= Dornier Do 17 =

The Dornier Do 17 , sometimes referred to as the Fliegender Bleistift (" flying pencil ") , was a World War II German light bomber produced by Claudius Dornier 's company , Dornier Flugzeugwerke . It was designed as a Schnellbomber (" fast bomber ") , a light bomber which , in theory , would be so fast that it could outrun defending fighter aircraft .

The Dornier was designed with two engines mounted on a " shoulder wing " structure and possessed a twin tail fin configuration . The type was popular among its crews due to its handling , especially at low altitude , which made the Do 17 harder to hit than other German bombers .

Designed in the early 1930s , it was one of the three main Luftwaffe bomber types used in the first three years of the war . The Do 17 made its combat debut in 1937 during the Spanish Civil War , operating in the Condor Legion in various roles . Along with the Heinkel He 111 it was the main bomber type of the German air arm in 1939 ? 1940 . The Dornier was used throughout the early war , and saw action in significant numbers in every major campaign theatre as a front line aircraft until the end of 1941 , when its effectiveness and usage was curtailed as its bomb load and range were limited .

Production of the Dornier ended in mid @-@ 1940 , in favour of the newer and more powerful Junkers Ju 88 . The successor of the Do 17 was the much more powerful Dornier Do 217 , which started to appear in strength in 1942 . Even so , the Do 17 continued service in the Luftwaffe in various roles until the end of the war , as a glider tug , research and trainer aircraft . A considerable number of surviving examples were sent to other Axis nations as well as countries like Finland . Few Dornier Do 17s survived the war and the last was scrapped in Finland in 1952 .

On 3 September 2010 , the Royal Air Force Museum London announced the discovery of a Henschel @-@ built Dornier Do 17Z buried in the Goodwin Sands off the coast of Kent , England . On 10 June 2013 , the salvage team raised the airframe from the seabed .

= = Development = =

In 1932 , the Ordnance Department (Heereswaffenamt) issued a specification for the construction of a " freight aircraft for German State Railways " , and a " high speed mail plane for Lufthansa " . The factory at Friedrichshafen began work on the design on 1 August 1932 .

When the Nazis took power in 1933 , Hermann Göring became National Commissar for aviation with former Deutsche Luft Hansa employee Erhard Milch as his deputy , soon forming the Ministry of Aviation . The Ministry of Aviation designated the new aircraft Do 17 , and on 17 March 1933 , just three months after taking office , Milch gave the go ahead for the building of prototypes . At the end of 1933 , the Ministry of Aviation issued an order for a " high speed aircraft with double tail , " and for a " freight aircraft with special equipment , " in other words , a bomber . The original design (the Do 17 V1) configuration in 1932 had sported a single vertical stabilizer , and Dornier continued developing that model . The Do 17 was first demonstrated in mock @-@ up form in April 1933 . The " special equipment " was to be fitted later , to disguise its offensive role .

In April 1934 , the Dornier works at Manzell began project " definition . " During this month , the defensive armament was designed and the bomb release mechanism details ironed out . Production of these prototypes began on 20 May 1934 and , on 23 November 1934 , the Do 17 V1 , with a single fin and powered by two BMW VI 7 @.@ 3 motors , took off on its first flight . Testing was delayed by a series of accidents , with V1 being damaged in landing accidents in February and April 1935 . The twin @-@ tailed V2 (powered by low @-@ compression BMW VI 6 @.@ 3 engines) first flew on 18 May 1935 and was evaluated together with the V1 by the Ministry of Aviation at Rechlin in June . During the tests , the single fin proved to be only marginally stable , resulting in the V1 being modified with a twin tail . The aircraft was destroyed in a crash after an engine failure on 21 December 1935 . The V3 , also fitted with a twin tail , was originally planned to be powered by Hispano @-@ Suiza 12Ybrs engines , but as these were unavailable , it was fitted with BMW VI 7 @.@ 3 engines like the V1 and flew on 19 September 1935 . The V1 prototype remained the only built machine with the single stabilizer .

It is claimed that , unlike the Heinkel He 111 series , whose military use was planned from the start , the Do 17 V1 was contracted as a fast six @-@ passenger mail plane to compete with the smaller Heinkel He 70 monoplane It has been suggested that it was rejected by Luft Hansa , as the cramped cabin was too uncomfortable for passenger use and the operating costs were too high for a mail plane . According to the story , the three prototypes remained unused in the Dornier factory in Lowental for almost six months , until Flight Captain Untucht of Luft Hansa came across them . After receiving permission to fly one of the machines , he proceeded to put it through an almost stunt flying routine . After landing , he said that " the machine is as nimble as a fighter , give it more lateral stability and we 'll have a high speed bomber ! " Untucht 's comments prompted Dornier to redesign the tail unit and revived interest in the type .

Dornier was then ordered to produce the V4 prototype . Some sources state this differed from the V3 in that the passenger portholes were removed and the single fin was replaced with two smaller ones . Photographic evidence demonstrates the V3 had twin stabilizers from the start of its construction . The tests of the " twin @-@ tailed " V4 , V6 and V7 prototypes were positive and more prototypes like the V8 emerged as the forerunner of the long @-@ range reconnaissance version , while the V9 was tested as a high @-@ speed airliner . The V9 machine was still flying in 1944 .

