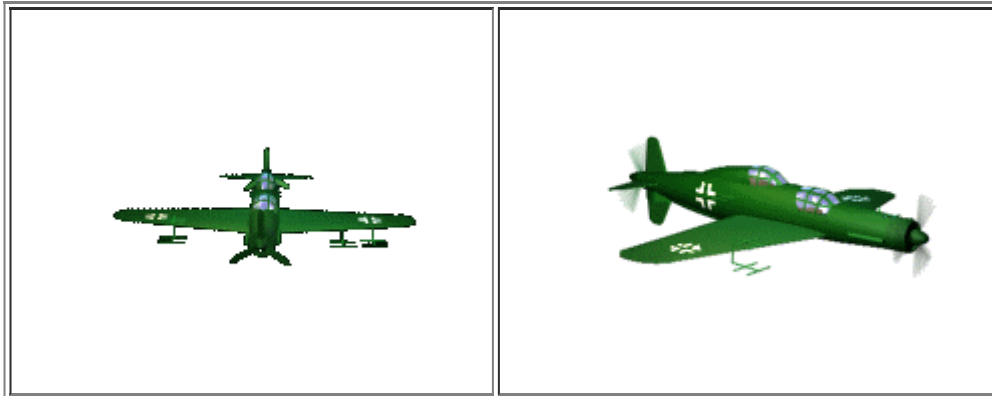


Dornier 335 "Arrow"



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Specifications & Production Details

Type: Single-seat fighter-bomber

Powerplant: Two Daimler-Benz DB603E-1 12-cylinder inverted-vee liquid cooled engines in push-pull arrangement – each rated at 1,800 hp for take-off.

Armament: One 30 mm MK103 cannon with 70 rounds, firing through the front propeller hub, and two 15 mm MG151/15 cannon with 200 r.p.g. above the nose, plus one 1,102 lb (500 kg) bomb or two 551 lb (250 kg) bombs internally and 551 lb (250 kg) bombs on underwing racks.

Performance: Max speed 474 mph (763 km/h) at 21,325 ft (6,500 m); Max cruising speed 426 mph (685 km/h) at 23,360 ft (7,100 m); Economical cruising speed 281 mph (552 km/h) at 19,685 ft (6000 m); Range on internal fuel at max continuous power 867 miles (1400 km), at economical cruise power 1,280 miles (2050 km); Time to 3,280 ft (1000 m) 55 sec, to 26,245 ft (8000 m) 14.5 min; Service ceiling 37,400 ft (11,400 m).

Weights: Empty equipped 16,005 lb (7,260 kg); Normal loaded 21,165 lb (9,600 kg).

Dimensions: Span 45 ft 3.3 in (13.8 m); Length 45 ft 5.25 in (13.85 m); Height 16 ft 4.8 in (5.0 m); Wing area 414.411 sq ft (38.5 sq m).

Table I: Do335V series prototypes (14 aircraft built at Friedrichshafen, mid-1943 to mid-1944, and tested at Mengen).

Model	Code	Werk Nr.	Notes
Do335V-1	CP+UA	230001	1st prototype. DB603A-1 engines. FF 28.10.43
Do335V-2	CP+UB	230002	to Rechlin, rear engine caught fire, w/o 15.04.44
Do335V-3	CP+UC/T9+ZH	230003	A-4 prototype, to Ob.d.L.
Do335V-4	CP+UD	230004	Do435 prototype, not completed
Do335V-5	CP+UE	230005	1st with armament fitted, A-2 engines
Do335V-6	CP+UF	230006	Dornier development a/c, hit by bomb
Do335V-7	CP+UG	230007	Junkers Jumo 213A & E testbed, Dessau
Do335V-8	CP+UH	230008	Daimler-Benz DB603E-1 testbed, Stuttgart
Do335V-9	CP+UI/V9	230009	A-0 prototype, to Rechlin May 1944
Do335V-10	CP+UK	230010	A-6 prototype night fighter with SN-2 radar
Do335V-11	CP+UL/11	230011	A-10 prototype trainer
Do335V-12	CP+UM	230012	A-12 prototype trainer
Do335V-13	RP+UA/13	230013	B-1 prototype, to France for tests
Do335V-14	RP+UB/14	230014	B-2 prototype, destroyed

Table II: Do335A-0 preproduction batch (10 aircraft built at Oberpfaffenhofen July-October 1944. One example converted to A-4 standard.

