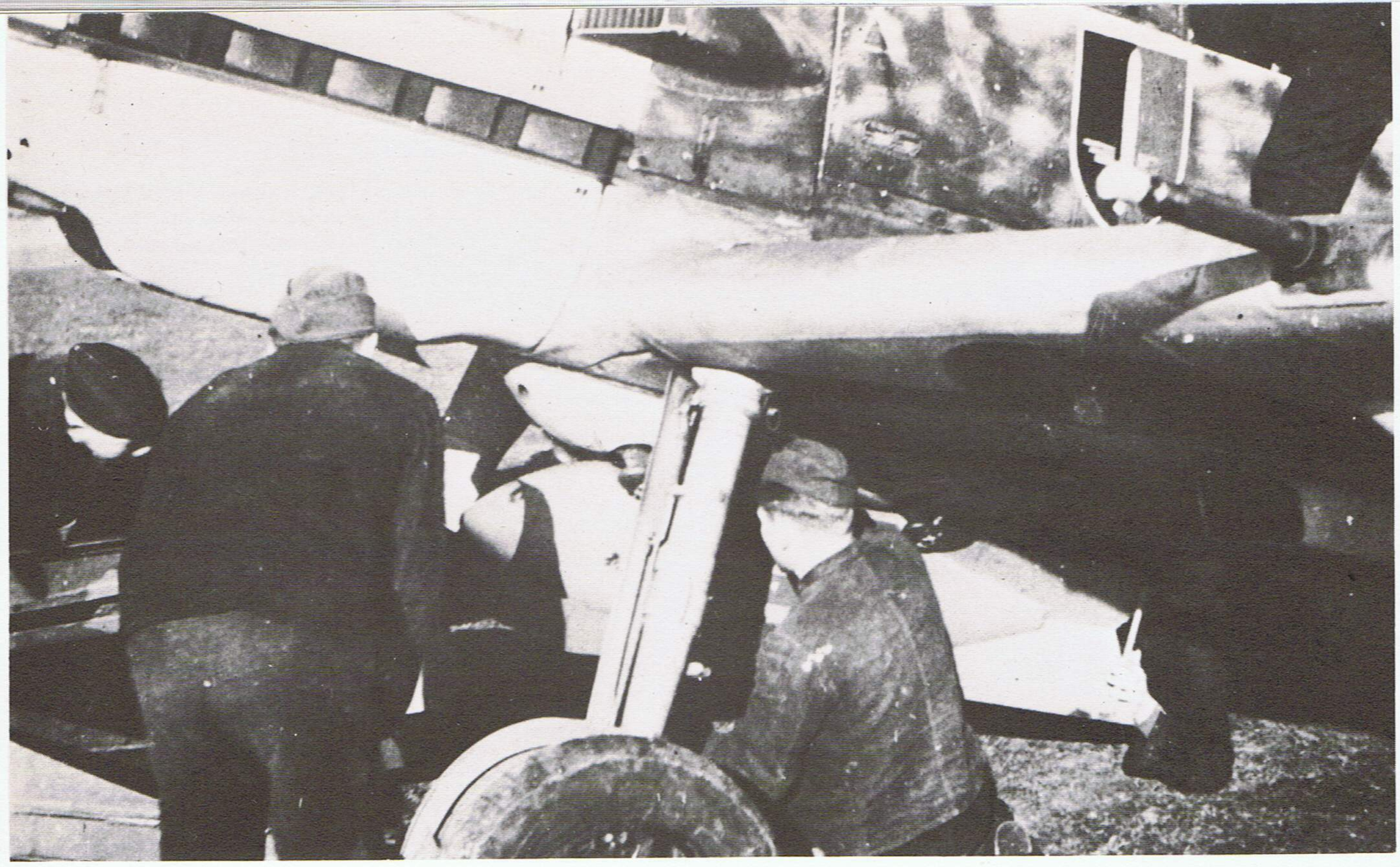
Left, below left: Shot down on October 27, 1940, *Uffz* Zimmermann's Bf 109E-1, W.Nr. 3576 was the subject of a detailed intelligence report. White 13 was a 7./JG 54 machine, the spinner being painted in the *Staffel* colour of white. Camouflage is described as darkish grey on the wings this colour being repeated as a dapple on the light blue side sufaces. Close examination of the side surfaces shows two shades of mottling, however, the darker matching the wing colouring while the lighter matches the camouflage just forward of the cockpit. The latter also matches the black-green colouring of the propeller blades. The lighter colouring above the *Balkenkreuze* is only marginally darker than the tone of the Khaki webbing and pack of the guard. The entire engine nacelle and rear half of the rudder is yellow./*Fox Photos*



rudder stripes. In addition, single, double and treble stripe combinations were used.

Positioning of the stripes was usually confined to one side of a particular aircraft, i.e. port wing and port side of fin and rudder and vice-versa, and was directly related to normal Luftwaffe formation practices. A double vee formation, each of 10 aircraft, formed the basic unit, and extended lines of these made up the massed bombing formations. Exceptions occurred in the case of individual formation lead aircraft whose markings were carried on both sides of the vertical tail surfaces. Descriptions of precise applications are not possible because of the daily variations to the battle order of the massed formations, but a theoretical example will help to illustrate the principle involved, e.g. a massed formation proceeding in three parallel columns would be allocated white for the left hand column, red (pink) for the centre column and yellow for the right hand column. Within the mass formation the leading elements would carry a single bar marking, the middle a double bar marking, and the rear a triple bar marking.

The earliest recorded use of these tactical formation markings reputedly occurred on September 7 when two Do 17s



Above: Loading a 65 coloured bomb beneath a Bf 109E of JG 52. The engine nacelle is yellow. *H. Obert*

Top right: Temporary night black, plus some form of unit manufactured night camouflage has been used to virtually obliterate all markings on this He 111. Only the fuselage *Balkenkreuze* and aircraft letter have been partly restored with what appears to be chalk, the letter E being neatly cross-hatched with narrow lines of white. *Bundesarchiv*

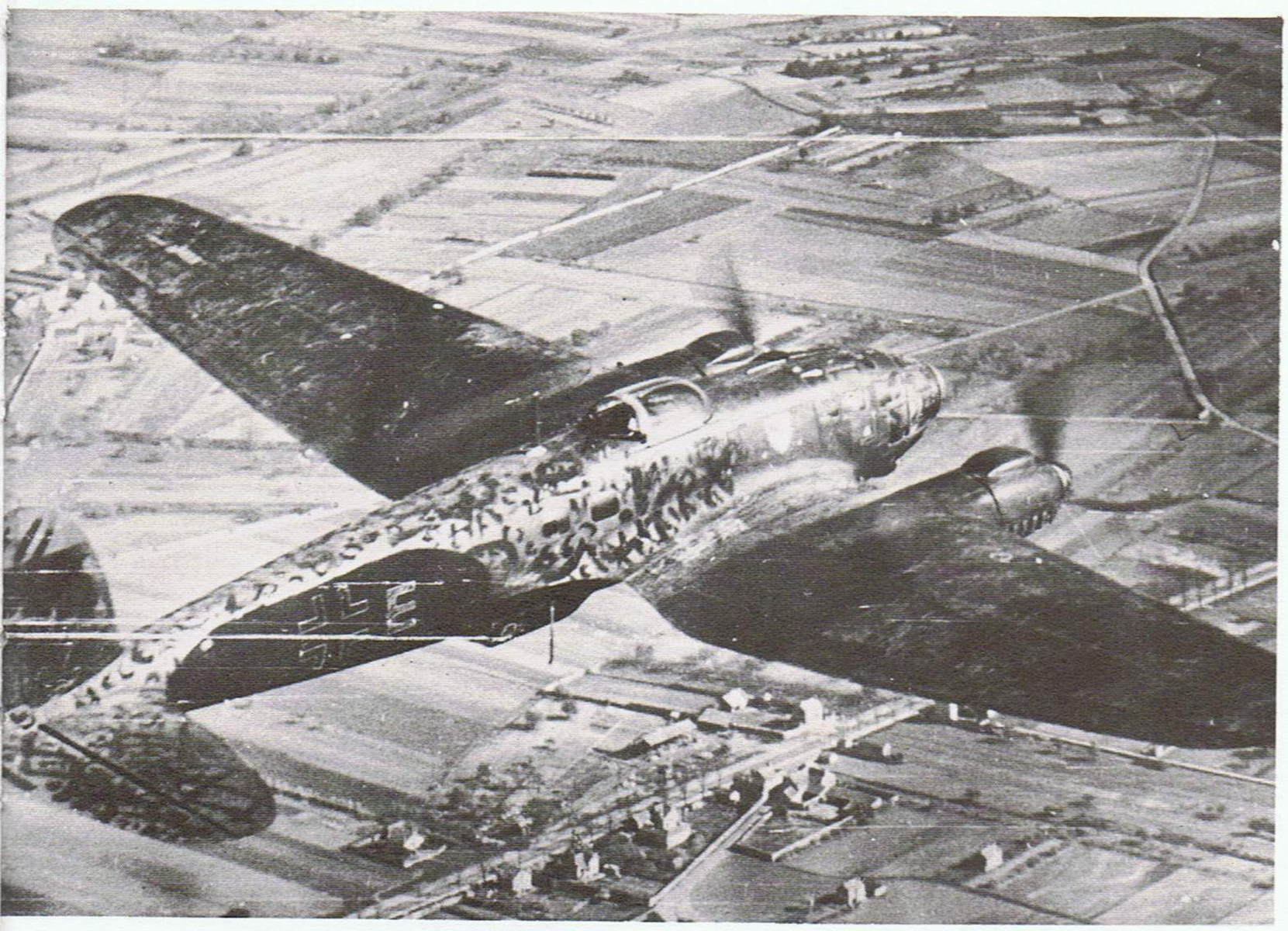
were photographed during the evening raid on London. The intelligence report of September 11 is, however, the earliest corroborated date. The last British official record of the use of this form of marking occurred on October 28 when a Do 17, 5K+CH of 1./KG 3, was shot down by two Hurricanes of No 17 Squadron. According to the report on the aircraft's remains its codes were all black and it had '. . . a large pink horizontal stripe on its rudders'. The crest carried by the aircraft was rather interesting, being described as '. . . a man's figure with cockatoo's head, carrying a bomb under left arm and an owl on his right hand. All on a light blue shield.' This particular piece of heraldry was the invention of the I *Gruppe Kommandeur, Oblt* Gablemann.

Most units used both a *Gruppe* crest and a *Staffel* crest, fighters often carrying both, while bombers, other than *Stab* aircraft, usually bore only the *Staffel* crest. On the occasions when both were carried by a bomber they were usually displayed on either side of the fuselage, e.g. a Ju 88, L1+GS of 8./LG 1, brought down on October 30 wore the *Kampfgruppe* crest of a red griffon on a white shield on the port side, and the III *Gruppe* emblem of three white swans on a blue shield, flying over the sea, on the starboard side. Codes were black, with the G outlined in white, and spinners red. Some *Kampfgruppe* crests were designed such that the main background colour could be applied in the appropriate *Gruppe* colour, *Geschwader Stab* aircraft carrying a three segmented coloured background.

The battle continued in all its ferocity throughout September, losses mounting to staggering proportions. Some anomalous markings appeared during this period. Among the 64 combat losses for September 27 were seven Bf 110s of LG 1, all from V *Gruppe*. Six of these were ordinary *Staffel* aircraft, i.e. L1+BH and L1+CH from 13./LG 1, L1+CK from 14./LG 1, and L1+Bl, L1+GL and L1+LL from 15./LG 1. According to Luftwaffe unit code structure these aircraft, in fact, bore codes appropriate to 1, 2 and 3 Staffel of I *Gruppe*, and yet their V *Gruppe* status was clearly established in the German records. In addition the British report on L1+CK revealed the letter C applied in green, outlined in white, and the tip of the spinners painted red, a direct reversal of the usual *Gruppe/Staffel* colour markings.

The remaining Bf 110 from this unit was L1+XB, listed in the German Records as belonging to V/LG 1 and was presumably a *Stab* aircraft. The British report recorded green *Balkenkreuze* on the upper surfaces of the wings and green and white spinners. Here again the code would normally have indicated a I *Gruppe Stab* aircraft, but I, II and III *Gruppe* of LG1 were equipped with Ju 88s and IV Gruppe with Ju 87s. Codes for the latter, where available in German records, were consistent with the normal *Staffel* letter allocations of U, V and W.

Erprobungsgruppe 210 also lost several Bf 110s, that day, among them S9+DH, listed in German records as a *Stab* aircraft. The code cross checks with the British report which also stated that the letter D was blue, outlined in white. The





Above: An even more rudimentary application of temporary black has been applied to these He 111s. Removal of the black from the lower areas indicates that the photograph may have been taken during the weekly removal and refurbishing of the temporary night camouflage

letter H should have indicated a I *Staffel* aircraft; to add to the mystery S9+JH, shot down in the same raid, was listed in German records as belonging to I *Staffel*.

Such enigmas seem to have centred principally on the Bf 110-equipped units, although a seemingly similar code mix up did appear on a Ju 88 that had been shot down on September 9. Coded 4D+KK, it was listed in German records as belonging to *Stab* II/KG 30. The last letter K identified 2 *Staffel* under normal circumstances and the code colouring bore this out; the first K was red, outlined in white, the second K black, also outlined in white. The spinners were red. In this instance the aircraft bore all the correct markings for a 2 *Staffel* aircraft and logic points to the aircraft having been operated by a *Stab* crew, most probably due to lack of an available replacement aircraft for the particular operation. The Bf 110 code mystery is not so easily solved.

September 15 1940 marked the climax of the battle. From that point onward the fury of the Luftwaffe's onslaught by day gradually eased, paused and finally dwindled away virtually to nothing. It did not cease entirely, the introduction of bomb carrying Bf 109s in force keeping Fighter Command's crews busy, but the main heavy bomber threat had gone. Night attacks continued unabated and with a frustrating degree of immunity for the attackers.

Erprobungsgruppe 210 had become highly successful as a precision bombing unit, with its Bf 110s, doing much to vindicate an aircraft type which had earned an unjustified reputation through mis-use earlier in the battle. The success of these fast, light bombing tactics, which were also being emulated by LG 2 with its Bf 109E-7s, led to the order that one Bf 109 Gruppe from each *Jagdgeschwader* in *Luftflotte* 2 was to be equipped with bomb racks. The results were poor in terms of actual deliberate damage to specific targets, but the force did, as stated, keep Fighter Command heavily committed.

The story of the night bombing offensive was very different and a considerable amount of damage was achieved. Camouflage for the earlier night operations of the campaign had been organised at unit level, methods, materials and style of application varying in the extreme. Some units merely operated their aircraft without further embellishment to the existing day camouflage, encouraged to do so, no doubt, by the paucity of opposition offered by the fledgling British night fighter force. Others used crude applications of soot and water, or soot and oil, to cover the upper surfaces while lower surfaces were painted out with 7120.22, the temporary paint pigmented black. Field conditions during the winter months could not have been less conducive to an almost continuous weekly schedule of painting and scraping. (See Appendix 2.)

The night of December 29/30 marked the climax of the night bombing campaign, when London received its most disastrous raid to date. The bombing was to continue but never again would the result be so devastating. The worst had passed and the Luftwaffe, despite the courage and tenacity of its crews, had failed.

The War in the West

During the closing months of 1940 the daylight offensive over Britain had given way to a nocturnal onslaught, a transition that had caught the Luftwaffe unprepared in some respects.

No provision had been made for extended, continuous night operations and thus only the temporary night finish 7120.22 was available. As mentioned earlier, this had distinct drawbacks, and unit-devised night schemes served only as stop-gap palliatives. A permanent solution appeared early in 1941 when two new paints were issued to field units of the Luftwaffe. The new colours, 7124.22 permanent black and 7125.65, were to be used in conjunction with the temporary black finish 7120.22 to allow rapid deployment of aircraft for day or night operations.

The prosecution of night bombing by the RAF stimulated the growth of the joint defensive/offensive Luftwaffe night-fighter force. Earlier efforts to fill this role had relied on aircraft quite unsuited to the task. By June 1941, however, I/NJG 1 had been formed, equipped with the versatile Bf 110; it was the forerunner of a steadily expanding night-fighter force. While the Bf 110 was retained primarily for defensive duties, Do 17s and Ju 88s were employed on intruder operations.

Initial night-fighter intruder camouflage consisted of an application of black to all upper and side surfaces with lower surfaces remaining in blue-grey 65 these being overpainted with temporary black as required. This scheme was rapidly phased out and an overall finish of permanent black used in its place. Code letters were applied in grey 77. This scheme was to endure until, like their British counterparts, the German camou-

Below left: Herbert Ihlefeld was the *Gruppenkommandeur* of I/LG 2 at Calais-Marc when this photograph of his Bf 109E-3 was taken on March 13, 1941. The rudder carries 32 kill markings on the dark-green background of the original camouflage. Only the areas above and below have been painted yellow, a common practice where kills were recorded. On the tailplane and sections of the wings can be seen the original camouflage of 71/02 which has been heavily oversprayed with a dark coloured mottle. The fuselage also shows evidence of overspraying. The wing *Balkenkreuze* are of correct size but wrong proportions, having wide white surrounds. / *Frank Smith*

Top right: Far to the north in Norway a Bf 109E-4 from the *Stab* of 11/JG 77 basks in the spring sunshine. Camouflage of this type was common to most single engined fighter aircraft based along the western seaboard during 1941. This aircraft also wears a yellow rudder. *H. Obert*

Centre right: A factory fresh early production Fw 190A-1, W.Nr.067, shows the limited form of mottling introduced at production centres early in 1941.

Bottom right: The thirteenth long wing Fw 190A-0 used for service evaluation trials by 5./JG 26 personnel at Le Bourget. The kill markings had been transferred from the pilot's previous aircraft, a Bf 109E, and included a Curtis Hawk, a mixture of Hurricanes and Spitfires and one Wellington. The rudder had been over-painted in yellow obliterating the very soft mottle similar to that just visible on the fin. Note the style of application used for the *Werk Nummer*.









flage experts realised the superiority of a lighter colour scheme – the night sky is rarely pitch black.

With the stabilization of the situation along the western seaboard of Europe the Luftwaffe withdrew most of its fighter units, leaving the coastal defences in the hands of JG 2 and JG 26, based in France, JG 1, based in Holland and JG 5 and JG 77 in Norway.

Offensive operations were pursued by the bomber and anti-shipping units, fighter units being primarily engaged in opposing RAF fighter sweeps and Bomber Command's daylight shallow-penetration raids.

Camouflage for the fighters remained variations of the standard schemes plus the unofficial blues and greys of the previous autumn and winter which were mixed and applied by the units. *Jagdgeschwader* 5, however, did exhibit a camouflage variation as explained further on. Little change in tactical markings was observed during the late winter and early spring. Yellow engine nacelles and rudders were still in vogue but JG 1, at least initially, also used white wingtip and rudder markings, a practice not seen since the previous September.

The reason for these extra markings is not definitely known, but it may possibly be related to this unit's geographical location astride the main bomber route into Germany. Retaliatory raids by RAF Bomber Command were a potential threat that could not be ignored. The shallow penetration raids on occupied territories in daylight might well have prompted fears that daylight penetration raids might also be attempted against Germany itself. Knowing the obvious limitations facing Bomber Command, the route over Holland, favoured by night, would also be the most logical entry point for a day raid. The additional markings were dispensed with during the late spring which lends some credence to the conclusions drawn; Bomber Command by then having demonstrated its reluctance to carry out daylight bombing raids in force against targets in Germany. (A similar set of tail markings in white, but including the fin area as well, was to appear on aircraft of JG 1 and other units engaged in daylight defence operations but this was still in the distant future).

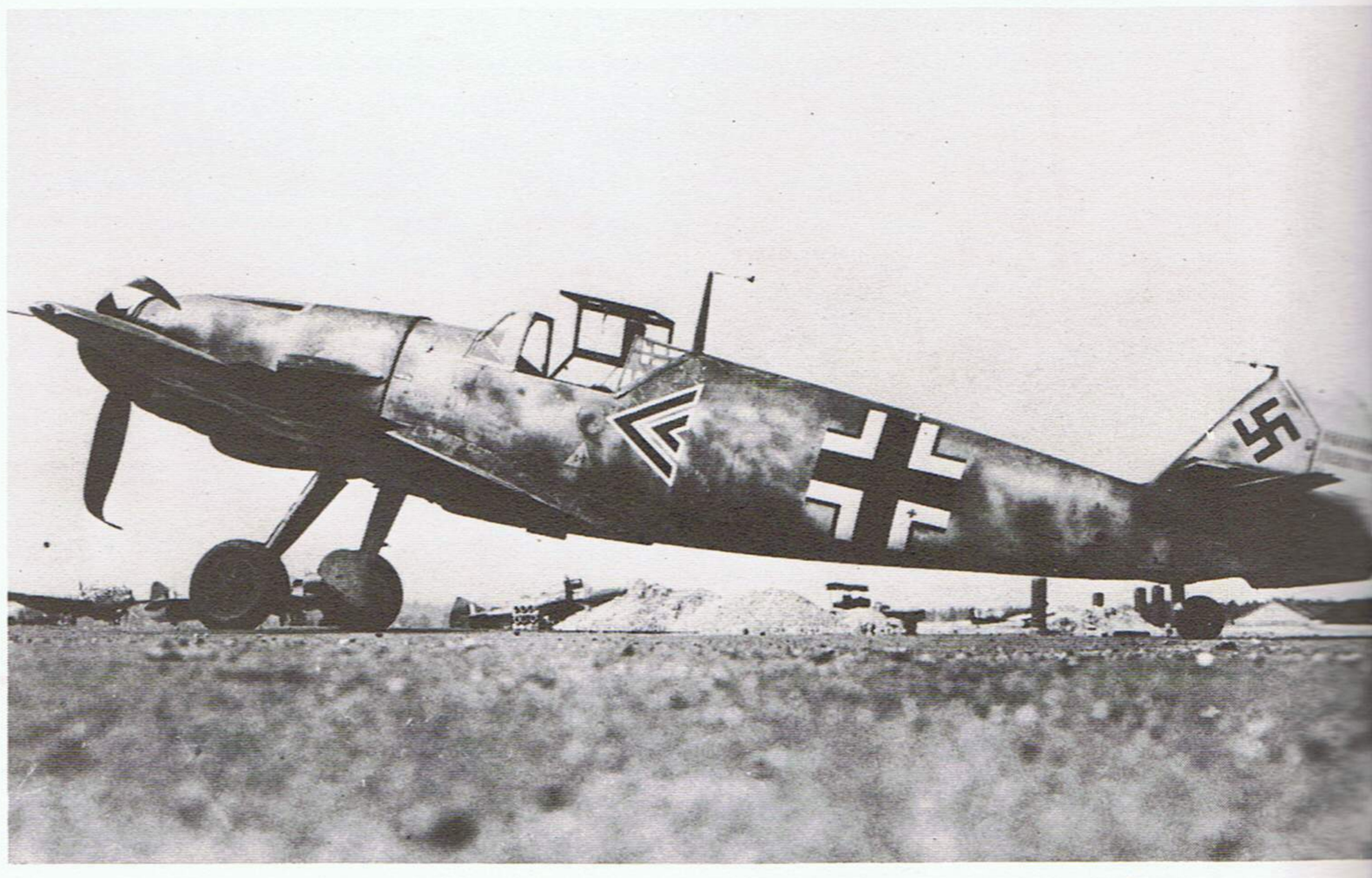
Deletion of the extra tactical markings coincided with the abandonment by JG 1 of its very high demarcation line used for upper surface camouflage colours and the reintroduction of yellow for rudders. Fuselage sides were mottled, using a combination of the upper surface colours.

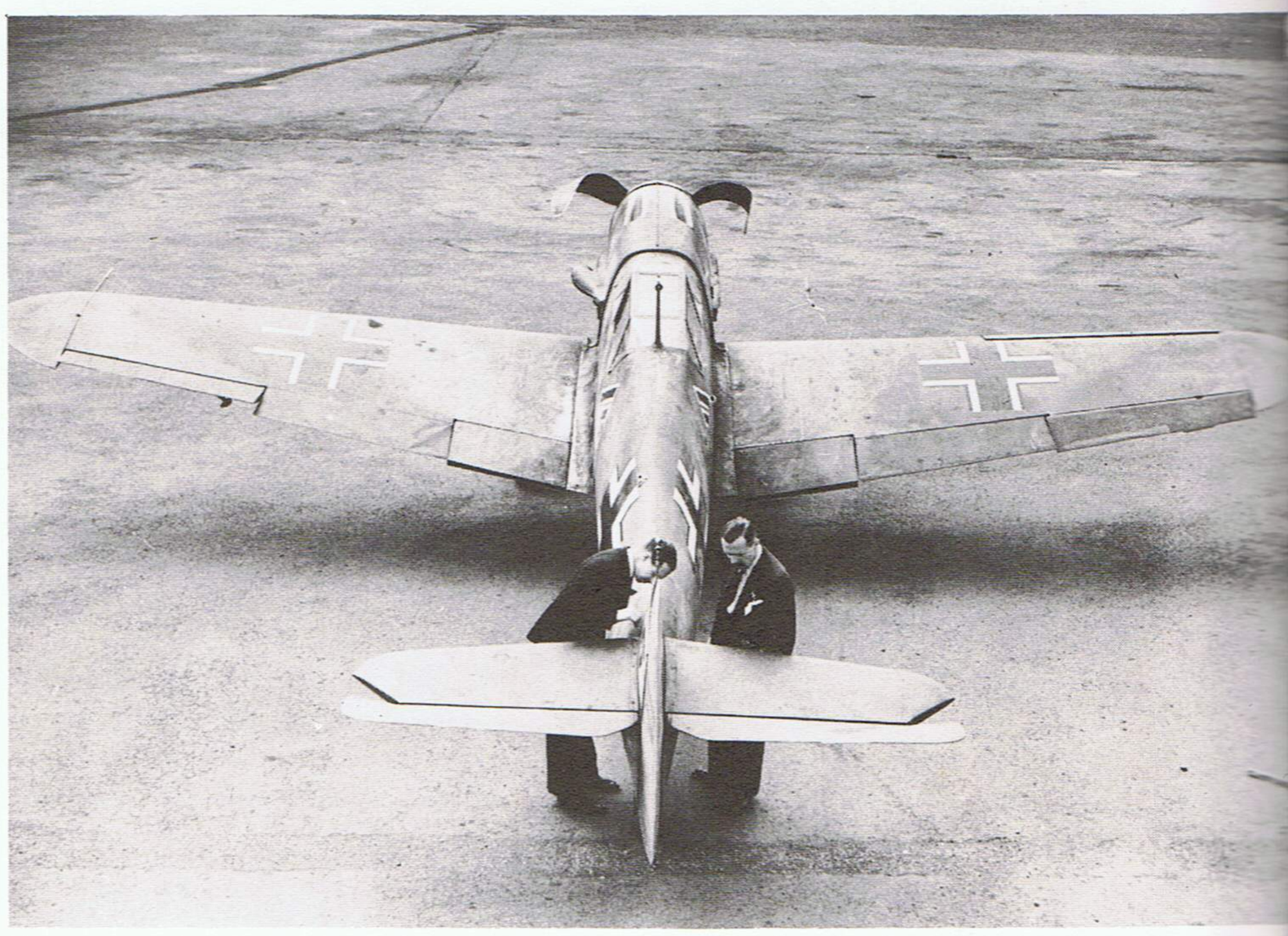


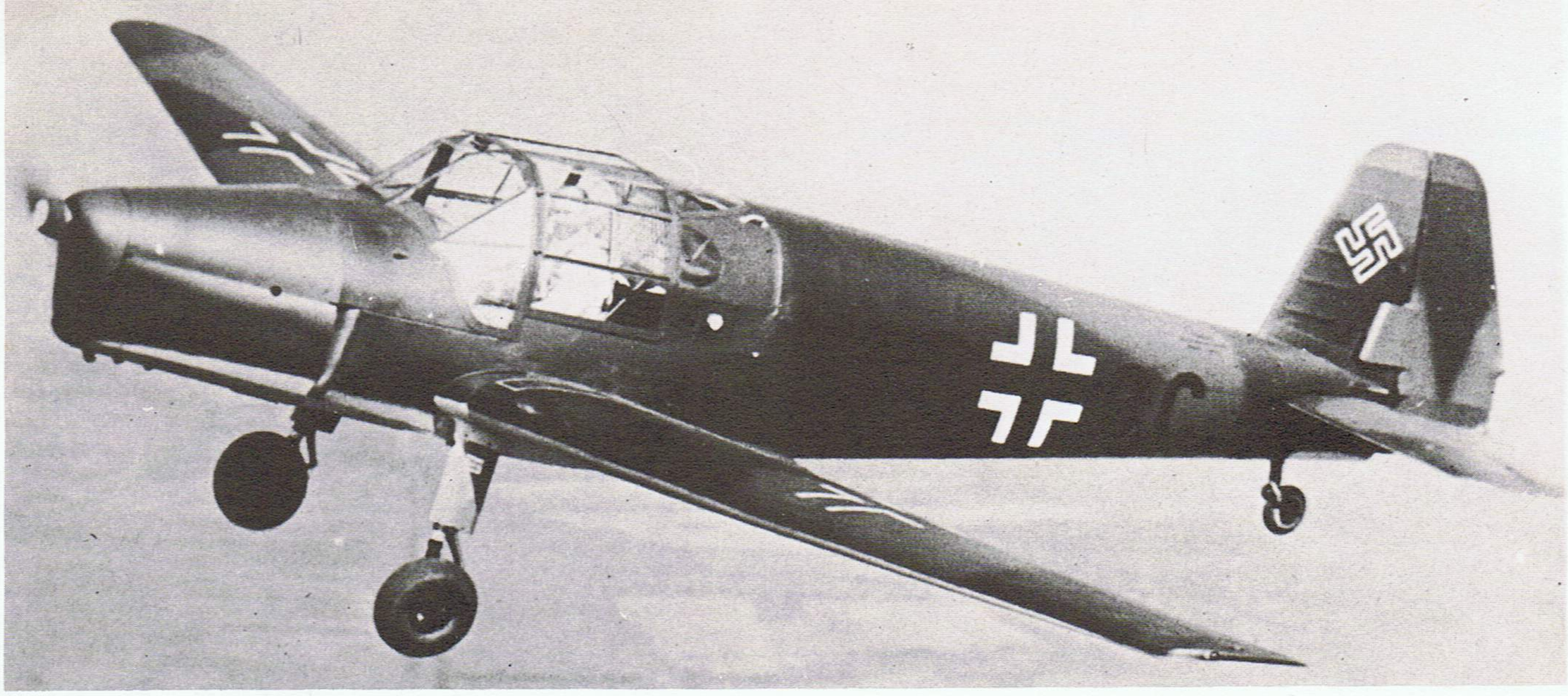
Spinner colours were still prevalent amongst single engined fighter units, but whereas replacement aircraft had formerly been delivered with 70 colour spinners, those now leaving the assembly lines wore one quarter of their spinner coloured white. This became standard practice for the remainder of the war and, despite the issue of an order relating to spiral markings in 1944, single engined fighters were found on the assembly lines in 1945 wearing spinners with one quarter white. (The optical effect produced under rotation was an excellent air to air identification aid during aerial fighting). Some units simply retained the application while others repainted the white segment with the appropriate *Staffel* colour. Others either added their *Staffel* colour to the tip of the spinner or repainted the whole spinner.

During May the first of the improved Bf 109Fs began to reach III/JG 26. The following month supplies of the new Fw 190 fighters arrived on the Channel coast. Evidence points strongly to this being the point of change to a new camouflage scheme of greys as detailed further on. No specific change-over date has been found amongst the surviving records but an official order relating to aircraft paint finishes, TAGL IP 10g Nr. 18/41 Ifd. Nr. 363/41, was issued on June 24, 1941.

Retrospective painting of aircraft already engaged in front line duties was slow, but new deliveries from the manufacturers wore the revised colour scheme. The use of such colours, whilst other maritime patrol aircraft retained the old 72/73/65 scheme, seems anomalous at first glance. The answer, however, is found in the different types of duty and operating techniques. Convoy shadowing, mine laying and anti-shipping bombing/torpedo attacks were all basically low-level operations. The darker colouring was







Above left: The improved Bf 109F-2 began to re-equip the two Channel based *Jagdgeschwadern* in the spring of 1941. The extensive use of yellow on the engine cowling, as well as the rudder, indicates that this shot was taken shortly after the type entered service. The fuselage sides have been lightly oversprayed with what appears to be 02 colouring, part of the rather stark 76 colouring being visible below the tailplane. *Real Photos*

Left: Perhaps the two best known photographs of a Bf 109F-1, they nevertheless present a unique coverage of both the camouflage and markings disposition of the period. *Hptm* Rolf Pingel was the *Gruppenkommandeur* of I/JG 26 when he was forced down near Dover on July 10, 1941. The yellow rudder of his aircraft carried 22 kill markings in red. The very soft edged application of 74/75 colouring on the upper surfaces can be seen; fuselage sides, however, show a heavy mottle in 74 over the pale 76 colouring. Some secondary mottling in 75 can also be seen in few areas. */IWM*

Above: Communications aircraft usually wore a camouflage scheme of 70/71/65; this Bü 181 TP+CC, however, wears 71/02/65. Aircraft engaged on communications duties were required to carry tactical markings appropriate to the theatre of operations where they were operating. Lack of any such markings indicates that this aircraft was photographed within Germany.

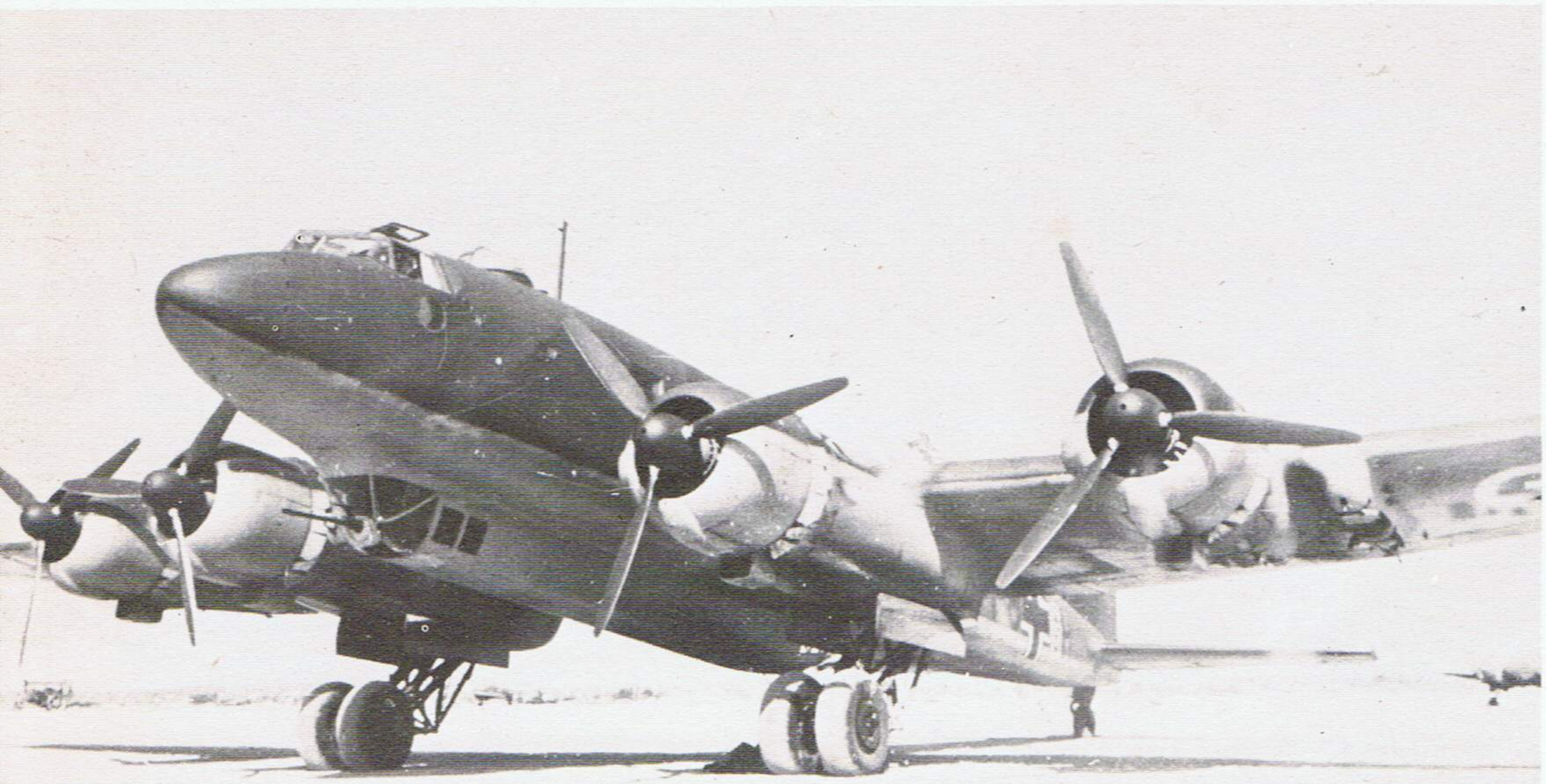
thus advantageous since enemy fighters usually operated at higher altitude. Higher altitudes required a far different form of camouflage, something to blend the aircraft into the immediate sky region or the distant ocean seascape. Grey tones were far more practical for the latter purpose, a realisation obviously shared by the RAF who changed their fighter camouflage colours to dark green and ocean grey during 1941.

Offensive operations were confined mainly to efforts by the anti-shipping units. KG 40, equipped with Fw 200s, had been highly successful throughout 1940 and early 1941, but increasingly effective counter measures eventually reduced their role to that of convoy shadowing. Consistent with this change was a modification to the fuselage *Balkenkreuz;* the black central area was increased to reduce the width of the white border whilst still retaining the overall dimensions. This modification appears to have been unit-originated in an attempt to increase the effectiveness of the camouflage. Unlike KG 40's original Fw 200s, later deliveries had been received wearing standard 72/73/65 in place of the earlier 70/71/65.

New life-blood had been injected into the unit with the introduction in March 1941 of the very efficient Do 217E-1. II/KG 40 completely re-equipped with this subtype, becoming operational from Soesterberg in the spring. Shortly afterwards, they appear to have been singled out for field evaluation of a revised form of camouflage for anti-shipping operations. The colour 02 was substituted for the 65 of the undersurfaces and extended right up the fuselage sides and vertical tail surfaces. The 72/73 coloured camouflage was confined to the extreme dorsal plan view areas. Lower wing surface *Balkenkreuze* had their black edging removed while those on the fuselage and upper wing surfaces were reduced to a simple white outline variety. Codes were deleted either in their entirety or just the aircraft code letter was retained and the codes were re-applied across the fin in miniature white characters separated by a hyphen. In some instances even this miniature coding was reduced to simply the last two letters of the code group.

This type of camouflage application was very similar to that used by RAF Coastal Command's Whitleys and Sunderlands, but unlike that organisation, the Luftwaffe abandoned its trial schemes fairly rapidly and returned to the old 72/73/65. However, the use of the miniature coding across the fin remained in vogue, extending to other units based in the Low Countries, and was often displayed along with full-size fuselage codes. Some 4./KG 40 Do 217Es eliminated the *Hakenkreuze* completely, replacing them with the miniature codes mentioned. This does not appear to have been intended as a temporary measure because 73 coloured paint was used for the overpainting process.

With the introduction of the Fw 190 into JG 2 and JG 26, the former unit seems to have all but abandoned its use of red for spinners, a practice linked to the unit's historical connections. Red colouring for rudders, so often quoted in connection with this unit, has been hard to substantiate, 'authenticated' accounts of this practice failing to stand up to close scrutiny. Odd examples that could possibly be red have been noted but the practice, if it did occur, was not general in application. Perhaps one of the most photographed but least accurately documented Fw 190s was that of *Oblt* Faber, adjutant of III/JG 2, whose aircraft was captured in June 1942. Yellow was used beneath the lower engine cowling and on the rudder, not red as so often misquoted.



Left: F8+GH, a Fw 200C of I/KG 40 shows the enlarged centre to its fuselage *Balkenkreuze* and the application of the aircraft letter beneath the wing in the 1 *Staffel* colour of white. Many aircraft of KG 40 carried the entire code beneath the wings with all but the aircraft letter in black.

Tactical markings applied to aircraft operating along the western seaboard of Europe varied with the operational area of command to which the aircraft belonged. Clarification of the areas, colours, and aircraft types might be useful at this point.

All single-engined day fighters based along the coast of France and the Low Countries used yellow on their rudders and on, or under, their engine cowlings. All other aircraft-bombers, reconnaissance, weather, anti-shipping aircraft and night fighters – wore no form of tactical marking. This also applied to the same categories of aircraft under the control of *Luftflotte* 2, which encompassed part of the Danish coastline.

Norway, however, came under the control of *Luftflotte* 5, a command soon to absorb the Baltic states with the opening of the offensive in the east. A wide variety of aircraft operated over the cold, dark, northern waters of the Arctic and Baltic seas; Ar 95s, Ar 196s, Bv 138s, Do 24s, He 59s, He 60s and He 115s, all of which wore standard 72/73/65 camouflage regardless of their specific duties. A yellow fuselage band and yellow wingtip lower surfaces were also common to all, variations occurring only with the disposition of the fuselage band. Many units complied with the regulations but tried to retain the full effectiveness of their camouflage by placing the yellow fuselage band immediately behind the *Balkenkreuz*, thus making the band barely visible except when viewed from directly above or below. The lone representatives of the single-engined fighter were two *Gruppen*



Above: The aging He 59 remained the mainstay of the sea rescue service; RC+BN carries the emblem of one of the *Seenotgruppen*. Precise identification of this particular emblem remains unsolved but it has also been noted on a Do 24T. It possibly identified either 1 or 2. / *Seenotgruppe*.

of JG 5 equipped with Bf 109Es. This unit was distinctive in its use of camouflage, the Bf 109Es adopting 72/73/65 camouflage with yellow rudders and lower engine cowlings. The upper surface colours were taken right down the fuselage sides in similar fashion to the other aircraft types operating in the area. JG 5 did eventually adopt the 74/75/76 colour scheme, but not for some considerable time. Herr William Berge kindly supplied actual fabric samples from this unit's Bf 109Gs and examples of several camouflage greens were found under the grey top coat.

Declining aerial activity against Britain in 1941 had seen many units withdrawn to Germany for rest and refitting. The rest aspect was brief for most, a few units remaining for home defence duties, but the bulk were transferred to other theatres of operations. Camouflage remained un-

changed although fighter aircraft were now being received direct from the factory with mottled fuselage sides as standard finish.

One particular unit, JG 54, showed distinct individuality throughout its career with regard to camouflage. During the period of its withdrawal from operations over Britain and its transfer to the Eastern Front, camouflage on its Bf 109Es was modified to what can best be described as a stone-wall effect. Top surfaces were finished in 70/71, or 71/02, but the 70 colour was 'bled' down the 65-coloured side surfaces like a mortar seam, the enclosed area being almost completely filled with a soft-sprayed application of 71, or 02. This system of camouflage was retained by JG 54 when first re-equipped with Bf 109Fs, only to be replaced by an equally original scheme later in the Russian campaign.

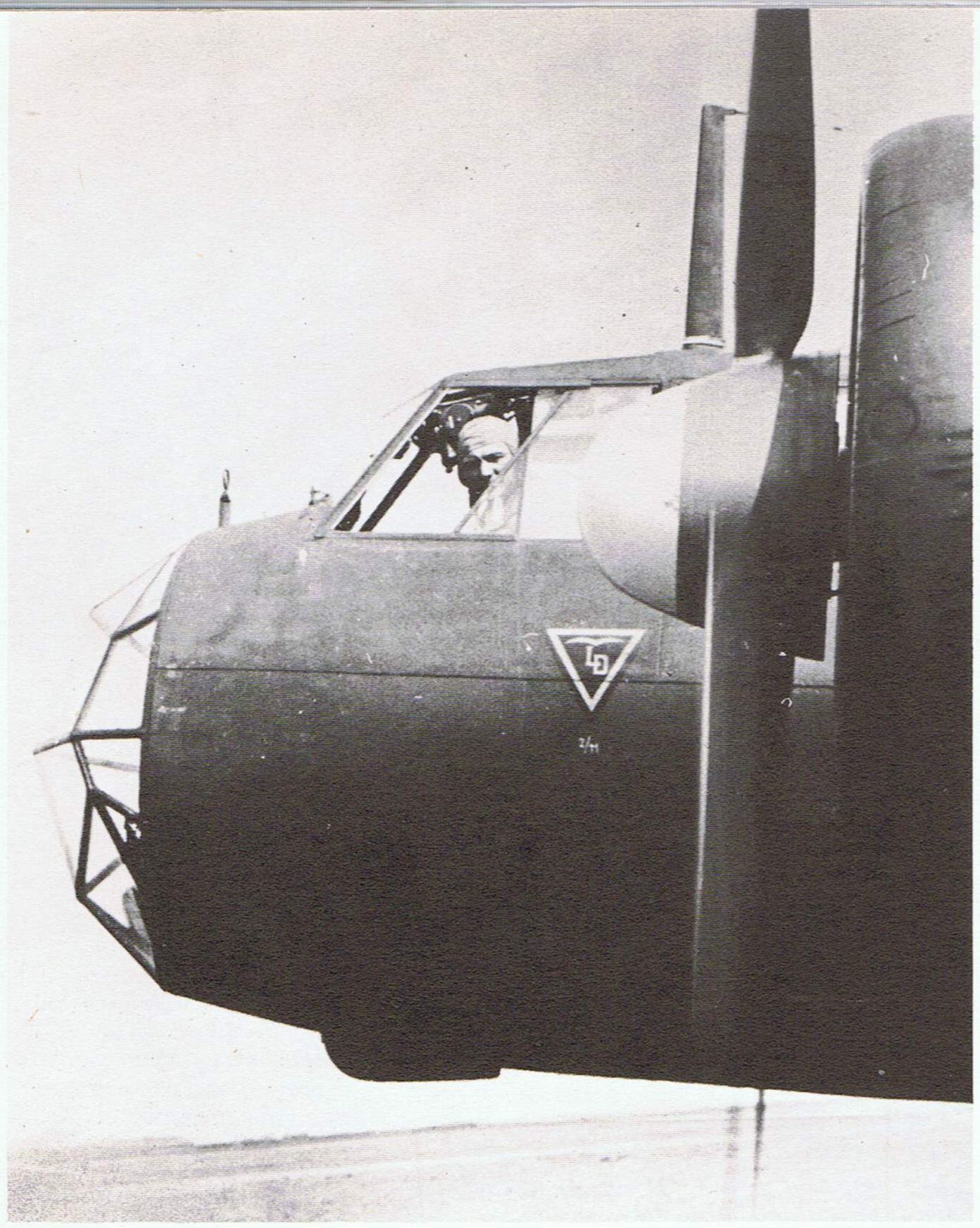
In November 1941, L.Dv.521/1 and 2 were re-issued with amendments dictated by the progress of the war; the two previous intermediary documents, TAGL IP 10g Nr. 8/40 Ifd. Nr. 439/40 of 24.12.40 and TAGL IP 10g Nr.18/41 Ifd. Nr.363/41 of 24.6.41, were superseded. The re-issue summarised all official changes that had come into effect since the 1938 edition. The colours 61, 62 and 63 had long been discarded as also had the use of the colour 02 as an overall finish for sea based aircraft (the actual colour recorded was 04, an obvious printing error as all yellow seaplanes had never been in vogue!). All land based bombers were to use the colours 70 and 71, sea based aircraft 72 and 73, fighters and heavy fighters (i.e. *Zerstörers*) 74, 75 and 76.

It will be noted that these colour regulations all referred only to *upper* surface camouflage, no mention being made of lower surface colouring. Further on in the same document, a more complete listing of camouflage colours listed the following schemes;

a School aircraft (existing camouflage).
b Fighter aircraft (colours 74, 75, 76, 65).
c Heavy fighters (as for (b)).
d Bomber aircraft and Transports (colours 70,71,65).
e Sea based aircraft (colours 73,72,65).
f Tropical aircraft (colours 78,79,80).

It becomes quite clear that land based fighter and heavy fighter aircraft were to use a *four* colour camouflage scheme i.e. 74, 75, 76 for all upper and side surfaces and 65 for lower surfaces. A four colour camouflage scheme was still in force for some types of aircraft in 1943, (e.g. Do 217N night fighters) but by the time that the 1944 issue of *Der Flugzeugmaler* was issued instructions specified only 74 and 75 for the upper surfaces. All classes of aircraft, excepting fighters and heavy fighters for which 76 was specified, were to use only 65 for their lower surface colouring. (Interestingly enough, the tropical colours 78, 79, 80 were also still in force according to the 1944 document, despite the cessation of the North African campaign some twelve months previously. The 1941 issue of L.Dv.521/1 included a colour chip card which contained the additional

Above: Bf 109E-4s of II/JG 54 wearing the unit's very distinctive form of camouflage. The upper surface colours were 71/02, the 71 colouring being taken down the fuselage sides in a random 'seam' pattern over the 65 colouring. The areas between the 'seams' have been partly filled with a soft sprayed application of 02. These 3 *Staffel* aircraft also wear yellow engine cowlings and rudders, the photograph having been taken during the transfer of the unit to the east. */H. Obert*





Above: The *Luftdienst* (Air Service) was engaged in a multitude of second line duties. Through out its career its strength increased, 13 *Luftdienstkommandos* existing at the outbreak of war, each of which had up to 120 aircraft on strength. This Do 17Z wears the small, distinctive blue and yellow *Luftdienst* badge. The small numerals 2/11 beneath the badge are possibly related to unit identity, e.g. II *Gruppe* of *Luftdienstkommando* 11. Since these aircraft used the normal four letter registration some form of markings would be needed with such a large aircraft strength. If the deduction is correct the spinner colours of red and yellow would indicate a 6 *Staffel* II *Gruppe* aircraft. Similar combinations of numerals have also been noted on other *Luftdienst* aircraft.

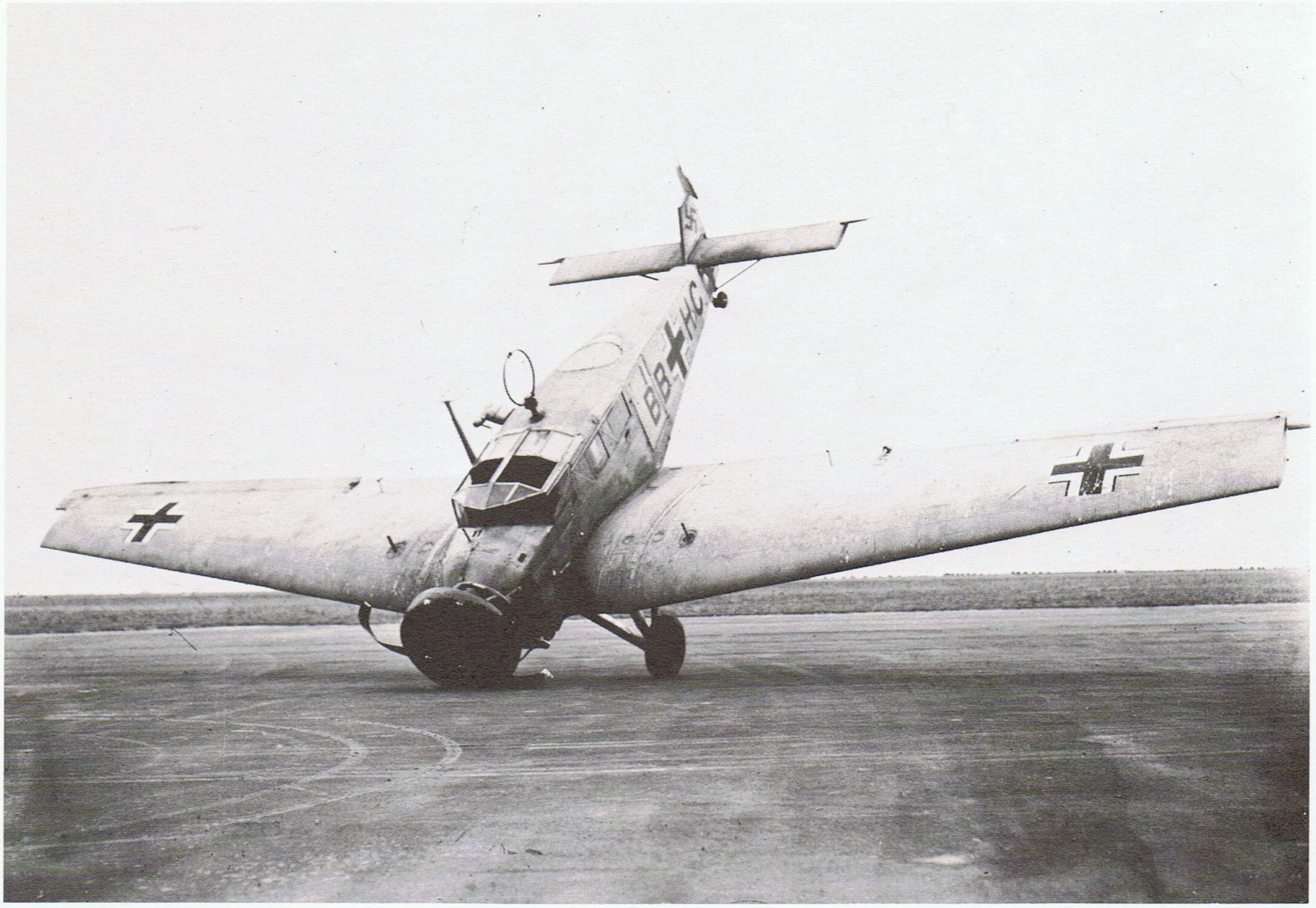
Above right: The red cross marking proportions as set out in the 1941 issue of L.Dv.521/1 are shown on this Ju 52. Note the retention of both camouflage and armament

colours 74, 75 and 76 but not samples of 78, 79 and 80, despite the fact that the latter group of colours were specifically mentioned throughout).

To return to the 1941 document, use of the colour 01 was forbidden for either exterior or interior applications. All cockpits or crew positions, visible through a glazed covering, were to be painted in black-grey 66, this use being specified as an anti-glare measure. The remainder of the aircraft interior, wheel wells, and where applicable bomb bay, was to be finished in 02 colouring. Internal structures, such as wings, tailplane etc., were finished in what can best be described as a golden colouring. This resulted from an electro-plating process which produced a very high quality anti-corrosive finish which did not flake or wear under normal conditions. (For ease of maintenance, the airframe *Werk Nummer* was usually painted in black on the interior finish of small access panels).

Of the pre-war *Flieglacketten,* 01, 03, 21, 31 and 32 had been withdrawn, 02, 20 and 30 retained and 04, 05, 22 and 33 added. (*Flieglackette 33* was to be officially withdrawn by the RLM on March 29, 1943, when all plans were finally abandoned for the development of a German aircraft carrier. Despite the order, the 1944 edition of *Der Flugzeugmaler* still listed it). A precis of the main points related to each of the paint groups and their associated paint identification codes will be found in Appendix Two.

Also listed were two new ultra thin, high density pigmentation, paints which had been developed to meet the Luftwaffe's needs for rapid change from night to day bombing and vice-versa. Both the permanent night camouflage 7124.22 and permanent day camouflage 7125.65 single coat paints were issued to front line units. Only portions of the under surfaces of the aircraft were painted in permanent night camouflage as shown in the accompanying diagrams, the remaining areas being finished with the old temporary black paint 7120.22. The latter could be removed with scrapers to reveal the original blue-grey 65 coloured surfaces, but the ravages of the elements had always meant that for campaigns of more than a few days the temporary black finish along the more exposed areas of the airframe had to be constantly touched up. The new paints not only eliminated this task but also greatly reduced the somewhat arduous job of scraping large areas of the airframe. The blue-grey coloured 7125.65 allowed a com-



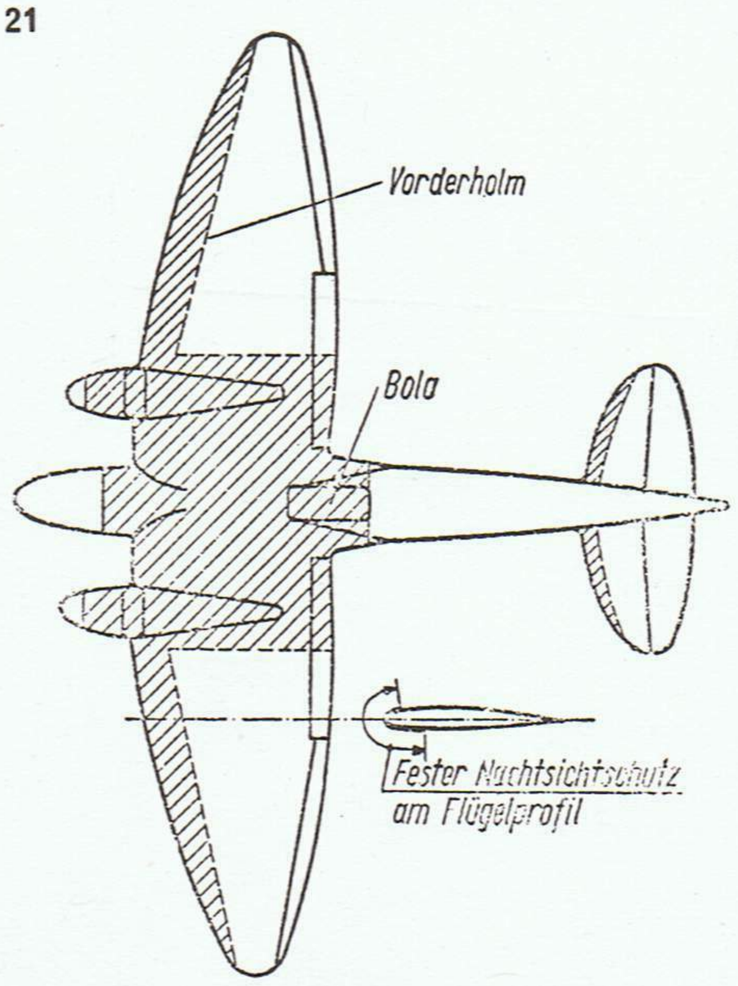
plete reversion to permanent day camouflage within the shortest practicable time by simply overpainting the permanent black 7124.22 coloured areas.

Because of their chemical composition either paint could be used to overpaint the other almost immediately. Also, their high density pigmentation and resulting thinness (an average coat was less than 0.1 mm thick), made it possible to repeat the process up to 15 times before it became necessary to strip the surfaces right back to the original camouflage paint. By that time the aircraft was usually due for a major overhaul. The weight penalty for a single coat of both colours was approximately 10 Kg for an He 111.

The 7124/7125 paints were applied with soft brooms, all strokes being made along the length of the aircraft. Total drying time was one to two hours, dependent upon weather conditions, but if required the aircraft could be flown before drying was complete.

A special reference was included to the effect that it had been noted that ground crews often painted black the areas where exhaust fumes fouled the paintwork, and in doing so they often painted areas larger than required. This practice was henceforth officially forbidden because it was detrimental to the general camouflage, and exhaust areas were to be kept clean at all times. (This sensitivity to the needs of maximum camouflage benefit is a good indicator of the general war situation). Needless to say many crews

21



Above: Wearing its pre-war 63 overall colour scheme this Junkers W 34 carries incorrectly proportioned upper wing surface *Balkenkreuze*. Despite such anomalies the *Hakenkreuze* had been correctly repositioned, on the fin. A single yellow training band can just be seen immediately forward of the tailplane, overlapping the letter C of the registration. The school emblem of an owl is almost indistinguishable behind the exhaust collector ring of the engine. */Frank Smith*

Left: Diagram 21. Areas to which the permanent black is to be applied.



Left: An obsolescent Do 17, BA+BF of *Flugzeugführerschule* (B) 16 retains its existing camouflage scheme as stipulated in L.Dv.521/1. Only the *Balkenkreuze* and *Hakenkreuze* have been altered to bring them into line with standards current at the time. The application of yellow to the engine nacelles and spinners, in place of the more usual fuselage band, is unusual.

Below: Diagram 22. Proportions for red cross markings on ambulance aircraft.

turned a blind eye to this order and black painted exhaust areas remained a not uncommon feature.

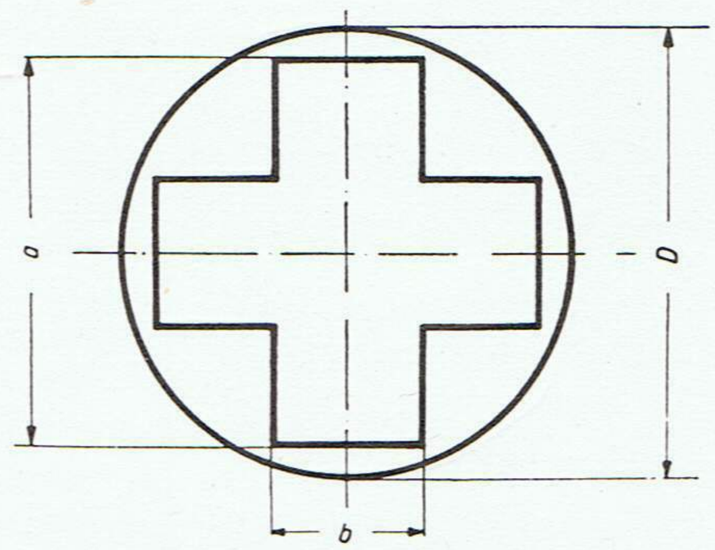
Ambulance aircraft also underwent a revision of markings and in future all *Sanitätsflugzeugen* were to be marked as follows;

1. The original camouflage scheme was to be retained.
2. The vertical tail surfaces were to bear a standard *Hoheitsabzeichen (Hakenkreuz)* as for all front line aircraft.
3. In place of the *Balkenkreuz* there was to be displayed a red cross on a white disc, painted on both wings and fuselage.
4. The proportions were to be in the ratio of D:a:b as 7:6:2.

A full table of proportions is given in the accompanying diagram, all dimensions being in centimetres. Diameter of the white disc was selected from the table and corresponded to the overall size of the original *Balkenkreuz* marking carried by the particular aircraft.

The general order for all fighter and heavy fighter aircraft to adopt grey tones for their camouflage has often been questioned, but the reasoning behind the order is not difficult to understand. At the time of the order's original formulation, which would have been at least one to two months prior to the release of the November 1941 issue of L.Dv.521, Germany's military situation was excellent. In the West a simple holding campaign, at

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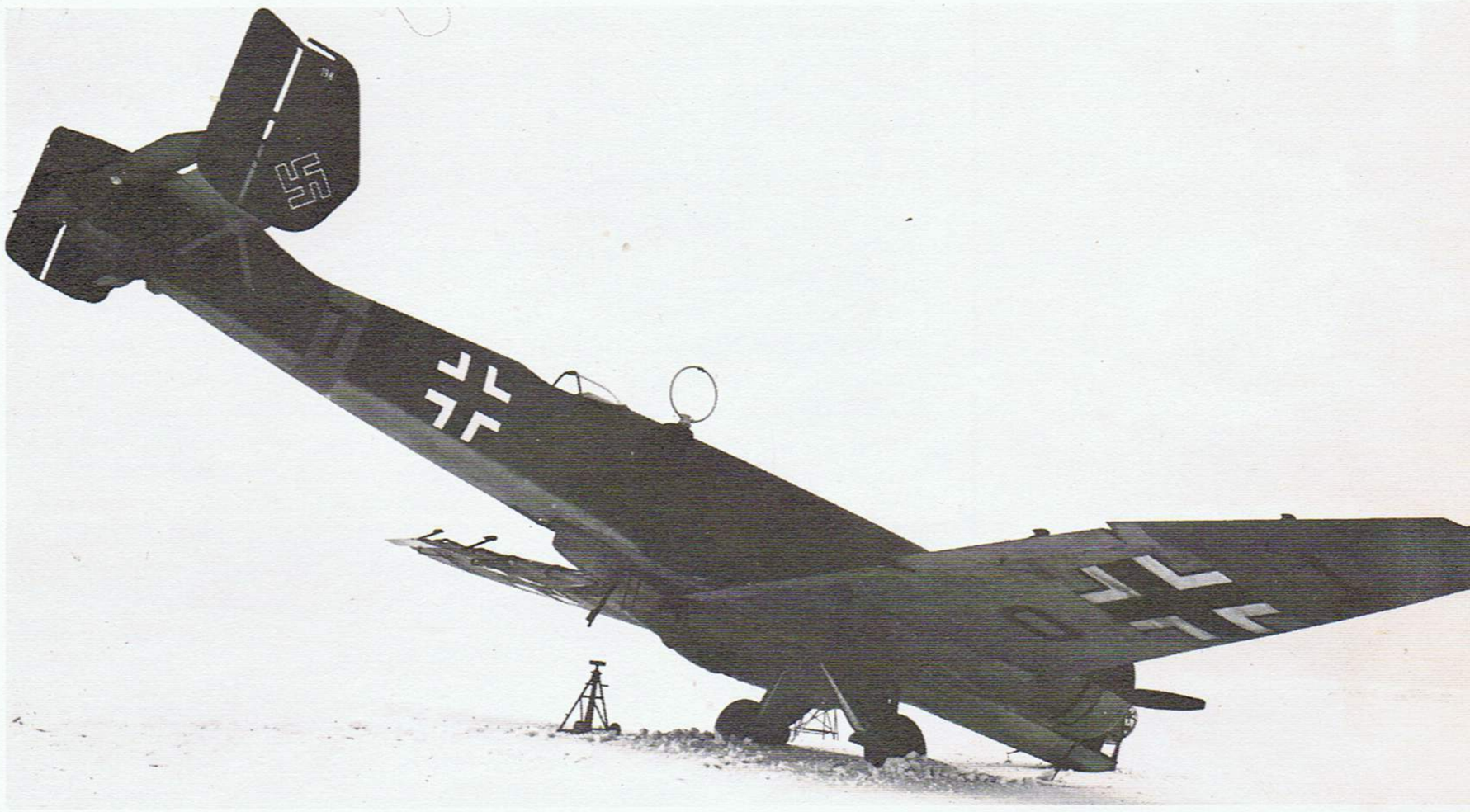


D =	52	70	87	105	122	140	157	175	192	210
a =	45	60	75	90	105	120	135	150	165	180
b =	15	20	25	30	35	40	45	50	55	60



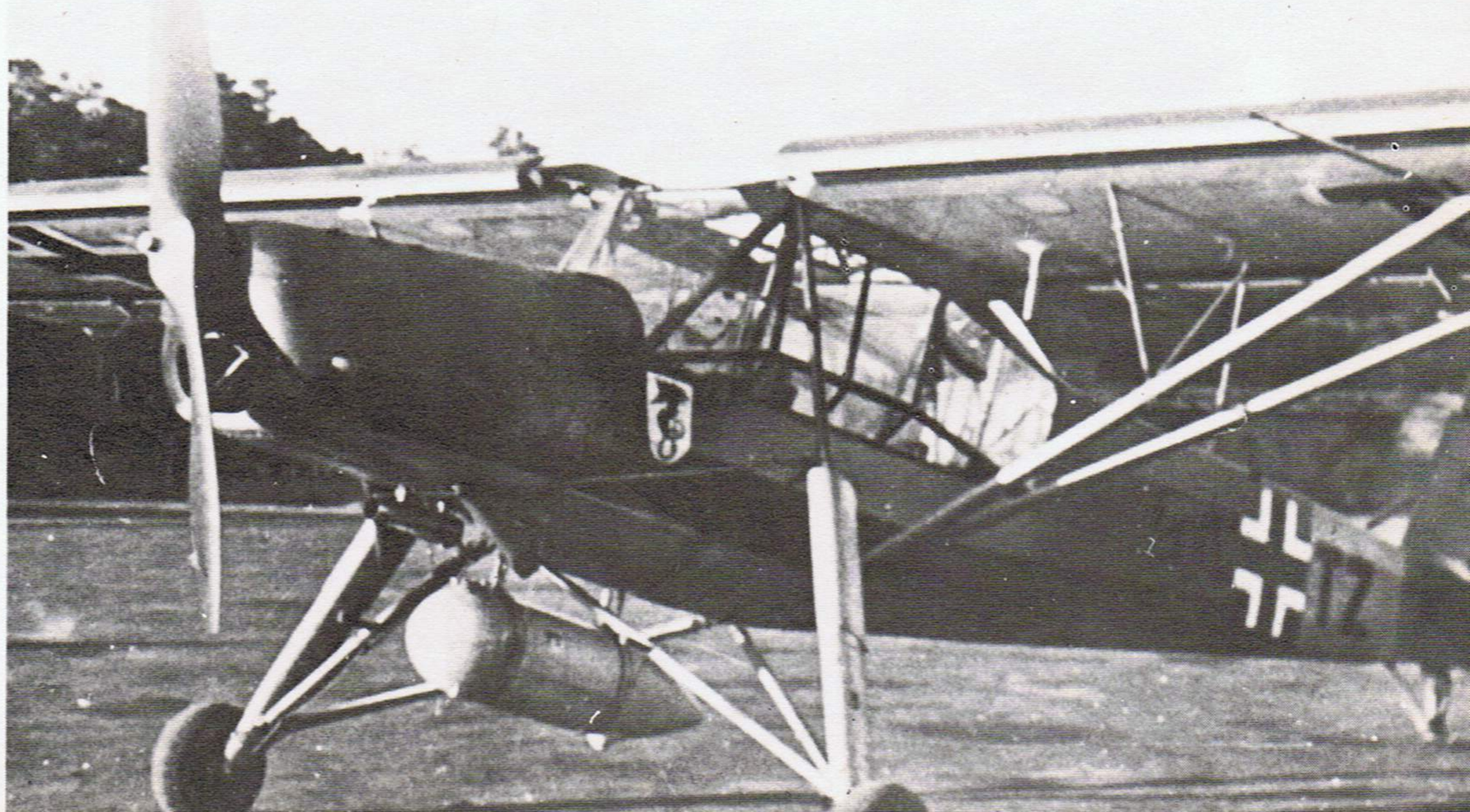


Above, centre right: Some Ju 86Ds were still in first line service when war broke out and presumably a few were repainted in70/71/65 camouflage. This example W.Nr.198, TO+CV of FFS. (B) 16 wears the 70/71/65 scheme plus the yellow fuselage band and lower wingtip surface markings appropriate to aircraft used for advanced training purposes. */Frank Smith*



Below right: School markings with a slight difference. This Fw 156C, GA+TZ, belonged to FFS. A/B 5 at Stendal. Camouflaged in70/71/65 and wearing both a wide yellow training band and the schools black and white seahorse emblem, it was most probably used by the instructors' general communications flight. */H Jonas via Vincent*

Bottom left: A more standard application of the yellow training band can be seen on the remains of this early model He 111 DA+AZ which also retains its pre-war camouflage of 61/62/63/65, */G. Long via Lutz*



1 A Bf 110 of II/ZG 76 in standard camouflage of 70/71/65 displays the Gruppe's well known shark's mouth marking. Spinner hubs and propeller blades are dark green, the dark blue tips to the spinners denoting that this aircraft belonged to a *Stab* flight. The wheel chocks are painted red, the usual colouring for these items.