= = Design = =

The cockpit and forward fuselage had a conventional stepped cockpit , and its nose was fully glazed . Early variants had been labelled the " flying pencil " owing to its sleek and continuous " stick @-@ like " lines . As a result of the lessons learned in the Spanish Civil War , the cockpit roof was raised and the lower , or bottom half , of the crew compartment was a typical under @-@ nose " Bodenlafette " , abbreviated Bola , inverted @-@ casemate design ventral defensive armament position , a common feature of most German medium bombers . The Bola was extended back to the leading edge of the wings where the lower @-@ rear gunners position and upper @-@ rear gunner position were level with each other . As with contemporary German bombers , the crew were concentrated in a single compartment . The cockpit layout consisted of the pilot seat and front gunner in the forward part of the cockpit . The pilot sat on the left side , close up to the Plexiglas windshield . One of the gunners sat on the right seat , which was set further back to provide room for the 7 @.@ 92 mm (0 @.@ 312 in) MG 15 machine gun to be traversed in use . The Do 17 usually carried a crew of four : the pilot , a bombardier and two gunners . The bomb @-@ aimer also manned the MG 15 in the nose glazing and Bola @-@ housed rear lower position . The two gunners operated the forward @-@ firing MG 15 installed in the front windshield , the two MGs located in the side windows (one each side) and the rearward firing weapon . The cockpit offered a bright and panoramic view at high altitude . The standard ammunition load was 3 @,@ 300 rounds of 7 @,@ 92 mm ammunition in 44 double @-@ drum magazines .

The wings were of a broad 55 m ² (590 ft ²) area and had a span of 18 m (59 ft 0 ? in) with a straight leading edge which curved in a near @-@ perfect semicircle into the trailing edge . The positions of the wing roots were offset . The leading edge wing root merged with the top of the fuselage and cockpit . As the wing extended backwards , by roughly two thirds , it declined downwards at a sharp angle so that the trailing edge wing root ended nearly halfway down the side of the fuselage increasing the angle of incidence . This design feature was used on all future Dornier bomber designs , namely the Dornier Do 217 . The trailing edge was faired into the round fuselage shape . The engine nacelle was also faired into the flaps . The extreme rear of the nacelle was hollow and allowed the flap with an attached vertical slot to fit into the cavity when deployed .

The fuselage was 15 @.@ 80 m (51 ft 9 ? in) long . It was thin and narrow , which presented an enemy with a difficult target to hit . The fuselage had twin vertical stabilizers to increase lateral stability . The power plant of the Z @-@ 1 was to have been the Daimler @-@ Benz DB 601 but , owing to shortages from priority allocation for Bf 109E and Bf 110 fighter production , it was allocated Bramo 323 A @-@ 1 power plants . The Bramos could only reach 352 km / h (220 mph) at 1 @,@ 070 m (3 @,@ 500 ft) . The limited performance of the Bramo 323s ensured the Do 17 could not reach 416 km / h (260 mph) at 3 @,@ 960 m (13 @,@ 000 ft) in level flight when fully

loaded . The range of the Do 17Z @-@ 1 at ground level was 635 nmi (1 @,@ 176 km) ; this increased to 1 @,@ 370 km (850 nm) at 4 @,@ 700 m (15 @,@ 500 ft) . This gave an average attack range of 400 nmi (740 km) . The introduction of the Bramo 323P increased the Z @-@ 2 performance slightly in all areas .

The Dornier had self @-@ sealing fuel tanks to protect fuel stored in the wings and fuselage . This reduced the loss of fuel and risk of fire when hit in action , and often enabled the aircraft to return . Twenty oxygen bottles were provided for crew use during long flights above 3 @,@ 660 m (12 @,@ 000 ft) .

Communications usually consisted of FuG X , the later FuG 10 (Funkgerät) , navigational direction finder PeilG V direction finder (PeilG - Peilgerät) and the FuG 25 IFF and FuBI 1 blind @-@ landing devices . The crew communicated by EiV intercom . A primitive autopilot device , the Siemens K4Ü , was installed and could maintain bearing using the rudder 's control surfaces .

The bomb bay accommodated four bomb racks , the No. 5 for SC50 bombs and two ETC 500 racks to carry heavier loads of up to 500 kg (1 @,@ 100 lb) each . A Lotfe A , or B bombsight was issued together with the BZA @-@ 2 aperture (a modernised optical lens system) . The aircraft 's bomb bay allowed two options . The first was to carry four 250 kg (550 lb) bombs for a load of 1000 kg (2 @,@ 200 lb) , which reduced aircraft range . With half the maximum load , ten 50 kg (110 lb) bombs , additional fuel tanks could be placed into the forward part of the bomb bay to increase range . The bomb aimer would deploy the bomb load via the Lotfe (A , B or C 7 / A , depending on the variant) bomb sight which was in the left side of the nose compartment directly under and forward of the pilot . When fully loaded , the Z @-@ 1 weighed 7 @,@ 740 kg (17 @,@ 200 lb) .

= = Variants = =

= = = Early Daimler @-@ Benz @-@ powered variants = = =

The initial production variants were the Do 17E @-@ 1 bomber , which was tested with two Daimler @-@ Benz DB 600 , and Do 17F @-@ 1 reconnaissance aircraft , powered like the early prototypes with BMW VI engines , which entered production in late 1936 . The first Luftwaffe units converted to the Do 17 in early 1937 .