Model	Code	Werk Nr.	Notes
Do335A-0	VG+PG/101	240101	DB603A-2 engines, at Rechlin July 1944
Do335A-0	VG+PH/102	240102	sole survivor, to USAAF as FE 1012, now at NASM
Do335A-0	VG+PI/103	240103	to Ob.d.L. late July 1944
Do335A-0	VG+IJ/104	240104	to Erkdo 335 Sept 1944
Do335A-0	VG+IK/105	240105	to Erkdo 335 captured by US at Lechfeld April 1945
Do335A-0	VG+PL/106	240106	to Erkdo 335
Do335A-0	VG+PM/107	240107	to Erkdo 335
Do335A-0	VG+PN/108	240108	to Erkdo 335
Do335A-0	VG+PO/109	240109	to Erkdo 335
Do335A-0	VG+PP/110	240110	to Erkdo 335 October 1944

Table III: Do335A-1 production batch (11 aircraft built at Oberpfaffenhofen, plus 9 aircraft partially assembled, November – April 1945).

Model	Code	Werk Nr.	Notes
Do335A-1	113	240113	Captured by US
Do335A-1	—	240161	Captured by US
Do335A-1	—	240162	Captured by US
Do335A-1	—	240163	Captured by US
Do335A-1	—	240164	Captured by US

Do335A-1	—	240165	Captured by US
Do335A-1	—	240166	Captured by US
Do335A-1	—	240167	Captured by US
Do335A-1	—	240168	Captured by US
Do335A-1	—	240169	Captured by US
Do335A-1	—	240170	Captured by US
Do335A-1	01	240301	Partly assembled; captured by US
Do335A-1	02	240302	Partly assembled; captured by US
Do335A-1	03	240303	Partly assembled; captured by US
Do335A-1	04	240304	Partly assembled; captured by US
Do335A-1	05	240305	Partly assembled; captured by US
Do335A-1	06	240306	Partly assembled; captured by US
Do335A-1	07	240307	Partly assembled; captured by US
Do335A-1	08	240308	Partly assembled; captured by US
Do335A-1	09	240309	Partly assembled; captured by US
Do335A-2	—	—	Project only
Do335A-3	—	—	Project only

Table IV: Do335A-4 (10 aircraft scheduled January – February 1945; only four partially assembled at Oberpfaffenhofen).

Model	Code	Werk Nr.	Notes
Do335A-4	10	240310	Partly assembled; captured by US
Do335A-4	11	240311	Partly assembled; captured by US
Do335A-4	12	240312	Partly assembled; captured by US
Do335A-4	13	240313	Partly assembled; captured by US

Do335A-6: none assembled, Heinkel Vienna factory bombed out.

Table V: Do335A-10 (aircraft built at Oberpfaffenhofen).

Model	Code	Werk Nr.	Notes
Do335A-10	111	240111	Flew late Nov 1944; captured by US at Oberpf.
Do335A-10	—	240114	Not completed

Table VI: Do335A-12 (two aircraft built at Oberpfaffenhofen, plus 2 aircraft partially assembled).

Model	Code	Werk Nr.	Notes
Do335A-12	112	240112	Air Ministry 225, to RAE, w/o 18 Jan 1946
Do335A-12	121	240121	to England, w/o 13 Dec 1945
Do335A-12	122	240122	Not completed, scrapped by US
Do335A-12	—	—	Partly assembled

Table VII: Do335B series prototypes. (six aircraft partially assembled at Oberpfaffenhofen).

Model	Code	Werk Nr.	Notes
Do335B-2	RP+UB 14/18	240118	B-2 replacement proto, to France with CEV until 4.6.48

Do335V-15	RP+UC 15/19	240119	B-1 2nd prototype to Lwe February 1945
Do335V-16	RP+UD 16/20	240120	B-2 2nd prototype night fighter with FuG 218
Do335V-17	RP+UE 17/16	240116	B-6 prototype to France Autumn 1945
Do335V-18	RP+UF 18/17	240117	B-6 2nd prototype night fighter to Lwe February 1945
Do335V-19	RP+UG 19/15	240115	B-3 prototype; not completed
Do335V-20	—	—	B-7 prototype; not completed
Do335V-21	—	—	B-8 prototype; not completed
Do335V-22	—	—	B-8 2nd prototype; not completed

Photos



- [View](#) Photo 1: Do335 with American markings (11K, B&W).
- [View](#) Photo 2: View of rear propeller (9K, B&W).
- [View](#) Photo 3: View of left side (8K, color).
- [View](#) Photo 4: Alternate view of left side (10K, B&W).
- [View](#) Photo 5: View of right side from front (10K, B&W).
- [View](#) Photo 6: View of left side showing landing gear (8K, B&W).