2 A pair of Do 17Zs of 8./KG 2 coded U5+GS and U5+MS, each of which wears a band around its nose in the *Gruppe* colour of yellow. Typical of the inconsistencies of this period, the aircraft letter on each machine is outlined in white and not the *Staffel* colour of red.

3 This II/ZG 2 Bf 110 displays the interim camouflage used by many aircraft from this *Gruppe*. The entire spine of the fuselage has been sprayed with a solid application of 02. Note that the aircraft letter is red, denoting 2 *Staffel,* instead of yellow as would be expected because of the *Staffel* letter L.

4,5,6 The battered remains of Bf 109E, W.Nr.1190, which force landed after combat at East Dean at 17.30 hours on September 30th 1940. From 4./JG 26 it was coded 4+– in white, thinly outlined in black. Although ravaged by time and vandals the remains are still most interesting, revealing quite a lot of unusual information. Built by Erla Maschinenwerk at Leipzig in 1939, it originally wore the early style camouflage of 70 and 71 on all upper and side surfaces, terminating at the lowest point of the fuselage, undersurfaces being 65. It was later repainted to comply with the revised standards introduced early in 1940, the 65 colouring being taken high up the fuselage sides. Wing and fuselage *Balkenkreuze* were also reapplied in revised form to comply with the October 1939 order. Weathering of the paintwork has revealed the original, smaller, wing upper surface *Balkenkreuze* immediately outboard of the existing markings. Weathering has also revealed the presence of the black double chevron marking of a *Gruppenkommandeur.* Although flown by *Unteroffizier* Horst Perez at the time of its capture, the aircraft had previously belonged to *Hauptmann* Karl Ebbighausen, Gruppenkommandeur of II/JG 26 who was killed in action on August 16th. Perez flew with 4 *Staffel* and does not appear to have had the opportunity to add any personal markings, only the double chevron marking being overpainted. The tiger's head emblem was a 6 *Staffel* marking and five *Abschus* markings on the fin were victories scored by Ebbighausen between May and June 1940. When captured camouflage was 65 on all lower and side surfaces with two tone, unit mixed and applied blue upper surfaces. Although badly faded some idea of the strength of the blue can be judged from the greens of the surrounding grass and trees and the blue of the Volkswagen car. Faded portions of the original green fuselage colours can be seen where the wingroot fairings have been removed. Comparison with black and white shots taken during exhibition of the aircraft in the U.S.A. and Canada shows that minor touch up work to the wing and fuselage *Balkenkreuze* was the only variation from the original. Traces of the original internal pipe system colour coding still remains visible. Tactical markings at time of capture were a yellow rudder, spinner and engine cowling, the latter as far back as the supercharger intake. The black script 'S' emblem of JG 26 appeared on both sides of the fuselage but the tiger's head was applied only to the port side. This aircraft is currently under restoration in England. (The fact that the 6 *Staffel* emblem slightly overlaps the chevron marking indicates that the aircraft may well have been used for some time by that *Staffel before being taken over by 4 Staffel.*)

7 T3+HK of 2./Bordfl.Gr. 196 finished in 72/73/65 camouflage. The unit emblem of a seahorse can be seen just behind the engine cowling.

8 F8+EH of 1./KG 40 being prepared for a mission. The aircraft letter is thinly outlined in white and the central area of the fuselage *Balkenkreuze* have been enlarged as explained in the text.

9 Werner Schroer's Bf 109E-7/Trop of 2./JG 27 finished in full North African camouflage of 78/79/80 with a single white fuselage band. The black number 8 is thinly outlined in the *Staffel* colour of red, the same colour being used for the spinner and the kill markings on the rudder.

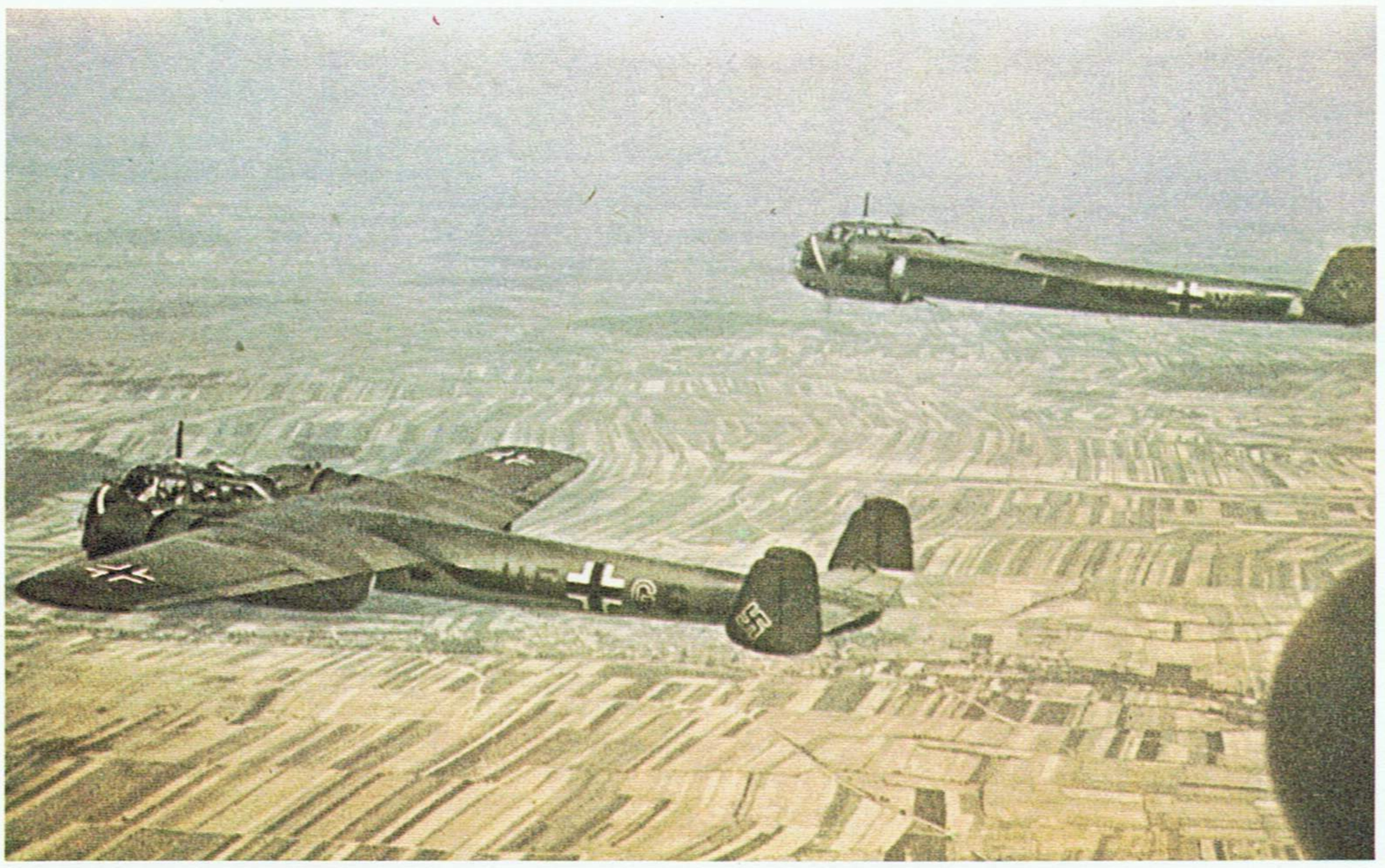
10 The Bf 110s of III/ZG 26 were the first heavy fighters to be transferred to North Africa, arriving in January 1941. The 8 *Staffel* trio seen here, with 3U+GS in the foreground, still retain their European camouflage of 71/02/65. The soft 02 mottling of the fuselage sides has been intensified in places with small patches of 71.

11 A 7./ZG 26 machine wearing an early form of desert camouflage which appears to consist of sand yellow fuselage sides with a soft sprayed application of green on the upper surfaces. The spinners are green 71 with white tips.

12 A reconnaissance Bf 110C-5 wearing a locally applied hybrid camouflage of greens over a base colouring of 65.

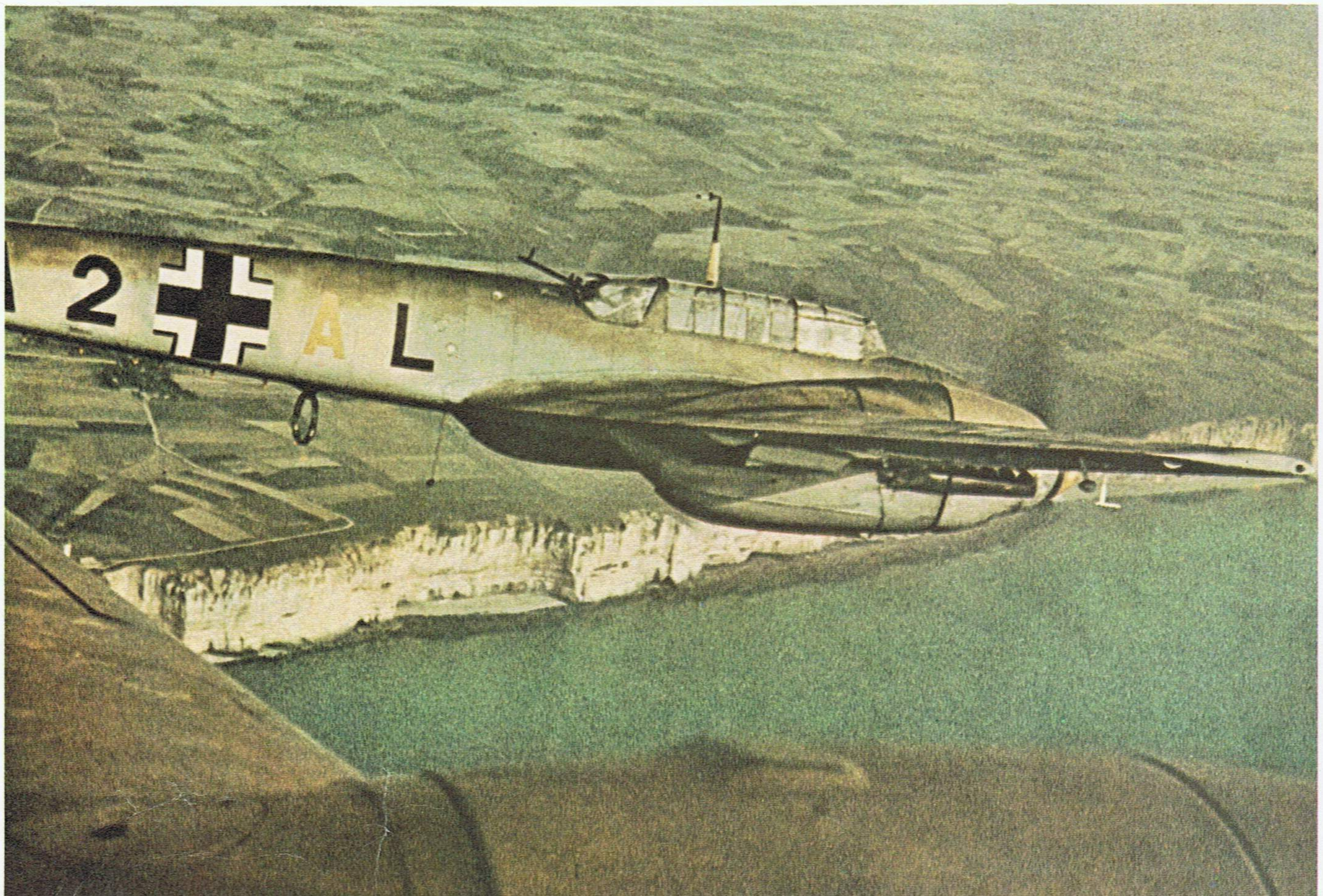


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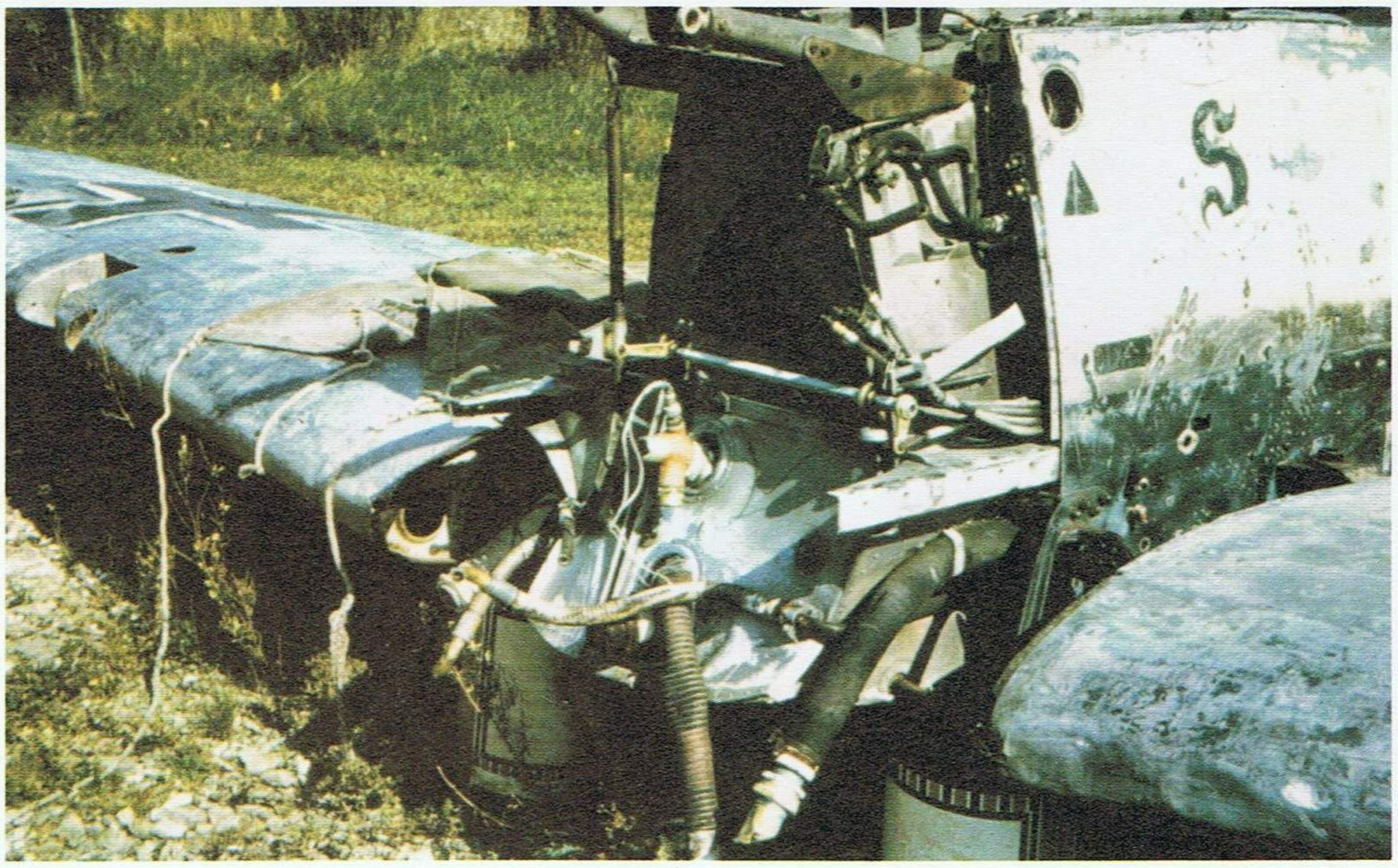
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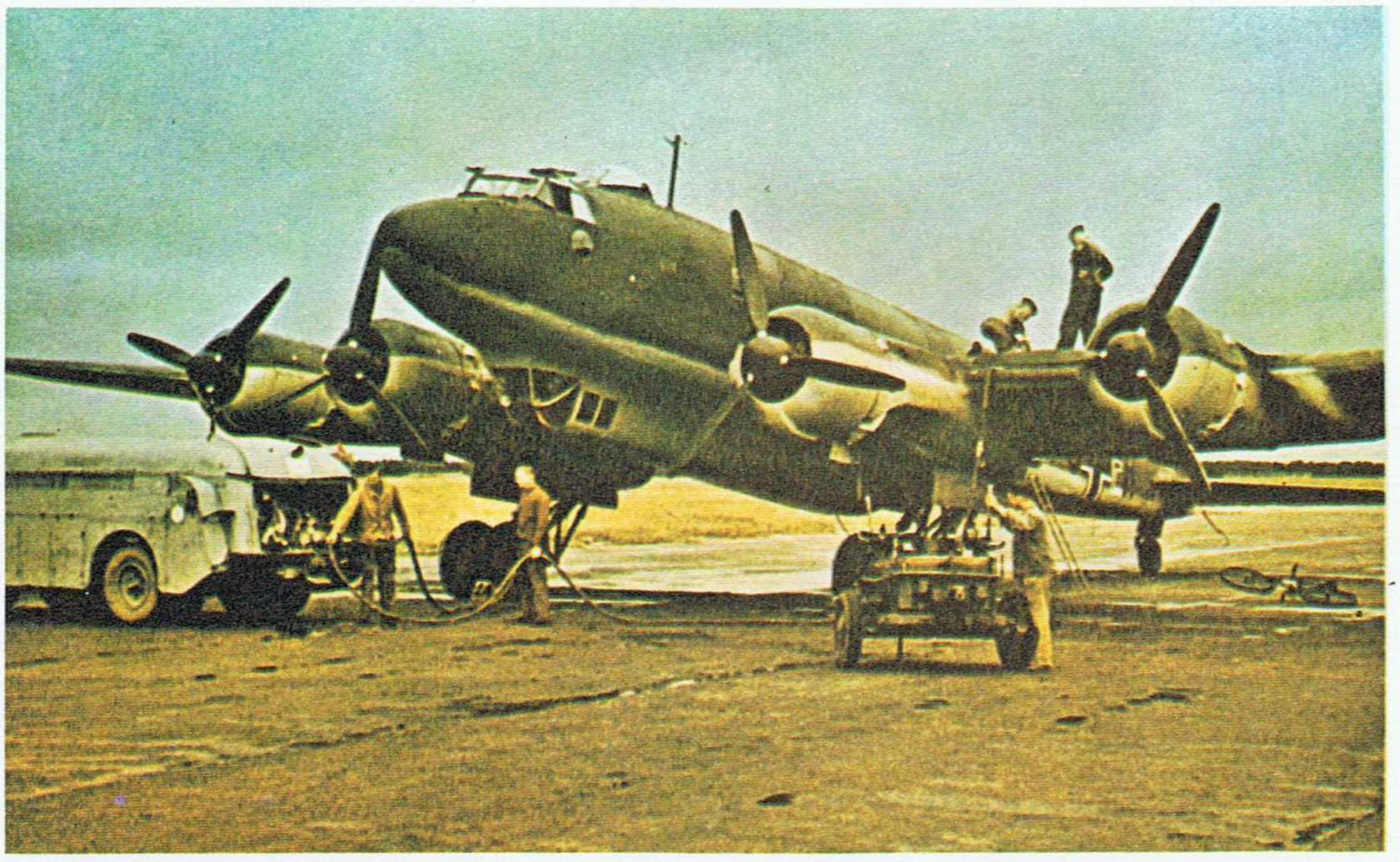
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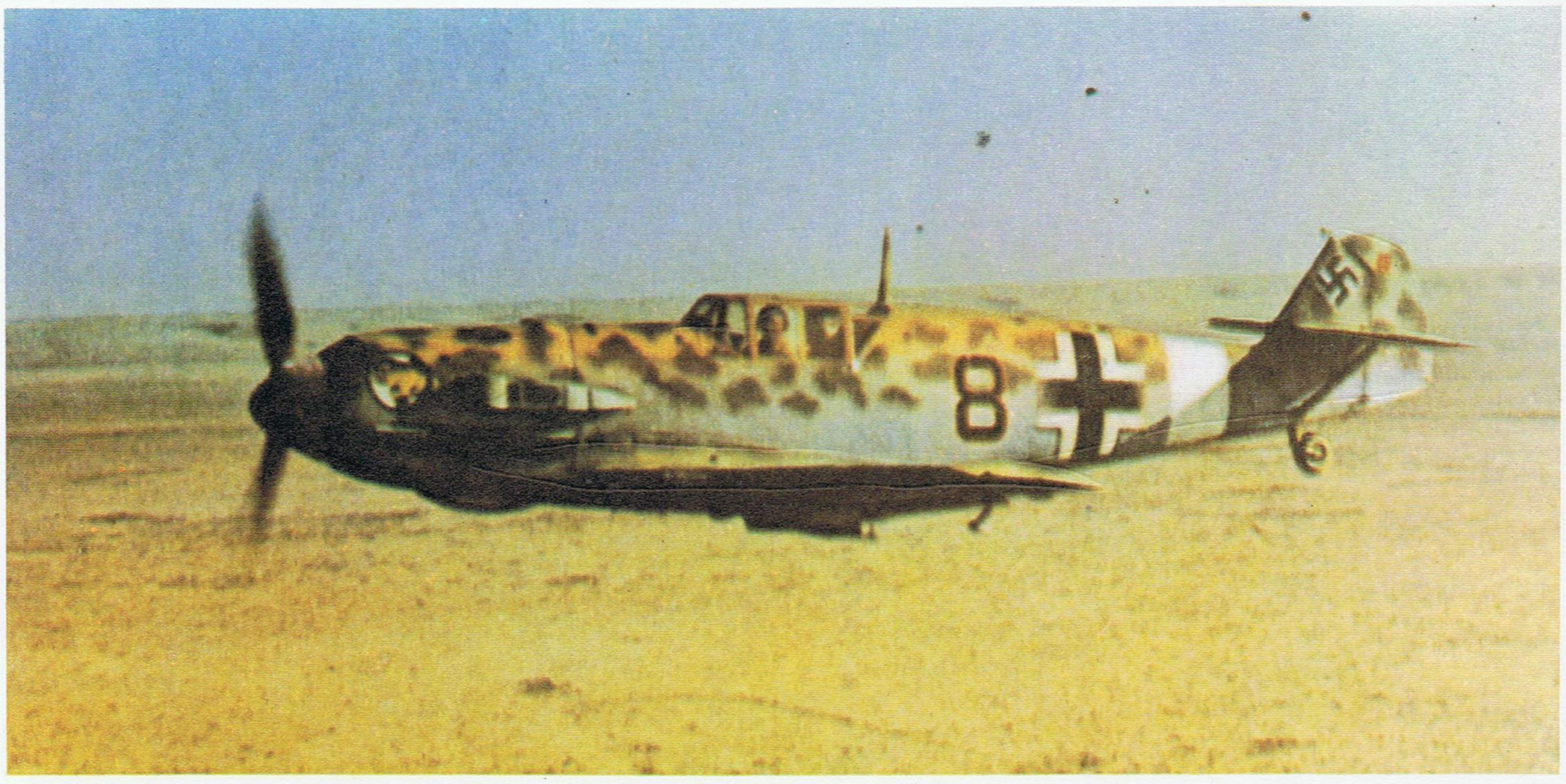


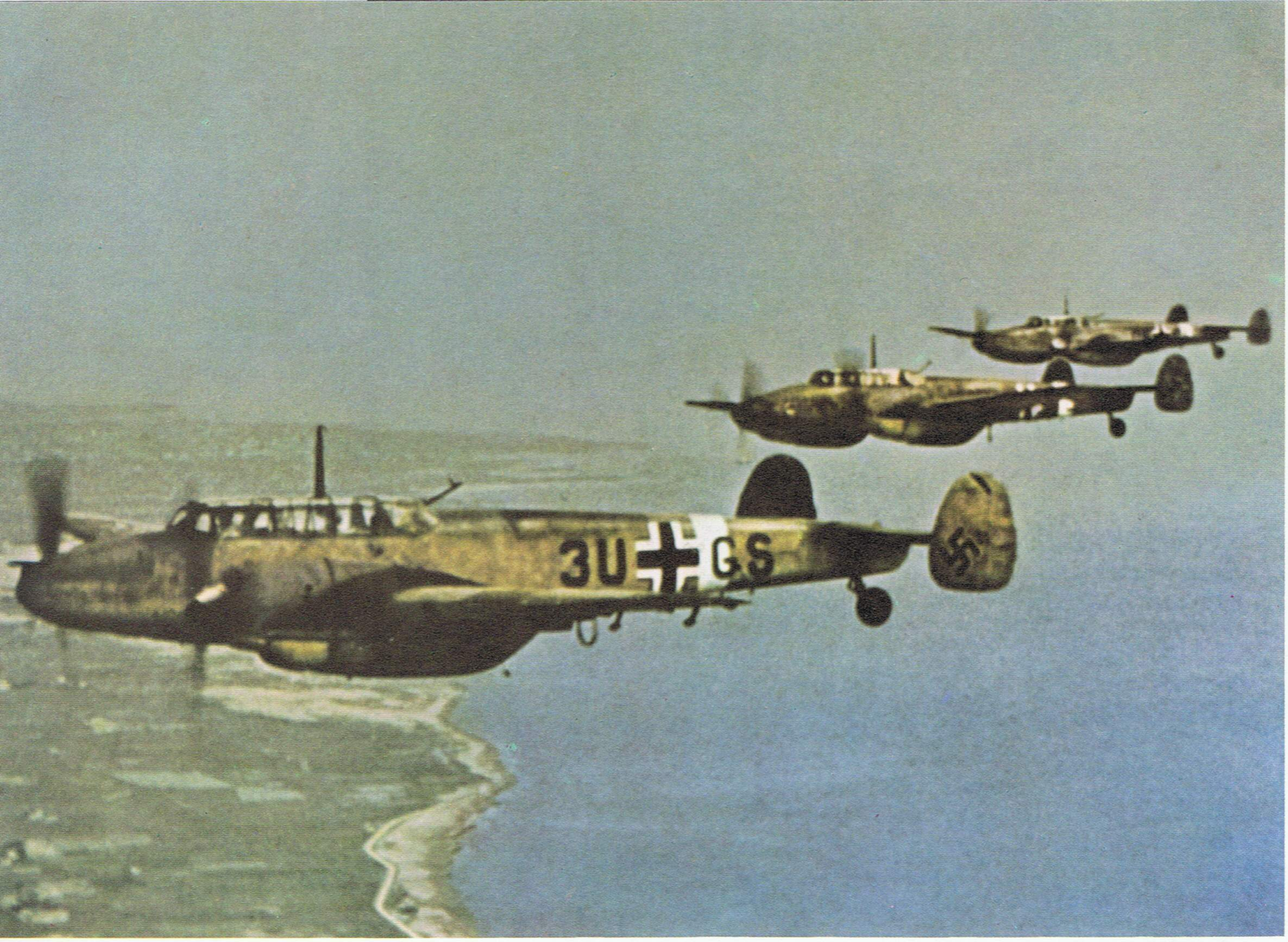
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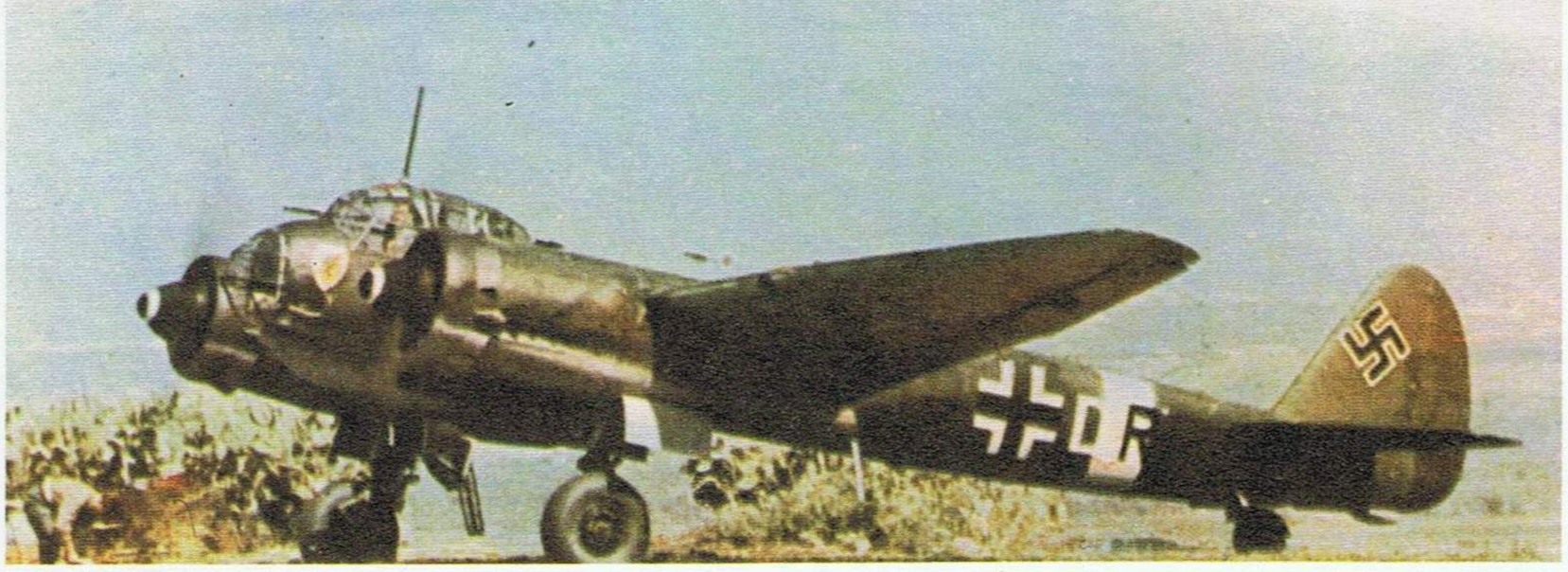


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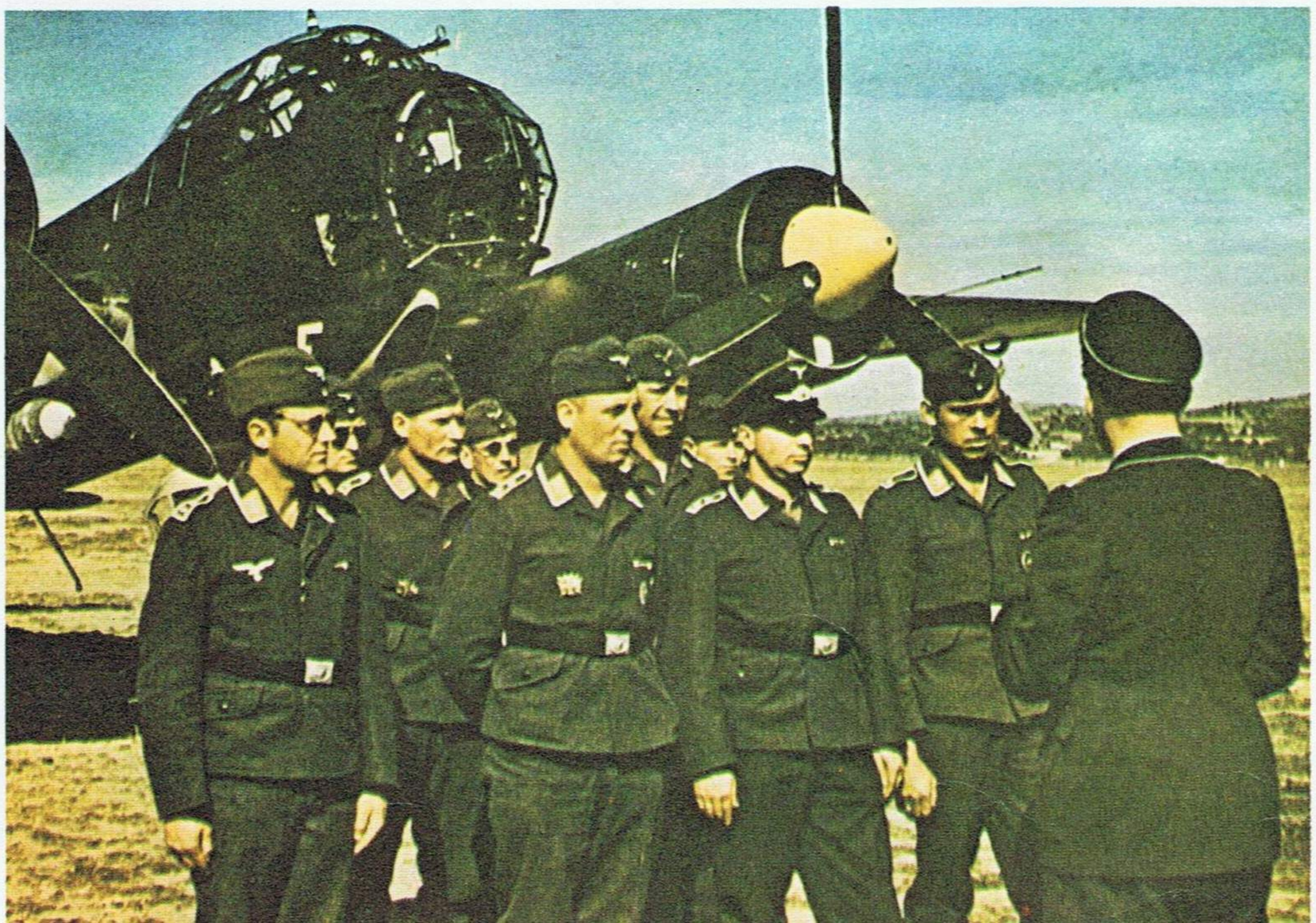


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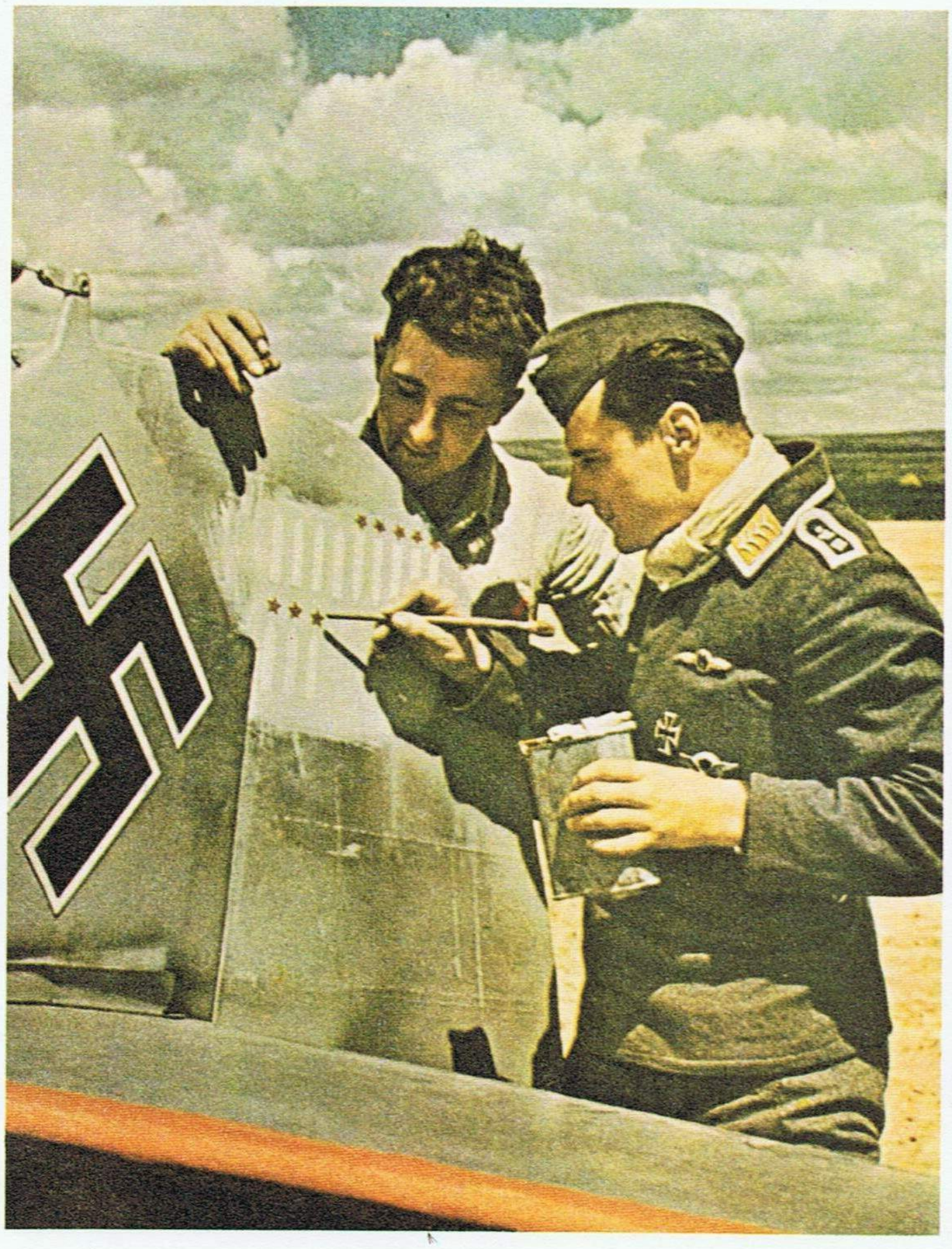
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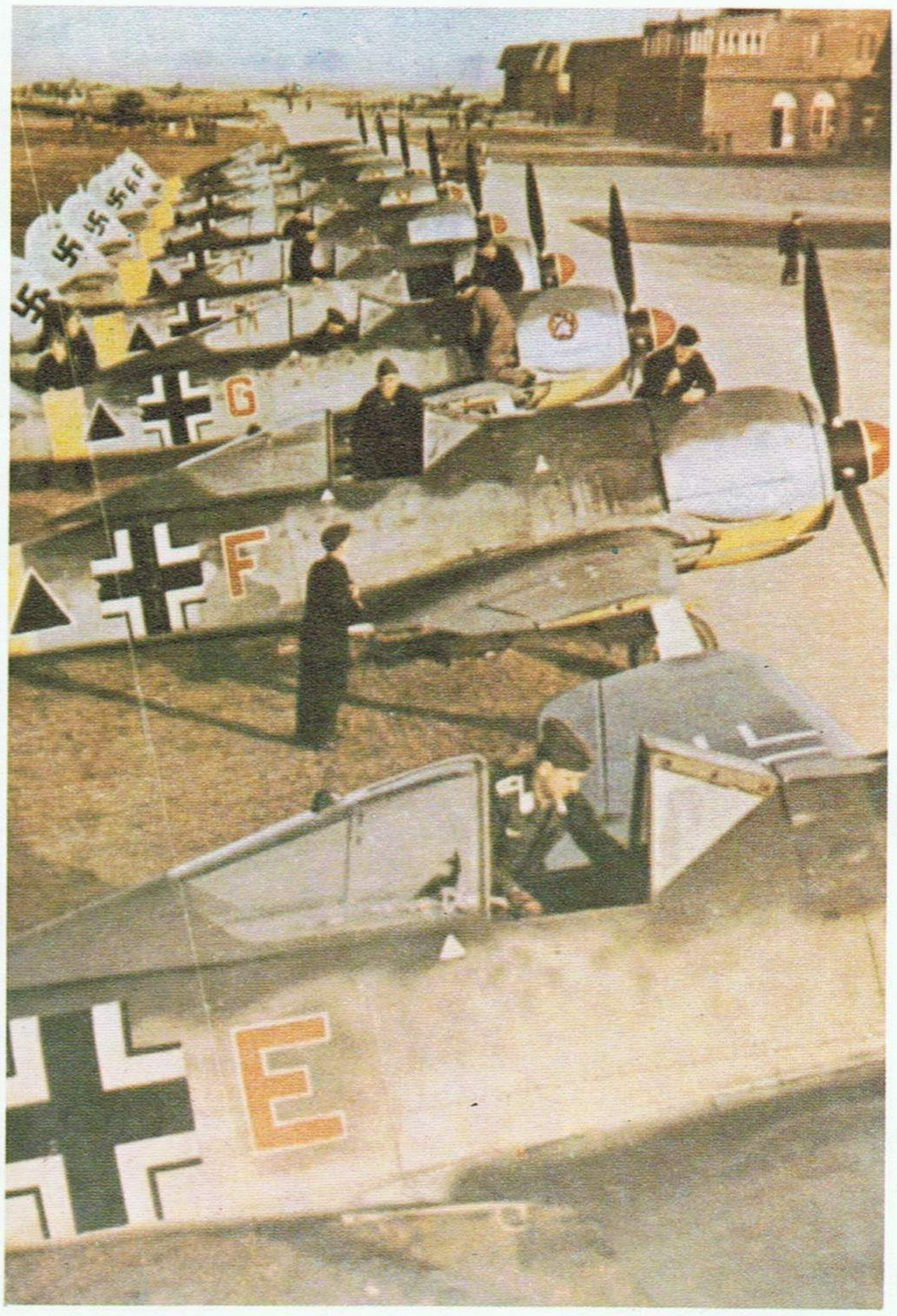
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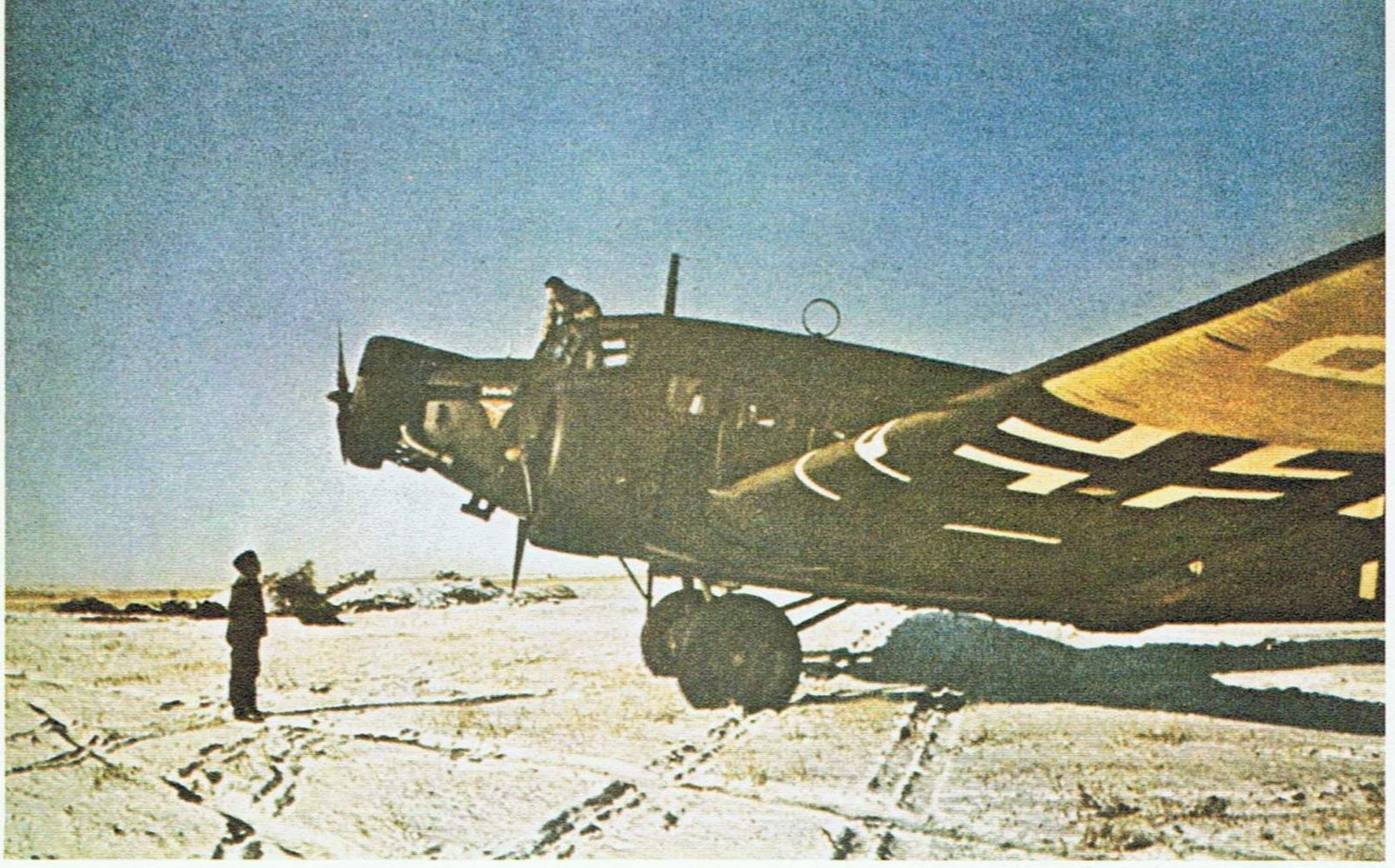


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13 This pair of ZG 26 Bf 110s display the overall sand yellow colouring initially applied to this type of aircraft. The nearest aircraft, 3U+KS, wears the *Geschwader* emblem in place of the 8 *Staffel* emblem; the spinner tips and aircraft letter are, however, in the 8 *Staffel* colouring of red. The aircraft behind still wears its manufacturers registration letters of SB+GO as well as a white Mediterranean band indicating that this was a direct delivery from the factory in North African camouflage. The extensive exhaust discolouration shows that both aircraft had been flown for some considerable time.

14 The Royal Navy suffered heavy losses from Luftwaffe attacks during the withdrawal from Crete, St.G.2 and St.G.77 both playing prominent roles in these attacks. The bold yellow tactical markings on the rudder, elevators and engine cowling of each of these St.G.77 Ju 87Bs testifies to the Luftwaffe's air superiority at that time.

15 From the Mediterannean came III/ZG 26s Bf 110s to aid in the Balkan campaign. This 9 *Staffel* machine retains its European camouflage of 71/02/65 and its white Mediterannean tactical marking band around the rear fuselage. In addition yellow Balkan campaign markings have been added to the engine and rudder. The *Staffel* emblem of a white cockeral appears on the nose of the aircraft.

16 Comrades in arms. A pair of Rumanian Bf 109Es in company with a Luftwaffe Bf 109E. The yellow markings are correct for the initial phase of the Russian campaign. Camouflage for all three aircraft is 70/71/65.

17 A Sicilian based Ju 88A of KG 30, 4D+DR, wears its aircraft letter in white as well as repeating the *Staffel* colour on the spinners. This is a variation from the more usual practice of using the *Gruppe* colour on the spinners. Like all northern Mediterranean based aircraft it wears only a white fuselage band. Camouflage is normal 70/71/65.

18 The Ju 88As of KG 54 were also based on Sicily for the Malta offensive. A 7 Staffel aircraft (possibly white E) forms the backdrop to these Luftwaffe personnel. Note the worn surfaces of the 70 coloured propeller blades.

19 Marking up another kill on the rudder of a 74/75/76 camouflaged Bf 109 in Russia. The first four of the nine kills in the top row are air victories; the last five, bearing red stars, have their pointed end at the bottom indicating aircraft destroyed on the ground. The three in the bottom row are air victories. The red leading edge to the tailplane is interesting but unfortunately unexplained.

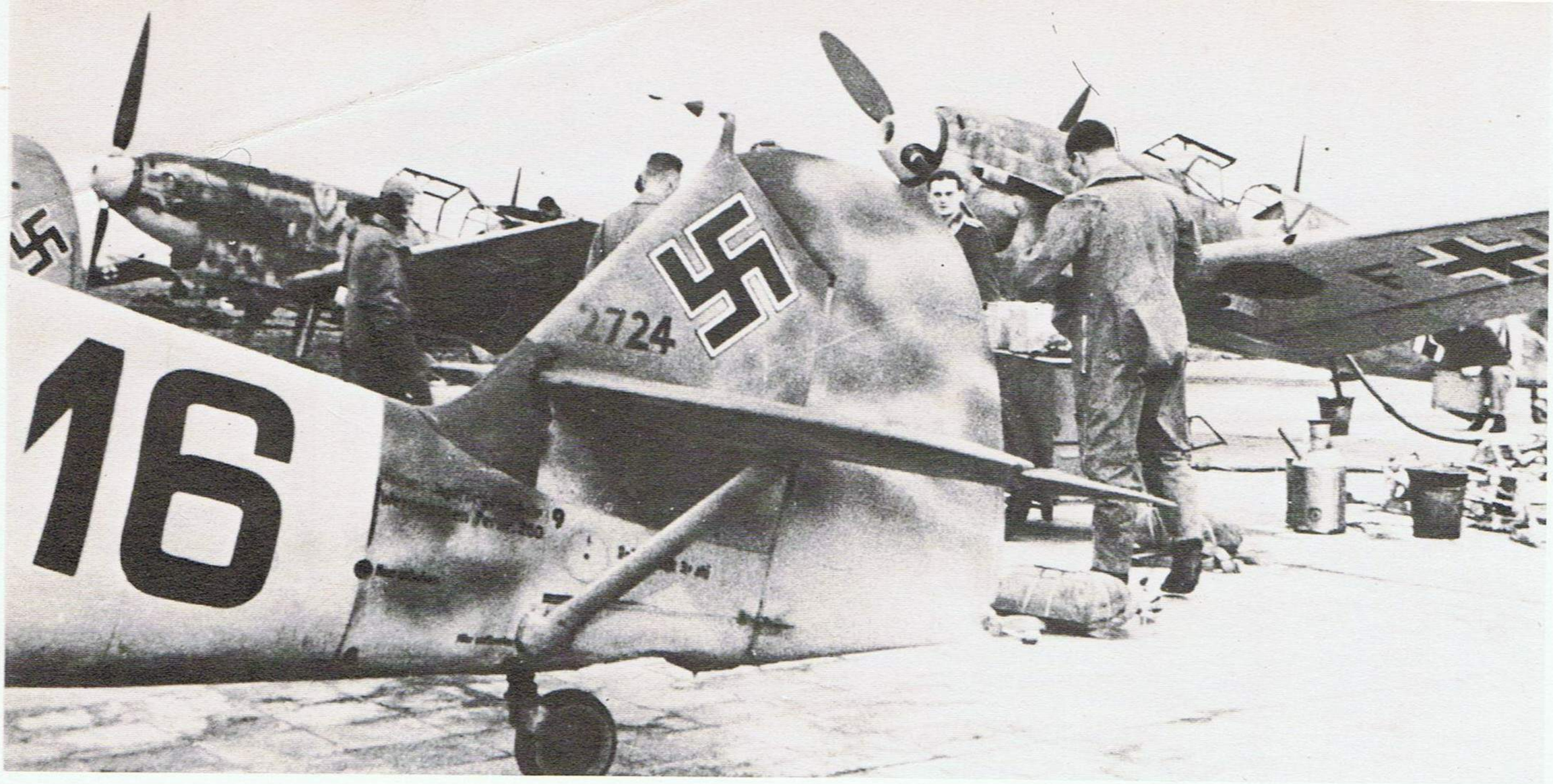
20 These Fw 190s of II/SG 1 wear the four colour camouflage of 74/75/76/65 that was originally specified for all fighter aircraft. The 65 colouring is readily distinguishable on the vertical tail surfaces and the engine cowlings. Yellow tactical markings are also worn beneath the wingtips.

21 The white hell of a Russian winter. This III/JG 53 Bf 109F-2 wears partly reduced yellow tactical markings, the top of the engine cowling having been oversprayed with temporary winter white camouflage. The fuselage band, however, remains intact.

22 A Ju 52 of an unidentified KG.z.b.V, C3+IP. It bears the same emblem as the Ju 52 illustrated in Chapter Seven. Note the black undersurfaces and application of the full code in white both beneath the wings as well as on the leading edges of the wings.

23 A surviving Bf 109G-10, a series that was first introduced in the spring of 1944. This example retains its original camouflage and serves to illustrate the wide variation that existed during the late war period. Although the lower and side surfaces are finished in 76 the upper surfaces are camouflage in 71 and 02. Traces of a much stronger shade of blue are visible on the lower rear half of the machine gun breach fairings, either side of the fuselage.

24 This photograph shows both a unique aircraft and even more unique camouflage. Stored since the close of hositilities this Me 163B has only recently been reassembled, its camouflage being entirely original. Upper surfaces are finished in the late war colours of 81 and 82; the slight brown cast of the 81 can be clearly seen in this side view of Werk Nummer 191907. The vertical tail surfaces are sprayed with a soft mottle of both 81 and 82. Lower surface colouring is the blue-green colouring tentatively identified as 83. Note the strong highlights on the camouflage. It was common practice to finish the paintwork on high speed *Luftwaffe* aircraft with a coat of clear lacquer. Wing *Balkenkreuze,* both upper and lower, are black/white/black type while those on the fuselage, and the *Hakenkreuze,* are white outline type. The various red patches on the fuselage are primer, the large screw fasteners of the skid fairing panels being sealed with this paint also.



Above: Bf 109C-2s of the fighter training school at Werneuchen display 1941 style camouflage, four letter registrations beneath their wings and white fuselage band markings with black identification numbers. The nearest aircraft also shows some of the multitude of stencilling that adorned many Luftwaffe aircraft. Apart from the usual frame numbering, instructions where to lift, tyre pressures etc., there also appears a two line legend which gives the name of the aircraft owner and the telephone number. In this instance it reads; *Halter: Jagdfliegferschule Werneuchen Fern 260.* The aircraft in the left background wears the school emblem of a top hat suspended on a sabre, superimposed on a yellow (?) shield.

home the skies were free from enemy intrusion by day, and in the East Russia was reeling under a sustained and successful onslaught. In all instances Germany had air superiority and the Luftwaffe's principal need was for concealment in the air where her fighters were concerned. Airfields had little to fear from daylight retaliatory attacks, and for concealment in the air greys were indisputably superior to other camouflage colours. This situation was not to last, particularly in the East, and gradually greens would usurp the greys in many areas.

The actual order pertaining to the new colour scheme was naturally issued before the release of L.Dv.521 and was almost certainly contained in the TAGL order of June 24, referred to earlier. Photographs taken of Bf 109Fs of JG 2 in October show them wearing the full 74, 75, 76, 65 colour scheme, liberal applications of 74 and 75 mottles almost obscuring the very pale 76 coloured side surfaces. Quite possibly the new scheme had appeared on aircraft prior to October but insufficient precise dating for some photographs has not made it possible to quote a more exact physical introduction date.

Among home-based aircraft were those of the training schools. The use of 02 on primary types had been phased in with the diminishing stocks of the superseded 63 grey, although a few long-lived aircraft kept the usage alive for some considerable time. Such types as the Ar 66, Ar 96, Bü 131, Bü 133, Bü 181, Fw 44, Fw 56, Go 145, He 45, He 46, He 50, He 72, Kl 35 and W 34 were recorded in either basic 63, 02 or full 70/71/65 camouflage, in combination with four- letter registrations. Use of camouflage on these aircraft was originated at unit level and to some extent reflected the lengthening of the war. Examples of all the finishes mentioned, on aircraft of the same type at the same unit, were not infrequent.

Pre-war the Luftwaffe training organisation was second to none as regards both quality and quantity. A progressive system of schools took aircrew trainees of all categories through a most comprehensive training programme. Commencing, in the case of pilot candidates, at an FFS A-Schule (*Flugzeugfürerschule*) an introductory ground instruction course and initial flying were undertaken. A more common procedure, particularly once war commenced, was for trainees to attend an FFS A/B-*Schule* where they progressed to the point at which they were ready to commence advanced flying instruction at an FFS C-*Schule*. Obsolescent combat aircraft were used in the final stages of training at a C-*Schule* before students passed to a *Blindflugschule*. There a thorough course of instrument flying instruction was carried out, finishing off with some instruction on current first line types.

The final stage of pure training was undertaken by a series of specialist schools, such as the *Fluglehrschulen*, where pilots, navigators, radio operators and gunners were finally amalgamated into crews. Aircrew other than pilots had previously progressed through a similar range of schools e.g. *Bordfunkerschule*, LN-*Schule*, LN-*Schule* (*See*). Pilots destined for fighter aircraft were posted to a JFS (*Jagdfliegerschule*) to receive their final specialised training. The diminutive Bü 133 appeared on the strength of these schools for advanced aerobatic training, the Ar 96 being used for advanced fighter techniques before the pupils converted to current front line fighter types.

During the last mass expansion of the

armed forces in 1939, Luftwaffe units had had their strength increased by the addition of a fourth *Gruppe* which was intended primarily for the final phase of operational training. Aircrews could thus be gradually eased on to full operational duties.

An effort was made to standardise, or rather prevent, further embellishment to the colour schemes carried by aircraft of the training establishments; hence the order included in L.Dv.521 which stated that ex-operational aircraft seconded to training establishments would retain their existing camouflage at the time of transfer. The addition of yellow training school markings was determined by the aircraft role rather than by the aircraft type; for primary training a single yellow fuselage band, for advanced training, a yellow fuselage band in combination with yellow wingtip lower surfaces. In the instance of aircraft engaged in blind flying training a double yellow fuselage band was carried as a warning to other aircraft.

Aircraft of the advanced schools and reserve units, where crews received their final polish before going to an operational unit, utilised an aircraft identification number applied in various locations along the fuselage in either black, white or yellow. On some aircraft, particularly those of the dive-bomber schools, the number was sometimes repeated on the wingtip upper surfaces outboard of the *Balkenkreuz*, or simply on the wheel spats alone. Suitable areas for training, both from weather and enemy intrusion aspects, saw a wide diversification of school locations, and aircraft operating from Italian-based advanced schools, were required to adopt a white Mediterranean fuselage band marking.

Demands of the Russian campaign cut deeply into the training organisation; robbing it of irreplaceable men and machines. The supply of fully-trained personnel had been strained by the losses incurred over Britain, but the war over Russia was to eventually bankrupt the source completely. By Summer 1942 the effects on the supply of aircrew of all categories were being felt. The reserve training *Gruppen* of fighter units, IV *Gruppe*, were disbanded, three fighter pools being formed, one at Cazaux in France, one at Mannheim in Germany and one at Cracow in Poland. Each served to supply pilots to the Western, Southern and Eastern fronts respectively.

The effect on bomber schools occurred later in the same year. Fuel shortages began the problem, but the reprisal raids against Britain in answer to the RAF's successes of 1942, drew heavily on the bomber reserve training units based in France and Belgium. Losses were heavy, particularly among crews drawn from he training establishments, but it was the Stalingrad air lift which sounded the final death-knell. Subsequent disruption and breakdown in training routine and flying hours was disastrous. Eventually, only partly-trained crews were being passed on to operational units for completion of their training. The result was inevitable and what had once been one of the finest training organisations in the world crumbled into impotency.

The almost negligible bombing activities against Britain since May 1941 had allowed, among other things, the British aircraft industry to press ahead with heavy bomber production. This, in turn, was reflected by ever increasing night bombing attacks against Germany and German occupied territory. The breaking point, as far as the German High Command was concerned, was reached on the night of March 28/29, 1942, when Bomber Command launched a new and highly successful form of night attack. The technique was a concentration in both time and space – the target Lubeck.



Above: Believed to be part of IV/Sch.G.1, these Hs 123s wear the pre-war camouflage scheme of 61/62/63/65 which has been extensively overpainted in some areas. Twelve of these aircraft were used, in conjunction with several Bf 109Es, to instruct pilots in ground attack techniques. Registrations and numbers positively identified are BV+WM (6), PF+UV (7), PJ+AZ (8), CK+KZ (10) and CN+AX (12), the numbers being applied in white. *R. Lutz*

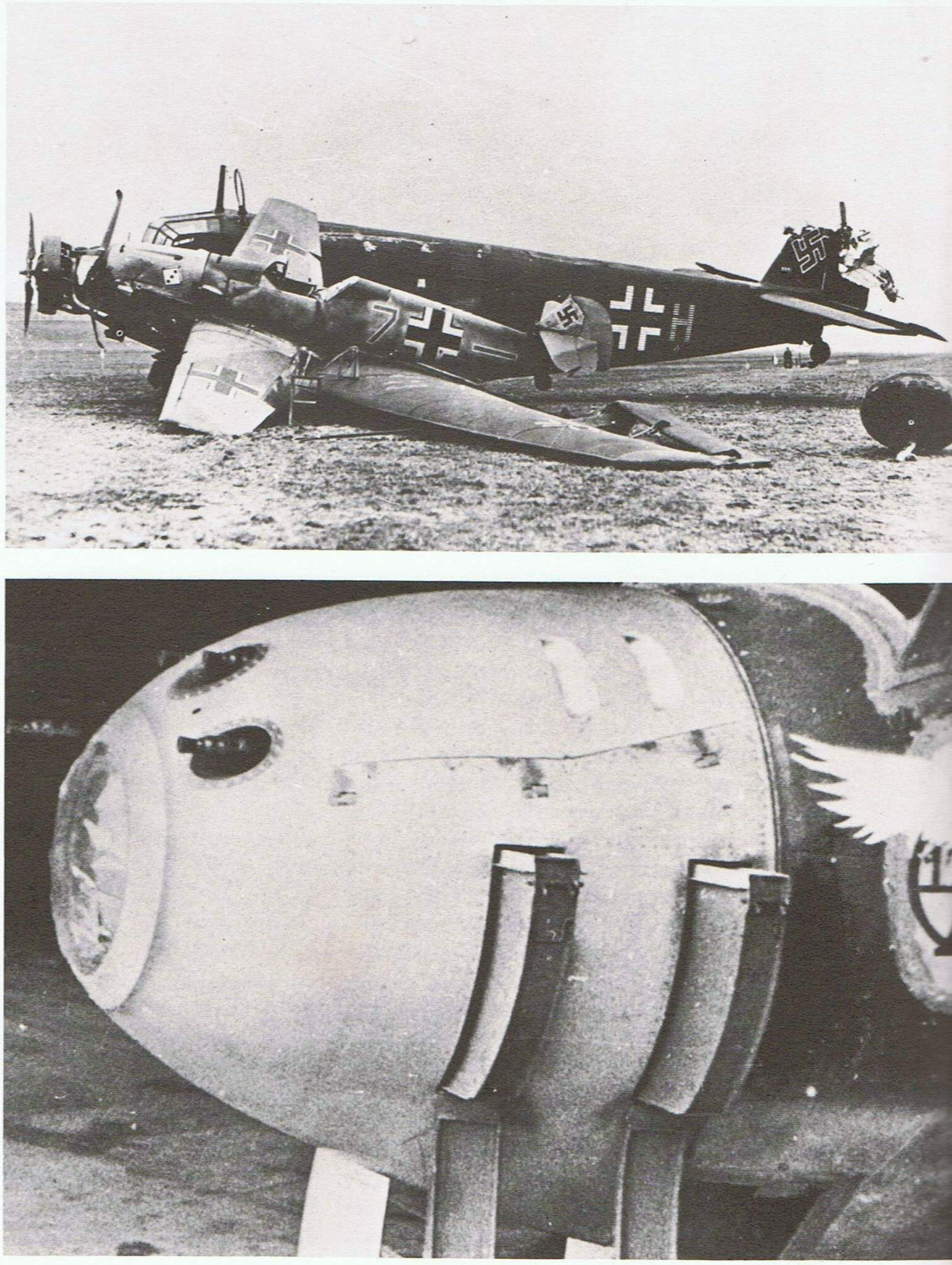
Subsequent public outcry in Germany was matched by Hitler's vitriolic demands for heavy reprisals against Britain. The war in Russia, however, was not proceeding as well as expected and little could be spared in the way of a bomber force. The original Luftwaffe pathfinder unit, KG 100, was returned to France and after some initial practice it led a force of some 45 aircraft in an attack on Exeter, on the night of April 23/24. The bombing force was largely composed of aircraft drawn from anti-shipping and mine-laying units, the principal type being the Do 217E.

Their existing 72/73/65 camouflage was modified for the night bombing missions by overpainting all lower and side surfaces with temporary black. Fuselage *Balkenkreuze* had their white borders overpainted to leave only a thin outline style cross, and in many instances codes, with the exception of the individual aircraft letter, were also obliterated.

The first raid was a failure, but continuing pressure of Bomber Command raids forced the meagre Luftwaffe force to continue its efforts. The following night Bath was attacked by 150 aircraft but this figure was only achieved by carrying out double sorties and the utilisation of crews and aircraft from the bomber reserve training units in France and Belgium. Further heavy Bomber Command raids produced Hitler's famous pledge to eradicate all British cities, one by one, and his reference to Baedeker's guide book. The so called (at least in Britain) 'Baedeker' raids by night bombers finally came to a halt at the end of July. Sporadic attacks by single aircraft in daylight, under cover of poor weather, were interspersed with a few night sorties and mine laying operations, but for all serious purposes the little blitz was over.

Where the heavy bombers failed, however, the single engined fighter bombers proved more successful. From small beginnings early in January 1942 by a few Bf 109s of JG 2 and JG 26, the fighter bomber attacks grew both in number and effectiveness. Not that any great material damage was achieved, but the RAF were forced to maintain a sizeable, and much needed, force of fighter aircraft in an effort to combat these shallow penetration raids.