The Do 17E @-@ 1 was equipped with two BMW VI 7.3D inline engines of 750 PS each . The crew numbered three . The radio operator manned the two 7 @.@ 92 mm MG 15 machine guns within a B @-@ Stand pod in the rear cockpit . They had 750 rounds of ammunition . The bomb bay was divided into two compartments . Each had five bomb racks with individual capacity of 50 kg (110 lb) . A single ETC 500 / IX bomb rack could be mounted externally underneath the aircraft to carry a 500 kg bomb . A Do 17 E @-@ 1 with the designation D @-@ AJUN was tested with an unusual configuration , two SC 500 bombs mounted side by side under the fuselage . It showed a notable performance reduction due to the increase in weight and drag , this configuration was not used operationally . The E @-@ 1 continued to carry low bomb loads into the Second World War . The performance of the E @-@ 1 enabled it to reach a speed of 330 km / h (205 mph) at 3 @,@ 000 m (9 @,@ 842 ft) . Conducting a shallow dive the light frame of the Do 17 could reach 500 km / h (310 mph) . Its maximum ceiling was 5 @,@ 500 m (18 @,@ 044 ft) .

Several E @-@ 1s were rebuilt as E @-@ 2 or E @-@ 3 , at least three E @-@ 2 and one E @-@ 3 were used by DVL and Hansa @-@ Luftbild GmbH (Hansa Aerial Photography Ltd) in a secret military reconnaissance role prior to the war .

The Do 17F @-@ 1 was a long @-@ range reconnaissance aircraft based on field modified Do 17Es . The Do 17 prototype V8 was used to test the configuration of the F @-@ 1 and V11 for the F @-@ 2 . The defensive armament consisted of a MG 15 in the B- and C @-@ Stand (B @-@ Stand - an upper rear firing position , C @-@ Stand ? lower gun emplacement) . The fuselage had two cameras along with six ejector tubes for flashlight cartridges . The F @-@ 1 would see service until replaced by the Do 17 P in 1938 . Only one F @-@ 2 was ever built , it was designated D @-@ ACZJ and was used by Zeiss @-@ Jena Company as a factory aircraft .

Conversion of two E @-@ 2 series aircraft with two BMW 132F radial engines led to the Do 17 J @-@ 1 and J @-@ 2 . These aircraft served as flight testing machines to evaluate the BMW 132 for usage in the Do 17 . The aircraft were the V18 (Wrk Nr , or Werknummer meaning works / factory number , 2021) and V19 (Wrk Nr 2022) prototypes . Trials began in late 1937 . A similar conversion , but with Bramo 323 radial engines , led to the designation Do 17 L @-@ 1 and L @-@ 2 . Two Do 17 (Wrk Nr 2031 and 2032) were renamed as V20 and V21 prototypes and used to evaluate the Bramo 323 fur usage in the Do 17 . The test were satisfactory and all future production models would be equipped with this engine .

After seeing the Do 17M V1 at the Zürich air races in 1937 , the Yugoslav Royal Air Force bought license rights for production at the Drzavna Fabrika Aviona factory in 1938 . They equipped it with the more powerful Gnome @-@ Rhône 14N radial engine (although the French exaggerated its performance) Dornier designs were delivered to the Pomorsko Vazduhoplovstvo (Naval Aviation - PV) in 1926 , namely the Dornier Komet and Dornier Do Y heavy bombers . The Yugoslavs were familiar with Dornier designs , and on 19 November 1935 Yugoslav pilots test @-@ flew the Do 17 V @-@ 3 prototype , D @-@ ABIH , W.Nr. 258 . They decided to select the Do 17 for service , despite it being more expensive than any other aircraft , because of the German willingness to deliver them quickly without limitations on numbers .

The Do 17L @-@ 0 and Do 17M @-@ 0 were developed in parallel as replacements for the earlier E and Fs , the L being the reconnaissance version . Both were designed around the more powerful DB 600A engines , delivering about 746 kW (1 @,@ 000 hp) . Two L and one M versions were built as prototypes , both with another MG 15 in the nose . The first prototype of the revised version , the Do 17M V1 (D @-@ ABVD) was powered by two DB 600s , and demonstrated impressive performance , including a maximum speed of 425 km / h (264 mph) .

At the International Military Aircraft Competition at Zürich , Switzerland in 1937 , the Dornier Do 17M V1 proved a leader in its class and was faster than the fastest foreign fighter , the French Dewoitine D.510. The Do 17 , along with the Messerschmitt Bf 109 , won many prizes , demonstrating the prowess of German aviation design .

= = = The radial variants = = =

Despite its success , owing to shortages in the supply of the Daimler @-@ Benz engine , the production Do 17M was fitted with the Bramo 323 engine , with the corresponding reconnaissance aircraft , the Do 17P , being powered by BMW 132Ns to give better range .

The supply of the DB 600 remained extremely limited as production was soon switched over to the fuel @-@ injected DB 601 , which was reserved for the Messerschmitt Bf 109 and Messerschmitt Bf 110 fighters . Therefore , production versions of the basic Do 17M model airframe were fitted with the new Bramo 323A @-@ 1 Fafnir engines of 670 kW (900 hp) , which gave reasonable performance and raised the bomb load to 1 @,@ 000 kg (2 @,@ 200 lb) . The resulting Do 17M @-@ 1 was produced in small numbers and operated until 1941 .

The prototypes for the M @-@ 1 series were Do 17M V1 (Wrk Nr 691) and Do 17M V2 (Wrk Nr 692) which were tested with bomb loads of a medium bomber . The third prototype , Do 17M V3 was evaluated as a fast bomber . The MV1 was fitted with two Daimler Benz DB 601 inline engines while the MV2 and MV3 had the Bramo 323 A and D respectively . The Ministry of Aviation favoured the widespread use of the DB 601 , but demand for the DB 601s in fighter aircraft and the lack of production forced the use of the Bramo .