Development History and Technical Overview

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Introduction

As the Second World War in Europe drew to a close, a powerful new twin- engined fighter was preparing to enter service with the Luftwaffe. The unique configuration of this aircraft conferred on it a phenomenal performance, which completely eclipsed all of its contemporaries; whilst its potential for devastating the massive Allied bomber streams that almost daily pounded the Reich was rivalled only by the Me262 jet. This amazing machine was the piston-engined Dornier Do335.

Aircraft designers are constantly seeking to maximize engine power and minimize drag. The increased power resulting from the adoption of a twin- engined layout, is normally partially offset by the increased drag and reduced manoeuvrability of an orthodox wing-mounted arrangement. An alternative arrangement, with the two engines mounted fore-and-aft in tandem is known as centre-line thrust. With the power from both engines being delivered along the aircraft centre-line, the obvious benefits of this layout include reduced frontal area, an aerodynamically clean wing and the elimination of the asymmetry problems associated with engine failure.

The Dornier Do335 was a bold attempt to embody the centre-line thrust concept in a practical and efficient airframe. Its unique layout featured a conventional nose mounted engine and tractor airscrew, together with a second engine located in the rear fuselage, driving a pusher propeller situated aft of the tail unit.

Flying Boats

The origins of the Dornier Do335's novel layout go back to the First World War. During the war Prof. Claude Dornier designed a number of flying boats, which typically featured a tandem engine installation. The engines were mounted back-to-back in pairs, with the forward unit driving a tractor airscrew and the aft facing unit a pusher propeller. This engine arrangement was subsequently adopted for the highly successful Dornier DoJ Wal (Whale) flying boat of 1922.

In 1935 Dornier produced the Do18, a much improved development of the Wal concept. To enable the pusher propeller to clear the trailing edge of the broad chord wing featured on this type, an extension drive shaft from the rear engine was introduced for the first time. The idea of placing the pilot between the two engines in such an arrangement obviously occurred to Dornier. Indeed, on 3rd August 1937 he filed patent number 728044 for an aircraft of just such a configuration. It was on the basis of this patent that the Do335 came to be developed.

During 1939 Dornier was busy working on the P.59 high speed bomber project, which featured the tandem engine layout patented earlier. Work on the P.59 was stopped in early 1940 when Reichsmarschall Goering, anticipating a quick end to the war, ordered the cancellation of all work which would not see fruition within a year or so.

Despite this setback, Dornier soon began working on another unarmed high speed bomber project - the P.231. With an internal bomb load of 2200 lb, this design used a similar configuration to that of the P.59. In May 1942 Dornier submitted a refined version of the P.231 design in response to a Technische Amt requirement for a single seat high speed bomber. The Dornier proposal was selected as the winner after beating rival designs from Arado and Junkers. Despite official resistance to the unconventional layout, a development contract was awarded under the RLM designation Do335.

Change Of Role

In the Autumn of 1942, with detail design progressing, Dornier were informed by the RLM that the Do335 was no longer required. In the light of the massive Allied air raids which had begun that year, the aircraft was to be redesigned as a multi-role fighter of broadly similar

performance. Capable of duties as a single-seat fighter bomber, high speed reconnaissance, heavy fighter, and two seat night and all-weather interceptor.

However, the Technische Amt delayed issuing a formal contract, and Dornier eventually turned to the Inspector-General of the Luftwaffe, Generalfeldmarschall Milch, to expedite matters. The necessary redesign had been completed, and the first metal cut on the prototypes at Oberpfaffenhofen by the end of 1942.