The two *Jagdgeschwadern* were each engaged in two distinct types of operations – pure coastal defence interceptions and fighter bomber raids. Each of these tasks required a particular form of camouflage for best effect. The fighter bomber *Staffeln* usually flew fast and very low over the Channel to avoid radar and visual detection. Their very pale 76 coloured fuselage sides were hardly advantageous

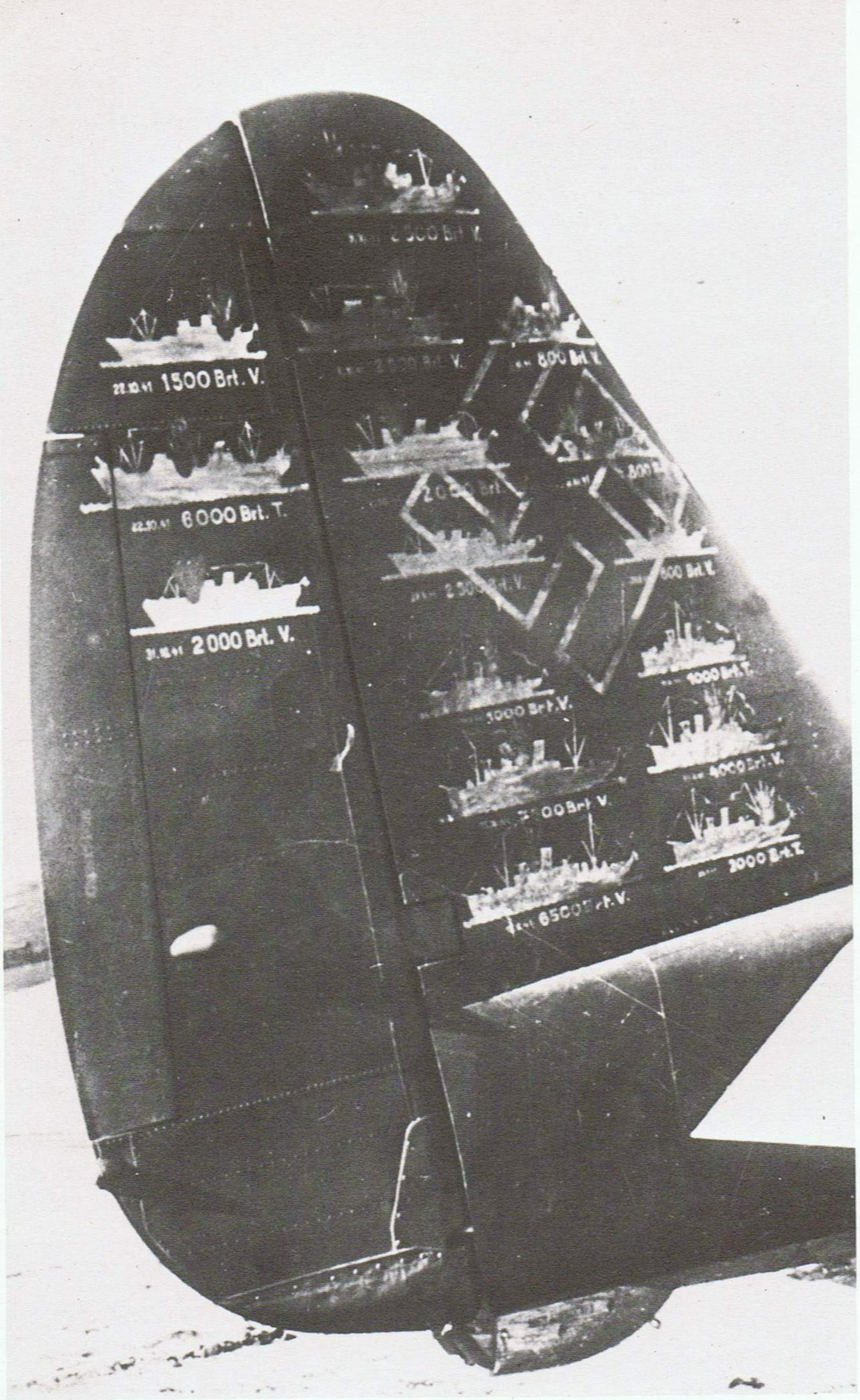


to such tactics, and an intensified form of mottling was introduced which virtually obliterated the 76 colouring under a tightly interwoven, soft sprayed, network of 74 colouring. In some instances the 74 colouring formed an almost solid veil over the fuselage sides right down to their lower extremities. The yellow tactical markings were confined to the underside of the engine nacelle and the rudder. Upper wing surface *Balkenkreuze* were also often reduced to a simple white outline form.

For normal fighter interception duties standard camouflage was retained, this incorporating a degree of mottling on the upper fuselage sides to blend the dark upper surfaces into the pale side surfaces. Units did modify this scheme with some additional mottling, but to nowhere near

Top: A Bf 109E of II/EJG 3 at Cracow, in Poland, after a collision with a Ju 52 of FFS. (B) 17. The Bf 109 wears yellow cowling and rudder markings applicable to the operational area. */R. Lutz*

Above: Photographed at Stendal in late 1941 this intriguing night fighter modification appears to belong to either a Do 17 or Do 215. The unit badge, unfortunately only partly visible, resembles the style used for 5./NJG 2 emblem. */ H. Jonas via Vincent*



Above: Extensive use was made of the fin and rudder areas by many of the anti-shipping units to mark up their mission and kill tallies. This particular example is reputed to be the tail of the KG 30 Ju 88 used by Werner Baumbach.

the degree used by the fighter bomber *Staffeln.*

With the advent of the new Fw 190s a rather interesting example of unusual camouflage occurred amongst the aircraft of 8./JG 2. Most of the *Staffel* aircraft carried the normal camouflage but at least one Fw 190 was recorded in a different colour scheme. The camouflage pattern was confined to the extreme upper surfaces and was the normal soft, slightly curved edged type peculiar to the Fw 190. The two colours used were, however, of distinct contrast; they appear to have been 75 and a shade very similar to 02. The 76 colouring of the fuselage sides was much paler again than the lighter of the two upper surface colours. Wing upper surface *Balkenkreuze* were the white outline type, and apart from a faint vestige of mottle on the fin no other colour was used on the fuselage sides. (This total lack of mottling on the fuselage sides has been noted on other Fw 190s of JG 2 but upper surface colours were the normal 74 and 75 with 76 coloured sides). Yellow tactical markings were carried on the rudder and beneath the engine cowl.

Whether this was an official experimental scheme or a unit originated one is unknown, but while it was certainly unusual it did have some practical merit. The Channel-based Fw 190 units did engage in unit modifications to camouflage but normally not involving the entire colour scheme. The addition of short, thick 74 coloured lines to the leading edge of both wings and engine cowling was such a modification. Strangely, one of the greens, 71, made a limited reappearance on some of JG 2s Fw 190A-3s, the leading edge of the fin being liberally coated. Some of the excellent colour material that has survived shows this quite clearly. In some instances it was used in conjunction with the 74 coloured lines mentioned before. The latter were also to come into more extensive use along the engine lower nacelle and the fuselage as 1942 passed into 1943.

The fighter bomber attacks persisted throughout the remainder of 1942, penetration in numbers sometimes occurring. On October 31, Canterbury was attacked by 30 fighter bombers escorted by a similar number of fighters, and they achieved complete surprise. A heavy bomber attack followed the same night.

This combination of day attacks followed by a night attack on the same target occurred from time to time, but the major results were achieved by the fighter bombers. *Schnellkampfgeschwader* 10 joined the attacking force in March 1943, soon changing over to night attacks on a wide variety of targets, including London. They were subsequently joined in this task by the Me 410s serving on the strength of KG 2 as the 5 *Staffel*. Eventually a full *Gruppe*, V/KG 2, was formed and operated almost exclusively at night over Britain.

The Fw 190s of SKG 10 retained their normal day fighter camouflage but for night operations they had their fuselage sides and undersurfaces overpainted in temporary black 7120.22 night camouflage. This obscured all markings except the aircraft letter, which was overpainted with 7120.77 grey.

At this point we must leave the war on the Western Front and look at other events which had occurred during the same period, firstly in the Mediterranean area.

The Mediterranean Air War

In June 1940, whilst the air war over Britain was gaining tempo, a liaison staff was set up in Italy under General von Pohl. The appearance of Luftwaffe aircraft followed in October, when a transport unit arrived to assist with the ferrying of Italian troops and equipment to Albania in support of the Greek offensive. More bellicose elements arrived at the end of the year in the form of *Fliegerkorps* X, which was to assume responsibility in the central Mediterranean, i.e., Southern Italy, Sicily, South-East Sardinia and portion of the North African coastline.

With characteristic speed the Luftwaffe had approximately 330 firstline operational aircraft based in Italy and Sicily by January 1941, increasing the number to about 450 by March. Of these, approximately 200 were stationed in North Africa. Under the leadership of the two foremost anti-shipping experts in the Luftwaffe, Geisler and Harlinghausen, *Fliegerkorps* X's duties had a very definite bias. The main objectives for the force were to neutralise Malta and thus ensure the safety of the supply route from Italy to North Africa; to disrupt the British supply route from Egypt to North Africa; and to support the Axis armies in North Africa. Significantly, the initial force of some 330 aircraft included 120 bombers, 150 dive-bombers, 40 twin-engined fighters, and 20 reconnaissance aircraft – but no single engined fighters.

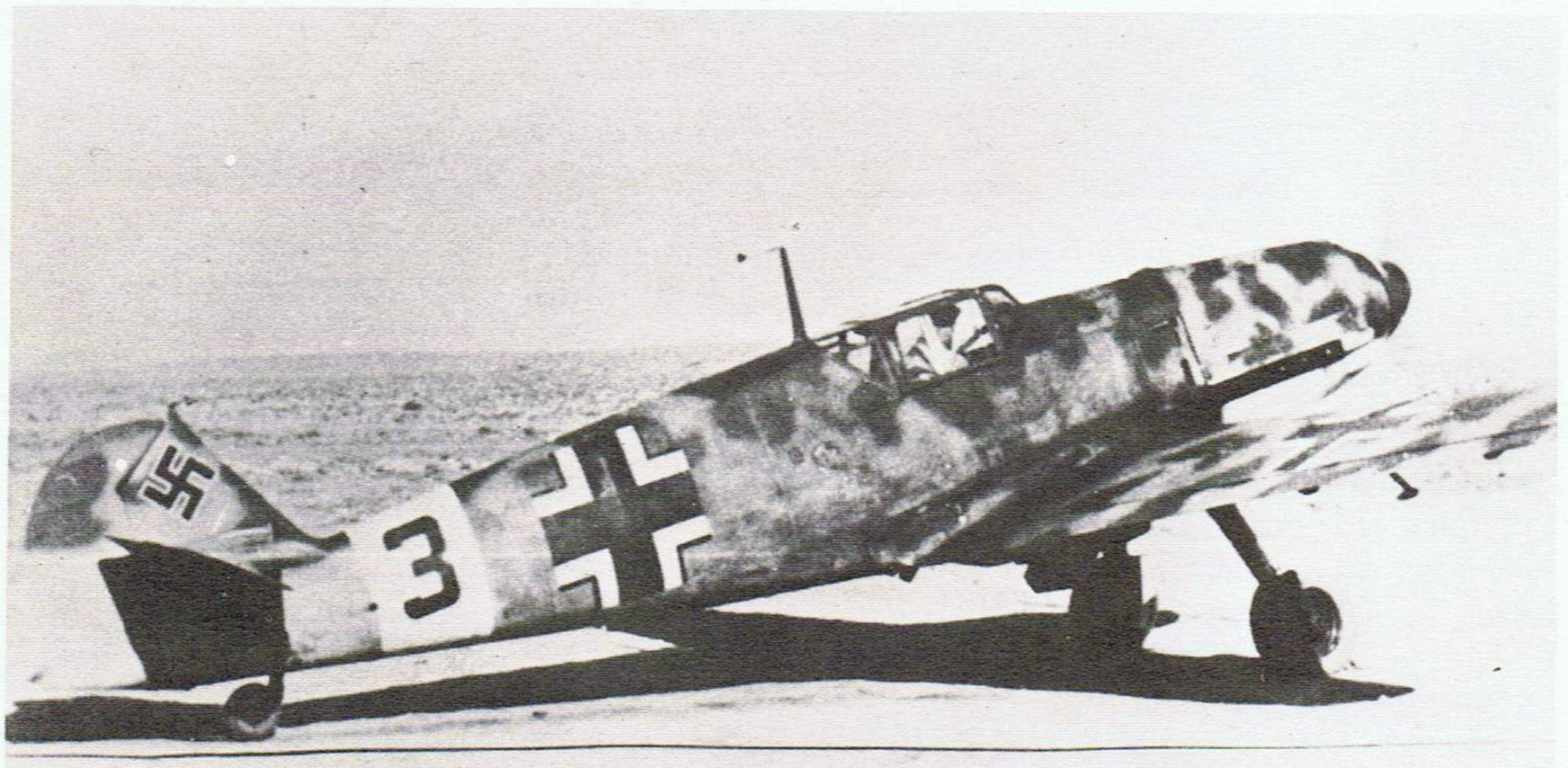
Operations began on January 7, 1941, with an attack on a British convoy which included the carriers *Illustrious* and *Ark Royal*. The attacking force included some 40 Ju 87s plus Ju 88s and He 111s. This was followed by a series of intense day and night raids on Malta which were to continue until March.

As in other operational theatres the Luftwaffe adopted tactical markings, in this case a white fuselage band for all types of aircraft. Airborne opposition was very limited and large blocks of colour were not required for rapid air-to-air identification. Camouflage remained the normal

Below: Typical of the early arrivals in North Africa, this Bf 109E-4, a casualty of the first Libyan offensive, shows its European camouflage complete with yellow rudder and elevators. The white fuselage band was the earliest form of tatical marking to appear in North Africa, having already been adopted as the general marking for all aircraft in the Mediterranean area. */IWM*



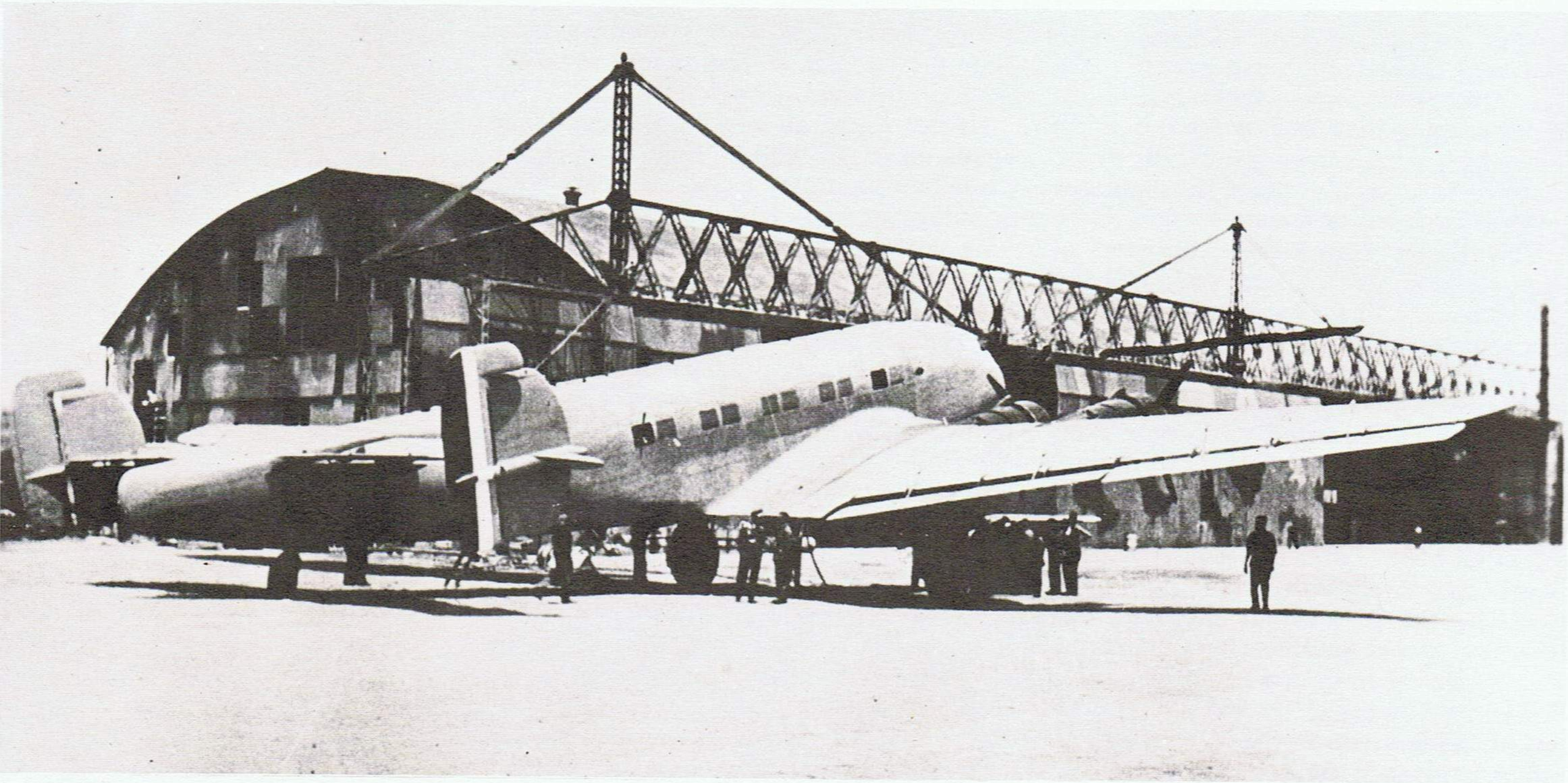




Top left: Werner Schroer's Bf 109E-7 Trop. of 2./JG 27 displays the full tropical camouflage scheme of 78/79/80 and single tactical marking of the period, a white fuselage band. This paler shade of 79 sand yellow was peculiar to locally repainted aircraft, as distinct from pre-painted deliveries from Germany. */Frank Smith*

Centre left: A Bf 109E-7 Trop. shows the variation between the two shades of 79, the base colour of the engine cowling being a lighter shade. The marking of the aircraft number in black on the white fuselage band was common amongst I *Gruppe* Bf 109Es in North Africa. */Frank Smith*

Below: Markings of convenience. The Ju 90V3 wearing the national markings of Syria during the Luftwaffe's brief involvement in support of the Axis inspired uprising. Tail stripes, from leading to trailing edge, are green, white, red and black. Overall colouring of the aircraft appears to be 02 with black engine nacelles.



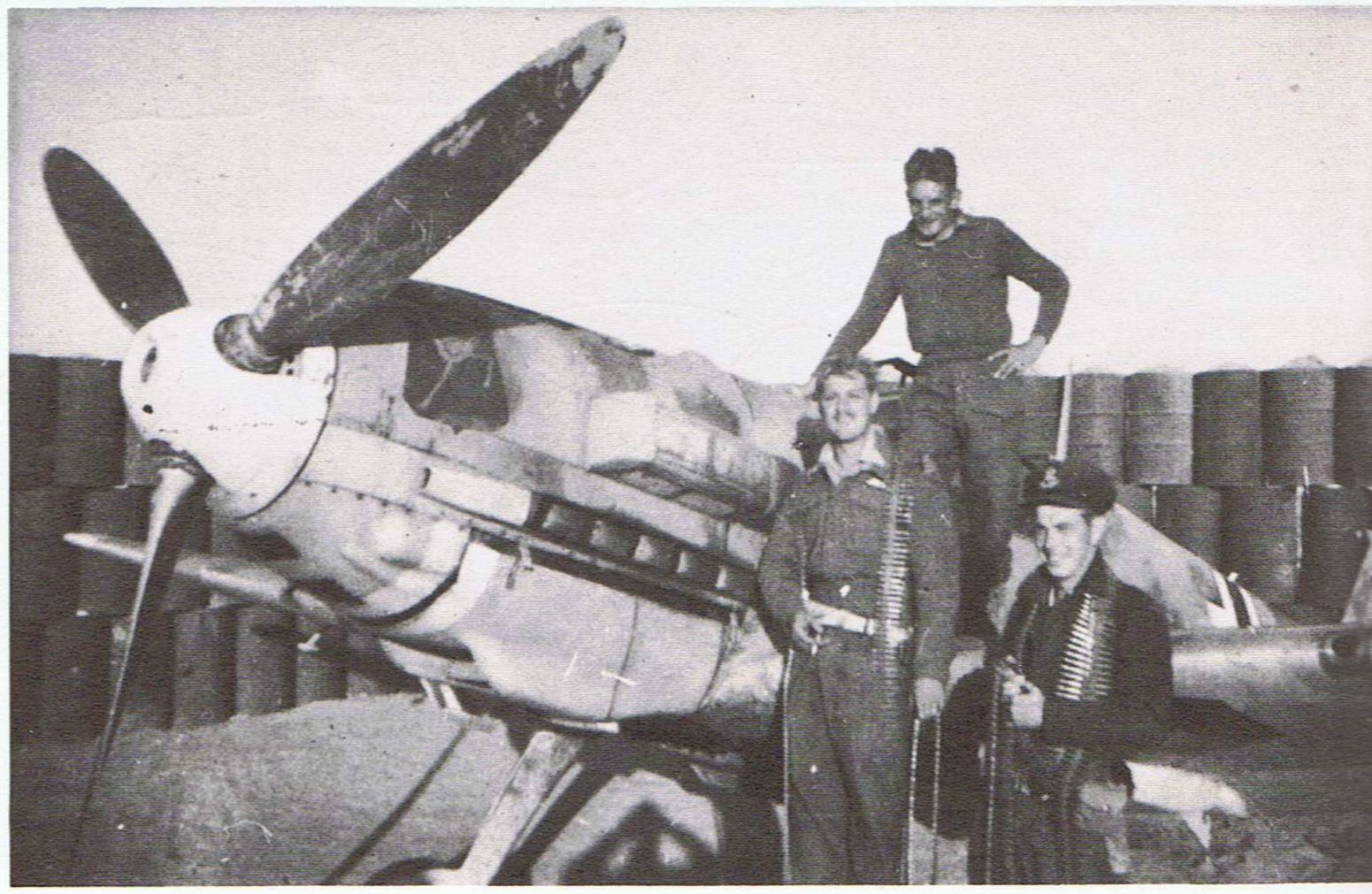
European-type greens since this blended well enough with the Italian topography and the sea.

Small numbers of aircraft had, as stated, already arrived in North Africa in January 1941, namely the Bf 110s, of III/ZG 26 and 2 *Staffel* of I/ZG 26. Badly mauled in operations over Britain, they were accompanied by another victim of the battle, the Ju 87Bs of St. G. 3. The transfer of forces from Sicily in February brought the Ju 88s of I (F)/121, II and III (K)/LG 1, Ju 87s of I/St. G.1 and II/St.G.2 and the He 111s of KG 26. This amounted to almost 50% of the Luftwaffe operational strength in Italy.

In April the first single-engined fighters arrived direct from France, I/JG 27 being rapidly brought up to full strength. By an interesting coincidence, and that is all that it was, the *Gruppe* emblem was a map of Africa on which was superimposed the heads of a panther and a negro. The Bf 109Es retained their camouflage and full Channel coast tactical markings of yellow on engine cowlings and rudders. To conform with local campaign requirements, however, a white band was applied to the fuselage of each aircraft. They were joined on June 1 by 7./JG 26 which for several weeks had been operating its Bf 109Es over Malta from Sicily. Again the bold yellow nose and rudder markings were retained by these aircraft.

This seemingly disjointed collection of camouflage schemes and markings was soon to be rectified. The Luftwaffe's commitments had taken its aircraft into a wide range of varying environments and a general revision of camouflage schemes was promulgated. In North Africa a new camouflage scheme also appeared, similar in colouring to that used by the Italian air force but which was intended to be confined to aircraft engaged in operations south of the Mediterranean.

This desert camouflage consisted of three colours; blue 78, sand yellow 79 and olive green 80. The controversial aspect of this scheme relates to the sand yellow 79 colour. Both black and white and colour photographs of early Bf 109s and Bf 110s, taken early in the desert campaign, show this yellow to be a lighter and brighter shade than the lower surface blue; a near match in fact to the panther's head of the JG 27 emblem. Later issues of aircraft to North Africa show a distinctly darker shade for the 79, a colour for which, fortunately actual samples have survived. These were taken from a Bf 109F and a Ju 87B and are identical. (It is this shade that has been identified in the Munsell colour reference given in the Appendices.)



Above: A captured Bf 109E-5 Trop. with a running ostrich emblem on its engine cowling. This aircraft has a white spinner, wingtips and rear fuselage band with a black number 10 on the latter. A sand worn narrow band of white can also be seen on the lower engine cowling. The additional white tactical markings indicate that this aircraft was amongst the last of the E models to serve in North Africa./*P. T. Malone*

Why the earlier shade should have been lighter and brighter is not clear, the only practical suggestion offered being that since only very early arrivals were involved, the repainting was done locally, a locally mixed and issued stock of 79 was used. Favouring this suggestion is the fact that the darker shade of sand yellow only appears with deliveries of aircraft direct from the factories in Germany, already pre-painted in desert camouflage.

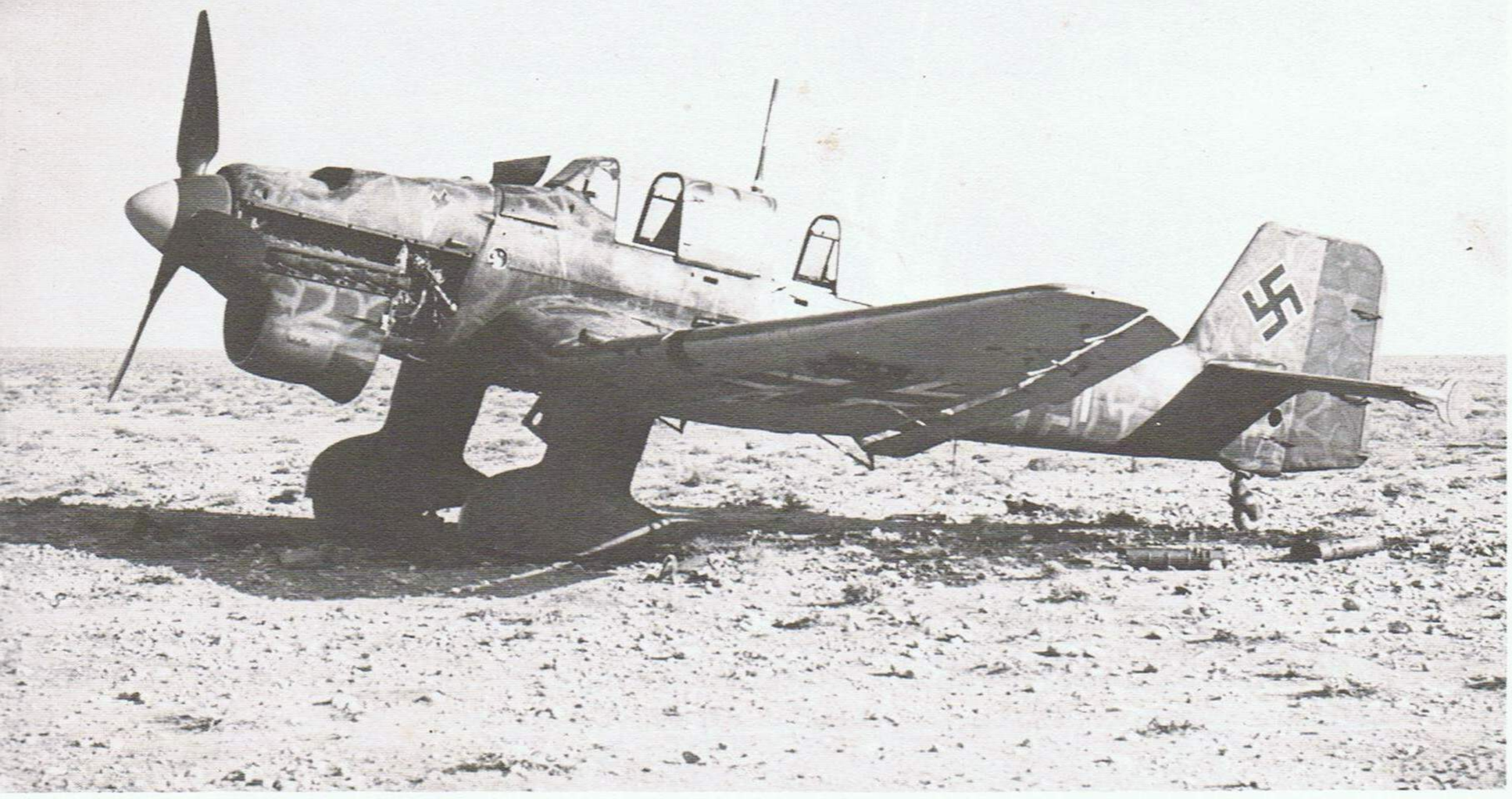
Supplies of any type were usually at a premium in North Africa and retrospective changes to existing camouflage schemes were slow, some aircraft still wearing their original European camouflage scheme as late as 1942. Replacement aircraft were, however, delivered in appropriate camouflage complete with tactical markings.

Other unusual markings had also appeared in the Middle East. Success in Crete had prompted a German-instigated uprising in Iraq. Unfortunately for the Axis, withdrawal of most of the Luftwaffe units from Crete denied them the opportunity to exploit the situation. Instead, a few He 111s and Bf 110s moved into Syria and Iraq, adopting the national markings of the latter country. These were applied in the normal wing and fuselage positions, the *Balkenkreuz* in each case being first overpainted. The *Hakenkreuz* also disappeared beneath a thin coat of paint, to be replaced by green, white, red and black markings on the rudder. The Bf 110s also retained their tactical markings from the previous campaign.

The small number of aircraft involved, lacking proper support facilities, proved inadequate to exploit the tactical opportunity and the Axis plan came to nothing.

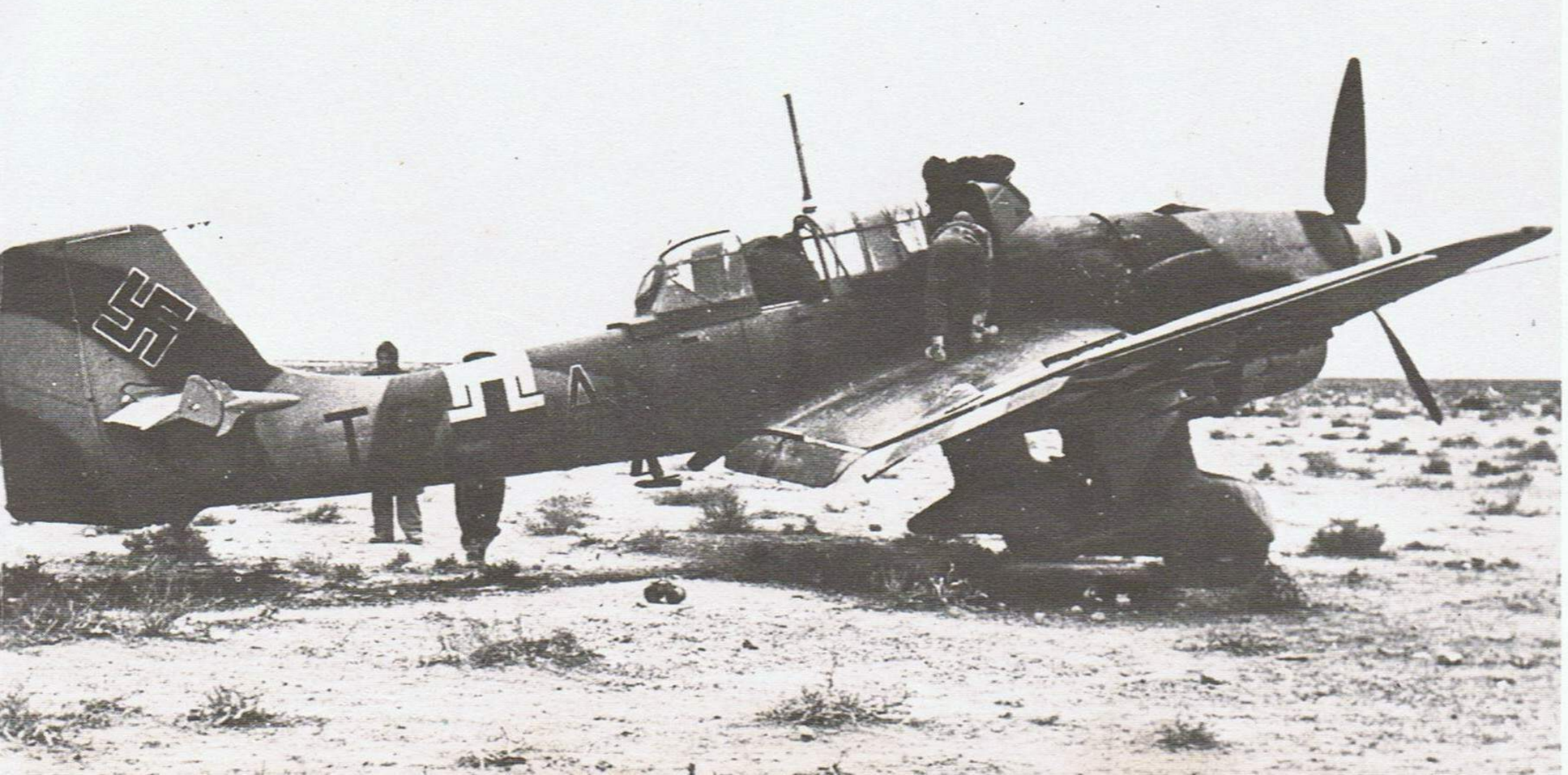


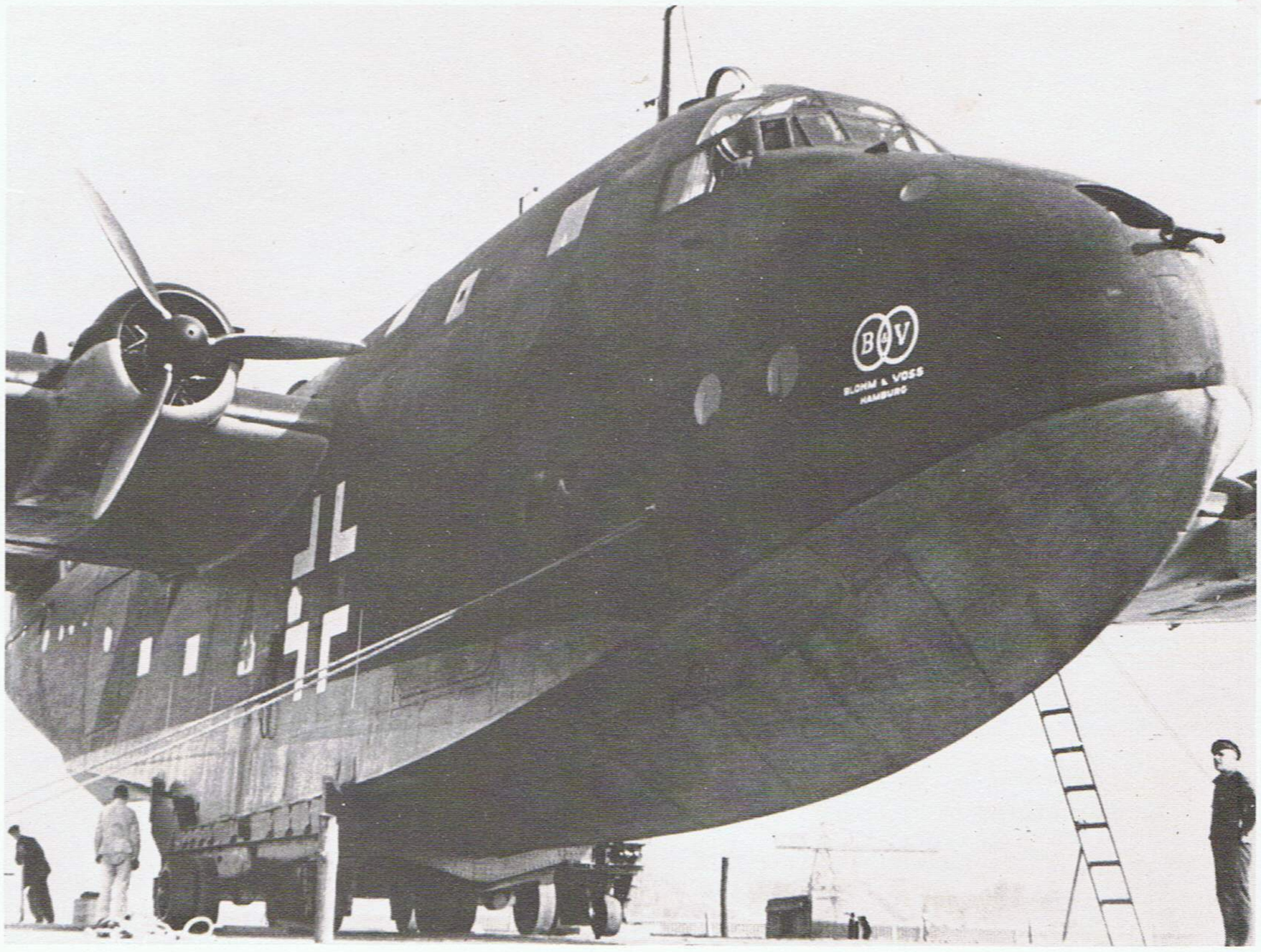
Above: The remains of a Bf 110D-2, W.Nr.4430, from the *Stab* of ZG 26 at Gambut, December, 1941, in the early style desert camouflage adopted for the type; the division line for the two camouflage colours is along the fuselage centre line. Prior to the introduction of this scheme, interim camouflage had taken a rudimentary form, one colour from the standard segmented pattern being over painted in sand-yellow. *Australian War Memorial*



Centre left: A Ju 87B-1, A5+IL of 3./St.G.1 at Acroma in December 1941. It shows the very intensified pattern of 80 coloured patches over the 79 base colouring on upper and side surfaces. The 78 colouring is confined to the extreme lower surfaces. Note the total lack of any form of tactical markings. */Australian War Memorial*

Below left: A variation in camouflage is seen on T6+AN, a Ju 87B of 5./St.G.2 which has a segmented form of 79/80 upper surface camouflage. The positioning of the white fuselage band is unusual for a North African based aircraft. Width and positioning did vary considerably on Ju 87s but it was rarely ever positioned as shown here. */IWM*

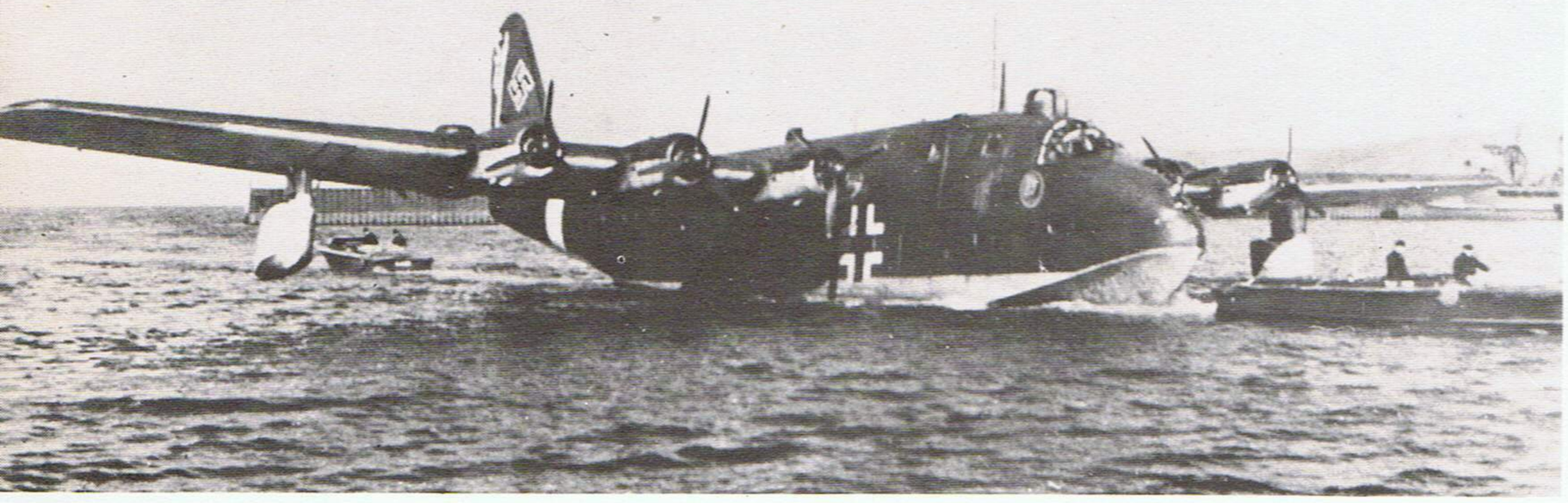


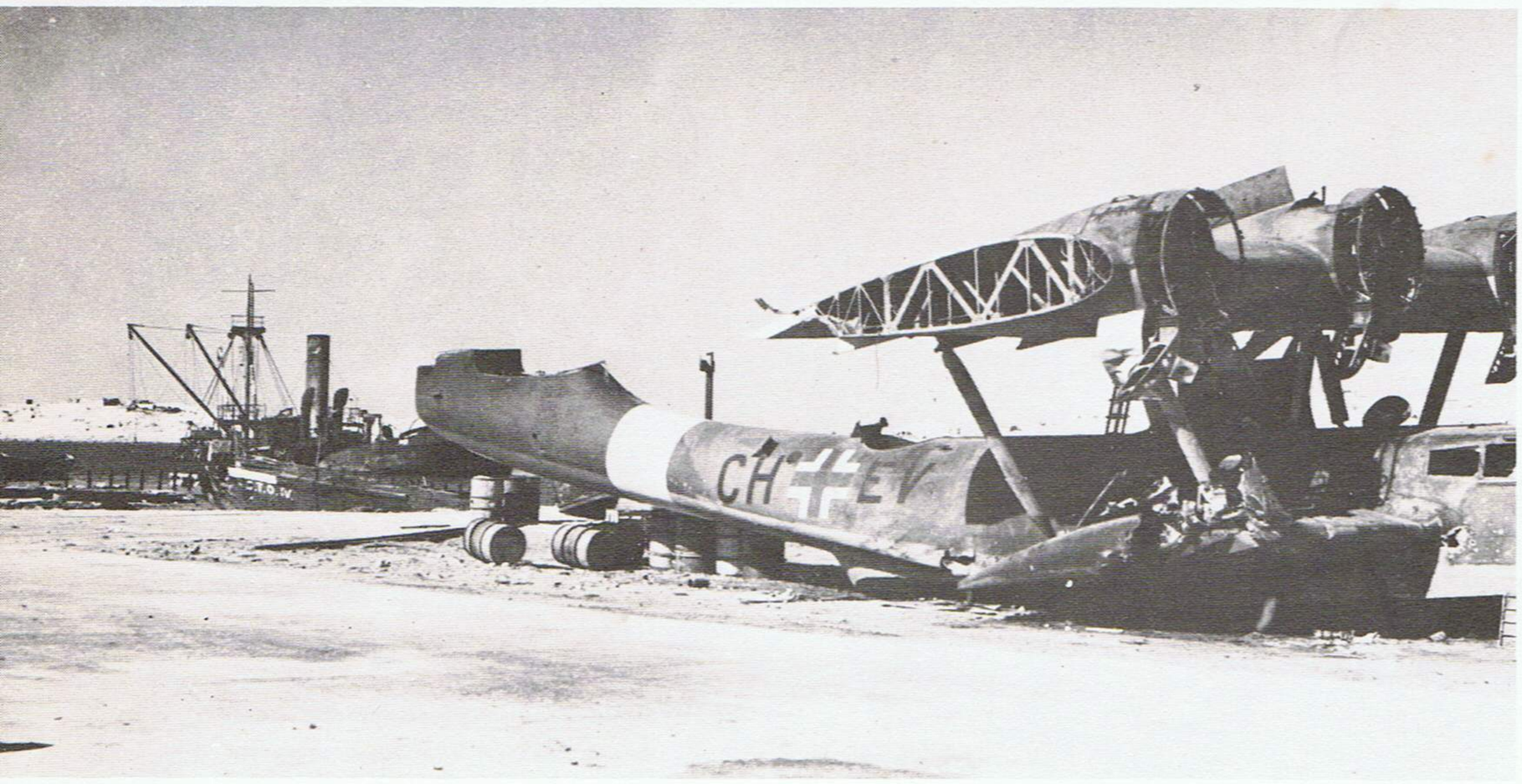


Right: Bv 222 V1, X4+AH, which was delivered to LTS (*See*) 222 in May, 1942. The black codes, lost against the 72/73 paintwork, used by the Bv 222s were unusual in structure as explained in the text. The company insignia on the nose was retained in service. */ Deutsches Museum Munich*

Below: The Bv 222 V4, X4+DH, of LTS (*See*) 222 wearing both the white fuselage band and the white rudder marking S/4. The unit badge of a Viking ship is just visible below the cockpit. */IWM*

Bottom: Do 24Ts serving in the Mediterranean were comparatively rare before 1943. This one served with *Seenotdienstführer Mittlemeer* and like the Bv 222 force its only tactical marking is a white fuselage band. */Australian War Memorial*





Above right: With part of its original 70/71 camouflage still visible around the cockpit area this Go 242 appears to have had some form of netting left in place when the rough coat of 79 was sprayed over the upper and side surfaces. This particular Go 242 was not from a *Schleppgruppen*, part of its second line registration, DQ, being visible near the break in the rear fuselage. */IWM*

Centre right: This DFS 230B-1 was originally based in Italy and at that time carried a large emblem beneath the cockpit, showing an elephant towing a wingless glider across the desert. Unit identity is not known but it is possible that it belonged to LLG 1. The miniature *Balkenkreuze* markings were common to most first line gliders. */IWM*

Bottom right: The battered remains of Ju 52 from the *Stab* of LLG 1 coded H4+AA. */Frank Smith*







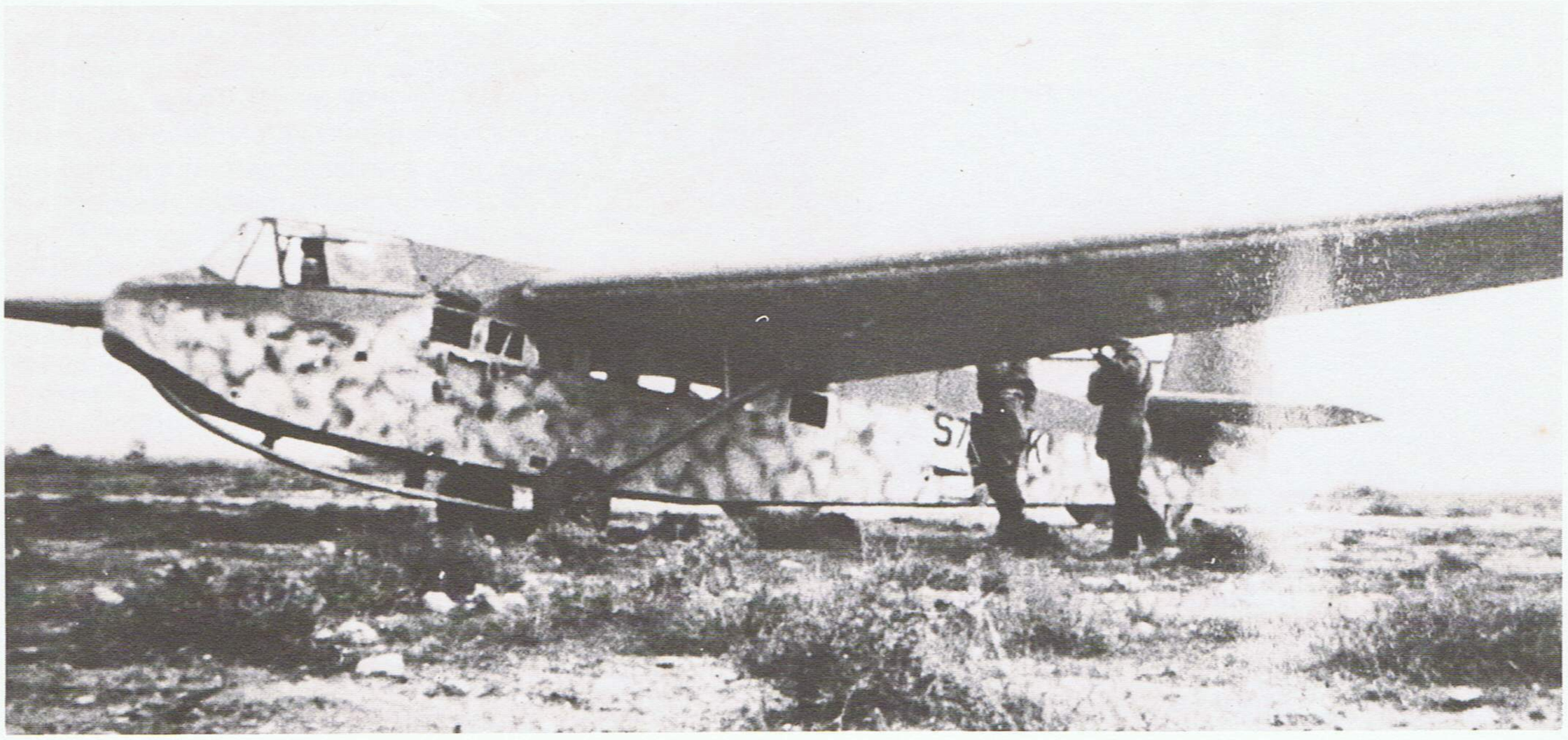
In September 1941, JG 27 began ferrying its ageing Bf 109Es back to Germany one *Staffel* at a time, returning with the improved Bf 109F model. These arrived at a time when fighter camouflage was again undergoing a revision, namely the deletion of the 80-coloured mottle, leaving all upper and side surfaces in 79. There appears to have been a definite transition period involved, for a few of the Bf 109Es were recorded in the new camouflage while early delivery Bf 109Fs carried a 78/79/80 colour scheme.

A minor variation to the new scheme was the termination of the upper and lower surfaces in a straight line along the centre line of the fuselage. This type of application was also recorded on some Bf 110s.

As had happened so often before, the Luftwaffe encountered stiffer fighter opposition and the need for rapid air-to-air identification arose once more. A full set of white tactical markings, designed to be clearly visible from all angles, was adopted. Spinners and engine cowling front panels were painted white, as also were wingtips on both upper and lower surfaces. In addition, the original white fuselage band was retained. There were the inevitable minor variations, but in general the application met the above standards. The few remaining Bf 109Es were painted with the additional markings, but most retained their original 78/79/80 colour schemes.

Other aircraft types in use had also adopted tropical colour schemes, but again with certain distinctions. While Ju 88s were to be seen wearing either 78/79/80 or just 79/80, He 111s appear to have made exclusive use of the latter scheme. A few examples of both types were also seen wearing white wingtip panels, a distinction normally exclusive to the fighters. Very few examples of the 78/79 scheme were recorded in use by Ju 87Bs and most wore 78/79/80. Early conversions to tropical camouflage followed the style applied to Bf 109Es; i.e. a base coat of 79 on all upper and side surfaces with large, well-spaced patches of 80. This, however, rapidly gave way to a more refined version using a closely-spaced, random pattern of 80. Like the Hs 126s a few early unit-applied paint schemes on some Ju 87Bs used the 79 and 80 in continuous segments rather like RAF camouflage patterns.

Smaller machines such as the Fi 156 wore a variety of obviously individual styles of camouflage utilising 78/79/80, the latter colour being applied in streaks, patches or wavy lines. As was to be expected a few used a plain application of 78/



79. One point of consistency did, however, link these three types – Ju 87, Hs 126 and Fi 156 – a simple fuselage band of white.

Night fighting was carried out on a very limited scale due to the limited ground control facilities, vastness of the area to be defended, and the relatively small number of British aircraft engaged in night operations. I/NJG 3 had arrived at Derna, from Greece, in August 1941, only to depart again in October. Camouflage for these aircraft remained unaltered due to their nocturnal operations; the addition of standard white tactical markings was considered impractical for obvious reasons.

Following the capture of Crete, *Fliegerkorps* X had been transferred from Sicily to the Eastern Mediterranean area and based on Greece. This resulted in German air transport forces being shifted from Italy to Athens, Crete then forming the stepping stone between Europe and North Africa. Italian air transport forces had to assume the major portion of the responsibility for supplying the Axis forces in North Africa, a responsibility not met due to technical and training deficiencies. The situation was aggravated further by the depletion of Luftwaffe forces in Athens, these being transferred north for the impending invasion of Russia.

This reduced the Luftwaffe transport force to approximately 65 aircraft, which included the Bv 222V1. This giant flying boat retained its 72/73/65 camouflage, but a broad white fuselage band was added. A second Bv 222, the V2, arrived exactly one month later, on August 10, to swell the meagre ranks of *Luft-Transportstaffel* (*See*) 222. Five more were received by the end of the year. Coding on these aircraft

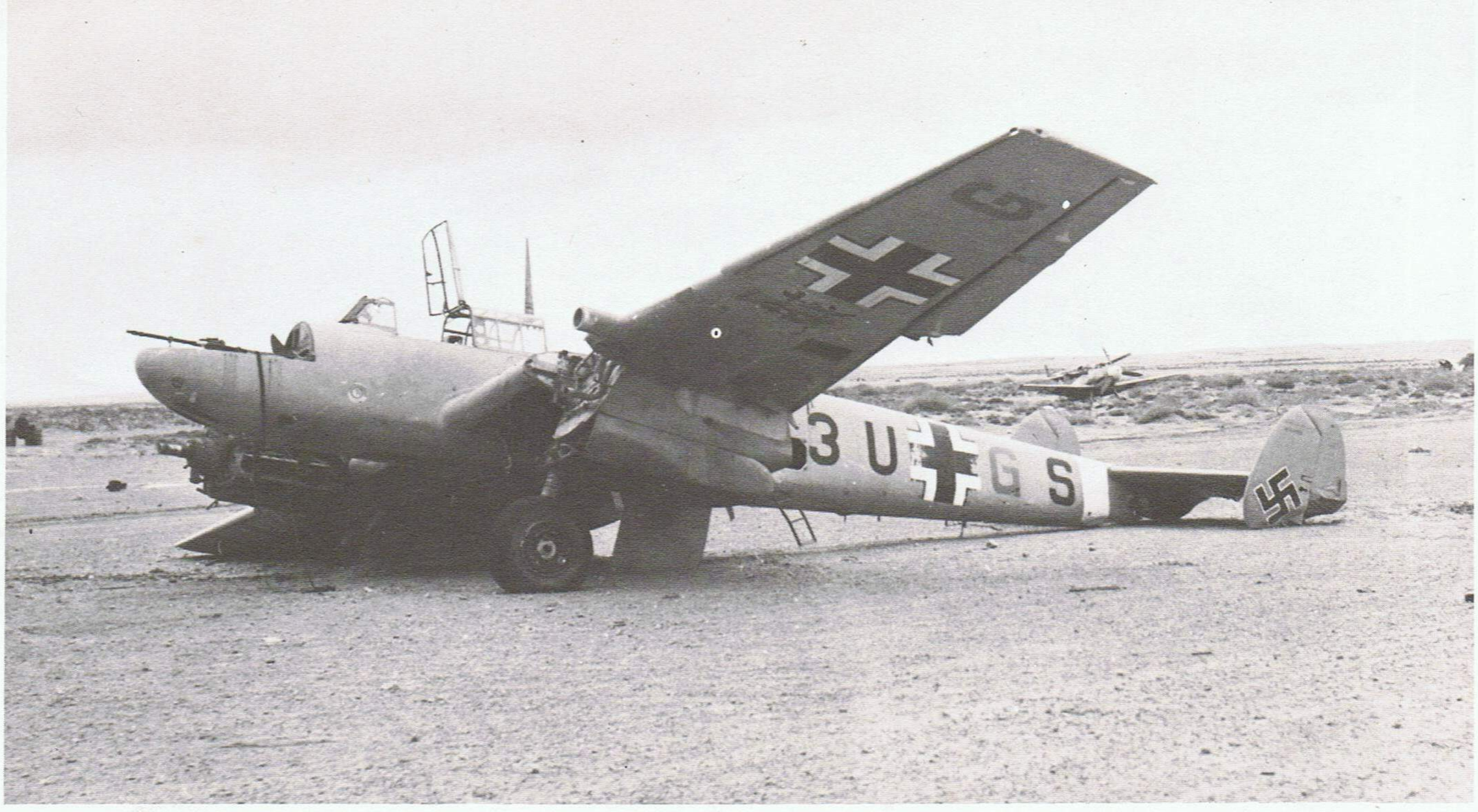


was similar in application to that used by the Do 26 flying boats which had been pressed into service, in pre-production form, in 1940. Both types used a combination of military-style coding plus portion of the normal four letter registration. However, where the Do 26 varied the fourth character of the code group, e.g. V4 (P5+DF), V5 (P5+DG) and V6 (P5+DH) the Bv 222 aircraft varied the third, e.g. V1 (X4+AH), V2 (X4+BH), V3 (X4+CH) etc. In addition to the white fuselage band, a special rudder marking was introduced, consisting of a white letter S beneath which appeared the aircraft's *Versuch* number. This cypher group was divided by a white diagonal line.

On May 26 the battle of Gazala commenced. It was to witness the most dis-

Top: Some degree of mystery surrounds the codes on this DFS 230B, Coded S7+?K, it appears to have belonged to 2./St.G.3. Possibly it was a unit hack used to transport equipment during the frequent moves to which the desert units were subjected. */via F. Smith*

Above: Wearing the same type of camouflage as the DFS 230 in the previous photograph, i.e. 70/71/65 with mottling on the sides in both 70 and 71, it carries no form of national markings. */IWM*

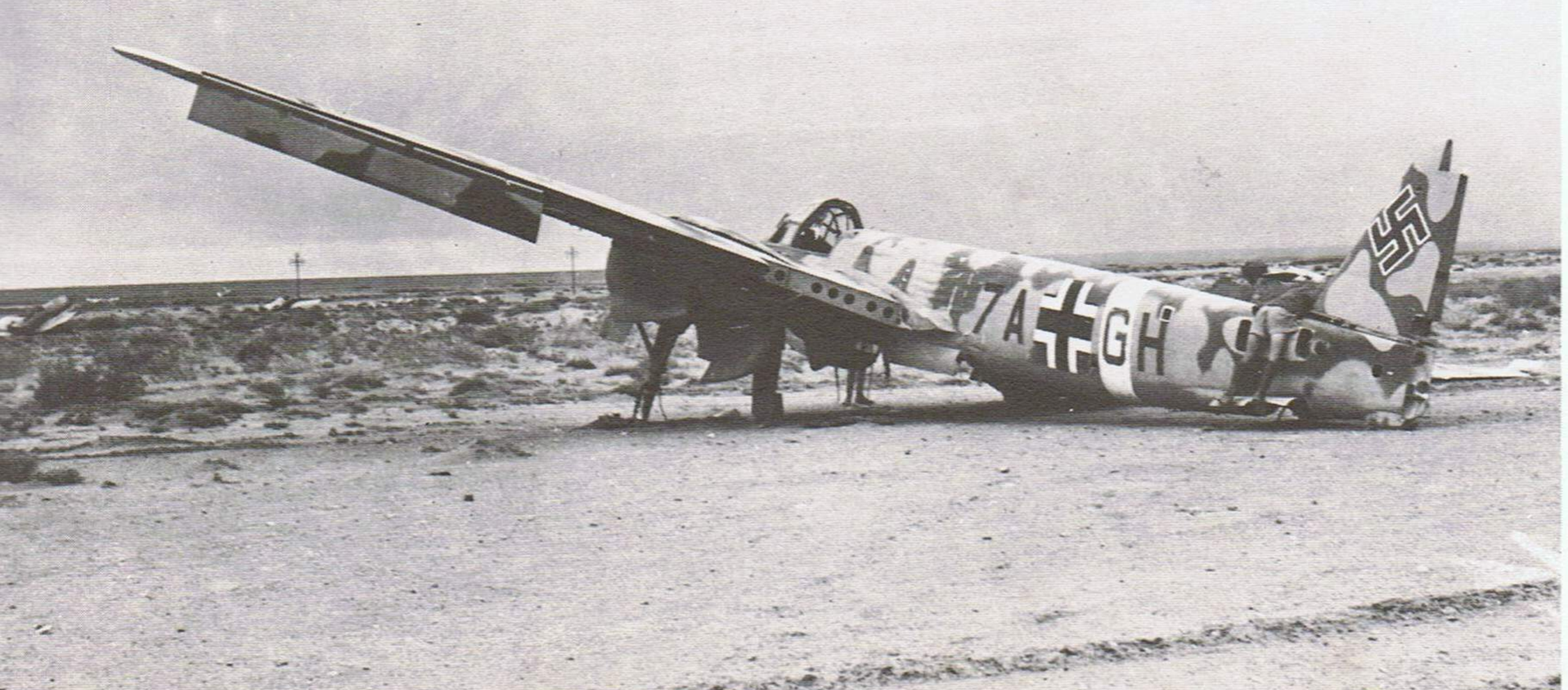




Above: Representative of the final camouflage scheme for Bf 110s, the sand colouring has been taken right down the fuselage sides. This appears to be a fully tropicalised aircraft, a filter extension protruding from the port wing carburettor intake. */Australian War Memorial*

Centre left: Bf 109F, W.Nr. 10182, in European camouflage and full North African tactical markings. Such anomalies continued to the end of the campaign. Just below the rear fuselage can be seen a dark blue oxygen bottle with two white distingushing bands. */ Australian War Memorial*

Bottom left: A most unusual application of desert camouflage colours adorns this Ju 88 of 1.(F)/ 121. The nose carries the well known white swan emblem of this unit. */Australian War Memorial*



astrous series of reversals by both combatants, and ultimately led to the final defeat of Rommel's superb *Afrika Korps*.

Since the transfer of Luftwaffe forces from Sicily in April 1941, Malta-based British aircraft had become a steadily growing annoyance to Rommel's forces in North Africa. Considerable damage to port facilities and the harassment of convoys had proven costly. By December, Luftwaffe strength in Sicily had again been increased, a process that continued until March 1942 when air strength stood at approximately 425 aircraft.

A general, if modest, series of air attacks had commenced against Malta in January 1942, and continued at that level until mid-March when a major assault began on March 21. The full fury of attack continued throughout April in preparation for an intended airborne assault. To this end a mixed force of gliders, composed of DFS 230s and Go 242s, was assembled in Sicily with a small detachment in the Western Desert. Camouflage for the gliders remained standard 70/71/65 as applied by the manufacturers.

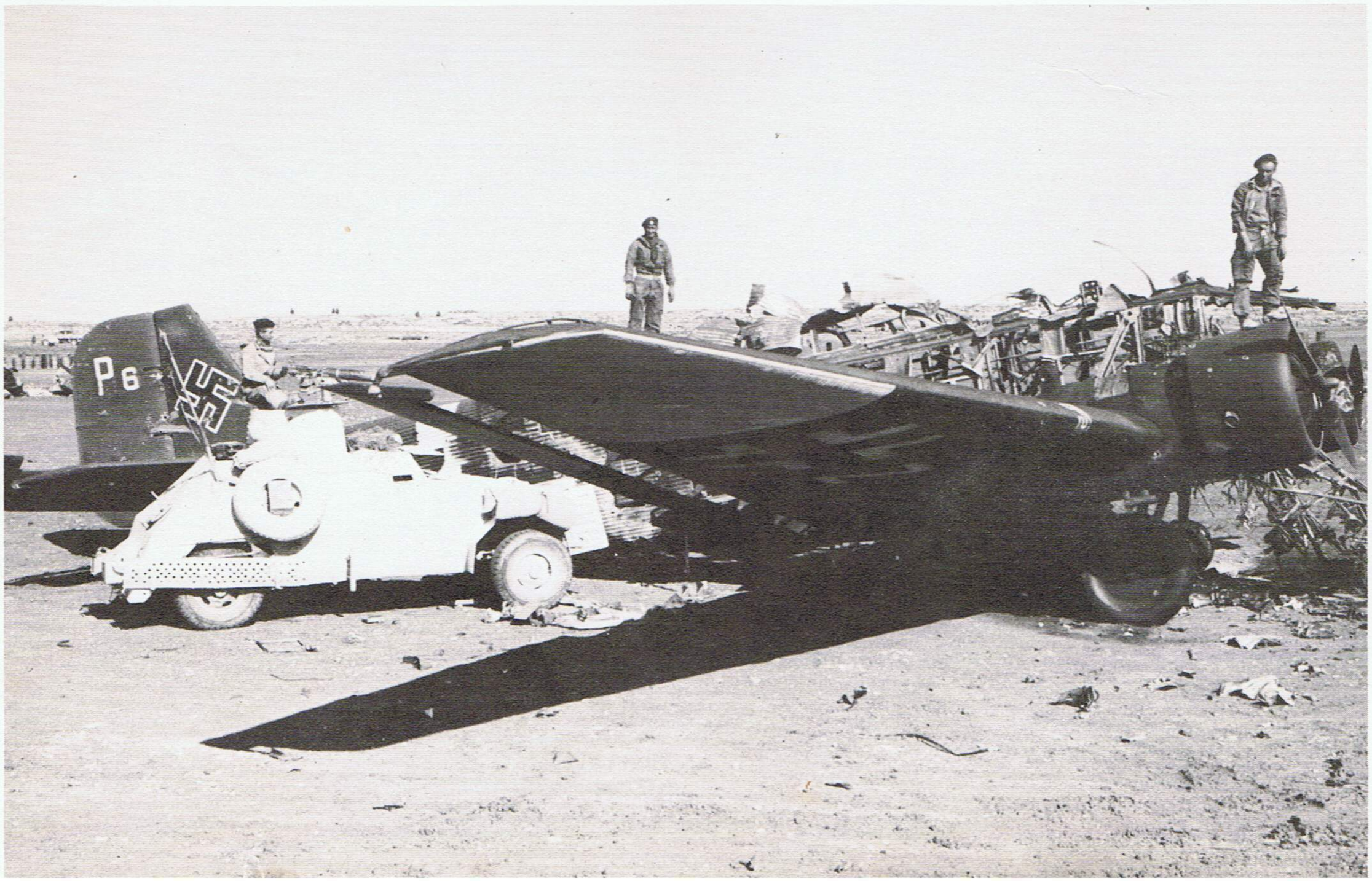
Early in the renewed assault on Malta, the British had attempted to run in supplies by convoys from Alexandria, but these had met with staggering opposition from the Luftwaffe. Most anti-shipping aircraft based in Sicily appear to have retained their European camouflage scheme of 72/73/65 which was well enough suited for the waters of the central Mediterranean. North African-based aircraft, however, were forced to retain their totally unsuited desert camouflage colours, due no doubt to the multiplicity of roles required of the small forces available south of the Mediterranean. White fuselage bands were, however, common to both. Some of the Sicilian-based anti-shipping Ju 88s adopted additional patches of 73 to the lower fuselage forward of the wings and engine nacelles, in order to blend with the seascape during low-level attacks.