The Do 17M @-@ 1 started its service as a medium bomber and was able to carry 2 @,@ 200 lb (1 @,@ 000 kg) of bombs . It was equipped with two air @-@ cooled Bramo 323 A @-@ 1 or A @-@ 2 . The defensive armament consisted of two , and later three , MG 15 machine guns . The first was operated in an A @-@ Stand pod operated by the navigator through the windshield . The position was allocated 370 rounds of ammunition . The rearward firing B @-@ Stand was operated by the radio operator and allocated 750 rounds . The rear position in the lower fuselage was allocated 375 rounds in a C @-@ Stand pod . The Do 17M could carry a bomb load of either 20 SC50 50 kg (110 lb) or two SC250 250 kg (550 lb) bombs or 10 SC50 and a single SC250 bomb .

The speed of the M was superior to that of the E variant . The Do 17M could reach 420 km / h (250 mph) at altitudes of 3 @,@ 500 m (11 @,@ 500 ft) and could achieve a maximum service ceiling of 5 @,@ 790 m (19 @,@ 000 ft) and a range of 850 nautical miles (1 @,@ 570 km) .

Reconnaissance aircraft based on the M @-@ 1 , the under @-@ surfaces of the wing were covered with duralumin and it had a wider engine axis and longer engine nacelles . The demand for a reconnaissance aircraft based on the M @-@ 1 led to the development of the P @-@ 1 variant .

The L version would not be able to enter production with the DB 600 owing to its use in the Bf 109 , and the Bramo engine was rather thirsty on fuel and left the M models with too short a range for reconnaissance use . BMW 132N radials of 865 PS were selected instead , which had lower fuel consumption for better range . Another two prototypes with DB 600 engines were produced as the Do 17R @-@ 0 , but did not enter production . During reconnaissance missions the P @-@ 1 was armed with four MG 15s in the A , B and C ? Stands . One machine gun was located in the rear of the cockpit , another in the lower rear Bola mount , one facing forward through the windscreen and the other in the nose glazing . In earlier variants the B @-@ Stand (the gun position in the upper rear cockpit) was open to the elements , but the P @-@ 1 now provided an enclosed bulb @-@ shaped mount protecting the radio operator from the weather .

The P variant had similar features to the Do 17M @-@ 1 , with added blind flying and camera equipment for reconnaissance work . The Do 17P @-@ 1 was powered by two Bramo 132 N radial engines with a maximum performance of 865 PS (853 hp , 636 kW) each . The machine was fitted with several radio variations . The FuG IIIaU radio (Funkgerät) , the PeilG V direction finder (PeilG - Peilgerät) and the FuBI 1 radio blind @-@ landing device (FuBI - Funkblindlandegerät) . The crew of three communicated with each other via the EiV intercom (EiV -Eigenverständigungsanlage) . The P @-@ 1 was equipped with either Rb 20 / 30 and Rb 50 / 30 or Rb 20 / 18 and Rb 50 / 18 cameras . The P @-@ 1 / trop was fitted with filters and protection for the cameras . The cameras were controlled remotely by the crew from the cockpit .

Due to a shortage of night fighters , at least one Do 17P @-@ 1 was assigned to this role . A smooth metal sheet was installed in place of its glass nose and it was armed with three 20 mm (0 @.@ 79 in) MG 151 / 20 cannons . The machine operated under Luftflotte 1 .

The Do 17P @-@ 2 was identical to the P @-@ 1 , with the additional installation of an ETC 500 bomb rack under the fuselage . These aircraft were designed for night reconnaissance . It is assumed that Dornier converted most , if not all , P @-@ 2 models from existing P @-@ 1 production aircraft .

Unlike the P @-@ 2 , the Do 17R @-@ 1 did not see series production . The experiences of the Spanish Civil War proved that unarmed aircraft were easy prey for fighter aircraft . The R @-@ 1 was to be a fast long @-@ range reconnaissance aircraft with two additional fuel cells inside the fuselage aft of the bomb bay . Two variants were suggested , the first (variant I) had a single Rb 50 / 30 and two Rb 20 / 30 cameras , while variant II had a third fuel cell to replace the rear Rb 20 / 30 . The aircraft had a gross weight of 7 @,@ 250 kg (15 @,@ 980 lb) but could be overloaded to 7 @,@ 500 kg (16 @,@ 500 lb) in emergencies . The crew usually numbered three , but a fourth was added depending on the missions to be flown . To achieve a high performance at increased altitudes two DB 600 Gs were to be used . The power plants were tested in the Do 17RV1 prototype registered D @-@ ABEE . The second , the RV2 , registered D @-@ ATJU , received the even more powerful DB 601 Aa engines . The power plant of the R @-@ 1s that did exist are not known .

The lessons from the Spanish Civil War had led Dornier 's designers to incorporate more defensive machine guns . Battles with Soviet @-@ built fighter aircraft had demonstrated that the Dornier was not as fast and invulnerable as was first thought . To cope with this , a completely new pod @-@ like cockpit was designed to give the crew more room and better visibility . The roof was extended upward over the line of the fuselage , sloping down to meet it just in front of the wing . The dorsal gun was moved to the rear of the pod where it had a considerably better field of fire . Likewise , the floor was dropped under the fuselage as a Bola casemate @-@ style defensive armament emplacement , and the ventral gun moved to the back of the Bola , allowing it to fire directly to the rear . The changes in the roof and floor made the whole front of the aircraft much larger . The rest of the airframe remained the same . The new cockpit design was nicknamed Kampfkopf (German : "

Battle head ") .