As construction of the prototypes proceeded, the war situation was growing more serious. On 7 June 1943, Hitler himself intervened to expedite the Do335 and Me262 programmes. However, on 7 Sept 1943 Messerschmitt persuaded Hitler that the Me262 would be a better suited as a high speed bomber than the Ar234 or Do335, and the Me262 received sole priority. This was despite the fact that the Do335's bomb load was twice that of the Me262. Milch's advocacy of the other two types was brushed aside.

Fitted with Daimler-Benz DB603A-2 engines delivering 1750 hp at take-off, the first example, Do335 V1 (CP+UA), flew for the first time on 26 October 1943 from Mengen, Wurttemberg, with Flugkapitan Hans Dieterle at the controls.

Unusual Features

Aside from its unusual engine layout, the design incorporated several other unusual features. These included a reversible-pitch tractor airscrew, to shorten the rather long landing run; a wing leading edge de-icing system; hydraulically operated flaps; a tunnel radiator for the rear engine and a compressed air powered ejection seat. The latter being essential for a safe bale-out clear of the rear propeller, although the vertical tail and propeller could be jettisoned by explosive bolts when required.

After initial handling trials at Oberpfaffenhofen, the Do335 V1 was ferried to the Rechlin Erprobungstelle for official evaluation. Although some snaking and porpoising was found at high speeds, the Rechlin test pilots were generally enthusiastic. They commented favourably on its general handling behaviour, manoeuvrability and in particular on its acceleration and turning circle. However, they also criticized the very poor rearward vision and weak undercarriage.

Development Aircraft

During the Winter and Spring of 1943-44, the first prototype was joined on the test programme by additional development aircraft. The Do335 V2 (CP+UB) and V3 (CP+UC/T9+ZH) incorporated several minor changes with respect to the first prototype. The oil cooler intake under the nose was deleted and incorporated into an enlarged annular engine cowling; blisters were added to the cockpit canopy to house small rear view mirrors, and the main undercarriage doors were redesigned. Both aircraft were retained at Oberpfaffenhofen for further flight trails.

The Do335 V4 was intended to be the prototype for the two-seat Do435 night and all-weather interceptor, featuring side-by-side seating, cabin pressurisation, 2500 hp Jumo 222 engines and long span wooden outer wing panels. It was cancelled by the RLM in the Autumn of 1944 whilst still under construction.

The Do335 V5 (CP+UE) was the armament test prototype, fitted with a 30 mm engine mounted MK103 cannon, and two 15 mm MG151 cannon mounted in the upper nose. The Do335 V6 (CP+UF) and V7 (CP+UG) were retained at Oberpfaffenhofen for various equipment trials. The V7 later being transferred to Junkers at Dessau for ground tests with Jumo 213 engines installed. The Do335 V8 (CP+UH) was used as an engine test bed, by Daimler-Benz.

The main production line was intended to be at Manzel, but a bombing raid in March 1944 destroyed much of the production tooling and forced Dornier to set up a new line at

Oberpfaffenhofen.

On 23 May 1944, with an Allied invasion of France expected at any time, Hitler ordered maximum priority to be given to the Do335 production effort. The decision was made to cancel the Heinkel He219, and use its production facilities for the Do335. However, Ernst Heinkel resisted the cancellation, and managed to delay (and eventually ignore) its implementation.

The Do335 V9 (CP+UI) was the prototype for the Do335A-0 pre-production model. Fitted with a strengthened undercarriage, DB603A-2 engines, and full armament, it was delivered to the Rechlin Erprobungstelle in May 1944 for further official trials. It was shortly followed off the Oberpfaffenhofen production line by the first Do335A-0 (VG+PG). In all, ten Do335A-0 fighter-bombers were produced. Several were used by Erprobungskommando 335 (EK335), formed in September 1944 for the service evaluation and development of operational tactics for this new type.

In late 1944, the Do335A-1 superseded the A-0 on the production line. This was the initial production model, similar to the A-0 but with the uprated DB603E-1 engines and two underwing hard points for additional bombs or drop tanks. Delivery commenced in January 1945.

Capable of a maximum speed of 474 mph at 21,325 ft with MW 50 boost, or 426 mph without boost, and able to climb to 26,250 ft in only 14.5 minutes, the Do335A-1 could easily outpace any Allied fighters it encountered. It could also carry a bomb load of 1100 lb for 900 miles.

Although given the nickname 'Pfeil' (arrow) by Dornier test pilots, on account of its speed, service pilots quickly dubbed it 'Ameisenbaer' (ant-eater) because of its long nose.