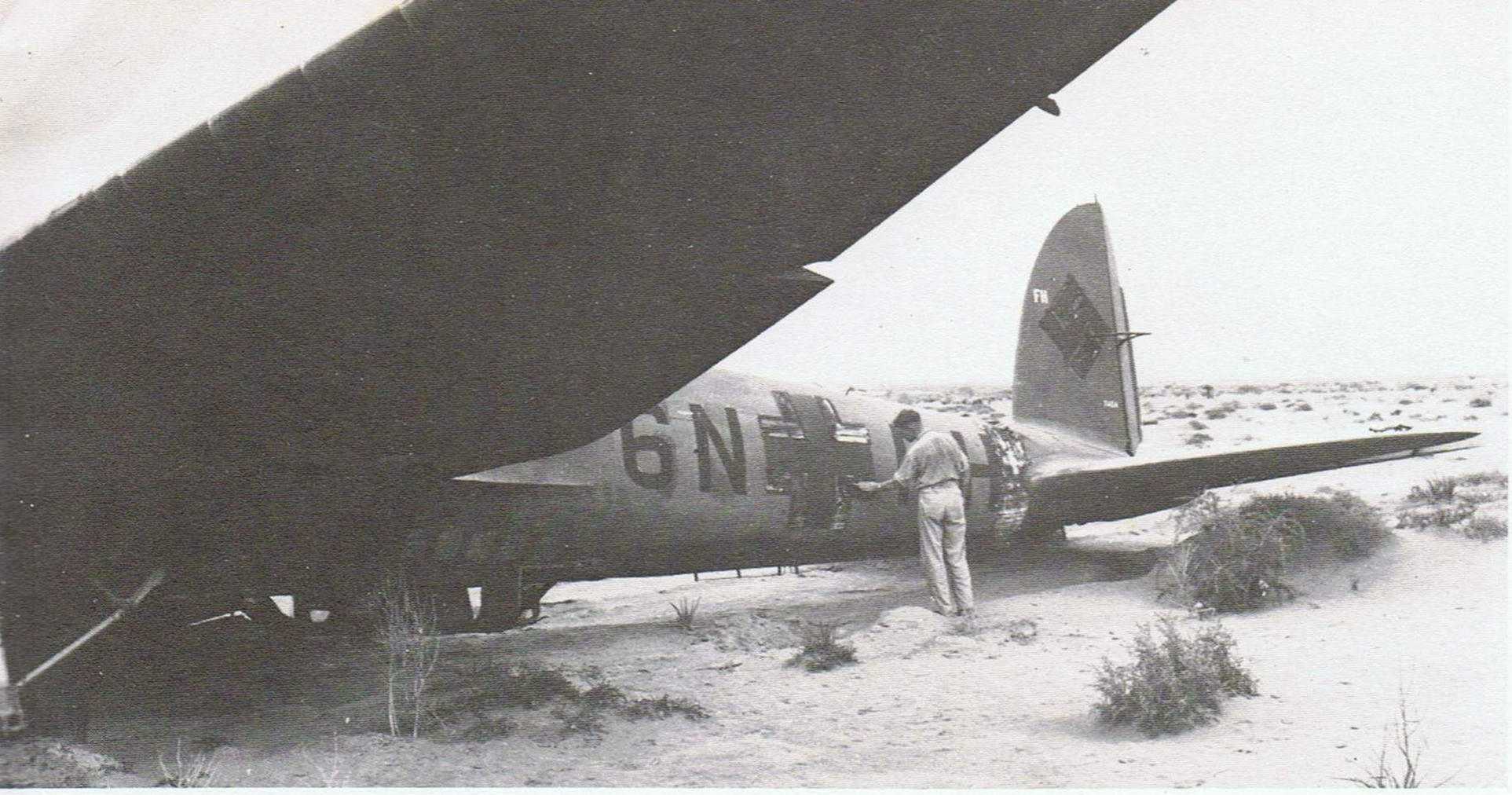
By June Rommel's offensive had the Allied forces hard pressed and in retreat toward El Alamein. This rapid advance, however, created a massive supply problem and a force of 150 supply aircraft was gathered together by taking over the special transport aircraft of the signals, ambulance, and transport services of *Fliegerkorps* II. Deterioration of the air and sea supply route resulted in a pile-up of men and materials urgently needed to sustain the Axis advance. To overcome this 100 Ju 52s were released from the Russian front in July, a further 50 arriving in Athens by the end of the month.

Extended supply lines began to aggravate the fuel problem until a critical situation was reached. By October this could only be eased by using all available aircraft to lift fuel from Crete to Tobruk. The final leg of the journey was serviced by a small force of Go 242 gliders. These were given a rudimentary form of desert camouflage by simply, and roughly, overspraying the 70/71-coloured surfaces with 79. White lower surface wing panels were also added.

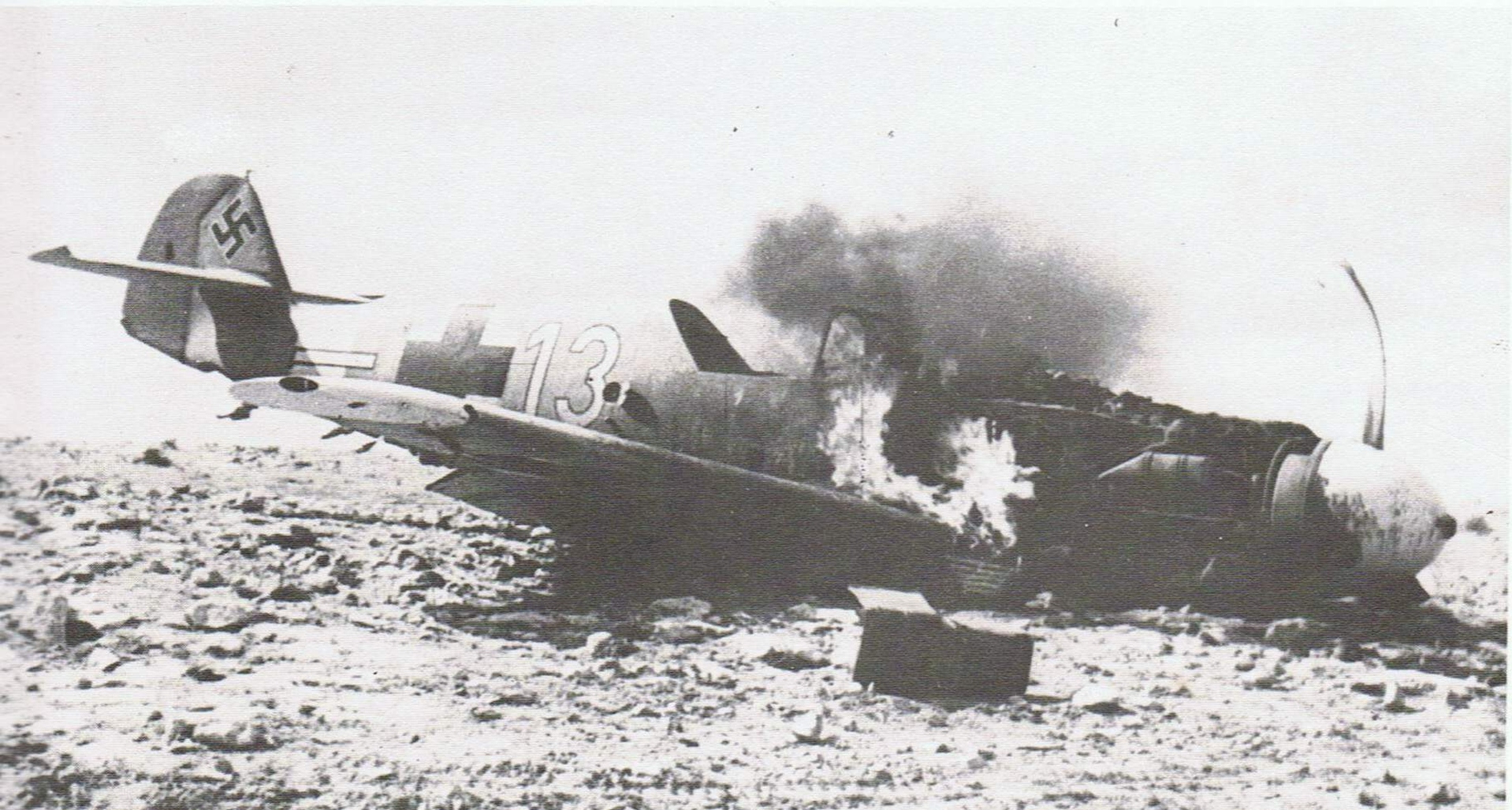
National markings on gliders were, in general, unusual in that they were applied in much reduced size; *Hakenkreuze* were often missing as also were the wing upper

Below: Typical of aircraft of the hastily formed transport units this Ju 52, 1Z+JN, normally belonged to KG.z.b.V 1 but wears the temporary unit identification markings on its rudder. The under surfaces are black and contrast strongly with the large area of yellow, (this unit had been pulled back from Russia) and the white code letters under the wings. The aircraft letter J is repeated in red, thinly outlined in white, on the wing leading edge. A yellow fuselage band is just visible. */Australian War Memorial*











Above left: A I/KG 100 He 111, W.Nr.7404, bears traces of temporary black camouflage on its national and tactical markings. The full code of 6N+FH is black but the last two letters can be seen applied in white on the fin; a practice that was to become more common amongst the bomber force based along the Channel coast./*Australian War Memorial*

Above right: Detail of the emblem from L1+FH, a Ju 88 of I/LG 1, which shows that it was applied by using a stencil and spray painting equipment. This was the most commonly used method, the luxury of hand painted emblems belonging to less turbulent times. The aluminium plate was also a common feature of Luftwaffe aircraft, being a manufacturers plate which gave details of construction. /*Australian War Memorial*

Centre left: A 6 *Staffel* Bf 109F Trop. burns after a crash landing. Note the width of the black centre to the fuselage *Balkenkreuze*. The same excessive proportions are also used for the wing lower surface *Balkenkreuze*. /*IWM*

Bottom left: The same type of oversized black centre also appears on this 6 *Staffel* Bf 109F. *Australian War Memorial*

Above: The oversized black centre was not exclusive to one unit as the two preceding photographs tend to imply. This Bf 109E of 7./SKG 210 also wears an odd, but by no means rare combination of 71/02 camouflage on its wings and tailplane with sand-yellow 79 fuselage top and side surfaces, plus full North African tactical markings. */Australian War Memorial*

Right: The odd size *Balkenkreuze* marking was also not restricted to Bf 109s as shown by this Bf 110C of LG 1 which was shipped back to America for technical analysis. The only feasible explanation for the markings appears to be the same old rapid identification problems associated with the declining fortunes of battle.



surface *Balkenkreuze*. Codes were also quite different.

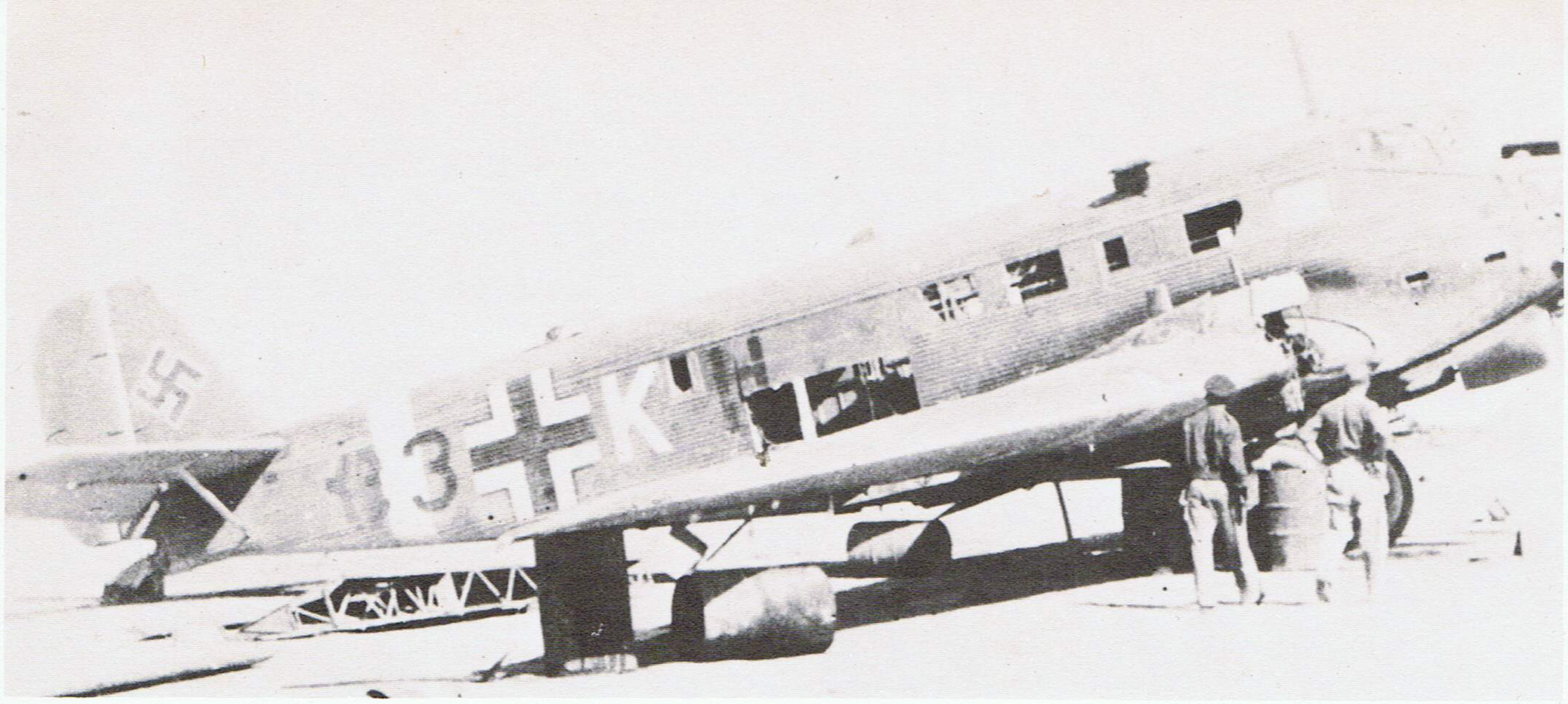
The initial glider-borne attack of World War II had been carried out by I *Gruppe* of *Luftlandegeschwader* 1 equipped with DFS 230s. The success achieved led to the formation of II and III *Gruppen* later in the year, but the opportunity for further glider-borne operations had not occurred until April 1941 in Greece. Three different pairs of prefix letters have been repeatedly recorded on DFS 230s, LB, LC and LH, the middle number of the code in all cases being 1; the last section of the code varying from single to triple figures. There is insufficient evidence to make a definite statement regarding the significance of each element of the code group, but what is known points to the following possibility. The first two letters were possibly part of the normal, factory applied, four letter registration group, the middle number the *Geschwader* identity, and the last number the aircraft's identity. The very high numbers recorded on some suggest that this was the glider's identity within the *Geschwader* rather than the *Gruppe*. The DFS gliders of the *Luftlandegeschwadern* were in a somewhat unique category; although technically first line aircraft they were, in fact, only committed to combat on very rare occasions. The suggestion that they used a combination of both second and first line codes may not, then, be so radical. In support of this reasoning is the fact that official code allocation for *Luftlandegeschwader* 1 was H4, and this was carried by the Ju 52 tug aircraft used by the unit.

The DFS 230 was also used by the *Lastenseglerstaffeln* (Cargo Glider *Staffeln*) forming 1 to 10./DFS 230 *Staffeln der Luftwaffe*. This was supplemented by a Go 242 force comprising 1 to 6./Go 242 *Staffeln der Luftwaffe*, both types being amalgamated into *Schleppgruppen* 1, 2 and 3. These gliders carried a similar style of coding to those of the *Luftlandegeschwader* but with definite differences. The first two characters of the code identified the *Gruppe* and were applied in very tiny figures and letters; the next number identified the *Staffel* and was often applied in the appropriate colour; the last number was the aircraft's identification and was applied in either black or white to obtain maximum contrast with the background. The very low numbers used indicate that it identified the aircraft within the *Staffel*.

The seemingly wide difference in code structure between the *Luftlandegeschwadern* and the *Schleppgruppen* becomes clearer when it is remembered that one applied to a full *Geschwader*, the other to a *Gruppe*.

One final word is required concerning gliders operated by the second-line units, but which nevertheless carried full camouflage and operational theatre tactical markings. In accordance with the

Above: III/JG 77 received a batch of brand new replacement aircraft during their transfer from Russia to North Africa in October 1942. This Bf 109F Trop. wears a camouflage scheme of 78/79 applied at the factory of manufacture. This is an example of a new aircraft marked with the appropriate tactical markings prior to delivery to an operational theatre. Note the high-light reflection from both the camouflage paint and that used for the national markings. The registration letters GG+GT, however, reveal their matt finish consistent with the temporary black paint used for this interim identification. Note the parts of the letters already scratched away. *H. Obert*



Above: Unfortunately of poor quality, this photograph illustrates a Ju 52, C3+KH, of an unidentified transport unit. It was found amongst the remains of other aircraft in the final push towards Tunisia. The aircraft letter K was repeated on the leading edge of both wings but in mirror image form. This unusual practice has been noted on a few other aircraft. The emblem on the nose is almost lost due to the quality of the print but it consisted of a red triangular shield, point down, with a stylised German eagle on it in white. Above the shield was a motto in white.

relevant official directive these gliders retained their allotted four letter registration.

Rommel's Afrika Korps continued its rapid advance toward Egypt until El Alemein was reached and there, on October 23, the Allied armies launched their counter-offensive. Soon the tide of battle was reversed and Rommel's forces began the long retreat to the west.

On November 7 Allied forces began the landings in Morocco and Algeria. Luftwaffe reconnaissance had revealed the build-up of shipping but it had been thought that the objective was to reinforce the British Eighth Army in Egypt. In anticipation, four *Gruppen* of bombers, most of which were well versed in torpedo techniques, were rapidly transferred from northern Norway to Catania and Comiso in Sicily and Grosseto in Italy. The rapidity of the move and the immediate committing of these aircraft to action left little or no time for the application of Mediterranean markings, and most retained their yellow wingtip lower surface markings and fuselage band.

Other aircraft, bombers, twin-engined fighters and reconnaissance machines were moved rapidly from the eastern mediterranean to Sicily. A force of single-engined fighters and dive-bombers was also dispatched to Tunis on November 9, despite the lack of ground troops for protection of the airstrips. Further arrivals over the next few days brought more aircraft, ground staff and supplies, the latter two items being moved by transport aircraft and gliders.

The Fw 190 made its first appearance south of the Mediterranean with the arrival of 35 aircraft from III/SKG 10 in Tunis to take over the Ju 87 commitments, Allied air superiority making it near impossible to operate the latter type. Still wearing their 74/75/76/65 colour scheme, the Fw 190s were pressed into service as both fighters and fighter-bombers. Their grey colouring was of some advantage for they were also called upon to attack harbours and supply installations.

Another type to make its debut on the Mediterranean front was the He 129B, 4./Sch.G.2 arriving with its remaining eight aircraft in early November. Unlike the Fw 190s, North African camouflage was applied, possibly due to the small number involved and the close support work required of them. Application of the 80 colouring varied from soft-sprayed patches to short, wavy lines, the variations in so few aircraft pointing strongly to local painting, the aircraft having come direct from Poland. A white fuselage band was common to all of them but white lower surface wingtips were seen on but a few.

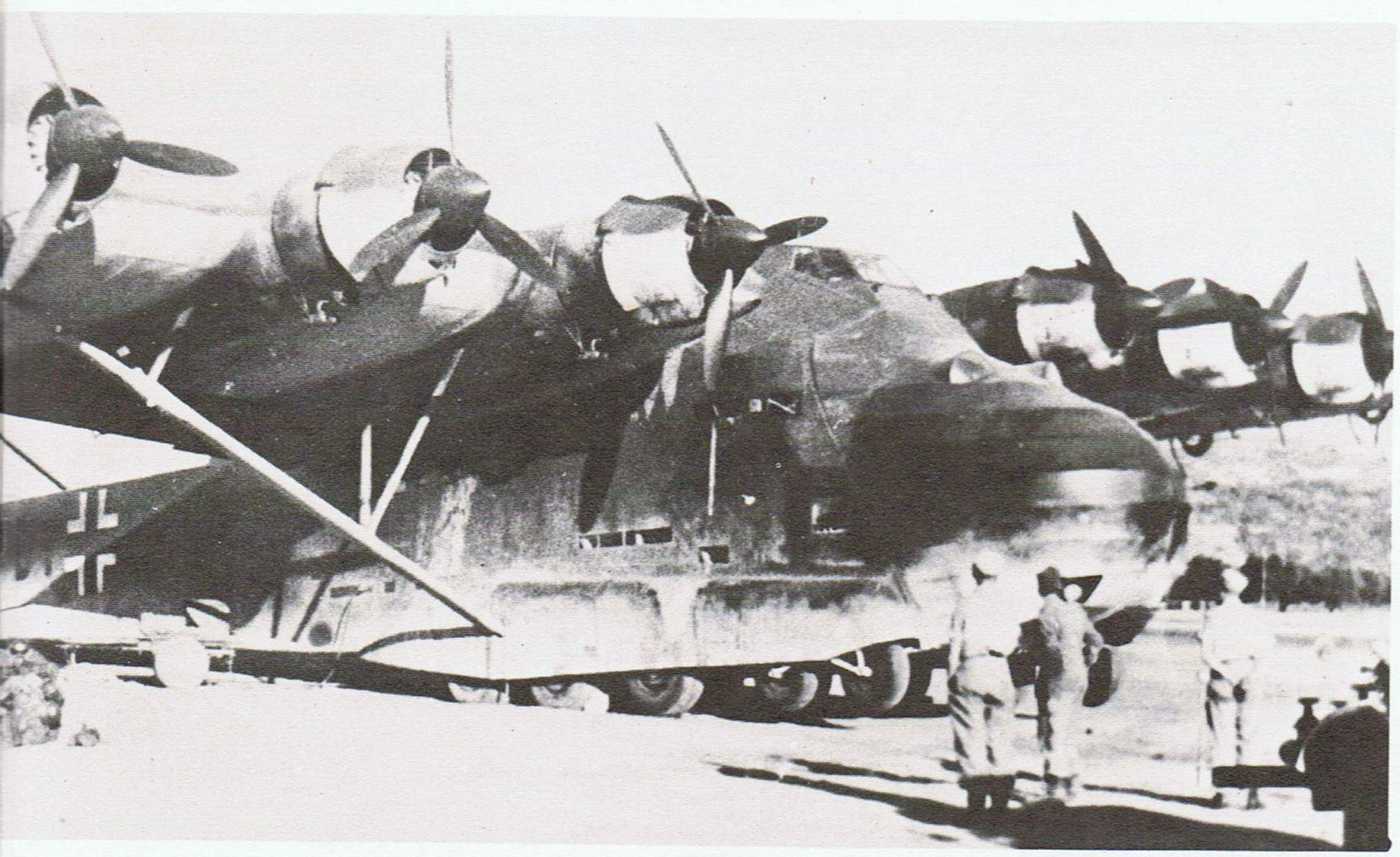
A further small batch of Hs 129Bs, this time from 8./Sch.G.2, arrived at Tunis-El Aouina. These also wore white fuselage and wingtip markings but, of greater interest, a new style of camouflage. Colours remained 78/79/80 but the 80 was used as a base colour over which a closely packed, continuous wavy line of 79 was applied to all upper and side surfaces. A similar style of camouflage was seen on the few Fw 58s and Fw 189s that saw service in North Africa.

The German forces were caught in a war of attrition with rapidly diminishing supplies and mounting losses, particularly by the Luftwaffe. Air transport bore the full responsibility for keeping the Axis bridge-head in Tunisia supplied, and for the first time the giant Me 323s went onto operations. KG.z.b.V 323 began operations from Castelvetrano and Trapani to Tunisia, averaging 30 tons per day per aircraft during December 1942 and January 1943. Camouflage for these giants remained 70/71/65 to which was added a white fuselage band.

The worsening situation on the Russian front at Stalingrad had resulted in a con-







Above: Believed to be part of SKG 10s force this Fw 190F-8 wears standard European camouflage of 74/75/76, to which has been added a white fuselage band and wingtips. Several other Fw 190s seen in Tunis also wore factory codes, understandable considering the pressures of battle. Behind stands an Hs 129B, red K, of 8./Sch.G.2. */Crown Copyright*

Centre left: An Me 323D of KG.z.b.V 323 disgorges its load in Tunisia. A white band encircles the rear fuselage, but less easily seen is the white area beneath the lower half of the open nose doors

Bottom left: These huge transport aircraft wore standard 70/71/65 camouflage to which were added the appropriate tactical markings. DT+IE is seen here after unloading its cargo. */T. Hitchcock*

siderable portion of the transport forces being withdrawn from the Mediterranean front. Approximately 200 Ju 52s and 15 Me 323s were left to maintain the supply line, but Allied aircraft wrought havoc amongst these over the next few weeks and losses became prohibitive.

On March 28 the Eighth Army broke through the Axis' 'MQARETH Line' and the end of the campaign followed shortly afterwards. By May 13, 1943, the battle for North Africa had ended.

From the Balkans to Russia

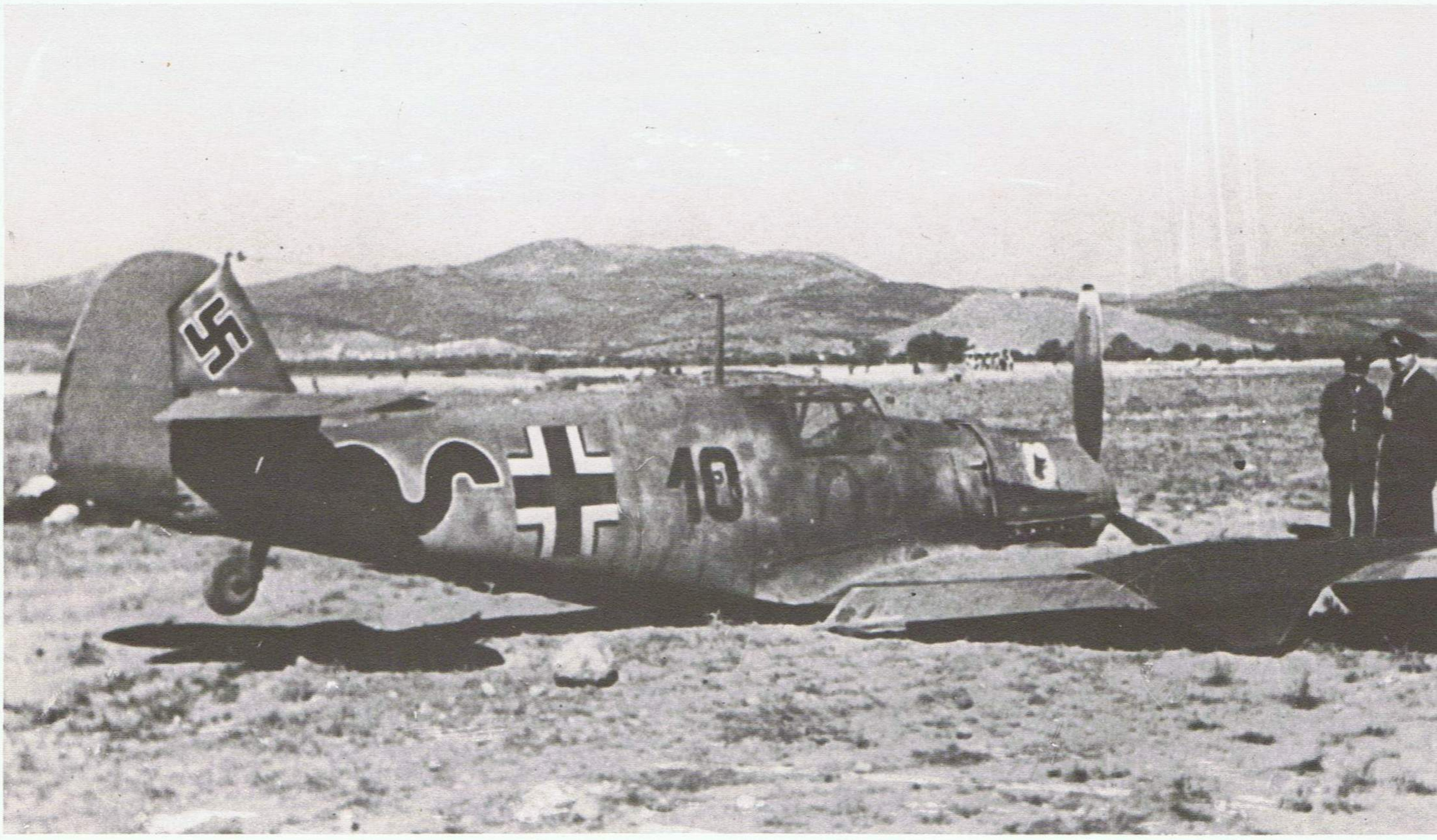
The prerequisite to the German plans for the invasion of Russia was the political preparation of the border states of Rumania and Bulgaria to enable German forces to enter those countries.

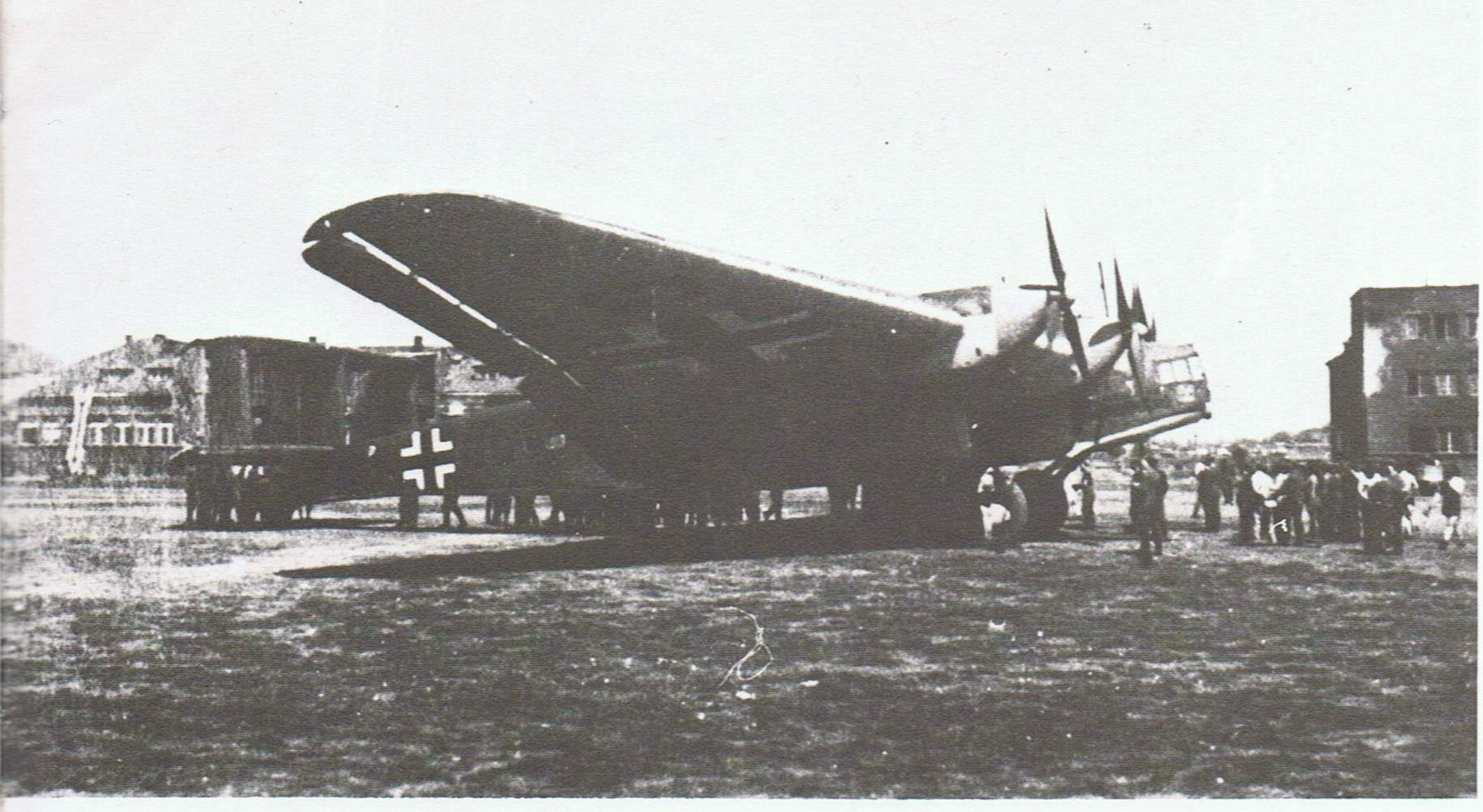
By November 1940, flying and ground units had taken up positions in Rumania, allegedly for the protection of the rich oilfields. Bulgaria also saw an influx of Luftwaffe personnel, disguised as civilians, begin in December – and continue to increase in number until March 1941. At that time Bulgaria joined the Axis, after which Luftwaffe units entered the country openly.

Some 400 aircraft of all types were thus in position when suddenly, and quite unexpectedly, the Jugoslavians began a revolt on March 27, 1941. The degree of surprise was matched by the rapidity with which the Luftwaffe transferred approximately 600 additional aircraft into the Balkan area within a space of ten days. These aircraft were drawn from diverse locations, i.e. three *Kampfgruppen*, two *Stukagruppen,* six *Jagdgruppen* came from France, one *Kampfgruppe* and one *Zerstörergruppe* from north-west Germany, one *Kampfgruppe* from Sicily and one *Stukagruppe* from North Africa.

Rapid assembly of so many aircraft from such varying operational theatres produced a potpourri of markings. Yellow, the tactical colouring used throughout the European mainland battle zones, was applied to those aircraft which required either a change or lacked any form of tactical identification. The single-engined fighters already bore yellow markings from their previous operational area; yellow engine nacelles and rudders, and, in some instances, yellow wingtips and elevators. One of No 33 Squadron's victims, which crashed at Larissa, wore the whole range of

Below: A Bf 109E-3 of III/JG 77 after a crash landing in Greece. The III *Gruppe* emblem appears on the engine cowling and, what is believed to be a personal emblem immediately beneath the cockpit. The latter was a caricature of a pig's head on an oval background. The fuselage *Balkenkreuze* is the old 1939 size and thus the aircraft's number is proportionately smaller. By contrast the III *Gruppe* marking is oversize, even by normal standards. Part of the force rapidly transferred from the French coast the aircraft still retains its yellow wingtips as well as a yellow engine cowling and rudder. */IWM*

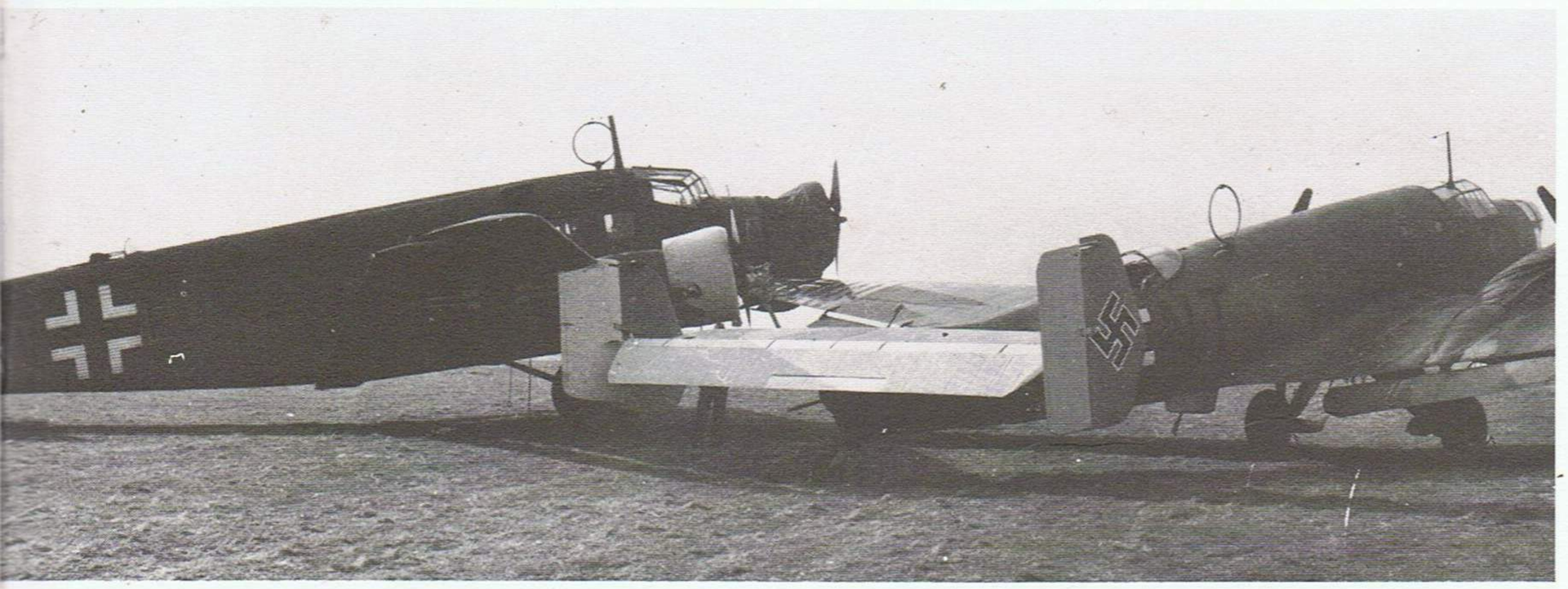




Top left: The old Junkers G.38, GF+GG, camouflaged in 70/71/65 with temporary yellow applied to its engine nacelles and rudders. It was pressed into service to meet the urgent needs of the Balkan supply crisis. */Wilhelm Hesz*

Centre left: More temporary transport aircraft displaying the extensive use of yellow employed for the Balkan airlift. The Ju 52, GV+FU, wears the emblem of FFS.(B) 16. Outlining of the third letter was not normal practice with second line registrations but several Ju 52s of various training schools have been noted with this form of distinction. */Zazvonil Jaroslav*

Below: Milos, May, 1942 – troops prepare their equipment and await the order to board their aircraft for the drop on Crete. Ju 52s of KG.z.b.V 1 display their yellow engine cowlings, rudders and elevators. The nearest aircraft still has its red coloured rudder gust lock in place. */ Australian War Memorial*





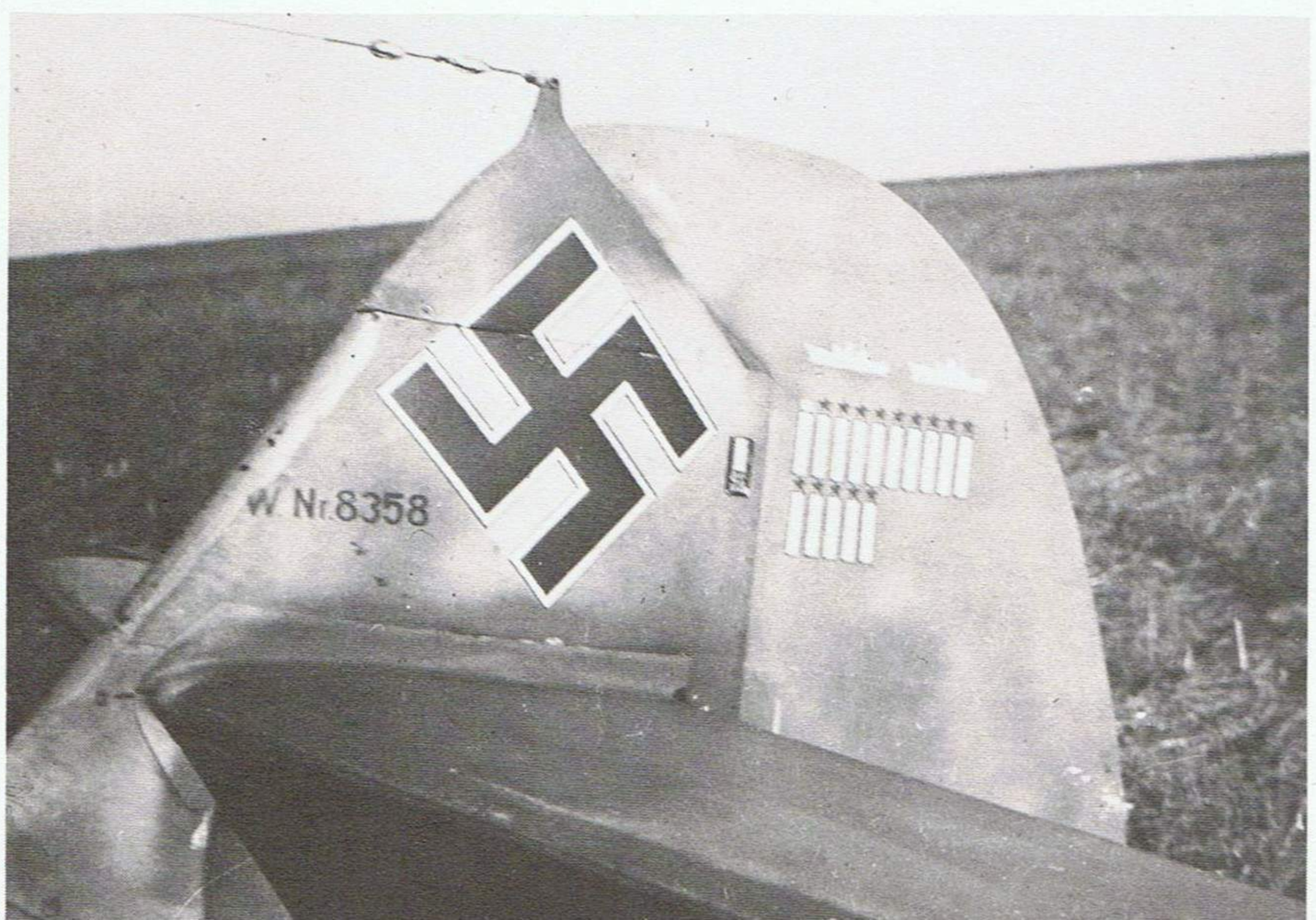


Right: Some of the Ju 52s displayed more elaborate code styles, choosing to outline all four letters as shown on 1Z+LK, instead of just painting the aircraft letter in the appropriate *Staffel* colour. */Australian War Memorial*

Below: This Bf 109F wears tactical markings typical of the boldness seen during the opening phase of the war against Russia. Belonging to the adjutant of II/JG 53 it carries approximately 20 kill markings on its rudder. */Greiner via Vincent*

Bottom: Fighter units were called upon to perform a wide range of duties in Rusia. Photographed in the Crimea in November, 1941, the rudder of Hans Pichler's Bf 109F of 7./JG 77 shows a kill tally of one British and 14 Russian aircraft plus two ships presumably damaged in the Black Sea. */H. Obert*





yellow tactical markings mentioned. The aircraft was yellow five from six *Staffel,* but the unit identity is not known. Six kills were marked on the fin, each bearing an RAF roundel. Other Bf 109s were noted wearing yellow wingtip markings; in view of the general abandonment of this form of tactical marking from about mid-September 1940 it is probable that yellow colouring for wingtips was reintroduced for the Balkan/Greek campaign. Certainly the lack of aerial opposition, in any substantial form, during the brief Yugoslavian campaign would have encouraged such boldness. A general survey of markings showed bombers, twin engined fighters, transports and coastal reconnaissance aircraft wearing yellow engine cowlings, rudders and, in many cases, elevators.

The time factor should be remembered when considering this period. The Yugoslavian revolt was quickly put down and the bulk of the Luftwaffe rapidly transferred to Greece to bolster the ground forces. The latter campaign was concluded with equal rapidity, German troops occupying Athens on April 27, 1941. The same bold yellow markings were used by the Luftwaffe, contemporary British military reports speaking of roving yellow-





Top: Both short and long range reconnaissance aircraft were in great demand in Russia, particularly as German forces penetrated the vast interior areas. This Fi 156, C2+OK, belonged to Aufkl.Gr.(H)/41. Camouflage is 70/71/65 plus a broad yellow fuselage band.

Above: Winter at Siwerskaja. This Ju 52, H8+ZM, wears temporary winter camouflage and a broad yellow fuselage band immediately behind the *Balkenkreuze*. This was a hack aircraft used by the Bf 110 equipped Aufkl.Gr.33 for ferrying equipment and supplies. */Greiner via Vincent*

nosed fighters. (No 33 Squadron are reputed to have been after a particular pink-nosed Bf 109 flown by, presumably, a *Stab* pilot).

The British withdrew to Crete and it was feared that unless they were dislodged, Allied air attacks could be launched against the Rumanian oilfields. The answer to the problem formulated itself into a bold plan for an airborne invasion of the island.

Action during the previous weeks had taken a heavy toll of airframes and engines, particularly those of the Ju 52s which were so vital to the coming operation. Despite this, maintenance crews, by working around the clock between May 1 and 15, had 493 Ju 52s serviceable and back at their bases in the Athens area. These aircraft retained their yellow engine cowlings, rudders and elevators. By contrast, in the face of all these specialist markings, the DFS 230s wore nothing other than their standard camouflage of 70/71/65. Other aircraft committed to the campaign, Do 17s, He 111s, Ju 87s, Bf 110s and Bf 109s retained their yellow markings of the previous brief Balkan conflict.

Crete proved to be one of the bloodiest battlegrounds of the war, its terrible cost in lives having been well documented many times before. Once more a campaign had been swiftly concluded. Crete was lost but the German paratroop corps never fully recovered from the shocking losses.

With the value of tactical markings well established, yellow colouring, so familiar to the German ground forces, was retained for the next phase of operations – the invasion of Russia. This time, however, the areas of colour were a little more restricted. Bomber, reconnaissance and ground attack aircraft wore a yellow fuselage band and engine cowlings. In the latter category yellow on the engine cowlings of Bf 110s was usually restricted to the lower panels. All other aircraft adopted markings similar to those specified for bombers etc.

Inevitably units added minor variations of their own, e.g. a few bombers were noted wearing yellow on their lower engine cowlings, and the actual positioning of the fuselage band and even its width varied considerably. The general application, however, was fairly consistent.

The full fury of a *Blitzkrieg* burst upon the Russians on June 22. As so often before the German forces swept forward, seemingly invincible. By mid-July the battle for Smolensk had begun and long-range bombing of Moscow became possible. To do this, however, meant stripping the Western Front of further aircraft.

By the end of July the East Front had developed into such proportions that flying units were being rapidly transferred from one command to another in order to meet localised battle requirements. The failure to make progress at Smolensk forced a halt, the first of many that German forces were to encounter. Early in August, 400 close-support aircraft from *Fliegerkorps* VIII were sent to reinforce the efforts of *Luftflotte* 1.

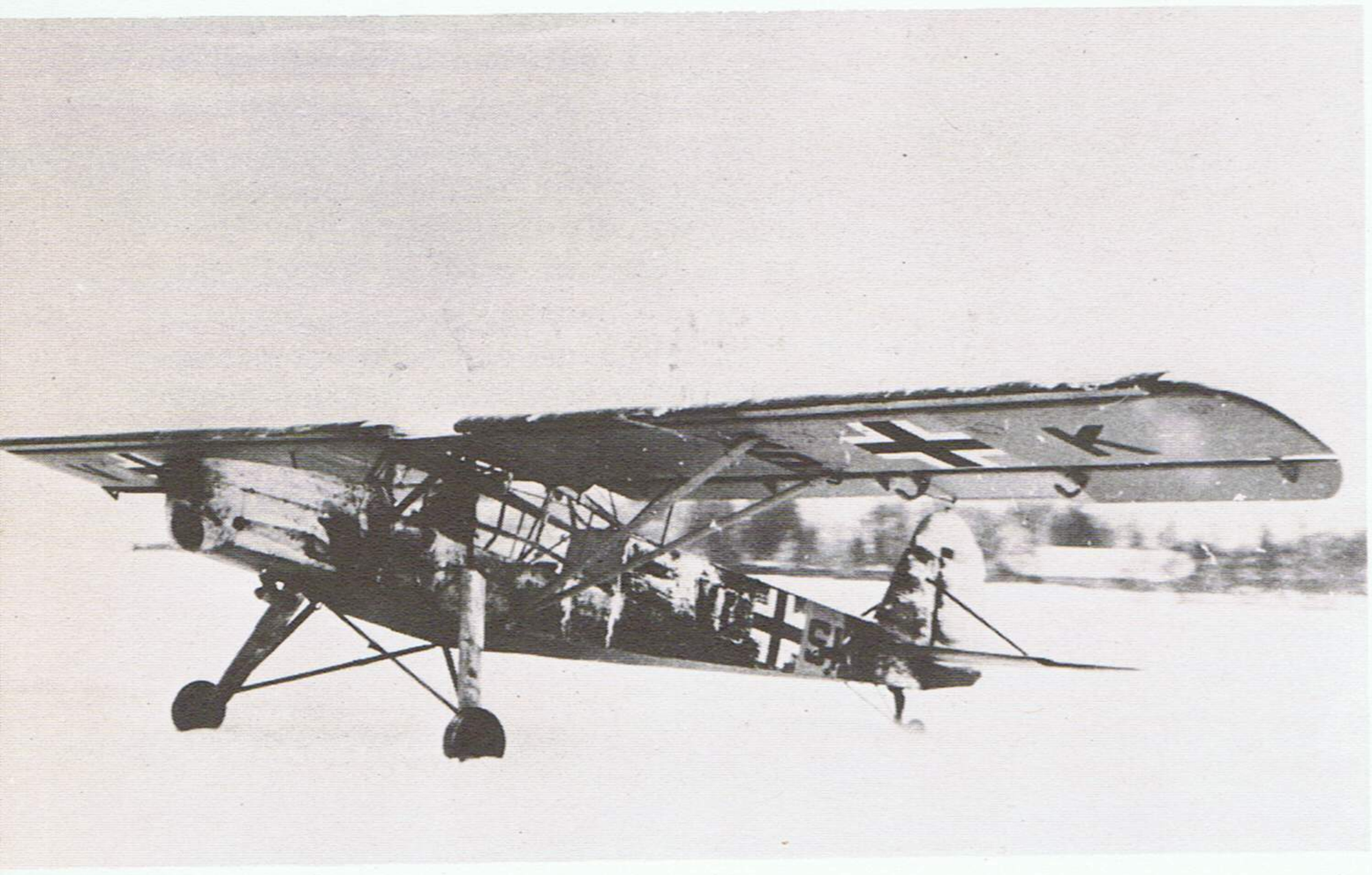
The importance of close-support aircraft led eventually to the amalgamation of existing *Schlachtgruppen* into a full *Schlachtgeschwader*, Sch.G.1, in January 1942. Whereas before each *Schlachtgruppe* had been portion of an existing bomber or heavy fighter unit, the centralisation of these specialist aircraft allowed better utilisation.

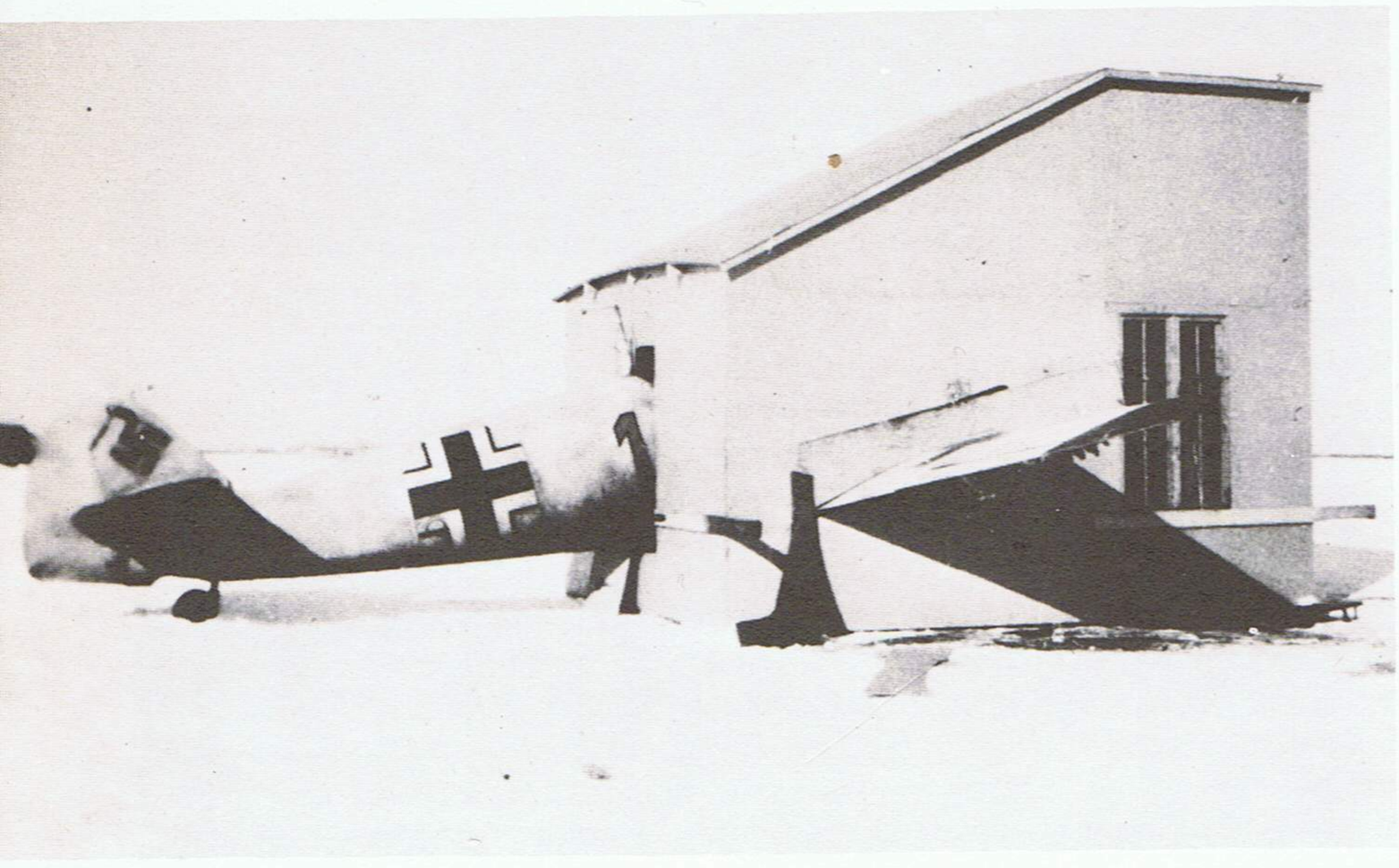
One other small but none the less distinctive marking appeared on most *Schlachtgeschwader* aircraft; the *Infanterie Sturmabzeichen*, painted in white on either side of the aircraft foward of the cockpit. Camouflage on these aircraft was standard 70/71/65.

The Russians had met the German onslaught with typical age-old scorched earth tactics, a policy ruthlessly pursued



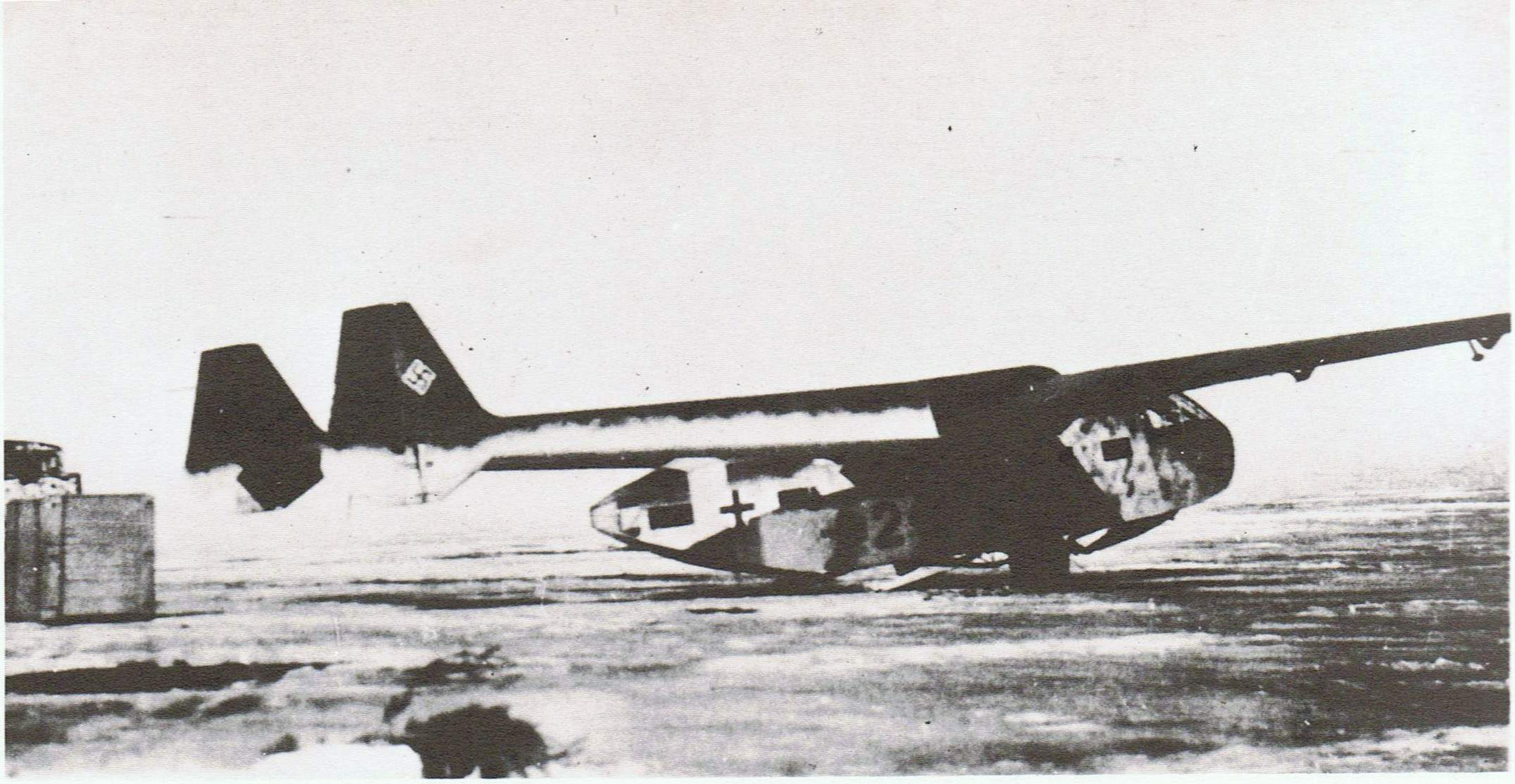
Right: This Do 17P was engaged on second line duties and thus wears a four letter registration, KB+TA. Yellow is used for the fuselage band and the lower surfaces of the wings from the *Balkenkreuze* outwards. The small quartered square emblem on the rudder is believed to be an Army Group insignia, in which case this aircraft was probably used for courier work. (Several other aircraft serving in Russia have been noted wearing Army Group insignia). In the background is a Ju 88 in full temporary white winter camouflage.





and one which produced major supply problems for the Germans. The perennial Ju 52 was summoned to solve the problem; a task for once carried out without undue loss due to the negligible Russian air opposition. Times were to change, however, as the campaign progressed. In October an all-out offensive was launched against Moscow, but it was to prove a failure due in no small part to Russia's greatest ally – winter. On January 9, 1942 the Russians counter-attacked and 100,000 German troops found themselves cut off, surrounded at a place called Demjansk. By the second week in February, 75 miles separated them from the main German lines. To supply such a force by air required a standing body of 150 serviceable aircraft.

Available transport aircraft numbers fell far short of this and, as before, aircraft were rapidly diverted from other theatres of war to meet the demand. The advanced flying schools provided their share of men and machines, a factor that was to have a lasting effect. Tactical colour markings were applied to these aircraft, not surprisingly in rudimentary fashion in some instances. As in the last major supply campaign in North Africa, composite units were formed for the duration of the operation. Special temporary identification codes were applied to the rudder of each aircraft, a single large letter identifying the *Gruppe* and a number the *Staffel*, the aircraft's own original individual letter appearing immediately beneath. In some instances the last two letters of the aircraft's original code were repeated in miniature near the top of the fin. Large units already serving in the area retained their own identification but a



similar system was utilised for conformity, e.g. KG.z.b.V 9 used a single figure 9 on the rudder of each of its aircraft.

An overall white finish was applied to many of the Ju 52s, but time and circumstance prevented all from receiving winter camouflage. As with most aircraft serving on the Russian front in winter, a single coat of 7124.21 was used rather than 7120.21 since the finish had to last the entire snow period. Operating conditions soon dirtied and eroded this finish.

On February 20 the first relief aircraft arrived on Demjansk's meagre 800 yard by 50 yard snow-encrusted field. The 40 Ju 52s had just 90 minutes to unload and depart; not an easy task with no ground facilities and in foul weather conditions. As the airlift progressed, enemy opposition increased and losses mounted, but in the end the siege was broken.

A second pocket of resistance at Kholm had also to be supplied by air; 3,500 men surrounded in a small area one and a half miles in diameter. Because of size limitations, the Ju 52s were forced to land in the no-man's-land between the German and Russian lines. Supplies were pushed out while the aircraft were still taxying, Russian artillery notwithstanding. Losses to the Ju 52s of KG.z.b.V 9 (formerly KG.z.b.V 172) were alarmingly high and the Luftwaffe was forced to resort to a second line of action. Gliders were again brought into use, DFS 230s being used initially, but the quantities required demanded more or larger gliders, and at this point the Go 242 made its debut at Kholm.

Towed by the Ju 52s of KG.z.b.V 9, they cast off and force landed in the no-man's-land, a mad dash by troops from both sides deciding the fate of each batch of supplies. Additional supplies were dropped from the air by He 111s from KG 4. Wearing 70/71/65 camouflage, the Go 242s bore a wide yellow band around the rear of the fuselage plus yellow wingtip lower surfaces. Although these gliders maintained their unique three-part code structure, they utilised KG.z.b.V 9's code 4V, in miniature, for the first element.

Like Demjansk, the Kholm pocket held out and was finally relieved. The success of the two airlift operations, however, was to lead ultimately to disaster at a place called Stalingrad.

In the interim period the usefulness of the Go 242's capacious interior was put to good use ferrying men and materials. It was perhaps one of the most interesting types of aircraft for the variety of original camouflage schemes that it used. Combinations of colours for upper surfaces utilised 02,70,71 and even 65 in a variety of pattern styles ranging from continuous segments to a veritable patchwork quilt effect. Even the temporary winter white finish was applied in very original style.

Failure of the German forces to gain a complete victory before the winter of 1941/42 placed the Allied Arctic convoys in a position of significant importance. Available Luftwaffe forces were of a mixed nature, and being based on the Norwegian/Finnish border, they were charged with a wide variety of duties. Thus early convoys had found little opposition and losses had been light.

Conditions changed in May 1941, when I/KG 26 arrived with its first 12 He 111s fresh from the torpedo training school at Grosseto. In addition, its old rival KG 30 had assembled some 60 Ju 88s for anti-

Centre left: Winter at its extreme – not temporary white camouflage but snow encrustation on the surfaces of this Fi 156C-3, VL+SK. Yellow appears beneath each wingtip and as a band around the fuselage.

Bottom left: Servicing of aircraft became a virtual nightmare under the extremes of the Russian winters. This unique light structure was mounted on runners and could be manoeuvred into place by hand. The 2 *Staffel* Bf 109F wears full winter camouflage of white, but strangely the wingtips have not been overpainted. */H. Obert*

Above: A few more supplies for the Kholm pocket. A Go 242, coded 4V+2-1 waits to be loaded. Camouflage appears to be standard 70/71/65 with overspraying of the fuselage sides in both 70 and 71 coloured mottling. The rear of the fuselage sides, however, has a rough application of white. Note also the double *Balkenkreuze* markings on the rear fuselage, one over-lapping the yellow band and the other between the first two sections of the code. Both *Balkenkreuze* and *Hakenkreuze* were usually reduced to the sizes shown here for gliders.



Above: Other glider types were also used to ferry supplies to the Russian front. This Me 321 *Grossraumlastensegler*, W2+SH, is seen here at Merseberg, the main base for these aircraft when in Germany. From here they were towed to Schroda, the next marshalling point, before heading for various locations in Russia. Camouflage was 70/71/65.

shipping attacks. III/KG 26 joined the operations in June and Allied Arctic convoys began to suffer increasingly heavy losses.

Some of the principal participants in these operations were the Bv 138s and He 115s which were responsible for locating the convoys, subsequent shadowing and, in the case of the old but versatile He 115s, torpedo attacks. Operating from their northern Norwegian bases they patrolled the Arctic convoy route where their very dark green camouflage blended with the sombre ocean seascape. When the pack ice melted and moved south they were given a temporary camouflage scheme using patches of white to break up their outline in profile. The rigours of weather and operations soon dirtied this finish to a distinct off-white shade. Upper surfaces were often left untouched so that the aircraft would still blend with the dark Arctic waters when seen from above.

The declining fortunes of the German forces was reflected in the reduction of the yellow areas on fighter aircraft. Engine cowlings were no longer coated all over, the yellow being confined to the underside of the engine. I/JG 51, who arrived on the Russian Front in September 1942, were the first to take the Fw 190 into action in the east. Their aircraft served to emphasise the change in tactical markings. Like the Bf 109s they wore yellow only on their lower engine cowlings and the base of the rudder, as well as the normal fuselage band, and carried yellow lower wingtip surfaces. The significance of this redistribution of tactical markings is obvious. Increased air opposition made concealment far more important, but viewed from below from any quarter, indentification was still rapid and positive. The wheel had turned full circle – the Luftwaffe was back to a tactical situation similar to that of the battle of Poland, where air operations were tied closely to ground actions.

A further reflection of the changing fortunes of the Luftwaffe was mirrored by the field modifications to the overall camouflage schemes carried by the aircraft of the fighter units. On both Bf 109s and Fw 190s the standard greys soon disappeared beneath applications of the greens, 70 and 71. In many instances even the basic camouflage pattern was obliterated and some very original 'one-off' patterns appeared in their place. These dark greens were well suited to the

Russian landscape and provided far better concealment, both at dispersal and when flying over the local terrain.

The battle for Stalingrad began in the autumn of 1942 and rapidly moved towards apparent success. Approximately 85% of the city was in German hands when a double blow heralded the death-knell of General Freidrich von Paulus' 6th Army. On November 19 the first icy fingers of winter arrived, accompanied by a massive Russian counter-offensive. Within two days the Germans had to decide whether to retreat or allow themselves to become encircled. The decision was a fatal one based on the assumption that what had been achieved at Demjansk and Kholm could be repeated at Stalingrad.

Only five Ju 52 transport units were in the immediate operational area, a force totally inadequate to meet the demands of a beleaguered army. Again a rapid pooling of aircraft was made from all sources, the *Kampffliegerschulen* being stripped of yet more men and machines. Two emergency transport *Gruppen*, KG.z.b.V 21 and 22, were formed with Ju 86s, beginning operations in December with 58 aircraft. By the end of January 1943, 42 had been lost and the surviving 16 withdrawn and

Above: Unusual markings were not confined to aircraft operated by fighter units. This Fi 156 was used by the adjutant of II/Sch.G.1 and bears a variety of markings; a black *Schlacht* emblem thinly outlined in white, the letter Z in green 25, and the *Infanterie-Sturmabzeichen* badge. Normal wintip panels and yellow fuselage band are worn on the 70/71/65 camouflage. */R. Lutz*

Left: Major Trautloft, *Kommadore* of JG 54, in front of his Bf 109F-2 at Siwerskaja. This unit was always a source of unusual camouflage schemes as this particular photograph shows. The colours appear to be 70 and 02; the dark shade of green almost matches the black of the fuselage *Balkenkreuze.*



Above: This Fi 156, B1+B?, wears the codes of an unidentified unit, and the badge on the cowling appears to have its lower portion missing due to the removal of the side panel. The positioning of the yellow fuselage band behind the *Balkenkreuze* indicates the date as 1942 when declining fortunes produced this subtle revision in tactical markings. /*Bundesarchiv*

returned to their former occupation. Their 70/71/65 colour schemes had remained unaltered, the yellow *Schule* markings sufficing to meet the demands of the emergency operation. Two more transport units, KG.z.b.V 5 and 20, joined the airlift with their He 111 transports, the He 111 force being expanded to approximately 190 by the addition of two more *Gruppen* drawn from the ranks of KG 55, I/KG 100 and KG 27.