Three S variant prototypes with the DB 600 G inline engines were tested . The S @-@ 01 (designation D @-@ AFFY) , 03 and 04 were flown . The inverted V @-@ 12 engines were constructed as the Do 17 S @-@ 0 reconnaissance version , but it did not go into production . An additional 15 Do 17 U @-@ 1 pathfinder models were built , similar to the S @-@ 0 but adding another crewman (taking the total to five) to operate the extra radio equipment . The U models were to fly ahead of other bombers on night missions , using the radio equipment to locate the target and drop flares on it . They were personally requested by KG 100 as experimental models for this role . The U @-@ 1 had a maximum speed of 265 mph (424 km / h) and a combat ceiling of 4 @,@ 500 m (15 @,@ 000 ft) . The U @-@ 1 had a cruising speed of 384 km / h (240 mph) and a maximum reachable height of 5 @,@ 700 m (19 @,@ 000 ft) , owing to the " rather low performance of the Bramo 323 A @-@ 1 engines " . The three prototypes (U @-@ 01 - U @-@ 03) and twelve production aircraft were built by 1938 .

= = = Dornier Do 17Z : The main variant = = =

The Dornier Do 17Z series was the most recognised and mass @-@ produced variant , and saw more combat service than the E @-@ U types . The type was modified as a result of combat experience during the Spanish Civil War . The forward fuselage was redesigned , with the cockpit area being " dropped " , or extended further to enable a rear firing gunner position to be installed , and the canopy extended aft , until it was nearly parallel with the leading edge and wing root .

To test the design , the Do 17S and Do 17U were produced , both to be powered by the DB 600 power plants . However , a call for all DB 600 series engines to be reserved for fighters led to the variants being fitted with Bramo Fafnir 323 A radial engines . The bomb load was increased to 1 @,@ 000 kg (2 @,@ 200 lb) and a fourth crew member was added . It proved to be underpowered , so Bramo 323 P engines were then fitted . Only three Do 17S and 15 Do 17Us were built . With the updates , the Dornier , with a full bomb load , had a combat radius of 322 km (200 mi) . Later variants , in the Do 17 Z @-@ 3 , Z @-@ 4 and Z @-@ 5 , which were fitted with cameras , dual trainer controls and flotation aids (for maritime operations) respectively , still could not solve the problems with range and bomb load .

At first , a batch of Z @-@ 0s were built with the Fafnir for testing , the DB 600 again proving to be too hard to obtain . These were quickly replaced with the Z @-@ 1 model , which added another gun for the bombardier , but the additional weight of the nose and guns meant the bomb load was reduced to 500 kg (1 @,@ 100 lb) . The Luftwaffe , not being satisfied with the test outcome of the Z series , immediately ordered performance and design studies to increase the overall performance of the bomber . These resulted in very optimistic speeds and altitudes for all future Z variants , especially for the Z @-@ 5 aircraft . Planned performance altitudes of up to 7 @,@ 620 m (25 @,@ 000 ft) at a maximum speed of 418 km / h (260 mph) with an aircraft weight of 8 @,@ 100 kg (17 @,@ 800 lb) were planned . Unfortunately , production aircraft never reached these optimistic performances during the service career of the Do 17Z . At 7 @,@ 740 kg (17 @,@ 200 lb) , the heavy Do 17Z @-@ 1 used two Bramo 323 A @-@ 1 engines with self @-@ sealing fuel cells in the fuselage and wings . The crew of four consumed approximately 20 bottles of oxygen during long flights above 3 @,@ 700 m (12 @,@ 100 ft) . The Do 17Z @-@ 1 had a speed of 352 km / h (220 mph) at 1 @,@ 100 m (3 @,@ 500 ft) . However , the performance of the Bramo 323s did not permit the Do 17 to reach 416 km / h (260 mph) at 3 @,@ 900 m (13 @,@ 000 ft) and level flight when fully loaded . Range of the Z @-@ 1 at ground level was 635 nmi (1 @,@ 176 km) while at 4 @,@ 700 m (15 @,@ 500 ft) this increased to 850 nmi (1 @,@ 570 km) . This gave an average range of 400 nmi (740 km) . The introduction of the Bramo 323P increased subsequent performance in the following sub variants .

This was addressed in the major production model , the Do 17 Z @-@ 2 . The Z @-@ 2 mounted the new 323P @-@ 1 version of the Fafnir with 746 kW (1 @,@ 000 hp) , which was specifically tuned to the performance needs of the Do 17 by decreasing supercharger power at lower altitudes and thus improving low @-@ level performance . The increase in takeoff power allowed the bomb

load to be increased from 500 kg (1 @,@ 102 lb) to 1 @,@ 000 kg (2 @,@ 200 lb) . However the combat range with a full 1 @,@ 000 kg (2 @,@ 200 lb) bomb load was a very short 330 km (200 mi) . The armament was further upgraded by adding another pair of guns firing out of the sides of the upper part of the pod , but as the three guns were all fired by a single gunner , only one of them could be fired at a time . From May 1940 , 422 Do 17 Z @-@ 2s flew with Kampfgeschwader 2 , Kampfgeschwader 3 , Kampfgeschwader 76 and Kampfgeschwader 77 . The upgrades of the Z @-@ 2 had its overall weight increased from 17 @,@ 600 lbs to 17 @,@ 920 lbs (7 @,@ 983 to 8128 kg) . After heavy losses of Do 17s during the Battle of Britain it was decided to replace the MG FF cannon with the more powerful MG 151 / 15 . Losses had mounted in spite of an increase of up to eight machine guns in some Dorniers . The standard MG 15 machine guns were retained . These features were present in the next variant the Z @-@ 3 .