Later Versions

The Do335A-2 And A-3 were proposed developments with improved cannon armament, but were never built. One Do335A-0 became the prototype for the Do335A-4. This was an unarmed long range reconnaissance model, with two Rb50/30 cameras in the weapons bay and DB603G engines. Ten A-4s were ordered for production, but none were completed.

The Do335 V10 (CP+UK) was the prototype for the Do335A-6 radar equipped two-seat night fighter variant. A second cockpit for the radar operator was inserted above and behind the normal cockpit. The weapons bay was replaced by a redesigned fuel tank, radar antennae were attached to the wing leading edges and flame dampers fitted to the exhausts. However, the FuG217 radar equipment was never actually fitted to the V10. Production of the A-6 was transferred to Heinkel in Vienna, but none were assembled.

The Do335 V11 (CP+UL) and V12 (CP+UM) were prototypes for the Do335A-10 and A-12 dual control conversion trainers respectively. The former having DB603A engines and the latter DB603E powerplants. The instructor occupied the second cockpit - although without an ejection seat, due to production shortages. Production examples were interspersed with the A-1 on the same production line.

As the war situation continued to deteriorate, development effort switched from the A-series fighter-bomber to the more heavily armed B-series heavy fighter. The Do335 V13 (RP+UA) was the prototype of the Do335B-1 which featured a revised nose undercarriage arrangement - the larger wheel being tilted at 45 degrees when fully retracted, a V-shaped armoured windscreen and DB603E engines. Its weapons bay was replaced by an additional fuel tank, and the two 15 mm MG151 cannon in the nose replaced by 20 mm MG151s. The B-4 prototype, Do335 V14 (RP+UB) had this armament supplemented by two 30 mm MK103 cannon mounted on the inner wing leading edges. Only the two B-series prototypes were actually completed and flown - further developments were still under construction, some with two-stage supercharger DB603LA engines capable of 2100 hp.

Plagued by mechanical unreliability and lack of aviation fuel, the operational career of the Do335 is rather obscure. Do335A-0 and A-1 aircraft are thought to have flown a number of operational missions with EK335. Some were also used by III/KG2 in the Spring of 1945. There is no evidence of the type being met in combat, so it seems likely that all the operations were high speed interdiction missions - many taking place at night.

Production Numbers

When the US Army overran the Oberpfaffenhofen factory in late April 1945, only 11 Do335A-1 single seat fighter-bombers and two Do335A-12 conversion trainers had been completed. A further nine A-1's, four A-4's and two A-12's were in final assembly, and components and assemblies for nearly 70 more had been completed. Heinkel at Vienna had been unable to build any Do335A-6 night fighters.

A number of planned developments of the Do335 were on the drawing board when the war ended, including several big-winged high altitude fighter versions, the Do535 with a jet rear engine, the Do635 (later Ju 8-635) long range reconnaissance version which featured twin fuselages linked by a common wing centre section, and the P.256 twin jet fighter.

As part of Operation Seahorse, two of the surviving A-0 single seaters were put aboard the US aircraft carrier 'Reaper' and shipped back to the USA, for detailed evaluation by the US Navy. The two airworthy A-12 two seaters were flown to Britain and flight tested at RAE Farnborough. Both were destroyed in crashes. Two of the B-series prototypes were also evaluated by the CEV in France.

Today, the sole remaining example of this unique type is on display at the National Air and Space Museum in Washington DC. Do335A-0 VP+GH (Wk Nr. 240102) was one of the two examples evaluated at the US Navy's Patuxent River Test Center in 1945. Thereafter, it languished in open storage for 27 years in the grounds of the NASM storage facility at Silver Hill. In October 1974 the decaying airframe was flown back to Munich, for a complete restoration by Dornier Aircraft at Oberpfaffenhofen (then building Alphajets). The magnificently restored aircraft was first displayed at the Hannover Airshow, 1 – 9 May 1976, and then loaned to the Deutsches Museum, Munich, for a several years before returning to the NASM.

Conclusion

Technically innovative, heavily armed, and possessing a performance which no other piston-engined aircraft has ever achieved or surpassed, the Do335 possessed great potential as a combat aircraft, but never got the chance to prove itself. Delayed by high ranking indecision and Allied bombing raids, it simply ran out of time.

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