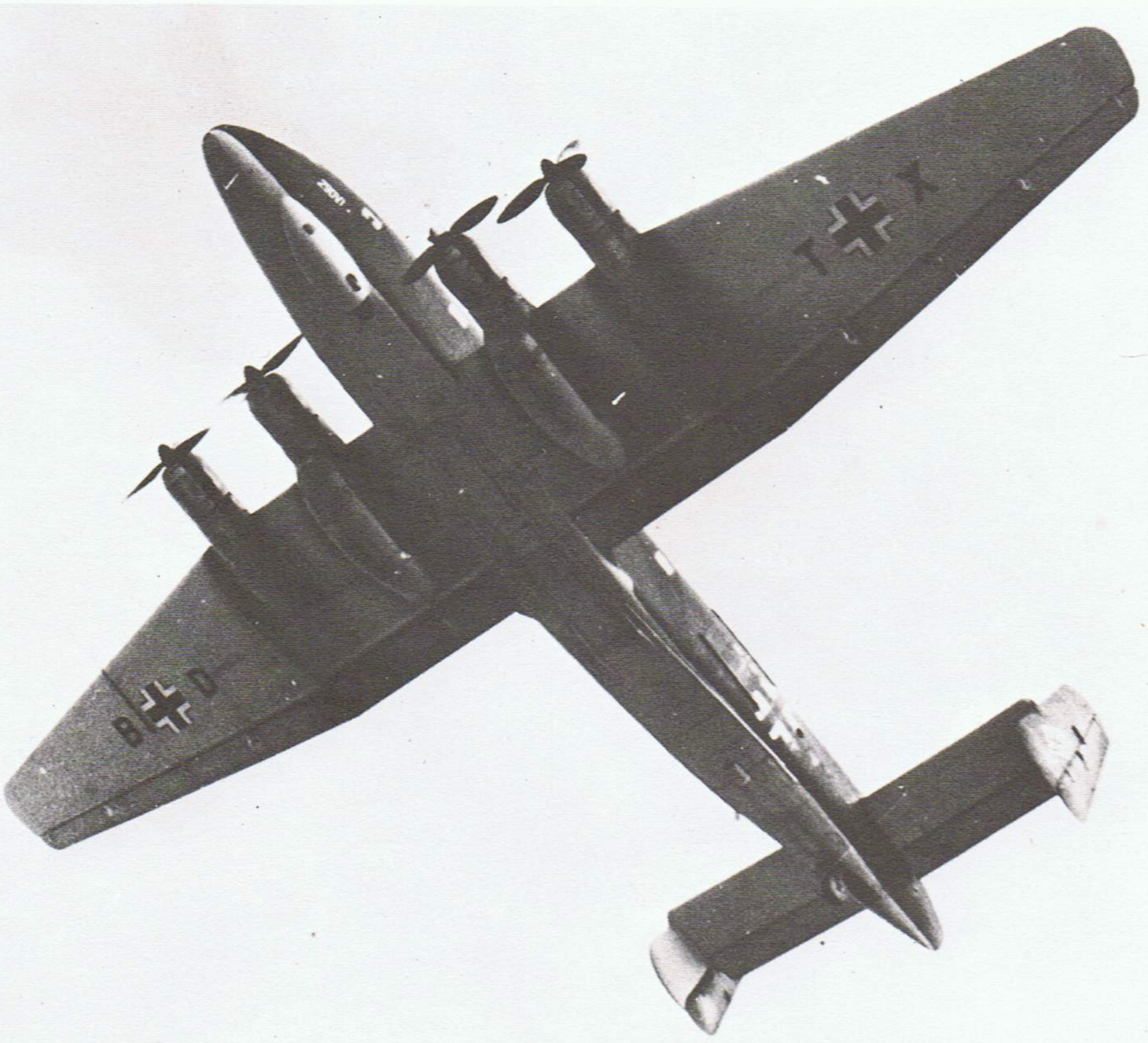
Additional aircraft were sought out and added to the operation; on January 9 1 and 3./KG 40 arrived with 18 Fw 200s, having been amalgamated under the temporary title of KG.z.b.V 200. After the airstrips were overrun they continued to do supply drops until the last week of the month. Like the Ju 86s these aircraft retained their original camouflage, of 72/73/65, but adopted yellow fuselage band markings. The survivors returned to duty with KG 40 but were reconstituted as 8 *Staffel*.

The He 177 made its operational debut at Stalingrad. I/KG 50 was under training with the type when the call for aircraft came through. Although only seven were immediately serviceable and seven were lost during the operation at Stalingrad, others must have been used as they became serviceable. Herr Jurgen Rosenstock, formerly of KG 40, records that after the operation, some of the Fw 200s and He 177s of that unit wore the word Stalingrad stencilled on their fins with white bars denoting the mission tally. (The He 177s of I/KG 50 were eventually redesignated II/KG 40 in October 1943 and used for anti-shipping operations. At the time of the Stalingrad airlift, however, they were training for use as a normal bomber unit and wore camouflage of 70/71/65).

The desperate search for aircraft led to two Ju 290s, one A-O model and the V1 being used for the operation. The Ju 290 V1 was ultimately lost in a take-off crash at Pitomnik airfield on January 13 while the Ju 290 A-O was so badly damaged by Russian fighters that it had to be ferried back to Germany. Camouflage for both aircraft was 70/71/65 to which had been added a yellow fuselage band.

With all airfields but one overrun, the final supply drop was made by an He 111 of I/KG 100 in the dawn of February 3, but no survivors were to be seen. The battle for Stalingrad was over.





Above: A pair of Ju 88A-4s of III/KG 51 flying over the Caucasus mountains show the difference in markings even between *Staffels*. In the foreground 9K+DS has its aircraft letter thinly edged in yellow, the *Gruppe* colour, while the spinners are all red, the 8 *Staffel* colour. The other aircraft, 9K+FR, wears its aircraft letter in the *Gruppe* colour of yellow and the spinners in the 7 *Staffel* colour of white. Camouflage for both aircraft is normal 70/71/65 with a yellow fuselage band and wingtip lower surfaces. */H. Obert*

Left: The Ju 290 V1, BD+TX, which was eventually lost during the Stalingrad airlift. Camouflage is 70/71/65 and at the time that it was destroyed it wore a yellow fuselage band.

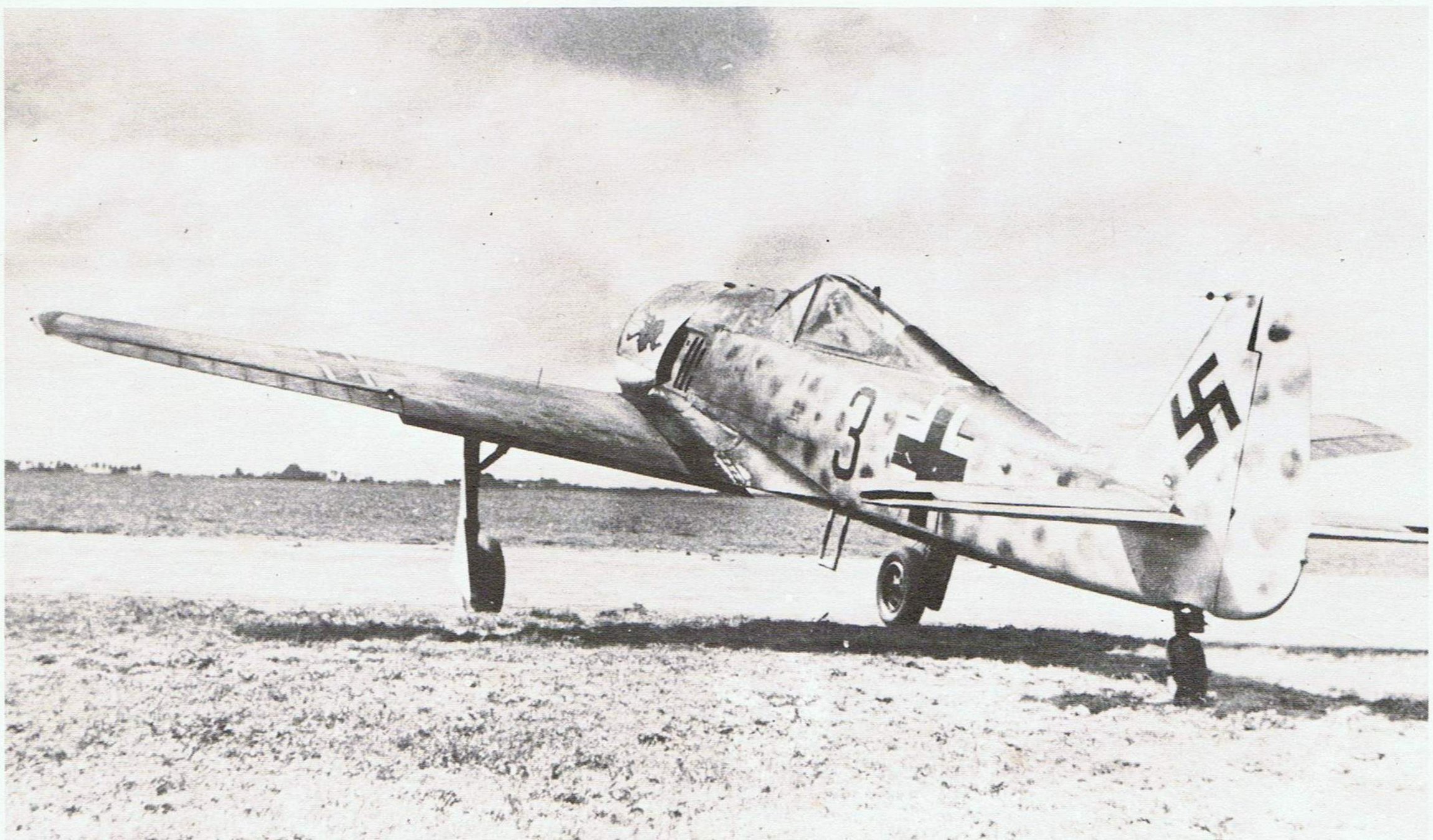
Defence of the Reich

While Stalingrad moved toward its final, fatal moments the attention of the High Command was suddenly forced to focus on events much closer to home. On January 27, 1943, the USAAF daylight bombing offensive began with an attack on Wilhelmshaven by 55 B-17s which bombed the dock area and harbour installations. This was the first time that American bombers had attacked a target anywhere other than in France. The only opposition encountered by the B-17s were a few Fw 190s of JG 1, who employed the head-on attack tactics developed by the Channel based units, JG 2 and JG 26, who had previously fought American formations.

From this point onwards, until the Allied landings on June 6, 1944, the combined British and American bombing offensive was to become the dominating feature of the air war. At first the pressure of daylight bombing was secondary to the RAF's night offensive, with the American bombers confining their attacks to U-Boat bases, airfields, industrial and other military targets in the occupied territories. In addition, the number of American bombers used for each attack rarely exceeded 100. Because of this, day fighter defences continued to retain a low priority with less than 300 aircraft based in France and the Low Countries to meet these attacks. The war in the East and the Mediterranean had priority, but this would soon be altered.

The relative weakness of the German daylight fighter defence in the occupied western territories produced a false estimation of the success of American bombing tactics. The heavy British fighter escorts available for shallow penetration raids, did not have the range to accompany deeper penetration raids and the Americans were to pay dearly for their mistaken beliefs. Be that as it may, the effects of the first daylight penetration raid on Germany, on July 18, galvanised the High Command into a serious reappraisal of the situation. Two *Gruppen* of JG 3 were immediately withdrawn from Russia and based in Germany. This was but the beginning of a process that was to denude the Norwegian, Russian, Balkan and Italian fronts of much needed aircraft. By October all of JG 3, the newly formed JG 11, II/JG 51 and III/JG 54 had been recalled to Germany to reinforce the

Below: A Fw 190 of 2./JG 3 wearing the sprayed, well spaced 74/75 mottle that was generally seen on this type of aircraft. The cowling bears the I *Gruppe* emblem. Elements of this *Jagdgeschwader* were the first to be hastily recalled from Russia to counter the initial American daylight bomber offensive.



Top left: A B 17F, 41-24585 of the 303BG which force landed in France on December 12, 1942. *'Wulf Hund'* belonged to the 360 BS and originally carried a letter B below the serial number on the fin. It is shown being examined by personnel from 4./NJG 1. Repainted in Luftwaffe markings and allocated the registration DJ+XC it was used for tactical fighter training exercises. */H. Falk*

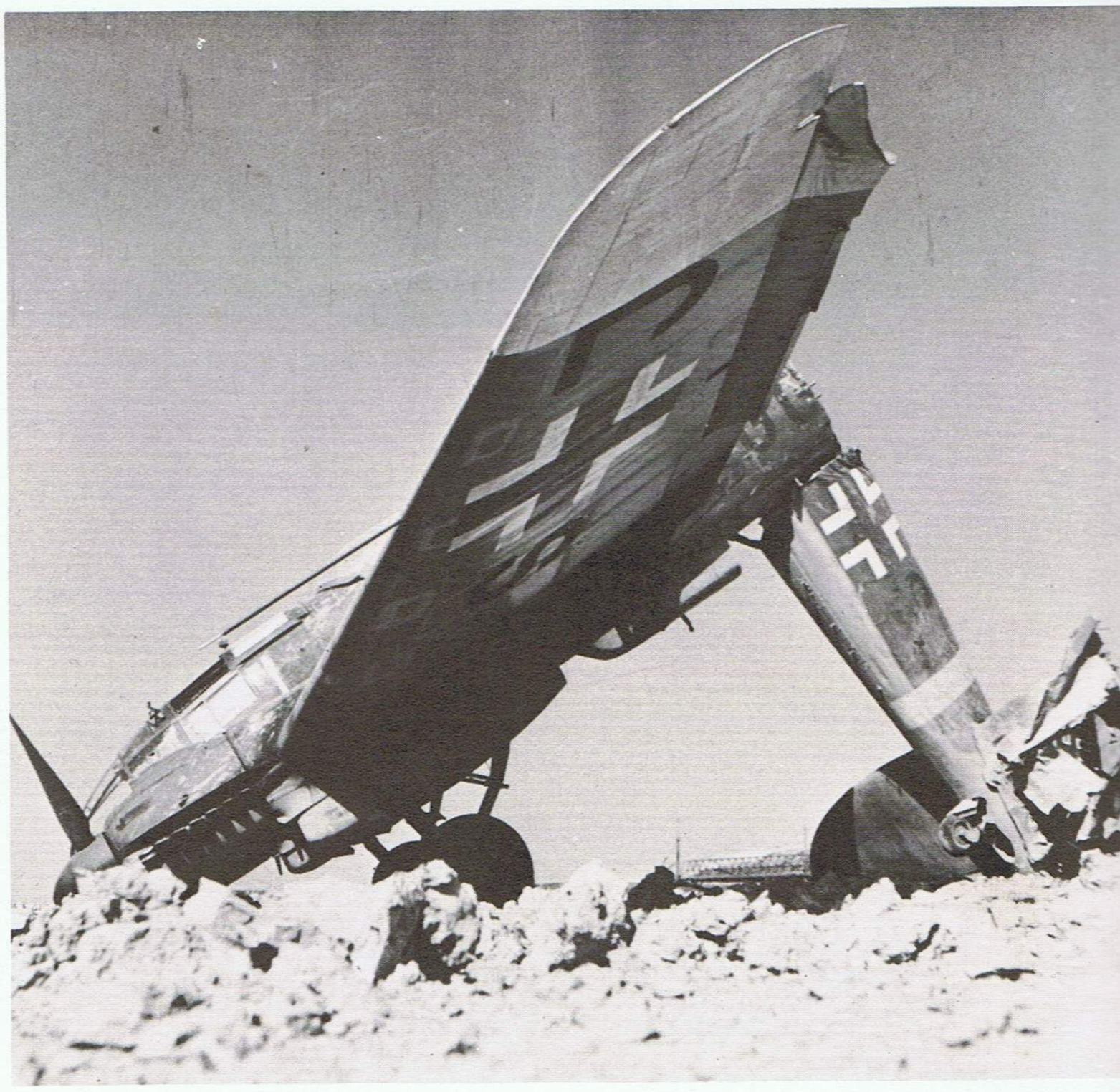
Centre left: As the Allied forces moved north through Sicily, towards Italy, the path of the retreating German forces became littered with aircraft and equipment of every description. Steinhoff's JG 77 was ordered to evacuate to the mainland on July 13, 1943 and these two Bf 109G-6 Trops. were abandoned at Comiso. The one on the left wears a *Gruppe* adjutant's chevron marking. Both aircraft wear standard European camouflage but the wing of the Ju 88 in the foreground is finished in North African colours of 79 and 80, the latter having lost some of its pigment strength through thinning during spraying.

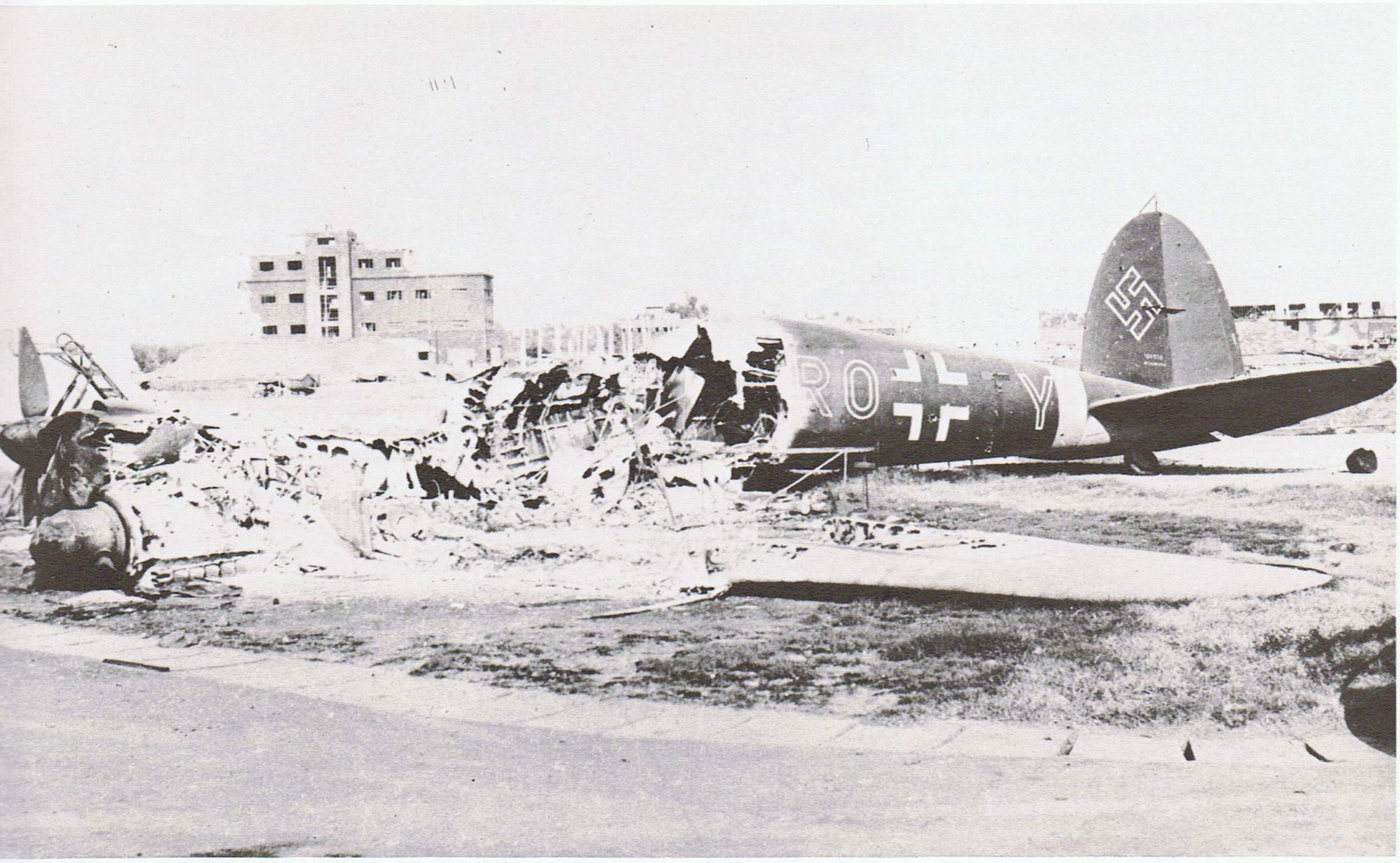
Below: At Catania the same scenes of desolation greeted the advancing Allied troops. This Bf 109F wears North African camouflage and tactical markings. The triple chevron marking was a comparatively rare form and still defies adequate explanation. The use of the figure four immediately behind it only adds to the confusion. To the right is a wingless Ju 88, L1+EH of LG 1, wearing 79 coloured upper surfaces and faded night camouflage on the side surfaces. */via Frank Smith*

daylight defences. A tactical marking was introduced for this force in the form of an all white empennage, i.e. fin, rudder and the fuselage immediately below the tailplane. This was sometimes abbreviated to the fin area above the tailplane and the whole rudder.

There is evidence to suggest that *Reichsverteidigung* markings were also introduced during the late summer of that year, to identify individual day fighter units based within Germany. Photographs of JG 1 Bf 109s taken at this time show both the white tail markings and a red fuselage band immediately in front of the tailplane. In the past it has always been assumed that the fuselage band markings were introduced after the Allied invasion, but the purpose for which they were created, i.e. identification of fighter units engaged in daylight defence duties from bases *within* Germany, existed from mid-1943 onwards. The very title of the marking, literally 'Empire defence', identified a specific force assembled to do a specific task.

A second blow followed on July 24, 1943 when the entire Luftwaffe night fighter defence system was thrown into chaos by the first RAF night attack in which 'Window', metal foil strips, was used. Until suitable electronic counter measures





could be created the night fighters were forced to engage the bombers over the actual target, using the light from the burning cities to silouhette their adversaries. These so called *Wilde Sau* (Wild Sow) tactics were used principally by single-engined night fighters; the twin-engined night fighters meanwhile attempted to penetrate the bomber stream and engage using visual tactics, code named *Zahme Sau* (Tame Sow). The single engined night fighters were from JG 300, a unit formed less than a month previously, June 27, to employ the new *Wilde Sau* tactics. A somewhat fortuitous occurrence in view of the introduction of 'Window'.

The following day news was received that Mussolini had fallen from power. This was of major importance to German forces in Italy as the Allies had already begun their thrust toward Italy in the previous month. Sicily fell on August 17, two days after Marshall Badoglio had entered into secret peace talks with the Allies.

On September 3 British and Canadian troops landed at Reggio, further landings taking place during the next few days. Progress by the Allied forces was rapid and on September 9 major landings were made at Salerno. That same day the Italian surrender was broadcast to the world. Undeterred, the Germans stiffened their resistance and took over all useful Italian war materials and equipment. Italian aircraft impressed into Luftwaffe service were marked with *Balkenkreuze* and *Hakenkreuze* although the latter tended to be somewhat over size in some instances. The original camouflage was retained by most aircraft but standard four letter registrations were applied to those used for second line duties. Not all Italian forces surrendered and those remaining loyal to the Germans took over most of these aircraft.

September 9 also marked the first success gained with a new weapon, the *Fritz* X guided bomb. The Italian fleet set sail from Genoa and Spezia to surrender to the Allies, but the fleet was intercepted between Corsica and Sardinia by the *Fritz* X equipped Do 217Ks of III/KG 100. The battleship *Roma* was hit and sunk, and the *Italia* damaged. As with all externally carried weapons, the *Fritz* Xs were painted blue-grey 65 overall to match the undersurface colouring of the carrier aircraft. For night attacks, carried out against Allied shipping during the Italian landings, temporary night black was daubed on the lower surfaces of the weapon.

Above left: Lack of sufficient transport aircraft was the major problem for the German forces on most fronts during the final years of the war. This Go 242 was part of the transport forces sent south from Russia and destroyed on the ground at Catania by the Allied bombing. The remaining vestiges of its code, a black 3, show that it belonged to a *Lastenseglerstaffel.* The wingtip panels and the lower third of the rudders are painted yellow.

Left: A He 111 transport aircraft, GG+SJ, still wearing its Russian front tactical markings rears its broken frame against the sky at Catania.

Above: Almost completely destroyed by fire, this He 111 transport, W.Nr.160256, displays its East Front tactical yellow band marking. Of the registration letters RO+TY, R, O and Y had been applied using a double white outline over the existing dark 70/71 camouflage, but the letter T had been applied in solid black. Both *Balkenkreuze* and *Hakenkreuze* had also been applied in white outline form.

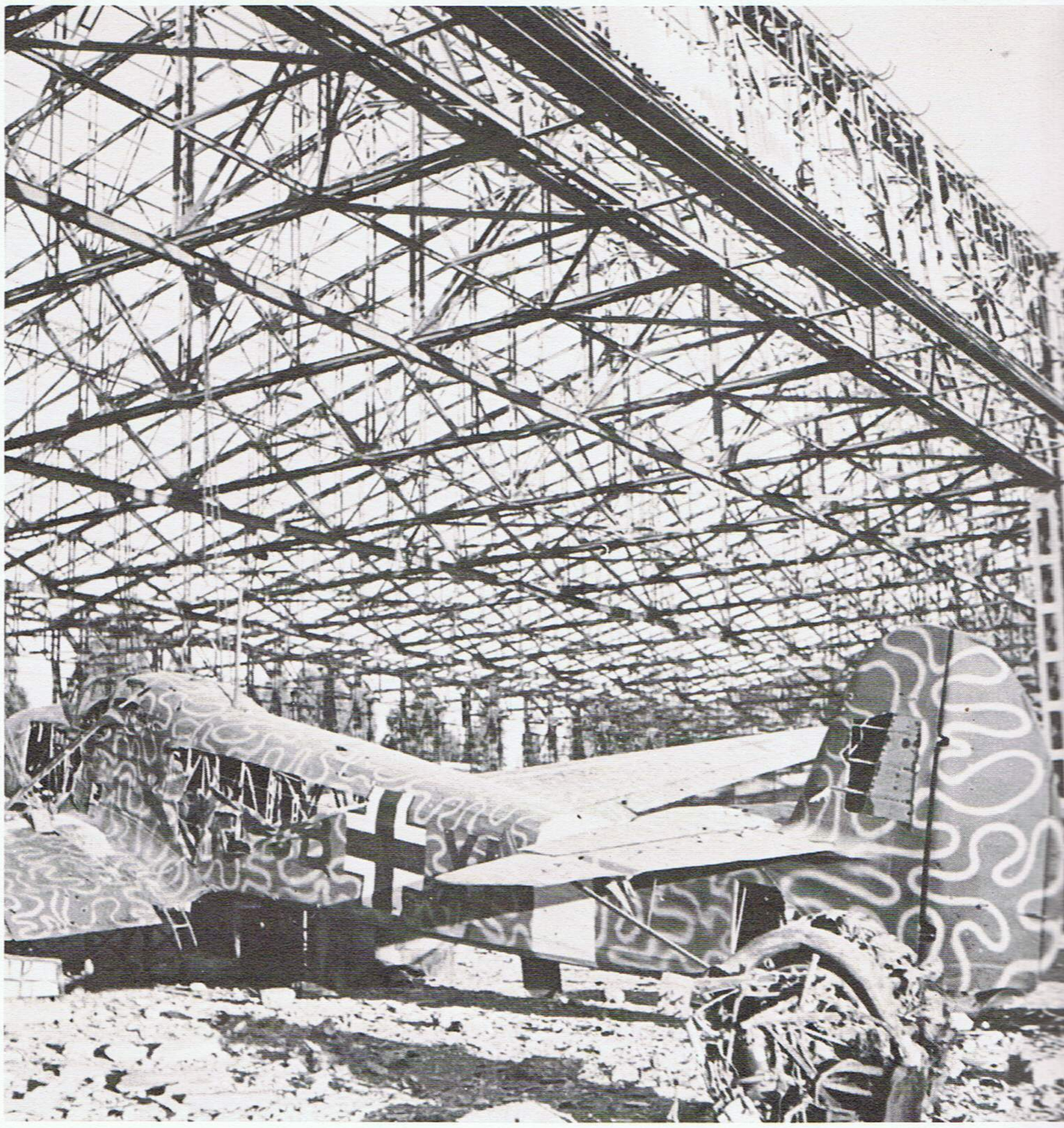
Other anti-shipping units based in Southern Italy which opposed the landings exhibited a modified form of camouflage that had developed, no doubt, from further attempts to increase the effectiveness during daylight operations of the old 72/73 upper surface scheme. During 1942 attempts had already been made to break up the stark contrast between the very dark upper surfaces and the very pale lower surfaces by applying patches of dark green to the blue-grey areas. These early attempts bore all the hand marks of unit origin and some extremely crude applications were seen, paint brushes being used instead of spray painting equipment.

A further development of this practice was to extend the blue-grey colouring over the dark upper surface colours by means of sprayed, continuous thin wavy lines of 65 which effectively broke up the bulk of the darker areas and blended upper and lower colours. This proved very effective, and units operating on armed reconnaissance and anti-shipping duties over the Bay of Biscay adopted the style of application. In mid-1943 the Do 217-equipped units operating over the Bay of Biscay adopted the colours 74, 75 and 76 for their camouflage scheme, using the same style as described previously.

Applications varied somewhat, indicating that the colour schemes had been applied by the individual units concerned. In some instances 76 was used as the base colour with continuous wavy lines of 74 sprayed over all upper and side surfaces. A variation of this scheme was the application of sprayed patches of 74 on the fuselage sides in addition to the 74 colour wavy lines on all upper surfaces. A few instances were noted of 76 being used for all under surfaces, as well as for the wavy line pattern over a base coat of 75 on the upper surfaces. For night operations temporary black paint was used to obscure the lower and side surfaces.

KG 40, the other principal anti-shipping unit in Southern France, began to re-equip with He 177s during early 1943. A revised camouflage scheme was introduced for these aircraft and from its singular use by this one unit, it would appear to have originated at unit level. Committed principally to daylight operations, the He 177s were given a more suitable camouflage to break up the aircraft's rather ample proportions.

Controversy has always attended any attempt to define the colours used for the rather unique ripple pattern of these He 177s. A detailed study of photographs and tone values leads to the conclusion that a





base coat of 02 was used overall, with a continuous pattern of wide green lines applied over this on all upper and side surfaces. The shade of green appears to have been 73 rather than the darker 72. Prior to transfer and redesignation to II/KG 40, the former I/KG 50 He 177s had used a standard 70/71/65 colour scheme. In view of the dubious reputation always associated with the He 177 it is worth recording that the A-5 version used by KG 40 was fast, well armed and considered a very good aircraft. The old problem of engine overheating was not really critical provided that the throttles were carefully handled. Losses were largely a result of air attacks during take off, landing or on the ground. Local airfield defence of the three bases used by KG 40 – Orleans-Bricy, Cognac and Bordeaux – was provided by guns removed from crashed aircraft, both Allied and German.

Allied command of the Mediterranean was virtually complete, German aircraft being isolated at the extreme western and eastern ends. An acute shortage of reliable long range maritime reconnaissance aircraft had already led to *Luft-Transportstaffel* (*See*) 222 being redesignated *Aufklärungsstaffel* (*See*) 222, but without loss of the unusual codes described previously. The very useful BV 222s had undergone a major change in armament during the early part of 1943, three power operated gun turrets being fitted to the hull and one above each wing, aft of the outboard engines. The unit again had its designation changed, this time to 1. (*Fern*)/*See-Aufklarungsgruppe* 129, several more Bv 222s arriving at the Biscarosse base to expand its meagre strength.

During October a very interesting encounter occurred between one of the Bv 222s and an RAF machine. According to the unit records a Bv 222 (believed to be either the V2 or V4) had been intercepted by a Lancaster which had subsequently been shot down into the sea. Lancasters were not engaged on long range anti-shipping duties, but Halifaxes were.

On October 8, Halifax HR983 'R' of No 58 Squadron was carrying out a daylight patrol when the crew sighted a Bv 222. Closing in on the flying boat, the Halifax made an initial attack from the port quarter, the navigator opening fire at 600 yards with the single VGO machine gun in the nose cone. The pilot then turned away on the port beam to allow the rear gunner to bring his four guns to bear. Dropping astern again, the Halifax passed over to the starboard quarter from where both the mid-upper gunner and the navigator opened fire. The Bv 222 took no evasive action but returned the fire with cannon shells from the two top turrets and from a single cannon on each beam. Strikes were seen on the fuselage and hull of the Bv 222 and the rear upper cannon position was silenced before the aircraft finally drew away from the Halifax.

During the de-briefing of the Halifax crew all members agreed that the enemy aircraft had been painted duck egg blue overall. (The term is somewhat anomalous, as any who have pursued the lengthy controversy over the British camouflage colour termed Sky type S will know). Duck egg blue is generally described as a bluish green, the strength of either colour varying with the individual person's colour perception. A reasonable photographic coverage of the relatively few Bv 222s has survived, including shots of both the V2 and V4 taken prior to the engagement described. Camouflage in all instances appears to have been the normal 72/73/65 variety.

It is possible that the Bv 222 encountered was testing a new form of camouflage. In many respects this pale blue-green colouring was far more practical than the older, darker colour scheme for the Bv 222's role of reconnaissance; only defensive weapons were carried. British experiments with maritime camouflage schemes had shown that under normal conditions an aircraft appeared darker than the sky when viewed from a lower position, but its underside was illuminated to some extent by reflected light from the surface of the sea. This, it was estimated, was about one-twentieth of the sky light. This led the British to adopt both white and pale grey colours for their maritime patrol aircraft.

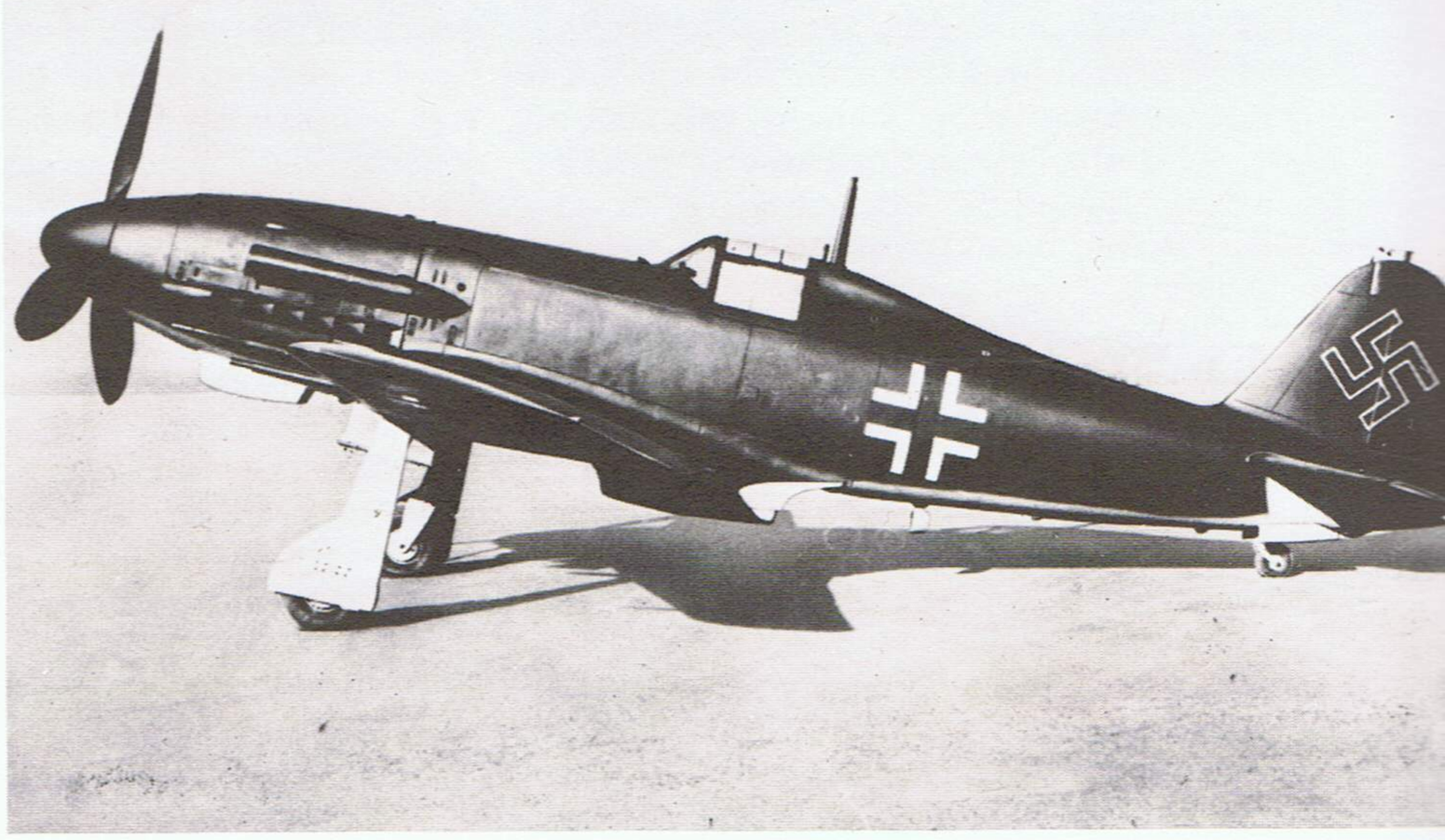
The use of this pale bluish green colouring, although apparently not adopted for Bv 222s in general, did make an appearance on the undersides of Fw 190s used in Norway. Extensive field research amongst the aircraft wrecks, both on land and under water, by Herr William Berge has resulted in several paint finishes being subjected to most careful scrutiny. Actual paint samples have been supplied to, and checked by, the author who agrees entirely with Herr Berge's findings. The actual samples were recovered only from areas which have not been exposed to the elements and where no form of corrosion was present.

At what date this undersurface colouring was introduced is not known, nor is its RLM identifying colour code number. The 1944 edition of *Der Flugzeugmaler* lists all standard camouflage finishes up to, and including, the tropical colours 78, 79 and

Top left: Wearing a camouflage base coat of 80 with a continuous wavy line of 79 over the top this Fw 58, CB+XF, was just one more shattered wreck encountered by the Allied troops. */IWM*

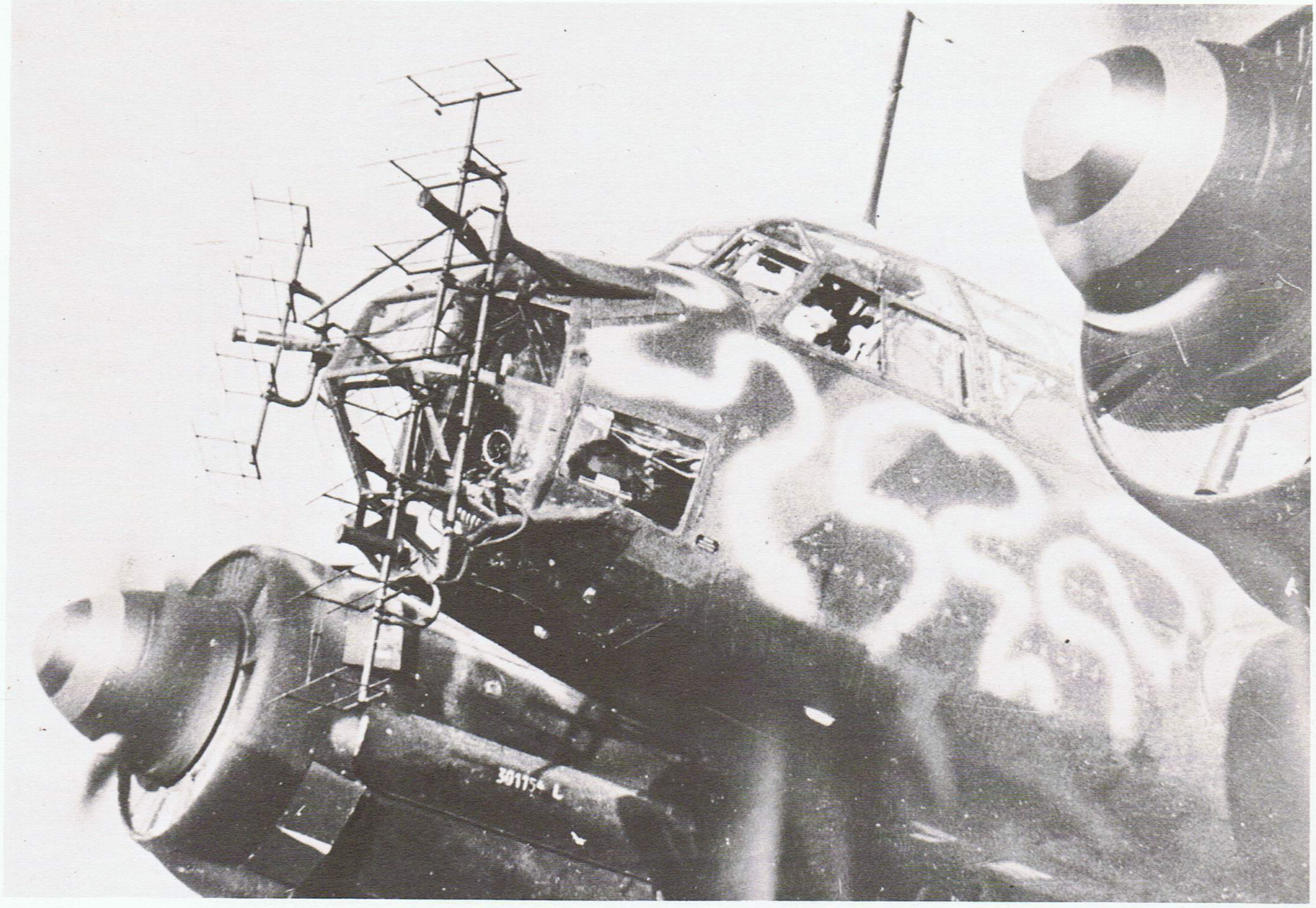
Bottom left: The rapid transfer of aircraft from western Europe and Germany to counter the Allied advances included portions of two newly formed *Jagdgeschwadern*. This Fw 190 wears the all white tailplane peculiar to aircraft used in the defence of the Reich force. It also wears a yellow fuselage band which, in this instance, is believed to be a *Reichsverteidigung* marking. JG 11, which used a yellow *Reichsverteidigung* band and all white tailplane, was formed on April 1, 1943, and aircraft of III *Gruppe* at Rotenburg in early 1944 were seen wearing exactly the same combination of markings. Total lack of any form of Mediterranean tactical markings adds to the conclusions set out./*S. Haggard*

80. Two other colours, both upper surface camouflage greens, are known to have been introduced late in the war, the identifying numbers 81 and 82 being allocated to them. The bluish-green must then have had a number between 83 and 98, the highest colour identification number known being 99. The possibility cannot be overlooked that the normal practice of issuing new colours used for camouflage in groups of three, was not also done in the case of the late war greens. The tropical colours 78, 79 and 80 are just such an example, as was 74, 75 and 76. (Note that the lone colour in between, 77, was not a camouflage colour in the sense that it was used only for code applications). Both 81 and 82 were upper surface camouflage greens which filled the place of the old 71/02 compromise and gave a much better 'woods and meadows' effect, with less contrast between the colours. The bluish-green colour used for lower surface colouring does form a very good blend with the two upper surface colours mentioned and with a reduced degree of contrast between the two areas. This is pure speculation of course, and must remain so until, or if, any supporting German documentation is recovered which gives details relating to the late war greens.



By October 1943, the German forces in Italy had retreated to the line of the river Volturno, 20 miles north of Naples, but from there onwards the Allied advanced slowed markedly. The capture of air bases in Southern Italy, however, added to Germany's defence dilemma. Foggia and its satellite airfield became the launching point for day and night bombing attacks on Germany.

Above: Italian aircraft impressed by the German forces in Italy were given full Luftwaffe markings, albeit with some inconsistancies as shown here.



The night bombing offensive was being countered to some degree by new aircraft and techniques introduced into the Luftwaffe's night fighter force. The success of the *Wilde Sau* tactics had led to the rapid expansion of the single engined force, JG 301 and JG 302 being formed and the entire force concentrated into a new command, *Jagddivision* 30.

The Do 217J-1 had entered service in the spring of 1942 but proved unsatisfactory and was replaced by the J-2 model which was joined, in turn, by the much improved Do 217N-1 early in 1943. About this time the night fighter force finally abandoned its overall black finish and adopted standard day fighter colours of 74, 75 and 76, albeit with variations. The technical manual for the Do 217N-1 (D. (*Luft*) T2217N-1), dated 23.2.43, contained a camouflage diagram for this model which used a straight edged splinter pattern of 74 and 75 for the dorsal surfaces. Base colouring for the fuselage sides was 02 with 76 being used for the undersurfaces of the wings and fuselage. The diagram included an extension of the 74 coloured area down the fuselage sides to provide a contrasting background for the white outline Balkenkreuze currently in use. Mottling of the fuselage sides and vertical tail surfaces was to be done with 74 and 75. Spinners were to be painted in 70 colouring.

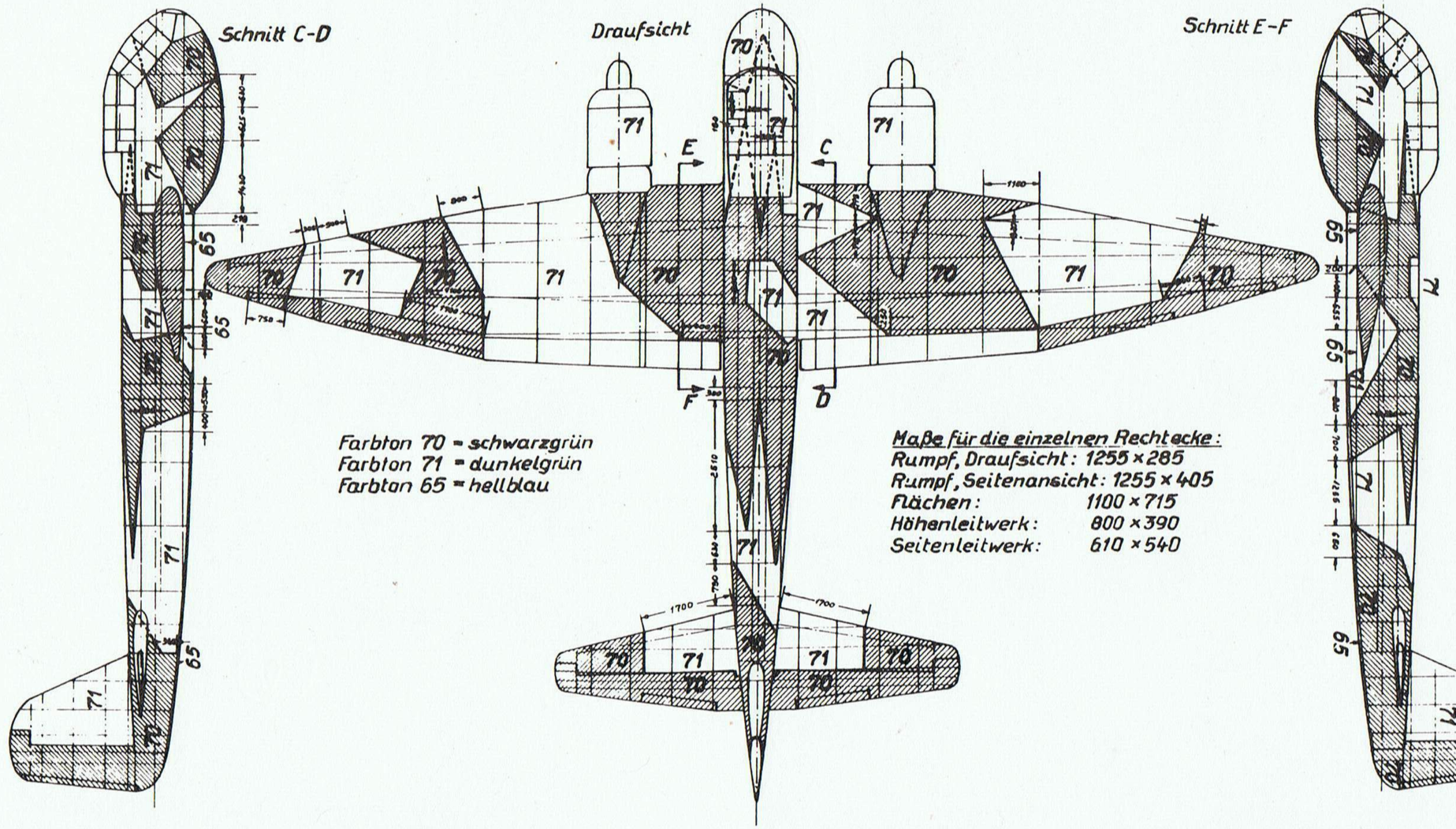
In practice the mottling generally appears to have been restricted to the vertical tail surfaces, fuselage sides remaining in plain 02 which blended into the 76 of the ventral surfaces. Use of this colour scheme appears to have been phased out toward the end of 1943.

Of the other night fighter types, the Ju 88 standardised on a base colour of 76 with soft mottled patches of 75 on all upper surfaces. Variations were seen with the mottling taken down the fuselage sides but in general the former scheme predominated. Bf 110s used two main colour schemes, the first of which was very similar to that used by the Ju 88 but with a marked tendency to substitution of 74 for 75 for the mottling. The second scheme used greens in quite a soft segmented pattern along the fuselage spine, with the paler of the two greens for the mottling on the fuselage sides. As with all night fighter aircraft the style of the *Balkenkreuze* and *Hakenkreuze* varied from unit to unit, sometimes appearing in full and at other times as an outline form, such variations persisting until the end of the war.

Bf 110 equipped units had been withdrawn from Russia, the Bay of Biscay

Above left: Framed between two Fw 190s, a Ju 52 reveals only the last two letters of its code, +KP. The aircraft letter is repeated on the rudder beneath the yellow markings H2 which identified a temporary transport unit, several of which were formed to meet the urgent needs of the Axis, withdrawal from the central Mediterranean. /*S. Haggard*

Above: With its original segmented camouflage (in this instance looking remarkably like a combination of 71 and 73) oversprayed with wavy lines of 65, this Ju 88A-6/U also wears temporary black lower surfaces used for night anti-shipping operations. The yellow rings on the spinners probably denoted III *Gruppe* ownership. Note the repetition of the aircraft's *Werk Nummer*, 301154, plus the suffix L (for *Linke*=left) on the exhaust manifold. Removable parts were usually identified in this manner.



Farbton 70 = schwarzgrün
Farbton 71 = dunkelgrün
Farbton 65 = hellblau

Maße für die einzelnen Rechtecke:

Rumpf, Draufsicht:	1255 × 285
Rumpf, Seitenansicht:	1255 × 405
Flächen:	1100 × 715
Höhenleitwerk:	800 × 390
Seitenleitwerk:	610 × 540

Junkers Flugzeug- und Motorenwerke A.-G.

Ju 188 2-Farbensichtschutz, Muster B

entspricht Zchng. S-18800-60002 vom 5. 8. 1942

and the Mediterranean and transferred to north west Germany. *Kampfgeschwader* 51 had also been brought back from Russia and re-equipped with Me 410s armed with 21 cm rockets, and approximately 175 twin engined fighters had been armed with this weapon by October. Based in western Germany behind a screen of single engined fighters in France, Belgium and Holland, it was hoped to stem the daylight thrusts of the Americans. The success of the defenders during the Americans' August 17 raid on Schweinfurt seemed to offer some hope, particularly as only three of the remaining 15 bombing raids carried out by the USAAF up to October 7 were against targets in Germany.

During one of these three attacks, however, a significant event occurred. On September 27, 1943 Emden was the target, but this time P 47s escorted the American bombers all the way. Small beginnings to what was to become a major tactical change. Owing to the limited range of the P 47s at that time, the renewed series of deep penetration raids which commenced on October 8 was made without fighter escort. It was brief and bloody. The final attack of the series on October 14 was again Schweinfurt, and once more the Americans paid a prohibitive price with 20% losses, 4% higher than the previous attack. This was the last unescorted deep penetration raid by the US 8th Air Force.

Any respite that might have been otherwise gained from the cessation of the 8th Air Force attacks during the remainder of 1943 was negated by the daylight raids carried out by the US 15th Air Force from Italy. This new threat necessitated the build up of fighter defences in southern Germany and Austria.

Such were the pressures applied to the German defence system that by the end of 1943 about 68% of the Luftwaffe's single and twin engined fighter force was engaged in this task. Some 75% of the force was actually based inside the German borders by the beginning of 1944.

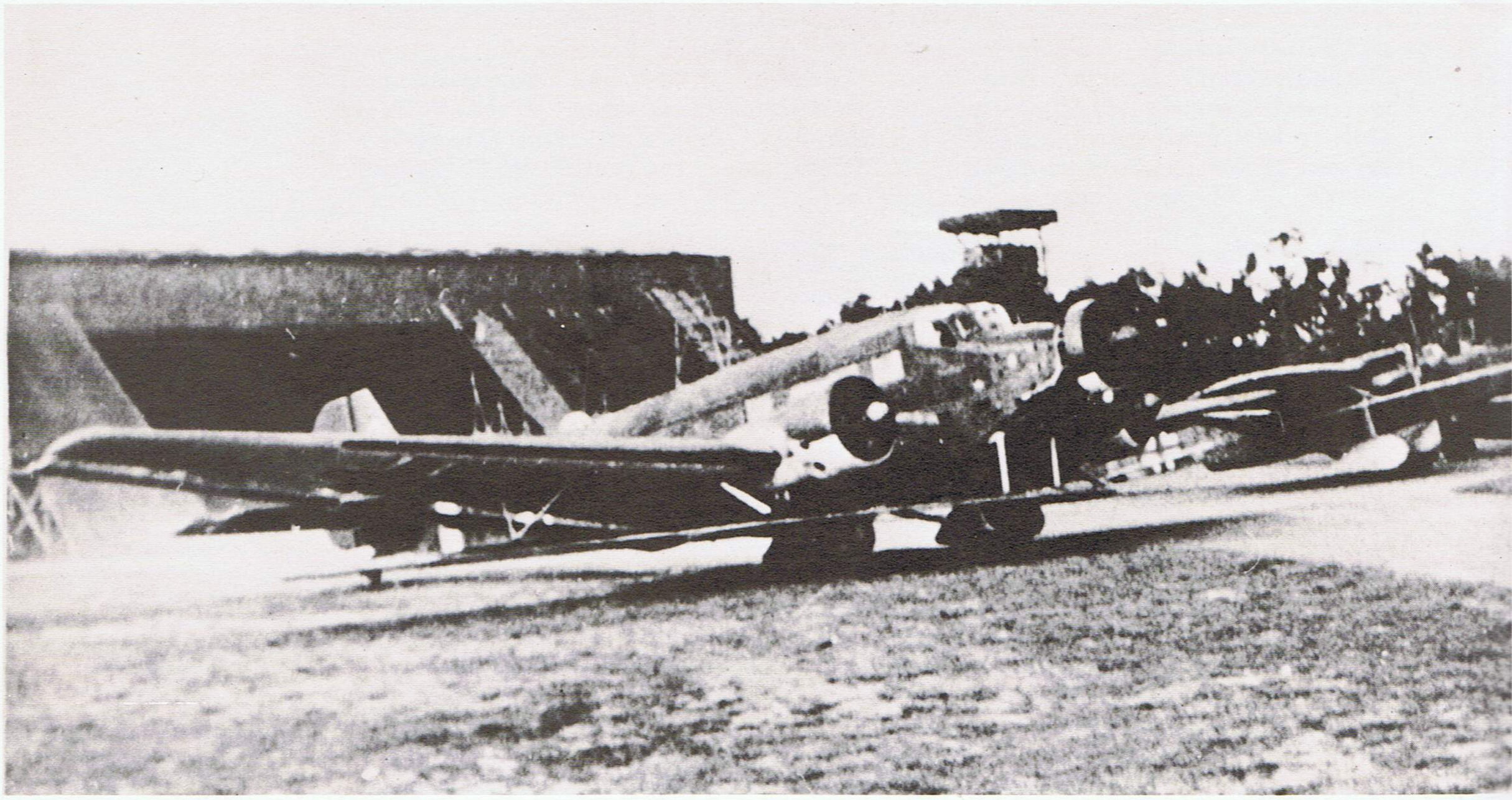
Resumption of 8th Air Force activities in January 1944, coupled with the appearance of long range escort fighters (P47s and P 51s), marked a major turning point for the German defences. On January 30 *Luftflotte Reich* was set up under *Generaloberst* Stumpff and seven *Jagddivisionen* were regrouped under two *Jagdkorps*. Aircraft production was placed under the control of the brilliant Albert Speer who, in turn, appointed the head of the newly formed *Jaegerstab* that was set up in March.

The bombing offensive continued unabated from March until May when a rapidly devised and actioned dispersal scheme made aircraft production centres far less attractive targets. This was a remarkable achievement and completely defeated the main purpose of the Allied

Left: The official camouflage diagram for the Ju 188, as issued on 5.8.42, shows the revisions introduced in the mid-war period. The longer span wing of the Ju 188 (and some other types) required the insertion of an additional area of colour, one grid square wide, immediately outboard of each engine. Comparison with the Ju 88 diagram shown earlier in the book reveals modifications to the basic camouflage pattern in the region of all control sufaces.

Below: Adopted for long range maritime reconnaissance duties, the first Ju 290A-2s were supplied to *Fern-Aufklärungsgruppe* 5 in July 1943, becoming operational from Mont de Marsan in October. Used for spotting shipping targets for both U-Boats and KG 40s aircraft, the Ju 290s wore standard sea camouflage of 72/73/65 but with the upper surface colours restricted to the dorsal areas.





Above: Allied mining operations become a steadily increasing problem for German shipping. The extent of the problem and the lack of resources with which to counter it is illustrated by this photograph of a Ju 52 and an ancient Do 23G of the *Minensuchgruppe*. Both aircraft wear full camouflage and the Ju 52 appears to have yellow wingtip lower surfaces in addition to its white fuselage band. Possibly it was also required to sweep the Danube for mines, yellow being the local tactical marking colour./*H. Jonas via D. Vincent*

attacks. Programme schedules were rapidly revised and updated, a vigorous production policy being instituted at the expense of such promising types as the Focke Wulf Ta 152, Ta 154, Do 335 and He 219 which were virtually stillborn.

Last minute hopes were nurtured for the jet and rocket aircraft under development. The Me 262 at last began to appear in small numbers, being joined by even smaller quantities of the excellent Ar 234. The rocket propelled Me 163 also appeared in production, JG 400 being formed to take it into action, but only 45 of the 90 aircraft produced had become operational by the following December. The aircraft's limitations, however, caused it to fall rapidly from favour and its production priorities were transferred in January 1945 to the jet propelled He 162. Time and events were to deny the He 162 its combat debut.

By comparison with the bombing offensive being directed against Germany, the Luftwaffe's operations over Britain during the first half of 1944 had been almost inconsequential. The long term night intruder operations by KG 2's Me 410s had been maintained right throughout 1943. They proved tough adversaries for the British night defences, but their numbers were insufficient to gain any long term result. On the occasion when normal heavy bombers were used losses were disproportionately high.

Toward the end of 1943 plans had been made for a new style of bombing operation using heavy bombers and concentrating their numbers in attacks of short duration, as the RAF was doing. A pathfinder force was to lead these attacks and the Ju 88S was chosen as the instrument. This mark of Ju 88 had been designed from the outset with speed as the prime requirement (hence the designation S for *schnell*). With a reduced crew, very light armour plating protection and GM 1 power boost for the engines, it proved to be the fastest version of the Ju 88 ever built. It entered service with the *Kampfgruppen* in January 1944, KG 6 being the first to receive the type.

Meantime, *Fliegerkorps* IX had been reinforced by withdrawing aircraft from Italy and strength stood at approximately 500 aircraft, comprised of Ju 88s, Ju 188s, Do 217s and He 177s. The latter numbered only 35 and this was the first occasion that the type had become available for operations over Britain. In addition, a mixed force of approximately 50 Me 410s and Fw 190s were also used.

It was recognised by *Generalmajor* Peltz, who was in charge of the operation, that his crews were inexperienced and every effort was made to provide thorough pathfinder guidance. Operations began with an attack on London on the night of January 21/22, 1944, but results were very poor, a pattern that was to persist throughout the campaign which finally ceased in April.

While the campaign was of minor conse-



quence the aircraft taking part exhibited some interesting camouflage schemes. The Ju 88Ss of the *Beleuchtergruppe* (Illuminator Gruppe) were seen wearing an overall finish of 74 which had been oversprayed, on *all* surfaces, with wavy lines of 76. Some wore a plain overall finish of 76, while others used 75 for all lower surfaces and a random mottle of 74 over a base coat of 76 for the upper and side surfaces. Of the main force bombers both Do 217s and He 177s were recorded wearing black sides and lower surfaces with mottled applications of 74 and 75 over a base coat of 76 for upper surfaces. Both the *Balkenkreuze* and *Hakenkreuze* on many aircraft were reduced to the barest outline and codes were overpainted with 7120.77. This process usually involved only the aircraft and Staffel code letters since most Kampfgruppen had adopted the reduced size ($\frac{1}{4}$ the height of the fuselage *Balkenkreuz*) characters for the actual unit code. This practice had been introduced around mid-1943 for all classes of aircraft which used any form of unit code identification. It is assumed that this was done as a security measure because of the growing pressures being brought to bear on the Luftwaffe's resources. The continuous transfer of aircraft through mainly occupied territories allowed considerable opportunity for the underground intelligence system to report on unit movements, information that was highly valuable.

Kampfgeschwader 2 machines, the only unit for which any substantial photographic evidence is available for the so called 'Little Blitz' of 1944, used a large numeral to denote the individual *Staffel*. This was applied across both fin and rudder and in some instances obscured the *Hakenkreuz*. In view of the great care taken to subdue all side and lower surface markings to ensure that the night camouflage would not be compromised, it was rather anomalous that the huge numeral on the fin and rudder should be painted in white. This was presumably the *Gruppe* colour, a singularly unfortunate circumstance for aircraft from 1, 2 and 3 *Staffeln*.

This style of simple *Staffel/Gruppe* identification was also to be seen on other anti-shipping aircraft, such duties being KG 2's normal occupation. Examples of KG 100's Do 217Ks have been noted wearing this type of application, the *Staffel* being identified by a large numeral applied in the *Gruppe* colour across both fin and rudder, or simply on the fin alone. These particular aircraft also adopted a permanent night black finish for the sides and lower surfaces because their duties were normally nocturnal.

Much had occurred during the period examined but one theatre of operations has been neglected and it is necessary to examine what had occurred on the Eastern Front before proceeding further.

Above: Destined to be delayed until it was too late for operational use, the Do 335 series of heavy fighters wore somewhat unusual camouflage. Official directives had stipulated the use of greys for all classes of fighter aircraft since mid-1941, yet all known examples of the Do 335, including the V14 shown here, wore dark greens on their upper surfaces./*Crown copyright*

The Shrinking Perimeter

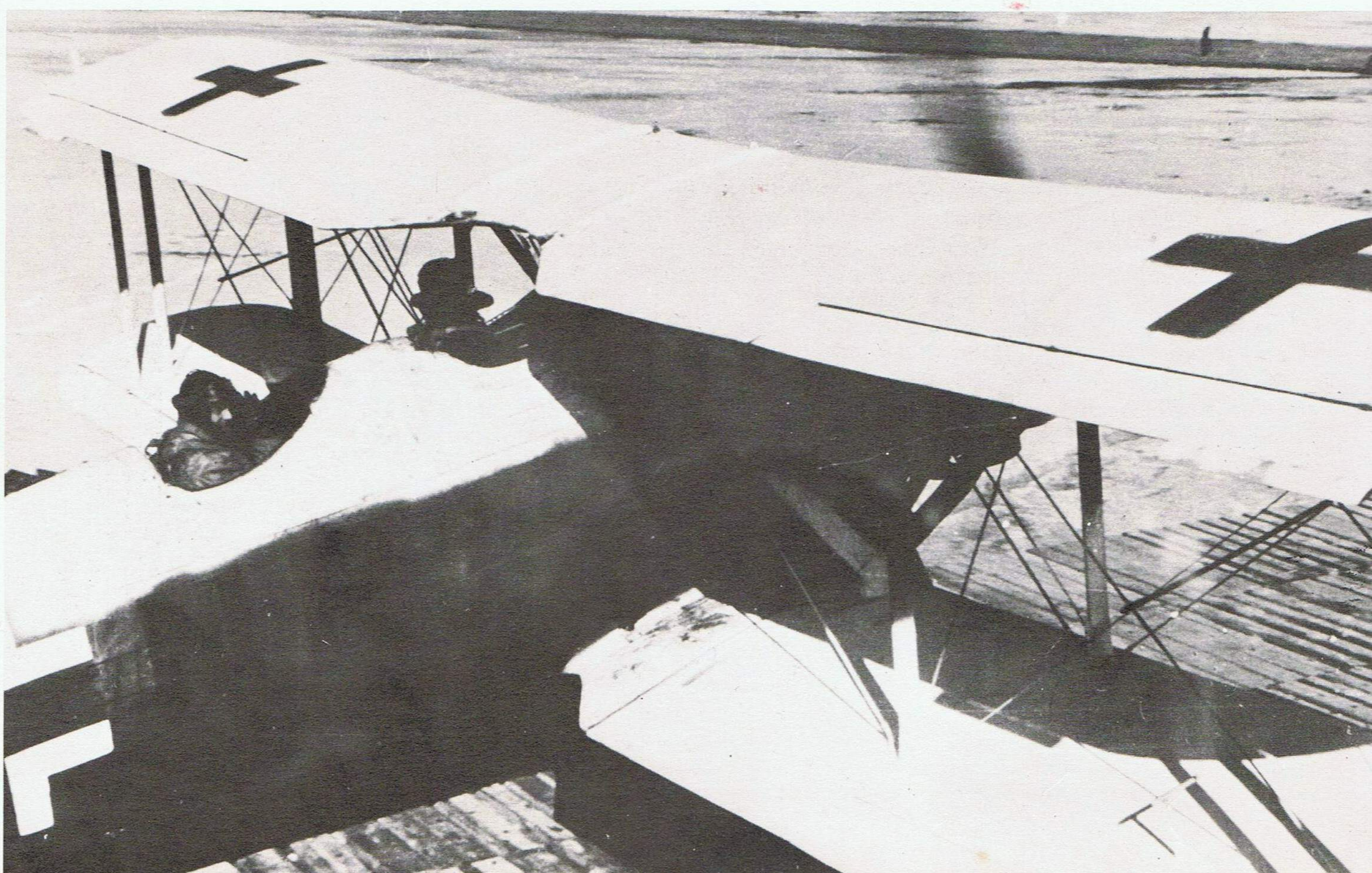
The Russians had been quick to exploit the German disadvantage caused by the necessity to concentrate their major resources on the Stalingrad battle. Going over to the offensive the Russians had soon moved forward, the most rapid progress occurring in the south where they had bypassed the German forces at Stalingrad. The general German retreat was to accelerate when they were forced to undertake a precipitous withdrawal from the Caucasus.

A series of savage battles took place in February 1943, Kirsk falling to the Russians on February 7, only to be retaken on the 9th. Krasnadov fell on the 12th then Kharkov on the 16th. At this point an attempt was made to check the Russian advance in the Donetz basin, Kharkov being regained on March 15. The Germans, however, lacked the reserves to exploit their position and a stalemate developed.

Ground fighting sank into a quiescence except in the Caucasus, where savage fighting continued albeit on a reduced scale. Air activity, however, again resumed an intensity similar to that of the previous December. Winter weather conditions had virtually grounded the Luftwaffe during January providing a desperately needed respite; the terrible toll taken by the sustained activities of all units throughout the autumn and early winter of 1942 in support of the Stalingrad offensive had severely strained both men and machines. Most units had had little or no opportunity for resting and refitting since the previous Summer.

In January 1943 an attempt had been made to step up the flagging Luftwaffe air activity. The Russians had already proved the value of night harassing attacks using obsolete aircraft types in lone attacks. Quick to sieze the incentive, the first eight of 13 *Störkampfstaffeln* went into action early in the new year. These units had been formed late in the previous December, their equipment being Ar 66s, Go 145s and a few He 45s. Retaining their

Below: He 50, 3W+NR, of N.S.Gr.11 shows the type of winter camouflage used by these lone nocturnal raiders. Permanent black was used for the lower surfaces but side surfaces remain in what appears to be a uniform application of dark green. All upper surfaces are sprayed in temporary white. This particular unit was disbanded in September, 1944.