The Z @-@ 3 formed part of the bomber versions of the Z series , it was , however , also used as a reconnaissance aircraft by the staff flight of the particular unit . The engines and the general equipment were identical to the Z @-@ 2 standard ; however two cameras ? the Rb 50 / 30 and Rb 20 / 30 - were incorporated into the crew entry hatch . A handheld camera was issued to the crew to validate the success during bombing missions . Autopilot equipment was added later . The Z @-@ 2 and Z @-@ 3 were identical visually , and could only be distinguished from each other by the altered crew hatch on the Z @-@ 3 . Owing to spacing problems because of the added camera equipment , the ammunition supply was reduced from 44 to 42 magazines . The power plant of the Z @-@ 3 was upgraded to the Bramo 323P @-@ 2 . The Bramo P @-@ 2 remained the engine of all the remaining Z series variants .

The Z @-@ 4 was designed as trainer . Although nearly identical to the Z @-@ 2 and Z @-@ 3 , it featured several equipment changes optimised for blind flying training . The four @-@ seat aircraft had a single control column with dual steering , which was achieved by a jib protruding to the right . Rudder pedals were in front of both seats . The defensive armament and bomb racks were reduced , or in most cases omitted to reduce weight .

The Z @-@ 5 was similar to the Z @-@ 3 with a weight of 19 @,@ 000 lb (8 @,@ 600 kg) . Designed as an anti @-@ shipping aircraft , the Z @-@ 5 , was fitted with flotation cells in the fuselage and engine nacelles in case it was forced down on water . Usually the flotation devices took the form of inflatable bags stored in the rear of the engine nacelles and in bulges on either side of the nose , just behind the front glazing .

Later variants of the Z model were developed . The Z @-@ 6 was to be a reconnaissance aircraft , although it was only built as a prototype . During the war only a few were converted from existing combat variants . The type was selected for weather check flights . It was identical to the Z @-@ 1 / Z @-@ 2 variants , but offensive armament was omitted and extra fuel cells fitted . This increased the fuel load to 2 @,@ 890 l (578 Imperial Gallons) . As flights required higher altitude , the oxygen supply was increased from 20 to 24 bottles . For long @-@ range flights over water , the larger dinghy of the Z @-@ 5 with its updated emergency escape equipment was mandatory during operations . The Z @-@ 6s were also used for night fighter operations . Some of the few converted Z @-@ 6s had the Ju 88C @-@ 6 nose installed and were equipped with machine guns and cannons . The nose proved to be unsatisfactory , and it was redesigned . In the tip of the new nose was an infrared spotlight which was soon made redundant after the introduction of Lichtenstein radar which was fitted to some of the Z @-@ 6 .

The Z @-@ 8 Geier was not produced . It was intended as a ground attack aircraft and reached the first planning phase but was given up due to lack of performance and protective armour allocation against anti @-@ aircraft artillery . An increase in armour would have meant a decrease in speed which would have exposed the aircraft further to enemy fire .

The Z @-@ 9 , which was fitted with special bomb release equipment , and delayed release gear for low @-@ level attack missions . Its purpose was to suppress enemy air defences . Therefore , it was designed to fly over anti @-@ aircraft positions and drop Butterfly Bombs , an early form of cluster bomb munitions . This could only be done with air superiority , as the Z @-@ 9 was unarmoured . The airframe and equipment was identical to the Z @-@ 1 / Z @-@ 2 version . Only the bomb bay was altered to accommodate 16 bomb @-@ dispenser systems . The maximum

weight of the Z @-@ 9 was 7 @,@ 800 kg (17 @,@ 200 lb) . The design did not reach serial production .

After bomber production ended in 1940 , the Z model was modified with a " solid " nose from the Ju 88C , fitted with one 20 mm MG FF cannon and three 7 @.@ 92 mm (.312 in) MG 17 machine guns , to be used as night fighters . Three prototypes were converted from existing Z @-@ series airframes to the Do 17 Z @-@ 7 Kauz I (" screech @-@ owl ") configuration . The standard Z @-@ 7 was fitted with Bramo 323P @-@ 1 radial engines and had a crew of three airmen . In comparison to the standard bomber version , the fuel load arrangement was altered by subdividing into cells . Two cells were in the wings , with a capacity of 770 litres (154 imperial gallons) each . A third cell was placed in the bomb bay within the main fuselage , having a capacity of 895 litres (179 imperial gallons) . The oxygen supply for the three man crew was reduced to nine bottles , as intercepts at high altitudes were not anticipated . Add @-@ on armour in the form of heavy steel plates was bolted to the nose bulkhead to protect the crew against frontal fire . Originally , it was planned to completely armour the crew compartment . This idea , was given up again as the increased weight would have reduced flight performance of an already slow aircraft . The ammunition loads for the three 7 @.@ 92 mm MG 17 amounted to 3 @,@ 000 rounds and 400 rounds of ammunition for the 20 mm MG 151 cannon (although some Do 17Z bombers carried a single 20 mm for ground attack missions) .

Later , the design was further modified to the Do 17 Z @-@ 10 Kauz II , the solid nose now containing an infra @-@ red searchlight for the Spanner Anlage infrared detection system . The infrared lamp in the nose was used to illuminate the target while the display unit in the windshield made the reflection visible to the target . The Z @-@ 10 was armed with four 7 @.@ 92 mm (.312 in) MG 17 machine guns grouped above the IR light and two 20 mm MG FF in the lower nose . The crew could reload the 20 mm cannons ' drum magazines internally . The Z @-@ 10 contained an IR searchlight (Spanner @-@ Anlage) for the Spanner infrared detection system . A single Kauz II was equipped with and tested the Lichtenstein radar .

Only 10 of these Kauz II designs were converted from existing Z @-@ series airframes . The Spanner system proved to be essentially useless and many Z @-@ 10 were left without any detection system . At least one Z @-@ 10 , coded CD + PV , was used as a flying test bed to help developing the early low @-@ UHF band B / C version of the Lichtenstein radar system in late 1941 ? 1942 . When the Z @-@ 10 was stripped of all non @-@ night fighter equipment , it had a maximum weight of 7 @,@ 300 kg (16 @,@ 100 lb) . Armament fit was similar to that of the Z @-@ 7 , with an added MG 17 and an additional 1 @,@ 000 rounds of ammunition in the nose section . Defensive gun positions included the B and C stand , each equipped with a single MG 15 .

= = Production = =

= = = German = = =

Official figures state 2 @,@ 139 Do 17s were built on German assembly lines . At the Dornier factory at Oberpfaffenhofen , 328 Do 17Es were built along with a further 77 Do 17Fs and 200 Do 17M variants . Do 17Z production figures for Oberpfaffenhofen stand at 420 . At Friedrichshafen , 84 Do 17Ks were built , some of which were sold to the Yugoslav Royal Air Force . Do 17P production was spread out over different factory lines . At Siebel / Halle , eight were built . At the Henschel factory at Berlin @-@ Schönefeld 73 were constructed . At the HFB plant in Hamburg 149 were built . Henschel also produced some 320 Do 17Zs , HFB contributed to construction of 74 at its Hamburg plant , and another 73 were built at Siebel . Some 105 examples of the Dornier Do 215B was later built at Oberpfaffenhofen .

By 19 September 1938 , the Luftwaffe had received 579 Dornier Do 17s . These were mostly Do 17E , F , M and P variants . During 1939 ? 1940 , some 475 Dornier Do 17Z bombers , 16 reconnaissance aircraft and nine night fighters were built . Another 100 Dornier Do 215s , an updated variant of the Do 17 , were built during this period also .

= = = Yugoslav = = =

Other governments were interested in the Do 17 . In June 1936 , the Yugoslav government ordered 36 Do 17E variants from Germany . The negotiations for a licence were completed on 27 June 1938 for 36 Do 17Ka 's at the cost of 1 @,@ 829 @,@ 825 Reichsmark (RM) . On 18 March 1938 , Yugoslavia ordered 16 complete Do 17 Ka @-@ 2 's and Ka @-@ 3 's at a cost of 3 @,@ 316 @,@ 788 RM . They received the last on 21 April 1939 . The machines were from 72 @-@ 96 % complete .

The Dorniers were devoid of German equipment , including engines . The Yugoslavs found a French manufacturer to supply the powerplants instead . Gnome et Rhône was the supplier chosen , and the Gnome @-@ Rhône Mistral Major engine was to be used in the Dornier . The French had inflated the performance data of the engine , claiming it to have 649 kW (870 hp) and a speed of 420 km / h (261 mph) at 3 @,@ 850 m (12 @,@ 320 ft) . The constant @-@ speed propellers were also poor , and delivered late . This led to trials with Piaggio Aero and Ratier propellers . Only one of the Do 17s delivered was fitted out complete with German equipment . The rest of the Dorniers were equipped with Belgian FN 7 @.@ 9 mm (.31 in) machine guns , Czech camera equipment and eventually Telefunken radio sets . Altogether , 70 Do 17s were produced by Yugoslav factories .

= = Operators and operational history = =

Bulgaria

The Bulgarian Air Force received 11 Do 17 Ms and Ps in 1940 and at least 11 ex @-@ Yugoslav aircraft in 1941 . Six more Do 17 Ms were delivered in 1943 . They remained in service until at least 1945 .

Independent State of Croatia

The Air Force of the Independent State of Croatia (Zrakoplovstvo Nezavisne Dr?ave Hrvatske) received at least 21 Do 17Zs (the last 12 in 1945) , 11 ex @-@ Yugoslav Do 17Ka 's in 1942 and 30 Do 17Es in 1943 .

Finland

Finnish Air Force

46 Squadron received 15 aircraft in January 1942 :

Germany

Luftwaffe

Hungary

Royal Hungarian Air Force received one ex @-@ Yugoslavian Do 17Ka @-@ 3 .

Italy

Regia Aeronautica operated at least one ex @-@ Yugoslavian Do 17Ka @-@ 3 under 1 ° Centro Sperimentale in Guidonia , where it was tested until September 1943 .

Romania

Royal Romanian Air Force received 10 worn Do 17Ms in November 1942 .

Spanish Republic

Spanish Republican Air Force received ex @-@ Legion Condor Do 17E , F , and Ps and 13 remained in service after the end of the Spanish Civil War .

Switzerland

Swiss Air Force operated a single Do 17Z @-@ 2 , interned after landing at Basel Airport in April 1940 .

Kingdom of Yugoslavia

Royal Yugoslav Air Force

United Kingdom

Royal Air Force pressed into service two Yugoslav @-@ built Do 17Ks which escaped Yugoslavia carrying King Peter and gold . The aircraft were given the serials AX706 and AX707 . Both aircraft

were destroyed in an air attack on Ismaïlia airfield on 27 August 1941 .

United States

United States Army Air Forces operated at least one Do 17E @-@ 1 , WkNr 2095 . Renamed Axis Sally , it was taken to the United States after the war and tested .