Top left: This Do 17J wears a thinly sprayed application of white over all upper surfaces including the spinners. By using a patch pattern with fogging at the edges the normal 70/71 colour scheme has broken up the white areas most effectively. The badge beneath the cockpit is similar to the one shown previously on a Do 17, but in this instance a Luftwaffe eagle is emblazoned across its centre. It is thought that this was a *Luftflotte* emblem. */ Bundesarchiv*

Centre left: A more common style of application of sprayed temporary winter white is seen on this 9 *Staffel* Ju 87D. Only the aircraft and *Staffel* letters remain exposed, albeit with rather ragged edging. Overspraying has also obscured portions of the other markings. The dark green 70 coloured bombs in the foreground have 40 mm wide yellow stripes while those in the other two rows wear red stripes. Some of the latter appear to be finished in pale grey colouring. */Bundesarchiv*

Below: Fighter aircraft also utilised a plain white winter finish for all upper and side surfaces. In this instance the application has been done with spray painting equipment.

existing camouflage, most were given a temporary finish of white on all upper surfaces and permanent black on their lower and side surfaces. The use of white, in view of their nocturnal duties, was not as impractical as it first appears. Operations by these aircraft were flown at relatively low altitude and their white upper surfaces blended well with the white terrain. During the day, at dispersal, the same white upper surfaces afforded an equally useful static camouflage. With the passing of the winter snows the temporary white was removed, but the lower surfaces retained their black colouring because the aircraft were normally restricted to night operations.

The lull in fighting allowed the Wehrmacht to prepare for a major offensive designed to recapture Kharkov, the Donetz line from Kharkov to Voroshilovgrad and, if possible, Rostov. In addition the Kuban bridgehead would be held to maintain a foothold across the Kirch straits.

Luftflotte 4 was to provide air support for these operations and in mid-February began the task. The He 111 bombers, previously withdrawn for transport duties, were returned to normal offensive operations and a special bomber battle unit was formed to handle close support tasks. The Luftflotte also took over direct control of the air defence of the Crimea, the Kirch straits and Taman peninsula. Having taken over control of the entire southern front, a ruthless elimination of depleted, battle-tired units began. During February eight units were withdrawn for







Left: The spring thaw saw Luftwaffe aircraft return to normal camouflage schemes. This 8 *Staffel* Hs 126 wears its red letter F very thinly outlined in white and its yellow fuselage band immediately behind the *Balkenkreuze.* The white (in some parts badly discoloured) lines on the side of the fuselage are sighting guides for photographic work using a hand held camera. Each line bears a number; 1000 beneath the cockpit, 500, 100 and 50. Unit identity is not positively known but the emblem on the nose consists of a dark coloured, triple turreted castle wall with the left side of its round-topped gate open. The tips of the three turrets appear to be red, the open gateway yellow and the sky pale blue. A narrow yellow border surrounds the shield and also forms the main colour of the scroll immediately beneath it.
Bundesarchiv

resting and refurbishing, leaving behind some 250 aircraft for redistribution among the remaining units to bring them up to full strength. The subsequent mixture of markings and emblems, both personal and unit, must have been interesting.

The counter offensive opened on February 21 and for the last time the classic blitzkrieg technique was used. The Spring thaw, having turned roads into quagmires, meant that the Russians were heavily dependent upon their railway system. The ageing Hs 123s again bore the brunt of the task, their simple sturdy undercarriage enabling them to continue operating from primitive landing strips when more sophisticated aircraft were grounded. Newly formed *Eisenbahnstaffeln*, 9./KG 3, 14./KG 27 and 9./KG 55, equipped with a heavy-cannon armed version of the Ju 88, went into action for the first time. In conjunction with the ageing Ju 87s and the Hs 123s, the close support units blasted a path towards Kharkov which fell on March 15.

The pressure of air support was kept up, Belograd being taken, but in April the spring thaw interrupted operations and a brake was applied to Luftwaffe activities. The offensive had ended before Kirsk had been reached; the Russians now applied pressure to the last of the German held section of the Crimea, forcing the bulk of the Luftwaffe to move into this new sector. The Taman and Kuban peninsulas thus became the key to ultimate defeat for the Germans.

Having assembled nearly 600 aircraft in the Crimea the Luftwaffe launched a series of major attacks on April 17. Russian photo-reconnaissance had, however, spoiled any opportunity for surprise and the Luftwaffe was unable to secure tactical air superiority, and the offensive failed. In addition, Russian air attacks on German supply shipping in the Black Sea and the straits of Kirch forced the Luftwaffe to retain a defensive force in the Crimea. Numerical inferiority cost it dearly.

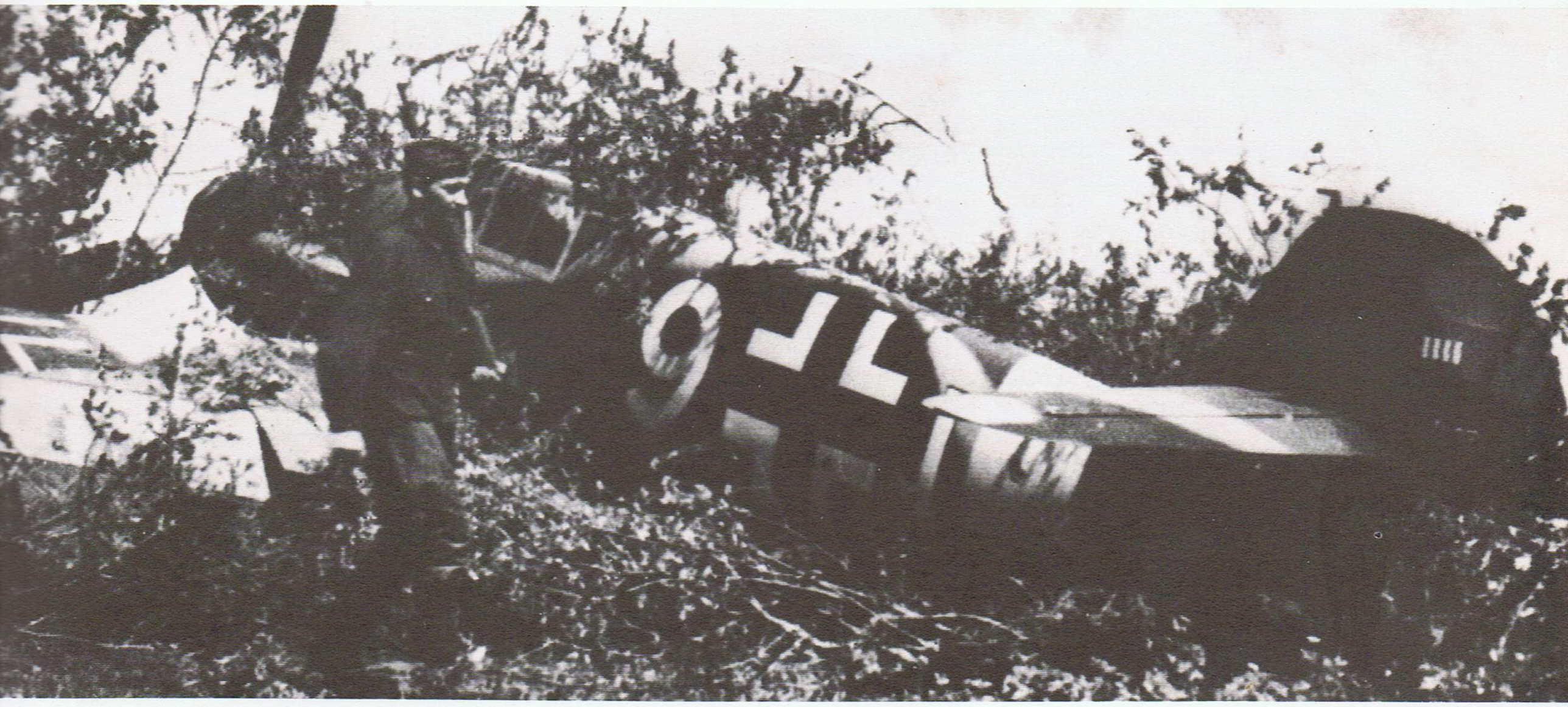
Early in May a build up of Russian forces in the Black Sea ports, obviously intended for amphibious landing operations in the Crimea, produced a series of retaliatory raids by Luftwaffe bombers. Continued Russian pressure over the Kuban peninsula during May initially produced a heavy commitment by the Luftwaffe which averaged 400 sorties a day. The price of failure was starkly clear to the Germans; if the Crimea was lost the Russian bomber force would then be within easy striking distance of the Rumanian oilfields. Compelled by this threat, the Luftwaffe was committed to an exhausting round of warfare which gave no opportunity for rest and denied major air support to other vital sectors.

Despite these pressures, the Luftwaffe force in the Crimea was gradually eroded by the transfer of piecemeal packets of aircraft to other sectors, until the available forces were once more thinly spread along the entire front. The Luftwaffe was aided in this distribution of aircraft by the return to the East Front of units which had been resting and re-equipping in Germany. These lifted the front line strength

Top left: A Fw 189, 6M+GH of Aufkl.Gr.(F)/11, shows its all white upper and side surfaces, this temporary finish having been applied by brush, resulting in a very patchy and streaked effect in places. */Bundesarchiv*

Centre left: Bombed up in readiness for its next operation, this KG 77 Ju 88 displays red and yellow spinner tip colours. The rear half of the spinners are black and propeller blades green 71. Aircraft from this unit carried various names in yellow Gothic script on the nose section, the position varying from aircraft to aircraft. */H. Obert*

Below: Such originality of colours and style of camouflage was comparatively rare – even by JG 54s standards! Reputedly one of a pair of Bf 109s surrendered to the Russians by two Luftwaffe deserters, this 9 *Staffel* aircraft uses the vertical III *Gruppe* emblem that had largely superceded the old horizontal S form. Three colours have been used for the upper and side surfaces, 70, 71 and 02, with a massive sweep of 70 behind the *Balkenkreuze* and the number 9. The latter colouring is only marginally lighter in tone than the black of the *Balkenkreuze*. Four yellow kill bars appear on the rudder. The foliage was added by Russians. */IWM*



to about 2,500 aircraft. Single engined fighter strength, however, amounted to only some 600 aircraft which was totally inadequate to meet the tactical changes which had forced the Luftwaffe into a defensive role. Unable to secure air superiority, the efficiency of the bomber force was greatly impaired.

Weather conditions again forced a lull in fighting and it was mid-June before the next offensive was launched. A series of heavy night raids far into the Russian interior against industrial targets and oilfields was undertaken. These were closely linked with sustained daylight raids on Russian airfields and rail communications immediately behind the lines between Orel and Kursk. The latter location was also the recipient of a very heavy series of day and night raids. Russian response was a similar series of night attacks against rail communications bringing up German reinforcements.

The Kursk offensive witnessed some of the heaviest and most bitter fighting of the war in the east. The pendulum of success swung first in the favour of the German forces, but the Russian counter offensive forced the Luftwaffe to commit its aircraft to three main areas. Thus weakened, it could not gain air superiority over the Russians. On July 23 the German offensive collapsed and a retreat began; by August 4 Orel was again in Russian hands and the first period of the summer campaign had ended. The great Russian offensive of 1944 was yet to come.

Air operations during the remaining four months of 1943 were dominated by two persistent factors, Russian strategic initiative and German numerical inferiority. Approximately 900 aircraft were initially concentrated in the Kharkov area and southwards. After the fall of Kharkov, evacuation of its airfields were carried out on August 23 and units moved south to new bases for the defence of the Dnieper line. Essential as this concentration was to the holding of the Crimea, it was done dangerously at the expense of the northern flank of the Ukranian salient. The Russians were not slow to take advantage of the weakness. With the majority of close support units removed from the central sector, approximately 500 aircraft, a high proportion of which were reconnaissance aircraft, were left to defend nearly 400 miles of front line. Not surprisingly Brjansk and Smolensk fell on September 17 and 25 respectively. This forced pattern of robbing one sector to support another cost the Germans dearly and the Russians advanced steadily, Kiev falling on November 6.





Top left: standard ambulance markings and camouflage are worn by this Ju 52. Tactical markings have also been added as required by the official directive.

Centre left: G6+AS of III/KG.z.b.V 2 loading its cargo of wounded. The scale of casualties on the Russian front in particular often produced numbers far beyond the capabilities of the normal ambulance corps aircraft force and transport aircraft were seconded to these humanitarian duties. The German censor has attempted to obliterate the last two letters of the code.

Bottom left: A Fw 190, wearing yellow on the lower surfaces of its wingtips engine nacelle bottom panels, fuselage band and rudder, shows the black triangle marking which rapidly disappeared from general use following the issue of the order on October 5, 1943. */Bundesarchiv*

Below: The Hs 129 finally proved to be a very effective anti-tank weapon and gave excellent service in Russia. The massive armour plated nose of this aircraft wears the *Infantrie-Sturmabzeichen* emblem stencilled in white, and the aircraft letter F on the extreme nose. Yellow paint, somewhat faded in places, covers all of the nose section except for the central panel bearing the emblem. Official camouflage for this aircraft type was 70/71/65. */Bundesarchiv*

This major emphasis on ground support operations had produced a rationalisation of the ground attack formations. On October 5, all dive bomber, ground attack and fast bomber groups had been incorporated into new ground attack wings. The Ju 87D was replaced wherever possible by Fw 190F and G models, but its final replacement with most units did not take place until August 1944. It never completely disappeared from front line use, and various odd *Staffeln* were still using it quite effectively when the war ended. This collective grouping of aircraft into one category saw the disappearance of the old *Schlact* emblem of a black triangle. Within the space of less than three months little evidence of it remained other than on odd aircraft which exhausted ground crews had not bothered to overpaint.

The pressure virtually never ceased, with a renewed Russian offensive opening in late December. Again units were moved backwards and forwards in an attempt to stem the tide of battle, but with little real effect. Bad weather, poor airfields, declining serviceability and the general dislocation caused by frequent moves took their toll. Supply depots and aircraft parks had to be withdrawn to central Poland, which added to the maintenance and serviceability problems.

The Russian offensive spread along the entire front in January 1944. The Luftwaffe was in no position to sustain such an onslaught, many units being long overdue for resting and refitting. Its strength was further weakened by the withdrawal of He 111-equipped units on February 5 to act as supply aircraft for troops isolated in the bridgehead at Nikopol. These pressures were directly responsible for the delay in replacing the Ju 87 with the Fw 190 and also an attempt to re-equip the Fw 189 units with the Bf 109.

By mid-March Russian forces were threatening the Rumanian oilfields, but Russian pressures were not restricted to the front line alone. Political unrest in Hungary precipitated a display of strength by the Luftwaffe, bombers being concentrated at Vierine and single engined fighters from the Balkan area at Belgrade and Nish, while airborne landings took place in Hungary and Bulgaria.

By early April the Russians had pushed the German forces back, clearing the path for an offensive on the Crimea. Luftwaffe losses were heavy during the ensuing campaign, approximately 250 aircraft, mainly single engined fighters, being lost between April 8 and May 9. Added to these losses were considerable numbers which had to be abandoned where they stood.

The evacuation brought hasty reinforcement from a variety of sources and once again aircraft wearing a variety of tactical markings were seen in Russia. From the Western Mediterranean came torpedo bombers, the air defence in Austria sent twin engined fighters, while the Balkans yielded a few Fw 190s. These Fw 190s, approximately 80 in all, provided a measure of air cover from Rumanian bases for the evacuation convoys. Russian night bombing of Constanza necessitated the move of a night fighter *Staffel* to counter their activities and the evacuation was finally completed.

The seriousness of the declining German foothold in the east brought about a last frantic attempt to concentrate sufficient forces to stem the Russian advance. The defence of Poland was sacrificed to this need and during late May some 750 aircraft, approximately 40% of all front line forces in the East, were moved into Rumania and Bessarabia to defend the vital oilfields. The Russian and Balkan fronts now became fused into one.

Allied air attacks on Danube ports and shipping, begun in support of the Russians' Crimean offensive, revealed the need for a unified control of the available Luftwaffe forces. On June 2 'shuttle' bombing began with American bombers landing in Italy and then bombing German targets on the return flight to England. All Luftwaffe fighter forces were henceforth employed where ever needed along the unified front, including those aircraft previously committed exclusively to the Russian front.



The Breach in the West

Below left: W.Nr.412951, a Bf 109G-6/U1 which fell into Allied hands on July 1, 1944. Its 74/75/76 camouflage is standard although the straight edged division between upper and lower surface colours is a slight variation from normal practice. Both *Balkenkreuze* and *Hakenkreuze* markings are representative of the official standards but application of the *Werk Nummer* to both sides of the fin was uncommon for Bf 109s, this marking normally being confined to the port side./*IWM*

Top right: Representative of the general style of camouflage scheme common to all Fi 103s, this captured example has a soft, wavy line division between upper and lower surface colours. A late production example, it uses a slightly more elaborate camouflage scheme of both 70 and 71, albeit in a very random fashion. Wing upper surfaces appear to be coloured in 70 from the leading edge back to the mid-chord position, the remainder being in 71. The warhead section looks as though it was taken from another missile, hence the variation in camouflage colour and style of application. The yellow coloured nose cone is a type not often seen. A wide variety of stencilling appeared on Fi 103s, the very prominent yellow *Nicht Auftreten* seen here warns against opening the warhead section.

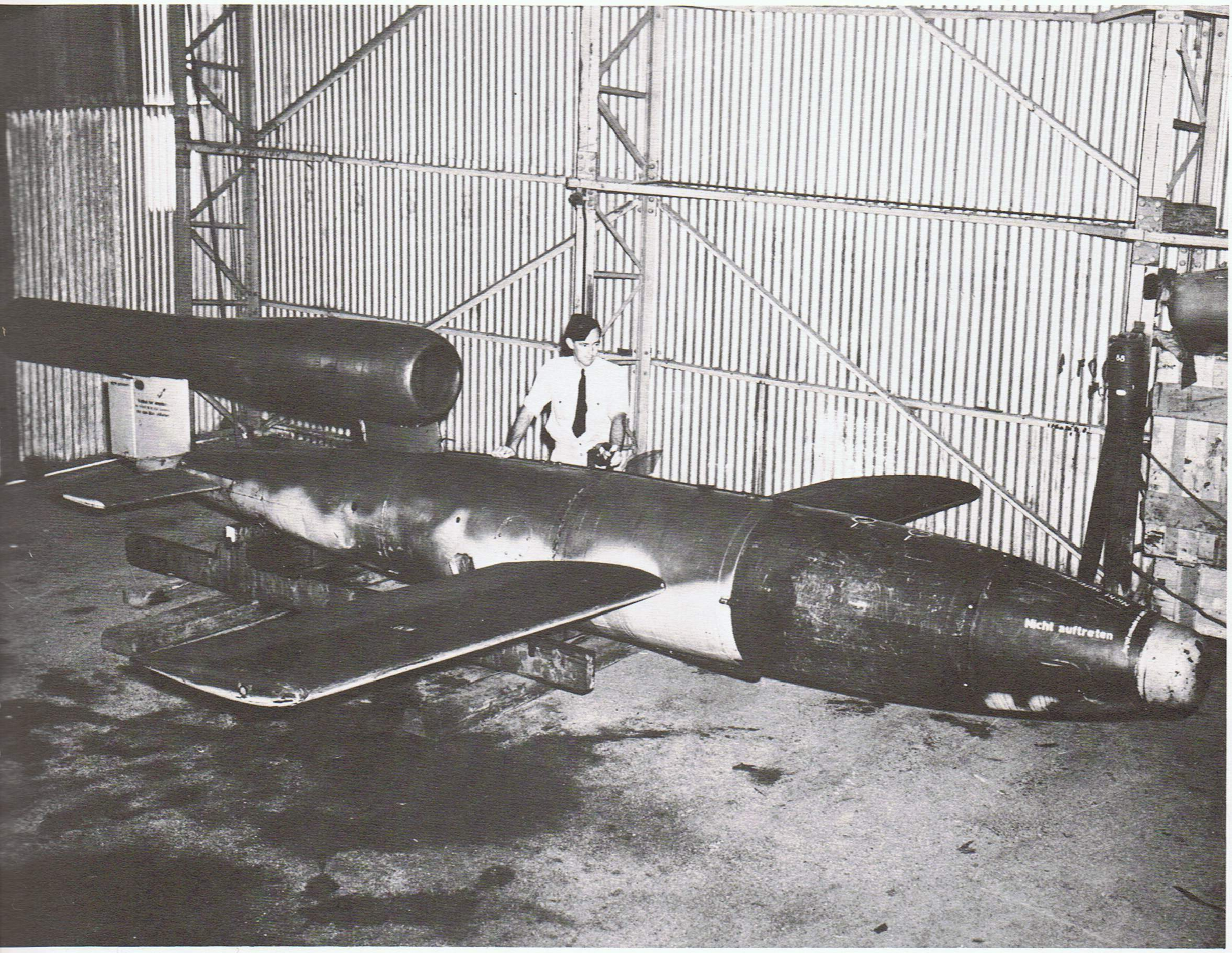
Indecision by the German High Command concerning the impending Allied landings were resolved in drastic manner on the morning of June 6, 1944. Despite the one fact that had never been in doubt, namely that a landing would be made, the slender resources of *Luftflotte* 3 had remained unreinforced in the face of demands from other theatres of operations. The threat alone of Russian advances into Bulgaria and Rumania had led, in May, to the transfer of units from Austria, southern Germany and northern Italy. Thus the process of rotation continued; little wonder that inconsistencies appeared in tactical markings.

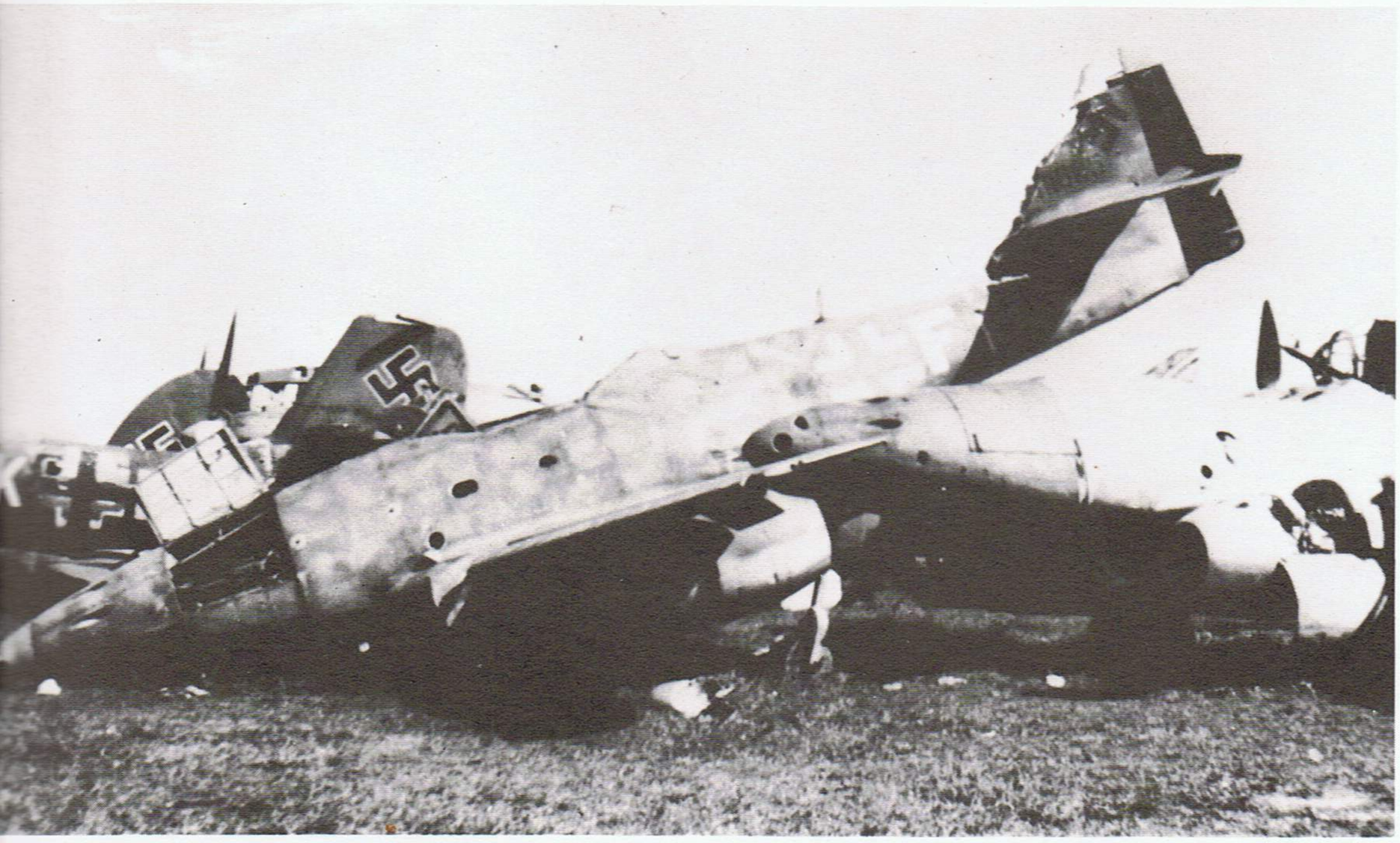
Slightly more than 800 front line aircraft were distributed along a strip running from Spain and south-western France to Holland. Of these only about 600 could be utilised for operations against the landings. Disadvantaged despite anticipation of the event, less than 100 daylight sorties were flown on June 6, 70 of these being by single-engined aircraft. That night, however, bomber and anti-shipping units mounted 175 sorties, the majority being carried out by the former. Single-engined fighter reinforcements from Germany began almost immediately, some 300 aircraft arriving by June 10. This transfer no doubt accounted for the appearance of *Reichsverteidigung* markings outside Germany proper.

The bomber and anti-shipping forces were also reinforced with aircraft from Germany, which moved to southern France, and from Italy, which moved into Belgium. The rapidity of the moves and the pressing operational urgencies led initially to the aircraft from Italy retaining their Mediterranean tactical markings. One thousand aircraft were on strength by the end of the week, a figure not surpassed again and one that was rapidly eroded by the ensuing battle.

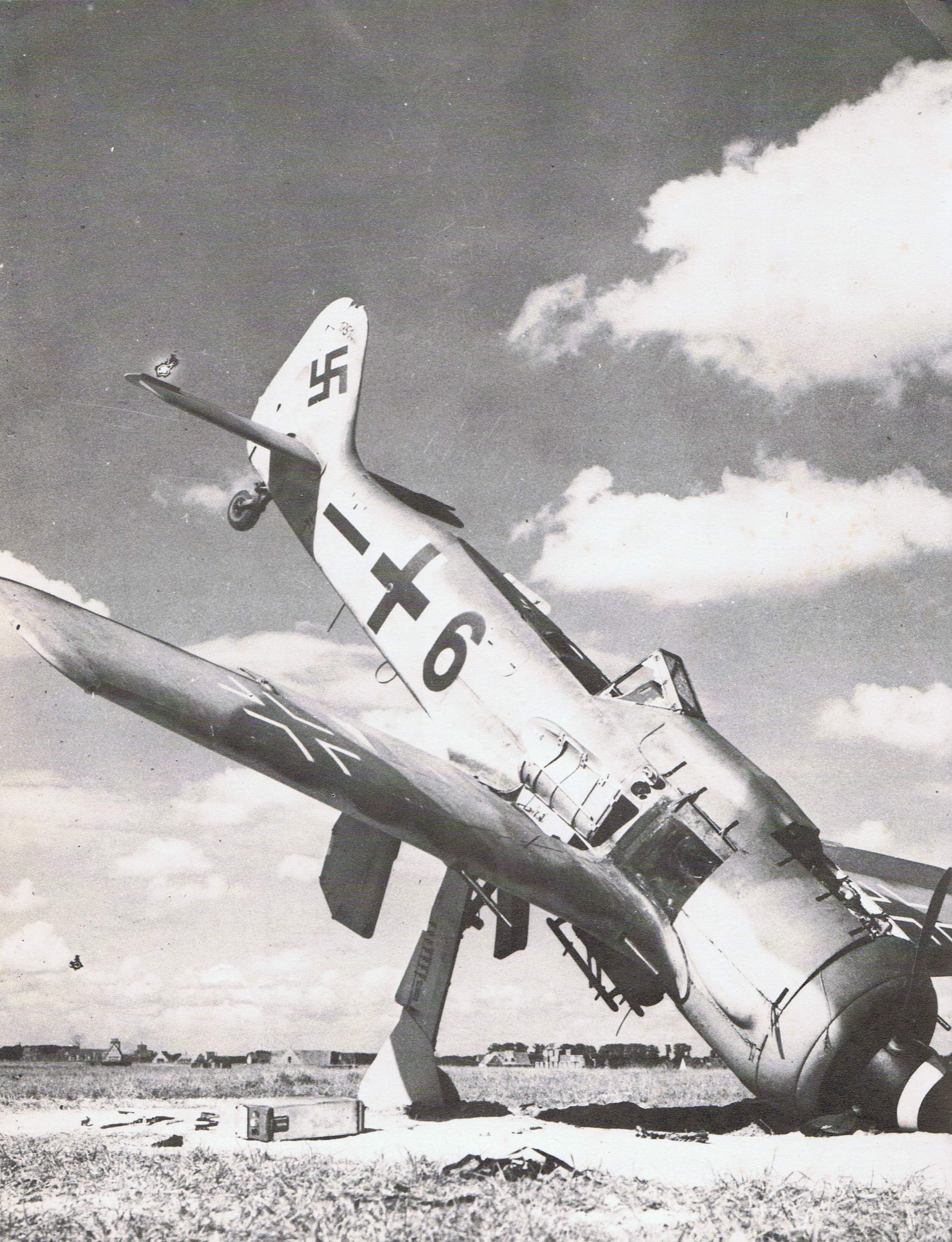
As the last hour of June 12 ticked away, the first Fi 103 flying bomb winged its way across the Channel towards England, marking the opening phase of a campaign that might have met with better success under more favourable circumstances. Initially the Fi 103, more popularly known as the V1, employed camouflage of 70 on







Left: The shattered remains of two Me 262s. W.Nr.111685, white F, wears a very soft mottle of 74 over a base coat of 75 (compare the colours with the 70/71 finish on the Ju 87 in the immediate background). This aircraft is an A-2a bomber version, as indicated by its code, and it bears traces of white colouring on both the nose cone and the tip of the fin and rudder./*Frank Smith*



all upper surfaces and 65 on lower surfaces, division between the two colours being along the fuselage horizontal centre line. Like other un-manned flying weapons no nationality markings were carried; stencil markings, however, appeared in abundance, white or yellow being used on the 70 coloured areas and black on the 65 colouring. More elaborate camouflage schemes were to be seen on later deliveries of this weapon, the plain upper surface monochrome colouring being applied as a mottle over the rear half of the fuselage and motor unit. This was done with spray equipment, a subtle blending being achieved between the solid colouring of the front half of the weapon and the rear portion through which vestiges of 65 colouring showed. The Fi 103R-I, –II, –III and –IV series of piloted weapons used the plain 70/65 scheme for the non-operational versions, the R-IV having a mottled scheme in two shades of green on all upper and side surfaces.

The pressure of Allied air activity and the growing problem of rapid recognition was highlighted by an order issued on July 20. From that date all German aircraft in western Europe (which included northern Italy) were to comply with the following regulations. All fighters, both single and twin-engined, ground attack and reconnaissance aircraft were to use a black and white spiral marking on their spinners. Operational aircraft of other categories were to carry no special form of spinner marking. Captured aircraft, *if flown operationally*, were to bear spiral markings on their spinners. If not flown operationally, the outermost third of the wing lower surfaces was to be painted yellow. All civilian aircraft, regardless of type, were to have their fuselage undersurfaces, the entire engine nacelles and rudders painted yellow.

The reference to operational use of captured aircraft is interesting, and since the order encompassed northern Italy, was probably intended primarily for ex-Reggia Aeronautica machines seized when the main Italian forces surrendered. The shortage of transport aircraft, which had so often resulted in operational aircraft being withdrawn to fill the gap, meant that suitable Italian aircraft formed a welcome addition, SM 79s and SM 82s proving most useful.

August witnessed the Allies pushing steadily forward, a tactical situation that made it all the harder for the Luftwaffe to bear the effects of an order issued to *Luftflotte 3* on the 11th. On previous occasions fuel shortages had seriously curtailed training and supply flights, but this time the front line units were involved. Serious restrictions on all forms of flying activities were necessary; fighter aircraft were only permitted to carry out unrestricted engagement of the enemy if it were a defensive operation against bombers. Reconnaissance, so vital to the battle tactics, virtually ceased.

Three days later only 75 serviceable single-engined fighter aircraft were available for operations. Despite multiple sorties by this hard pressed force, it was frighteningly clear that unless rapid reinforcement occurred there would be disastrous consequences. Four fighter units from the *Reichsverteidigung* force were thrown into the breach. Unfortunately for the Luftwaffe a relatively high percentage of this force was composed of inexperienced pilots, some of the units having only just been re-equipped after being decimated in France during the initial phase of the invasion. Heavy losses resulted almost immediately, and with the worsening ground situation two further fighter units were rushed to the battle front from Germany during the third week of August. *Reichsverteidigung* markings were becoming as common in France as in Germany.

Conditions were chaotic, with fighter units being steadily withdrawn toward the Belgian frontier. Long range bomber and night fighter forces were also forced to retire from Belgium and north east France into Holland and north west Germany. Allied landings in southern France on August 15 added pressure to the German withdrawal, and all Luftwaffe units were pulled back along the line Dunkirk-Charleville on August 29, by which date the single engined fighter force stood at approximately 420 aircraft.

By early September the Luftwaffe was again forced to withdraw its fighter units, which abandoned their Belgian airfields and moved into Germany. Large quantities of aircraft were lost through a variety of causes during this rapid withdrawal; equipment shortages quite often meant that unserviceable aircraft had to be abandoned. Allied strafing attacks, in the face of rapidly declining Flak protection, added to the trail of aircraft wrecks strewn along the line of retreat.

German forces fared no better within the shrinking perimeter of the other fronts. Rumania had been lost, forcing Luftwaffe forces to withdraw into Hungary; Greece was under evacuation with German forces retiring into Yugoslavia. In Finland evacuation was also under way, Luftwaffe units being transferred to East Prussia

A8

Left: An Fw 190G, W.Nr.175149, abandoned near Volkel in Holland during the Luftwaffe's withdrawal. The 74/75/76 camouflage and the markings are quite standard for the period. The rudder and engine nacelle lower cowlings are yellow showing that this aircraft had been part of the force stationed in France. Note the 66 colouring of the upper fuselage decking where the canopy is missing./*IWM*



Above: Wearing white on its nose cone and the tip of the fin and rudder in similar style to the previously illustrated Me 262A-2a, this aircraft belonged to I/KG 51. Camouflage, however, appears to be in the greens 70 and 71 with 65 coloured lower and side surfaces.

and the Baltic states. A reorganisation of the command structure took place to cope with these major redistributions of forces. *Luftflotte* 3 was down-graded in standing and responsibilities for both strategic and tactical operations concerned with the defence of Germany. Other commands were also down-graded in a general concentration of control which was intended to increase the fighting efficiency of the forces that remained.

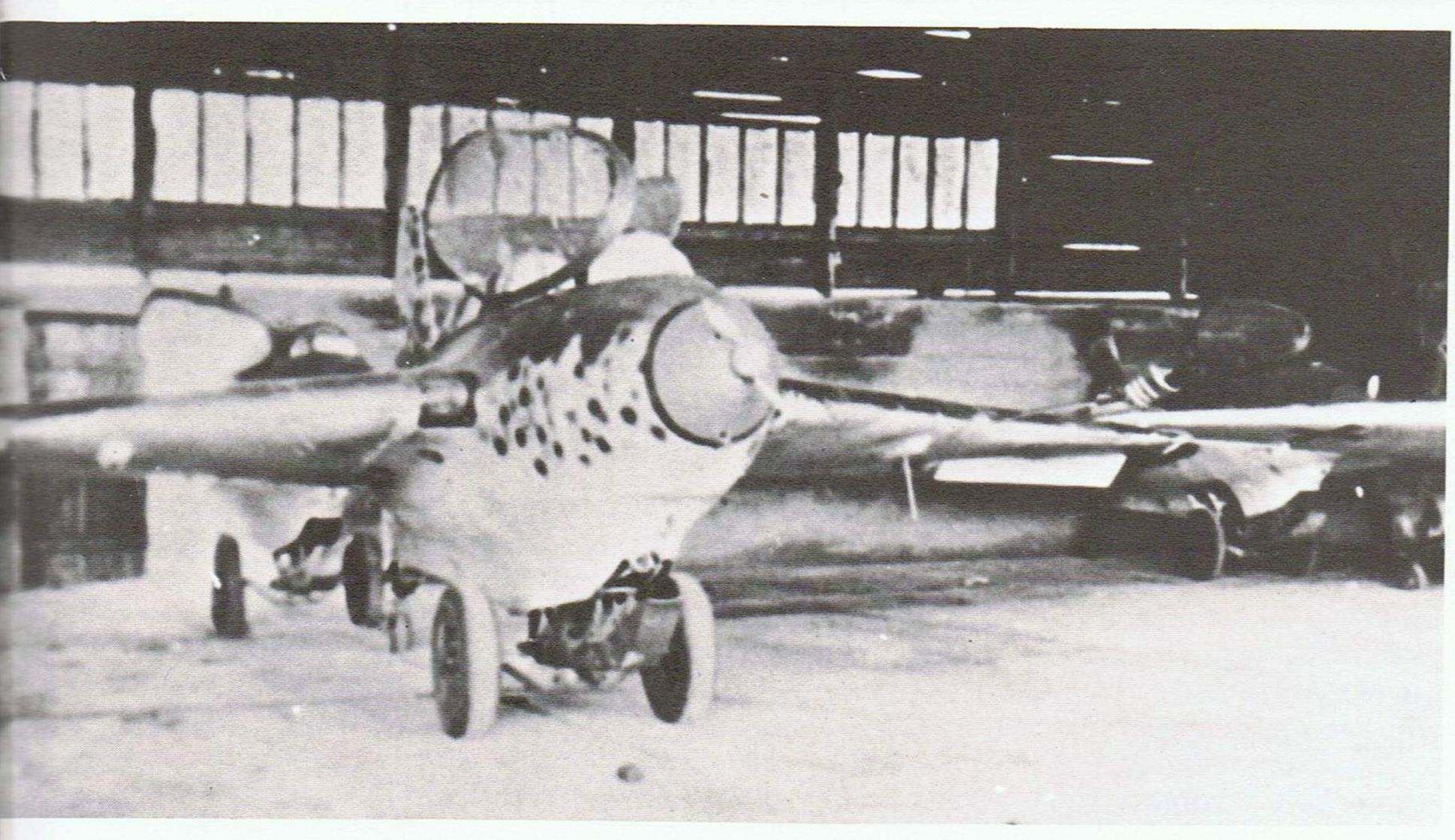
Amidst this chaos Allied airborne landings took place at Arnhem on September 17. Ill-fated though the operation proved to be, it nevertheless drew heavily on German resources by forcing the Luftwaffe to take approximately 350 fighter aircraft from the *Reichsverteidigung* force in Germany. The long range bomber force made its last appearance during this battle. Inactive for more than a fortnight, the force carried out approximately 100 sorties over a two night period. Following these operations, *Fleigerkorps* X was withdrawn from operations on September 22 and relegated to training bomber pilots for fighter duties.

Early in October the Allied advance was approaching Aachen. The ageing Ju 87 was thrown into the fray in an attempt to stem this thrust, and approximately 70 were used for intensive night ground attack operations against Allied communications and airfields. Between 40 and 60 sorties per night were maintained by the Ju 87s during the two weeks prior to Aachen's capture on October 21. Focke-Wulf 190s were used to back up these attacks, some aircraft carrying 1,000 Kg bombs. The Ju 87s proved extremely effective in this role, just as they had done on the East Front and in Italy. Moonlight conditions were needed for success and when such conditions occurred multiple missions were flown. Standard night fighters were also used in support of this brief campaign, all aircraft types participating using temporary black for their lower surfaces.

Operations by day were near impossible due to Allied air supremacy, and such activities were left to the Me 262 force which initially concentrated against Nijmegen and Grove, and later against the Allied close support airfields. KG 51, the first operational bomber unit to be equipped with the Me 262A-2a, kept up a very effective series of attacks from October 2 to the 21st, producing casualties and damage out of all proportions to the number of aircraft employed for the task.

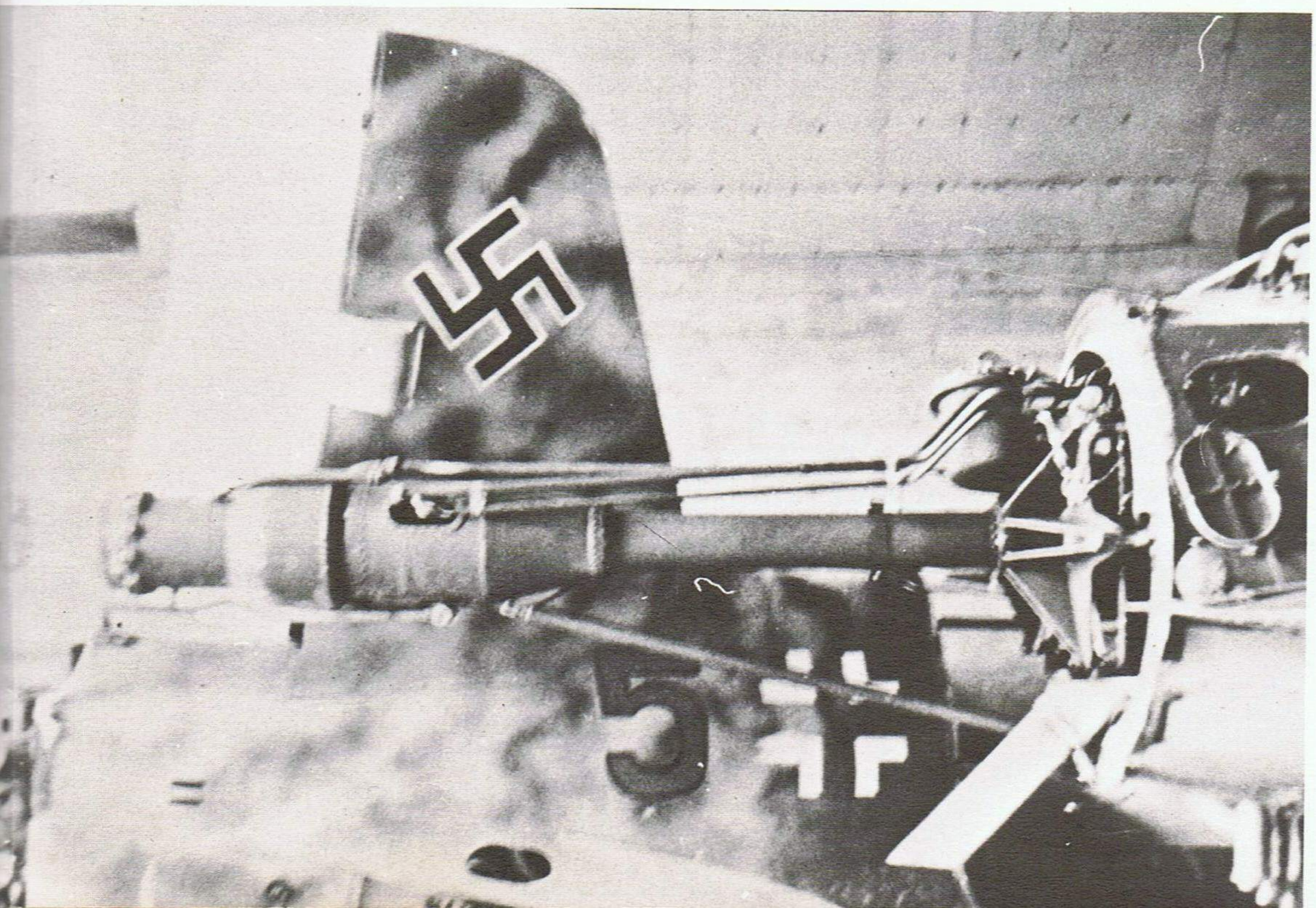
The Me 262 was subjected to a variety of colour schemes during its career. Early prototypes used standard fighter camouflage of greys, but following Hitler's personal decree in December 1943 that the aircraft should be used as a fast bomber, there appears to have been a shift to greens for camouflage on the upper surfaces. The Me 262 V10, which first flew in May 1944, wore the later colouring and, as far as can be established, so did a considerable number of the early production batch. A further distinction, however, occurred with this batch, some aircraft wearing a fighter style camouflage application with soft sprayed mottling being used to blend upper and lower surface colouring. The Me 262s of *Kampfgeschwader* 51 exhibited a variety of colour schemes and styles of application, some using the one mentioned while a few wore more normal bomber style camouflage with the greens being taken right down the fuselage sides to the lowest point.





Above: This Me 262A-1a, W.Nr.112385 yellow 8 of 3./JG 7, shows yet another variation in camouflage. All upper and side surfaces are finished in 70 and 71, both colours being merged into each other, and lower surfaces in 65. Note that the paint used for the *Balkenkreuze, Hakenkreuz, Werk Nummer* and the twin *Reichsverteidigung* band markings produced a distinct highlight under strong lighting conditions, giving the illusion, in particular, of a pale coloured *Hakenkreuz*. The fuselage bands are red 23 and dark blue 24, the latter being the rearmost colour. */U.S. Air Force*

Left: Of indifferent quality but extremely interesting, these two photographs show details of Me 163Bs of 3./JG 400. Aircraft numbers and nose cones are yellow, edged in black. The very small 71 and 02 coloured, strongly pigmented mottling on the forward fuselage is yet another of the many camouflage variations seen on these unique type of aircraft. The detail shot of the rear fuselage and rocket motor of yellow 5 shows a soft sprayed mottle of 71 over the base colour of 65. The rudder appears to be a replacement component still in its 02 primer coat. */P. Dunne*





Above: In service to the last – this Ju 87D-8, W.Nr.142891, wears the familiar 70/71/65 camouflage finish. The flame damping exhausts, lack of black undersurfaces and spraying equipment indicate that this aircraft had been withdrawn from night assault duties and used for daylight smoke laying operations. */Bilderdienst Nowarra*

The few rare photographs of *Kommando Nowotny* Me 262A-1a fighters indicate that a high proportion of them also wore an upper surface camouflage of greens. Equipped with approximately 40 aircraft, this field test unit put into practice the techniques of its semi-operational predecessor *Erprobungskommando* 262. Unlike KG 51, *Kommando Nowotny* was not a normal front line unit and most of its aircraft wore a narrow yellow fuselage band between the wing trailing edge and the *Balkenkreuz*, common to aircraft engaged in test and experimental work.

Aircraft engaged in these duties should not be confused with pure prototype aircraft, which did not carry a yellow distinguishing band. In addition to their normal four letter registration, most prototypes carried a *Versuchs* (experimental) marking composed of the letter V followed by the prototype number. Colouring was usually white against a dark background or black against a light background. A variation to the *Versuchs* numbering, seemingly peculiar to the Messerschmitt firm, and Me 262 production in particular, was to be seen on aircraft retained for development work. The normal factory registration letters were not applied; instead a large letter V, followed by the last three digits of the particular aircraft's *Werk Nummer*, was applied to each side of the fuselage forward of the cockpit. In some instances the three numerals were repeated on the rear fuselage, beneath the tailplane.

The narrow yellow fuselage band marking described earlier should not be confused with *Reichsverteidigung* markings. The latter was used by the Me 262s of JG 7, but in the normal position specified for fully operational front line aircraft, i.e. around the fuselage immediately forward of the tailplane.

The contemporaries of the Me 262 in the field of jet propulsion were also in limited operational use. The first operational sortie by an Me 163 had been carried out by an aircraft from *Erprobunskommando* 16 on May 13. The Me 163 V41, registered PK+QL, had unsuccessfully attempted to intercept two P.51s. This particular aircraft had previously been painted bright red overall on no other authority than that of the ground crew who serviced it. The use of an aircraft bearing second line registration markings for operational duties was, strictly speaking, anomalous,



but the duties of EK 16 covered a wider spectrum than normal.

Standard colour scheme for Me 163As and the initial B series was 02 overall. Permission to use this scheme, if desired, had been promulgated in the November 1941 edition of L.Dv.521. Messerschmitt's had also used this scheme on the Me 262 V6. Other manufacturers also utilised it, several of the He 280 prototypes and the He 162 V1 being finished in 02.

JG 400 eventually commenced operations with the Me 163B in June 1944. Camouflage for these aircraft was quite varied in application but careful colour analysis points to four main paint colours being used, 02,70,71 and 65. The following schemes are the principal ones;

a A soft edged splinter pattern of 70/71 for all upper surfaces and fuselage sides down to the horizontal centre line of the fuselage. Lower surfaces and lower fuselage sides 65.

b A variation of (a) with the vertical tail surfaces, from the base of the fin and rudder, painted in 65 colouring and soft sprayed with a disruptive mottle of 71.

c Upper surfaces of the wings and the area of the fuselage between the wing roots finished in a splinter pattern of 70 and 71 colouring. The remainder of the fuselage, both forward and aft of the wings, finished in 65 with extensive 71 and 02 soft sprayed mottling carried right down the fuselage sides.

d A variation on (c) with the 65 colouring and 71/02 mottling taking in the dorsal area of the fuselage between the wing roots.

e Very similar to (d) but using large, soft edged, sprayed mottling in 71.

These are only the basic variations that existed, and the reader is reminded that the density of the mottling varied considerably with 'touch' of the particular painter. On some Me 163Bs the mottling was almost bled into an inter-connected hazy pattern.

The Ar 234 formed the third type of aircraft in this unusual group. Intended principally as a high speed bomber, it utilised standard bomber camouflage of 70/71/65, upper surface colouring being taken right down the fuselage sides. The initial batch of 13 Ar 234B-O pre-production aircraft, delivered to *Erprobungstelle* 2 at Rechlin, had their

Above: A more elaborately camouflaged Ju 87D-5, W.Nr.1884, after a heavy landing. Colouring appears to be a combination of a green of similar tone value to 71 sprayed over a base coat of 02 – including the rear half of the spinner! Part of standard segmented camouflage pattern is visible on the port wing root leading edge, the pale colouring matching the 02 on the inside surface of the open fuel filler hatch further outboard. The yellow 3 on the engine cowling highlights the point that after the amalgamation of the dive bomber and ground attack units, code applications became confused. Some of the former *Stukageschwadern* retained their codes, while others, equipped with a mixture of Ju 87s and Fw 190s, used single identification letters. The use of a number as shown here merely adds to the inconsistencies mentioned. */Bilderdienst Nowarra*

engine nacelle undersides painted in 04 yellow to denote their experimental status. The type had entered into limited operational use with 1 Staffel of the *Versuchsverband Ob.d.L.* in mid-1944, being used as a high speed reconnaissance aircraft. The Ar 234 and the Me 262 were to join forces in the months that lay ahead.

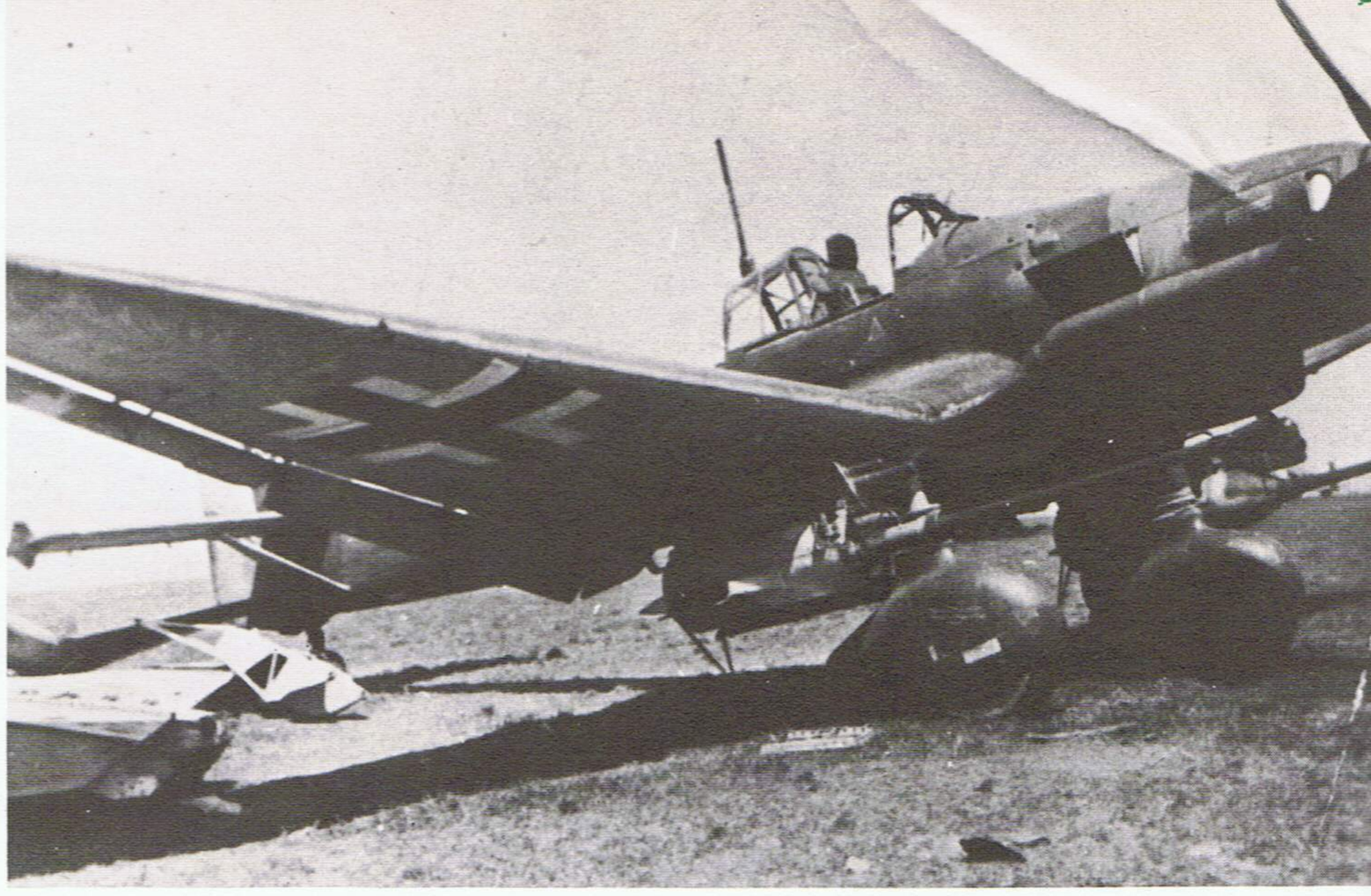
Close on the heels of the Allied landings came the Russian summer offensive which opened on June 10. Its spearhead was launched against the Finish frontier in Karelia, along the Gulf of Finland. The need to concentrate the majority of Luftwaffe forces along the main front meant that only a small force of aircraft was available in Finland. This was soon boosted by the transfer of about 50 single-engined fighters and dive-bombers to central Finland. Transfer of another 50 fighters to Germany, to strengthen the home defences against increased Allied bombing, further weakened Luftwaffe strength on the central front along the Pripet Marshes, where the Russian offensive began on June 23.

The central front reeled under the Russian attack and by July 3, the need for rapid reinforcement was critical. Aircraft were brought in from all sources; the *Reichsverteidigung* force yielded 40 single engine fighters while *Luftflotte* 4, to the south, furnished a similar number. The largest contribution, however, came from the Italian front, 85 Fw 190s being transferred to meet the desperate need of effective ground attack forces to stem the Russian columns. Normandy yielded 40 more, in spite of the critical shortages in that area of operations, another 70 coming from the already depleted *Luftflotte* 4.

Two points require examination here; first the speed with which these transfers were accomplished, secondly the wide variety of sources from which the aircraft were drawn. In the west some aircraft were still wearing Channel coast markings in yellow, operating in company with machines from the German home defence force wearing *Reichsverteidigung* bands and Italian Fw 190s with their white tactical markings. Time and circumstances, in most cases, did not allow repainting of tactical markings, the rapidity with which the forces were transferred being an outstanding accomplishment. Thus a wide variety of markings were to be seen, equalled in many respects by the variety of camouflage finishes and styles. Virtually every variation from greys through to greens was to be seen, and it is well to remember the extensive mixing of markings and camouflage that occurred with increasing frequency during the last year of the war. The mixing that had occurred previously was on a minor scale by comparison.

During the actual progress of the battle it is possible that some form of rough over-painting of tactical markings was attempted, but in view of the continual retreat and subsequent change of bases it is very unlikely. The inflow of aircraft barely kept pace with the losses, and by the end of July every last available aircraft had been thrown into the fighting. *Luftflotte* 4 was stripped of its remaining close support aircraft to provide the last of the reinforcements, but the effort proved wholly inadequate and the Russian advance continued.

At this critical moment serious trouble flared in the Balkans. Luftwaffe forces in Rumania were already badly weakened, a fact high-lighted by the increased bombing attacks on the Ploesti oilfields





Top: A battered Ju 87G-1 camouflaged in 70/71/65 and fitted with flame damping exhausts for night operations. Lack of black undersurface colouring and the addition of a yellow rudder and nose band indicate that this aircraft had been used for daylight operations.

Above: Typical of the rapid transfer of aircraft from one front to another, this Ju 290, white B of 1 *Staffel,* shows its hastily applied yellow fuselage band.

during July. Fear of Turkey's renunciation of neutrality in favour of the Allies increased this sensitivity, but August 23 dealt the final death blow. A coup d'etat in Rumania coincided with a Russian offensive across the River Pruth. Once again rapid transfers of Luftwaffe aircraft occurred, involving 40 Ju 87s from Esthonia and 30 Fw 190s from north of the Carpathians. Less successful were the attempts to move troops by air, due principally to lack of suitable landing areas. A further effort at troop movements, this time from Yugoslavia on August 25, was thwarted by aircrew shortages and unserviceabilities in the Me 323 force.

In the face of a rapidly developing disaster, all elements of the Luftwaffe were evacuated from Rumania, mainly to Hungary. Those that went to Bulgaria had to make a further rapid withdrawal when that country declared war on Germany on September 6. For all practical purposes the Balkans had been lost.

The front continued to shrink, drawing further westward. In September the fuel shortage struck another blow at the already diminishing Luftwaffe activities. Operations were ruthlessly pruned to a minimum and Russian airpower became overwhelming. Earlier that month, on the 4th, Finland had agreed to a ceasefire and the Russians had reached the Baltic by early October, entering East Prussia soon after. Belgrade fell on September 20.

A brief respite followed, however, when the Russian offensive slowed in Poland and the Balkans, main air activity being confined to the Baltic-East Prussia region. In time *Luftflotte* 1 was to become isolated in Latvia. Fuel shortages kept the Luftwaffe grounded, only the four special railway attack units continuing to operate, albeit without achieving any strategic results.

A rapid consolidation of the remaining Luftwaffe forces took place during October, when units from northern Greece, Albania and southern Greece were evacuated and concentrated in the Pecs area to cover the approaches along the Danube from Belgrade. Most of the few remaining aircraft of *Luftflotte* 4 were concentrated in the Kecskement area to cover the approaches to Budapest.

While the front from the Carpathians to East Prussia remained relatively quiet, the Russians were very active in the south, particularly in Hungary. Heavy and sustained fighting continued throughout November with the Russians thrusting toward Budapest. Easing of the pressure in the north allowed the Luftwaffe to concentrate approximately 600 aircraft in the south, of which 200 were ground-attack aircraft. A similar easing of the fuel crisis also enabled an increase in operations, but despite these aids the Russians had reached the Danube north of Budapest by December 9.

The failure at Arnhem had delayed the Allied break-out into the north German plain. The subsequent time advantage provided the Luftwaffe in particular with the opportunity to rebuild its fighter force. September marked the peak output of single-engined fighter aircraft by the aircraft industry and a much depleted fighter force was able to build up its strength to an all-time high. This remarkable achievement was unfortunately offset to a large

Below: A Ju 88G-7a wearing the very pale colours of the night fighter arm. The 75 soft sprayed mottle is restricted to the upper surfaces, the entire aircraft being finished in a base coat of 76. Spinners and propeller are black-green 70. */H. Obert*



degree by the poor standard of replacement pilots, reflecting the decline of the training establishments.

This 70% increase in front line strength was the end product of an expansion programme, commenced in 1943, to build up the single-engined fighter force. It had been completed in mid-1944 with the formation of three new *Nachtjagdgruppen* (JG 300, JG 301 and JG 302), bringing the force's strength up to approximately 200 aircraft. These aircraft were, however, diverted to other duties, specialising in daylight bad weather interception techniques for which their camouflage of greys was eminently suited.

A further point of significance evolved from this massive expansion. From May 1944 single engined fighter units had their *Staffel* structure increased from three to four per *Gruppe*. In addition, *Staffel* strength had been increased by 50%, a point made obvious by the much higher numbers seen on individual aircraft. Under normal circumstances this would have been a remarkable achievement by the German aircraft industry, and at this crucial stage of the war it was even more so. Further indication of the scale of achievement can be gauged from the fact that 15 fighter units, devastated in the fighting between mid-August and late October in France, were re-equipped and returned to operations.

On the debit side, however, could be measured the decline of the long range bomber and reconnaissance forces. Between January and September 1944 some 25 operational bomber units had been disbanded, 80% of them from July onwards. Anti-shipping forces had dwindled to a mere 60 Ju 88 and Ju 188 torpedo bombers based in Germany and Norway. The 60 or so Ju 88s which equipped the bomber force in the West were employed mainly for random mine laying operations, the remaining 60 He 111s being temporarily out of action undergoing a refit for air launching operations with the F1 103 flying bomb.

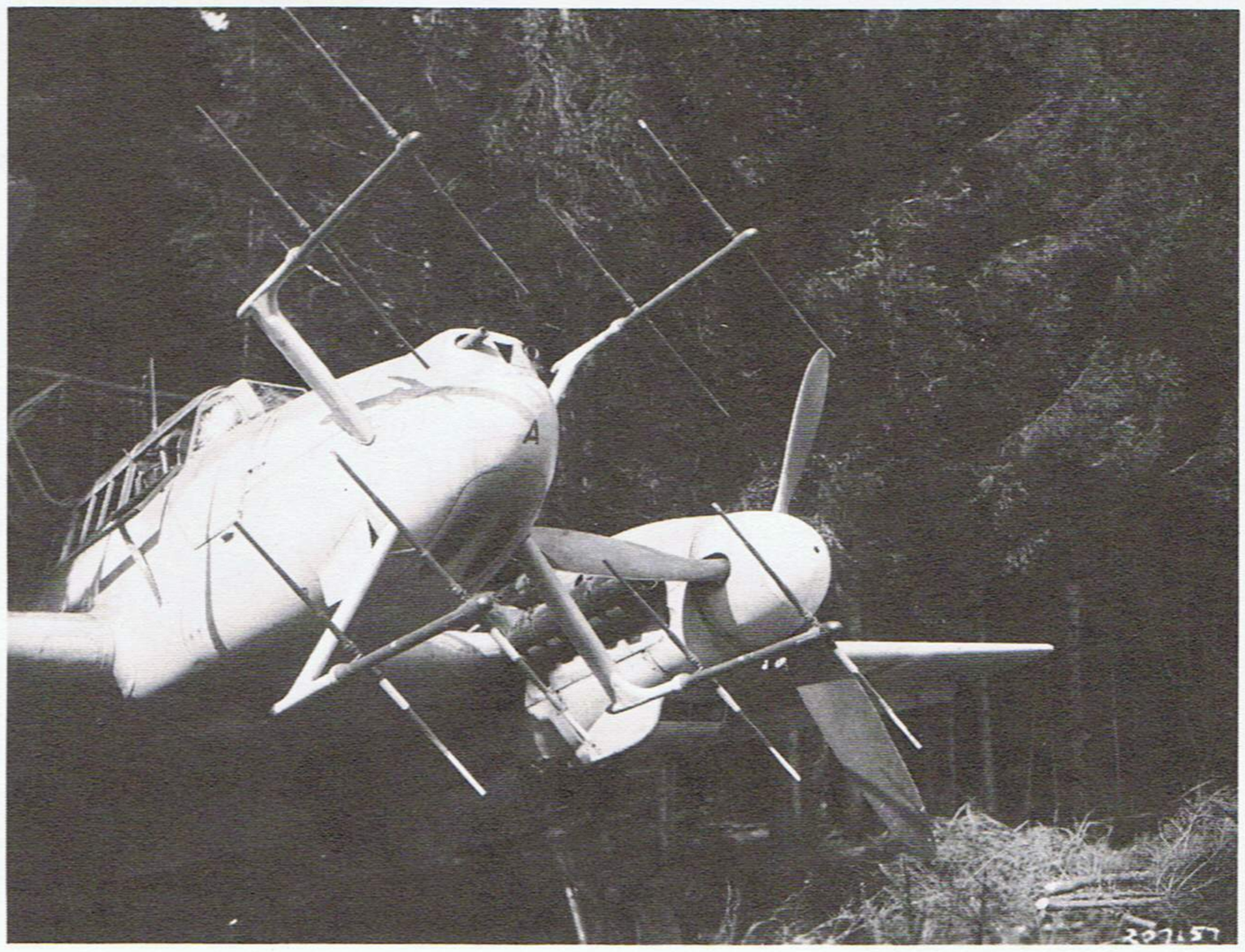
Allied advances across France and the Low Countries had deprived the German night fighter force of its early warning system, producing a rapid decline in that highly efficient and successful arm of the Luftwaffe. In July the night defence system ran from Denmark to Paris, by October it ran from Denmark to Switzerland. Increasingly effective electronic counter-measures by the RAF, coupled with intruder operations, speeded the decline.

As recorded earlier, demands for air support by the Wehrmacht were answered, in part, by diverting the less successful night fighter crews to this purpose. The Bf 110 aircraft used for this task retained their normal camouflage of greys but had their lower surfaces overpainted with temporary black finish. The eastern front, now so close to the homeland, also exercised demands for night fighter aircraft to counter Russian night bombing attacks. Added to all this was the decline in training standards, which in turn, produced a marked drop in efficiency.

As October succeeded September a further distinct change took place. The number of single-engined fighters available for use on the western front was reduced from about 850 to 350, the balance being transferred to northern Germany to defend Berlin and the oil centres to the east. Total forces in the west were thus reduced overall to some 640 aircraft of all types, while *Luftflotte Reich* had approximately 1,800 aircraft available for defensive operations. The confusion of tactical markings was compounded, and would become even more so during the next few months with the rapid and continuous transfer of large numbers of aircraft from west to east and vice-versa.