= = Survivors = =

Until 2007 none of the Dornier twin @-@ engined bomber variants were thought to have survived intact , but various large relics of the Do 17 and Do 215 are held by public museums and private collectors . In September 2007 a Do 215 B @-@ 5 (variant of Do 17Z) was found largely intact in the shallow waters off Waddenzee in the Netherlands .

= = = Dornier Do 17Z Werknummer 1160 = = =

On 3 September 2010 , the RAF Museum announced that a Do 17 had been discovered in 50 ft (15 m) of water off the coast of England . The aircraft had been discovered in September 2008 on the Goodwin Sands , a large sandbank 6 kilometres (3 @.@ 7 mi) off the coast of Kent , but the discovery was kept a closely guarded secret . The Dornier Do 17Z @-@ 2 , Werknummer 1160 , built under license by Henschel with the full Geschwaderkennung (combat wing aircraft ID code) of 5K + AR , was operated by 7 Staffel , III Gruppe , Kampfgeschwader 3 (KG 3) .

On 26 August 1940 , 5K + AR was taking part in a raid by KG 2 and KG 3 , targeting the RAF stations RAF Debden and RAF Hornchurch . While flying over clouds , the aircraft became separated from the bomber formation and lost its bearings ; it was then attacked by Boulton Paul Defiant fighters of No. 264 Squadron RAF . One of the Dornier 's engines was disabled and the other damaged , so the wounded pilot , Feldwebel (Flight Sergeant) Willi Effmert , elected to make a crash landing on the Goodwin Sands . He and another crew member survived and were taken prisoner . The other two crew were killed ; one is buried at Cannock Chase German war cemetery and the other in the Netherlands . The identity of the Defiant that shot down the Dornier is not certain ? it may have been one of three 264 Squadron aircraft that was shot down soon after in a battle with Messerschmitt Bf 109 fighter escorts from Jagdgeschwader 3 .

In June 2010 diving operations were carried out and the survey report indicated that the aircraft was largely complete , although 5K + AR lay inverted on the seabed , indicating that it ground @-@ looped on landing . The port rudder , starboard stabiliser , forward nose glazing , undercarriage doors and engine cowling were missing , but the discovery of a small debris field associated with the wreck indicates that some or all of those parts may still be present at the site . Some items , including two of the Dornier 's six MG 15 machine guns , are missing and are believed to have been stolen by unauthorized divers sometime after the aircraft 's discovery .

It was then taken to the Michael Beetham Restoration Centre at the Royal Air Force Museum 's Cosford site , where metallurgists from Imperial College London have a significant role in the post @-@ recovery conservation of the aircraft .

= = = Dornier Do 17M @-@ 1 (Hansakollen , Norway) = = =

On 2 July 1942 , a Dornier Do 17M @-@ 1 crashed in Hansakollen in Maridalen , outside of Oslo , Norway . The Do 17 was heading to the airport at Gardermoen , but crashed into a mountainside . All three German aviators on board were killed . They are buried at the German war cemetery at Alfaset . The wreck is well preserved and remains clearly visible , over 70 years after the accident .

= = Specifications (Do 17 Z @-@ 2) = =

Data from Aircraft of the Third Reich , Fighters and Bombers of World War II and Do 17 Z @-@ 2 Baubeschreibung , April 1938

General characteristics

Crew : 4
Length : 15 @.@ 8 m (51 ft 10 in)
Wingspan : 18 m (59 ft 1 in)
Height : 4 @.@ 56 m (15 ft 0 in)
Empty weight : 5 @,@ 210 kg (11 @,@ 486 lb)
Empty equipped : 5 @,@ 888 kg (12 @,@ 981 lb) to 5 @,@ 963 kg (13 @,@ 146 lb)
Max takeoff weight : 8 @,@ 837 kg (19 @,@ 482 lb)
Fuel capacity : standard fuel 1 @,@ 540 l (339 imp gal) , with aux tank in forward bomb bay 2 @,@ 435 l (536 imp gal)
Powerplant : 2 × Bramo 323P 9 @-@ cyl. air @-@ cooled radial piston engines with 1 @,@ 000 PS (986 hp , 736 kW) for take @-@ off
Propellers : 3 @-@ bladed variable @-@ pitch propellers
Performance
Maximum speed : 350 km / h (217 mph ; 189 kn) at 8 @,@ 040 kg (17 @,@ 725 lb) at sea level
410 km / h (255 mph) at 8 @,@ 040 kg (17 @,@ 725 lb) at 5 @,@ 000 m (16 @,@ 404 ft)
Cruising speed : 300 km / h (186 mph ; 162 kn) at 8 @,@ 837 kg (19 @,@ 482 lb) at 4 @,@ 000 m (13 @,@ 123 ft)
Combat range : 660 km (410 mi ; 356 nmi) with 1 @,@ 540 l (339 imp gal) fuel and 1 @,@ 000 kg (2 @,@ 205 lb) of bombs
1 @,@ 010 km (628 mi) with 2 @,@ 435 l (536 imp gal) fuel and 500 kg (1 @,@ 102 lb) of bombs
Service ceiling : 8 @,@ 200 m (26 @,@ 903 ft)
Wing loading : 156 kg / m2 (32 lb / sq ft)
Power / mass : 0 @.@ 170 kW / kg (0 @.@ 11 hp / lb)
Armament
Guns : 6 × 7 @.@ 92 mm (0 @.@ 312 in) MG 15 machine guns in front , rear upper , rear lower and cockpit side positions
Bombs : 1 @,@ 000 kg (2 @,@ 205 lb) of bombs carried internally , either 20 x 50 kg (110 lb) bombs or 4 x 250 kg (551 lb) bombs