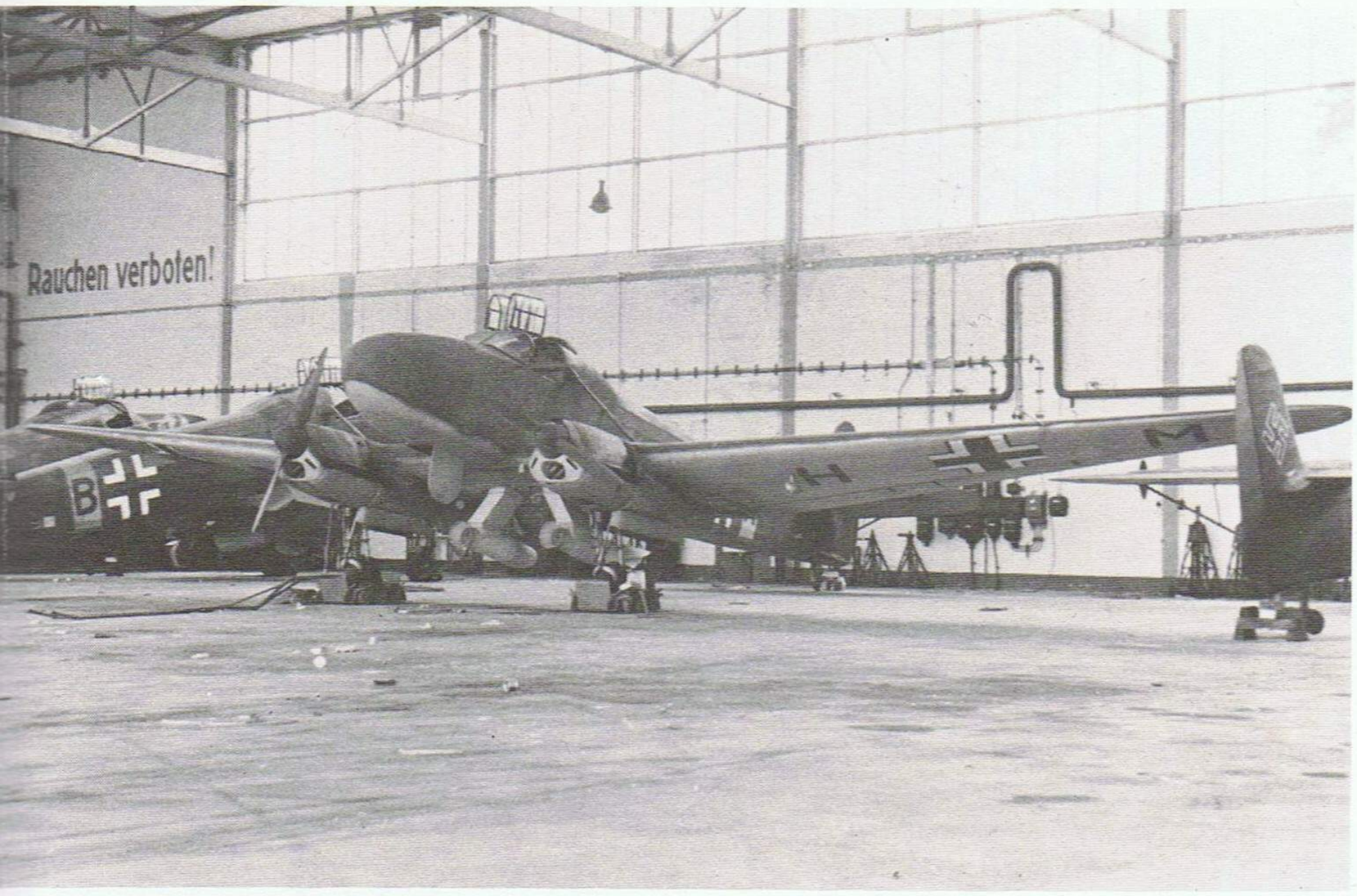
On December 16 the German counter offensive in the west began at Ardennes. Thick fog persisted for the first few days, aiding the German ground forces but handicapping flying operations by both sides.

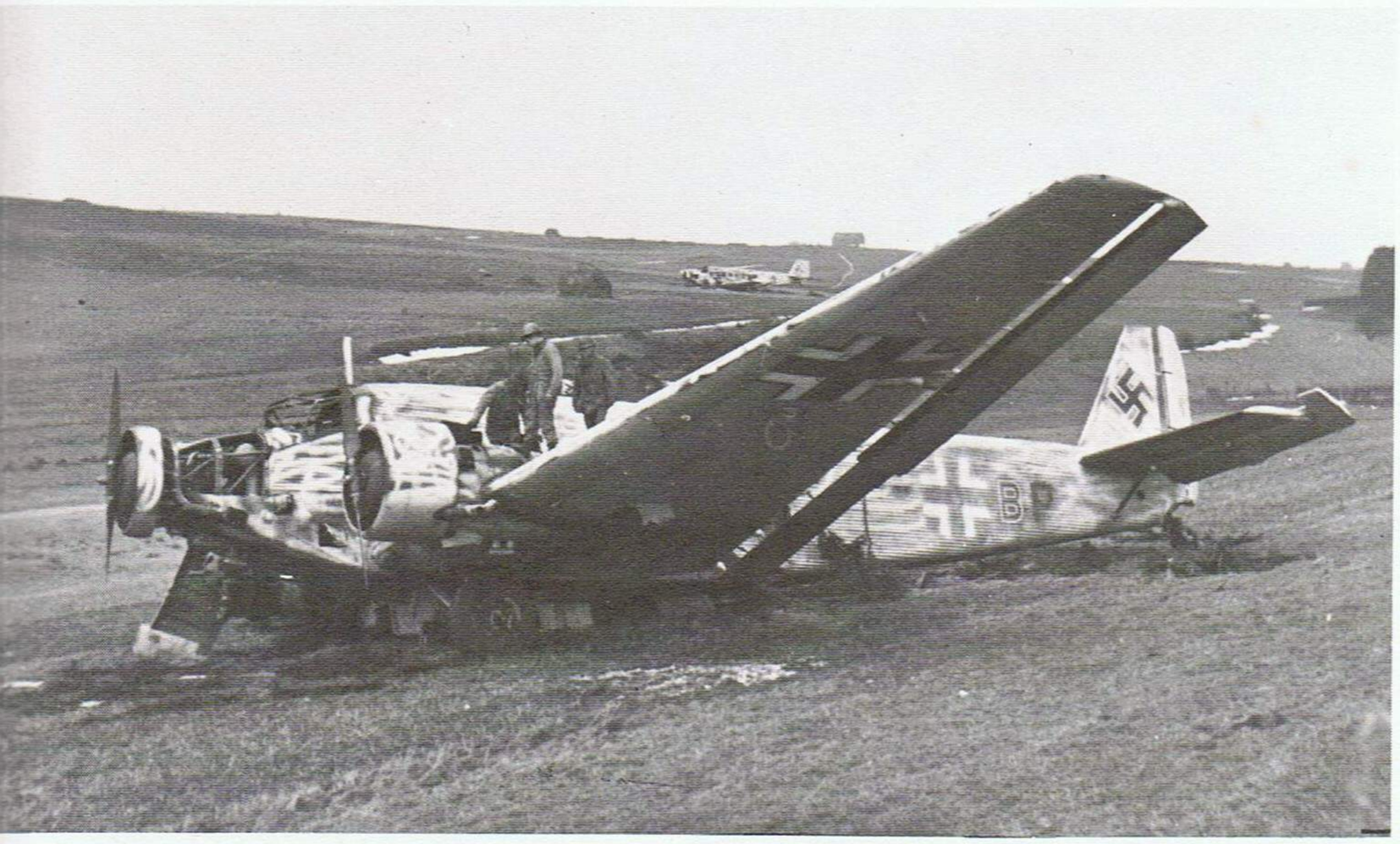
Plans for the offensive had begun in great secrecy in late October. The Luftwaffe were to provide between 20 and 23 *Gruppen* of fighter aircraft from the *Luftflotte Reich* command, while three *Gruppen* of Fw 190 fighter-bombers and



Above: This Bf 110G-4c wears the same pale 76 colouring overall with 75 coloured soft sprayed patches, rather than mottling, along the fuselage spine. The white stripes added to the lower elements of the Fu 220b radar aerials was a visual warning for ground staff to prevent accidental damage due to the reduced ground clearance./*S. Haggard*

Top right: One of the many small, relatively obscure Luftwaffe units was *Erprobungskommando* 40 which operated a mixture of Do 13s, Do23s, He 45s, Fi 156s and about 30 Fw 58s. Originally titled *Fliegerfrostschutzverband,* it was used for smoke spraying as an anti-frost measure for crops in the middle Danube district. It later undertook spraying of malarial swamp areas on the East front. The Fw 58s were fitted with a tank behind the pilot's cockpit, the powdered insecticide being released through the venturi operated ducts beneath the fuselage. As a non-combatant unit its aircraft wore four letter registrations, camouflage 70/71/65 and appropriate tactical markings of yellow. Fuel shortages finally caused the disbandment of the unit./*IWM*





Above: This Ju 52 of 6./TG 3 4V+BP was shot down at Aaselborn, Luxembourg in December, 1944 during the Bastogne fighting. Originally found amidst dense snow which was more applicable to its temporary winter camouflage, this photograph was taken after the spring thaw. The rapid shuffling back and fourth between east and west is exemplified by the markings on this aircraft which still wears its East Front lower wing surface panels and engine cowling rings./*S. Haggard*

one *Staffel* of anti-tank aircraft were to be transferred from the eastern front. The transfers were to be made at the last possible moment and in complete secrecy. The plan, however, was modified by circumstance, and despite orders that aircraft transfers were not to begin until three days before the offensive, some 650 aircraft had arrived from Germany by late November and were pressed into limited tactical operations over Alsace-Lorraine. *Reichsverteidigung* markings were presumably seen once more outside of Germany proper. Göring had meanwhile ordered that all fighter aircraft were to be modified so that they could be put into service as fighter-bombers at 24 hours notice.

Badly waterlogged airfields and shortages of fuel and supplies hampered the preparations. Despite this, on November 14, the true reason for all this activity was revealed to the Luftwaffe in general. Orders were also issued that the preparations must be completed by November 27, with all units capable of moving into position in three days.

In theory this massive offensive was to redress the balance of the war, in practice it was doomed to failure for a variety of tactical and logistic reasons. The Luftwaffe's role was to carry out a single concentrated attack on all Allied airfields near the front. This would neutralize the Allied close support forces and guarantee the Wehrmacht a clear go. Ground attack aircraft were to be used as close support forces for the Wehrmacht; bomber and night ground assault forces were to destroy enemy reinforcements and communication centres while night fighters were to be employed for night strafing attacks. The Mistel combinations of a fighter and a bomber, despite their earlier lack of operational success at Normandy, were to be used against bridges and other prime tactical targets.

Several postponements delayed the commencement of the offensive until December 16. Both sides waited for the fog to disperse, the Luftwaffe with over 2,300 aircraft at its disposal. This included some 1,770 single-engined fighter aircraft (which had been modified to carry bombs despite the chronic shortages and associated problems for the ground crews), 140 Ju 88 night fighters (which were to act as lead navigation aircraft for the main attacking formations), 40 Me 262A-2a aircraft from KG 51, plus an assortment of long range bombers, ground attack, night ground attack, and reconnaissance aircraft.

Air operations finally commenced with a force of Ju 52s dropping about 1,000 paratroopers ahead of the advancing German ground forces. Unlike previous paratroop operations, however, the Ju 52s were flown by very inexperienced crews. Hampered by poor airfield facilities and lack of fuel, the operation boded ill for what was to follow. Limited air support was given by ground attack aircraft, major operations being carried out at night. Weather conditions never allowed the original plan to be put into effect.

When the fog finally lifted, on December 24, the Allied air forces struck first and kept up the pressure during the four days of good weather. By the time that the weather closed in again, the German forces were glad of the respite and von Runstedt placed his men on the defensive. The offensive had failed.

The Final Days

A8

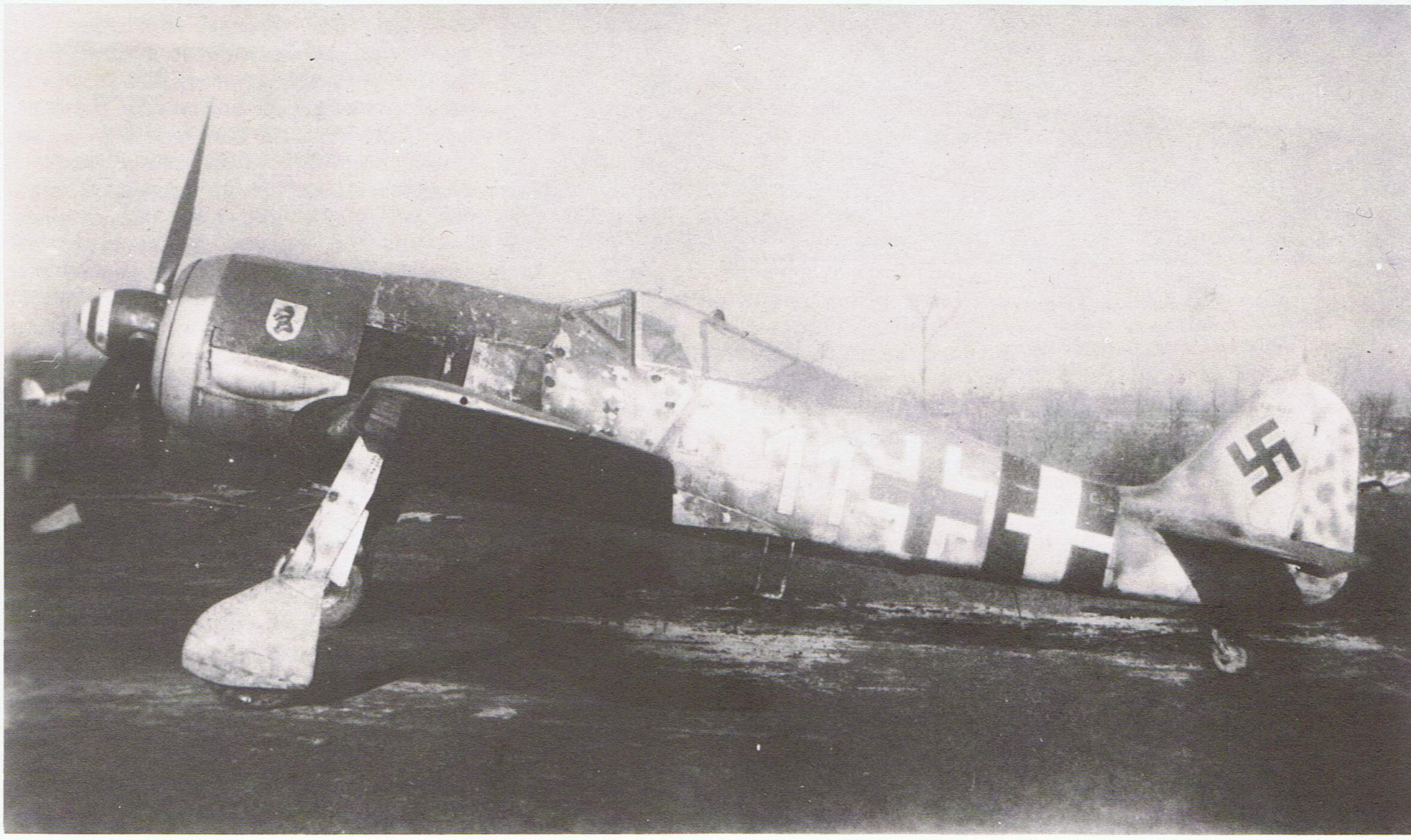
Below: This Fw 190G, W.Nr.681437 of 4./JG 4, wears black-white-black *Reichsverteidigung* bands and the II *Gruppe* emblem. Camouflage was 76 on the lower and side surfaces with a very pale shade of green, similar to thinly sprayed 82, as the darker of two upper surface colours. The other upper surface colour appears to be 02 with a soft mottling in both colours along the sides and vertical tail surfaces. All four *Balkenkreuze* on the wings and the *Hakenkreuze* are solid black type but the fuselage *Balkenkreuze* have their centres filled in with the upper surface green colouring. Section of the engine cowling had been taken from another aircraft which probably accounts for the *Gruppe* emblem only apppearing on the port side. The spinner is black with a white spiral. */Frank F. Smith*

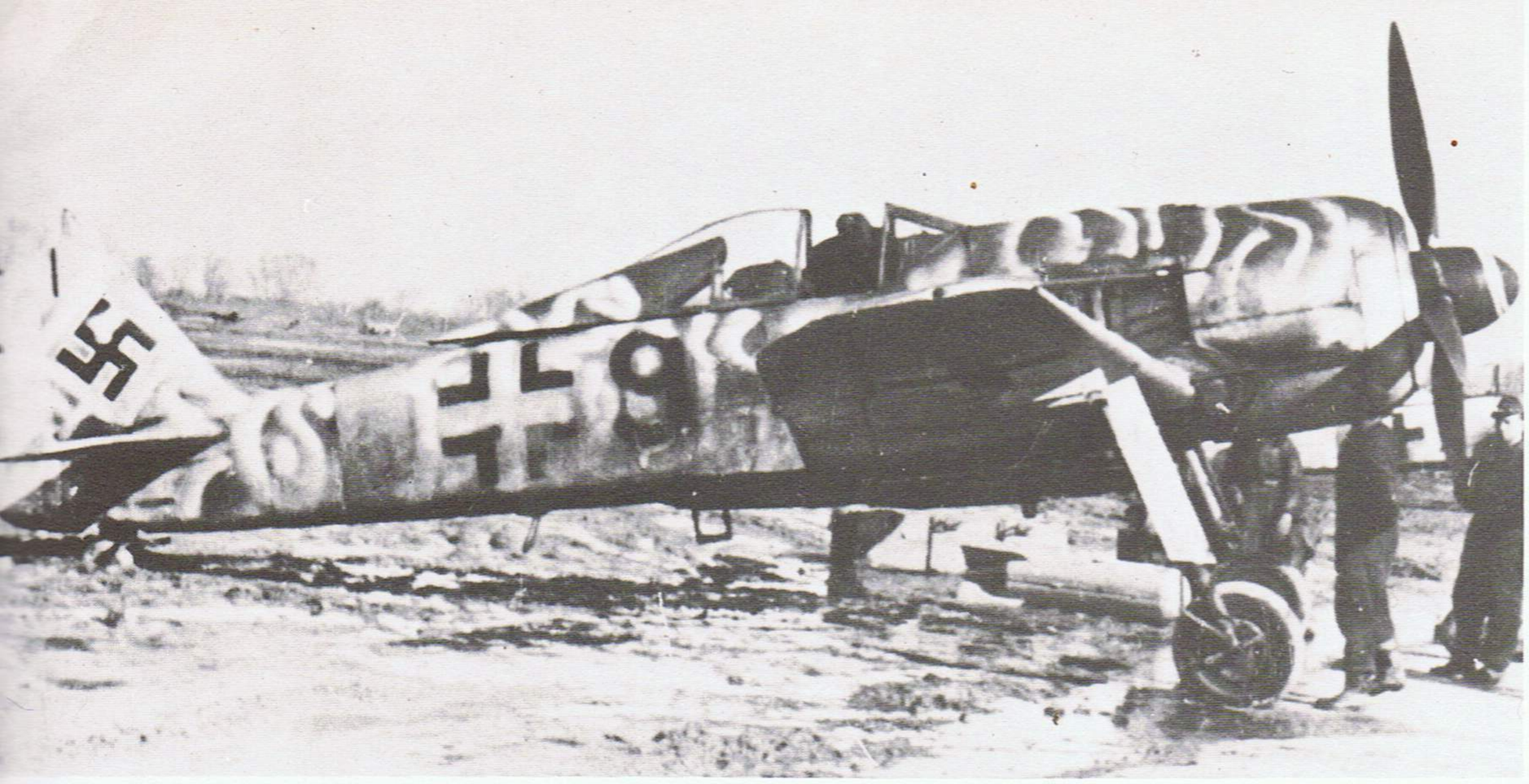
Dawn of New Year's Day 1945 opened in a carnage of death and destruction; unfortunately for the attacking Luftwaffe it bore the largest proportion of both.

Despite the failure of the German counter-offensive in the west, plans for the massive daylight air strike remained active, and all single-engined fighters and fighter-bombers had been prepared during the last days of December. Numbers had, however, dwindled due to the attrition of late December, and only about 800 fighter aircraft took part in the attacks on 16 airfields in Holland and Belgium and one in France. Losses from a variety of causes accounted for approximately 220 aircraft and a similar number of Luftwaffe pilots. The latter wastage alone made poor return for the destruction and serious damage to around 200 Allied aircraft. The gesture was both futile and pointless since the original purpose, to support the German Ground offensive, was no longer valid.

On January 2, 1945 Allied intelligence was presented with a relatively undamaged specimen of a Fw 190D (W.Nr. 210079) which made a wheels up landing at Wemmel, near Brussels, after a partridge had apparently damaged the coolant radiator. The intelligence report included the following comments on camouflage colours. 'The camouflage is mottled greeny-grey on the fuselage with green predominating. The upper surfaces of the wings are a rather orighter green than is usual with German aircraft, whilst the undersurfaces of the wings are a light blue. The spinner is black with a white spiral.'

Examination of a series of detail

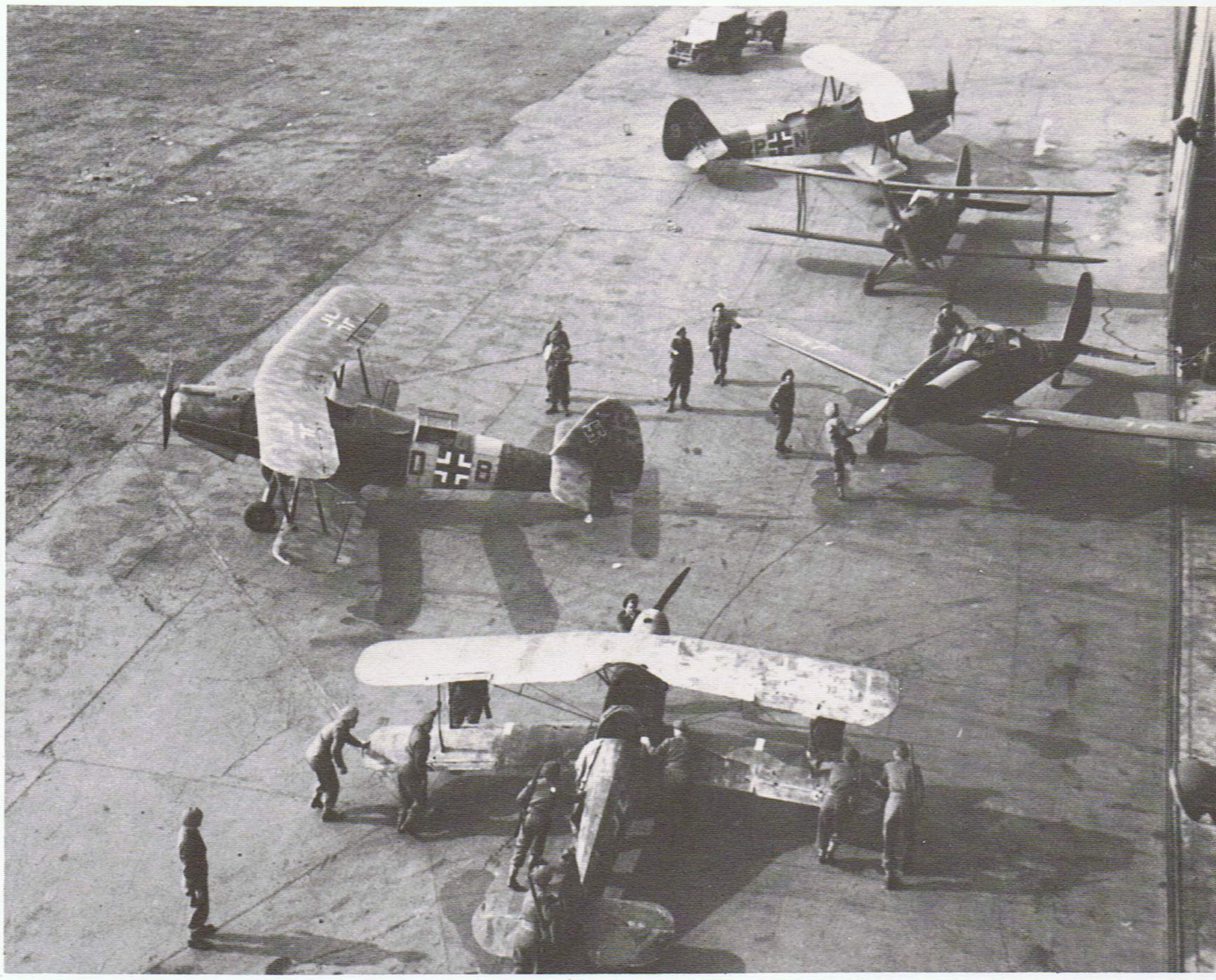






Left: Winter on the East Front, albeit on the German borders, was the usual harsh experience in early 1945. These Fw 190F-8s wear temporary winter white sprayed in rippled bands over their normal day fighter camouflage. The aircraft in the lower photograph bears a *Gruppe* adjutant's single black chevron marking, outlined thinly in white and bordered in black, followed by the number 2. Detail photographs of this and other aircraft of this unit show a V-shaped yellow marking which starts under the port wing aileron at the trailing edge, passes forward and around the leading edge of the wing and terminates on the top surface of the aileron with maximum divergence at the trailing edge. (The Smithsonian Institutes Fw 190 wears an identical form of marking and also has blue-green undersurfaces). Yellow tactical markings are confined to a fuselage band on these aircraft. The wheel fairing plates have been removed to prevent ice ingestion locking the wheels after take off. */H. Obert*

Right: These captured Go 145 training aircraft wear odd camouflage and the normal second line registration letters. TD+BN (facing left) has all of its upper and side surfaces mottled with a medium green over a pale base coat colouring of 02, and double yellow fueselage band markings which identify it as a blind flying instructional aircraft. RP+NN in the far background wears the same double yellow band marking, a yellow 8 on its rudder, and narrow white edging to its registration letters. Camouflage appears to be in dark greens, the lone Ar 96B wears similar camouflage. */IWM*





Right: Klagenfurt airfield in Austria became the last resting place of many training and communications aircraft which fled westward to escape the Russian advance. Most of the Ar 96s wear a mixture of Hungarian and German markings. Other types such as Kl 35s and Bü 181s can be seen in the background, most of them wearing standard 70/71/65 camouflage as seen on the Ar 96Bs. */IWM*



Centre left: A sleek He 162A-2, yellow 4 of 3./JG 1. Some of this unit's aircraft are known to have used the late war camouflage greens including the unidentified blue-green lower surface camouflage colour. This particular example appears to have all its upper and side surfaces in one shade of green, and the rear portion of the engine nacelle in black. The arrow marking on the nose cone is red. / *R. Harrison*

Bottom left: At least 30 aircraft are visible in this photograph and the variety of camouflage colours and style of application is nearly as numerous. The two Fw 190s bearing the number 8 both have fuselage *Balkenkreuze* with the centres scraped back to the bare metal. Both white 7 and white 8 show signs of overpainting of previous identity numbers. The rear fuselage of each aircraft has been chopped through to make them unusable. */T. Hitchcock*





photographs of this aircraft highlights some of the traps inherent in such intelligence reports. The fuselage was finished in a basic coat of 02 colouring which was blended into the 65 coloured side surfaces by means of soft sprayed edges. Over this coat of 02, green had been sprayed in mottled patches that had bled in some places into almost continuous areas. The wings were finished in a soft edged segmented pattern in two shades of green, one of which was lighter and brighter in tone. This is believed to have been 82 and the darker green 81, which was also used for the fuselage mottling. The intelligence officer can be forgiven for not commenting on the darker of the two greens used on the wings and tailplane because 81 was very nearly as dark a shade of green as the old 71, its principal distinction, a slight brownish cast, being hard to detect under certain light conditions.

On Christmas Day 1944 an Me 262 had been shot down by Bofors fire during an attack on an airfield in Holland. The official intelligence report on the wreckage stated that the upper surfaces were finished in two shades of bright green and undersurfaces in light blue. The second bright green is something of a mystery, the only obvious explanation being the use of 25 in conjunction with 82 to give a very light upper surface camouflage with less colour contrast than the 81/82 combination.

The use of 81 and 82 for upper surface camouflage appears principally on some late model aircraft which entered service during the last 12 months, or less, of the war. One of the He 162s brought to England after the war exhibited a soft edged, random segmented pattern of dark and light green on the wings and tailplane, the dark green having a slight brown cast. The fuselage was finished in the same dark green while all under surfaces were a distinct blue-green identical with the colour described in relationship to certain Fw 190s based in Norway.

The position on the western front grew steadily worse, with the Luftwaffe having to divide its forces between defensive operations and minor offensive sorties in northern Alsace.

On the eastern front the Russians were preparing for a last major offensive, a fact that was obvious to the German High Command and one which necessitated the large scale transfer of Luftwaffe forces from the western front. Such was the magnitude of the threat that again the defence of the Reich was given low priority. By the last week of January, 20 *Jagdgruppen* and three *Schlachtgruppen* had been moved from west to east. Units remaining in the west were maintained at maximum strength and conserved by strict utilisation methods whereby only 50% could be used operationally at any one time. In addition, all single-engined fighter aircraft were forbidden to operate beyond the German front line. Combat was to be avoided unless under the most favourable conditions, and formations were to be used in maximum possible strength. Defence of supply lines was their primary function.

A chronic shortage of ground attack aircraft was filled by the same means as used for the Ardennes offensive; one *Staffel* from each of the Ju 88 and Bf 110 home based night fighter units were equipped

Above: A *Gruppenkommandeur's* Fw 190 wears its II *Gruppe* markings in red, a return to a practice not seen since the early stages of the war when unofficial use was made of *Gruppe* colouring. The rudder and *Reichsverteidigung* band around the engine cowling are both yellow indicating that this was a JG 11 aircraft which had seen service in France. Camouflage is in greens on the upper surfaces, possibly 81 and 82 in view of their lighter tone when compared with the He 111 in the background.

with bomb shackles and sent to the eastern front to operate in the Stettin-Breslau area.

By February the Russian advance was eating into Germany, the river Oder being crossed either side of Breslau by February 15. The meagre Luftwaffe forces in Hungary were skimmed to provide an additional 60 ground attack aircraft and 20 long range bombers. the Russian advance in western Poland and Silesia caused another problem for the Luftwaffe training units, or what remained of them, had to be transferred to less congested airfields, and eventually they found their way to Denmark and the Leipzig area. This final disruption was never overcome.

With the exception of the southern flank, the bulk of the single-engined fighter force were now contained within Germany on both the western and eastern fronts, and a last desperate attempt was made to reorganise the force as one defensive entity. To date we have seen how the *Luftwaffe* shuttled great numbers of aircraft back and forth, from one front to another, subsequently negating the purpose of its long established tactical markings system. On February 20 a last order was issued by the High Command in an attempt to rationalise the use and display of *Reichsverteidigung* markings. With effect from that date each *Jagdgeschwader* was to apply its markings in a uniform manner. A maximum width was stipulated and the marking could be applied as either a single 900 mm band, two 450 mm bands or three 300 mm bands.

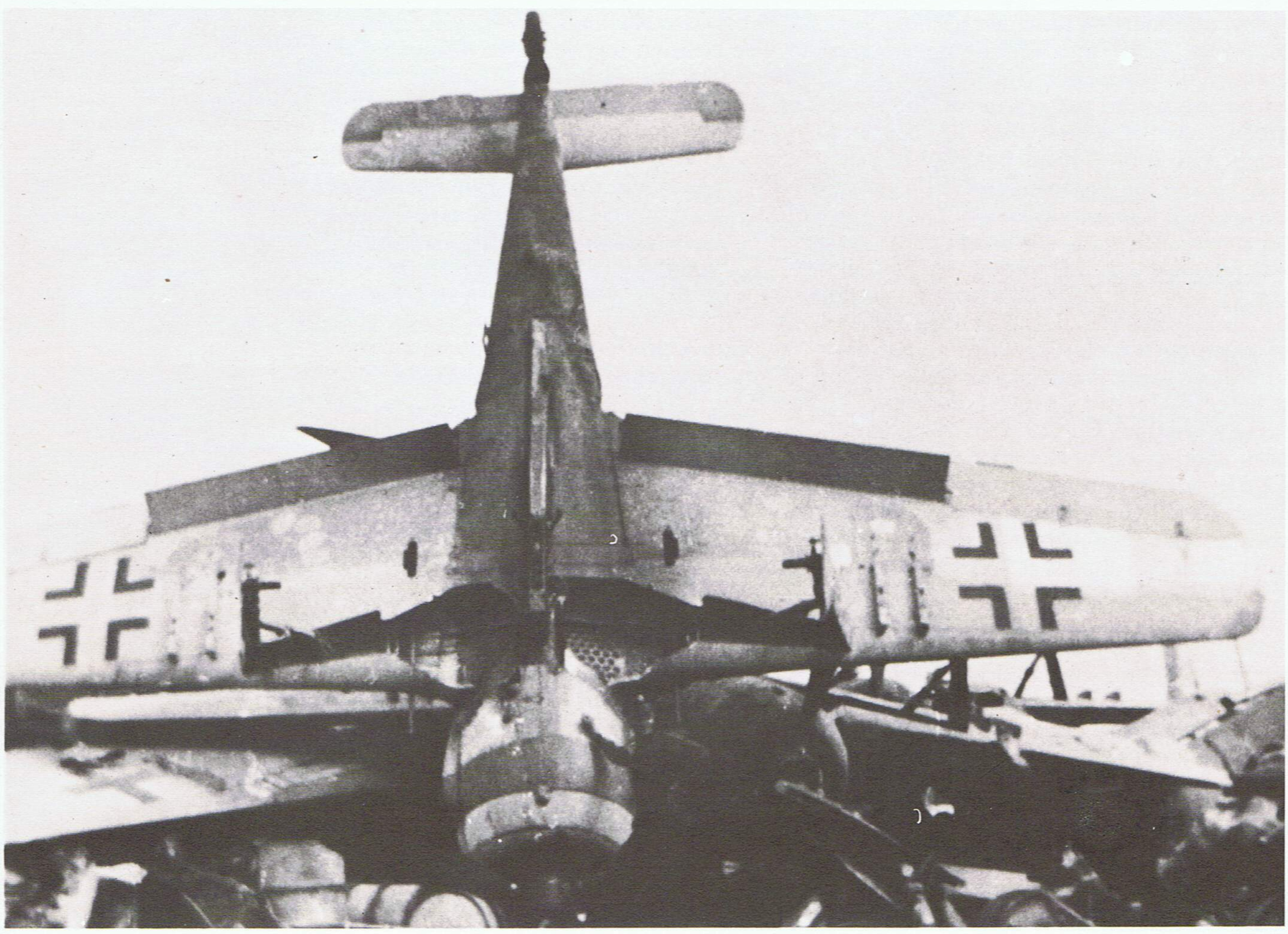
The order, not surprisingly, seems to have had little effect amidst the daily struggle to keep aircraft serviceable for the endless operations. Positioning of the bands was also far from uniform and some Bf 109s and Fw 190s displayed band markings on the engine nacelle in lieu of the more normal location. Even the aged Ju 87 was seen wearing what was possibly an unofficial *Reichsverteidigung* band marking around the engine nacelle during the daylight operations mentioned later.

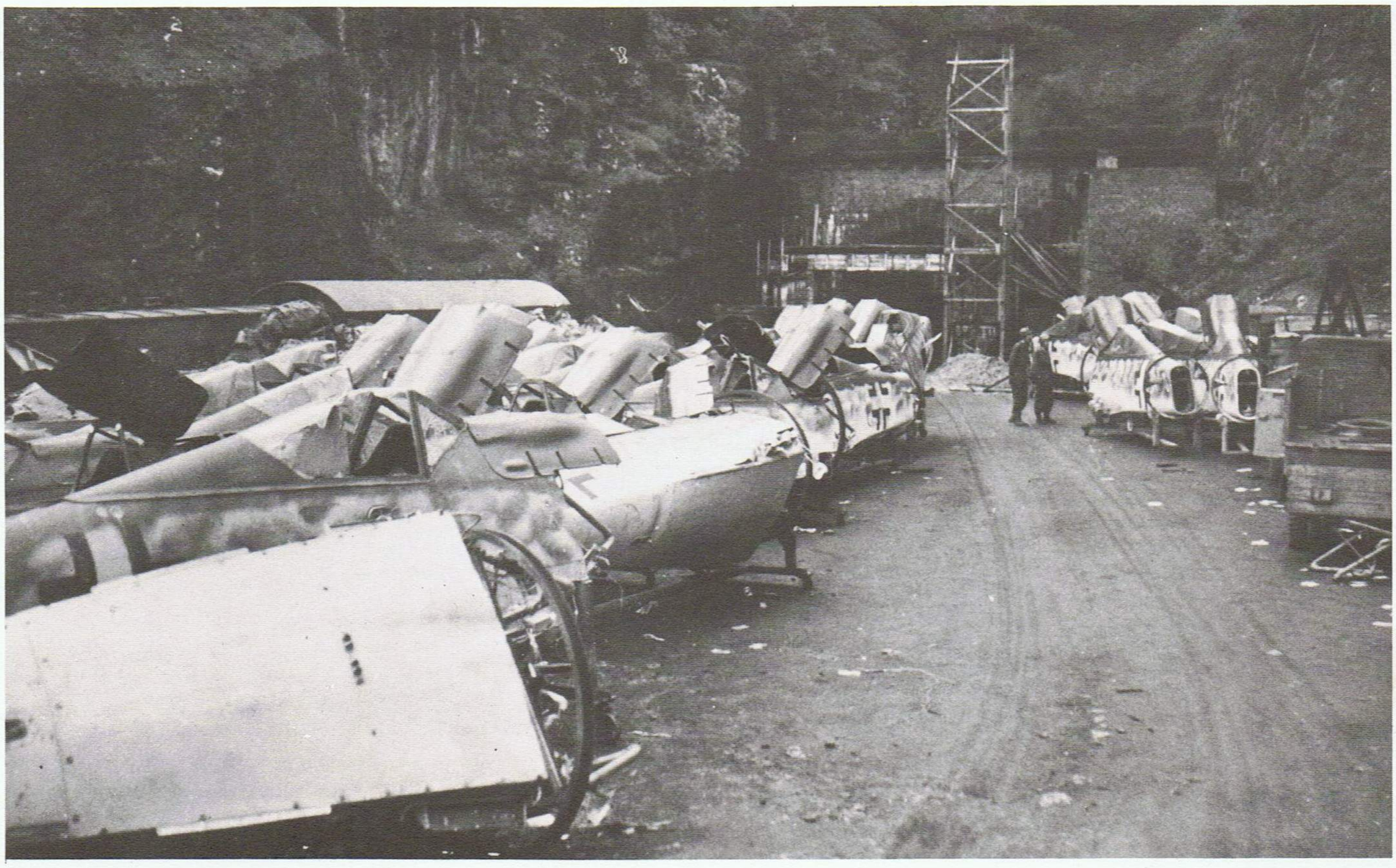
The reversion to greens of all shades for most classes of aicraft reflected the heavy reversals suffered by the German forces and the Luftwaffe's growing need for ground concealment of its aircraft. Photographs of Ta 152s show a marked contrast, in some instances, between the main upper surface camouflage colours,

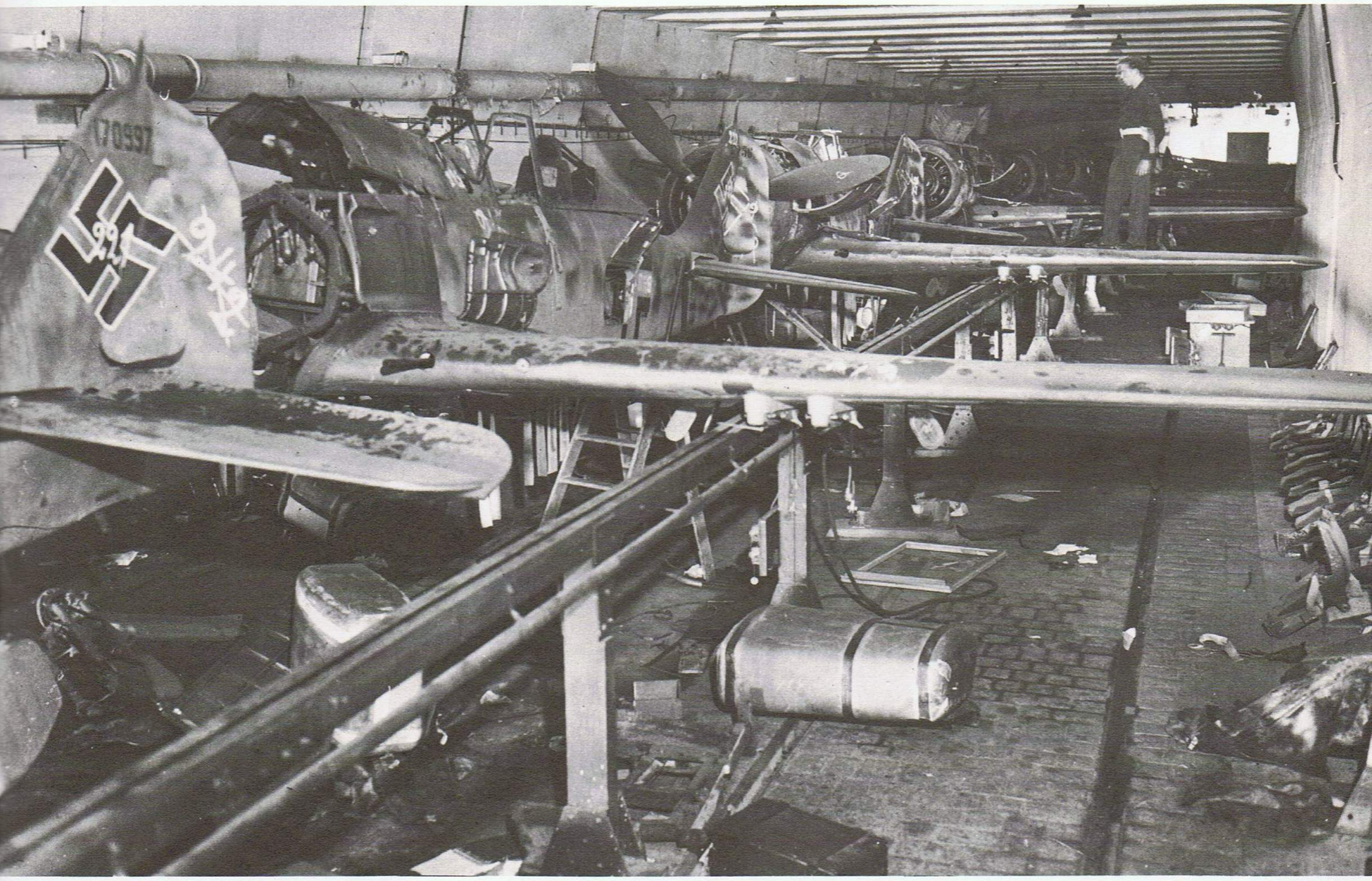
Below: A battered Fw 190F-8 shows the style of late war underwing *Balkenkreuze*. Again the *Reichsverteidigung* band is worn around the engine cowling.

Top right: Brand new airframes, stacked outside the entrance to an underground workshop, wait in vain for transportation to a final assembly depot. A familiar sight during the closing months of the war. Camouflage appears to be 74/75/76, the repetitious style of mottling identifies the handiwork of a single manufacturer. */S. Haggard*

Bottom right: Part of the Fw 190 assembly line beneath Templehof airport. Note the variations in both the style of camouflage application and the *Hakenkreuze* on the first two aircraft. The inconsistency of *Werk Nummern*, plus the previous points shows that this was purely a final assembly line facility for components produced at a variety of centres. */IWM*







but with insufficient contrast to be the old 71/02 colour combination. Concealment as the prime need was also to be seen in the declining boldness of the fuselage *Balkenkreuz*. The thin black border had been the first item to be shed, in 1942, but by 1944 the black centre was also discontinued on some aircraft used for daylight operations. By late 1944 aircraft were caught in that old, awkward compromise of the need to conceal themselves and yet remain easily recogniseable by friendly aircraft during the air battles. Thus some aircraft were seen with the centre of the fuselage *Balkenkreuze* filled in with dark green or dark grey. Equally as effective, but in direct contrast to the methods described, some very late Fw 190s were to be seen with all the paint removed from the centre of the *Balkenkreuze* on the fuselage, the bare metal finish providing a surprising degree of contrast.

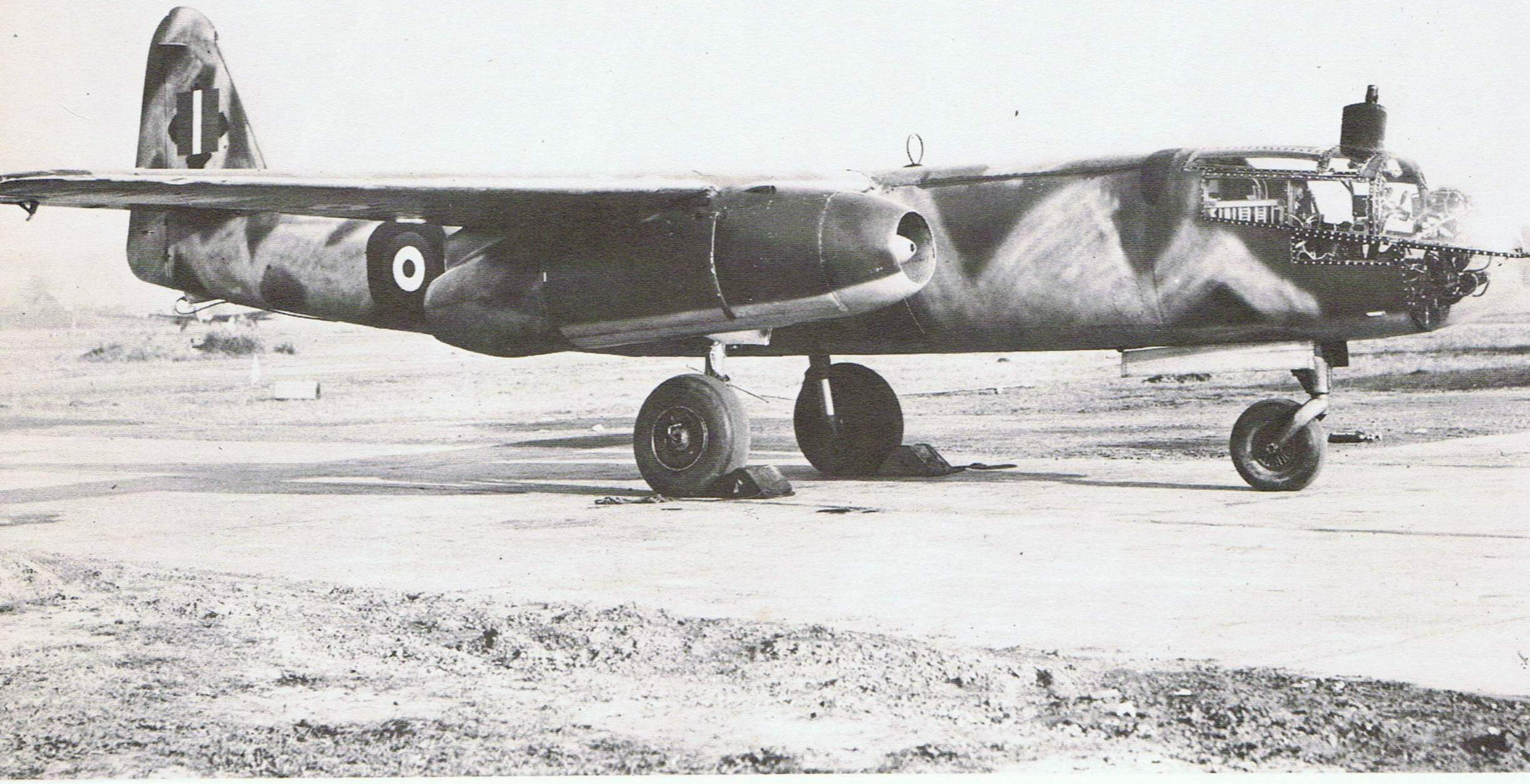
The pressures of battle survival appear to have become paramount during the closing stages of the war, hence the attempts to increase the visual perception range of the *Balkenkreuze* markings once more. The variety was endless and, in most cases, reflected anything but official policy. The *Hakenkreuz*, by contrast, remained bold in most cases, albeit with minor variations.

The Russian advance soon over-ran several important aircraft assembly plants, subsidiary component and repair factories and aircraft depots, among them the Fw190 facilities at Marienburg. These losses reduced Fw 190 output to 25% although established reserves countered this to a major degree.

Subsequent pressure on the southern flank was dealt with, in the main, by the 6th SS Panzer Army, who failed to relieve the Budapest garrison and were finally driven back to the Austrian border in the face of the Russian offensive. The Luftwaffe was barely represented during these operations and its meagre forces were further depleted in mid-February by the transfer of 60 ground attack aircraft and 20 long range bombers to the northern battle zone. Of the remainder, lack of fuel kept them grounded and many were captured by the Russians.

This was to be a common fate during the closing months of the war, fuel restrictions helping to bring the Luftwaffe to its knees. Gestures, as brave as they were futile, were

Below: A captured Ar 234 still wearing its streaky off-white temporary camouflage over the 70/71 camouflage of the upper and side surfaces. */IWM*





Top left: To the victors go the spoils – Munich airfield. This 4 *Staffel* Bf 109G-10 wears no emblem by which its unit can be identified. Camouflage is standard greys of 74, 75 and 76 with a yellow rudder and a broad band of what appears to be green 25 around the nose of the fuselage. If this is correct then the aircraft probably belonged to JG 27. */ Frank F. Smith*



Centre left: A most interesting combination of markings. The Bf 109G-10 in the foreground wears camouflage of greens, possibly 81 and 82. The combination of coloured markings and the overpainted diamond shaped emblem on the engine cowling raises some interesting points. Only two single engined fighter units used badges of this size and shape, JG 53 and JG 77, and only the latter unit had all three *Gruppen* equipped with Bf 109s at the end of the war. This aircraft has a II *Gruppe* marking; another Bf 109G-10 with similar markings and overpainted emblem belonged to I *Gruppe*. Both of these aircraft had a yellow rudder and broad nose band, but the one shown here also carries a fuselage band in the same colour that has been used to overpaint the emblem and both the spinner and propeller blades. This colour appears to be green 25. Overpainting of the emblem indicates that the aircraft were ex-JG 53 machines that had been transferred to another unit. A single green band was the *Reichsverteidigung* marking allocated to JG 27 which not only ended the war with all three *Gruppen* equipped with Bf 109s but also served with *Luftflotte Reich*. The aircraft behind, its nose painted yellow almost back to the airscoop, has a fuselage band roughly applied in black which was the *Reichsverteidigung* colour allocated to JG 53. This unit had relinquished its II and III *Gruppe* Bf109s by this stage and this aircraft wears a II *Gruppe* marking. The Bf 109s in the distance also wear yellow nose markings as well as Hungarian markings. */Frank F. Smith*



Bottom left: JG 301 had two of its Gruppen equipped with Fw 190s, serving as part of *Luftflotte Reich*. This G model, red 11 of III *Gruppe,* wears its yellow and red *Reichsverteidigung* markings around the front of the engine cowling. Camouflage is the standard three greys. */M. Olmsted*

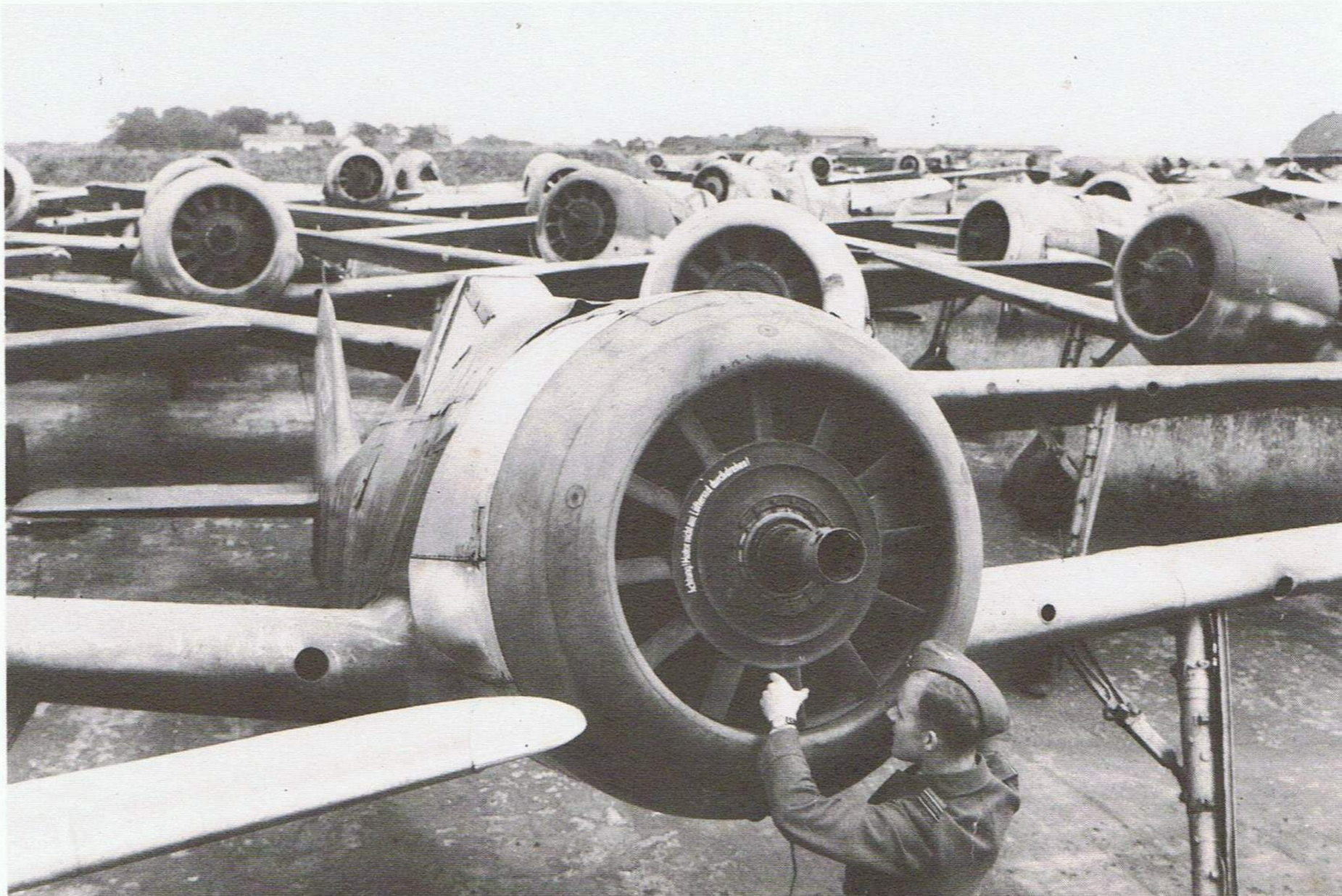


Left: Ju 88s and Ju 188s of KG 26 show the two types of camouflage used by this unit. The Ju 88 in the foreground is in standard 72/73/65 while the aircraft in the background have had liberal applications of 65 sprayed over their upper and side surfaces to effectively break up the 72/73 coloured areas. The unit code of 1H has been applied in miniature. */IWM*

Centre right: Endless variety abounds amongst this collection of aircraft types, no two are the same. The Bf 109G-10 in line with the wingtip of the He 219 in the foreground wears a yellow and white *Reichsverteidigung* marking, which, with the horizontal bar marking, identifies it as belonging to II/JG 3. The Fw 190 to the left rear has its entire tail unit painted in pale yellow (this style of marking was used for *Reichsverteidigung* aircraft earlier in the war), and a yellow *Reichsverteidigung* fuselage band which identifies it as a JG 11 machine. Both JG 11 and JG 3 were serving with *Luftflotte* 6 at the end of the war. */S. Haggard*



Bottom right: Flensburg airfield and the remains of dozens of aircraft. The propellers have been removed to prevent the aircraft being used. The nose of the nearest Fw 190 carries a *Reichsverteidigung* band marking in the colours yellow and green, an unidentified combination. The yellow stencil marking on the cooling fan reads *Achtung! Motor nicht am Lüfterrad durchdrehen!* which literally translated, means 'Warning! motor is not to be rotated by means of the cooling fan.' */Crown copyright*



made in desperation but without any real effect. During the Allied river crossings in the west the Ar 234Bs of III/KG 76 carried out repeated, almost suicidal, attacks against the Remagen bridge over the Rhine, Me 262s being used in conjunction with Fw 190 fighter-bombers to suppress the Flak batteries. Night harassment aircraft kept up the pressure, including daylight operations when weather conditions were bad.

It was an Ar 234 of III/KG 76 that provided the Allies with their first complete example of this excellent aircraft, when P 47s forced a 9 *Staffel* machine down near Segelsdorf on February 24. Camouflage was standard 70/71/65 but large random areas had been oversprayed with temporary white for the winter operations.

At the end of February the Russians paused briefly before commencing their final drive towards Berlin in mid-April. In the west, by the second week in April, the Allied forces had pushed the Luftwaffe back into central Germany. The distinction between Luftwaffe forces engaged in east and west ceased to exist, for both shared the same airfields.

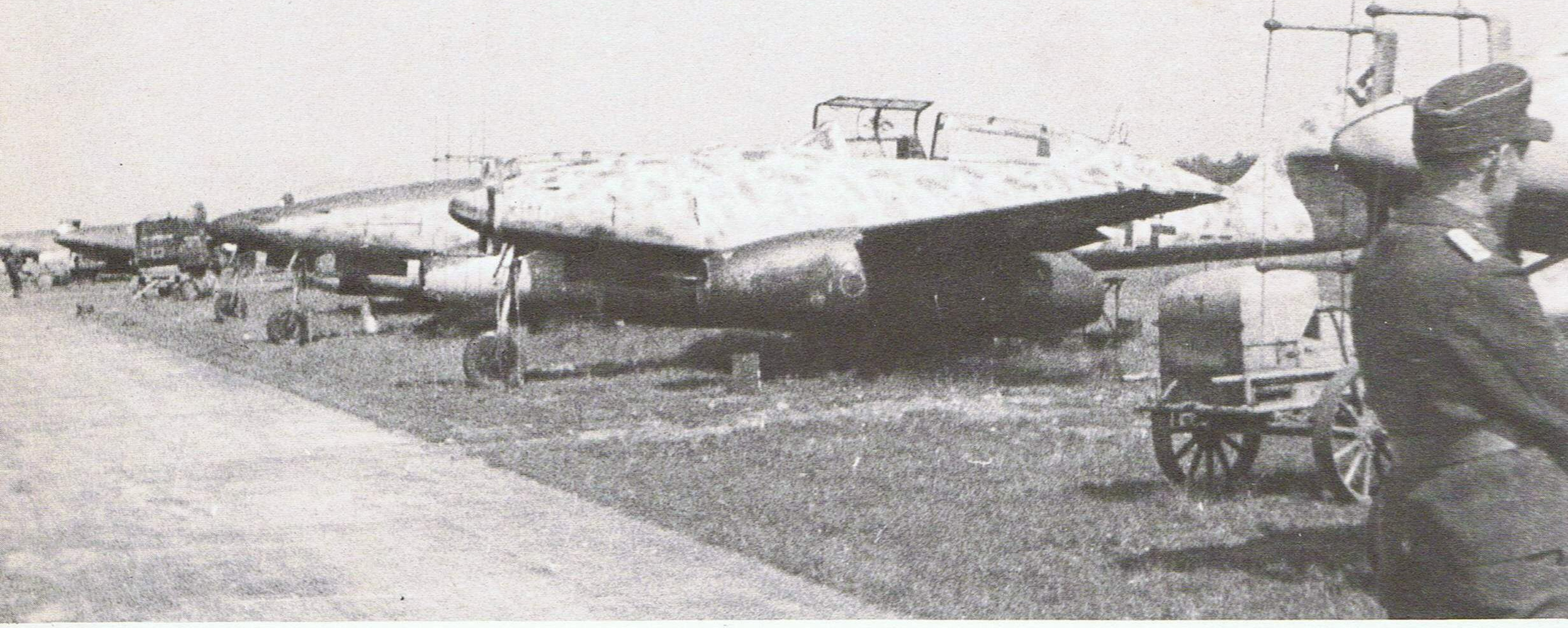
Despite pressures from the west, major Luftwaffe activity was concentrated against the Russians but without effect. When the final Russian drive towards Berlin began the Luftwaffe succumbed beneath the tide of battle. Again large amounts of aircraft were captured where they stood. Allied forces from the west swept forward to crush the last vestiges of the German military forces, and by May it was all over.

From Norway to Italy, literally thousands of aircraft stood motionless upon airfields, hidden in forests, partly completed on production lines or stacked at rail depots and aircrafts parks – silent witnesses to the death of an air force.

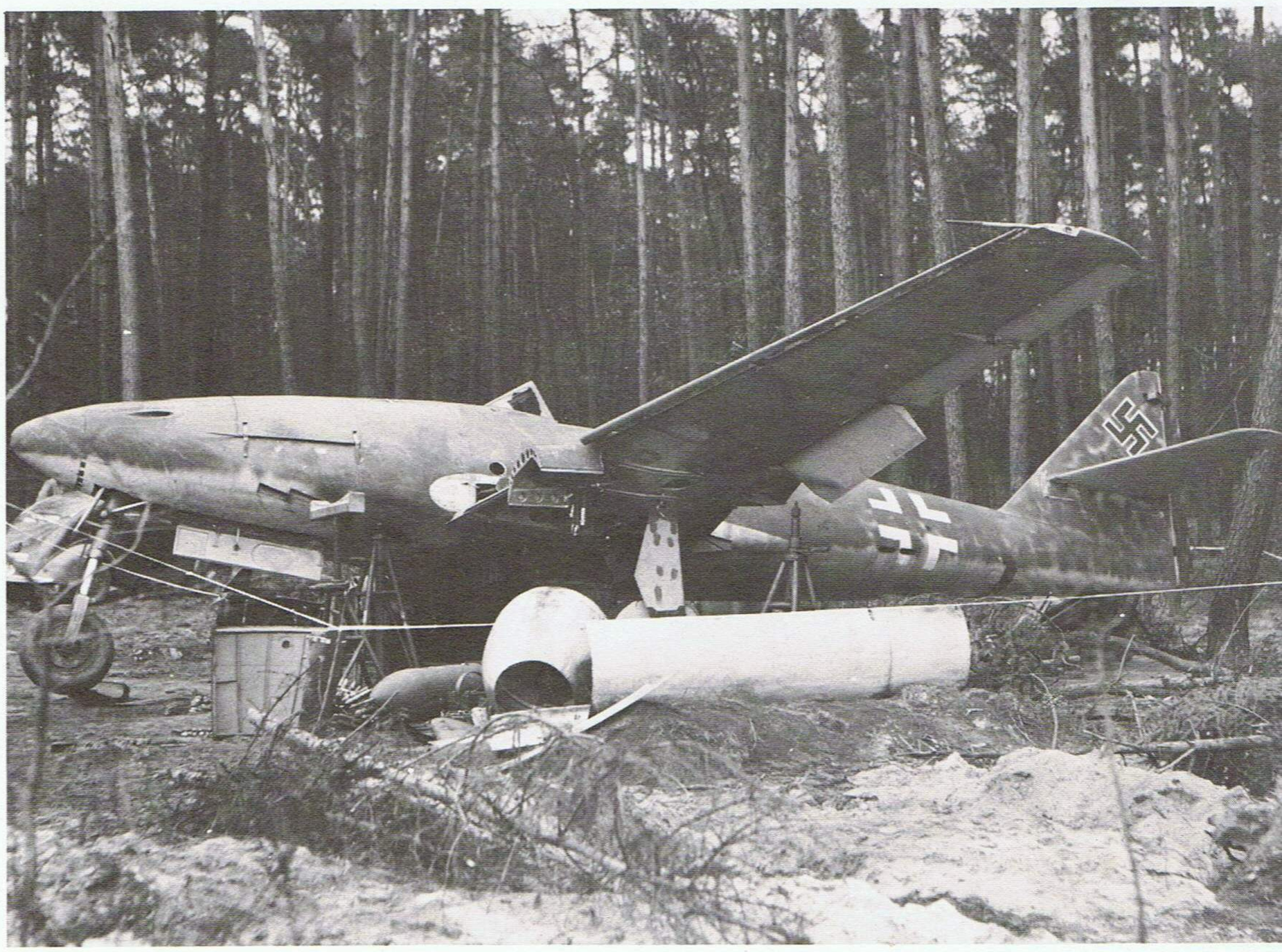
Below: The aircraft dump at Flensburg airfield yields some interesting items. The Ju 52 belonged to the *Minensuchsgruppe* and wears the unit code of 3K in tiny black characters. The last part of the code, CK, is interesting because as a 2 *Staffel* machine the aircraft letter should have been red, but instead it appears to be yellow. Note also that the fuselage band has been painted out. Beneath the Ju 52 is the wreckage of a Fw 190 from III *Gruppe* of a *Schlachtgeschwader,* the yellow vertical bar and letter C denoting 9 *Staffel.* In this instance the *Balkenkreuze* is standard but the *Hakenkreuze* is the white outline type. The very pale camouflage colours suggest a faint overspray of 75 over a base colouring of 76. / *Crown copyright*



Below: A line up of six Me 262s, two B-1a/U1s with radar antennae, a B-1a and three A-1as, all of which are believed to belong to 10./NJG 11 which was formed from *Kommando Welter.* Charged with the night defence of Berlin the Me 262B-1a/U1 in the centre of the photograph wears a base coat of 76 with short streaks of 75 sprayed over the upper and side surfaces. The engine nacelle lower surfaces are finished in temporary black as are the fuselage and wing lower surfaces. Upper surfaces of the engine nacelles are painted in 74. Black outline style *Balkenkreuze* are used on the fuselage sides and wing upper surfaces with full black/white/black type on the wing lower surfaces. The *Hakenkreuze* are solid black with breaks marks across the arms showing that they were applied with a stencil. The last three digits of the *Werk Nummer,* 306, are repeated in white on the nose cone. The next aircraft along wears a similiar camouflage but the upper surfaces are finished in a solid application of 74. The remaining three aircraft appear to be finished in 74 on all upper and side surfaces with black lower surfaces. This reversion to black for the extreme lower surfaces may have something to do with the intense fires and subsequent strong illumination from the burning city at night. The normal pale lower surface colouring would have been useless under such circumstances./*U.S. Air Force*



Right: More conventional colours are seen on this Me 262 which wears greens on its upper and side surfaces. Commencing as a solid two colour application at the nose cone the fuselage colouring becomes a dense mottle with the lower surface colouring showing through towards the tail. Lower surface colouring may have been the unidentified blue-green mentioned in the text. Note the small amount of contrast between the area around the nose wheel bay and the 02 coloured interior of the engine cowling on the ground beneath it. Wing lower surfaces appear to be unpainted, there being ample evidence of roughly daubed part numbers; the flaps and ailerons are also still in their basic primer coat of 02. The carefully applied black guide line for the nose trestle contrasts with the crudely applied one beneath the rear fuselage. /*U.S. Air Force*



Left: A Bf 109K-10 with a most unusual form of camouflage. The fin and rudder are finished in a base coat of 02 with large spots of green (possibly 82 by its relatively light tone value). The base of the fin is 76 and a wavy line of this very pale colouring runs along the lower fuselage side surface. The entire fuselage top and sides, both above and below the 76 coloured line, is finished in a soft, almost continuous hazy mottle of 82. The panel immediately beneath the tailplane is bare metal. Despite the unusual camouflage both the *Balkenkreuze* and the *Hakenkreuze* are regulation type and style. */Monogram Aviation Publications*

Below: LD+XT shows the final form of markings used by gliders. Even this very basic form of *Balkenkreuze* did not come into use until the closing stages of the war. Overall finish is the creamy yellow 05 glossy paint used exclusively on gliders. */IWM*

Appendix 1

In Chapter Two it was explained that aircraft sent by both Germany and Italy to aid the Nationalist Spanish forces were integrated into the existing air force structure as regards both markings and code structure. The following list is an attempt to identify the codes used by the Nationalist Air Force, the Condor Legion and the *Aviacion del Tercio*. It is by no means a complete listing, except for the Condor Legion, but it serves to illustrate the extent of the code system. An example of aircraft type is quoted in each case but the reader is reminded that in some instances a variety of aircraft used some code numbers. This occurred particularly during the very early period of the war when the selection of aircraft available was as large as the numbers of each type were few.

Code	*Example*
2	He 51*
3	Letov S-231
4	Hawker Fury
5	He 112
6	Bf 109*
10	Breguet 19
14	He 70*
15	He 45*
17	Aero A-101
18	Vultee V-1A
19	Hs 126*
20	Fokker FXIII
22	Ju 52/3m*
24	Hs 123*
25	He 111*
26	Ju 86*
27	Do 17*
28	SM 79
29	Ju 87*
30	Fokker F-402
31	Monospar ST-25
40	Dragon Rapide
41	Airspeed Envoy
42	Lockheed 10
43	Junkers W 34
44	Bf 108*
45	Fokker FVIIb/3m
46	Fi 156*
47	Consolidated 17
60	He 60*
63	Fairchild 91
64	Ar 95
71	Dewoitine D-500
72	Potez 54.

*Denotes aircraft used by Condor Legion.

Appendix 2

The following set of tables are a direct translation of the revised paint codes system introduced in 1937. The first of these lists the paint groups, paint types, pigments and uses. The second gives a detailed breakdown for each paint type, cross referred to the relevant paint group, and the original paint manufacturers code number and colour description.

Flieglackette Nr	*Flieglacke*	*Application*	*Forbidden for*	*Thinning Agent*
01 a Interior of metal skinned landplanes.	7100.– 7105.02	All metals.	Painting of floats and underwater sections of flying boats.	7200.00 Ikarol standard thinner 104/07
b Exterior of metal skinned land and sea-planes. Interior of seaplanes.	7100.– 7106.– 7107.02			
02	7102.– 7106.– 7108.01 7107.02	Only for metal floats, interior and exterior. Flying boat hulls interior and exterior.		7200.00 Ikarol standard thinner 104/07
03 a Interior of metal skinned landplanes.	7100.– 7105.01	All metals.	Painting of floats and underwater sections of flying boats.	7200.00 Ikarol standard thinner 104/07
b Exterior of metal skinned land and sea-planes.	7100.– 7106.– 7107.01			
20	7130.– 7135.02 7136.–	Exclusively for painting aircraft fabric.		7230.– (Cellesta standard thinner colourless 1661.)
21	7130.– 7135.01	Exclusively for painting aircraft fabric.		7230.– (Cellesta standard thinner, 1611.)
30	7131.00 7132.– 7135.02 7136.00	Exclusively for painting external wooden parts of aircraft.	Painting of floats and hulls.	7230.– (Cellesta standard thinner 1611.)

31	7131.00 7132.00 7135.01	Exclusively for painting external wooden parts of aircraft.	Painting of floats and hulls.	7230.– (Cellesta standard thinner 1611.)
32 Interior painting Exterior painting a for all surfaces b above water. c below water.	7180.22 7181.00 7181.00 7145.02 7162.01.	Only permissable for interior and exterior painting of wooden floats and hulls.		

Flieglack Nr.	*Flieglackette*	*Previous designation*	*Application*
7100.–	01/a and b 03/a and b	Ikarol light metal base green 101.	
7102.–	02	Ikarol light metal base green 201.	
7105.01	03/a	Ikarol metal surface paint silver 103/5.	
7105.02	01/a	Ikarol metal surface paint RLM-grey 103.	
7106.–	01/b 02 03/b	Ikarol surface paint grey 103/1.	
7107.01	03/b	Ikarol Surface paint silver 103.	
7107.02	01/b	Ikarol surface paint RLM-grey 103/2.	
7108.01	02	Ikarol surface paint silver 111/S.	
7130.–	20 21	Cellesta Nitro aircraft base paint red 1603.	
7131.00	30 31	Cellesta wood base preparation colourless 2254.	
7132.00	30 31	Cellesta wood filler grey 2070.	
7135.01	21 31	Cellesta aircraft coating paint silver 1604.	
7135.02	20 30	Cellesta aircraft coating paint RLM-grey 2000.	
7136.00	20 30	Cellesta aircraft coating paint colourless 1606.	For isolating fabric paints from metal paints. This is to be exclusively used to cover such pre-painted metal parts upon which fabric is to be laid and painted
7140.00	Single coat paint (Paint thinner 7233.00)	Herboid paint VC6929	For interior and exterior painting of covered wooden parts.

7142.00	Single coat paint.	Ikarol propeller paint red 135.	Used with 7146.22 and 7200.00 as blending protection to paint the rear face of propellers.
7145.02	32/b	Light metal protective paint 1227.	Used above water
7146.22	Single coat paint.	Ikarol propeller paint black 136.	As for 7142.00.
7160.00	Single coat paint thinner 7232.	Vekoloid cellulose paint 420	For marking pipe ducts, all instructions and nationality markings on all types of materials.
7161	Single coat paint thinner 7234.	Vekoloid Plastic paint 420K.	As for 7160.00.
7162.01	32/c	Avionorm bitumen paint 120.	Used below water.
7170.00	Single coat paint.	Avionorm nitro-surface paint light grey 1791.	For painting accumulator containers and all areas exposed to acids, on wood and metal.
7180.22 Protective finish.	32/b	Aniline varnish, black.	For interior painting.
7181.00 Protective finish.	32/a	Wood protection Unikum V 2070.	For all surfaces.
7182.00 Protective finish.	Single coat paint.	Einoxhdöl.	For interior painting of welded tubular steel frame work.
7200.–	Paint thinner.		For sealer paste 7240, and for Flieglacketten 01,02,03.
7230	Paint thinner		For Flieglacketten 20,21,30,31.
7232	Paint thinner.		For Flieglack 7160.00
7233	Paint thinner.		For Flieglack 7140.00.
7234	Paint thinner		For Flieglack 7161.00.
7240	Sealer paste. (Paint thinner 7200.00).	Ikarol rivet sealer 106.	On metal aircraft for the weather-proofing of rivets and for the sealing of seams – forbidden for floats and hulls.
7242	Sealer paste.	Heavy duty adhesive for repair tape 20 011.	For metal hulls and floats, for compartments which do not contain fuel.

7243	Sealer paste.	Heavy duty fluid for repair tape 20 010.	For metal hulls and floats, for compartments which do not contain fuel.
7245	Sealer tape.	Repair tape 6 cm, 17 060.	As for 7243.
7246	Sealer tape.	Repair tape 12 cm, 17 120.	As for 7243.
7250	Sealer paste.	Chemical, made from 30 parts Stearin, 20 parts beeswax, 50 parts paraffin in a water base compound.	For isolating metal frame work under the tape roll.
7253	Sealer paste.	Heavy duty tape for continuous fuel flow 5130.	For metal hulls and floats for compartments with possible fuel flooding.
7255	Sealer tape.	6 cm wide continuous fuel flow tape 17 600.	As for 7253.
7256	Sealer tape.	12 cm wide continuous fuel flow tape 17 610.	As for 7253.

Note: Column three contains brand names used by various suppliers.

Appendix 3

The following is a summary of the principal contents of L.Dv.521/1, issue two of November 1941. Please note that the suffix 'coloured' denotes that certain paints within the specific group could have pigmentation added as required.

Flieglackette 01
Withdrawn from use.
Flieglackette 02 (coloured)
Used for painting metal floats, flying boat hulls and tropical aircraft. All seaplanes are to be given an anti-corrosive finish as stipulated in a special instruction issued by the RLM. (At the time of issue not all firms have the facility to do this).

a Aircraft with anti-corrosive finish used;
Flieglack 7118.–
7102.–
7109.02 plus standard camouflage colours.

b Aircraft without anti-corrosive finish and tropical aircraft are to use;
Flieglack 7102.–
7106.–
7109.02 plus standard camouflage colours.
Paint thinner 7200.00 used with 7106.– and 7109.–.

Flieglackette 03 (silver)
Withdrawn from use.
Flieglackette 04 (coloured)
Used for painting aircraft, which are not listed for single-coat paint application, as a two-coat application. In general use as a two-coat alternative system to the standard single-coat paint 7122.
Flieglack 7102.–
Flieglack 7109.02 plus standard camouflage colours.
Paint thinner 7200.00.
Flieglackette 05 (coloured) non combustible
Used exclusively for those aircraft which were originally treated with paints in this group, (shipboard aircraft, cargo gliders etc.). This group cannot be repaired with any other types of paint.
Flieglack 7113.–
Flieglack 7114.–
Flieglack 7115.02 plus standard camouflage colours.
Paint thinner 7213.00.
Flieglackette 20 (coloured)
Used exclusively for painting aircraft fabric.
Flieglack 7130.– (also used as an adhesive).
7135.02 plus standard camouflage colours.
7136.00 (clear external finish used over 02 and camouflage colours).
Paint thinner 7230.00 used with 7135.02, paint stripper 7236.00 used where necessary.
Flieglackette 22 (coloured) non combustible
Used exclusively for fabric covered surfaces of those aircraft which were originally treated with paints from this group (shipboard aircraft, cargo gliders etc.). This group cannot be repaired with paints from the number 20 series.
Flieglack 7137.–
Flieglack 7115.02
Paint thinner 7213.00. Paint spreader 7215.00 plus standard camouflage colours.
Flieglackette 30 (coloured)
Used exclusively for exterior wooden parts, but prohibited for use on wooden floats or hulls etc.
Flieglack 7131.00
7132.–
7135.02 plus standard camouflage colours.
7136.00
Paint thinner 7230.00 used with 7135.02, paint stripper 7236.00 used where necessary.
Flieglackette 33 (coloured) non combustible
Used exclusively for exterior wooden parts which were originally treated with paints from this group (shipboard aircraft, cargo gliders etc.). This group cannot be repaired with paints from the number 30 series.
Flieglack 7138.–
Flieglack 7139.–

Flieglack 7115.02 plus standard camouflage colours.
Paint thinner 7213.00. Paint spreader 7215.00.

Single coat paints for hangar and workshop repairs.

Flieglack 7140.– (green hue)
Used on all wooden sections not in contact with free flowing air, i.e. for interior painting. Paint thinner 7233.00.

Flieglack 7122 (single coat paint)
Used principally for interior application in the colour 02, and exterior application in camouflage colours where a single coat finish is required. Paint thinner 7200.00 used in conjunction with this paint.

Flieglack 7160.21 to .28 inclusive
Used for the marking of pipelines, connections, instruction markings and national insignia. Specifically intended for sprayed applications. Paint thinner 7232.00 used in conjunction with this paint.

Flieglack 7164.21 and .22
Used specifically for instruction markings and national insignia. Specifically intended for brush applications over large areas. Paint thinner 7234.00 used with this paint.

Flieglack 7165.21 and .22, non combustible
Used for instruction markings and national insignia on non flamable paint surfaces (Flieglackette 05, 22 and 33), Paint thinner 7232.00.

Flieglack 7119.– (acid proof paint)
Used for accumulator containers and other areas exposed to acids, both wood and metal. This paint replaces *Flieglack* 7117. – which is no longer available. Dual purpose paint thinner 7200.00.

Flieglack 7136.00
Used as an insulator between metals and fabrics both of which have already been painted. (e.g. wing control surfaces).

Flieglack 7102.–
Used for the interior of hollow welded steel sections. Applied by pumping paint into lowest section and continuing until it flows out at the top. Excess paint is then allowed to drain out. Specifically intended for use on ocean going aircraft.

Flieglack 7120.22 (removable temporary night camouflage)
Used on under surfaces of aircraft, painted in 65, where required and applied as per instructions. For ease of removal an insulating coat of IS 238 from Gustav Ruth, Temperolwerke, Hamburg-Wandsbeck, shall first be applied. The insulator coat shall only be applied to the under surfaces (the areas coloured 65), under no circumstances shall the upper dark surfaces be painted with it. This paint is only to be applied at an operational unit. The entire under surfaces are to be covered, (wings, tail section and all protrusions) even if already painted black, to a point approximately $\frac{1}{2}$ metre over the top surfaces. Fuselage sides are to be covered to a height in line with the upper edge of the *Balkenkreuz*. Ailerons, rudder and elevators are also to be overpainted along with the *Hakenkreuze*. *Balkenkreuze* on wing under surfaces and fuselage sides are to be painted out and only the white border areas re-applied in the temporary paint 7120.77 (grey). No other paint type or colouring is to be used for this purpose. For daytime flights over occupied territory or Germany only the white borders of the *Balkenkreuze* are to be stripped to facilitate identification of high flying aircraft.

Stripping of the temporary night camouflage is to be done no later than eight days after application. Removal is done with rubber scrapers except for oil stained areas. Wooden scrapers are to be used in the latter instance and the surfaces cleaned and washed with petrol. The use of metal scrapers is forbidden because of the likelihood of damage to the permanent paintwork.

Flieglack 7124.22 (permanent night camouflage)
Where weathering would necessitate continuous repainting of the temporary 7120.22 finish, permanent 7124.22 is to be used. An intermediate paint 7123.– and paint thinner 7205.00 are used in this process. Wing and fuselage sections are to be stripped of their temporary camouflage 7120.22 by using an application of special cleanser 'Z' until the insulator coat of IS 238 begins to lift. These sections are then allowed to dry for a period of at least two hours to ensure that the cleanser 'Z' has evaporated.

Groundstaff are reminded that all paint is to be thoroughly stirred. No sediment is to be left in the bottom of the can as this consists mainly of pigment necessary to produce the camouflage properties of the paint. A single coat of 7124.22 is then sprayed on the areas shown in the accompanying diagram. (See Chapter Six). A second coat completes the process.

Flieglack 7146 (propeller paint)
Metal propellers are only to be painted as per the manufacturers requirements. Paint 7142.– is used as an undercoat and thinner 7200.00.

Note; the detailed painting instructions stipulated a single base coat of 7142.–, followed by a single coat of 7146.71 and a final top coat of 7146.70.

Flieglack 7111.– (protective paint)
An anti-corrosive paint used as a sprayed application in conjunction with paint thinner 7200.00.
Flieglack 7118.– (protective paint dip)
A similar paint type to 7111.– but used principally as a dip for water-proofed light metals on ocean going aircraft. Its function is similar to a primer or sealer, in that it produces a virtually scratchproof surface which can be easily cleaned prior to application of the final paint finish. To distinguish parts treated with this dip a blue tinge is added to it. Normal drying time is one hour. Paint thinner 7200.00.
Sealers
To seal butt joints in metals, and rivets in floats the following items are used.

For floats and flying boat hulls:
Sealing tape 7260.–
Sealing adhesive tape 7265.–
Sealing filler paste 7264.–
Sealer cleaner 7235.–.
For auxiliary tanks and other fuel tanks:
Leak proof – Sealer tape 7263.–
Sealer filler 7261.–
Fuel proof – Sealer filler 7262.–
Sealer cleaner 7235.–.

Note; all materials listed had provision for the addition of pigmentation.

The remainder of this section of the document dealt with the care of paint work and the technical aspects of various applications. A specific reminder was included that all finishes should be *flat* and not *gloss*. No reference has been found to a matt finish in any documentation.

Changing from night to day camouflage
With the introduction of permanent night camouflage 7124.22, a single coat permanent day finish blue paint 7125.65 has also been issued to front line units. (See Chapter Six). Paint Thinner 7205.00.

The 1938 issue of L.Dv. 521/1 and /2 included colour chips for 23 paint samples identified by numbers ranging from 00 to 73. The 1941 revised issue added actual paint chips for the colours 74, 75 and 76 and made written reference to the colours 77, 78, 79 and 80. Two additional greens are known to have been added to the official listings late in the war, these were 81 and 82.

A further colour, for which no positive identification number has been found, was the pale blue-green referred to in Chapter Nine. This has been given the tentative number of 83 but this designation is purely speculative and is in no way based on documented evidence.

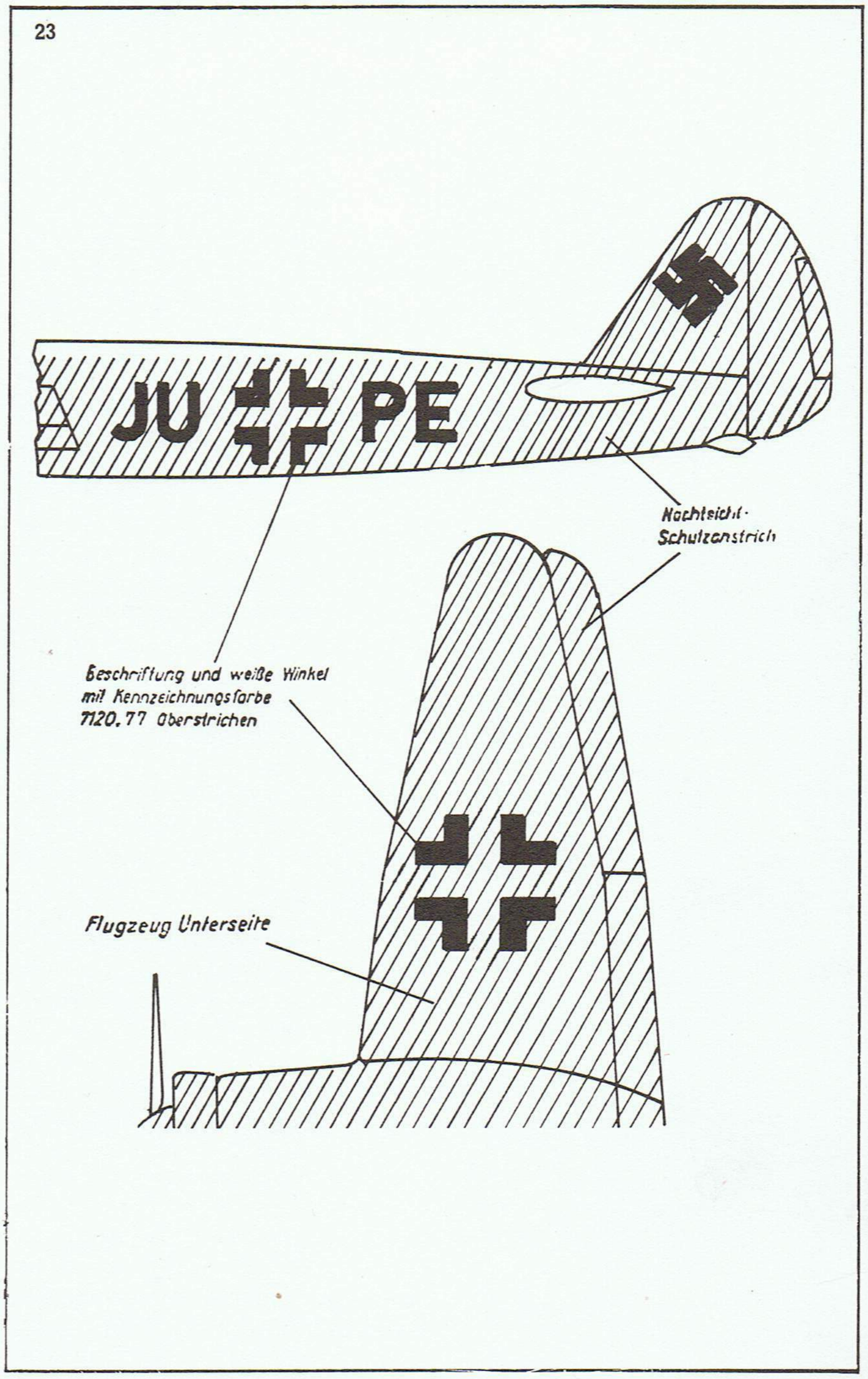


Diagram 23. Camouflage instructions for the use of 7120.22. Marking of the white areas of the *Balkenkreuz* is to be done with 7120.77.

In the following listing colour matching was made against the 1970 edition of the 'Munsell Matte Book of Color'. For those readers who do not have access to this world-wide reference system an approximation has been made against the United States Federal Standard No. 595. Where two numbers are quoted this indicates that the actual camouflage colour lays between the two shades given.

All matching has been made against either original official issue paint chips or actual paint samples in the case of the colours 77 onwards. Exceptions are the colours 61, 62 and 63 which were matched from a reliable but officially unsubstantiated source.

RLM Ref. No.	*Colour*	*Munsell Code.*	*Federal Standard 595.*
00	*wasserhell* (colourless)		
01	*silber* (silver)		
02	*RLM-grau* (RLM-grey)	5GY 5/1	34226
03	*silber* (silver)		
04	*gelb* (yellow)	2.5Y 8/12	33538
05	(creamy yellow)	5Y 8/6 Gloss	13618
21	*weiss* (white)	N9.5	
22	*schwarz* (black)	N2.75	
23	*rot* (red)	7.5R 4/12	31136
24	*dunkelblau* (dark blue)	5PB 2.5/6	25053
25	*hellgrün* (light green)	5G 5/6	24260/24108
26	*braun* (brown)	2.5YR 4/6	20109
27	*gelb* (yellow)	5Y 7/10	33655
28	*weinrot* (wine-red)	1ORP 2.5/4	20061
61	*dunkelbraun* (dark brown)	1OR 2.5/6	30109/30177
62	*grün* (green)	5 GY 5.5/4	34258
63	*hellgrau* (light grey)	1OBG 7.2	34518
65	*hellblau* (light blue)	1OBG 6/2	35414
66	*schwarzgrau* (black-grey)	N3.0	36076
70	*schwarzgrün* (black-green)	1OGY 2.5/1	34052
71	*dunkelgrün* (dark-green)	5GY 3/1	34079
72	*grün* (green)	5BG 3/1	37056
73	*grün* (green)	1OG 3/1	34092
74	*grau* (grey)	5B 3/1	36081
75	*grauviolett* (grey-violet)	5BP 4/1	36173
76	*lichtblau* (light blue)	7.5B 7/2	35622
77	*hellgrau* (light grey)	N7.5	36492
78	*hellblau* (light blue)	7.5BG 6/2	35414
79	*sandgelb* (sand-yellow)	7.5YR 5/4	30252/30257
80	*olivgrün* (olive-green)	7.5GY 3/2	34096
81	*braunviolett* (brown-violet)	5.5GY 3/3	34102/34127
82	*dunkelgrün* (dark green)	7.5GY 4/4	34108/14110
83	*blaugrün* (blue-green)	4G 8.0/1.1	34373

The question has been asked why so many RLM reference numbers were apparently not used. In actual fact many, if not most, were used. They refer, however, to paint finishes that were used for interior applications which would normally not require repainting during the expected life of the aircraft, i.e. paints that were applied at production centres as opposed to paints that were issued to Luftwaffe units. Significantly, all the colours listed were associated with paint applications used for areas that were normally subjected to wear and tear.

In the category of the unlisted numbers we have two examples which are both known to be shades of grey. 7107.41 was used for instrument panels and is possibly the grey N4.5 identified from the wreckage of an Fw 190. 7170.42 was used for accumulators. Other unlisted interior colours, for which no identifying numbers are known, are a turquoise blue, 7.5 BG 5/3, from the airframe of an Me 262; a Do 24T airframe yielded a lead grey, 6Y 5.9/0.7. Examples of the latter interior colour were also found inside the airframe of several Fw 190s. In addition, an instrument box from the radio compartment of the same type of aircraft was painted in a primer coat of brownish red, 9R 4.3/6.4, and finished in 66 schwarzgrau. Numerals and markings were in green of approximately 7GY 5.6/4.4. External primer coats from Fw 190s produced 2GY 4.9/3.0, a semi-gloss bright green, overlaid with the camouflage colours 74, 75 and 76. This colour was also found on an Me 262. From another Fw 190 a layer of dark green, 5GY 3.4/2.5, was discovered between the primer coat and the external finish of 74, 75 and 76.

The identification number 99 is, however, well documented but a precise colour description cannot be made, because it bore both the written description *'gelb lasierend'* and *'grün lasierend'*. The word *'lasierend'* is a modern one stemming from the world of technology, the closest English equivalent being the description 'a tinge' of colour. (The term was used in the 1941 document to describe the blue tinge added to *Flieglack* 7118.– but no colour identification number was quoted). The 99 colour could, therefore, be either a faint yellow or a faint green.

The suffix 99 was added, in the 1944 document, to all paint numbers previously listed with the ending .– in the Flieglacketten 02, 04, 05, 20, 22, 30 and 33; but without any specific colour reference being given. A paragraph was devoted specifically to its use in relation to paints used for wooden parts.

Painting of interior wooden structures
Flieglack 7141.99 (*gelb lasierend*).
Flieglack 7140.99 (*grün lasierend*).
Used exclusively for the painting of wooden parts not in contact with the air-stream. Paint thinner 7233.00.

A further reference concerned Flieglack 7147 which had replaced 7142 and 7146 for the painting of metal propeller blades. 7147.99 was used as the base coat, thinned with 7200.00, while 7147.70 was used for the final external coat and thinned with 7230.00. Again no specific colour identification was given for the 99.

The following list gives the main uses for each colour issued to Luftwaffe units and the chart details the official listing for internal pipe markings. Where a system had an external access point a marking in the relevant colour was used, either in the form of a special emblem such as a fuel triangle, or simply as a band of colour around the edge of the hatch.

RLM Ref No. and colour	*Use*
00-colourless	Protective external finishes and paint thinners.
01-silver	Exterior and interior finish on landplanes pre-war.
02-RLM-grey	Pre-war external finish for floatplanes and flying boats. Also used as a primer coat and upper surface camouflage colour.
03-silver	Exterior finish pre-war
04-yellow	Exterior and interior markings. Gruppe/Staffel markings.
05-creamy yellow	Exterior finish on sailplanes and gliders.
21-white	National markings. Gruppe/Staffel markings.
22-black	National markings. Codes and registration markings.
23-red	Gruppe/Staffel markings. Interior and exterior markings. e.g. wing walk markings, trim tabs, gust lock positions.
24-dark blue	Gruppe/Staffel and Stab markings. Interior markings.
25-light green	Stab markings. Exterior and interior markings.
26-brown	Exterior and interior markings.
27-yellow	Interior markings on engines. External stencilling.
28-wine-red	Pre-war used as a 3 mm wide demarkation line between 02 upper surface colour and 01 lower surface colour on floatplanes and flying boats, positioned 10 cm above high water line.
61-dark brown	Pre-war upper surface camouflage colour.

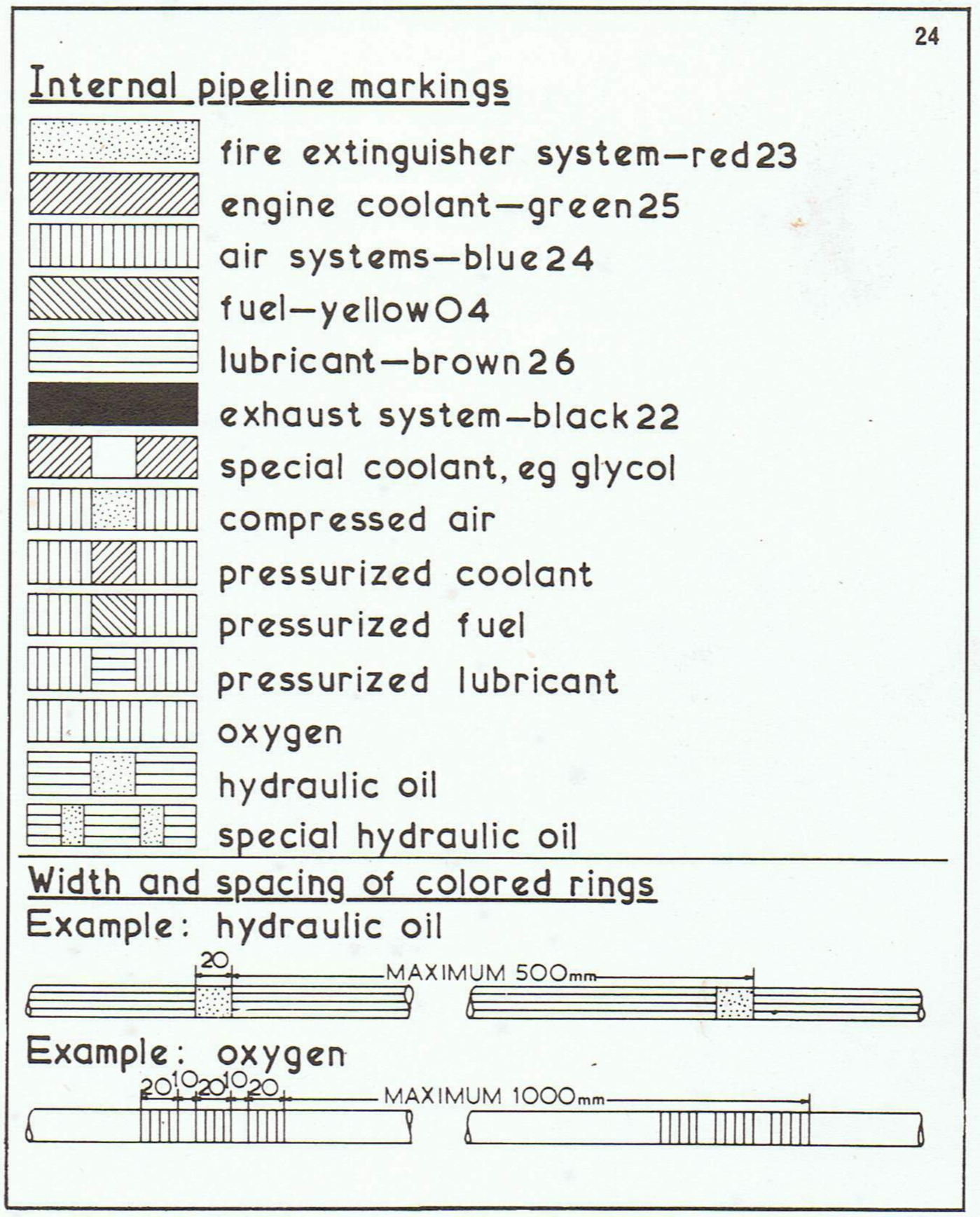


Diagram 24. Colour coding and dimensions for aircraft internal systems.

62-green	Pre-war upper surface camouflage colour.
63-light grey	Pre-war overall finish for land planes. Later used as an upper surface camouflage colour.
65-light blue	Lower surface camouflage colour.
66-black-grey	Interior colour used for all areas visible through glazed coverings.
70-black-green	Upper surface camouflage colour for land planes.
71-dark green	Upper surface camouflage colour for land planes.
72-green	Upper surface camouflage colour for aircraft used over the sea.
73-green	Upper surface camouflage colour for aircraft used over the sea.
74-grey	Upper surface camouflage colour for fighters and heavy fighters.
75 – grey violet	Upper surface camouflage colour for fighters and heavy fighters.
76 – light blue	Camouflage colour used on both upper and lower surfaces.
77-light grey	Colouring for code letters on night fighter aircraft. Also used in temporary paint form for national markings on night bombers.
78-light blue	Lower surface camouflage colour for tropical aircraft.
79-sand-yellow	Upper surface camouflage colour for tropical aircraft.
80-olive green	Upper surface camouflage colour for tropical aircraft.
81-brown-violet	Upper surface camouflage colour.
82 – dark green	Upper surface camouflage colour.
83 (?)-blue-green	Lower surface camouflage colour.

Six of the non camouflage colours were used for the special *Reichsverteidigung* band markings; white (21), black (22), red (23), blue (24), green (25) and yellow (27). Note that the shade 04 was sometimes substituted for 27, this variation in yellow most probably being the result of supply problems rather than deliberate variation. The following list is based on previously published material with additions and amendments. Unit identity is listed with each example.

White	JG 3.
White/Green	JG 77.
Black	JG 53.
Black/Yellow	JG 5.
Black/White	JG 26.
Black/White/Black	JG 4.
Red	JG 1.
Red/Blue	JG 7.
Red/White	JG 52.
Red/White/Red	JG 6.
Blue	JG 54.
Blue/White/Blue	JG 300.
Green	JG 27.
Green/Yellow	Unknown. (Possibly JGr 10).
Green/White/Green	JG 51.
Yellow	JG 11.
Yellow/Red	JG 301.
Yellow/White/Yellow	JG 2.

Appendix 4

The four letter registration system, introduced in October 1939, utilised virtually the entire alphabet from the outset. Certain sequences appear to have been omitted, but the fragmentary nature of surviving records could possibly account for this fact. Examples from the series commencing AA+AA are an instance of this elusiveness, only one being positively identified and even this is incomplete.

Throughout the examples listed there occur some incomplete registrations which have been included to illustrate the extent to which various registration blocks were issued. In the past it has proved a potential trap for the unwary to assume the remainder of a registration block because of its similarity to one worn by the same type of aircraft. The following list demonstrates the possibilities for such errors.

AW+?? VEF I-16

BA+BF Do 17
BA+HQ Ar 66
BA+KM Ju 52
BA+KZ Do 17

BB+CK He 46
BB+DA Hs 123
BB+HC W.34
BB+MG W.34
BB+RD Ju 86
BB+SO Fw 58
BB+XD Fw 44
BB+YQ Ar 196

BC+BP He 177
BC+FG Bf 110
BC+KB Potez 63
BC+NJ Do 17
BC+NL Do 17

BD+GC Bf 109
BD+GP Bf 109
BD+OH Ju 52
BD+PY Fi 156
BD+TX Ju 290
BD+VF Fi 156
BD+XS Go 244

BE+TU Ar 96

BF+AN Do 23
BF+YT Ju 88

BG+IP Fi 156

BH+AI A-304
BH+CC Fw 190
BH+CF Fw 190

BI+EY Ju 88
BI+XB PA.22

BJ+CP Me 261
BJ+CQ Me 261
BJ+CR Me 261
BJ+IL Bf 109
BJ+VB Ju 52
BJ+WW Ju 88
BJ+YJ Ju 52

BK+CO He 111
BK+HS Ju 288

BM+PL Fi 156

BO+FS Ar 68
BO+KE He 72
BO+T? D 520

BP+?? Si 204

BQ+AZ Fw 189
BQ+GO Ju 52
BQ+UJ Me 163
BQ+UZ FGP 227

BS+AG Fw 200
BS+AJ Fw 200

BT+AJ Ju 52

BU+AP Si 204
BU+EH Ju 52
BU+PP Si 204

BV+AA Fw 58
BV+AY Benes-Mraz BE 555
BV+ED Kl 32
BV+MH He 59
BV+WM Hs 123
BV+ZA Fw 44
BV+ZW Hs 123

BW+BA Kl 35
BW+CA Fi 156
BW+NC Fw 44

BY+?? Bf 109

BZ+NG Bf 109

CA+BV He 115
CA+NK Bf 109
CA+SN Fw 44

CB+AF Hs 123
CB+FB Fw 200
CB+OE Ju 88
CB+RP He 177
CB+TL Fi 156
CB+VB Fi 156
CB+ZB DFS 230

CC+BK Ju 52
CC+EQ Bv 222
CC+ER Bv 222
CC+FV Ju 87
CC+KF He 111
CC+PK Bf 109
CC+PO Bf 109
CC+PU Bf 109

CD+DH Ar 96
CD+IK Me 163
CD+IL Me 163
CD+IM Me 163
CD+IN Me 163
CD+IO Me 163
CD+MO Bf 110
CD+PV Ju 88
CD+YF C.445

CE+BM Bf 109
CE+BN Bf 109
CE+BO Bf 109
CE+BP Bf 109
CE+BW Me 209
CE+GX Fi 156
CE+IB Fw 200
CE+IC Fw 200
CE+ID Fw 200
CE+NX He 111
CE+PE Fw 189

CF+BB Me 210
CF+BF He 70
CF+HF Fi 156
CF+JE Ju 52
CF+KS Fw 190
CF+KT Fw 190
CF+NB Bf 110
CF+NS Bf 110
CF+OV Fw 190
CF+OW Fw 190
CF+OX Fw 190
CF+OY Fw 190
CF+WD Ju 88
CF+YD Fh 104

CH+AM Hs 126
CH+BL Fw 44
CH+EV Do 24
CH+EW Do 24
CH+HG He 72
CH+NP He 111
CH+NR He 111
CH+SC Ca 313
CI+EJ Bf 109
CI+IE He 111
CI+MX Bf 109
CI+NY Fw 187
CI+QV Fi 156
CI+TU Fl 282
CI+XM Ta 152

CJ+AZ Fw 44
CJ+MG Bf 109
CJ+XM Si 204
CJ+ZY Spitfire

CK+FJ Ar 196
CK+IK Fw 44
CK+KD Fi 156

CL+AM He 46
CL+ME Ju 88
CL+NE Bf 109
CL+XZ B-24

CM+AL Do 23
CM+IS Do 24
CM+NH Ar 65
CM+RY Do 24
CM+SA Envoy

CN+AI W.34
CN+AX Hs 123
CN+BP Ju 52
CN+EL Fi 156
CN+HL Do 217
CN+UX LeO 455

CO+DQ MB 200
CO+JF Do 18
CO+NN Fh 104
CO+OR Do 215
CO+RR Fw 44
CO+TF Ju 52

CP+AQ Ar 96
CP+UA Do 335

CQ+HG Do 17
CQ+HK Fh 104
CQ+HO S.M.79
CQ+QE Fi 156
CQ+QS Fi 156

CR+YU Bu 181

CU+BS Go 145

CV+?? Fw 58
CV+CK Ju 290

CW+HX Fw 44

CX+HI Bü 131

DA + A? Fw 56
DA+AZ He 111
DA+BN Ar 76
DA+ER He 70
DA+MG He 59
DA+MJ He 59
DA+WT He 59
DA+ZX W.34

DB+CR Fw 58
DB+DF Go 145
DB+FX Bü 131
DB+HG Go 145
DB+SB Do 23
DB+UC Hs 123
DB+YG He 45
DB+ZQ Fh 104

DC+DM Ar 79
DC+GL He 115
DC+GM He 115
DC+RI He 111
DC+SP Ju 52

DD+IJ W.34
DD+LF Do 217

DE+CN Bf 110
DE+GS He 111
DE+ZZ Ju 288

DF+BP Ju 252
DF+BQ Ju 252
DF+BW Ju 252
DF+CT Ju 288
DF+FW Ju 188
DF+IM Ju 52
DF+OV He 111
DF+WE Ju 88

DG+UA Bf 109

DH+EJ Bf 109

DI+NW Me 210
DI+NX Me 210
DI+PC Fi 156

DJ+JW Bf 109
DJ+LN He 111
DJ+MN Bf 110
DJ+NY Fi 156
DJ+PX Fi 156
DJ+RW Fi 156
DJ+XC B 17
DJ+YE Ju 290

DK + GQ Kl 35
DK+HS Fw 44
DK+NV W.34
DK+QE Ar 66
DK+UI Ar 95

DL+AP He 177
DL+AQ He 177
DL+AS He 280
DL+AT He 177
DL+AU He 177
DL+AV He 177
DL+AW Fi 156
DL+DV Go 242
DL+NT Si 204
DL + UI Kl 35

DM+BY Fi 156
DM+DV Do 17
DM+EZ Ju 88
DM + HCI-16
DM+SD Bv 222
DM + SO Fl 282

DN+FP Fw 190
DN+FR Fw 190
DN+FV Fw 190
DN+YK Bf 109
DN+YO Bf 109
DN+YW Bf 109

DO+NJ Fi 156

DP+AW Ar 234
DP+AX Ar 234
DP+FJ Ju 52
DP+NC Fi 256

DQ+AQ Go 242
DQ+YE Ju 290

DR+IA NAA-64
DR+IC Fw 58
DR+XD NAA-64

DS+CA W.34
DS+E? He 111

DT+IE Me 323

DU+UC Fw 190

DV+AV DFS 230
DV+DI He 219
DV+IZ Bf 110
DV+JB Bf 109
DV+JC Bf 109
DV+PA Me 263

DW+YY Ju 388

FO+LY Fw 190
FO+LZ Fw 190

GA+AB Benes-Mráz BE 51
GA+DO Ar 196
GA+DX Ar 196
GA+GH Bf 109
GA+GI Bf 109
GA+HP Bf 109
GA+MK Bf 109
GA+QQ He 277
GA+SS He 111
GA+TH Fi 156
GA+TL Fi 156
GA+TY Fi 156
GA+TZ Fi 156
GA+UF He 111
GA+VK He 51
GA+WZ Fw 187

GB+CE Ju 188
GB+NT W.34
GB+OE Ju 88

GC+AF Fw 200
GC+GF He 111
GC+YI Ar 96

GD+EU Bu 131
GD+GW He 111
GD+KA He 111

GE+CU Me 309
GE+CV Me 309
GE+CW Me 309
GE+EA Do 217

GF+GA Ju 90
GF+GF Fw 200
GF+GG G.38
GF+GH Ju 290
GF + YF Fl 282

GG+GT Bf 109
GG+SJ He 111
GG+SY He 111

GH+IG Me 163
GH+IH Me 163
GH+IN Me 163
GH+JD Fw 190
GH+KS Fw 190
GH+KT Fw 190
GH+KU Fw 190
GH+KV Fw 190
GH+KW Fw 190
GH+UK Ju 390

GI+HT Bü 181
GI+RG Fw 189
GI+SK Go 145
GI+SN Me 210
GI+SO Me 210
GI+SP Me 210
GI+SQ Me 210
GI+SR Me 210
GI+SS Me 210
GI+ST Me 210

GJ + AH Ar 79
GJ+CA He 280
CJ+CB He 280
GJ+CC He 280
GJ+CD He 280

GK+IV Ar 234
GK+IW Ar 234
GK+IX Ar 234
GK+IY Ar 234
GK+RZ Me 208

GL+MY Fw 190
GL+QA Ar 240
GL+QB Ar 240

GM+AG Fh 104
GM+AZ Fw 58
GM+BN Ar 234
GM+OG Hs 129

GN+HP Fi 156
GN+IO He 111
GN+IS He 111
GN+IV He 111
GN+IW He 111
GN+IZ He 111
GN+WX Ju 87

GO+CC Bf 110
GO+EL Go 242
GO + M? Fw 190

GP+AR He 111
GP+YA Ju 87

GU+HO He 177
GU+NW He 51

GV+CY Fw 190
GV+FU Ju 52

GW+N? Fi 156

HG+DH He 111
HG+NN He 111

HP + ?? He 111

HS+HN Ar 76

IR+BH Do 17

JT+EL Do 217

JU+BM Ju 52

JV+KG Bf 109

JZ+FL He 111

KB+IF Bf 109
KG+JC Bf 109
KB+LS Bf 109
KB+OU Go 145
KB+PD Fw 190
KB+PJ Fw 190
KB+PN Fw 190
KB+PO Fw 190
KB+PV Fw 190
KB+QA Hs 123
KB+QZ Hs 123
KB+TA Do 17

KC + BY Kl 35
KC+CU Ju 52
KC+HL Fw 189
KC+JC Fw 189
KC+JZ Fw 189
KC+LJ Fi 156

KD+BH Do 24
KD+EA Me 262
KD+GG T.VIII-W
KD+GH T. VIII-L
KD+GJ Do 24
KD+GO Ju 52

KE+IJ Fw 200
KE+IV Fw 200
KE+IW Fw 200
KE+JA Do 217
KE+KF Fi 156
KE+OC Go 242
KE + SB Kl 35
KE+SW Me 163

KF+QR Ju 52
KF+WN Bf 109
KF+YK He 72
KF+XL Fi 156

KG+EM Bf 108
KG+GB Bü 131
KG+QE Fi 167

KH+YN Fi 156
KH+YX Fi 156

KI+LA Do 17
KI+LP Fw 56

KJ+BB He 219

KK+AL Do 23
KK+BP Ar 231
KK+CD Ar 240
KK+UB Fw 58
KK+UM Do 24
KK+UP Do 24
KK+V? Hs 129

KL+MA Bv 138

KM+EY Fw 190
KM+IO Go 242
KM+UD He 177

KN+ED Hs 130
KN+KM Fw 58
KN+ND He 70
KN+OJ Fi 156

KO+UA C.445
KO+ZD M.S. 230

KP+AB Fw 58
KP + GI Fi 156

KQ+AU Ar 76
KQ+CP Ju 52
KQ+CW Ju 52
KQ+CX Ju 52
KQ+CY Ju 52
KQ+TC Ju 87
KQ+ZA Hawk 75

KR+HO C.445
KR+LA Ju 290
KR+LB Ju 290
KR+LC Ju 290
KR+LD Ju 290
KR+LE Ju 290
KR+LF Ju 290
KR+LG Ju 290
KR+LH Ju 290
KR+LI Ju 290
KR+LJ Ju 290
KR+LK Ju 290
KR+LL Ju 290
KR+LM Ju 290
KR+LN Ju 290
KR+LO Ju 290
KR+LP Ju 290
KR+LQ Ju 290
KR+LR Ju 290
KR+LS Ju 290
KR+LT Ju 290
KR+LU Ju 290
KR+LV Ju 290
KR+LW Ju 290
KR+LX Ju 290
KR+LY Ju 290
KR+LZ Ju 290
KR+QI Fi 156
KR+QX Fi 156
KR+QZ Fi 156

KT+AF Fw 58
KT+QO Ju 87

KU+AP Bü 131
KU+SN Ta 154
KU+SO Ta 154
KU+SP Ta 154

KW+TT He 277

KX+NB L.101

KZ+RZ He 219

LA+QU Grunau Baby

LB+?? DFS 230

LC+?? DFS 230

LD+XT DFS Kranich

LG+?? Bü 131
LG+TR Grunau Baby

LH+?? DFS 230

LN+FX Bf 110
LN+KR Bf 110

LZ+GH Grunau Baby

MB+?? M.S.315

MJ+ZE Bf 110

MN+EB Hs 130

NA+LP Ju 86
NA+OM Si 202
NA+PS Bv 138
NA+WN Fw 200

NC+OZ Bv 141
NC+RA Bv 141
NC+RC Bv 141
NC + RF Bv 141
NC+RH Bv 141
NC+RI Bv 141

ND+IE Bf 109
ND+IF Bf 109
ND+VX Me 210
ND+VY Me 210
ND+VZ Me 210

NE+BH Me 210
NE+HZ D.520
NE+TA He 59
NE+UN G.I
NE+UU Do 18
NE+UW He 59
NE+UX He 59
NE+ZC Go 244
NE+ZD Go 244
NE+ZE Go 244
NE+ZX Go 244
NE+ZY Go 244

NE+ZZ Go 244

NF+GB He 177
NF+I? Bü 181
NF+KQ Ju 188
NF+LA Me 210
NF+LB Me 210
NF+MS Bf 108
NF+NV Fw 58

NG+EQ Fw 58
NG+JQ He 111
NG+YC Fw 56

NH+AS Ar 96
NH+BJ Go 145
NH+OI Fw 58
NH+RT Bf 109
NH+VZ Bf 109

NI+BK Bf 109
NI+BW Bf 109

NK+O? Bf 109
NK+ZZ Ju 188

NL+AY Ar 68
NL+EX Ju 88
NL+UU Fi 156

NM+NJ W.34
NM+ZS Fi 156

NN+BA Bf 110
NN + GK Ju52
NN+QQ He 277

NO+FU He 59
NO+GO He 111
NO+IJ Ju 52
NO+OD Fi 156
NO+TB Do 215
NO+TF Do 215

NP+BL Bf 109

NQ + NR Kl 35

NS+OA Ar 396

NT+AJ He 111
NT+CB Me 210
NT+FL He 111

NU+BA D.520
NU+EA He 280
NU+EB He 280
NU+EC He 280
NU+ED He 280

NV+BT He 70
NV+EW Ju 86
NV+GL Fi 156
NV+KK He 111

NW+LC Ju 88
NW+TN Do 215

NX+EA Hs 130

NZ+HN Bf 110

OB+TG He 51

OC+G? He 115

OH+?? He 111

OK+ZD Le0 451

OM+HP Si 204

OR+?? Ar 96

OU+AR Ar 196

OV+BI Re 2002

PB+AK Do 23
PB+AL Do 23
PB+AM Do 23
PB+KC G.1
PB+PD He 111

PC+BB Bv 142
PC+BC Bv 142
PC+EA DC3
PC+NO Do 215
PC+UA Me 262
PC+UB Me 262
PC + UC Me 262
PC+UD Me 262
PC+UE Me 262

PE+AW Do 217
PE+I? Ju 388
PE+OO Fi 156
PE+ZI Ju 88

PF+HA He 111
PF+LS Ar 66
PF+LW Go 145
PF+NO Fw 56
PF+NS Ar 65
PF + NT He 45
PF+OD Fw 58
PF+RQ Go 145
PF+TP He 45
PF+UV Hs 123

PG+AN Fw 44
PG+IC Bloch 157

PH+AP Fw 44
PH+BE Bf 109
PH+GN Ar 96
PH+GQ Ar 96
PH+LV Bf 109
PH+PY Ar 96
PH+SP Ar 234
PH+SQ Ar 234
PH+SR Ar 234
PH + SS Ar 234
PH + ST Ar 234
PH+SU Ar 234
PH + SY Ar 234
PH + SW Ar 234
PH+XH Bf 109

PI+AJ Fw 56
PI+AS Ar 96

PJ+AZ Hs 123
PJ+PS Ju 290

PK+EH Do 215
PK+EM Do 215
PK+ET Do 215
PK+HX Bf 109
PK+QJ He 219
PK+QL Me 163

PL+BN Bü 181

PM+AP Fw 56
PM+OD He 177

PN+MT Ju 88
PN+PA Me 210
PN+PC Me 210
PN+PD Me 210
PN+SN Ju 88
PN+UA Bv 40
PN+UF Bv 40

PO+NT He 72

PP+AO He 59
PP+AX He 115
PP+QA Fi 156
PP + QL Fi 156
PP+VG Me 410

PR+GS Bf 109

PT+AD Bf 109

PV+ZZ Fi 156

PW+BC Ju 88
PW+NP Fw 56

PY+NN He 59

RB+CL B-122
RB+ND Ju 87
RB+NE Ju 86
RB+NO Fw58
RB+OP Bf 109
RB+UH Ju 86

RC+BN He 59
RC+DA Ju 390

RC+DF W.34
RC+HC Ar 66
RC+HR Ar 199
RC+NE Fw 58
RC+NJ Fw 58

RD+JE Do 217
RD+TS Go 244
RD+TV Go 242, Go 244.

RF+NG He 111
RF+NT He 111

RG+AG Ju 52
RG+AW Fw 44
RG+B? Bf 109
RG+MJ Bf 109
RG+NI Fw 58
RG+NX Fw 58

RH+ED Do 217
RH+EJ Do 217
RH+ES Do 217
RH+GL Go 244
RH+LH Me 309

RI+OA Ju 52

RK+NC Ju 86
RK+NL He 111
RK+NM Do 23

RL+AB He 219

RM+CA Fw 190
RM+ND Do 23

RN+AB Fw 44
RN+EE He 111

RO+EZ Bv 238
RO+TY He 111

RP+NN Go 145

RQ + ?? Bf 109

RS+RA Ju 287

RT+AQ Ar 68
RT + KE Ju 388
RT+ZX Fi 156

RW + BA Kl 35

RX+DL Bf 109
RX+NM Do 23

RZ+AO Bf 110
RZ+AT Do 18

SA+FJ Do 23
SA+HN Do 17
SA+HS He 46
SA+PB He 111
SA+QA Ao 192
SA+UO Do 17

SB+BD Bü 131
SB + DE Kl 35
SB+IA Fw 190
SB+KA Fw 190
SB+KH Fw 190
SB + LC Bü 181
SB + QB Ju 290
SB + QC Ju 290
SB + QD Ju 290
SB + QE Ju 290
SB + QF Ju 290
SB + QG Ju 290
SB + QH Ju 290
SB + QI Ju 290
SB + QJ Ju 290
SB + QK Ju 290
SB+RY Ju 88
SB+UD Fi 156
SB+UG Fi 156

SD+DV W.34
SD+EE He 59
SD+K? Ar 66
SD+QP Fw 44
SD+VB Do 23
SD+WJ He 60

SE+DX B71/SB-2
SE+EZ B71/SB-2
SE+GP He 111
SE + HU Ju 52
SE + IM Ju 52
SE+JB Fw 44
SE+KC Ju 52
SE+VK Fw 58

SF+QL He 111
SF+QM He 111
SF+QR He 111
SF+SV He 111
SF+TB He 177
SF+TC He 177
SF+ZA He 111
SF+ZE He 111
SF+ZG He 111
SF+ZQ He 111
SF+ZR He 111
SF+ZX He 111

SG+B? Ju 52
SG+EK Bf 109
SG+GV Bf 109
SG+JJ Bf 109
SG+KH Fw 200
SG+KR Fw 200
SG+KS Fw 200
SG+SC He 46
SG+ZP He 70

SI+EG Fw 189
SI+EM Fw 189
SI + EZ Kl 35
SI+FU Fi 156
SI+MK He 111

SJ+CM Me 210
SJ + EV Kl 35
SJ+GE Me 210
SJ+GM Me 210
SJ + KY B-17
SJ+XY Bf 109

SK+IO He 111
SK+JS Fw 190
SK+WI Bü 181
SK+XM C.445

SL+EF Bf 109

SM+N? Go 145

SN+BE Go 242
SN+MO Fi 156

SP+AZ K1 35
SP+LJ Me 209

SQ+FT Bf 109

SR+A? Si 204

ST+GL Ju 188

SU + F? Bf 109

SV+GB D.520

TA+EY Bü 131

TB+BK Ar 196
TB + HQ He 42
TB+PE B71/SB–2
TB+QL Bv 222

TC+ZZ Fi 156

TD+BA Go 145
TD+HK Fw 58
TD+IN Go 242
TD+IR Go 244
TD+IU Go 242
TD+IW Go 244
TD+IZ Go 244
TD+SI Fw 190

TE+FE Ta 154
TE+FF Ta 154
TE+FG Ta 154
TE+FH Ta 154
TE+FI Ta 154
TE+FK Ta 154
TE+UI Go 244

TF + AS Fi 156
TF+BO Avia-Fokker F.IX
TF+EQ Me410

TG+KA He 111
TG + UK Ar 96

TH+AF Fi 156

TI+DQ Fw 190
TI+NI W.34
TI+VR Fi 156

TJ + AH Kl 35
TJ+AJ Fi 167
TJ+AN Fi 167

TK + AN Fl 265
TK+BN W.34
TK + EV Go 244
TK + MJ Fw 190

TL+DR Bf 109

TL+DT Bf 109
TL+DU Bf 109
TL+NA W.34

TM+A? Bf 109
TM+IF He 177
TM+IU He 177

TO+CV Ju 86
TO+XL Fw 200
TO+XO Fw 200

TP+CC Bü 181

TQ+BB S-328
TQ+BC Fw 56
TQ+BI Fw 44
TQ+BZ Fw 44
TQ+XE Ta 154

TR+BE Fw 58

TS+BI Go 145
TS+MB Bf 109

TU+BW Bf 109
TU+YA Fw 190

TV+FX Bf 110
TV+HM He 59
TV+HO He 59

TW+HH He 59
TW+NO Fw 44
TW+SH Ar 196

VA+HP Ar 79
VA+HS Ar 79
VA+MV Go 242 stb
(VM+AV port)

VB+IT Ar 79
VB+KK Do 215
VB+KT Do 215
VB+NA He 72
VB+TP Fw 58
VB+UF Ju 52

VC+FV Go 244
VC+OI Go 242
VC+OR Go 244
VC+SU Me 210
VC+SZ Me 210
VC+XP He 111

VD+EK Me 163
VD+EL Me 163
VD+EM Me 163
VD+ER Me 163
VD+EW Me 163
VD+TD Fi 156
VD+VF Bf 109
VD+XS He 177
VD+YA Ar 232
VD+YB Ar 232
VD+YC Ar 232

VE+QP Ju 288
VE + WW Potez-CAMS 161

VF+UE He 111
VF+RJ He 177

VG+ON Ju 88
VG+PG Do 335
VG + PH Do 335

VH+SM Do 24

VI+AA Me 262
VI+AB Me 262
VI+AC Me 262
VI+AD Me 262
VI+AE Me 262
VI+AF Me 262
VI+AG Me 262

VJ+CL He 111
VJ+HP He 111
VJ+OQ Bf 110
VJ + WA Bf 109
VJ+WC Bf 109

VK+AB Bf 109
VK+AZ Ju 52
VK+IY Do 317
VK+QJ Bf 109
VK+VU Ju 88

VL+AK Bf 109
VL+SK Fi 156
VL+SL Fi 156

VM+AV Go 242 port
(VA+MV stb)

VN+AD Me 210
VN+AT Me 210
VN+Q? Bf 109

VO + AI Kl 35

VR+BU Ju 87
VR+CH Ju 87
VR+CM Ju 87
VR+FA Ju 87
VR+FO Ju 87

VT+AN Bü 131

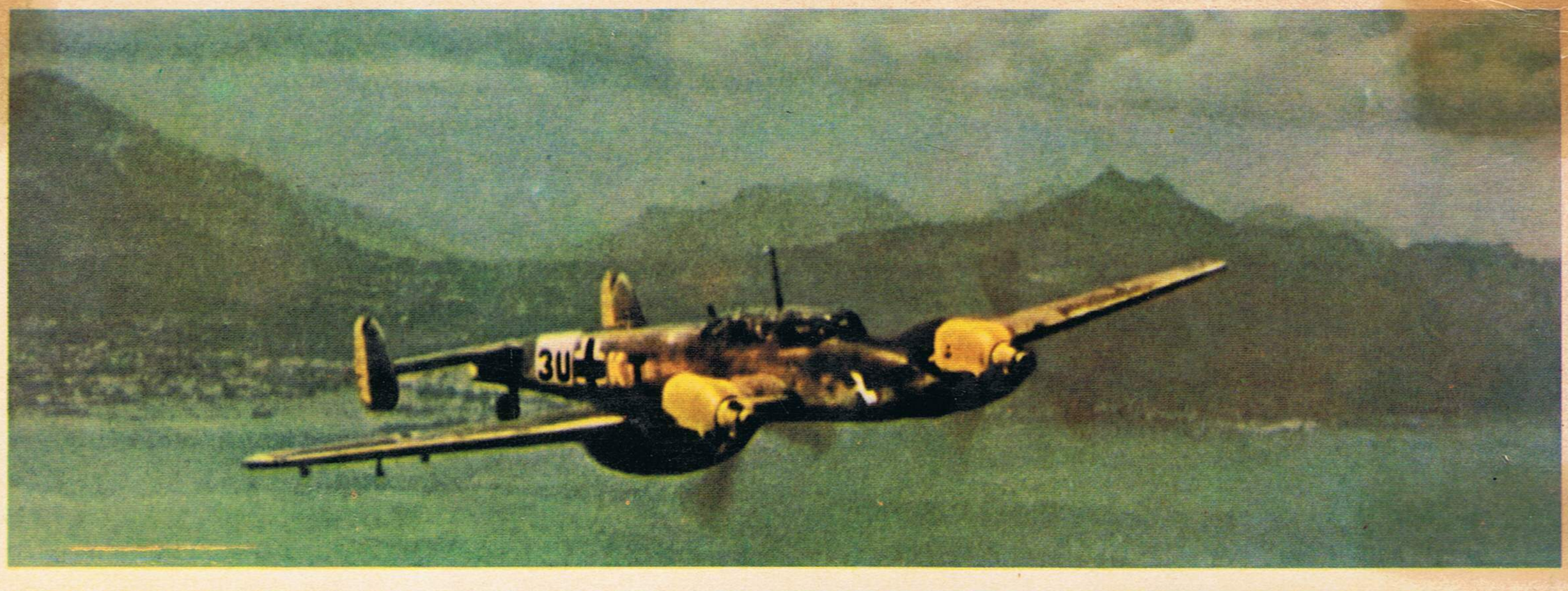
WL+RR Bf 109

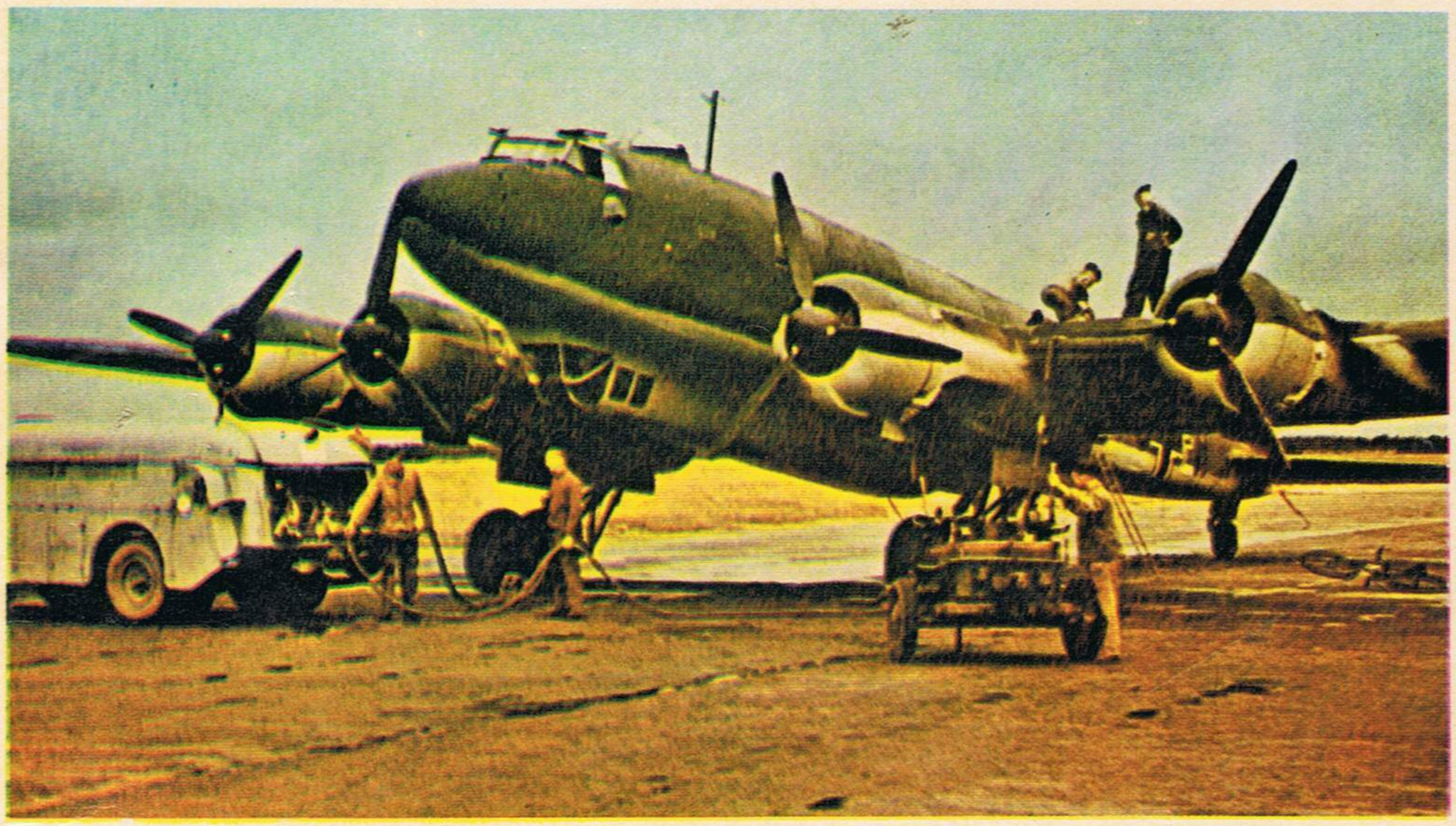
Appendix 5

Luftwaffe codes contain many traps which make it difficult to determine precise ownership. Part of the difficulty lays in the fact that some units used several codes, sometimes for each of the *Gruppen* and other times within a single *Gruppe*. The following list is by no means complete but it does attempt to rectify some of the more repetative errors that have been previously published as well as adding some new information. Where it has not been possible to identify positively a code with a unit the aircraft type and place at the time of recording is given. It is hoped that this may help eventually to establish the unit identity. Codes were also used by successive units in some instances and where this occurred all the known users are listed.

A1	KG 53
A2	I/ZG 52, II/ZG 2
A3	KG 200
A5	Gr. *Stab* KG 2, St.G. 1, SG 1
A6	Aufkl.Gr.120
B1	(Fi 156, Russia)
B3	KG 54
B4	*Nachtjagdstaffel Norwegen*
C1	E.Kdo. 16
C2	Aufkl.Gr. 41
C3	(Ju 52, North Africa)
C6	KG.z.b.V 600
C8	TG5
C9	NJG 5
D1	S.A.Gr. 126
D5	NJG 3
E2	*Erprobungstelle* E2
E8	*Erprobungstelle E8*
F1	KG 76, I/St.G.76, III/St.G.77
F2	Erg.(F).*Gruppe*
F5	(He 111, Italy)
F6	Aufkl.Gr. 122
F8	KG 40
G1	KG 55
G2	4 Aufkl.Gr.Ob.d.L
G6	KG.z.b.V 2, TG 4
G9	NJG 1
H1	Aufkl. Gr. 12
H3	(Fi 156, Russia)
H4	*Luftlandegeschwader* 1
H7	St. G. 3
H8	Aufkl. Gr. 33
J4	T. St. 5
J9	St.G. 5
K6	Kü.Fl.Gr.406
K7	Aufkl. Gr. Nacht
K9	Aufkl.Gr.Ob.d.L
L1	LG 1
L2	LG 2
L5	KG.z.b.V 5
L8	(Fi 156, Russia)
M2	Kü.Fl.Gr. 106
M4	(Fw 189, Russia)
M7	Kü.Fl.Gr.806
M8	ZG 76
N3	Stab KG 3, KG.z.b.V 172
P1	KG 60
P2	Aufkl.Gr. 21
P4	*Korps-Fuhrungskette X Fliegerkorps*
P5	1./Kü.Fl.Gr. 406
R4	I/NJG 2
S2	St.G.77, SG 77
S2	St.G. 77
S3	T.Gr. 30
S4	Kü.Fl.Gr. 506
S7	St.G.3, SG 3
S9	Erpro.Gr.210,SKG 210, ZG1
T1	Aufkl.Gr. 10
T3	Bordfl.St. 196, Bordfl.Gr. 196
T5	Wetterkundungsstaffel Ob.d.L
T6	St.G.2, SG 2
T9	*Versuchsverband* Ob.d.L
U5	KG 2.
U8	I/ZG 26.
V4	KG 1.
W2	*Grossraumlastenseglergruppe* 321
W7	NJG 100
W9	(Me 323 V1)
X4	*Lufttransportstaffel* See 222
Z6	I/KG 66
1B	Wetterkundungskette Luftflotte 5
1G	KG 27
1H	III/KG 26
1K	III/KG 27
1T	KG 28, I/Kü.Fl.Gr. 126
1Z	KG.z.b.V 1, TG 1
2A	II/NJG 2
2C	I/ZG 1
2F	KG 54, II/ZG 26

2H	Versuchsstaffel 210, III/ZG 1, II/ ZG 26	5J	KG 4
		5K	KG 3
2J	ZG 1	5M	St.G. 76
2N	I, II, III/ZG 26	5T	KSG 1
2S	III/ZG 2	5W	*Wetterkundungsstaffel* 76
2U	ZG 1	5Z	*Wetterkundungsstaffel* 26
2Z	NJG 6	6G	St.G. 51
3C	NJG 4	6K	Aufkl. Gr. 41
3E	KG 6	6M	Aufkl.Gr. 11
3K	Minensuchgruppe der Luftwaffe	6N	KG 100
3M	I/ZG 2	6T	Kü.Fl.Gr. 706
3U	ZG 26	6U	ZG 1
3W	I/ZG 2	6W	Kü.Fl.Gr. 196
3W	NSGr. 11	7A	Aufkl.Gr. 121
3Z	KG 77	7J	NJG 102
4D	KG 30	7R	S.A.Gr. 125
4E	Aufkl.Gr. 13	7T	Kü.Fl.Gr. 606
4F	(Ju 52, Russia)	7V	KG.z.b.V 700
4N	Aufkl.Gr. 22	8L	Kü.Fl.Gr. 906
4T	*Wetterkundungsstaffel* 51	8T	KG.z.b.V 800, TG 2
4U	Aufkl.Gr. 123	8V	NJG 200
4V	KG.z.b.V 9, TG 3	9K	KG 51
5D	Aufkl.Gr. 31	9V	Aufkl.Gr. 5
5F	Aufkl.Gr. 14, (F) *Staffel*	9W	NJG 101
5H	Aufkl.Gr. 14, (H) *Staffel*		


3U+GS






3U+GS